

**DRAWINGS**

201-1	Watermain and Servicing Laterals
201-2	Watermain and Servicing Profiles
601-1	Floor Plan and Reflected Ceiling Plan For Water Main
2200-1	Floor Plan Cold Water & FP Entrance

**SPECIFICATIONS:**

<b><u>DIVISION</u></b>	<b><u>SECTION</u></b>	<b><u>NO. OF PAGES</u></b>
DIVISION 01	01 10 01 – General Requirements.....	11
	01 35 29 – Health and Safety Requirements.....	02
	01 35 54 – Site Security Requirements.....	05
DIVISION 20	20 04 00 – Mechanical General Requirements.....	06
	20 05 00 – Basic Mechanical Materials and Methods.....	10
	20 05 54 – Identification.....	04
	20 07 00 – Thermal Insulation for Piping.....	04
	20 08 01 – Performance Verification Mechanical Piping System...	01
DIVISION 22	22 11 18 – Plumbing Piping, Valves and Fittings.....	06
	22 42 01 – Plumbing Specialties and Accessories.....	03
DIVISION 31	31 23 00 – Excavation and Backfill and Trenching.....	06
DIVISION 32	32 12 16 – Asphalt Paving.....	05
DIVISION 33	33 11 17 – Watermains.....	10
	33 31 13 – Sanitary Sewerage.....	05

<u>Section</u>	<u>Title</u>	<u>Pages</u>
01 10 01	General Requirements	11
01 35 29	Health and Safety Requirements	2
01 35 54	Site Security Requirements	5



---

## 1 General

### 1.1 INDEX OF ARTICLES

ARTICLE	TITLE
1	General
1.1	Index of Articles
2	Summary of Work
2.1	Requirements Included
2.2	Examination
2.3	Documents Required
2.4	Codes and Standards
2.5	Laws and Regulations
2.6	Permits and Licenses
3	Site Layout
3.1	Layout of Work
3.2	Concealed or Unknown Conditions
4	Project Coordination
5	Cutting, Fitting and Patching
6	Project Meetings
7	Submittals
7.1	Administrative
7.2	Shop Drawings
7.3	Samples
7.4	Record Drawings
7.5	Progress Photographs
8	Construction Schedule
9	Quality Control
9.1	Inspection
9.2	Rejected Work
10	Construction Facilities and Temporary Controls
10.1	Installation/Removal
10.2	Hoarding
10.3	Barriers
10.4	Site Storage
10.5	Sanitary Facilities
10.6	Water Supply
10.7	Temporary Power and Light
10.8	Temporary Telephone
10.9	Offices and Sheds
10.10	Project Cleanliness
11	Materials and Equipment
11.1	Products and Materials
11.2	Storage, Handling and Protection
11.3	Manufacturer's Instructions
11.4	Workmanship

- 12 Contract Closeout
  - 12.1 Final Cleaning
  - 12.2 Operating and Maintenance Manual
  - 12.3 Documents
  - 12.4 Substantial Performance Inspection
  - 12.5 Total Performance of the Work

## 2 Summary of Work

### 2.1 REQUIREMENTS INCLUDED

- .1 Work under this Contract includes new water main, new sanitary connection, interior water connections, and well decommissioning, complete with related site work, mechanical and electrical work.
- .2 Work shall be Substantially Completed by time stated in Bid Form.

### 2.2 EXAMINATION

- .1 Before submitting Bid, visit the site and examine conditions of work. Departmental Representative will arrange only one site visit.
- .2 Before commencing work, verify all relevant field dimensions.
- .3 Report to the Departmental Representative in writing, defects, faulty work or unsuitable working conditions which may affect the quality of workmanship of this project.

### 2.3 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each of the following:
  - .1 Contract Drawings
  - .2 Specifications
  - .3 Addenda
  - .4 Reviewed shop drawings and, if applicable, all revisions thereof
  - .5 Change Orders
  - .6 Other modifications to Contract
  - .7 Building permit(s).

### 2.4 CODES AND STANDARDS

- .1 Work shall conform to requirements of the National Building Code of Canada 2010 and local codes which may govern the requirements of the installation.

### 2.5 LAWS AND REGULATIONS

- .1 Comply with all federal, provincial, territorial, municipal or local laws and regulations of the authorities with regard to the works or having jurisdiction in the locality of the works including, but not limited to, any law, ordinance, rule or regulation of public health and safety.

### 2.6 PERMITS AND LICENSES

- .1 Obtain building permits and other permits and licenses required to fully comply with all laws, ordinances and regulations in connection with the performance of the works.

3 Site Layout

3.1 LAYOUT OF WORK

- .1 Establish basic horizontal and vertical control lines and levels from the drawings.
- .2 Assume responsibility for the layout of work of all trades from the aforementioned basic control lines and levels. Supply, establish and maintain all additional survey reference points and other work lines and levels necessary to perform the work.
- .3 Where layout dimensions are not indicated, respect alignment shown with other elements.

3.2 CONCEALED OR UNKNOWN CONDITIONS

- .1 Promptly notify the Departmental Representative in writing if:
  - .1 subsurface or otherwise concealed physical conditions which existed before the start of the Work which differ materially from those indicated in the Contract Documents.
  - .2 Physical conditions of a nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents.
- .2 After prompt investigation, should Departmental Representative determine that the conditions do differ materially, instructions will be issued for changes in the work.

4 Project Coordination

- .1 Contractor shall provide necessary coordination between all trades on site and ensure cooperation of trades with each other.

5 Cutting, Fitting and Patching

- .1 Execute cutting, fitting and patching required to complete the work.
- .2 Remove defective and nonconforming work, and replace with new at no cost to Owner.
- .3 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- .4 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed without prior approval.
- .5 Restore work with new products in accordance with requirements of Contract Documents.

6 Project Meetings

- .1 Schedule project meetings at least once per month (more often if deemed necessary by Departmental Representative). Distribute written notice four (4) days in advance of meetings.
- .2 The Contractor shall preside at meetings, record the Minutes, and reproduce and distribute copies of Minutes to all parties.
- .3 Representatives of Contractor, subcontractor and suppliers attending meetings shall be qualified and authorized to act on behalf of the party each represents.
- .4 Distribute copies of minutes within three (3) days after meeting.

---

## 7 Submittals

### 7.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative, submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the work.
- .2 Review submittals prior to submission to the Departmental Representative. This review represents that the contractor has:
  - .1 determined and verified all field requirements and conditions, or will do so, and
  - .2 has checked and coordinated shop drawings with requirements of work and contract documents.
- .3 Present submittals in same units of measurement as drawings and specifications (ie. if drawings and specifications are done in metric, then shop drawings are to be in metric). Where items or information is not produced in the appropriate units of measurement, converted values are acceptable.
- .4 Work affected by the submittal shall not proceed until review is complete.

### 7.2 SHOP DRAWINGS

- .1 The term shop drawings means drawings, diagrams, illustrations, schedules, performance charts, brochures, product data, and other data which the Contractor provides to illustrate details of portions of the work.
- .2 Contractor shall arrange for the preparation of clearly identified shop drawings, as called for by the Contract Documents.
- .3 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Cross references to:
    - .1 Design drawing, including plan, detail or section number.
    - .2 Specification Section, Article and paragraph.
  - .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .6 Details of appropriate portions of Work as applicable:
    - .1 Materials.
    - .2 Fabrication or construction.
    - .3 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .4 Installation, setting or erection details.
    - .5 Capacities.
    - .6 Performance characteristics.
    - .7 Standards.
    - .8 Operating weight.
    - .9 Wiring diagrams.
    - .10 Single line and schematic diagrams.
    - .11 Relationship to adjacent work.

- .4 At time of submitting shop drawing, advise Departmental Representative in writing of deviations in a shop drawing from the requirements of the Contract Documents. Departmental Representative will indicate, in writing, acceptance or rejection of deviations.
- .5 Departmental Representative's review of shop drawing is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work.
- .6 Shop drawing review stamp definitions:
  - .1 "No Exception Taken":
    - .1 The product/system is acceptable as submitted.
  - .2 "Make Corrections Noted. Resubmission Not Required":
    - .1 The product/system is acceptable with the modifications indicated. Resubmission of shop drawing is not required.
  - .3 "Revise and Resubmit":
    - .1 The product/system is not acceptable as submitted. Take actions as indicated to bring product/system in compliance with contract documents. Submit the revised shop drawing.
  - .4 "Rejected. Submit Compliant Product/System":
    - .1 The product/system does not meet requirements of contract documents and cannot be made compliant with contract documents. Submit a different product/system; do not resubmit this product/system.
- .7 Make changes in shop drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
- .8 Adjustments made on shop drawings by the Departmental Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Departmental Representative prior to proceeding with the work.
- .9 When resubmission is required, submit corrected shop drawings through the same procedure indicated above. Fabrication and installation of work shall not proceed until shop drawings are acceptable to Departmental Representative.
- .10 Quantity of shop drawings submitted shall be at the discretion of the Contractor. A total of two (2) copies will be retained by the Departmental Representative.
- .11 Only shop drawings which have been stamped by the Departmental Representative will be permitted at the site.
- .12 Electronic submission of shop drawings will only be acceptable when Departmental Representative and Contractor agree. The exchange of documentation shall be undertaken as follows:
  - .1 Documents shall be submitted as a PDF file.
  - .2 Include an electronic transmittal form.
  - .3 Content of submission and procedures for submission shall be consistent with that of submitting hard copies.
  - .4 Departmental Representative will return stamped PDF copy to e-mail address from which the submission originated.
  - .5 Contractor shall provide confirmation of receipt of returned shop drawings.

- .6 Departmental Representative's hard copy is the record copy and takes precedence over all other copies, electronic or otherwise.

### 7.3 SAMPLES

- .1 Submit for review, samples as requested in respective specification sections or as may reasonably be required by Departmental Representative. Label samples as to origin and intended use in the work.
- .2 Deliver samples prepaid to Departmental Representative's business address.

### 7.4 RECORD DRAWINGS

- .1 After award of Contract, the Departmental Representative will provide a CD of contract drawings and specifications so the Contractor can provide copies to any and all trades that require additional copies for record drawings or any other reason.
- .2 Accurately and neatly record deviations from Contract Documents caused by site conditions and changes ordered by the Departmental Representative.
- .3 Record locations of concealed components of mechanical and electrical and site services.
- .4 Identify drawings as "Project Record Copy." The progress of recording and preparing record drawings shall be reported at each job meeting.
- .5 On completion of work and prior to final inspection, submit record documents to Departmental Representative.

### 7.5 PROGRESS PHOTOGRAPHS

- .1 On commencement of work and at monthly intervals thereafter, supply the Departmental Representative with photographs taken from three (3) different views to indicate progress of work. Locations of photographs as selected by Departmental Representative.
- .2 Photographs are to be high resolution colour JPEG images.
- .3 Submit progress photographs with monthly application for payment.

### 8 Construction Schedule

- .1 Provide a construction schedule showing starting and completion dates for each phase of work.
- .2 Work may start immediately after award of contract.
- .3 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Activities prior to start of construction activities
    - .1 Submission of Site Specific Health and Safety Plan.
    - .2 Submission of Shop Drawings, Samples.
    - .3 Procurement of permits.
  - .3 Mobilization.
  - .4 Major construction activities.
  - .5 Testing and Commissioning.



9 Quality Control

9.1 INSPECTION

- .1 The Departmental Representative shall have access to the work.
- .2 Give timely notice requesting inspection if work is designated for special tests, inspections or approvals by Departmental Representative instructions, or the law of the place of the work.
- .3 If the Contractor covers or permits to be covered, work that has been designated for special tests, inspections or approvals before such test is made, uncover such work, have the inspections or tests satisfactorily completed and make good such work.

9.2 REJECTED WORK

- .1 Remove defective work which has been rejected by the Departmental Representative as failing to conform to the Contract Documents. Replace or re-execute in accordance with Contract Documents.

10 Construction Facilities and Temporary Controls

10.1 INSTALLATION/REMOVAL

- .1 Provide construction facilities and temporary controls in order to execute the work expeditiously.
- .2 Remove from site after use.

10.2 HOARDING

- .1 Erect hoarding where indicated on drawings to protect the public, workers, public and private property from injury or damage.

10.3 BARRIERS

- .1 Provide barricades, signs and warning lights as required by governing authorities.

10.4 SITE STORAGE

- .1 Confine the work and the operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

10.5 SANITARY FACILITIES

- .1 Provide sufficient sanitary facilities for workers in accordance with local health authorities. Maintain in clean condition.

10.6 WATER SUPPLY

- .1 Provide a continuous supply of potable water for construction use.
- .2 Arrange for connection with appropriate utility company, and pay costs for installation, maintenance and removal.
- .3 Pay for utility charges at prevailing rate.

## 10.7 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power required during construction for temporary lighting and the operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

## 10.8 TEMPORARY TELEPHONE

- .1 Provide and pay for temporary telephone and facsimile machine necessary for own use.

## 10.9 OFFICES AND SHEDS

- .1 Provide and maintain in clean condition during progress of work, adequately lighted, heated and ventilated temporary site office.
  - .1 Size of office shall accommodate:
    - .1 Filing and layout of Contract Documents.
    - .2 Plan rack and filing cabinets.
    - .3 Contractor's normal site office staff.
    - .4 Monthly meetings.
  - .2 Provide adequate required first aid facilities.
  - .3 Provide and maintain, in a clean and orderly condition, lockable, weatherproof sheds for storage of tools, equipment and materials.
  - .4 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause the least interference with work activities.

## 10.10 PROJECT CLEANLINESS

- .1 Maintain the work in tidy condition, free from the accumulation of waste products and debris other than that caused by the Owner or other contractors.
- .2 Remove waste material and debris from the site at the end of each working day.
- .3 Clean interior areas prior to start of finish work; maintain areas free of dust and contaminants during finishing operations.

## 11 Materials and Equipment

### 11.1 PRODUCTS AND MATERIALS

- .1 Products, materials, equipment and articles (referred to as Products throughout the specifications) incorporated in the work shall be new, not damaged or defective, and of the best quality (compatible with specifications) for the purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective products at own expense, and be responsible for delay and expenses caused by rejection.
- .3 Should any dispute arise as to the quality or fitness of products, the decision rests strictly with the Departmental Representative, based upon the requirements of the Contract Documents.

- .4 Unless otherwise indicated in the specification, maintain uniformity of manufacture for any particular or like item throughout the building.
- .5 Contractor's options for selection of materials:
  - .1 Select any product that meets or exceeds the requirements of the specified standard plus additional requirements as may be specified herein.
  - .2 Upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, showing that the product meets or exceeds the specified standard or requirements.

## 11.2 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition, with manufacturer's seals and labels intact.
- .3 Store products subject to damage from weather in weatherproof enclosures.

## 11.3 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify the Departmental Representative, in writing, of conflicts between the specifications and manufacturer's instructions so that the Departmental Representative may establish the course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and reinstallation at no increase in Contract Price.

## 11.4 WORKMANSHIP

- .1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed.
- .2 Do not employ any unfit person or anyone unskilled in their required duties.
- .3 Decisions as to the quality of fitness of workmanship in cases of dispute rest solely with the Departmental Representative, whose decision is final.

## 12 Contract Closeout

### 12.1 FINAL CLEANING

- .1 When the work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining work.
- .2 Remove waste materials and debris from the site at regularly scheduled times, or dispose of as directed by the Departmental Representative.
- .3 Leave the clean before the inspection process commences.

## 12.2 OPERATING AND MAINTENANCE MANUAL

- .1 Two weeks prior to Substantial Completion, submit to the Departmental Representative, three copies of operating and maintenance manuals.
- .2 Manuals shall contain:
  - .1 Title sheet, labelled "Operating and Maintenance Instructions," containing project name and date.
  - .2 List of names, addresses and phone numbers of contractor, subcontractors and suppliers who can effect repair or maintenance on equipment.
  - .3 Table of contents.
  - .4 Full description of building systems and operation.
  - .5 List of maintenance materials, special tools and spare parts.
  - .6 List of equipment including service depots.
  - .7 Equipment nameplate information.
  - .8 Parts list.
  - .9 Installation details.
  - .10 Operation and maintenance information for equipment.
  - .11 Maintenance information for finishes.
  - .12 Warranties, guarantees and copies of approvals and certificates as called for
  - .13 Reports such as those from manufacturer's representatives and balancing contractor.
  - .14 Complete set of final reviewed shop drawings.
- .3 Bind contents in three-ring, hard-covered binder. Organize contents into applicable categories of work, parallel to specification sections.

## 12.3 DOCUMENTS

- .1 Collect reviewed submittals and assemble documents executed by subcontractors, suppliers and manufacturers.
- .2 Submit material prior to total performance of work.
- .3 Provide warranties fully executed and notarized.
- .4 Execute transition of Performance and Labour and Material Payment Bond to warranty period requirements.
- .5 Submit a final statement of accounting giving total adjusted Contract Price, previous payments and monies remaining due.

## 12.4 SUBSTANTIAL PERFORMANCE INSPECTION

- .1 Review work to ensure that Substantial Performance has been achieved before notifying Departmental Representative regarding Inspection. Provide Departmental Representative with detailed list of items not completed prior to notification.
- .2 Notify the Departmental Representative in writing when the project is substantially complete. Departmental Representative will review the work and prepare a deficiency list.
- .3 Departmental Representative will issue deficiency list to the Contractor. Contractor will have 14 days to clean up deficiencies and reach Total Performance. Departmental Representative will re-check deficiency items to assure that building is ready for occupancy.

12.5 TOTAL PERFORMANCE OF THE WORK

- .1 After the deficiencies established at the time of the Substantial Performance Inspection are completed, and when Change Orders are completed, the Contractor shall apply to the Departmental Representative, in writing, that the Work is completed.

END OF SECTION

## 1 General

### 1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Nova Scotia
  - .1 Occupational Health and Safety Act, S.N.S. - Updated 2013.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .2 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction and Departmental Representative, weekly.
- .3 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Submit WHMIS MSDS - Material Safety Data Sheets.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

### 1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

### 1.4 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

### 1.5 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

### 1.6 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.7 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, N.S.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.10 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.11 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 BLASTING

- .1 Blasting or other use of explosives is not permitted.

1.13 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

2 Products

2.1 NOT USED

- .1 Not used.

3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

## 1.1 GENERAL

- .1 Due to nature of the Work and client operations on the site, security regulations pertaining to the site and existing operations, access will be in place during the work resulting in need for:
  - .1 Control and limit of movement of construction workers at the site.
  - .2 Escort and continuous supervision of workers by security personnel.
  - .3 Workers must undergo a security clearance process.
  - .4 Specific rules and regulations as specified in this section and as directed by the Departmental Representative to be stringently followed.
- .2 It is the Contractor's responsibility to:
  - .1 Submit necessary documentation required and obtain security clearances for all workers;
  - .2 Become familiar with and abide by security rules and regulations;
  - .3 Brief all workers and subcontractors in respect of the security regulations and ensure that they abide by all rules and directives.
- .3 The Departmental Representative will coordinate a pre-construction meeting between Contractor and Security Personnel who will provide details and directives on control and movement on site.
- .4 Any infraction of site security regulations on the part of the Contractor, members of work force or any Subcontractor in his employ, could result in:
  - .1 Financial penalties in the form of progress payment reduction or holdback assessments being levied against the Contractor and;
  - .2 Demand immediate removal of offending party from the site.

## 1.2 SECURITY PERSONNEL

- .1 Obtain and pay for the services of security personnel, employed by the Canadian Corps of Commissionaires to provide escort and security supervision of all workers during the work of this contract.
- .2 Commissionaires employed on this project must have a current Enhanced Security Clearance status issued by RCMP.
- .3 Provide minimum of 1 Commissionaire to be on site at all times when work is carried out, having the following responsibilities:
  - .1 Limit movement of workers within the boundaries established by the Departmental Representative;
  - .2 Maintain security control list of workers authorized to be on site as determined by Contractor and the Departmental Representative;
  - .3 Manage the distribution and control of worker ID tags;
  - .4 Escort workers who need to circulate on site beyond the established boundaries of work, including entry into and work inside existing building;
  - .5 Escort and supervise short term visitors who need access to the work site such as for material deliveries or to conduct inspections.
- .4 Provide additional Commissionaires when required to perform supervision or escort function as may be needed due to Contractor's work operations such that no worker is left unsupervised if work is required to take place inside restricted building(s) on site.



- .5 Ensure Commissionaire(s) are present on site for entire work shift including work breaks and time period after work shifts until all workers have left site.
- .6 Commissionaire must stay within the actual construction area and provide surveillance of all workers ensuring that security rules and requirements are obeyed and requirements are obeyed and to limit movement beyond approved work areas of site.
- .7 Commissionaire must also escort workers from approved entry locations and work area(s).
- .8 Escort and supervision of workers by Commissionaire, when required by the Work, will be provided at all times when work of the Contract is being performed regardless of whether this is during regular business hours or beyond.
- .9 Commissionaire shall report directly to the Departmental Representative and ensure that siren security directives are obeyed by all workers.
  - .1 Empower Commissionaire with authority to remove any worked deemed non-compliant with security directives.
- .10 Ensure Commissionaire is fitted and wears approved safety hard hat, safety footwear and other personnel protective equipment appropriate to work in accordance with applicable Occupational Health and Safety requirements specified.

### 1.3 SECURITY CLEARANCE REQUIREMENTS

- .1 All persons employed by Contractor or by subcontractors who will be working on site must undergo the following check:
  - .1 Apply for RCMP personnel security clearance screening and obtain a clearance ranging from a Facility Access up to Reliability Status. This will vary as the Contractor involvement and access requirements during and after construction.
- .2 Persons who do not have security clearance, as specified above, will not be allowed to circulate freely in restricted areas of site and must be under constant escort and surveillance by security personnel.
  - .1 Restricted area defined as: areas of site beyond designated Construction area and work yard, and where required areas within other existing building(s) on site.
- .3 Departmental Representative will advise when worker security clearance has been received and whether escort and supervision is still needed for any worker.
- .4 Escort and supervision functions specified herein are still required on the project after workers having obtained security clearance.

### 1.4 SECURITY CLEARANCE APPLICATION

- .1 Within 2 weeks following notification of acceptance of bid, submit application form for all workers who require security clearance.
  - .1 Make application for all workers as one submission to facilitate processing and minimize delays.
- .2 To obtain the RCMP Reliability Status clearance, the following information is required for each applicant:
  - .1 "Personnel Screening, Consent and Authorization Form" (Form No. TBS/SCT #330-23E, Rev. 2006/02) completed by each worker.

- .2 Contractor Declaration to Public Works & Government Services Canada (RCMP Security Form "A") completed by Contractor attesting to having conducted an assessment of reliability for each worker applicant verifying employment and other reference data.
- .3 Proof of applicant's identity consisting of a picture ID such as a Canadian Motor Vehicle Driver's License or other similar official ID card. Provide copy of front and back of Driver's License or Governmental ID.
- .4 Proof of applicant's Canadian citizenship consisting of a provincial issued birth certificate, baptismal certificate, citizenship certificate or passport.
- .5 Include both forms along with a clear legible photocopy of the citizenship and identity documents submitted as one complete package for each applicant.
- .3 Forms will be provided by the Departmental Representative upon request. In general there are several sections to be filled out as indicated below:
  - .1 Part A: by RCMP Project Manager;
  - .2 Part B: by applicant. Provide full name, including middle name (not simply and initial). Ensure addresses listed represent last five (5) years of residence and each address is fully completed including postal code. Print data in clear, legible manner.
  - .3 Part C: only boxes 1, 2, 3 and 5 need to be completed, requiring applicant's initials. Name of official requested here can be RCMP Project Manager of RCMP Regional Security Agent provided that Contractor submits the RCMP Security Form "A" specified above.
- .4 Fingerprinting may be required depending on level of security requirements and if previous criminal conviction exists.
- .5 Departmental Representative will provide details as to what procedures, location and time where workers must go should fingerprints be required.
- .6 Processing Time:
  - .1 The RCMP departmental processing time to obtain basic security clearances is estimated to be 4 weeks from date of receipt of required documentation.
  - .2 To avoid delays, prepare worker documentation as soon as possible, however submit documentation for each applicant as one package and send information for entire workforce as one submission. Ensure forms are fully completed, signed and that all information and photo identification is clear and legible.
  - .3 Be aware that processing time for applicants requiring higher level security requirements or those with criminal convictions may take longer and could extend to 6 months duration.
    - .1 An interview with such applicant may also be required as part of the security clearance process.
- .7 Facilitate workers security clearance process as follows:
  - .1 Prepare comprehensive list of workers who will require security clearance throughout project, including those of subcontractors.
  - .2 Provide copy of list to Departmental Representative.
  - .3 Coordinate and expedite submission in preparing and submitting documentation.
  - .4 Brief and assist applicants in preparing and submitting documentation.
  - .5 Review documentation of each applicant for completeness before submission.

- .6 Have each worker keep a copy of their completed application form in case the initial submission gets lost.
- .7 Submit documentation in an organized manner with transmittal letter clearly identifying project for which worker clearance is required.
- .8 Send submission(s) directly to Departmental Representative or to the approved mailing address as directed by Departmental Representative.
- .9 Persons who have not been successful in obtaining security clearance, upon documentation review by RCMP, will not be allowed further access on site and cannot work on project any longer.

#### 1.5 SECURITY PASSES

- .1 All personnel, visitors or workers requiring access on site and/or inside the existing building(s) on site beyond the public lobby require a HRMIS number issued by RCMP. It is the responsibility of the Contractor and all personnel, visitors and workers to know their HRMIS number.

#### 1.6 SECURITY CONTROL LIST

- .1 Provide a list of employee names from work force and from subcontractors who will be present at site during the course of work.
- .2 List to include each person's name, address and telephone number.
- .3 Submit copy of list to Departmental Representative and to Security Commissionaire for control of workers.
- .4 Update list as work progresses.
- .5 Ensure that each worker can provide proof of identity upon demand, when requested by Security Personnel or Departmental Representative.

#### 1.7 BUILDING ACCESS

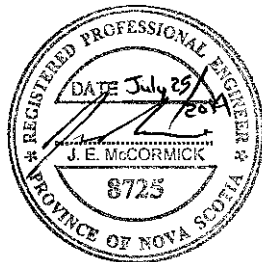
- .1 Keys and door security access cards necessary for access to restricted areas may be issued at the discretion of the Departmental Representative. Follow all instructions in regards to use, care and disposition of all keys and access cards so issued.
- .2 Keys and security access cards given to the Commissionaire for his sole possession, as determined by Departmental Representative, shall not under any circumstances be given to any worker or subcontractor.
- .3 Do not, under any circumstances, make or allow workers to make duplicates of keys issued.
- .4 At end of project, return to Departmental Representative all keys and access cards issued. Departmental Representative will deduct from final contract payment, \$25.00 for each item not returned, regardless of the reason.
- .5 Immediately report to Departmental Representative any lost, stolen or destroyed keys and door security access cards.

1.8 SITE SECURITY

- .1 When work must be carried out during hours beyond the work hours previously agreed upon at start of work, provide notice within 48 hours beforehand to minimize impact on security and other operations on site.

END OF SECTION

<u>Section</u>	<u>Title</u>	<u>Pages</u>
20 04 00	Mechanical General Requirements	6
20 05 00	Basic Mechanical Materials and Methods	10
20 05 54	Identification	4
20 07 00	Thermal Insulation for Piping	4
20 08 01	Performance Verification Mechanical Piping System	1
22 11 18	Plumbing Piping, Valves and Fittings	6
22 42 01	Plumbing Specialties and Accessories	3



## 1 GENERAL

- .1 This section covers items common to all sections of Divisions 20 through 25.

## 2 EXAMINATION OF SITE AND DRAWINGS

- .1 The Contractor shall examine the site and local conditions affecting the work under this Contract. No additional costs will be considered due to existing conditions.
- .2 The drawings do not show all structural or mechanical details and where accurate dimensions of existing structures are required these dimensions shall be taken by the Contractor in the field. The Contractor shall confirm to their own satisfaction the accuracy of these field measurements and all necessary minor changes to piping/ducting/equipment to accommodate field conditions shall be approved by the Departmental Representative and made at no charge to the Departmental Representative.
- .3 The Departmental Representative reserves the right to alter locations of pipes, ducts or equipment without incurring additional costs provided such alterations are made before the Contractor has begun fabrication of the work in question.
  - .1 The Contractor shall carefully examine the structural, civil, architectural, and electrical drawings and confirm to their own satisfaction that the work under this division can be carried out without changes to the equipment as shown on these drawings. Before commencing the work, the Contractor shall examine the work of other trades and report at once any defect or interference affecting the work of this division.
  - .2 Notes on the drawings are intended to form a part of this specification and must be examined by the Contractor.

## 3 SCOPE OF WORK

- .1 This work includes, but is not limited to, the supply and installation of all supervision, labour, permits, equipment, materials, and consumables necessary to provide this facility with complete and operational systems listed below, as indicated on the drawings, and described in the specifications:
  - .1 Plumbing consists of the supply and installation of a new water supply to serve the existing building.

## 4 PRODUCT SPECIFICATIONS AND STANDARDS

- .1 All equipment and materials specified to conform to an applicable code and/or standard, and shall be listed and/or labelled under the provisions of such code or standard, when available.
- .2 Product description shall take precedence over product model numbers as manufacturers may change numbers during design and tender bid periods.
- .3 Reference is made in the documents to NPS which is to be understood as Nominal Pipe Size in inches, inside or outside diameter as applicable to the piping or tubing product in question.

---

## 5 EQUIPMENT INSTALLATION

- .1 Unions or flanges: provide for ease of maintenance and disassembly.
- .2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

## 6 TRIAL USAGE

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

## 7 PROTECTION OF OPENINGS

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

## 8 SLEEVES

- .1 Pipe sleeves: provide at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
  - .1 Through foundation walls.
  - .2 Where sleeve extends above finished floor.
- .4 Sizes: minimum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- .6 Fill voids around pipes:
  - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
  - .2 Where sleeves pass through walls or floors, provide space for firestopping.
  - .3 Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
  - .4 Ensure no contact between copper tube or pipe and ferrous sleeve.
  - .5 Fill future-use sleeves with lime plaster or other easily removable filler.
  - .6 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

## 9 PREPARATION FOR FIRESTOPPING

- .1 Uninsulated unheated pipes not subject to movement: no special preparation.
- .2 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging firestopping material.
- .3 Insulated pipes and ducts: ensure integrity of insulation and vapour barrier of fire separation.

---

## 10 ESCUTCHEONS

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Chrome plated plastic split ring, pressfit.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.
- .5 Standard of Acceptance: Belanger.

## 11 TESTS

- .1 Give 24 h written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Departmental Representative.
- .3 Conduct tests in presence of Departmental Representative when requested.
- .4 Bear costs including retesting and making good.
- .5 Piping:
  - .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
  - .2 Test domestic cold water piping at 1-1/2 times system operating pressure or minimum 860 kPa whichever is greater.
- .6 Equipment: test as specified in relevant sections.
- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

## 12 PAINTING

- .1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work. Outdoor ferrous supports to be painted with two coats of enamel paint in addition to the primer coat.
- .2 Quality and color selection as specified by Departmental Representative.
- .3 Prime and touch up marred manufacturers' finished paintwork to match original.
- .4 Restore to new condition, manufacturers' finishes that have been extensively damaged.

## 13 DIELECTRIC COUPLINGS

- .1 General:
  - .1 To be compatible with and to suit pressure rating of piping system.
  - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes NPS 2 and under: isolating unions.
- .3 Pipes NPS 2-1/2 and over: isolating flanges.

## 14 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 10 01 – General Requirements.



- .2 Operation and Maintenance Manual to be reviewed by, and final copies deposited with, Departmental Representative before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for each system including environmental controls.
  - .2 Description of each system and its controls.
  - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for each system and each component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data shall include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified elsewhere.
- .6 Reviews:
  - .1 Submit three (3) copies of draft Operation and Maintenance Manual to Departmental Representative for review. Submission of individual data will not be accepted unless so directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data.
  - .1 Prepare and insert into Operation and Maintenance Manual when need for same becomes apparent during demonstrations and instructions specified above.

## 15 SHOP DRAWINGS

- .1 Submit shop drawings and product data in accordance with Section 01 10 01 – General Requirements.
- .2 Shop drawings and product data shall show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances, e.g., access door swing spaces.
- .3 Shop drawings and product data shall be accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Acoustical sound power data, where applicable.
  - .3 Points of operation on performance curves.
  - .4 Manufacturer to certify as to current model production.
  - .5 Certification of compliance to applicable codes.
  - .6 Electrical requirements.
  - .7 Accessories.

---

**16 EXISTING SYSTEMS**

- .1 Be responsible for damage to existing systems by this work.
- .2 Connections into existing systems to be made at time approved by Departmental Representative. Minimize disruptions to existing services and coordinate all downtime with Departmental Representative.

**17 CLEANING**

- .1 Clean mechanical (building) systems in accordance with Section 01 10 01 – General Requirements.
- .2 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and ventilating units.
- .3 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

**18 RECORD DRAWINGS**

- .1 Site records:
  - .1 Departmental Representative will provide one (1) CD containing pdf files of mechanical drawings. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 On a weekly basis, transfer information to prints, to show all work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection at all times.
- .2 Record drawings.
  - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED." (Signature of Contractor) (date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 TAB to be performed using record drawings.
  - .5 Submit completed reproducible record drawings with Operation and Maintenance Manuals.
- .3 Submit copies of record drawings for inclusion in final TAB report.

**19 COMMISSIONING**

- .1 Commissioning shall be performed in accordance with Section 01 10 01 – General Requirements.
- .2 Installing trades shall provide site attendance by qualified technicians to assist with the commissioning process, verify in writing that tests and adjustments have been made for each item requiring commissioning, and submit verification to Departmental

Representative for review. Commissioning and verification requirements are indicated in detail in the specifications that follow for some equipment/systems; however, as a minimum, verification shall be a list of each piece of equipment showing the tag # for the equipment, room numbers, date commissioned, personnel's name performing the work and comments indicating the work performed. Report may be hand printed in ink and must be legible. Submit proposed method of commissioning to Departmental Representative prior to performing the work, showing all equipment to be commissioned.

END OF SECTION

## 1 General

### 1.1 WORK INCLUDED

- .1 Provide all labour, materials, products, equipment and services to supply and install the basic mechanical materials indicated on the drawings and specified in Divisions 20 through 25 of these specifications.

### 1.2 IDENTIFICATION OF MECHANICAL SERVICES

- .1 Identify all mechanical services after finish painting is complete.
- .2 Use consistent terminology:
  - .1 With the drawings and specifications, and
  - .2 With the Departmental Representative's requirements and standards.
- .3 Mark valve and equipment identification on record drawings.
- .4 Provide typewritten master lists for each Equipment Room. Frame under glass. Insert copies in Operation and Maintenance Instruction Manuals.

### 1.3 PIPE IDENTIFICATION

- .1 Provide SMS Wrap-Mark on all pipe coverings, using Wrap-Mark pipe markers with alternating flow arrow wording. For outside diameters up to 150 mm (6"), allow marker to completely wrap pipe. For larger outside diameters, secure markers with stainless steel springs. Secure markers on vertical piping and elsewhere where markers could be inadvertently moved.
- .2 Locate identification and flow arrows so they can be seen clearly from floor and service platforms:
  - .1 At least once in each room,
  - .2 At each piece of equipment,
  - .3 At each branch close to connection point to main piping and ductwork,
  - .4 At not greater than intervals of 15 m (50') on straight runs of exposed piping and ductwork,
  - .5 At entry and leaving point to pipe and duct chases, or other concealed spaces,
  - .6 Both sides where piping and ductwork passes through walls, partitions and floors,
  - .7 On vertical pipes and ducts approximately 1800 mm (70") above floor,
  - .8 Behind each access door and panel, and
  - .9 At valves, identify piping upstream of valves and identify branch, equipment, building part or building serviced downstream of valve.
- .3 Colour code pipes to meet code and Departmental Representative's requirements. At minimum, colour code pipes with 50 mm (2") wide bands in accordance with the detail shown on the drawings.
- .4 Identify electrical tracing of pipes on pipe insulation.

### 1.4 VALVE TAGS

- .1 Provide 40 mm (1-1/2") dia., 1 mm (1/32") thick brass tags with 10 mm (3/8") high die-stamped black letters.

- .2 Attach to valve handles with 100 mm (4") long brass chains through a hole in the handle.
- .3 Tag all valves except for small valves isolating a single piece of equipment such as a unit heater, fan coil unit, terminal reheat coil and radiation section.

## 1.5 COMMISSIONING

- .1 Perform commissioning activities in accordance with Section 20 04 00 - Mechanical General Requirements.

## 2 Products

### 2.1 INSERTS

- .1 Submit proposed materials and methods for cast-in-place inserts.
- .2 Where inserts must be placed after concrete is poured, use Phillips Red Head Multiset II Anchor system or equivalent Hilti System.

### 2.2 PIPE HANGERS

- .1 Provide pipe hangers and supports for all piping. Provide hangers in accordance with the following requirements. Provide galvanized steel hangers and supports with galvanized fittings and accessories where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.
- .2 Provide manufactured hangers, accessories and supports in accordance with ANSI B31.1 and MSS SP58, SP69, SP89 and SP90 similar to the Grinnell or Myatt figures numbers below.
- .3 Select products to ensure adequate safety factors under anticipated loads.
- .4 Provide upper attachments as follows:
  - .1 Standard beam clamp for normal service - Grinnell Fig 133 with Fig 290 or Fig 278 or Myatt Fig 500 with Fig 480 or Fig 440.
  - .2 Standard side beam clamp for normal service - Grinnell Fig 225 or Myatt Fig 505.
  - .3 Top beam clamp - Grinnell Fig 92 or Myatt Fig 406.
  - .4 C clamp - Grinnell Fig 86 or Myatt Fig 586.
  - .5 Angle clip for light duty side mounting - Grinnell Fig 202 or Myatt Fig 542.
- .5 For vertical adjustment of hanger rods, provide forged steel turnbuckle - Grinnell Fig 230 or Myatt Fig 475.
- .6 Provide pipe attachments as follows:
  - .1 Adjustable swivel rings for uninsulated fire service piping - ULC approved - Grinnell Fig 69 or Myatt Fig 41.
  - .2 Clevis hanger for copper piping up to and including 100 mm (4") diameter - Grinnell Fig CT-65 plastic coated or Myatt Fig 56 epoxy coated.
  - .3 Swivel ring hanger for copper tubing up to and including 25 mm (1") diameter - Myatt Fig 43 epoxy coated.
  - .4 Standard duty clevis hanger for steel piping - Grinnell Fig 260 or Myatt Fig 124.
  - .5 Standard duty long clevis hanger for steel piping - Grinnell Fig 300 or Myatt Fig 124L.

- .7 Provide vertical pipe supports as follows:
  - .1 Riser clamp for copper pipe - Grinnell Fig CT121C plastic coated or Myatt Fig 186 epoxy coated.
  - .2 Riser clamp for steel or cast iron pipe - Grinnell Fig 261 or Myatt Fig 182 or Fig 183.
- .8 Provide supports for other piping types such as plastic, mechanically fused or packed joint pipe according to the pipe manufacturer's published recommendations. Support piping continuously where required to prevent sagging.
- .9 Provide protection saddles where insulated piping is supported from below.
  - .1 For high temperature insulated pipe - Grinnell Fig 160 or Fig 165 or Myatt Fig 210 or Fig 240.
  - .2 For insulated pipe with vapour barrier for low temperature service, insulate pipe with calcium silicate at hangers and provide Grinnell Fig 167 or Myatt Fig 251.
- .10 Provide roll type supports where shown on the drawings and where longitudinal movement may occur. Provide single pipe rolls - Grinnell Fig 177 or Myatt Fig 262 where supported from below and Grinnell Fig 171 or Myatt Fig 261 where suspended. Provide spring cushions where slight vertical movement is likely and cushioning required - Grinnell Fig 178 or Myatt Fig 880.
- .11 Provide Grinnell or Myatt engineered constant support hangers on piping subject to vertical movement exceeding 40 mm (1-1/2") due to vertical pipe expansion.

## 2.3 SLEEVES, WALL AND FLOOR PLATES

- .1 For pipe sleeves, use machine cut and reamed standard weight steel piping.
- .2 Concealed perimeter risers and runouts may have sleeves of 1.31 mm (0.05") galvanized steel set around section of insulation to provide freedom of movement of piping. Extend 50 mm (2") above finished floor level.
- .3 For piping through exterior walls, cooperate with the waterproofing trade at all times, and do not break any waterproofing seal without consent of the waterproofing trade. Provide waterproof link seals as detailed on drawings.
- .4 Provide leak plates where pipe sleeves pass through exterior building walls. Each leak plate shall be a 3.42 mm (1/8") steel plate, welded to the sleeve, 100 mm (4") diameter greater than sleeve outside diameter.
- .5 Provide 1.31 mm (0.05") galvanized steel duct sleeves. Provide adequate bracing for support of sleeves during concrete and masonry work. For fire rated floors and walls, build fire damper assemblies into structure to attain fire rated construction, in a manner acceptable to the governing authorities.
- .6 Cover pipe sleeves in walls and ceilings of finished areas, other than Equipment Rooms, with satin finish stainless steel, or satin finish chrome or nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks, however, may be used.
- .7 Cover exposed duct sleeves in finished areas with 1.31 mm (0.05") galvanized steel plates in the form of duct collars. Fix in position with non-ferrous metal screws.

## 2.4 STRAINERS

- .1 Provide Spirax Canada Limited pipeline strainers with stainless steel screens according to the following:

Pipe Schedule	Pipe Size	Type	Model	Screen Perforation
Copper	All sizes	Y	BT Bronze	0.76 mm (0.03") 20 Mesh
Steel	Up to 50 mm (2")	Y	IT Cast Iron	0.76 mm (0.03") 20 Mesh
Steel	65 mm (2-1/2") to 150 mm (6")	Y	IF Standard for Water	3 mm (1/8")
Steel	200 mm (8") and up		Basket 528B Cast Iron	3 mm (1/8")

- .2 Supply strainers with extra construction screens and remove after systems have been thoroughly cleaned.
- .3 Equip each strainer 40 mm (1-1/2") and smaller in size, with plugged blow-off tappings.
- .4 Equip each strainer 50 mm (2") and larger in size, with blow off tapping. Provide blow-off piping complete with capped shut off valve. Terminate in downward vertical position. Size blow-off piping and valve the same size as the blow-off tapping.
- .5 Ensure that each strainer can be isolated from piping systems with isolating valves on each side of strainer, and which are not more than 3 m (10') away from strainer.
- .6 Provide strainers in the following locations:
- .1 At the suction side of each pump.
  - .2 Immediately upstream of each pressure reducing valve.
  - .3 Where shown on detail drawings.
- .7 Provide Victaulic No. 730 tee type or No. 732 wye type strainers where Victaulic piping systems are used.

## 2.5 FIRESTOPPING

- .1 Provide ULC classified firestopping products by 3M or Hilti, which have been tested in accordance with CAN4-S115.

## 3 Execution

### 3.1 PIPE AND EQUIPMENT INSTALLATION

- .1 Locate distribution systems, equipment and materials for maximum usable space, optimum service clearances and to accommodate current requirements and identified future expansion.

- .2 Coordinate mechanical services installation above typical floor modular ceilings to allow installation and future relocation of lights and air troffers without interfering with or requiring relocation of mechanical, electrical or other services, or removal of ceiling grid.
- .3 Include all pipe offsets required to eliminate interference with the work of other trades.
- .4 Install equipment and materials to present a neat appearance. Run piping parallel to or perpendicular to building planes. Conceal piping in finished areas. Install so as to require a minimum amount of furring.
- .5 Install pipe straight, parallel and close to walls and slab or deck underside, with specified pitch.
- .6 Use standard fittings for all direction changes. Do not use drilled tees and other field fabricated fittings.
- .7 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.
- .8 Where pipe sizes differ from connection sizes of equipment, provide reducing fittings between inline components such as valves, strainers and fittings, and equipment. Reducing bushings are not permitted.
- .9 Cap open ends of piping during installation.
- .10 Lay copper tubing so that it is not in contact with dissimilar metal and will not kink or collapse.
- .11 Use non-corrosive lubricant or Teflon tape equal to Dow Corning and apply on male thread.
- .12 Provide brass adaptors or dielectric couplings wherever dissimilar metals are joined.
- .13 No pipe to be laid in water or when, in opinion of Departmental Representative, conditions are unsuitable.
- .14 Protect buried copper and steel piping with Tapecoat materials using procedures recommended by Tapecoat Company of Canada Limited, or other approved manufacturer.
- .15 Ensure that pipe installation does not transmit vibration to the walls and floors through which they pass.
- .16 Make provisions for neat insulation finish around equipment and materials. Do not mount equipment within insulation depth.
- .17 In electrical rooms and elevator machine rooms, provide drip trays under the entire length of all pipe within the confines of the room. Pipe drip tray to nearest floor drain.
- .18 Perform pipe welding to meet ANSI B31.9.

### 3.2 CONNECTIONS TO EQUIPMENT

- .1 Provide unions or flanges at all connections to equipment. Ensure that piping adjacent to equipment is readily removable for servicing and/or removal of equipment without shutting down entire system.
- .2 Install unions in piping up to and including 50 mm (2") pipe size. Install flanges in piping 65 mm (2-1/2") pipe size and larger.



- .3 Control valves with threaded connections are to have unions at both inlet and outlet.
- .4 Prevent galvanic corrosion by isolating copper and steel. Use red brass adapters, or completely isolate flanges using full-face gaskets with bolts installed through phenolic sleeves with insulating fibre washers. Where the Plumbing Code prohibits the use of red brass adapters, use insulating couplings. Where system valves are required, solid brass isolating valves may be used in lieu of adapters or couplings.
- .5 Provide metallic code rated continuity link between flanges or unions, where pipe mains carry flammable fluids or gases.
- .6 Make all plumbing and sheet metal connections to equipment provided by the Departmental Representative.

### 3.3 INSERTS

- .1 Size and space for the loads to be supported.
- .2 Properly locate and firmly secure inserts to forms before concrete is poured.
- .3 Place inserts only within main structure and not in any finishing materials.
- .4 When inserts are required in precast concrete, supply inserts and location drawings to the precast concrete supplier for casting into material. Otherwise, include the cost of having the precast concrete supplier install inserts at the site.
- .5 Do not use powder actuated tools.

### 3.4 HANGERS

- .1 Suspend piping and equipment with all necessary hangers and supports required for a safe and neat installation. Ensure that pipes are free to expand and contract and are graded properly. Adjust each hanger to take its full share of the weight.
- .2 Suspend hanger rods directly from the structure. Do not suspend pipes or equipment from other pipes, equipment, metal work, steel deck or ceilings. Fasten to the bottom rib of structural members only.
- .3 Provide auxiliary structural steel angles, channels and beams where piping and equipment must be suspended between joists or beams.
- .4 Use galvanized rods, steel support angles, channels and beams where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.
- .5 Use space hangers to ensure that structural steel members are not over stressed. In no case shall pipe hangers be further apart than indicated in the tables. When requested, submit detailed drawings showing locations and magnitude of ductwork, piping and equipment loads on the structure. Provide calculations when requested by Departmental Representative. Space hangers so that point load on each hanger is no greater than 45 kg (100 lb). Minimum spacing of hangers to be 1220 mm (48") on center.
- .6 Do not use trapeze type hangers for support of piping, without prior review by Departmental Representative. Where permitted, fabricate from angle or channel frames, and space hangers to suit the smallest pipe size.
- .7 Do not use hooks, chains or straps to support equipment and materials.

- .8 For precast concrete work, if inserts cannot be cast into members, pass hanger rods between the members and weld to steel plates resting on the upper surface of the precast material. To prevent raising of the hanger rod, apply a lock nut and 50 mm (2") minimum dia. flat washer tight against the under surface of the precast material.
- .9 Ensure that copper materials are completely isolated from ferrous materials. Use plastic or epoxy coated hangers and clamps. Use lead inserts between copper piping and other ferrous materials.
- .10 If individual point loads are greater than 45 kg (100 lb), provide a signed letter from the steel deck manufacturer confirming the deck is capable of supporting the load.
- .11 Provide round steel threaded rods meeting ASTM A-36. Provide cadmium plated rod and accessories where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.
- .12 The following table establishes minimum standards of rod sizes and hanger spacing for steel and copper piping.

Maximum Horizontal Spacing of Supports			
Pipe Size mm (NPS)	Rod Size mm (in.)	Steel m (ft)	Copper m (ft)
12 (1/2)	10 (3/8)	1.5 (5)	1.5 (5)
20 (3/4)	10 (3/8)	1.8 (6)	1.8 (6)
25 (1)	10 (3/8)	1.8 (6)	1.8 (6)
32 (1-1/4)	10 (3/8)	2.4 (8)	2.1 (7)
40 (1-1/2)	10 (3/8)	2.7 (9)	2.4 (8)
50 (2)	10 (3/8)	2.7 (9)	2.7 (9)
65 (2-1/2)	12 (1/2)	3.0 (10)	3.0 (10)
75 (3)	12 (1/2)	3.0 (10)	3.0 (10)
90 (3-1/2)	12 (1/2)	3.0 (10)	3.3 (11)
100 (4)	16 (5/8)	3.0 (10)	3.7 (12)
125 (5)	16 (5/8)	3.7 (12)	3.7 (12)
150 (6)	20 (3/4)	3.7 (12)	3.7 (12)
200 (8)	22 (7/8)	3.7 (12)	
250 (10)	22 (7/8)	3.7 (12)	
300 (12)	22 (7/8)	3.7 (12)	

Maximum Horizontal Spacing of Supports			
Pipe Size mm (NPS)	Rod Size mm (in.)	Steel m (ft)	Copper m (ft)
350 (14)	25 (1)	3.7 (12)	
400 (16)	25 (1)	3.7 (12)	
450 (18)	29 (1-1/8)	3.7 (12)	
500 (20)	32 (1-1/4)	3.7 (12)	
600 (24)	32 (1-1/4)	3.7 (12)	

- .13 In addition to these basic requirements, provide hangers in the following location:
- .1 To eliminate vibration.
  - .2 At points of vertical and horizontal change of direction of pipe.
  - .3 At inline centrifugal pumps.
  - .4 At valves and strainers.
  - .5 On mains at branch takeoffs.
  - .6 To avoid stress on equipment connections.
- .14 Support horizontal cast iron soil pipe at each hub. Where groups of fittings occur, not more than three joints shall be between hangers.
- .15 Refer to applicable articles of the Specification regarding thermal insulation requirements. Unless shown specifically on Drawings, provide the following support methods.
- .1 For insulated warm and hot water piping, for condensate piping and for steam piping up to 65 mm (2-1/2") diameter, support with hangers directly on piping.
  - .2 For steam piping 75 mm (3") diameter and above, support with hangers under specified protection saddles.
  - .3 For chilled water and domestic cold water piping, hangers shall be large enough to fit over specified pipe covering. At each point of support, install specified protection saddles with sufficient length to prevent crushing of insulation.
- .16 Generally, support ducts with 2.7 mm (0.1") by 25 mm (1") wide galvanized hangers or with 12 mm (1/2") dia. rods and 40 mm (1.5") rolled angle saddles to meet SMACNA or ASHRAE Standards.
- .17 Support vertical duct risers at each floor with rolled angle collars bearing on building structure.

### 3.5 SLEEVES, WALL PLATES, FLOOR PLATES

- .1 Set sleeves for piping and ductwork in conjunction with erection of floors and walls. Locate sleeves accurately in accordance with submittal drawings, and as follows:
  - .1 Through interior walls, set sleeves flush with finished surfaces on both sides.
  - .2 Through exterior walls above grade, set sleeves flush with finished surfaces on inside and to suit flashing on outside.

- .3 For floors in Mechanical Equipment Rooms, Janitors Closets, Kitchens and similar areas where a water dam is required, set sleeves flush to underside of structure and extending 50 mm (2") above finished floor.
- .4 For other floors, set sleeves flush to both finished surfaces. Refer to Room Finish Schedule.
- .2 Size sleeves to provide 25 mm (1") clearance around insulated piping and ductwork.
- .3 Provide continuous insulation runs through fire separations. Ensure that piping does not touch sleeves or for warm and hot water piping terminate insulation cover on each side of sleeve. For chilled water and domestic cold water piping, provide same thickness Manville Thermo-12 pipe insulation with all-purpose vapour barrier jacket through fire separation to a point 100 mm (4") on each side of fire separation.
- .4 Install leak tight seals to meet the manufacturer's requirements. Select the inside diameter of each wall sleeve opening to fit the pipe and leak tight seal, all to ensure watertight joint.
- .5 Additional sleeving requirements.
  - .1 Provide sleeves for systems not part of Contract, but identified to be required on drawings.
  - .2 Provide sleeves to accommodate wiring conduits required for Divisions 20 through 25 work.
  - .3 Provide additional sleeves as required by drawings to accommodate service requirements. Include for the cost of drilling and setting sleeves.
  - .4 Fill unused sleeves through fire separations with firestop material (see Firestopping article). Fill other unused sleeves with suitable noncombustible materials.

### 3.6 FIRESTOPPING

- .1 Ensure that fire ratings of floors and walls are maintained.
- .2 Pack clearance spaces, fill all spaces between openings, pipes and ducts passing through fire separations and install firestopping systems in accordance with the appropriate ULC system number for the products and type of penetration.
- .3 Install firestopping systems using personnel trained or instructed by the product manufacturer.

### 3.7 PAINTING

- .1 Supply ferrous metal work except piping and galvanized and stainless steel ductwork, with at least one factory prime coat, or paint one prime coat on job.
- .2 Clean and steel brush surfaces with welds. Then prime coat all steel supports and brackets.
- .3 On uninsulated piping, steel brush and prime coat welds.
- .4 Touch up or repaint all surfaces damaged during shipment or installation and leave ready for finish painting.

- .5 Prime coat material shall conform to Canadian General Standards Board Standard No. 1-GP-48.

END OF SECTION

2014-Jul-25

## 1 General

## 1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-1.60-M89, Interior Alkyd Gloss Enamel.
  - .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

## 1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 10 01 - General Requirements.
- .2 Product data to include manufacturer's material description.

## 2 Products

## 2.1 SYSTEM NAMEPLATES

- .1 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size #	Dimensions (mm x mm)	No. of Lines	Letter Height (mm)
1	9 x 50	1	3
2	12 x 75	1	5
3	12 x 75	2	3
4	19 x 100	1	8
5	19 x 100	1	8
6	19 x 100	2	5
7	25 x 125	1	12
8	25 x 125	2	8
9	40 x 100	1	19

- .2 Use maximum of 25 letters/numbers per line.
- .3 Terminal cabinets, control panels: Use size #6.
- .4 Equipment in Mechanical Rooms: Use size #9.

- .5 Reheat coils, fans, etc., located above suspended ceilings to be identified via nameplates secured to the room side of the T-bar grid or drywall ceiling access door directly below the applicable equipment: Use size #6.

## 2.2 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
- .1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
- .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20 mm and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 All other pipes: Pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.
- .7 Colours and Legends:
- .1 Where not listed, obtain direction from Departmental Representative.
- .2 Colours for legends, arrows: The following table is provided as an example. Contractor shall coordinate with Departmental Representative to match existing identification used at the GOCB Bible Hill.

Background Color	Legend, Arrows
Yellow	Black
Green	White
Red	White

- .3 Background colour marking and legends for piping systems: The following table is provided as an example, Contractor shall coordinate with Departmental Representative to match existing identification used at the GOCB Bible Hill.

2014-Jul-25

Contents Marking	Background Color	Legend
Domestic hot water supply	Green	DHW
Domestic hot water return	Green	DHWR
Domestic cold water supply	Green	DCW
Sanitary	Green	SAN
Humidification Steam	Yellow	HUM. STM
Humidification Condensate	Yellow	HUM. COND
Refrigeration suction	Yellow	RS
Refrigeration liquid	Yellow	RL
Sprinkler	Red	---

### 2.3 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: Black, or coordinated with base colour to ensure strong contrast.

### 2.4 VALVES

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

### 2.5 LANGUAGE

- .1 Identification to be in English and French.

## 3 Execution

### 3.1 TIMING

- .1 Provide identification only after all painting specified in Section 09 91 23 - Painting has been completed.

### 3.2 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and or CSA registration plates as required by respective agency.



---

2014-Jul-25

---

### 3.3 NAMEPLATES

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover in any way.

### 3.4 LOCATION OF IDENTIFICATION ON PIPING SYSTEMS

- .1 On long straight runs in open areas, equipment rooms, galleries, tunnels: At not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

### 3.5 VALVES

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each Operation and Maintenance Manual.
- .3 Number valves in each system consecutively.

END OF SECTION

## 1 General

### 1.1 REFERENCES

- .1 ASTM A167-89a, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .2 ASTM C335-89, Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulations.
- .3 ASTM C411-82(1987), Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.
- .5 ANSI/NFPA 90A-1989, Installation of Air Conditioning and Ventilating Systems.
- .6 ANSI/NFPA 90B-1989, Installation of Warm Air Heating and Air Conditioning Systems.
- .7 CGSB 51-GP-9M-76, Thermal Insulation, Mineral Fibre, Sleeving for Piping and Round Ducting.
- .8 CGSB 51-GP-11M-76, Thermal Insulation, Mineral Fibre, Blanket for Piping, Ducting, Machinery and Boilers.
- .9 CAN/CGSB-51.12-M86, Cement, Thermal Insulating and Finishing.
- .10 CAN/CGSB-51.40-M80, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.
- .11 CGSB 51-GP-52Ma-89, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .12 CGSB 51-GP-53M-77, Jacketing, Polyvinyl, Chloride Sheet, for Insulating Pipes, Vessels and Round Ducts.
- .13 CSA HA Series-M1980, CSA Standards for Aluminum and Aluminum Alloys.
- .14 TIAC, Thermal Insulation Association of Canada, National Insulation Standards.

### 1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

### 1.3 DEFINITIONS

- .1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services and equipment in hung ceilings and non-accessible chases and furred spaces.
  - .2 "EXPOSED" - will mean "not concealed" as defined herein.

## 2 Products

### 2.1 GENERAL

- .1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.
- .2 Materials to be tested in accordance with ASTM C411.
- .3 Temperatures listed for fluid are approximate. Verify final operating temperatures and apply thicknesses as listed under relevant insulation type.

### 2.2 P-2 FORMED MINERAL FIBER WITH VAPOUR BARRIER TO 85°C

- .1 Application: for piping, valves and fittings on:
  - .1 Domestic cold water, temperature 4°C.
- .2 Material:
  - .1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping and CGSB 51-GP-52Ma, vapour barrier jacket and facing material.
  - .2 Standard of Acceptance: Manville Micro-lok-AP-T Plus; Manson Alley K-APT; Knauf 454°C pipe insulation with ASJ; Owens Corning SSLII jacketed pipe insulation.
- .3 Thermal Conductivity "k" shall not exceed 0.034 W/m.°C at 24°C mean temperature when tested in accordance with ASTM C335. Thickness:

Fluid Temperature (°C)	Nominal Pipe Sizes (NPS) thickness (mm)			
	1 and under	1-1/4 to 2	2-1/2 to 4	5 & over
51-85	25	25	38	38
30-50	25	25	25	25
5-29	13	25	25	25
below 5	25	38	38	38

### 2.3 FASTENINGS

- .1 For insulation system P-2:
  - .1 Tape: self-adhesive, ULC labelled for less than 25 flame spread and less than 50 smoke developed.
    - .1 Standard of Acceptance: Fattal Insultape; Venture Tape.
  - .2 Lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.
    - .1 Acceptable Material: Foster 87-75 asbestos free at 6 m<sup>2</sup>/L; Childers CP.80; Bakelite 230-06.

- .3 Lagging adhesive: fire retardant coating.
  - .1 Standard of Acceptance: Foster 30-36 asbestos free at 1.25 m<sup>2</sup>/L; Childers CP.50A-HV2; Bakor 120-09.

## 2.4 INSULATION CEMENT

- .1 To CAN/CGSB-51.12.

## 2.5 JACKETS

- .1 PVC:
  - .1 Apply in accordance with CGSB 51-GP-53M.
    - .1 0.38 mm thick minimum.
    - .2 Valve and fittings covers, one piece, premoulded to match.
    - .3 Roll or “cut and curled” form at discretion of installer.
    - .4 Secure with solvent weld to recommendations of manufacturer.
    - .5 Apply PVC jacket and fitting covers to all exposed piping.
  - .2 For outdoor applications, PVC jackets to be 1.0 mm thick minimum, UV and impact resistant.
  - .3 Standard of Acceptance: Manville Zeston, Kauf Proto.

## 3 Execution

### 3.1 APPLICATION

- .1 Apply insulation after required tests have been completed and approved by Departmental Representative.
- .2 Surfaces shall be clean and dry during application of insulation and finishes.
- .3 Apply insulation materials, accessories and finishes in accordance with TIAC National Insulation Standards and manufacturer's recommendations and as specified herein.
- .4 On piping with insulation and vapour barrier, install high density insulation under hanger shield. Maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.
- .5 Terminate insulation and each side of fire wall and seal insulation to all service jacket and to fire wall after fire stopping has been completed.

### 3.2 INSTALLATION

- .1 Preformed: sectional up to NPS 12, sectional or curved segmented above NPS 12.
- .2 Multi-layered: staggered butt joint construction.
- .3 Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 4.5 m centres.
- .4 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm between terminations. Pack void lightly with flexible mineral insulation.
- .5 Seal and finish exposed ends and other terminations with insulating cement.

- .6 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulation or finishes.
- .7 At flanges and unions at equipment, expansion joints, valves, circuit balancing and service and other components requiring regular maintenance: omit insulation and bevel away from studs and nuts to permit use of tools without damage to insulation.
- .8 Insulation is not required for:
  - .1 Chrome plated piping, valves and fittings.
  - .2 Drain valves.

### 3.3 FASTENINGS

- .1 Secure pipe insulation by tape at each end and centre of each section, but not greater than 900 mm on centres.

END OF SECTION

1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM E 202-04, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.2 POTABLE WATER SYSTEMS

- .1 When cleaning is completed and system filled:
  - .1 Verify performance of equipment and systems as specified elsewhere in Divisions 20 through 25.
  - .2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.
  - .3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.3 COMMISSIONING

- .1 Perform commissioning activities in accordance with section 20 04 00 - Mechanical General Provisions.

2 Products

2.1 Not Used

3 Execution

3.1 Not Used

END OF SECTION

## 1 General

### 1.1 REFERENCES

- .1 ANSI/ASME B16.15-1985, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI B16.18-1984, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-1989, Wrought Copper and Copper Alloy Solder-Joint Pressure fittings.
- .4 ANSI B16.24-1979, Bronze Pipe Flanges and Fittings, Class 150 and 300.
- .5 ANSI/AWWA C111/A21.11-85, Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- .6 NSF/ANSI 61-2008, Drinking Water System Components – Health Effects.
- .7 ASTM A307-89, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .8 ASTM B88M-89, Specification for Seamless Copper Water Tube (Metric).
- .9 ASTM B32-89, Specification for Solder Metal.
- .10 ASTM B306-88, Specification for Copper Drainage Tube (DWV).
- .11 ASTM C564-88, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .12 ASTM D2235-89, Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .13 ASTM D2564-88, Specification for Solvent Cements for Poly (Vinyl-chloride) (PVC) Plastic Pipe and Fittings.
- .14 CSA B67-1972, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .15 CAN/CSA-B70-M91, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .16 CAN/CSA-B125-M89, Plumbing Fittings.
- .17 CAN/CSA-B181.1-M90, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
- .18 CAN/CSA-B181.2-M90, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
- .19 CAN/CSA-B182.1-M87, Plastic Drain and Sewer Pipe and Pipe Fittings.
- .20 MSS-SP-67-1990, Butterfly Valves.
- .21 MSS-SP-70-1984, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .22 MSS-SP-71-1984, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .23 MSS-SP-80-1987, Bronze Gate, Globe, Angle and Check Valves.

### 1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.
- .2 Submit data for following: valves.

### 1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in Division 1.

### 1.4 POTABLE WATER SYSTEMS

- .1 All potable water systems and components, including solder, shall be free of lead.

## 2 Products

### 2.1 DOMESTIC WATER PIPING AND FITTINGS

- .1 Domestic hot, cold, and recirc systems:
  - .1 Above ground within building: copper tube, hard drawn, type L: to ASTM B88M.
- .2 Fittings:
  - .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI B16.24.
  - .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
  - .3 Cast copper, solder type: to ANSI B16.18.
  - .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .3 Joints:
  - .1 Rubber gaskets, 1.6 mm thick: to ANSI/AWWA C111/A21.11.
  - .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
  - .3 Solder/brazing: lead free 95.5/4/0.5 Tin-Copper-Silver solder.
    - .1 Acceptable Material: "Silvabrite 100"; Aquasol.
  - .4 Teflon tape: for threaded joints.

### 2.2 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
  - .1 To MSS SP-80, Class 125, 860 kPa bronze body, bronze swing disc, screw in cap, regrindable seat.
  - .2 Acceptable Material: Crane 1342; Jenkins 4093J; Milwaukee 1509-T, Nibco.
- .2 NPS 2 and under, screwed:
  - .1 To MSS SP-80, Class 125, 860 kPa bronze body, bronze swing disc, screw in cap, regrindable seat.
  - .2 Acceptable Material: Crane 37; Jenkins 4092J; Milwaukee 509-T, Nibco.
- .3 NPS 2-1/2 and over, flanged:
  - .1 To MSS SP-71, Class 125, 860 kPa cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap.
  - .2 Acceptable Material: Crane 373; Jenkins 587J; Milwaukee F-2974, Nibco.

### 2.3 BALL VALVES

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Bronze two-piece body, chrome plated brass or stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle.



- .3 Acceptable Material: Crane 9202; Jenkins 901BJ; Milwaukee BA-100; Watts B-6000-01, Nibco.
- .2 NPS 2 and under, soldered:
  - .1 To ANSI B16.18, Class 150.
  - .2 Bronze two-piece body, chrome plated brass or stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle, with NPT to copper adaptors.
  - .3 Acceptable Material: Crane 9222; Jenkins 902B; Milwaukee BA-150; Watts B-6001-01, Nibco.
- 3 Execution
- 3.1 INSTALLATION
  - .1 Install in accordance with National Plumbing Code and local authority having jurisdiction except where specified otherwise.
  - .2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
  - .3 Assemble all piping using fittings manufactured to ANSI standards.
  - .4 Install piping and tubing parallel and close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.
  - .5 Connect to fixtures and equipment in accordance with manufacturers' instructions unless otherwise indicated.
  - .6 Buried piping:
    - .1 Install buried pipe on 150 mm of washed clean sand, shaped to accommodate hubs and fittings. Install piping to line and grade as indicated.
    - .2 Backfill to 150 mm above top of pipe with washed clean sand.
    - .3 Bedding preparation and backfilling required to carry out this work shall be by this trade.
  - .7 Vent sanitary sewer in accordance with the National Plumbing Code.
- 3.2 VALVES
  - .1 Isolate domestic water system equipment, fixtures and branches with ball valves.
  - .2 Balance domestic hot water recirculation systems using balance valves provided. Mark settings and record drawings on completion.
- 3.3 DISINFECTION OF POTABLE WATER SYSTEMS (EXISTING AND NEW)
  - .1 Testing, Cleaning and Disinfection of Domestic Water Supply Systems (ASPE Plumbing Engineering Design Handbook – Volume 2, Chapter 5 – Cold Water Systems), which must be applied to the potable and non-potable water systems:
    - .1 Testing:
      - .1 Prior to disinfection, connection to faucets and equipment, and installation of pipe insulation, the domestic water system should be hydrostatically tested for leakage. A typical test for interior piping is

- accomplished by capping all system openings, filling the system with water, and then pumping a static head into the system at a minimum 1-1/2 times the working pressure (100 psi [689.5 kPa] minimum) for a period of not less than two hours. The aforementioned test requirements are acceptable to most inspectors, but note that 80 psi (551.6 kPa) is the maximum pressure allowed by most designs and codes.
- .2 Under conditions where systems are subject to freezing, and with the approval of the authority having jurisdiction, an air test may be substituted for the water test. This can be accomplished by connecting an air compressor to the system, bringing the system up to 40 psi (275.8 kPa), checking for leaks with liquid soap, repairing any leaks, and then subjecting the system to a minimum 1-1/2 times the working pressure (100 psi [689.5 kPa] minimum) for a minimum for two hours. Do not use an air test for most plastic piping, particularly PVC or CPVC.
  - .3 Any equipment that may be damaged by these tests should be disconnected or isolated and shut off from the system.
- .2 Cleaning and Disinfecting:
- .1 New or repaired potable water systems shall be cleaned and disinfected prior to use whenever required by the administrative authority. The method to be followed should be per AWWA or as follows (or as required by the administrative authority):
    - .1 Cleaning and disinfection applies to both hot and cold, domestic (potable) water systems and should be performed after all pipes, valves, fixtures, and other components of the systems are installed, tested and ready for operation.
    - .2 All domestic yard, hot and cold water piping should be thoroughly flushed with clean, potable water prior to disinfection to remove dirt and other contaminants. Screens of faucets and strainers should be removed before flushing and reinstalled after completion of disinfection.
    - .3 Disinfection should be done using chlorine, either gas or liquid. Calcium or sodium hypochlorite or another approved disinfectant may be used. Use nonhazardous materials that can be drained to the County of Colchester sewer.
    - .4 A service cock should be provided and located at the water service entrance. The disinfecting agent should be injected into and through the system from this cock only.
    - .5 The disinfecting agent should be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of the disinfecting agent into the main connected to the public water supply is not permitted.
    - .6 All sectional valves should be opened during disinfection. All outlets should be fully opened at least twice during injection and the residual checked with orthotolidin solution.
    - .7 If chlorine is used, when the chlorine residual concentration, calculated on the volume of water the piping will contain, indicates not less than 50 parts per million (ppm) or milligrams

- per litre (mg/L) at all outlets, then all valves should be closed and secured.
- .8 The residual chlorine should be retained in the piping systems for a period of not less than 24 hours.
- .9 After the retention, the residual should be not less than 5 ppm. If less, then the process should be repeated as described above.
- .10 If satisfactory, then all fixtures should be flushed with clean, potable water until residual chlorine by orthotolidin test is not greater than that of the incoming water supply (this may be zero).
- .11 All work and certification of performance should be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance should indicate the following:
- Name and location, job and date when disinfection was performed.
  - Material used for disinfection.
  - Retention period of disinfectant in piping system.
  - Ppm (mg/L) chlorine during retention.
  - Ppm (mg/L) chlorine after flushing.
  - Statement that disinfection was performed as specified.
  - Signature and address of company/person performing disinfection.
- .12 Upon completion of final flushing (after retention period) the Contractor should obtain a minimum of one water sample from each hot and cold water line and submit samples to a local approved laboratory. Samples should be taken from faucets located at the highest floor and furthest from the meter or main water supply. The laboratory report should show the following:
- Name and address of approved laboratory testing the sample.
  - Name and location of job and date the samples were obtained.
  - The coliform organism count. *An acceptable test shall show the absence of coliform organisms.* (Some codes require an acceptable test for two consecutive days.)
  - Any other tests required by local code authorities.
- .13 If analysis does not satisfy the minimum requirements, the disinfection procedure must be repeated.
- .14 Before acceptance of the systems, the Contractor should submit to the Departmental Representative for his review three copies of the laboratory report and three copies of the certification of performance as specified.
- .15 Under no circumstances should the Contractor permit the use of any portion of domestic water systems until they are properly disinfected, flushed and certified.

3.4 CIRCUIT BALANCING VALVES

- .1 Install flow balancing valves on DHWR lines as indicated on drawings.
- .2 Remove handwheel after installation and TAB is complete to satisfaction of Departmental Representative.

3.5 TESTING

- .1 Test piping system before concealing. Notify Departmental Representative 24 hours prior to testing. Test to National Plumbing Code.

END OF SECTION

## 1 General

### 1.1 REFERENCES

- .1 ASTM A126-84, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62-90, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ANSI/AWWA C700-77, Cold Water Meters - Displacement Type.
- .4 ANSI/AWWA C7011-88, Cold Water Meters - Turbine Type for Customer Service.
- .5 ANSI/AWWA C702-86, Cold Water Meters - Compound Type.
- .6 CAN/CSA-B64 Series-M88, Backflow Preventers and Vacuum Breakers.
- .7 CAN/CSA-B64.10-M88, Backflow Prevention Devices - Selection, Installation Maintenance and Field Testing.
- .8 CAN3-B79-M79, Floor Drains and Trench Drains.
- .9 PDI-WH201-77, Water Hammer Arrestors.

### 1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 10 01 - General Requirements.
- .2 Indicate dimensions, construction details and materials for following.

### 1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in Section 01 10 01 - General Requirements
- .2 Data to include:
  - .1 Description of plumbing specialties and accessories, giving manufacturers name, supplier's name and address, type, model, year and capacity.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list.

## 2 Products

### 2.1 BACKFLOW PREVENTERS

- .1 To CAN/CSA-B64 Series.
- .2 BFP-1: Reduced pressure principal backflow preventer.
  - .1 Standard of Acceptance: Watts 009QT, Wilkins, Conbraco.

### 2.2 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
  - .1 Acceptable Material: Armstrong F4SC; Leitch BE; Spirax BT; Watts 777 Series.

- .3 NPS 2 ½ and over, cast iron body, flanged ends, with bolted cap.
  - .1 Acceptable Material: Armstrong F4FL; Leitch 528 pipeline basket type; Spirax Fig 3; Watts 77F Series.

### 2.3 WATER METER

- .1 Water meter c/w strainer shall be supplied by the Village of Bible Hill. Contractor shall retrieve and install water meter c/w strainer. NPS 2 water meter for use with potable water systems.
  - .1 Standard of Acceptance: Neptune TRU/FLO Series.
- .2 Contractor shall provide an interface between the water meter and the building management system for batching processes, monitoring flow totalization, and/or flow rate data.
  - .1 Standard of Acceptance: Neptune TRICON/E3 Transmitter.

### 2.4 PRESSURE REDUCING VALVE

- .1 PRV: High capacity water pressure reducing valve. Outlet pressure setting 345 kPa (50 psi). Bronze body or iron construction suitable for use in a potable water system.
  - .1 Standard of Acceptance: Watts Model 223, Zurn, Wilkins, Nibco, Ross.

## 3 Execution

### 3.1 INSTALLATION

- .1 Install in accordance with National Plumbing Code and local authority having jurisdiction except where specified otherwise.
- .2 Install in accordance with manufacturer's instructions and as specified.

### 3.2 BACKFLOW PREVENTERS AND VACUUM BREAKERS

- .1 Install in accordance with CSA B64.10, where indicated and elsewhere as required by code.
- .2 Install as required for proper functioning of equipment and/or systems.
- .3 Pipe discharge to over nearest drain.

### 3.3 STRAINERS

- .1 Install with sufficient room to remove basket.

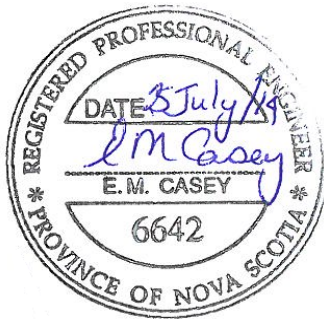
### 3.4 COMMISSIONING

- .1 After start-up, test, adjust and prove operation of all equipment and accessories to suit site conditions including but not limited to:
  - .1 Clean out strainers periodically until clear.
  - .2 Clean out and prime all floor drain traps using trap seal primers or other means acceptable to the National Plumbing Code.
  - .3 Prove freedom of movement of cleanouts. Clean out covers of cleanouts and floor drain strainers.

- .4 Backflow preventers: confirm operation of backflow preventers and vacuum breakers, with test procedures in accordance with CSA B64.10 and local authority.
- .5 Thermostatic mixing valves: Verify in writing maximum temperature settings as specified for each valve.
- .6 Maximum temperature settings to be verified using a digital thermometer.

END OF SECTION

<u>Section</u>	<u>Title</u>	<u>Pages</u>
31 23 10	Excavation and Backfill and Trenching	6
32 12 16	Asphalt Paving	5
33 11 17	Watermains	10
33 31 13	Sanitary Sewerage	5





## GENERAL

### 1.1 RELATED REQUIREMENTS

- .1 Sections 33 11 17, 33 31 13.
- .2 Standard Specifications for Municipal Services, January 2014 Edition published by the Joint Committee on Contract Documents, Nova Scotia Road Builders Association and Consulting Engineers of Nova Scotia.

### 1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-02e01, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

### 1.3 DEFINITIONS

- .1 Excavation classes: classes of excavation will be recognized; common excavation.
  - .1 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422: Sieve sizes to CAN/CGSB-8.1.
    - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
  - .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Make submittals in accordance with Section 01 10 01 – General Requirements.
  - .2 Quality Control: in accordance with Section 01 10 01 – General Requirements:
    - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
    - .2 Submit to Departmental Representative written notice at least 7 days prior to excavation work.
    - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
    - .4 Submit to Departmental Representative testing results as described in PART 3 of this Section.
  - .3 Preconstruction Submittals:
    - .1 Plan of underground utility locates will be provided by Departmental Representative.

## 1.5 QUALITY ASSURANCE

### .1 Health and Safety Requirements:

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

## 1.6 EXISTING CONDITIONS

### .1 Examine soil report available from Departmental Representative.

### .2 Buried services:

- .1 Before commencing work verify location of buried services on and adjacent to site.
- .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .3 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures.
- .4 Confirm locations of buried utilities by careful test excavations.
- .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
- .6 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Departmental Representative.
- .7 Record location of maintained, re-routed and abandoned underground lines.
- .8 Confirm locations of recent excavations adjacent to area of excavation.

### .3 Existing buildings and surface features:

- .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
- .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative

## PRODUCTS

### 2.1 MATERIALS

#### .1 Type 1 and Type 2 fill: properties to the following requirements:

- .1 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.
- .2 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
56 mm	-	100
28 mm	-	60-80
20 mm	100	-

14 mm	50-85	-
5 mm	20-50	25-45
0.16 mm	0-10	0-10
0.08 mm	0-7	-

## EXECUTION

### 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### 3.3 PREPARATION/PROTECTION

- .1 Protect existing features.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

### 3.4 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Remove concrete, paving, walks and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 5 m at end of day's operation.

- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .14 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
  - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .15 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

### 3.5 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated. Place bedding and surround material in unfrozen condition.

### 3.6 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Recording location of underground utilities.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place layers simultaneously on both sides of installed Work to equalize loading.

### 3.7 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

- .2 Replace topsoil as indicated.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements, curbs and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

## GENERAL

### 1.1 DESCRIPTION

- .1 This section specifies requirements for supplying, hauling, placing, shaping and compacting of hot-mix asphalt concrete.

### 1.2 REFERENCE STANDARDS

- .1 ASTM C136-96a, Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM D995-95b, Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .3 ASTM D1559-89, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
- .4 ASTM D3203-94, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

### 1.3 RELATED WORK

- .1 Refer to other Specification Sections for related information.

### 1.4 SOURCE SAMPLING

- .1 Inform Departmental Representative of proposed source of asphaltic concrete, and provide access for sampling at least two weeks prior to commencing hauling this material to plant site.

### 1.5 PRODUCTION SAMPLING

- .1 Use only material approved by Departmental Representative.
- .2 One or more samples per day to be taken of mix, or components thereof, being produced to determine compliance with general and special requirements.

### 1.6 MEASUREMENT FOR PAYMENT

- .1 Hot mix asphalt paving will be measured in accordance with Section 01 10 01-General Requirements.
- .2 Regrading of base material prior to placement of new asphalt will be considered incidental to the work.

## PRODUCTS

### 2.1 MATERIALS

- .1 Hot-mix Asphaltic Concrete design mix formula to be provided to Departmental Representative two weeks prior to commencing paving operations. Submit design mix for review providing at least the following information:
  - .1 Nominal aggregate size
  - .2 Marshall strength at 60°C
  - .3 Marshall stability at 60°C
  - .4 Flow Index
  - .5 Percent Air Voids in Mixture

---

.6	Min. % Voids in Mineral Aggregate
.7	Retained Stability

---

- .2 Departmental Representative may approve use of current grading requirements of Nova Scotia Department of Transportation Standard Specification for Pavement mixture.
- .3 Do not change job mix without prior approval of Departmental Representative. Should a change in a material source be contemplated, a new job mix formula to be provided to Departmental Representative and approved prior to installation.

## EXECUTION

### 3.1 EQUIPMENT

- .1 Pavers: Provide mechanical grade controlled self powered pavers capable of spreading mix, within specified tolerances, true to line, grade, and crown indicated on plans.
- .2 Rollers: Provide sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Haul Trucks: Provide trucks of such size, speed and condition to ensure orderly and continuous operation and as follows:
  - .1 Boxes with tight metal bottoms.
  - .2 Covers of sufficient size and mass to completely cover and protect asphalt mix when truck fully loaded.
  - .3 In cool weather or for long hauls, insulate entire contact area of each box.
  - .4 Trucks which cannot be weighed in a single operation on scales supplied will not be accepted.
  - .5 Hand Tools:
    - .1 Provide lutes or rakes with covered teeth during spreading operation when finishing by hand.
    - .2 Provide straight edges, 2.4 m in length to test finished surface.
    - .3 Provide tamping irons having weight not less than 12 kg and a bearing area not exceeding 310 sq. cm for consolidating material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, approved by Departmental Representative, may be used instead of tamping irons.

### 3.2 PREPARATION

- .1 When paving over existing asphalt surface, clean pavement surface to remove dust, contaminants, loose and foreign materials, oil and grease.
- .2 Prior to laying mix, clean surfaces of loose and foreign material.

### 3.3 TRANSPORTATION OF MIX

- .1 Transport mix to job site in vehicles cleaned of foreign material which may affect mix.



- 
- .2 Paint or spray truck beds with light oil, limewater, soap or detergent solution, at least once a day or as often as required. After this operation, elevate truck bed and thoroughly drain; no excess solution is permitted.

### 3.4 PLACING

- .1 General
  - .1 Place asphalt mixtures only when base of lower course is dry and air temperature is above 5°C.
  - .2 When surface temperature on which material is to be placed falls below 10°C, provide extra rollers to compact mix before it cools too much to obtain required density.
  - .3 Do not mix and place hot-mix asphalt when moisture of aggregate in stockpile or from dryer interferes with quality of mix production or with normal plant operations, or when pools of water are observed on surface to be paved.
  - .4 Construct asphalt concrete to design depth, width, and grade.
  - .5 Place asphalt concrete mix at temperature not less than 120°C at time of placing.
  - .6 Place asphalt concrete mix in two mm thick layers.
  - .7 Commence spreading at high side of pavement or at crown.
  - .8 Employ experienced rakers to correct irregularities prior to rolling.
  - .9 Spread and strike off mixture with self-propelled mechanical finisher.
    - .1 Construct longitudinal joints and edges to true line markings.
    - .2 When paving against a compacted mixture that has cooled, paint edge of previously laid lane with a thin coating of asphaltic material or heat joint with an Infra Red-type joint heater mounted on side of paving machine.
    - .3 When segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
    - .4 Correct irregularities in alignment left by paver by trimming directly behind machine.
    - .5 Correct irregularities in surface of pavement course directly behind paver.
- .10 When hand spreading is used:
  - .1 Distribute material uniformly. Broadcasting of material will not be permitted.
  - .2 Provide heating equipment used for keeping hand tools free from asphalt. Prevent high heating temperatures which may burn material. Temperature of tools when used shall not be greater than temperature of mix being placed.

### 3.5 COMPACTING

- .1 Start rolling operations as soon as placed mixture can bear mass of roller without undue displacement of material or cracking of surface.
- .2 Operate roller slowly initially to avoid displacement of material. subsequent rolling not to exceed 5 km/h for steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.
- .3 Overlap successive trips of roller by at least one half width of roller and alternate trip lengths.
- .4 Keep wheels of roller slightly moistened with water to prevent pick-up of material, but do not over water.
- .5 Roll material continuously to a density not less than 98% of density obtained with marshall specimen prepared from plant mix.

- 
- .6 General:
- .1 Provide minimum two rollers paver and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be a pneumatic-tired type.
  - .2 Operate rollers at a slow but uniform speed with drive roll or wheel nearest paver.
  - .3 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling. Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
- .7 Breakdown Rolling:
- .1 Commence breakdown rolling immediately following rolling of longitudinal joint and edges.
  - .2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
  - .3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.
  - .4 Use only experienced roller operators for this work.
- .8 Second Rolling:
- .1 Use pneumatic-tired, tandem or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix is still of a temperature that will result in maximum density from this operation.
  - .2 Rolling shall be continuous after initial rolling until mix placed has been thoroughly compacted.
- .9 Finish Rolling:
- .1 Accomplish finish rolling with two-axle tandems or three-axle tandems while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, Departmental Representative shall specify use of pneumatic-tired rollers.
  - .2 Conduct rolling operations in close sequence.

### 3.6 JOINTS

- .1 General:
- .1 Trim vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.
  - .2 Paint joint face with thin coat of hot asphalt cement or cut back asphalt or preheat joint face with approved heater, prior to placing of fresh mixture.
  - .3 Overlap previously laid strip with spreader by 100 mm.
  - .4 Rake fresh mixture against joint and thoroughly tamp and roll.
  - .5 Remove any material from surface of previously laid strip.
  - .6 Do not throw surplus material on freshly screened mat surface.
- .2 Longitudinal Joints:
- .1 Roll longitudinal joints directly behind paving operation.
  - .2 Before rolling, carefully remove with a lute or rake, and discard coarse aggregate in material overlapping joint.
  - .3 Ensure joints are offset at least 150 to 200 mm from those in lower layers.

3.7 FINISH TOLERANCES

- .1 Finish pavement surfaces smooth and true to design line, crown, and grade.
- .2 Remove irregularities exceeding 5 mm when checked with a 2.4 m long straight edge placed in any direction and replace with new material and compact.
- .3 Use straight edge at transverse joints and along pavement to check for surface irregularities.

3.8 DEFECTIVE WORK

- .1 Repair areas showing checking or hairline cracking to the approval of the Departmental Representative.

END OF SECTION

## General

### 1.1 RELATED REQUIREMENTS

- .1 Sections 31 23 10
- .2 Standard Specifications for Municipal Services, January 2014 Edition published by the Joint Committee on Contract Documents, Nova Scotia Road Builders Association and Consulting Engineers of Nova Scotia.

### 1.2 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA B300-10, Standard for Hypochlorites.
  - .2 ANSI/AWWA B301-10, Standard for Liquid Chlorine.
  - .3 ANSI/AWWA B303-10, Standard for Sodium Chlorite.
  - .4 ANSI/AWWA C104/A21.4-08, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
  - .5 ANSI/AWWA C105/A21.5-10, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - .6 ANSI/AWWA C111/A21.11-07, American National Standard for Rubber-Gasket Joints for Ductile-Iron and Fittings.
  - .7 ANSI/AWWA C110/A21.10-08, American National Standard for Ductile-Iron and Gray Iron Fittings for Water.
  - .8 ANSI/AWWA C150/A21.50-08, Standard for Thickness Design of Ductile-Iron Pipe.
  - .9 ANSI/AWWA C151/A21.51-09, Standard for Ductile-Iron Pipe, Centrifugally Cast.
  - .10 ANSI/AWWA C153/A21.53-11, Standard for Ductile-Iron Compact Fittings.
  - .11 ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Service.
  - .12 ANSI/AWWA C600-10, Standard for Installation of Ductile-Iron Water Mains, and Their Appurtenances.
  - .13 ANSI/AWWA C602-11, Standard for Cement-Mortar Lining of Water Pipelines - 4 Inch (100 mm) and Larger.
  - .14 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.
  - .15 ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.
  - .16 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.
- .2 ASTM International
  - .1 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube.
  - .2 ASTM C478M-11, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- .3 American Water Works Association (AWWA)/Manual of Practice

- .1 AWWA M9-2008, Concrete Pressure Pipe.
- .2 AWWA M11-2004, Steel Pipe - A Guide for Design and Installation.
- .3 AWWA M17-2006, Installation, Field Testing, and Maintenance of Fire Hydrants.
- .4 .
- .4 CSA International
  - .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
    - .1 CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
    - .2 CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- .5 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S520-07, Standard for Fire Hydrants.
  - .2 CAN/ULC-S543-09, Standard for Internal-Lug, Quick Connect Couplings for Fire Hose.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 10 01 – General requirements.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for [distribution piping materials] and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Pipe certification to be on pipe.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Recycled Content:
      - .1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
      - .2 Regional Materials: submit evidence that project regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 10 01 – General Requirements.
- .2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.

- .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.
- .3 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes, and hydrants for incorporation into manual.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.6 SCHEDULING OF WORK**

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
- .3 Notify Departmental Representative and building occupants minimum of 24 hours in advance of interruption in service.
- .4 Do not interrupt water service for more than 3 hours unless otherwise authorized.
- .5 Notify fire department of planned or accidental interruption of water supply to hydrants.
- .6 Provide and post "Out of Service" sign on hydrant not in use.
- .7 Advise local police department of anticipated interference with movement of traffic.

## **PRODUCTS**

### **2.1 PIPE, JOINTS AND FITTINGS**

- .1 Ductile iron pipe: to ANSI/AWWA C151/A21.51, pressure class 52 cement mortar lined to ANSI/AWWA C104/A21.4.
- .2 Joints and fittings for ductile iron pipe.
  - .1 Joints:
    - .1 Push-on joints: to ANSI/AWWA C111/A21.11.
    - .2 Rubber gasket for mechanical pipe joints: to [ANSI/AWWA C111/A21.11].
    - .3 Rubber gasket for flange pipe joints 1.6 mm thick: to ANSI/AWWA C111/A21.11.
    - .4 Bolts, nuts, hex head with washers: to ASTM A307, heavy series.
    - .5 Anodes required at all fittings and joints.
  - .2 Fittings:
    - .1 Mechanical joint cast iron and ductile iron fittings NPS 3 and larger: to ANSI/AWWA C110/A21.10.

- .2 Flanged cast iron fittings NPS 3 and larger: to ANSI/AWWA C110/A21.10.
- .3 Compact Fittings to ANSI/AWWA C153/A21.53.
- .3 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, DR 14, 1 MPa gasket bell end, cast iron outside diameter.
  - .1 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket.

## 2.2 PIPE PROTECTION

- .1 Provide means of protection for iron pipe in accordance with ANSI/AWWA C105/A21.5.
- .2 Provide Zinc Anodes for Ductile iron piping and fittings.

## 2.3 VALVES AND VALVE BOXES

- .1 Valves to open clockwise.
- .2 Gate valves: to ANSI/AWWA C500, standard iron body, brass mounted wedge valves with non-rising stems, suitable for 1 Pa with flanged and/or push-on joints.
- .3 Cast iron valve boxes: three piece sliding type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut, top of rod will not be more than 150 mm below cover.
  - .1 Base to be large round type with minimum diameter of 300 mm.
  - .2 Top of box to be marked "WATER ".

## 2.4 SERVICE CONNECTIONS

- .1 Copper tubing: to ASTM B88M type K, annealed.
- .2 Ductile iron pipe: to ANSI/AWWA C151/A21.51 pressure class 52 cement mortar lined to ANSI/AWWA C104/A21.4.
- .3 Polyvinyl chloride pressure pipe: to CAN/CSA-B137.3, type 1120 series 160.
- .4 Copper tubing joints: compression type suitable for 1 MPa working pressure.
- .5 PVC joints: solvent welded in accordance with manufacturer's specifications.
- .6 Joints for ductile iron pipe: push-on joints to ANSI/AWWA C111/A21.11. Rubber gaskets to ANSI/AWWA C111/A21.11. Requirement to maintain electrical conductivity between pipes.
- .7 Brass corporation stops: compression type having threads to ANSI/AWWA C800.
- .8 Brass inverted key-type curb stops: red brass to ASTM B62, compression type.
  - .1 Curb stops to have adjustable cast iron service box with stem to suit depth of bury.
  - .2 Top of cast iron box marked "WATER ".
- .9 Service connections for PVC pipe:
  - .1 Service connections less than 100 mm: corporation stop, tapped to main using AWWA threads, complete with stainless service saddle. Service saddle to consist of circumferential band type complete with side bars and fingers, keeper bar, stud bolts, nuts, washers and gaskets.
  - .2 Service connections 100 mm and over: use tee fitting.

- .10 Bronze type service clamps: for PVC pipe service connections.
  - .1 Service clamps to be of strap-type, with confined "O" ring seal cemented in place.
  - .2 Clamps to be tapped with threads to ANSI/AWWA C800.

## **2.5 HYDRANTS**

- .1 Post type hydrants: compression type hydrant, to CAN/ULC-S520, designed for working pressure of 1030 kPa with two 65 mm quick connect hose outlets, one 100 mm quick connect pumper connection, 150 mm riser barrel, 125 mm bottom valve and 150 mm connection for main.
  - .1 Hydrants to open counter clockwise.
  - .2 Provide key operated gate valve located 1.5 m from hydrant.
  - .3 Depth of bury 1.6 m.
- .2 Hydrant paint: exterior enamel to MPI #96. Colour to match Town of Truro hydrants.

## **2.6 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material to: Section 31 23 33 – Excavating, Trenching and Backfill.

## **2.7 BACKFILL MATERIAL**

- .1 As indicated. 31 23 33 - Excavating, Trenching and Backfilling .

## **2.8 PIPE DISINFECTION**

- .1 Sodium hypochlorite to ANSI/AWWA B300 or liquid chlorine to ANSI/AWWA B301 to disinfect water mains.
- .2 Disinfect water mains in accordance with Standard Specifications for Municipal Services.

## **EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 PREPARATION**

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
  - .1 Inspect materials for defects to approval of Departmental Representative.
  - .2 Remove defective materials from site as directed by Departmental Representative.



### 3.3 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe as indicated on drawings.

### 3.4 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95 % maximum dry density to ASTM D698.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

### 3.5 PIPE INSTALLATION

- .1 Terminate building water service as indicated.
  - .1 Cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Lay pipes to ANSI/AWWA C600 manufacturer's standard instructions and specifications.
  - .1 Do not use blocks except as specified.
- .3 Join pipes in accordance with ANSI/AWWA C600 and manufacturer's recommendations.
- .4 Bevel or taper ends of PVC pipe to match fittings.
- .5 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .6 Lay pipes on prepared bed, true to line and grade.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  - .2 Take up and replace defective pipe.
  - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .7 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
- .8 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .9 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .10 Position and join pipes with equipment and methods approved by Departmental Representative.

- .11 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Align pipes before jointing.
- .13 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .14 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .1 Remove disturbed or contaminated gaskets.
  - .2 Clean, lubricate and replace before jointing is attempted again.
- .15 Complete each joint before laying next length of pipe.
- .16 Minimize deflection after joint has been made.
- .17 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .18 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .21 Do not lay pipe on frozen bedding.
- .22 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .23 Backfill remainder of trench.

### **3.6 VALVE INSTALLATION**

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Valves not to be supported by pipe.

### **3.7 SERVICE CONNECTIONS**

- .1 Terminate building water service 1.5 m outside building wall opposite point of connection to main.
  - .1 Install coupling necessary for connection to building plumbing.
  - .2 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.
- .3 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops 300 mm inside roadway allowance.

- .4 Tappings on ductile iron pipe, may be threaded without service clamps.
  - .1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.
- .5 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .6 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.
- .7 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m minimum, whichever is greater.
- .8 Leave corporation stop valves fully open.
- .9 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
- .10 Install curb stop with corporation box on services NPS 2 or less in diameter.
  - .1 Equip larger services with gate valve and cast iron box.
  - .2 Set box plumb over stop and adjust top flush with final grade elevation.
  - .3 Leave curb stop valves fully closed.
- .11 Place temporary location marker at ends of plugged or capped unconnected water lines.
  - .1 Each marker to consist of 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade.
  - .2 Paint exposed portion of stake red.

### **3.8 HYDRANTS**

- .1 Install hydrants at locations as indicated.
- .2 Install hydrants in accordance with AWWA M17.
- .3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.
- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
- .5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.
- .6 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150 mm above drain holes.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

### **3.9 THRUST BLOCKS AND RESTRAINED JOINTS**

- .1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated.
- .2 Keep joints and couplings free of concrete.
- .3 Do not backfill over concrete within 24 hours after placing.

- .4 For restrained joints: only use restrained joints approved by Departmental Representative.

### **3.10 HYDROSTATIC AND LEAKAGE TESTING**

- .1 Do tests in accordance with Standard Specifications for Municipal Services.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
  - .1 Perform tests in presence of Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Departmental Representative.
- .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.
- .7 Leave hydrants, valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

### **3.11 PIPE SURROUND**

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95 % of corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % of corrected maximum dry density.

### **3.12 BACKFILL**

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
  - .1 In other areas, compact to at least 90 % maximum density to ASTM D698.
- .4 After installation, paint hydrants to suit Town of Truro standard.

**3.13 FLUSHING AND DISINFECTING**

- .1 Flushing and Disinfection operations as per Standard Specifications for Municipal Services.
- .2 Flushing and disinfecting operations: witnessed by Departmental Representative and carried out by contractor.
  - .1 Notify Departmental Representative at least 2 days in advance of proposed date when disinfecting operations will begin.

**3.14 SURFACE RESTORATION**

- .1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.

**END OF SECTION**

**GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 10
- .2 Standard Specifications for Municipal Services, January 2014 Edition published by the Joint Committee on Contract Documents, Nova Scotia Road Builders Association and Consulting Engineers of Nova Scotia.

**1.2 REFERENCES**

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - .2 ASTM International
    - .1 ASTM D3034-0], Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
    - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .4 CSA International
  - .1 CSA-B182.1-11, Plastic Drain and Sewer Pipe and Pipe Fittings.
  - .2 CSA-B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling:
  - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
  - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
  - .3 Notify Departmental Representative and building occupants 24 hours minimum in advance of any interruption in service.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .3 Certificates:
  - .1 Certification to be marked on pipe.
- .4 Test and Evaluation Reports:
  - .1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.
- .5 Sustainable Design Submittals:
  - .1 Regional Materials: submit evidence that project incorporates regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes from damage.
  - .3 Replace defective or damaged materials with new.

## **PRODUCTS**

### **2.1 PLASTIC PIPE**

- .1 Type PSM Polyvinyl Chloride (PVC): to ASTM D3034
  - .1 Standard Dimensional Ratio (SDR): 26
  - .2 Tracing wire required.
  - .3 Nominal lengths: 6 m.

### **2.2 SERVICE CONNECTIONS**

- .1 Type PSM Poly (Vinyl) Chloride: to CSA-B182.2.

### **2.3 PIPE BEDDING AND SURROUND MATERIALS**

- .1 Granular material to Section 31 23 33 Excavation, Trenching and Backfill.

### **2.4 BACKFILL MATERIAL**

- .1 As indicated.

**EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways,
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative. Clean and dry pipes and fittings before installation.
- .3 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

**3.3 TRENCHING**

- .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer or sewer connection.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

**3.4 GRANULAR BEDDING**

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% corrected maximum dry density .



- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

### 3.5 INSTALLATION

- .1 Lay and join pipes to: ASTM C12.
- .2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .3 Handle pipe using methods approved by Manufacturer.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length
- .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Joint deflection permitted within limits recommended by pipe manufacturer.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA-B182.11.
- .9 Pipe jointing:
  - .1 Install gaskets in accordance with manufacturer's written recommendations.
  - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  - .3 Align pipes before joining.
  - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
  - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
  - .6 Complete each joint before laying next length of pipe.
  - .7 Minimize joint deflection after joint has been made to avoid joint damage.
  - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
  - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of Work occurs, block pipes to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs approved by Manufacturer set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.

**3.6 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
  - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 95% corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

**3.7 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% corrected maximum dry density
  - .1 In other areas, compact to at least 90% corrected maximum dry density.

**3.8 FIELD TESTING**

- .1 Field Testing as per Standard Specifications for Municipal Services.
- .2 Repair or replace pipe, pipe joint or bedding found defective.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do infiltration and exfiltration test to Standard Specifications for Municipal Services.
- .6 Carry out tests on each section of sewer between successive manholes including service connections.
- .7 Repair and retest sewer line as required, until test results are within limits specified.
- .8 Repair visible leaks regardless of test results.
- .9 Television and photographic inspections:
  - .1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.
  - .2 Provide means of access to permit Departmental Representative to do inspections.

**END OF SECTION**