

MUNICIPALITY OF EAST HANTS

P.O. Box 190 Shubenacadie, N. S. B0N 2H0

MUNICIPALITY OF THE DISTRICT OF EAST HANTS

MUNICIPAL SERVICES SYSTEMS GENERAL SPECIFICATIONS

(Revised to June 15, 1999)



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1.0 INTRODUCTION / GENERAL REQUIREMENTS

This document has been prepared for use with and shall be read in conjunction with the "Standard Specification for Municipal Services" as published by the Nova Scotia Road Builders Association – Nova Scotia Consulting Engineers Association Joint Committee on Contract Documents. In case of discrepancy, the more stringent requirement shall apply.

These design standards and guidelines have been prepared for: setting minimum design and construction standards for Municipal Services Systems within the Municipality of East Hants (MEH); to list and suggest limiting values for items upon which an evaluation of such designs will be made by the reviewing authority; and to establish uniformity of practice in the Municipality. A complete documentation of all parameters relating to the design and construction of municipal services is beyond the scope of this document; however, an attempt has been made to touch upon the parameters of greatest importance and to present the policies and accepted procedures of MEH.

These Municipal Services Systems General Specifications shall apply to all proposed developments in the serviceable areas of the Municipality of East Hants.

The purpose of this document is to provide guidance for Designers in the provision of Municipal Services Systems meeting these criteria, but also consistent with cost effective installation, operation and maintenance. The design of these services, when submitted to MEH, must be under the seal of a Professional Engineer in accordance with the Nova Scotia Engineering Profession Act.

This document is not intended to eliminate the necessity for detailed design, rather it is intended to standardize the materials, design criteria and method of construction to be utilized in the installation of municipal services. Further, it is not the intention of MEH to stifle innovation. Where, in the judgment of the Design Engineer, variations from this document are justified or required and where the Designer can show that alternate approaches can produce the desired results, such approaches will be considered for approval. In considering requests for variations from these design criteria, the Director of Operational Services (DOS) shall take into consideration such factors as safety, nuisance, system maintenance, operational costs, life cycle costs, environmental issues, natural topography, configuration of the bulk land, etc..

These Specifications were prepared mainly to provide standards for Sanitary Sewage Collection and Water Distribution Systems.



Notwithstanding the consideration for approval from the DOS, all systems designed shall comply with the latest edition of the "Nova Scotia Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage" and shall have all approvals to construct from the Nova Scotia Department of the Environment (NSDOE). The most stringent requirements shall prevail between standards.

Each submission shall be accompanied by a statement from a Professional Engineer that the submission is in accordance with these Specifications except, if there are variations, the Designer shall indicate clearly, in all appropriate documents and plans included with the submission, the specific variances from the Design Standards. Also, where the Designer uses standards other than those outlined in this document, all appropriate documents and plans shall clearly indicate those areas of difference.

The acceptance by MEH of the design of proposed Municipal Services Systems does not relieve the Design Engineer of the responsibility for proper design, nor does it imply that MEH has checked the design exhaustively for compliance with this document. The Design Engineer retains full responsibility and liability for his/her work as a Professional Engineer. Where MEH has accepted a design which does not comply with these standards and where the Design Engineer has not brought variations from this document to the attention of the DOS, the provisions of this document still stand.

The Designer shall assess the possible changes in groundwater movement caused by the development (in particular the use of pervious bedding material) and shall be responsible for the design of corrective measures to prevent flooding or lowering of the groundwater table as a result of this groundwater movement. If requested by the DOS, the Designer shall provide a report prepared by a geotechnical engineer on the effectiveness of the proposed corrective measures.

All service systems shall conform to this document as well as any more stringent requirements established by other authorities having jurisdiction within MEH. In addition to these design criteria, and in any case where this document requires expansion or clarification, the latest revisions of all applicable and relevant codes and standards shall be used for reference by the Designer. These documents include, but are not limited to, the latest edition of:

- "Standard Specification for Municipal Services", prepared by the Nova Scotia Road Builders Association and the Nova Scotia Consulting Engineers Association
- "Nova Scotia Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage", prepared by the Nova Scotia Department of the Environment
- American Water Works Association Standards



- “Water Supply for Public Fire Protection”, prepared by the Fire Underwriters Survey - Insurers Advisory Organization (IAO)
- National Fire Protection Association (NFPA)
- Hydraulic Institute Standards
- Canadian Standards Association (CSA)
- National Building Code (NBC) of Canada
- National Plumbing Code (NPC) of Canada
- National Fire Code (NFC) of Canada
- Canadian Electrical Code (CEC)
- Underwriters Laboratories of Canada (ULC)
- National Electrical Manufacturing Association (NEMA)

All contract documents prepared for municipal services within MEH shall contain a clause requiring the Applicant and the Applicant's contractors and sub-contractors to carry out all work in compliance with all applicable Municipal, Provincial and Federal Regulations, including, but not limited to, the Occupational Health and Safety Act of the Province of Nova Scotia.

Any available recorded engineering drawings of municipal services will be provided to the Designers for their information only. Designers are responsible to verify the information in the field prior to any detailed design.

No services shall be constructed until the design has been approved by the DOS. The DOS' decision shall be final and binding in matters of design and construction. No alternatives to the construction of the design are permitted unless approved in writing by both the Designer and the DOS.

All permits and approvals from the Nova Scotia Departments of Environment and Transportation & Public Works and other applicable regulatory authorities shall be obtained by the Applicant or their agent. Copies of the approved permits and approvals shall be submitted for consideration by the DOS prior to recommending Tentative Approval as part of the municipal approval process. Further information on submission requirements is included in Section 5.0 of this document.

Upon Tentative Approval, a meeting between MEH and the Applicant's contractor and Design Engineer (or other Professional Engineer who will be inspecting the construction) is required prior to commencing construction. Construction documents must include all pertinent requirements stipulated in MEH approval documents or required by other agencies.

Prior to receiving Final Approval, a dylar copy of the original recorded drawing (reviewed and revised as per MEH comments) and three paper copies will have to be delivered to the Municipal Office.



The design shall comply with the Municipality's Master Plans for water and sanitary systems.

MEH will periodically revise the design criteria, guidelines and specifications contained in this document to conform with advances and improvements in engineering practices. The changes will be noted in a revision record and will be available to users of this document. It is the responsibility of the Designer to remain current with revisions to this document.



2.0 DEFINITIONS

.1 Approval

The approval of the Director of Operational Services (DOS). The DOS' decision will be final and binding in all matters of design and construction. However, the DOS does not certify any installations, procedures, equipment, or materials nor does he/she approve or evaluate testing laboratories. Approvals will be based on compliance with these Specifications and/or other appropriate standards as indicated throughout this document. Tentative Approval and Final Approval are as defined in MEH's Subdivision Bylaw.

.2 Corridor Area

The Corridor Area within the Municipality of East Hants extends from the community of Enfield to the community of Shubenacadie inclusive and is bound by Highway No. 102 and the Shubenacadie River.

.3 Council

The Municipal Council of the Municipality of the District of East Hants.

.4 Design Engineer or Designer or Engineer

The Professional Engineer representing the Applicant, who has affixed their professional seal to the Engineering drawings, plans, and specifications for the proposed development. This person must be registered and/or licensed to practice engineering in the Province of Nova Scotia.

.5 Developer or Applicant

The owner of the area of land proposed to be developed and includes anyone acting on their behalf with their written consent.

.6 Development

Development includes any erection, construction, addition, alteration, replacement or relocation of or to any building or structure, and any change or alteration in the use made of land, buildings or structures.



.7 Diameter

The nominal internal diameter of the pipe unless noted otherwise.

.8 Director of Operational Services

The appointed Director of Operational Services (DOS) of the Municipality of East Hants or his/her authorized representative as designated in writing by the DOS to act in his/her absence. The DOS reports to the Chief Administrative Officer (CAO) for MEH.

.9 Feeder Main

A water main which typically receives flow from transmission mains or from pressure control facilities (i.e. booster pumping stations or pressure reducing valves) and which supplies water to several branch mains (distribution mains). The feeder main provides a significant carrying capacity or flow capability to a large area.

.10 Floodplain

The relatively flat or lowland area adjoining a river, stream, watercourse, ocean, lake or other body of standing water which has been or may be covered temporarily with floodwater during storms of specified frequency.

.11 Municipality

Municipality of East Hants (MEH) or the Municipality of the District of East Hants.

.12 Municipal Services Systems

Municipal Services Systems include sanitary sewer collection and treatment systems and water distribution and treatment systems which are, or are to be, owned, operated and maintained by MEH.

.13 NSDOE

The Nova Scotia Department of the Environment.

.14 NSDOT&PW

The Nova Scotia Department of Transportation and Public Works.



.15 Provincial Regulation

The requirements and provisions of the Province of Nova Scotia contained in any Provincial Statute or in any Regulation or Order made pursuant to the authority of any Statute of Nova Scotia.

.16 Public Water Utility or Water Utility

The water utility controlled by the Municipality of East Hants including the East Hants Regional Water Utility and the Shubenacadie Water Utility.

.17 Public Works

The Public Works Department (PW) of the Municipality of East Hants. The appointed PW staff of the Municipality of East Hants or their authorized representative as designated by the DOS in writing to act in their absence. PW report to the DOS for MEH.

.18 Sanitary Sewage

The spent water from a community consisting of liquid conveying solids from residential, industrial, institutional and commercial buildings but excluding storm water or surface run-off and groundwater. It does not include contaminated liquid wastes or sewage at concentrations greater than that commonly found in domestic sewage.

.19 Sanitary Sewage Collection System

The system consisting of all pipes, mains, equipment, buildings and structures for collecting and pumping of sanitary sewage (including trunk sewers and pumping stations) operated by the Municipality of East Hants. It is designed to collect and convey sanitary sewage from its point of origin to a disposal or treatment location.

.20 Sewer Lateral

Lateral or service lateral, as used throughout this document, is synonymous with Building Service Connection as defined by MEH. Sanitary sewer lateral means the pipe which conveys sanitary sewage from the street line to the main sewer and includes the inspection port, if provided.



.21 Service Easement

In the event that sanitary and/or water services are installed outside of public right-of-ways (ROW), the Applicant shall provide a service easement in favor of the Municipality. The service easement shall be constructed to provide access by maintenance vehicles including service trucks and heavy equipment.

.22 Sewer

Pipe or conduit for carrying sanitary sewage, groundwater, stormwater or surface run-off and includes all sewer drains, storm sewer, clearwater sewers, storm drains and combined sewers.

.23 Street Line

Limit of the public road right-of-way (ROW) or the limit of the service easement.

.24 Subdivision

The division of any area of land, whether by plan or by metes and bounds or by description or otherwise, into two or more parcels and includes a re-subdivision and a consolidation of two or more parcels.

.25 Wastewater

Any liquid waste containing animal, vegetable, mineral or chemical matter in solution or suspension carried from industrial sectors.

.26 Watercourse

The bed and shore of every river, stream, lake, creek, pond, spring, lagoon, swamp, marsh, wetland, ravine, gulch or other natural body of water and the water therein, including groundwater within the jurisdiction of the Province, whether it contains water or not. (Reference – The Environment Act – Revised Statutes of Nova Scotia).



.27 Water Distribution System

The system which is owned and maintained by the Public Water Utility and which consists of watermains, water service laterals from the watermains to street lines and appurtenances carrying and distributing potable water for domestic and/or fire protection purposes and includes any pumping stations, pressure control facilities and reservoirs.

.28 Water Service Lateral

Pipe that conveys water from a watermain to the street line or the limit of a service easement.





PART A – DESIGN STANDARDS

3.0 SANITARY SEWAGE COLLECTION SYSTEM

3.1 SCOPE

The sanitary sewage collection system must meet the requirements of the Municipality before the system will be considered for takeover. The following are minimum requirements to consider in the system design and are intended to provide a directive to the Design Engineer responsible for design and construction of Municipal Services Systems in East Hants.

In addition to these design criteria, all systems shall conform to any more stringent requirements established by other authorities having jurisdiction such as the current version of the NSDOE “Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage”. No systems shall be constructed until the design has been approved by the DOS, the approval process followed and a permit to construct obtained from NSDOE.

Take note that industrial, institutional, or commercial sewage shall only be discharged to the Municipality’s Sanitary Sewage Collection System in accordance with the requirements as described in the Municipality of East Hants Sewer Bylaw. If the strength of the industrial wastewater is greater than domestic, pre-treatment prior to discharge will be required.

3.2 GRAVITY SYSTEMS

3.2.1 General

The sanitary sewage collection system shall be designed for flows generated from all lands naturally tributary to the drainage area as determined from contour plans regardless of the ownership of such lands. Any lands tributary by pumping or regrading which are at present or anticipated to flow through the design area shall be included in the calculated flows for the system being designed. Areas outside of the serviceable boundary or deemed undevelopable by MEH may be excluded at the discretion of the DOS.

With respect to depth of cover and grade of sewer mains, the design of the system shall take into consideration possible future extensions so that, wherever practical, those mains shall be installed at a sufficient depth to service adjoining lands.



The sanitary sewage collection system shall be designed for a gross population density of 18 persons per acre (45 persons per hectare). An increase in this density may be required depending on the projected land use or zoning of the tributary area. Any increase in population density or sewage design flows shall be dependent upon the available downstream capacity of the system.

Average dry weather flows shall be calculated on the basis of an allowance of 75 Imperial gallons per person per day (340 liters/person/day).

Design Peak Flows shall be calculated based on an allowance of 328 Imperial gallons per person per day (1,490 liters per person per day) plus an infiltration allowance of 1,080 Imperial gallons per acre per day (12,130 liters per hectare per day).

3.2.2 Pipe

PVC DR 35 or DR 26 (if loading dictates) pipe in any size or non-reinforced concrete pipe up to 10 inch (250 mm) diameter shall be used for sanitary sewer main installations in the Municipality unless approved otherwise by the DOS.

3.2.3 Hydraulic Design

The capacity of the sanitary sewage collection system shall be calculated using the Manning formula or its appropriate nomograph. The value of the Manning roughness coefficient (n) for PVC pipe shall be 0.010 and for concrete pipe shall be 0.013. For other types of materials, the value of (n) shall be approved.

Under design flow conditions from the tributary area when fully developed, sanitary sewage flow velocities shall be a minimum of 2 feet per second (0.6 metres per second) and a maximum of 15 feet per second (4.6 metres per second). Should the site conditions require a higher pipe velocity, special provisions shall be made to protect against displacement by erosion and shock as approved by the DOS.

Where complete development in the upper reaches of the sewershed is expected to be delayed, consideration shall be given to cleansing velocities in each phase.



3.2.4 Minimum Pipe Size and Grade

Sanitary sewage collection system mains shall have a minimum grade of one percent (1%) unless otherwise agreed to by the DOS. Under special conditions, slopes less than one percent (1%) may be permitted. Such decreased slopes 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. The slope shall be selected to obtain the greatest practical velocities to minimize settling problems.

Sanitary sewage collection system mains shall be a minimum of 8 inches (200 mm) in diameter. The DOS may require a larger diameter under special conditions.

3.2.5 Depth

In general, sewers shall be deep enough to prevent freezing (greater than 4 feet (1.2 m) of cover) and prevent sewage from entering basements. If site specific conditions are such that sewers cannot be placed at a depth to prevent freezing, insulation shall be used as approved by the DOS.

The depth of sanitary sewer mains as measured from the design road grade at finished asphalt surface to the crown of the pipe shall not exceed a maximum of 14 feet (4.3 m). 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 m). 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 installation of all laterals at manholes, or other means approved by the DOS. Long radius bends for service laterals shall be installed on undisturbed material or compacted bedding to the approval of PW.

Notwithstanding the above, the depth of sanitary sewer mains shall not be less than the depth required to service adjoining land by gravity or 4 feet (1.2 m) to crown of pipe, whichever is greater unless approved otherwise by the DOS.

3.2.6 Location

The sanitary sewer shall be installed along one side of the street, preferably the side with the most service connections. Extra manholes may be required on turns.

Sanitary sewer mains shall be placed under road shoulder. Watermains shall be placed parallel to and on the street side of the sanitary sewer main. Deviation from the desired location shall be approved by the DOS.



Construction of sewer mains outside of NSDOT&PW or Municipal road ROW's shall be avoided. Where it is necessary, a minimum 20 feet (6.1 m) service easement in favor of the Municipality shall be provided. For service easements containing more than one pipe, the minimum width shall be 20 feet (6.1 m) plus the distance between the pipes. Depending on the soil conditions, depth of pipe and other site specific requirements, additional width for service easement may be required. Service easement shall be centered on the services and shall be constructed to provide convenient access by maintenance vehicles including service trucks and heavy equipment. Service easements shall be of sufficient width to allow safe access to the pipe line in accordance with the requirements of the Municipality of East Hants Occupational Health and Safety Policy and the Occupational Health and Safety Act of the Province of Nova Scotia.

Sanitary sewers shall not be located in drainage courses. Sewers located along streams shall be located outside of the stream bed and sufficiently remote to provide for future possible stream widening and to prevent pollution by siltation during construction. Where sewers are required to cross streams, the alignment should be as perpendicular to the stream as possible and free from change in grade. The cover depth and construction methods when sewer enters or crosses streams must adhere to the requirements of NSDOE.

Where a need is identified by the DOS to accommodate future upstream lands naturally tributary to the drainage area, a service easement shall be provided from the edge of the street ROW to the upstream limit of the subdivision.

3.2.7 Manholes

A manhole shall be provided on a sanitary sewer main at any change in pipe size, material, grade or horizontal alignment and at all pipe intersections. The interval between manholes shall not exceed 300 feet (90 m) unless approved otherwise by the DOS. Extra manholes may be required on turns. Sewer bends shall not exceed 90 degrees. Manholes shall be precast and all manhole joints shall be water tight.

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

- (a) Minimum drop across manholes for pipes of similar diameters shall be
 - (i) Straight run – 0.10 feet (30 mm).
 - (ii) Deflections up to 45 degrees – 0.10 feet (30 mm)
 - (iii) 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.
- (c) At the connection of a local sewer main to a trunk sewer main (12 inches (300 mm) diameter or larger), the local sewer main invert shall be no lower than the 0.75 ID (inside diameter) point of the trunk sewer main.
- (d) A drop manhole shall be constructed when the vertical drop between incoming pipe invert and manhole base exceeds 3 feet (900 mm).
- (e) Drop manhole shall be with an:
Exterior drop when manhole is 42 inches (1050 mm) diameter or
Interior drop for manholes larger than 42 inches (1050 mm) diameter and
as per L.E. Shaw Limited's design or approved equivalent.

All sanitary sewer manholes shall be positioned so as to prevent the infiltration of surface water or groundwater. Manholes should not be located at or near the following locations:

- (a) Drainage ditch or swale inverts.
- (b) Roadway gutters or low points.
- (c) Any location where expected flooding levels during a major storm event will reach the level of the manhole frame and cover.

In some situations where manholes cannot be easily relocated from the areas noted above, the use of berms and/or watertight frames and covers may be required by the DOS.

The minimum internal diameter of a manhole shall be 42 inches (1050 mm). The Design Engineer shall ensure that the internal diameter is adequate to accommodate all pipe and appurtenances in accordance with manhole manufacturer's recommendations. At a three- way intersection, the manhole shall be a minimum diameter of 48 inches (1200 mm).

3.2.8 Service Laterals

Minimum size sanitary sewer lateral piping shall be 4 inches (100 mm) in diameter. The connection to the main shall be made with a manhole if the lateral is greater than 4 inches (100 mm) in diameter.

All service laterals shall be installed according to the following provisions:

- (a) All laterals shall be constructed with white PVC DR 28 pipe conforming to CSA standards.



- (b) A single sanitary sewer lateral shall be supplied and installed to each existing lot or potential future lot which could be created under the zoning in effect at the time of installation of services.
- (c) The lateral shall be laid at a minimum grade of two percent (2%). The Design Engineer shall ensure that where the grade is greater than the minimum, it shall adequately service the intended structure.
- (d) All sewer laterals, from the main to the building, shall be provided by the Developer or the property owner.
- (e) All sewer laterals, from the main to the property line, shall be inspected and approved by PW **before** backfilling.
- (f) All sewer laterals shall be tested for exfiltration.
- (g) All sewer laterals shall be capped at the lot line with a 4x4x4 tee and a 2x4 marker indicating depth of bury.
- (h) The minimum proposed elevations of sanitary sewer lateral inverts at property lines shall be indicated on Engineering Drawings and confirmed on Engineering Record Drawings.

It is recommended that a grading plan showing minimum basement floor elevations be prepared to ensure that drainage water is kept away from the sanitary sewer lines.

3.2.9 Back-Water Valves

Sanitary sewer back-water valves are required in any building which has a sewer related fixture located below the level of roadway or sewer service easement. The back-water valves are to be located and installed in accordance with the requirements of the National Plumbing Code of Canada. The back-water valves shall be readily accessible for maintenance purposes. Maintenance shall be the responsibility of the property owner.

3.3 PUMPED SYSTEMS

3.3.1 Design Flows

Pumping stations, pumps and forcemains shall be designed for the ultimate sanitary sewer flows from the tributary drainage area as described in Section 3.2.1.

Pumping stations shall be provided when, in the opinion of the DOS, a gravity system is either not possible or not economically feasible. (These specifications govern smaller or "submersible" type pumping stations with ultimate capacity of 1000 IGPM (75 L/sec) or smaller. Larger capacity pumping stations will be evaluated by the DOS on a site-specific basis).



The design shall ensure the safety of operations, in accordance with all applicable Municipal, Provincial and Federal regulations, including the Occupational Health and Safety Act and applicable CSA Standards and NSDOE "Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage".

Equipment that starts automatically shall be suitably designed to ensure that 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. All moving equipment shall be covered with suitable guards to prevent accidental contact.

Where auxiliary power supply buildings are provided, they shall include water, hot water and wash-up station facilities.

3.3.1.1 Private Pumps

Where private or on-site pumps are required, such installations shall be designed by a Professional Engineer. The Design Engineer shall indicate on the drawings those locations requiring private pumping installations. These private pumps shall be owned and operated by the property owner. Each property shall be independently serviced to the main sewer.

3.3.2 Pumping Stations

3.3.2.1 Wet Well Size

For any pumping station, the wet well shall be of sufficient size to allow for a minimum of 15 minutes cycle time for each pump. For a two pump station, the volume in cubic feet (cubic metres), between pump start and pump stop shall be 0.1835 (0.225 - metric factor) times the pumping rate of one pump, expressed in Imperial gallons per minute (litres per second). For other numbers of pumps, the required volume shall depend upon the operating mode of the pumping units. 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 a detention time greater than 30 minutes. The Design Engineer shall submit calculations for cycle and detention times for future reference, each under the most extreme future scenarios, especially where development will occur in phases. Pumping stations shall be designed such that the incoming sewers will not surcharge under normal or peak flow conditions.



3.3.2.2 Pump Types

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

- a) Submersible pumps shall be manufactured by "ITT Flygt" or approved equal.
- b) Self priming pumps shall be manufactured by "Gorman Rupp" or approved equal.

Submersible pumps shall be designed to minimize the deposition of solids in the wet well using flush valves manufactured by ITT Flygt or approved equal (one hydraulically operated flush valve per pumping station).

Pumps shall be specifically designed for pumping raw, unscreened, domestic sanitary sewage (non-clog, solids handling type). Pumps shall be complete with electric motors.

The pump supplier shall have a minimum:

- fifteen (15) years of continuous sales and repair service in Canada.
- A replacement mechanical seal, wear plate/ring and impeller for the selected pump in inventory at all times in Nova Scotia.
- Factory trained service personnel available at all times in Nova Scotia.

All pumps and motors must carry a minimum 24 months unconditional parts and labour warranty.

3.3.2.3 Emergency Overflows/Auxiliary Power Supply

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 established by NSDOE. In the absence of reliable data regarding the frequency and length of power outages, a minimum retention capacity of 4.5 hours at peak design flow shall be used. An auxiliary power supply may be used as a substitute for retention capacity at the pumping station.



If approved by NSDOE, an emergency overflow pipe may be provided under the following conditions:

The invert of the emergency overflow of the pumping station must be lower than the lowest sanitary sewer lateral at the property line and high enough to prevent backup into the pumping station from the high water watermark of receiving watercourse. The emergency overflow pipe shall be provided with a backflow prevention device conforming to National Plumbing Code of Canada and readily accessible for maintenance. Where public water supplies, shellfish production, or water used for culinary or food processing purposes exist, overflows shall not be permitted.

The building housing the auxiliary power supply shall be of adequate size to accommodate the auxiliary power supply unit, pumps, pump motors, control panel, piping, valves and any other accessories. These items shall be located in the building so as to provide safety for workers and convenient access for maintenance. The fuel storage tank shall be located outside and above ground. The tank and installation shall be designed to meet the requirements of the National Fire Code of Canada, Section 4 and the Petroleum Storage Regulations.

The auxiliary power supply building construction shall meet the requirements of the latest edition of the National Building Code of Canada. As a minimum, exterior wall assembly shall be 8 inch (200 mm) split face concrete block with a minimum of R-10 insulation. The building shall have a hip roof with a minimum slope of 12 horizontal to 6 vertical and a minimum of R-20 insulation. There shall be no windows in any exterior wall. Adequate ventilation for all mechanical equipment shall be provided by vandal resistant, heavy-duty steel intake and exhaust louvres. Sewage gas and engine emissions shall be directed away from the building so as not to create a ventilation "short circuit". Provision shall be made to support wall mounted equipment inside the building. The standby power supply shall be designed with adequate capacity to operate the sewage pumps, control and monitoring systems, and heating and lighting systems within the pump house.

The pumping station shall be designed in such a manner as to ensure the safety of operations in accordance with the Occupational Health and Safety Act. All moving equipment shall be covered with suitable guards to prevent accidental contact. 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.

All interior wall surfaces, doors and trim shall be painted to a color scheme as approved by the DOS.



Provisions for chlorination and dechlorination of overflows shall be in compliance with NSDOE Standards and Guidelines.

3.3.2.4 Pump Selection

Pumping equipment shall be selected to perform at maximum efficiencies under normal operating conditions. Pumping stations, wet well and dry wells shall be designed such that all pumps will operate under a continuous positive prime condition during the entire pump cycle. System head calculations and pump selection curves shall be provided for the extreme operating conditions of high and low water levels in the wet well, as well as the normal operating range in the wet well (medium water level). The curve representing the normal operating conditions shall be used to select the pump and motor, however, the pump and motor shall be proven to be capable of operating satisfactorily over the full range of operating conditions.

3.3.2.5 Flow Velocities

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

- (a) Minimum cleansing velocity of 2 feet per second (0.6 metres per second).
- (b) Maximum velocity of 5 feet per second (1.5 metres per second) for suction lines and 8 feet per second (2.4 metres per second) for discharge lines.

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

3.3.2.6 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.

All valves and other appurtenances must be installed so that they can be operated under normal conditions.

Forcemains shall be equipped with shut-off valve and emergency quick-connect discharge connection compatible with Municipal pumps.

Check valves shall be ball type designed and installed to suit all anticipated head conditions without vibration.



Ball check valves shall be installed in a vertical position unless approved otherwise by the DOS.

3.3.2.7 Wet Well Ventilation

A ventilation system capable of delivering a complete air change to the wet well in 5 minutes or delivering fresh air to the wet well at a minimum rate of 230 cubic feet per minute (110 liters per second) at 0.29 psi (2.0 kPa) static pressure, whichever is greater, shall be provided (acceptable model – Joy 4076, 115V, 1½ HP). A separate circuit with a ground fault interrupter shall be provided for the fan. The ventilation fan shall be controlled by a switch at the pumping station control panel set to operate when the control panel door is opened. The ventilation fan control shall also provide for automatic operation of the fan at least 4 times during a 24 hour period. The operation duration of each time shall be adjustable and shall be 10 minutes minimum. The ventilation fan shall be mounted on the pumping station control panel mounting structure adjacent to the control panel. Above ground ventilation piping shall be stainless steel and shall be goose-necked with a birdscreen on the open end.

Continuous ventilation shall provide a complete change of air in not more than 5 minutes and intermittent ventilation shall provide a complete change in not more than 2 minutes as per NSDOE requirements.

The Designer shall comply with NSDOE Standards and Guidelines.

3.3.2.8 Access

Adequate access hatchways shall be provided. Hatchways shall open in a direction which allows access from the driveway.

Pumping stations shall be provided with an acceptable device for the removal of pumps and motors for repair and maintenance.

Lift hatches must be able to be “locked-in” in the upright position.

A non-corroding working platform shall be constructed in the wet well of each submersible station to provide access to check valves and gate valves. The platform shall be set on a concrete lintel cast integrally with the station walls. Alternatively, a separate valve chamber shall be provided.

Locks shall be provided and shall be keyed alike to the Municipality's standard system.



3.3.2.9 Pumping Arrangement

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 design peak sewage 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 units will have capacity to handle design peak sewage flows, taking into account head losses associated with parallel operation. The pump control circuitry shall be designed to automatically alternate pumps for each pumping cycle.

3.3.2.10 Electrical

Electric motors less than 7.5 kW shall be 208 V, 3 phase; electric motors 7.5 kW and larger shall be 600 V, 3 phase.

Run-time meters shall be provided for each pump and an additional meter shall be provided to record run time for two pumps operating simultaneously. The run-time shall be recorded both on SCADA and also locally on mechanical meters mounted in the face of the control panel and facing outwards.

Pumping stations shall have either pressure transducer controls or ultrasonic echo controls to control pump starts and stops. The station liquid level shall be displayed both locally and remotely. Pump controls must be provided with two over-rides (over-riding the normal function of the station), both of which shall be operated by mercury float switches (equivalent to Flygt ENM-10). One float shall be set to lock-out pumps if the liquid level drops 3 inches (75 mm) below the normal pump shut-off level. This condition must provide an alarm that is self resetting. The other float must be set at the high-level alarm level, both to provide an alarm; but also to start both pumps, if they are not already running.

Pumping station control equipment shall be mounted in a CEC type 3 stainless steel enclosure (Surflex Model 215 or approved equal). Communication software and a SCADA unit shall be provided and must be fully compatible with the central monitoring system used in that area of the Municipality. Each panel is to be equipped with a Surflex Model 9015 pump controller complete with communications hardware including radio, radio power supply, antenna and interface cables or approved equal. Adequate lightning arrestors shall be provided.



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 monitoring system for that location:

- (a) Hand-off-automatic selector switch status.
- (b) Output control through SCADA system.
- (c) Power generating system (overload, battery status, fuel level, running, etc.).
- (d) Low level alarm.
- (e) High level alarm.
- (f) Panic alarm – located close to the door in auxiliary power building; on panel support structure where no building is present.
- (g) Building fire alarm.
- (h) Power failure alarm.
- (i) Illegal entry alarm.
- (j) Pump information (overload, motor current, pump status and phase monitoring).
- (k) Dry-well alarm – where applicable.
- (l) Any other at the request of the DOS.

Flow measurements at all pumping stations shall comply with NSDOE Standards and Guidelines Manual. For pumping stations with design peak hourly flow less than 1000 IGPM (75 L/s), an elapsed time meter used in conjunction with pumping rate tests are the minimum requirement. For pumping stations with a design peak hourly flow greater than 1000 IGPM (75 L/s), indicating, totalizing and recording flow measurement shall be provided as a minimum.

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.

3.3.2.11 Site Considerations

All pumping stations and control panels shall be located off the street ROW in an appropriate area specifically designated for that purpose. The property on which these facilities are located shall be sized to accommodate proper access, maintenance and all features associated with the station. The pumping station shall not be sited in a floodplain. 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. All exposed areas shall be sodded. Low maintenance shrubbery and foliage shall be used to screen the site. The station shall blend into the anticipated surrounding development. An access driveway approved by the



DOS shall be provided for access to the pumping station. The driveway shall be constructed of 4 inches (100 mm) of Type 1 gravel over 4 inches (100 mm) of Type 2 gravel to a minimum width of 12 feet (3.7 m) and a minimum length of 25 feet (7.6 m); an adequate turning area for service vehicles shall be provided. Unless approved otherwise by the DOS, the pumping station site perimeter shall be enclosed with an 8 foot (2.4 m) high fence complete with a 20 foot (6.0 m) double swing gate.

3.3.2.12 Operation and Maintenance Manual

Three copies of the pumping station design, operation and maintenance manual must be prepared in a form acceptable to the DOS and provided to the DOS prior to acceptance of the pumping station. This manual must contain, as a minimum, the following:

- (a) System description.
- (b) Design parameters, system hydraulics and design calculations (including system curves).
- (c) As-constructed civil, mechanical and electrical drawings.
- (d) Pump literature, pump curves and operating instructions.
- (e) Manufacturer's operation and maintenance instructions for all equipment.
- (f) Name, address, telephone number of all equipment suppliers and installers.
- (g) Information on guarantees/warranties for all equipment.

Special tools and standard spare parts for pumping station equipment shall be provided prior to acceptance of the system by the DOS.

3.3.3 Forcemains

3.3.3.1 Limiting Velocities

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



3.3.3.2 Pipe

Ductile Iron (DI) pipe, Class 52, cement mortar lined. When this pipe is utilized, the Design Engineer shall carry out an investigation of soil conditions to determine requirements for and shall apply the appropriate means of corrosion protection. Fittings shall be wrapped with an anti-corrosion tape such as Denso or approved equal.

PVC pipe, DR 18. Non-PVC fittings used with PVC pipe installations shall be wrapped with anti-corrosion tape such as Denso or approved equal.

Notwithstanding the specified minimum class of pipe, the pipe shall be designed taking into account: pipe pressure, transient pressure, earth pressure, etc.

The DOS may, on a project specific basis, approve a thinner wall of the above pipe materials if the Design Engineer presents a comprehensive design, including a complete transient pressure analysis, which has a minimum factor of safety of 2. Class 50 DI pipe shall be installed with polyethylene encasement.

Where the DOS has approved laterals which are acting as small diameter forcemains, acceptable materials are PVC, HDPE tubing and copper, rated at 2 ½ times the operating pressure of the system but as a minimum shall be DR 26 or Series 160 or Schedule 40 respectively. The minimum cleansing velocity shall be 3.3 feet per second (1 m/s); but regardless, the minimum size shall be 1.6 inches (40 mm) in diameter. Where possible, connections of the small diameter forcemains shall be made to gravity laterals at the property line utilizing pressure fittings; otherwise, connect directly to a manhole, discharging within 4 inches (100 mm) of benching. A shut-off valve shall be provided 5 feet (1.5 m) outside the street ROW on the small diameter forcemain.

The Hazen-Williams Formula shall be used to calculate hydraulic losses in the forcemain. Variations in the roughness coefficient (C) through the life of the pipe shall be taken into account.

The Designer shall assess the forcemain for possible damage from sulfide generation. In sections of the forcemain subject to sulfide generation (sections subject to wet and dry cycle), epoxy lining shall be substituted for cement mortar lining in DI pipe.



The forcemain shall be identified by placing an underground warning tape at the top of the first backfill layer above the pipe. The warning tape shall be 6 inches (150 mm) wide polyethylene tape with green background and black lettering. The message on the warning tape shall be "Caution, Sewer Line Buried".

3.3.3.3 Minimum/Maximum Depth

Forcemains shall have a minimum cover of 6 feet (1.8 m) and a maximum cover of 8 feet (2.4 m), measured from the finished surface to the crown of the pipe.

3.3.3.4 Location

Forcemains shall not be located in a common trench with a watermain. Horizontal and vertical separations from watermain, etc. shall be as specified by NSDOE.

Forcemains shall terminate in a well benched manhole such that the flow is directed down the barrel of the receiving gravity pipe. The downstream pipe receiving flow from a forcemain must be of sufficient size and grade to prevent surcharging from the forcemain.

Where the service easements contain both a forcemain and a watermain, the service easement shall be of a minimum width of 20 feet (6.1 m) plus the distance between the pipes. (See also Section 3.2.6).

3.3.3.5 Valves

Automatic air relief and vacuum valves, suitable for sewage applications, shall be located in a manhole at high points of the forcemain or as dictated by the design. The manhole shall be drained, preferably to the sanitary sewer. A suitably sized vent pipe ending in an above ground goose-neck at the property line shall be provided.

The DOS may require valves along the length of the forcemain.

Drain valves shall be located at low points as directed by the DOS. Unless authorized otherwise by the DOS, the drain valve shall drain to the sanitary sewer.



3.3.3.6 Thrust Restraint

Changes in direction, in excess of the allowable joint deflection, shall require a bend fitting. Thrust blocks shall be provided at changes of direction and shall be designed with consideration given to the operating pressure, surge pressure, shut-in pressure, peak flow velocity and in-situ material against which the thrust block bears. Thrust blocks must be designed and stamped by a Professional Engineer.

Thrust blocks shall be constructed of "ready-mix" concrete with a minimum 28 day compressive strength of 2900 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 galvanized steel tie rods securely embedded in the concrete. The DOS may approve the use of restrained joints in conjunction with a thrust block.

3.3.3.7 Soil Conditions

The Design Engineer shall take into consideration existing soil conditions when determining requirements for corrosion protection. In sensitive areas, tests shall be carried out to determine the acid producing potential of soil and bedrock at the discretion of the DOS. A minimum of 6 zinc anode "protective cap" nuts, such as "Protecto-Caps" or approved equivalent, shall be used on each buried mechanical joint valve and fitting installed in a new system.





4.0 WATER DISTRIBUTION SYSTEM

4.1 SCOPE

A water distribution system is a complete and properly functioning system of watermains, lateral lines from the watermain to the street lines and appurtenances, including pumping stations, hydrants, control valves, pressure control facilities and reservoirs, which is designed to carry and distribute an adequate supply of potable water for domestic, institutional, commercial, industrial and fire protection purposes. Water quality shall be monitored and maintained by the Municipality and its Water Utility. The system must be designed such that the quality is able to be maintained and there is an adequate pressure to supply the needs of the customers.

In addition to these design criteria, all applicable and relevant codes and standards shall be used by the Designer; several of the applicable standards are referenced in Section 1.0.

As well, all water distribution systems shall conform to any requirements established by NSDOE. No system shall be constructed until the design has been approved by the DOS and NSDOE.

The potable water supply and fire protection system must meet the requirements of the Municipality and its Water Utility before the system will be considered for takeover. The following are minimum requirements to consider in the system design and are intended to provide a directive to the Design Engineer responsible for design and construction of municipal services in East Hants.

4.2 HYDRAULIC CRITERIA

4.2.1 System Capacity

Water distribution systems shall be designed to accommodate the greater of fire flow demand plus maximum daily demand or maximum hourly demand unless approved otherwise by the DOS. Hydraulic analysis of any system shall be carried out by the Design Engineer using the Hydraulic Grade Line (HGL) for that particular Water Utility.

Fire flow demand shall be established by the Design Engineer in accordance with the latest recommendations contained in the publication "Water Supply for Public Fire Protection", as prepared by the Fire Underwriters Survey – Insurers' Advisory Organization.



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

- Average daily demand: 90 Imperial gallons per capita per day (410 litres per capita per day).
- Maximum daily demand: 135 Imperial gallons per capita per day (615 litres per capita per day).
- Maximum hourly demand: 225 Imperial gallons per capita per day (1025 litres per capita per day).

The water distribution system shall be designed for a gross population density of 18 persons per acre (45 persons per hectare). In developments where the anticipated population exceeds or is anticipated to exceed the population density of 18 person per acre or in areas of commercial or industrial development, the domestic demand shall be adjusted accordingly. The design population or assumed domestic demand must be clearly specified in the calculations submitted for review and approval.

4.2.2 Minimum/Maximum Pressures

Water distribution systems shall be designed and sized such that during a fire flow condition, a minimum residual pressure of 22 psi (150 kPa) is maintained in the street main at the point of withdrawal and that a minimum residual positive pressure of 5 psi (34 kPa) to 10 psi (69 kPa) is maintained at all points along the distribution mains in the water system. Design calculations shall be submitted with the engineering drawings when application is made for Tentative Approval of the watermain extension.

For any water system extension within the Water Utility, it is desirable to maintain a minimum residual water pressure of 40 psi (275 kPa) at all points along the distribution mains in the water system during maximum hourly demand conditions. Maximum water pressure during minimum demand periods shall not exceed 90 psi (620 kPa) unless approved otherwise by the DOS.

Calculations to determine residual water pressure shall be based on the Hydraulic Grade Line of the water distribution system.



4.2.3 Limiting Velocities

The watermain shall be sized such that the maximum velocity in the pipe shall not exceed 5 feet per second (1.5 metres per second) during maximum hourly domestic flow conditions or 8 feet per second (2.4 metres per second) during fire flow conditions unless approved otherwise by the DOS. The Hazen-Williams formula or its appropriate nomograph using a 'C' value of 120 shall be used for the design of the water system.

4.2.4 Looping/Interconnection

Water distribution systems shall be designed to provide looping of watermains and interconnection with adjacent developments as frequently as road or service easement layout permit. Additional looping may be required to increase the reliability of the system where a need is identified by the DOS. Dead ended pipe shall be avoided unless approved otherwise by the DOS.

4.2.5 Minimum Size

The minimum size of pipe shall be 8 inches (200 mm) for local distribution mains.

The size of the pipe in a feeder main grid shall be a minimum of 12 inches (300 mm) or such other size that may be required to properly serve the development being proposed as well as other existing or future developments potentially serviced by that line with domestic water and fire protection to the approval of the Municipality and its Water Utility.

Transmission, feeder and distribution mains shall conform to the requirements of the Water Utility's long term servicing plan.

4.2.6 Pumped Systems

4.2.6.1 General Requirements

As a result of difference in ground elevations or distance from the source of supply, isolated 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 area of a water distribution system based on defined limits. These areas are generally isolated from the remainder of the system.

Discharge pressure from the pumping station must be adequate to ensure that the pressure in the watermains of the area being serviced is in accordance with the requirements of Section 4.2.2.

4.2.6.2 Pumps

Domestic booster pumps, fire booster pumps and appurtenances including capacity, system sizing, control facilities, layout, installation, testing, etc. must meet all applicable and relevant standards and codes.

Since a single system head curve cannot be developed due to changing demands within the system, projected points of operating head and flow for at least the following conditions shall be developed:

- average day
- maximum day
- maximum hour (P.M.)
- maximum hour (A.M.)
- minimum hour

Pumps must be selected which will operate satisfactorily over the necessary pumping ranges expected at the station, from the minimum total dynamic head to the maximum total dynamic head. In general, the pumps must be capable of meeting the following criteria:

- The rated point corresponding to the maximum day consumption rate.
- The rated point for efficiency evaluation (the point at which the pump would normally run and at which the pump should be selected for best efficiency).
- The possible operating range (the range over which the pump must operate from the minimum total dynamic head to the maximum total dynamic head).
- The available Net Positive Suction Head (NPSH) must be specified.

The above criteria must be evaluated when a pump is selected. Typically, the unit will operate at a total dynamic head considerably less than the ultimate rated point. Therefore, the maximum efficiency point should be specified as that point at which the pump will normally run. The rated point must be selected as the point for which the pump will have to overcome the greatest amount of head with a specified flow rate.



Pumps shall be selected to avoid the following conditions:

- Destructive low-head, high-flow cavitation.
- High power consumption while handling low loads.
- Noise levels audible beyond the station.
- Suction line collapse on operation below recommended NPSH.

4.2.6.2.1 Domestic Booster Pumps

The pumping station shall have at least three (3) domestic pumps (one lead/jockey pump and two lag pumps). The pumps shall be sized such that the capacity of the pumping station with the largest pump out of service shall be a minimum of 80 percent (80%) of the peak demand of the serviced area when completely developed.

The pumps shall have the following service capability:

- Lead pumps shall provide a maximum of 25 percent (25%) of peak demand and provide an adequate supply during normal periods of domestic demand.
- Lag pumps shall provide a maximum of 55 percent (55%) of peak demand, provide an adequate supply to meet maximum hourly or peak demand periods and provide an adequate supply in the event of failure of the lead pump.

4.2.6.2.2 Fire Booster Pumps

The fire booster pump shall have adequate capacity to supply the necessary fire flow demand established in accordance with Section 4.2.1.

4.2.6.3 Pump House

4.2.6.3.1 Civil

The pump house building shall be of adequate size to accommodate the pumps, pump motors, control panel, auxiliary power supply and other accessories. These items shall be located in the building taking into consideration safety for operators and convenient access for maintenance. The fuel storage tank shall be located outside and above ground. The tank and installation shall be designed to meet the requirements of the National Fire Code of Canada, Section 4 and the Petroleum Storage Regulations.



The pump house building design and construction shall meet the requirements of the latest edition of the National Building Code. As a minimum, exterior wall assembly shall be 8 inches (200 mm) split face concrete block with a minimum R-10 insulation. There shall be no windows in any exterior wall.

Adequate ventilation for all mechanical equipment shall be provided by vandal resistant, heavy duty steel intake and exhaust louvres. Engine emissions shall be directed away from the building so as not to create a ventilation "short circuit". Provision shall be made to support wall-mounted equipment inside the building. The building shall have a hip roof with a minimum slope of 12 horizontal to 6 vertical and have a minimum of R-20 insulation.

The building floor shall be a minimum 6 inches (150 mm) above the external ground surface and any potential flood level. Pump house floors shall be reinforced concrete and shall be sloped towards the access door. All interior wall surfaces, doors and trims shall be painted to a color scheme as approved by the DOS. A non-metallic, colored hardener shall be added to the concrete floors during the finishing process to a color scheme as approved by the DOS.

Lifting devices of a type approved by the DOS should be incorporated into the design of the structure so that pumps and/or motors can easily be transferred from their location within the station to the access door.

Doors shall swing outward to open and all door locks shall be keyed alike to the MEH standard system.

4.2.6.3.2 Electrical & Miscellaneous

The pumping station shall be provided with a three phase power supply. Design and installation of the power supply system shall meet all applicable and relevant standards and codes.

Full standby power supply shall be provided utilizing a standby diesel generator set. The power generating system shall be capable of providing continuous electric power during any interruption of the normal power supply. The standby power unit shall be designed with adequate capacity to operate fire and domestic pumps, control and monitoring system, and heating and lighting systems within the pump house.



The generating system shall include the following items:

- Diesel engine
- Alternator
- Control panel
- Automatic change-over equipment
- Automatic ventilation system
- Battery charger and battery
- Fuel supply unit, etc.

All appurtenances, installation and testing shall meet all applicable and relevant standards and codes.

Pumping station equipment shall be equipped with control systems provided by the pump manufacturer and compatible with the pumping station monitoring system. The control system shall be capable of providing:

- Uninterrupted fully automatic operation of the pumping station to meet the various demand requirements of the area being serviced.
- Protection against equipment damage or failure during extreme hydraulic or electrical conditions.

Each pump shall be operated by an energy efficient electric motor capable of operating the pump over the full range of load conditions. Motors should be located such that they cannot be flooded should a pipe failure occur. Electric motors shall be as manufactured by U.S. Motor or equivalent as approved by the DOS.

All electrical apparatus shall be located in an accessible location above grade with a clear access of 3 feet (1 m) around all pumps and motors. All panels and controls shall be moisture resistant.

The pump house must contain at least the following:

- Electric unit heaters with thermostat control.
- Adequate vapor proof incandescent lighting.
- A single outside vandal proof light adjacent to or over the access door; this light shall be activated by a photo-electric cell.
- A weather proof switch and electrical outlet inside the pump house immediately adjacent to the access door.
- Adequate lightning arrestors.
- A fire extinguisher.



- Sufficient ventilation to ensure that heat generated from the electrical equipment is sufficiently dissipated.

4.2.6.3.3 Mechanical

Suction and discharge piping shall be designed and arranged to provide easy access for maintenance. All piping and tubing 4 inches (100 mm) diameter and smaller shall be stainless steel, Type 316 or 316L, Schedule 40, unless approved otherwise by the DOS.

All piping within the station larger than 4 inches (100 mm) diameter shall be DI Class 54, cement lined. Bolted flanges shall be used for all joints, fittings and connections within the station.

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. All exposed surfaces and pipes, other than stainless steel, shall be finished, treated and painted to prevent rusting. Color scheme and paint types shall be approved by the DOS.

A self-closing check valve must be incorporated in the discharge of each unit of the pumping station. It shall be designed in such a way that if pump flow is lost, the valve will close automatically. The type and arrangement of check valves and discharge valves is dependent on the potential hydraulic transients that might be experienced in the pumping station.

A hydraulic transient 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 either the customers on the water system or the water distribution system including the booster pumping station. Typical methods of surge protection that can be used to protect the booster station and equipment include the following:

- Surge anticipator systems that dissipate over-pressure from the discharge lines.
- Slow closing and opening control valves on pump discharges.
- Hydro-pneumatic surge tanks on discharge headers.
- Variable speed pumping units.

An adequate number of isolation valves must be provided to allow for maintenance of pumps and/or control valves.



For an in-line booster pumping station, the pressure on the suction side of the pump shall not be allowed to drop below 22 psi (150 kPa) when there are service connections on the suction side of the watermain.

4.2.6.3.4 Safety Precautions

The pumping station and appurtenances shall be designed in such a manner as 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 designed to ensure that 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.

4.2.6.3.5 Pumping Station Monitoring

Pumping station functions shall be monitored using an integrated Supervisory Control And Data Acquisition (SCADA) system to ensure that the station is performing satisfactorily. Monitoring signals and alarms shall be transmitted to the MEH central monitoring station by a separate Radio Transmission Unit (RTU). All software shall be fully compatible with the MEH central SCADA system. 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:

- Station flow
- Suction and discharge pressure
- Domestic booster pump information (overload, motor current, pump status and phase monitoring)
- Fire pump information (overload, motor current and pump status)
- Power generating system (overload, battery status, fuel tank level, etc.)
- Output control through SCADA system
- Hand-off-automatic selector switch status
- Low discharge pressure alarm
- High discharge pressure alarm
- Power failure alarm
- Illegal entry alarm
- Surge valve alarm
- Building temperature alarm (high, low)
- Building flood



An approved flow meter providing both local and remote flow indication shall be installed in the pumping station. Pressure gauges, complete with ball isolation valves, shall be installed on the suction side and on the discharge side of the pumps.

4.2.6.3.6 Site Consideration

All structures and appurtenances associated with the pumping station shall be located off the street ROW 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. All exposed areas shall be sodded. A paved driveway shall be provided for access to the pumping station.

The driveway shall be constructed of 8 inches (200 mm) of Type 2 gravel, 4 inches (100 mm) of Type 1 gravel and 3 inches (75 mm) of Type B asphalt to a minimum width of 12 feet (3.7 m) and a minimum length of 25 feet (7.6 m); an adequate turning area for service vehicles shall be provided. Unless approved otherwise by the DOS, the pumping station site perimeter shall be enclosed with a 8 foot (2.4 m) high fence complete with a 20 foot (6.0 m) double swing gate.

4.2.6.4 Operations and Maintenance Manual

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

- System description
- Design parameters, system hydraulics and design calculations
- As-constructed civil, mechanical and electrical drawings
- Pump literature, pump curves and operating instructions
- Manufacturer's operation and maintenance instructions for all equipment
- Name, address and telephone number of all equipment suppliers and installers
- Information on guarantees/warranties for all equipment.

Special tools and standard spare parts for pumping station equipment shall be provided prior to acceptance of the system by the DOS.



4.3 PHYSICAL CRITERIA

4.3.1 Pipe Material

The following types of pipe are approved for use as watermain within the Municipality of East Hants when installed in compliance with these General Specifications and subject to the stated restrictions.

4.3.1.1 Polyvinyl Chloride (PVC) Pipe

- .1 AWWA C900 Class 150.
- .2 PVC pipe shall be approved for installation in sizes up to and including 12 inch (300 mm) diameter.
- .3 Class 200 PVC or Ductile Iron pipe as specified in Section 4.3.1.2 may be required where the main is subject to operating pressures greater than 90 psi (620 kPa) and/or significant surge pressures as a result of normal operation or malfunction of water system infrastructure, such as booster stations and pressure reducing valves.
- .4 All valves, hydrants and water service laterals shall be installed with an attached zinc anode for cathodic protection.
- .5 All fittings for PVC pipe, excluding tapping couplings, shall be AWWA C104, C110, C111 and C153.
- .6 Non-PVC fittings used with PVC pipe installations shall be wrapped with anti-corrosion tape such as Denso or approved equal.
- .7 All PVC pipe installation shall include the installation of an approved trace wire system for pipe location purposes.
- .8 All water service lateral taps shall be completed using an approved saddle. Wet tapping of PVC pipe is not permitted when the pipe and/or trench environment is below 32 degrees Fahrenheit (0 degrees Celsius).

4.3.1.2 Ductile Iron (DI) Pipe

- .1 DI pipe (AWWA C151, Class 52, cement mortar lined) will only be considered for installation in pipe sizes larger than 12 inch (300 mm) diameter.
- .2 All DI pipe and fittings shall be installed with polyethylene encasement.
- .3 All valves, hydrants and water service laterals shall be installed with an attached zinc anode for cathodic protection.
- .4 DI pipe will not be approved for installation below the salt water tidal zone.



4.3.1.3 Consistency of Pipe Material

Consistency of pipe material within a section of the water distribution system or within a particular Subdivision shall be maintained. The design of a system extension shall identify the type of pipe material previously used in an area and shall specify the same pipe material for the extension, subject to the above requirements.

4.3.2 Pipe Cover

All watermains shall be designed and bedded to a minimum depth of 5.25 feet (1.6 m) below post construction grade or road subgrade whichever is deeper, unless specified otherwise by the Design Engineer and approved by the DOS. Excessive fill on watermains shall be avoided. The maximum allowable depth of cover shall be 7 feet (2.1 m). Over-excavation shall be avoided. Watermains shall be installed on undisturbed soil.

4.3.3 Location

- .1 All watermains shall normally be installed at a consistent grade to avoid localized high points in the same trench as the gravity sewer pipes. The location of the watermains and laterals relative to sewers shall meet the requirements of MEH and NSDOE. The watermain shall maintain a minimum 12 inch (300 mm) horizontal and vertical separation from the sewer mains with watermain at the higher elevation. If this separation cannot be achieved, the watermain shall be installed in a separate trench with a minimum 10 feet (3.0 m) separation from the sewers.
- .2 Whenever sewers must cross under watermains, a separation of at least 18 inches (450 mm) must be maintained between the top of the sewer and the bottom of the watermain. When the elevation of the sewer cannot be varied to meet this requirement, the watermain shall be relocated to provide this separation reconstructed with mechanical restrained joint pipe for a distance of 10 feet (3.0 m) on each side of the sewer. One full length of watermain shall be centered over the sewer. Concrete thrust blocks shall be used at all bends.
- .3 When it is not possible to obtain proper horizontal and vertical separation as stipulated, the sewer, for at least one pipe length on each side of pipe intersection, shall be designed and constructed equal to water pipe and shall be pressure-tested to assure water tightness. Each pipe trench will have adequate impermeable stops within 10 feet (3 m) of pipe intersection to prevent the movement of trench water to pipe intersection.



- .4 All watermains shall be located within the public street ROW or within a service easement. Service easements shall be a minimum width of 20 feet (6.1 m) granted in favour of the Municipality. Depending on the length and location of the service easement, an appropriate access road may be required within the service easement for maintenance and operation purposes. Where the service easements contain both a sewer and a watermain, the service easement shall be a minimum width of 20 feet (6.1 m) plus the distance between the pipes. (See also Section 3.2.6).
- .5 Unless approved otherwise by DOS, the watermains shall be installed in a straight line within the traveled way portion of the street ROW, parallel to and on the street side of the sanitary sewer. On existing streets without curb and gutter, subject to the approval of the DOS, the watermain may be installed within the gravel shoulder area or on customer's side of ditch centerline but not within 5 feet (1.5 m) of the property line.
- .6 Changes in alignment shall be accomplished by the use of pre-manufactured bends. Minor curvature of pipe at joints may be permitted under certain site conditions at the discretion of the DOS. Deflection must be within tolerances recommended by pipe manufacturer.
- .7 Where a need is identified to facilitate continued/future development on adjacent lands and/or to comply with Water System Master Plan, watermains and service easements shall be extended to the limit of the property boundary of the Subdivision.

4.3.4 Valves

- .1 All connections to existing water systems shall be valved so that the system can be isolated from the existing main to facilitate construction and testing while maintaining service in the existing main. Dead end stubs left for future extensions shall be provided with a valve and either a minimum two lengths of pipe on the extension side or approved thrust restraint.



- .2 Shut-off valves shall be provided on watermains to satisfy the following requirements:
 - .1 Three valves shall be required at each normal four-way street intersection. If there are more or less than four streets meeting at any intersection, the appropriate number of valves shall be installed to allow complete isolation of the system. Layout shall allow isolation from the supply side without interrupting flow to the other streets.
 - .2 Main line valves shall be located at a standard distance of 3 feet (900 mm) from the center of the tee/cross at intersections on paved streets. At intersections of unpaved streets, valves shall be located at the property line extension.
 - .3 On straight runs, the maximum linear distance spacing center to center for main line valves shall be 1400 feet (425 m) for residential development and 820 feet (250 m) for mixed use (residential/commercial) and 500 feet (150 m) for commercial/industrial areas. The linear distance between valves may be increased at the discretion of the DOS based on the ultimate service population that will be affected due to a break in the watermain.
 - .4 For looped systems with close intersection spacing, main line and intersection valve spacing may be adjusted providing that adequate shutdown capability is provided on the system without putting more than 30 customers out of service at any time after full development of the properties.
 - .5 Gate valves with centering wheel and valve box shall be used on pipes 12 inches (300 mm) diameter and smaller. Direct buried butterfly valves shall be used on pipes over 12 inches (300 mm) diameter.

4.3.5 Hydrants

- .1 Fire hydrants shall be placed in accordance with guidelines detailed in "Water Supply for Public Fire Protection" by Fire Underwriters Survey (current version). The maximum linear distance spacing centre to centre for fire hydrants shall not exceed 500 feet (150 metres) for residential development, 400 feet (125 metres) for mixed use (residential/commercial) development and 300 feet (100 metres) for commercial/industrial areas.
- .2 Hydrants shall be located at the extension of the boundary line between two lots.



- .3 Hydrants shall be located a minimum 6 feet (1.8 m) from the edge of a driveway and minimum 10 feet (3.0 m) from a utility pole.
- .4 Hydrants shall be located mid-block on cul-de-sacs that have a looped connection to the distribution system.
- .5 Dead end mains shall terminate at a hydrant to permit flushing of the distribution system.
- .6 The branch pipe to the hydrant shall be minimum 6 inches (150 mm) diameter and shall include a 6 inch (150 mm) diameter branch valve connected directly to the main with a hydrant anchor tee.

4.3.6 Trench Drainage Relief System

The design of the water system shall give consideration to the possible change in groundwater movement caused by the use of pervious bedding material. The design shall include corrective measures to prevent flooding as a result of this groundwater movement.

- .1 Watermains installed in a single pipe trench may require a trench drainage relief system to lower the hydraulic grade line of the groundwater in the trench. The design of the relief system shall be specific to the situation with due consideration for topography, subsurface conditions, groundwater conditions and local drainage patterns. Design of the trench drainage relief system shall be the responsibility of the Design Engineer and be subject to approval by the DOS.
- .2 Water service lateral trenches that have a trench bed sloping down from the main trench may require the installation of an appropriate clay plug, or similar solution, to prevent the flow of groundwater from the trench towards the abutting properties. The requirement of a barrier to prevent groundwater migration along the trench shall be considered by the Design Engineer. The groundwater migration prevention and relief system including material and spacing shall be the responsibility of the Design Engineer and be subject to approval by the DOS.

4.3.7 Thrust Restraint

- .1 Any change in direction of the watermain, in excess of the pipe joint deflection tolerance, shall be made using an appropriate fitting. Thrust blocks shall be designed and installed in conjunction with these fittings. The thrust block design shall consider the operating pressure, surge pressure, peak flow velocity and in-situ material bearing strength.



- .2 Thrust restraint for vertical bends shall be by gravity thrust blocks located below the fitting and shall be connected to the fitting with galvanized tie rods securely embedded in concrete.
- .3 The use of restrained joints for hydrants, tees and bends is not permitted unless used in conjunction with a thrust block or as approved otherwise by the DOS.
- .4 Gradient restraint anchor blocks for pipes installed at grades steeper than 16% shall be provided.
- .5 Approved thrust restraint shall be provided for valves on PVC pipe over 6 inches (150 mm) diameter.
- .6 Thrust blocks shall be provided for service lateral connections over 4 inches (100 mm) diameter.

4.3.8 Air Relief Valve and Vacuum Valves

Air relief and vacuum valves shall be installed, in a manhole, at all significant high points in the distribution system and at such other locations as required for efficient operation of the water system.

4.3.9 Water Service Laterals

- .1 All water service laterals shall be installed with a minimum cover of 5 feet (1.5 m) and a maximum cover of 6 feet (1.8 m). The water service lateral shall maintain a minimum 12 inch (300 mm) separation horizontal and vertical from the gravity sewer laterals in accordance with the requirements of NSDOE. The water service lateral shall be installed above the sewer lateral. In cases where a pressure sewer service will be used or where gravity sewer lateral is located above or within 12 inches (300 mm) below the water service lateral, the water service shall be installed in a separate trench with a 10 feet (3.0 m) horizontal separation.
- .2 All water service laterals, from the main line to the property line, shall be provided by the Developer of the lot. A single service shall be installed to each existing lot or potential future lot which could be created under the zoning in effect at the time of the water system installation.



- .3 The standard minimum diameter for water service laterals is 1 inch (25 mm) diameter polyethylene pipe, CSA Series 160 (potable water), copper tube outside diameter. For any service longer than the typical length required to service a house with a normal setback of 180 feet (55 m), a larger diameter lateral may be required to avoid excessive pressure loss in the pipe. Water service size shall be determined subject to required flow, internal plumbing arrangements, peak domestic demand, service length and operating pressure. Maximum velocity of water flowing through the water service lateral shall not exceed 15 feet per second (4.5 metres per second).
- .4 New water service laterals shall not have more than one compression fitting for each 70 feet (21 m) length of pipe.
- .5 The installation of a domestic service connection off a sprinkler line is not permitted except under the following conditions:
 - .1 If the length of domestic service on the public side (within the street ROW) would be more than one third of the street ROW width, the Municipality may allow connection of the domestic service to the sprinkler line at the property boundary, subject to a letter from the Fire Marshall's Office permitting such a connection;
 - .2 If the length of domestic service on the private side would be longer than 60 feet (18 m), the Municipality may allow connection of the domestic service to the sprinkler line at a point at least 5 feet (1.5 m) from the building foundation, subject to a letter from the Fire Marshall's Office permitting such a connection and provision by the Developer of a service easement agreement providing unrestricted access to the curb stop by Water Utility personnel. This type of connection shall not be permitted for fenced yards, storage areas, etc.

4.3.10 Backflow Prevention Devices

Backflow prevention devices are required to be installed on all new services where in the opinion of the Municipality, there is a potential risk of contamination of the potable water supply system resulting from back flow or back pressure from the individual premise. Backflow devices shall be installed in accordance with the applicable standard specifications on the following types of services:

- .1 Industrial, commercial and institutional buildings.
- .2 Residential buildings larger than four (4) units.
- .3 Sprinkler service lines.



4.3.11 Watermain Road Crossings

For new road construction crossing existing watermain, the Design Engineer (or other Professional Engineer inspecting construction) shall ensure that:

- .1 The existing backfill material is excavated over the watermain to the springline of the pipe.
- .2 Twenty-four (24) inch (600 mm) compacted layers of Type 2 gravel is backfilled for the entire width of the traveled way portion of the proposed service easement.
- .3 A minimum of 5.25 feet (1.6 m) of ground cover is maintained from the top of the existing pipe to finished grade.
- .4 Adequate drainage for new and existing roads is provided.
- .5 Where ditches cross the water main, 5.25 feet (1.6 m) of cover or insulation for frost protection is provided. The minimum cover over the watermain with insulation is not to be less than 3 feet (900 mm). Insulation shall be 2 inch (50 mm) HI-40 or approved equal. Insulation shall extend the full width of trench or be boxed in.
- .6 Exact location of existing watermain is determined by test pit prior to approval of road crossing design.
- .7 All work at watermain is inspected/supervised by a representative of the Municipality.

For installation of watermain under existing roadways under the jurisdiction of NSDOT&PW, core drilling as opposed to open cut may be necessary. The method selected shall be approved by NSDOT&PW.

4.3.12 Soil Conditions

The Design Engineer shall take into consideration existing soil conditions when determining requirements for corrosion protection. In sensitive areas, tests shall be carried out to determine the acid producing potential of soil and bedrock at the discretion of the DOS. A minimum of 6 zinc anode "protective cap" nuts, such as "Protecto-Caps" or approved equivalent, shall be used on each buried mechanical joint valve and fitting installed in a new system.



5.0 SUBMISSION REQUIREMENTS

This section is intended to assist the Design Engineer acting on behalf of the Applicant to prepare a submission for the approval of Municipal Services Systems designed and constructed for MEH. Design and construction of systems must be to these Specifications and in accordance with all relevant MEH Bylaws, Ordinances, Procedures and Regulations where applicable.

Specific requirements vary according to the nature of the application being made. Application for approval must conform with or exceed the following submission requirements:

5.1 TENTATIVE APPROVAL

A copy of the permit to construct from Nova Scotia Department of Environment will be required prior to recommending Tentative Approval.

An application for Tentative Approval of municipal services must conform, but not be limited to, the following:

5.1.1 Sanitary Sewage Collection System

5.1.1.1 General

- .1 An overall plan indicating tributary service areas, the existing sanitary sewage system, and the proposed sanitary sewage system. The proposed sewer system shall include manhole locations, size of pipes, flow direction, means of disposal of effluent and connection point(s) to the existing system.
- .2 Specifications and contract documents, if applicable.
- .3 Design shall comply with Master Plans prepared for MEH and as required by the DOS.



5.1.1.2 Gravity Systems

- .1 Plan and profile drawings.
- .2 Cross-sections and detail drawings.
- .3 For installations where, in the opinion of the DOS, such information is necessary, the Designer shall provide design calculations including a tabulation of calculations for:
 - population density
 - peak flow
 - design flow
 - pipe size
 - slope
 - minimum and maximum flow velocity
 - depth of flow
 - any other relevant information.

5.1.1.3 Pumping Station and Forcemain

- .1 Design calculations and curves for system and pump.
- .2 Motor horsepower.
- .3 Detailed drawings for each lift station giving:
 - capacity of selected pumps with flow rates
 - invert elevations for gravity inlet, overflow and forcemain
 - float, base, and top elevations
 - wet well size and capacity
 - bypass piping arrangement
 - any other relevant information.
- .4 Design calculations and information in tabular form including the following:
 - minimum, average and peak flow rates
 - pipe size and velocity in forcemain
 - pump cycle time.



5.1.2 Water Distribution System

5.1.2.1 General

- .1 An overall plan indicating existing and proposed water system including pipe diameter and material, valve locations and hydrant locations.
- .2 Technical specifications and contract documents, if applicable.
- .3 Plan and profile drawings.
- .4 Design calculations and information in tabular form including the following:
 - population density
 - domestic demand
 - fire flow rate requirements
 - maximum and minimum static pressures under normal operating conditions
 - residual pressures under fire flow conditions
 - flow velocity in the distribution system at each fire hydrant in the proposed system extension
- .5 Design shall comply with master plans prepared for MEH and as required by the DOS.

5.1.2.2 Booster Pumping Systems (Domestic and/or Fire Flow Demand)

- .1 Minimum, average and peak flow rates.
- .2 Capacity of selected pumps.
- .3 Motor horsepower and combined electrical/mechanical efficiency.
- .4 Electrical motor power factor.
- .5 Details of auxiliary power supply unit and pumphouse building.



5.2 DRAWING REQUIREMENTS

The complete engineering drawings and design shall be signed and stamped by a Professional Engineer. The drawings shall adequately represent the information needed to assess the design and to construct the services to the satisfaction of the DOS and shall include, but not be limited to, the items in this section:

5.2.1 Plan and Profile

The plan and profile drawings should be drawn to:

- i. a horizontal imperial scale of 1 inch = 40 feet or 1 inch = 20 feet (metric scale of 1:500 or 1:200, respectively) where greater detail is required;
- ii. a vertical imperial scale of 1 inch = 4 feet (metric scale of 1:50).

The plan portion of the engineering drawings shall include, but not be limited to:

- i. the location and dimensions of all existing and proposed public streets or highways and private roads and shall have the name of each road printed outside the road lines;
- ii. the proposed lot lines;
- iii. North arrow referenced to Nova Scotia Grid;
- iv. the chainage at 100 foot (30 m) intervals;
- v. the control monuments and bench marks within the area of the plan;
- vi. the sanitary sewage system showing the lengths, sizes and types of all pipes and the direction of flows with all elevations referenced to Geodetic datum;
- vii. the water distribution system including all valves, hydrants, tees, bends, and all other fittings, showing the lengths, sizes and types of all pipes, with all elevations referenced to Geodetic datum;
- viii. separate sanitary hook-ups and water service pipes to proposed and existing lots;
- ix. the surface drainage and related structures;
- x. minimum basement floor elevations referenced to Geodetic datum;
- xi. trees;
- xii. street lighting services;
- xiii. any other structures within the public street, highway or private road including, street-name and regulatory signs, electrical underground locations, telephone and power poles;
- xiv. Canada Post community mail box locations;
- xv. any other information deemed necessary by the DOS.



The profile portion of the engineering drawings shall include the existing and proposed location and vertical alignment and slope of:

- i. the center line of any public street, highway, private road, or service easement;
- ii. the complete sanitary sewage system including all appurtenances, and pipe lengths, sizes, types, classifications and slopes;
- iii. the complete water distribution system including all appurtenances, and pipe lengths, sizes, types and classifications;
- iv. invert elevation for both sewer and water;
- v. any other underground services and appurtenances.

The information required on plan and profile drawings shall be shown:

- i. at intervals based on sound engineering principles;
- ii. to a distance of 20 feet (6 m) beyond each public street or highway or private road line;
- iii. for a distance of 160 feet (50 m) where future road extensions may occur; in which case, only the existing and proposed grade of the street at center-line are required;
- iv. in reference to Geodetic datum.

5.2.2 Cross-Section and Details

The cross section and detail portions shall fully illustrate the subject matter.

The cross-section portion of the engineering drawings shall include existing and proposed:

- i. ground conditions;
- ii. public streets, highways or private roads;
- iii. service systems.

5.2.3 Drawing Size

The engineering drawings shall be submitted on standard size 24 inch by 36 inch sheets unless approved otherwise by the DOS.



5.3 PRE-CONSTRUCTION MEETING

Upon Tentative Approval, a meeting between MEH and the Applicant's contractor and Design Engineer (or other Professional Engineer who will be inspecting the construction) is required prior to commencing construction. Construction documents must include changes identified during document review by MEH or required by other agencies.



6.0 ACCEPTANCE REQUIREMENTS

Following completion of the construction of any Municipal Services Systems and prior to acceptance of ownership of any of those systems by the Municipality, the following information and/or documentation shall be provided:

6.1 GENERAL

.1 Record Drawings

The As-Recorded engineering drawings in reproducible format (dylar) for each Municipal Services System. The information shown on the record drawings shall be certified by a Professional Engineer. Record drawings are to be provided, prior to water meter installation, for all service laterals 2 inch (50 mm) in diameter and larger on private lands including buildings and shall also be provided for all sprinkler service lines. The Developer shall also include three (3) paper copies and one electronic copy (if available) provided at their own expense.

.2 Service lateral information.

.3 Sanitary sewer and potable water supply must meet the requirements of the Municipality and its Water Utility before the system is taken over.

.4 Professional Engineer's (Post-) Construction Report in compliance with NSDOE requirements.

.5 Summary of Municipal Services Systems installation costs.

The actual costs of the installed sewer and water systems on each individual street in the Subdivision shall be submitted. The actual cost shall be itemized under the following headings:

- i. Sewer pipes (including fittings).
- ii. Water pipes (including fittings).
- iii. Hydrants (including leads and valves).
- iv. Valves.
- v. Pumping stations.
- vi. Sewer Laterals.
- vii. Water Service Lateral.
- viii. All other system components.



- .6 Service easement legal documentation including property description and plan.
- .7 Warranty Deeds including property descriptions and plans for property which shall be transferred to MEH.
- .8 Copy of Permit to Operate from NSDOE.
- .9 Professional Engineer's Certification of Compliance with NSDOE requirements for site stabilization and erosion control.
- .10 Operation and Maintenance Manuals

These manuals shall include recommended procedures for operation of the complete system under normal and emergency operating conditions. Three copies of each manual shall be submitted.
- .11 Maintenance Bond in the amount of 10 percent of the actual cost of construction of the Municipal Service Systems to ensure the proper operation of such systems a period of 12 months from the date of Final Approval.
- .12 Conveyance of each Municipal Services System to the Municipality free of all encumbrances.
- .13 Certification from a licensed surveyor that all services are within streets or service easements being conveyed to MEH.
- .14 Statutory Declaration indicating that all labor and materials used in the construction of the Subdivision have been paid in full.
- .15 Statutory Declaration indicating that the Applicant carried out all work in compliance with all applicable Municipal, Provincial and Federal Regulations, as stipulated throughout these Specifications.
- .16 All deposits, fees, permits, legal documents, supplementary information or other items deemed necessary by the DOS and meeting all requirements of MEH or other regulatory agencies.



6.2 SANITARY SEWAGE COLLECTION SYSTEM

- .1 Video inspection (CCTV), mandrel test, and report are required prior to takeover of system and immediately prior to end of maintenance period.
- .2 Pipe test report.
- .3 Manhole test report.
- .4 Professional Engineer's Certificate of Inspection and Compliance.

6.3 WATER DISTRIBUTION SYSTEM

- .1 Records of water distribution system hydrostatic leakage tests and certification of compliance per NSDOE's Permit to Construct.
- .2 Acceptable bacteriological examination results.
- .3 Professional Engineer's Certificate of Inspection and Compliance.





PART B - CONSTRUCTION SPECIFICATIONS

7.0 SUPPLEMENTARY SPECIFICATIONS

This part of the Municipal Services Systems General Specifications shall be used in direct consultation with the "Standard Specification for Municipal Services", prepared by the Nova Scotia Road Builders Association - Nova Scotia Consulting Engineers Association Joint Committee on Contract Documents.

The following amendments have been made to the sections indicated for greater clarity and applicability to MEH.

SECTION 02200 EARTH WORK

PART 2 - PRODUCTS

2.1 Materials

Revise Sub-section 2.1.1 as follows:

Replace "200" with "100" and add the following: And subject to the approval of PW.

PART 3 - EXECUTION

3.1 Excavation

Revise Sub-section 3.1.6 as follows:

Replace "30" with "20".

3.6 Dewatering

Delete Sub-section 3.6.5 and replace with the following:

.5 Do not drain water from excavation into sanitary sewer under any circumstances.



3.7 Bedding and Backfilling

Delete Sub-section 3.7.1 and replace with the following:

- .1 Do not backfill until work has been inspected by Engineer and PW. Remove all timber, snow, ice, frozen material, and debris from excavation before backfilling. Contractor to provide for inspection by PW at all stages of construction.

Delete Sub section 3.7.2 and replace with the following:

- .2 Backfill with materials indicated and as described herein.

Granular materials for pipe bedding, haunching and initial backfill shall be clear stone for wet trench conditions. For dry trench conditions during winter installation, concrete aggregate mix may be used in place of Type ~~Z~~ gravel.

Actual bedding material will be dependent on trench conditions at the time. Contractor shall utilize all practical means to establish dry trench conditions which will permit the use of Type ~~Z~~ gravel for pipe bedding, haunching and initial backfill. Where in the opinion of the Engineer, dry trench conditions cannot be achieved or conditions are otherwise unsuitable, clear stone or concrete aggregate mix shall be used in place of Type ~~Z~~ material. Materials and installation procedure must meet the requirements of PW before municipal services can be considered for take over in whole or in part. Remaining backfill material shall be select backfill or other material approved by the Engineer and PW.

Delete Sub-section 3.7.5 and replace with the following:

- .5 For PVC pipe, after installation of pipe on compacted bedding, place and compact haunching material to horizontal centerline of pipe utilizing hand tools and taking care to ensure that the material is not arched or bridged beneath the haunch of the pipe and all voids are eliminated. Mechanical compaction equipment may be used if directed by the Engineer. When compacting the material underneath and at either side of the pipe, do not allow the tool or the machine to strike the pipe itself. Ensure that the compacting effort does not dislodge the pipe from the correct grade. If compacting effort dislodges the pipe, relay the pipe to the correct grade. Do not compact the initial backfill directly over the top of the pipe unless otherwise directed by the Engineer; compact only the initial backfill material on either side of the line of the pipe. When using machinery other than hand operated equipment to compact the final backfill, place at least 18 inches (450 mm) of material over the top of the pipe before using heavy vibratory equipment on the final backfill.



Revise Sub-section 3.7.7.3 as follows:

Replace “70%” with “80%”.

3.10 Road Gravels

Add the following Sub-sections 3.10.3, 3.10.4 and 3.10.5:

- .3 Protect municipal services such as valve boxes, manhole covers, etc. Any items damaged or displaced during preparation of road bed and gravels to be replaced and realigned.
- .4 Prevent entry of gravels into sanitary sewer valve boxes, valve chambers, etc. during gravel placement and compaction. Remove any material which enters said structures and fittings.
- .5 Where construction schedule and/or development activity will preclude completion of road to finished grade indicated on profile for extended period of time which may include winter conditions, provision must be made to ensure that buried piping is protected from frost.



SECTION 02515 - PRECAST MANHOLES, CATCH BASINS AND VALVE CHAMBERS

PART 2 - PRODUCTS

2.3 Gaskets

Delete Sub-section 2.3.1 and replace with the following:

- .1 O rings: ASTM C443 standard unless approved otherwise by the DOS.
"Ramneck" material is not acceptable.

2.4 Metal Castings

Add the following Sub-section 2.4.2:

- .2 Acceptable product for manhole covers: IMP R-10 Type or approved equal. Gas port holes to be less than 1 inch (25 mm) in diameter.



SECTION 02517 - SANITARY SEWERS

PART 2 - PRODUCTS

2.2 Concrete Pipe and Fittings

Add the following Sub-section 2.2.3:

10 inch (250 mm) non-reinforced concrete pipe is the maximum size acceptable for installation.

2.3 Plastic Pipe and Fittings

Delete Sub-section 2.3.1 and replace with the following:

Sanitary sewer main pipes to be PVC meeting CSA B182.2-M. Strength rating DR 35 unless loading conditions warrant otherwise. Minimum diameter to be 8 inches (200 mm).

Add the following Sub-section 2.3.4:

Proposed lateral connections from the sanitary sewer system main to the lot line shall be a minimum of 4 inch (100 mm) diameter DR 28 PVC pipe meeting CSA B182.1-M or approved equal.

PART 3 - EXECUTION

3.2 Trenching, Bedding and Backfilling

Add the following to Sub-section 3.2.1:

and as specified in the Design Standards or on the Standard Details – Supplement.

Add the following Sub-section 3.2.2:

Sanitary sewage system pipes shall be bedded and backfilled as shown on MEH Municipal Services Systems Standard Details Supplement EHMS-1. All proposed lateral connections from the sanitary sewage system main to the lot line shall be installed generally as shown on Standard Detail 02517 D1 and as specified in the Design Standards.



3.3 Pipe Installation

Add the following to Sub-section 3.3.1:

Installation materials and workmanship to meet the requirements of MEH.

Delete Sub-section 3.3.14 and replace with the following:

- .14 Make water tight connections to manholes using A-lok water tight gaskets manufactured by L.E. Shaw Limited or approved equal.

Add the following Sub-section 3.3.15:

- .15 Connections to existing manholes to be core-drilled to accommodate gasket connection.

3.6 Testing

Add the following to Sub-section 3.6.1:

Notwithstanding Sub-section 3.6.6 below, testing will be by exfiltration tests unless agreed otherwise by PW.

Air testing, if approved by PW, may be used for all pipes up to and including 24 inch (600 mm) diameter pipe and shall be conducted in accordance with the requirements of the Engineer and PW.

Revise Sub-section 3.6.3 as follows:

Replace "Engineer" with "Engineer and PW".

Delete Sub-section 3.6.5.1 and replace with the following:

- .1 Test section between manholes of sewer including main and service connections by filling section with water to displace air from main and service connections. Fill and maintain nominal head on concrete pipe 24 hours before testing to allow adsorption of water by pipe material.

Delete Sub-section 3.6.5.2 and replace with the following:

- .2 Place a plug in the lower end of the pipe and use a stand pipe at the upper manhole to a minimum depth of 10 feet (3 m) above the top of the pipe. Do not exceed net internal head of 26 feet (8 m).



Delete Sub-section 3.6.5.3 in its entirety and replace with the following:

- .3 Conduct the test by maintaining the test head for a minimum period of thirty (30) minutes.

Delete Sub-section 3.6.7 and replace with the following:

- .7 Allowable leakage: 0 Imp. Gal. (0 litres) permitted for PVC pipe. 100 Imp. Gal./inch diameter/mile/day (30 litres/mm diameter/kilometer/day) permitted for concrete pipe.

Delete Sub-section 3.6.8.3 and replace with the following:

- .3 Fill test section slowly until a constant pressure of 3.5 psi (24 kPa) is reached. If groundwater is above section being tested, PW may recommend an increase in air pressure.

Delete Sub-section 3.6.8.5 and replace with the following:

- .5 After a 5 minute period, shut off air supply.

Revise Sub-section 3.6.8.6 as follows:

Delete "Decrease pressure to 24 kPa".

3.8 Inspection

Delete Sub-section 3.8.2 and replace with the following:

Television camera inspections will be required prior to recommendation of Final Approval and two months prior to the end of the 12 month maintenance period. Additional TV inspections shall be carried out prior to takeover of the system where reasonable grounds to suspect faults is demonstrated. Such additional inspections shall be carried out at the discretion of and at no cost to the Municipality.

3.9 Closed Circuit Television Inspection

Revise Sub-section 3.9.7.3 as follows:

- .3 Replace "Engineer" with "Engineer and PW".



SECTION 02518 - WATER MAIN

PART 1 - GENERAL

1.4 Shop Drawings

Add the following Sub-section 1.4.3:

- .3 Submit shop drawings indicating details of all thrust restraint devices other than thrust blocks indicated on Standard Details 02518 E4 and 02518 E5. Thrust restraints shall be designed by a Professional Engineer.

1.7 Scheduling of Work

Delete Sub-section 1.7.2 and replace with the following:

- .2 Notify Engineer, PW and building occupants a minimum of 3 working days in advance of planned interruptions in service.

Add the following Sub-section 1.7.5:

- .5 Interruptions to existing services are not encouraged. When necessary, PW will be notified a minimum of three working days prior to planned interruption. Planned interruption will not be permitted without written permission of PW.

PART 2 - PRODUCTS

2.2 Ductile Iron Pipe and Fittings

Add the following to Sub-section 2.2.1:

"Class 52"

Delete Sub-section 2.2.2 and replace with the following

- .2 Fittings: to AWWA specifications C-104, C-110 and C111, cement mortar lined, minimum pressure rating 150 psi (1035 kPa) for cast-iron , 250 psi (1720 kPa) for ductile iron.



Add the following Sub-sections 2.2.5 and 2.2.6:

- .5 All ductile-iron pipe and fittings shall be polyethylene encasement.
- .6 Acceptable products: Megalug fittings or approved equal.

2.3 Polyvinyl Chloride Pipe and Fittings

Delete Sub-section 2.3.1 and replace with the following:

- .1 DR 18 C900 PVC pipe and joints shall conform to CAN/CSA B137.3-M and AWWA C900 or AWWA C905 cast-iron outside diameter, gasketed bell-end joint.

Class 150 (DR 18) or Class 200 (DR 14), where required.

2.4 Concrete Pressure Pipe and Fittings

Delete entire Sub-section 2.4.

2.5 Hydrants

Delete Sub-section 2.5.1.5 and replace with the following:

- .5 Nozzles: two standard 2½ inch hose nozzles and one standard 5¾ inch pumper nozzle conforming to Standard Hose Coupling Act of Nova Scotia. Pump is Nozzle (McAvity SD thread).

Delete Sub-section 2.5.1.6 and replace with the following:

- .6 Equip fire hydrants with a standard operating nut which will close the hydrant when rotated clockwise.

Delete Sub-section 2.5.1.8 and replace with the following:

- .8 Colour: red with caps and bonnets silver. Paint shall be rust protected with no lead content.

Add the following Sub-sections 2.5.1.9, and 2.5.1.10:

- .9 Laterals: minimum diameter of 6 inches (150 mm) and provided with a gate valve.



- .10 Acceptable product: McAvity M-67 complete with drains and Steamer pumper nozzle to meet requirements for 5 ¾ inch hose connection in accordance with the Standard Hose Coupling Act of Nova Scotia (McAvity SD).

2.6 Gate Valves

Revise Sub-section 2.6.1 as follows:

Delete "AWWA C500...1035 kPa or".

Delete Sub-section 2.6.1.2.

Add the following Sub-section 2.6.1.7:

- .7 Acceptable product: McAvity iron body, bronze mounted, solid wedge gate with inside screw or an approved equal.

2.8 Valve Boxes

Delete Sub-section 2.8.1 and replace with the following:

- .1 Valve Boxes: to AWWA C500 and as follows:
- .1 Cast iron, smooth and free from sand holes or other defects
 - .2 Equipped with cast iron covers at the surface and marked "WATER", "SPRINKLER" or "HYDRANT" as appropriate.
 - .3 Have a bonnet and centering wheel on the bottom section which is capable of enclosing and peaking gland section of the gate valve
 - .4 Consist of one top section and one base section which shall be telescopic with each other and give adjustment for height by sliding suitable for adjustment to future finished asphalt surface.
 - .5 Acceptable product: Type V.1 as manufactured by IMP or approved equal.

2.9 Service Pipe and Fittings

Add the following Sub-section 2.9.4.1:

- .1 Acceptable product: Mueller H-15008 with a Mueller thread inlet and a compression copper outlet or approved equal, complete with drain.



Add the following Sub-section 2.9.5.1:

- ~~H-15217~~
H-15219
- .1 Acceptable product: Mueller ~~H-15217~~, inverted key type with compression connections or an approved equal, complete with drain.

Delete Sub-section 2.9.7 and replace with the following:

- .7 Service box: telescopic stem type expanding from 5 feet, 6 inches (1.7 m) to 6 feet, 6 inches (2.1 m), cast iron bottom section, cast-iron lid with recessed pentagon nut and internal stem to suit depth of bury. Service box to have appropriate foot piece.

PART 3 - EXECUTION

3.2 Trenching, Bedding, and Backfilling

Add the following to Sub-section 3.2.1:

and as specified in the Design Standards or on the Standard Details - Supplement.

Add the following Sub-section 3.2.2:

- .2 Install watermain on undisturbed soil or compacted fill to the approval of PW.

3.5 Hydrant Installation

Delete Sub-section 3.5.1 and replace with the following:

- .1 Install hydrants in accordance with Standard Details - Supplement. Access across ditch to be provided complete with culvert sized in accordance with NSDOT and/or MEH requirements and to suit anticipated ditch flow.

Delete Sub-section 3.5.2 and replace with the following:

- .2 Install 6 inch (150 mm) gate valve and cast iron valve box on hydrant leads in accordance with Standard Details - Supplement. Gate valve to be tied to main by suitable thrust restraint device. Valve box to be adjustable.

Add the following to Sub-section 3.5.3:

Hydrant body to be equipped with specified nozzles prior to installation.



3.8 Service Connections

Add the following to Sub-section 3.8.2:

Direct tap not permitted in PVC pipe.

Add the following to Sub-section 3.8.3:

Bedding and backfill for water service pipe to be approved by PW.

Add the following to Sub-section 3.8.6:

Top of service box shall be set 6 inches (150 mm) above centerline finished roadway elevation and not more than 6 inches (150 mm) above finished grade.

Add the following Sub-section 3.8.8:

- .8 Water service lateral saddle to be double strap, stainless steel or single strap stainless steel Romac 202N, 202S, 101S or approved equal. Saddle body and strap must be compatible with DR 18 PVC pipe.

3.9 Connections to Existing Main

Add the following Sub-sections 3.9.4 and 3.9.5:

- .4 Where a tee connection is to be made in an existing main, it shall be by tapping sleeve and valve utilizing tapping sleeve with stainless steel strap except where interruption to existing serviced customers can be minimized subject to approval by PW.
- .5 When a connection is made to an existing main (i.e., inserting tapping sleeve) an inspection of the joints for leakage must be made by PW while the main is under operating pressure, prior to backfilling.

3.10 Hydrostatic and Leakage Testing

Revise Sub-section 3.10.4 as follows:

Replace "Engineer" with "Engineer and PW".



Add the following to Sub-section 3.10.11:

Chlorination and pressure test ports to be plugged with solid brass plug after testing complete.

Add the following Sub-section 3.10.12:

- .12 Following pressure test, test all hydrant barrels and nozzles for abnormal leakage at working pressure to the approval of PW.

3.11 Flushing and Disinfection

Add the following Sub-section 3.11.20:

- .20 Water for flushing and disinfection shall be provided by the Contractor. Water from the Utility may be provided with written permission of PW. Water Utility valves shall be operated by Water Utility personnel only.

All bacteriological sampling shall be carried out by PW. Bacteriological sampling must be verified by NSDOE tests prior to placing watermain in service, except where this requirement is waived by PW.

Chlorination and pressure test ports to be plugged with solid brass plug after testing complete.

Add the following Sub-sections 3.12 and 3.13:

3.12 Backflow Prevention Devices

- .1 Backflow prevention devices are required on services if there is a risk of contamination of potable water supply. Premises which require backflow prevention devices include, but are not limited to, the following:
 - .1 Industrial, commercial and institutional buildings.
 - .2 Apartment buildings greater than four units.
 - .3 Sprinkler service lines.
- .2 On domestic services, approved backflow prevention device should be installed immediately on customer's side of the water meter. A water distribution connection is not permitted between the water meter and backflow prevention device.



- .3 Where a meter by-pass is required and approved by DOS, backflow prevention devices on customer side of the meter and by-pass shall be installed.
- .4 For fire protection systems, all piping, fittings, valves and test ports must be National Sanitation Foundation (NSF) approved for contact with potable water (ductile iron, epoxy coated steel, stainless steel, plastic, copper or brass) up to and including the backflow prevention device.
- .5 Where a pump is installed on a fire protection system, the backflow prevention device must be installed downstream (i.e., on the Water Utility side) of the pump unless written approval is obtained from the Fire Marshall's office. Reduced pressure backflow preventers are not allowed upstream of the fire pumps under any circumstances.
- .6 Hydraulic analysis by a Professional Engineer should be conducted for every system where a backflow prevention device is installed.

3.13 Combination Air Relief and Vacuum Valves

- .1 3 inch (75 mm) diameter and larger:
 - .1 Heavy duty cast-iron body with bronze trim and combination of small orifice and large orifice units. Small orifice size shall be 1/8" (3.2 mm). Valves shall be suitable for operation at 145 psi (1 MPa) working pressure and have flanged ends to ANSI B161.
 - .2 Operation shall be through independent floating stainless steel balls located in both orifices.
 - .3 Orifices shall be capable of expelling air at a high rate during filling and at a low rate during operation and admitting air while draining the pipeline. Seats shall be replaceable.
 - .4 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.
 - .5 Valves shall not leak in the closed position when pipeline is filled.
 - .1 Acceptable products:
 - .1 G.A. Industries Ltd., Fig 960-C
 - .2 APCO, Model 147C
 - .3 Crispin, Model AL30
 - .4 or approved equal.



- .6 Corporation stop: Brass complete with IPS inside and outside thread, size as indicated
 - .1 Acceptable Products:
 - .1 Mueller A-218
 - .7 Service saddle: brass, double strap type
 - .1 Acceptable manufacturers:
 - .1 Rockwell
 - .2 Mueller
 - .3 Ford
 - .4 Robar
 - .8 Stainless steel nipples and ball valve are to be provided between saddle and air relief valve.
 - .9 Stainless steel gooseneck pipe arrangement to be provided at the threaded outlet for discharge protection.
- .2 2 inch (50 mm) diameter and less:
- .1 Heavy duty body consisting of metal and nylon reinforced glass fibre high impact plastic, with a combination small and large orifice. Small orifice shall be stainless steel with a minimum opening of 1/32" (0.8 mm), valve shall be suitable for operation at 218 psi (1.5 MPa) working pressure. Size as indicated.
 - .2 Operation shall be independent floats located in both orifices.
 - .3 Orifices shall be capable of expelling air at a high rate during filling and at low rate during operation and admitting air while draining the pipeline. Seats shall be replaceable.
 - .4 Valves shall have no moving parts except for the floats which shall remain in the throat area, discharging air without blowing shut.
 - .5 Valves shall not leak in the closed position when pipeline is filled.
 - .1 Acceptable products:
 - .1 Bernad, Model No. 4415
 - .2 Valve matic. Model 201C or 202C
 - .3 APCO, Model 143C or 145 C
 - .4 Crispin, Model AL20
 - .6 Corporation stop: Brass complete with IPS inside and outside thread, size as indicated.
 - .1 Acceptable product:
 - .1 Mueller A-218



- .7 Service saddle: brass, double strap type.
 - .1 Acceptable product:
 - .1 Mueller
 - .2 Rockwell
 - .3 Ford
 - .4 Robar
- .8 Stainless steel nipples and ball valve are to be provided between corporation stop and air relief valve.
- .9 Stainless steel gooseneck pipe arrangement to be provided at the threaded outlet for discharge protection.



SECTION 02519 - PRESSURE SEWERS

PART 2 - PRODUCTS

2.2 Ductile Iron Pipe and Fittings

Delete Sub-sections 2.2.1 and 2.2.2 and replace with the following:

- .1 Pipe: to AWWA C151, Class 52, cement mortar lined.
- .2 Fittings: to AWWA C110 or C153, cement mortar lined, minimum pressure rating 150 psi (1035 kPa) for cast-iron, 250 psi (1720 kPa) for ductile iron. Fittings are to be wrapped with anti-corrosion tape such as Denso or approved equal.

2.3 Polyvinyl Chloride Pipe and Fittings

Delete Sub-section 2.3.1 and replace with the following:

- .1 Pipe and joints: DR 18 to AWWA C900 or AWWA C905, CAN/CSA B137.3-M, cast iron outside diameter, gasketed bell-end joint.

Delete Sub-section 2.3.2.2 and replace with the following:

- .2 Gray or ductile-iron: to AWWA C110 or C153, cement mortar lined, minimum pressure rating 150 psi (1035 kPa) for cast-iron, 250 psi (1720 kPa) for ductile-iron. Fittings are to be wrapped with anti-corrosion tape such as Denso or approved equal.

Delete entire Sub-sections 2.4 and 2.5.

2.6 Gate Valves

Add the following Sub-section 2.6.1.7:

- .7 Acceptable products: Mueller NRS resilient seat A2370-23 or approved equal.



2.7 Valve Boxes

Add the following Sub-section 2.7.1.4:

- .4 Acceptable products: IMP model V.1 or approved equal

Add the following Sub-sections 2.10, 2.11 and 2.12:

2.10 Check Valves

- .1 Wafer swing check: wafer style, ANSI Series 125, minimum working pressure 290 psi (2 MPa) and as follows:
 - .1 Body: ductile iron with stainless steel disc or seat.
 - .2 Spacers: Teflon Buna-N O-rings.
 - .3 Seat: Teflon Buna-N O-rings.
 - .4 Acceptable Products:
 - .1 Check Rite, Model 210.
- .2 Ball Check: Acceptable products:
 - .1 HDL Check Valve.

2.11 Air Relief and Vacuum Valves

- .1 3 inch (75 mm) diameter and larger:
 - .1 Heavy duty cast-iron body with bronze trim and combination of small orifice and large orifice units. Small orifice size shall be 1/8" (3.2 mm). Valves shall be suitable for operation at 145 psi (1 MPa) working pressure and shall have flanged ends.
 - .2 Operation shall be through independent floating stainless steel balls located in both orifices.
 - .3 Orifices shall be capable of expelling air at a high rate during filling and at a low rate during operation and admitting air while draining the pipeline. Seats shall be replaceable.
 - .4 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.
 - .5 Valves shall not leak in the closed position when pipeline is filled.
 - .6 Acceptable Products:
 - .1 APCO
 - .2 Crispin
 - .3 or an approved equal.



- .2 2 inch (50 mm) diameter and less:
 - .1 Heavy duty body consisting of metal and nylon reinforced glass fibre high impact plastic, with a combination small and large orifice. Small orifice shall be stainless steel with a minimum opening of 1/32" (0.8 mm), valve shall be suitable for operation at 218 psi (1.5 MPa) working pressure.
 - .2 Operation shall be through independent floats located in both orifices.
 - .3 Orifices shall be capable of expelling air at a high rate during filling and at a low rate during operation and admitting air while draining the pipeline. Seats shall be replaceable.
 - .4 Valves shall have no moving parts except for the floats which shall remain in the throat area, discharging air without blowing shut.
 - .5 Valves shall not leak in the closed position when pipeline is filled.
 - .6 Acceptable products:
 - (i) APCO
 - (ii) Crispin.

2.12 Plug Valves

- .1 Acceptable products:
 - .1 Keystone plug valve.



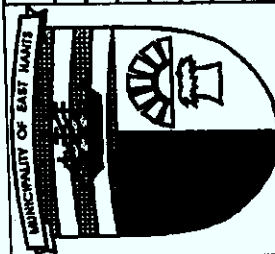
SECTION 17000 STANDARD DETAILS - SUPPLEMENT

These Supplementary Details are to supplement the details provided in "Standard Specifications for Municipal Services", Section 17000, prepared jointly by the Nova Scotia Road Builders Association and the Nova Scotia Consulting Engineers Association. (If a detail has the same identifying title, then the details presented in this document will take precedence).

INDEX

<u>Detail Title</u>	<u>Number</u>
Pipe Trench Detail	S-1
Location of Municipal Services - Two Unit Dwelling	S-2
Municipal Placement of Water Valves	S-3
Fire Hydrant Connection to Existing Services	S-4
Fire Hydrant Connection for Proposed Services	S-5
Culvert Headwall	S-6
Air Release / Air Vacuum Valve Chamber	S-7

/mdh

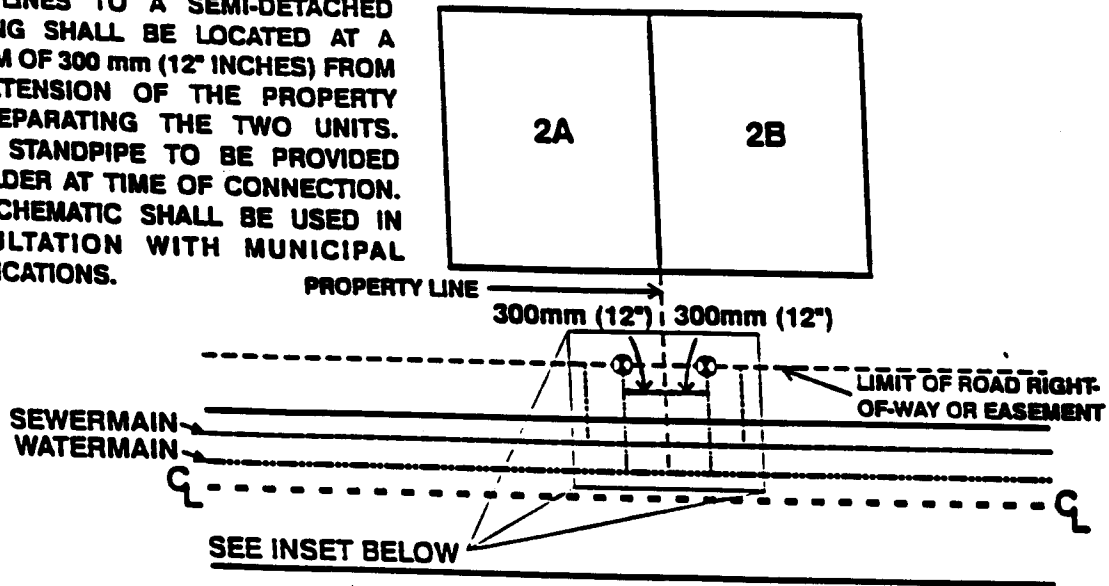


MUNICIPALITY OF EAST HANTS			
EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS			
PIPE TRENCH DETAIL			
DRAWN BY:	Jill Searle	DATE:	July-98
APPROVED BY:	DOS & PW	SCALE:	NTS
DRAWING #:	S-1		

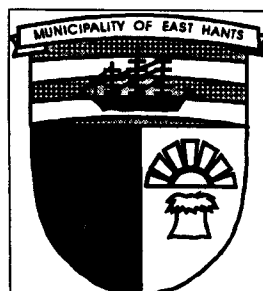
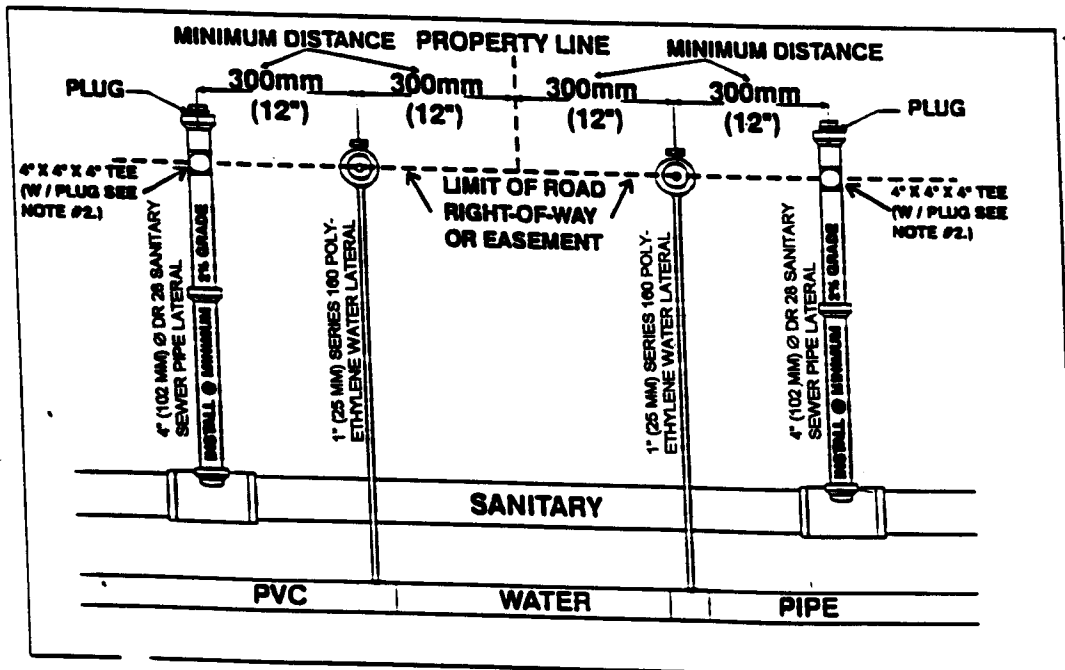
NOTES:

- 1.) WATER LINES TO A SEMI-DETACHED DWELLING SHALL BE LOCATED AT A MINIMUM OF 300 mm (12" INCHES) FROM THE EXTENSION OF THE PROPERTY LINE SEPARATING THE TWO UNITS.
- 2.) SEWER STANDPIPE TO BE PROVIDED BY BUILDER AT TIME OF CONNECTION.
- 3.) THIS SCHEMATIC SHALL BE USED IN CONSULTATION WITH MUNICIPAL SPECIFICATIONS.

PLAN



INSET



MUNICIPALITY OF EAST HANTS

EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS

LOCATION OF MUNICIPAL SERVICES - TWO UNIT DWELLING

DRAWN BY: Chad Renouf DATE: September-97

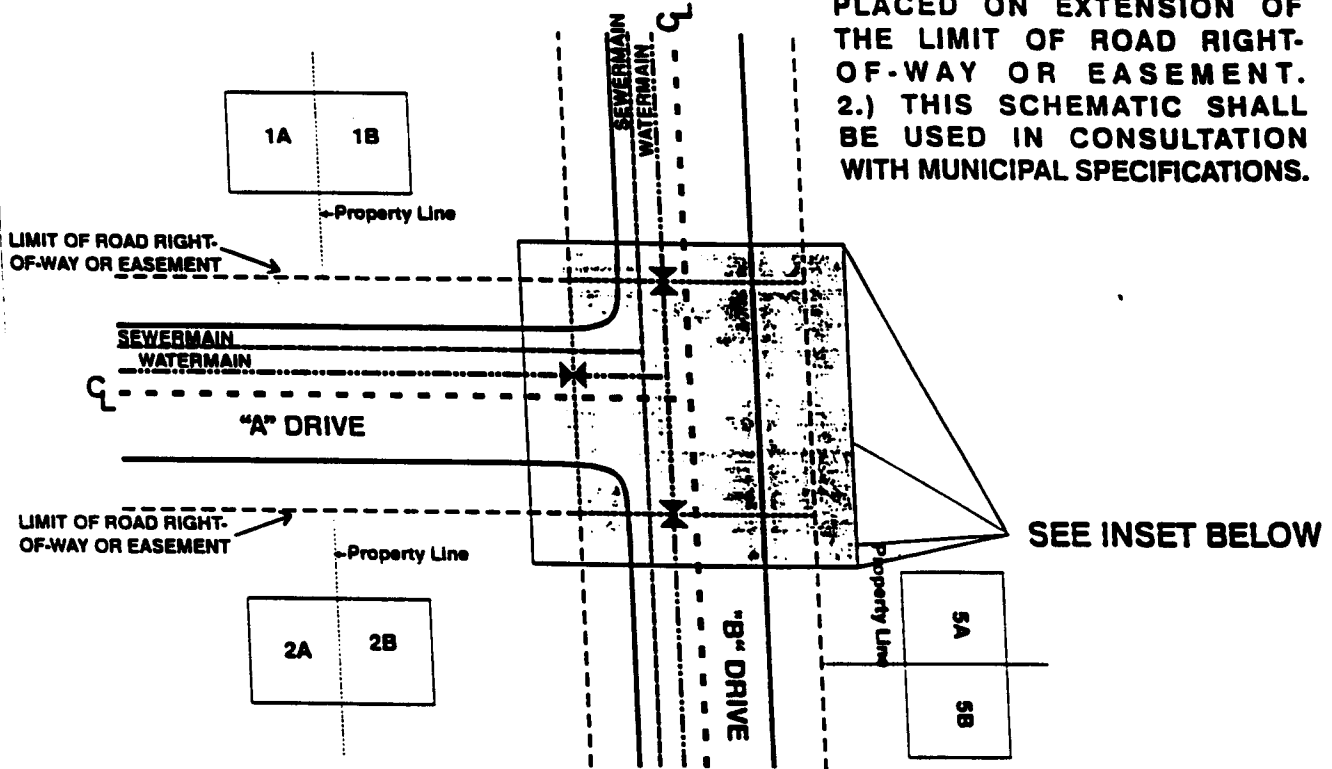
APPROVED BY: DOS & PW SCALE: NTS

DRAWING #: S-2

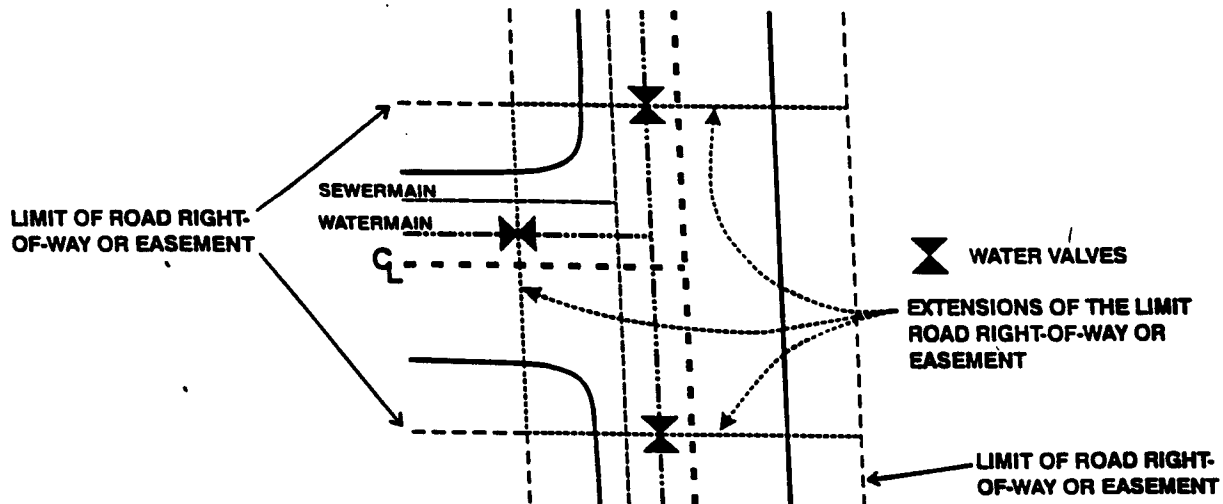
PLAN

NOTES:

- 1.) WATER VALVES SHALL BE PLACED ON EXTENSION OF THE LIMIT OF ROAD RIGHT-OF-WAY OR EASEMENT.
- 2.) THIS SCHEMATIC SHALL BE USED IN CONSULTATION WITH MUNICIPAL SPECIFICATIONS.



INSET



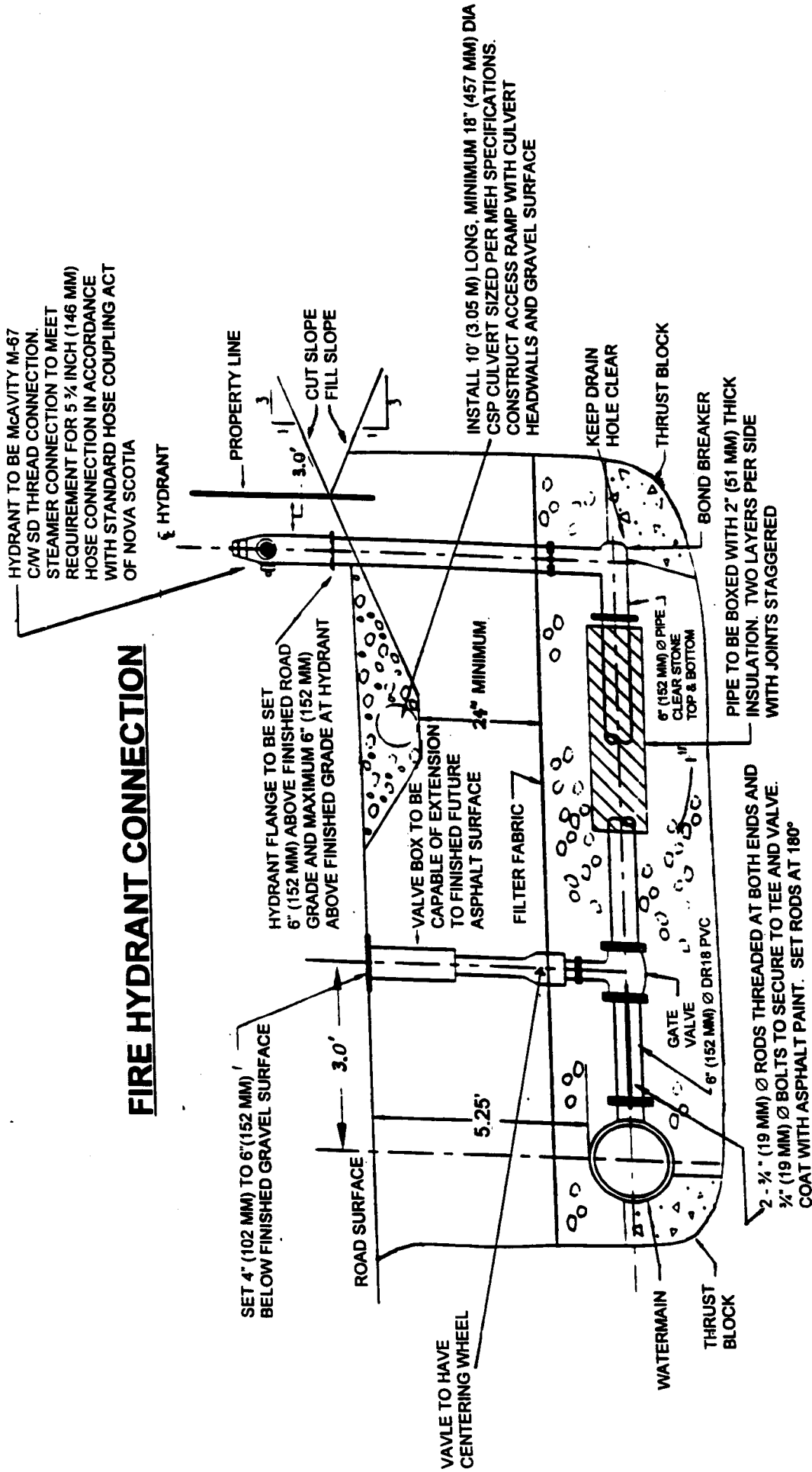
MUNICIPALITY OF EAST HANTS

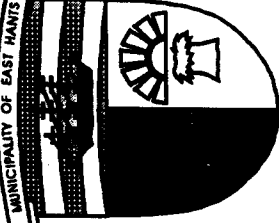
EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS

MUNICIPAL PLACEMENT OF WATER VALVES

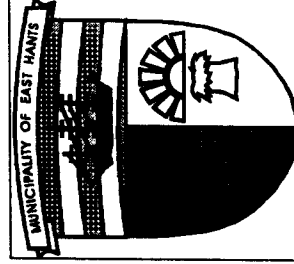
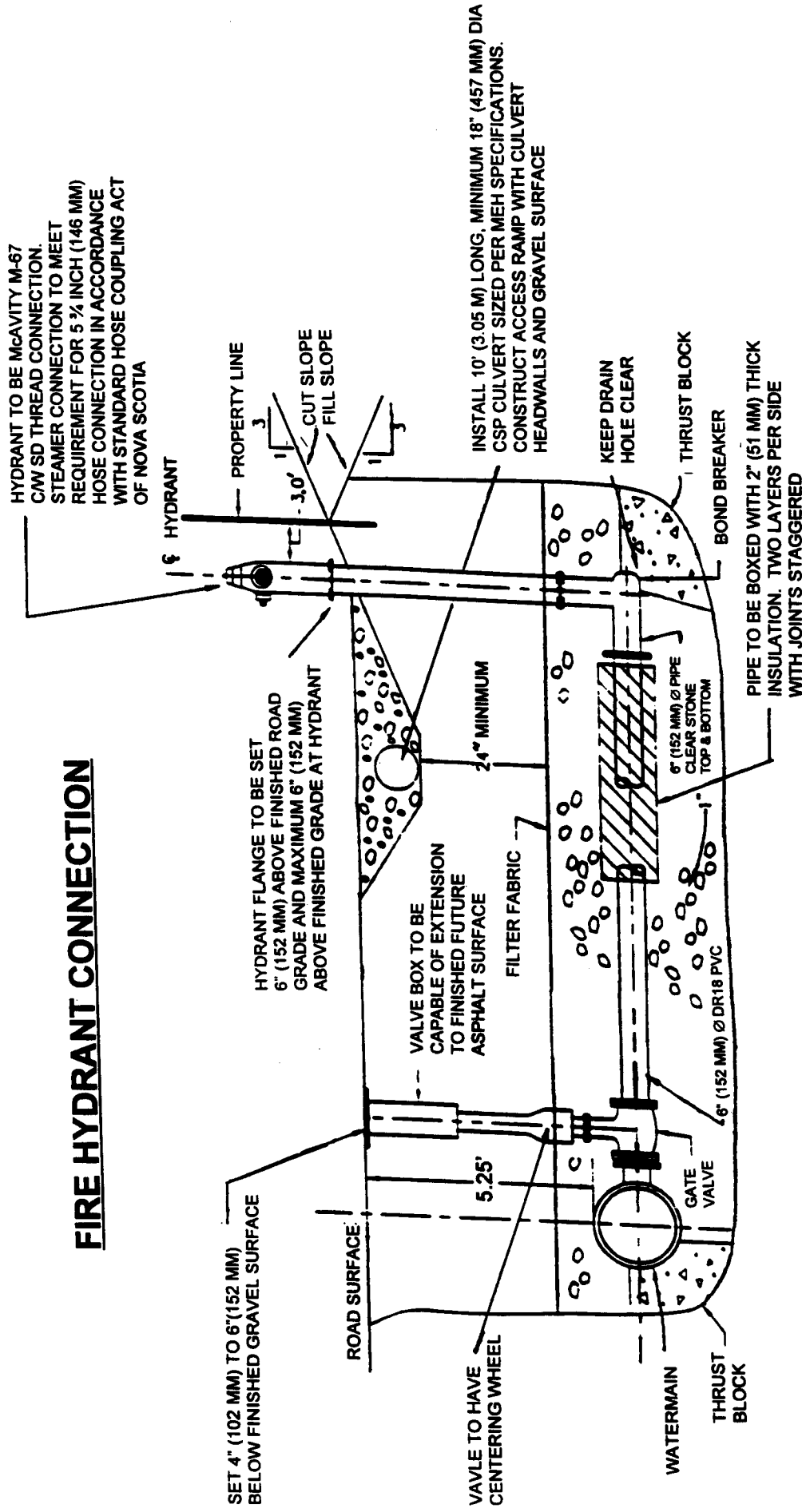
DRAWN BY:	Chad Renouf	DATE:	September-97
APPROVED BY:	DOS & PW	SCALE:	NTS
DRAWING #:	S-3		

FIRE HYDRANT CONNECTION



			
MUNICIPALITY OF EAST HANTS			
EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS			
FIRE HYDRANT CONNECTION TO EXISTING SERVICES			
ADOPTED BY:	DOS & PW	DATE:	August-97
APPROVED BY:	DOS & PW	SCALE:	NTS
DRAWING #:		S-4	

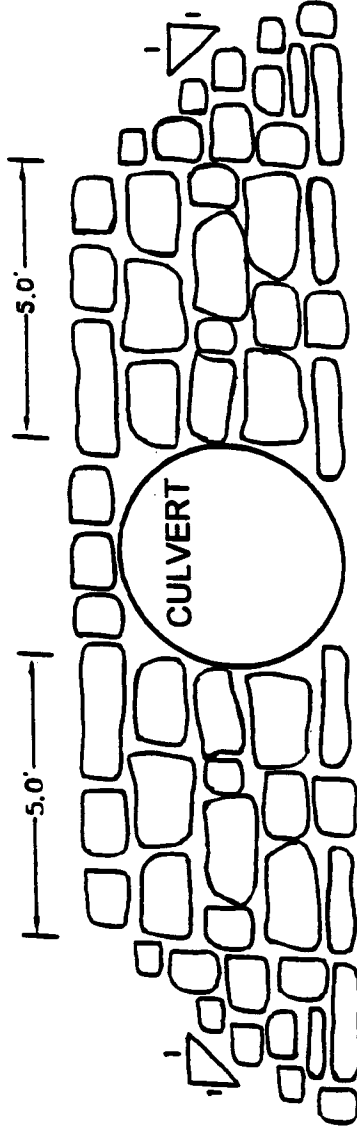
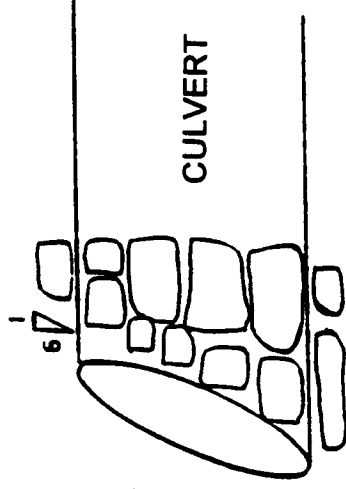
FIRE HYDRANT CONNECTION



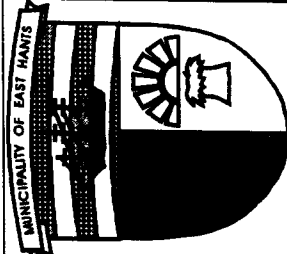
MUNICIPALITY OF EAST HANTS			
EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS			
FIRE HYDRANT CONNECTION FOR PROPOSED SERVICES			
ADOPTED BY:	DOS & PW	DATE:	July-97
APPROVED BY:	DOS & PW	SCALE:	NTS
DRAWING #:	S-5		

CULVERT HEADWALL DETAIL

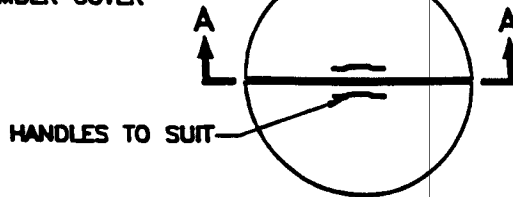
CONSTRUCT STONE HEADWALL AT EACH
CULVERT INLET AND OUTLET UNLESS
SPECIFIED OTHERWISE ON PLAN AND
PROFILE SHEETS.



USE MINIMUM 60 POUND STONES

		MUNICIPALITY OF EAST HANTS	
		EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS	
		CULVERT HEADWALL	
ADOPTED BY:	DOS & PW	DATE:	August-97
APPROVED BY:	DOS & PW	SCALE:	NTS
DRAWING #:		S-6	

CONSTRUCT IN TWO PIECES.
DIAMETER TO MATCH OPENING
IN CHAMBER COVER



PLAN

25x25x6 ANGLE ALL
AROUND OPENING
ANCHORED TO CONCRETE.



SECTION A-A



INSULATED COVER C/W HANDLE,
10 PLYWOOD & 100 INSULATION
SEE DETAIL 1

100mm ALUMINIUM VENT PIPE

IMP R-90 FRAME & COVER

150mm GRADE RINGS

VARIES
1200

750

1200 DIA min.
(PRECAST CONC. SECTION)

450
MAX.

'O' RING GASKET

1% SLOPE

50 RIGID POLYSTYRENE INSULATION

50 COMBINATION AIR RELEASE/
VACUUM VALVE (AS APPROVED)

STAINLESS STEEL NIPPLE
AND BALL VALVE.

50 CORPORATION STOP

50 DOUBLE STRAP SADDLE

WATERMAIN

300
200

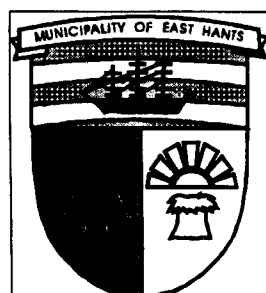
"A LOK" GASKET

SLOPE FLOOR TO DRAIN

CAST-IN-PLACE CONCRETE
FLOOR 30 MPA CONC. (TYP.)

25 CLEAR STONE
BRICK PIPE SUPPORTS
GROUTED TO MATCH
PIPE CROSS-SECTION

12" (300 MM) SQUARE FLOOR DRAIN AT A MIN. DEPTH
OF 4" (102 MM) BELOW FLOOR SURFACE. DRAIN TO
BE CONNECTED TO ATMOSPHERE AND FITTED WITH
A SUITABLE BACKFLOW PREVENTOR UNLESS
OTHERWISE DIRECTED BY THE DOS.



MUNICIPALITY OF EAST HANTS

EAST HANTS MUNICIPAL SERVICES SPECIFICATIONS

AIR RELEASE / AIR VACUUM VALVE CHAMBER

ADOPTED BY: DOS & PW DATE: March-98

APPROVED BY: DOS & PW SCALE: 1:25

DRAWING #: S-7