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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 16, 2009 | Modified ‘Related Sections’ |
| 3 | March 16, 2011 | Minor changes |
| 4 | June 18, 2014 | First draft review comments (AV). Incorporated components of Project T-14-23 related specification. |
| 5 | June 8, 2015 | Second Draft for Review (AV) |
| **6** | **September 16, 2015** | **Updated, Finalized Specification – Reference eDOCS #5823641-v4 (AV)** |
| 7 | April 13, 2016 | Phase 2 update – addition of references to allow for proper disinfection of equipment and piping (where required) in response to a lesson learned issue on a project (AV) |
| 8 | August 15, 2017 | Removal of cited products (CDP PMO, OMM) |
| 9 | December 7, 2017 | Updated reference to Design Guideline Section 30- Operation Manual Guideline (AAM) |
| 10 | June 13, 2022 | 1.6 Added tagging requirements (BM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GENERAL

## Work of this Section

### Provide all labour, materials, equipment and services required to complete the Work specified in the Contract Documents and as shown on the Drawings.

### The work specified in this Section generally includes plumbing, building drainage, piping and ventilating systems required for the Work.

### Provide all accessories and appurtenances as required to ensure complete, operational and energy efficient systems.

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### Contractor is responsible for coordination of the Work.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

#### Section 01080 – Process Equipment Location Tagging

#### Section 01300 – Submittals

#### Section 01425 – Computerized Maintenance Management System Data Requirements

#### Section 01430 – Operation and Maintenance Data

#### Section 01740 – Cleaning

#### Section 01750 – Disinfection and Testing of Water Retaining Structures and Process Piping

#### Section 01780 – Contract Closeout

#### Section 01810 – Equipment Testing and Facility Commissioning

#### Section 01820 – Demonstration and Training

#### Section 09900 – Painting and Protective Coating

#### Division 13 – SCADA and Instrumentation [insert applicable specifications]

#### Product requirements for [item]... for installation under this Section.

## Codes, Regulatory Act Standards

### The Work shall be performed in strict accordance with all applicable rules, regulations, by-laws and the requirements and interpretations of all authorities having jurisdiction, including but not limited to those listed below in subsection 1.3.5. *[Applicable standards to be defined by Consultant]*

### Where there are discrepancies between the requirements of the Contract Documents and the requirements of the relevant rules, regulations, by-laws and the requirements and interpretations of all authorities having jurisdiction, the Contractor shall notify the Consultant in writing and obtain clarification before proceeding with the Work.

### In the event that the standards and/or requirements established by the Contract Documents are more onerous than the standards established by any of the codes and standards referred to in the Contract Documents, the Contractor shall meet the standards established by the Contract Documents.

### Upon the request of the Consultant, the Contractor shall require suppliers to provide proof of compliance with all applicable codes and standards.

### Conform to the following codes, regulations, guidelines, and standards including the latest revisions issued up to closing date of tender.

#### Occupational Health and Safety Act (Ontario).

#### Building Code Act, 1992, O. Reg. 332/12 Building Code.

##### Plumbing and Drainage Systems Section 3.7.4.1. *[Consultant to confirm references]*

#### American Society of Plumbing Engineers (ASPE):

##### ASPE Data Book – A Plumbing Engineer’s Guide to System Design and Specifications, Volume 2 – Plumbing Systems

#### America Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standards and Guidelines

#### Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

##### SMACNA Low Velocity Systems Duct Manual (TAB 7.5)

##### SMACNA Low Velocity Duct Construction Standard (1969)

##### SMACNA High Velocity Systems Duct Manual (TAB 7.7)

##### SMACNA High Velocity Duct Construction Standards (1969)

##### SMACNA HVAC Testing, Adjusting, and Balancing Manual

#### Associated Air Balance Council (AABC):

##### AABC National Standards for Field Management and Instrumentation Total System Balance.

#### Ministry of Environment and Climate Change (MOECC)

##### Watermain Disinfection Procedure (November 2015)

#### National Environmental Balancing Bureau (NEBB):

##### NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems, 2005 – seventh edition.

##### NEBB Procedural Standards for Measuring Sound and Vibration, second edition – SEPTEMBER 2006.

#### American Society of Mechanical Engineers (ASME)

##### ASME B31.1 / B31.3, Power and Process Piping Package.

### All other codes, standards, regulations referred to in the above documents, and which have been adopted by the authorities having jurisdiction and/or which are applicable to the work of this Division as specified in the Contract Documents.

## Protection of Openings

### Protect equipment and systems openings from dirt, dust, and other foreign materials with materials which are appropriate for the equipment or system.

### Protect openings to water treatment process structures (where applicable) with perimeter curbs and access point hardware (hatches, manholes etc.) that are adequately sealed to prevent entry of liquids into such structures.

## Painting

### Apply a minimum one coat of corrosion resistance primer paint to supports and equipment fabricated from ferrous metals and before erection.

### Paint exposed piping and metal work.

### Refer to Section 09900 – Painting and Protective Coating.

#### Prime and touch up marred finished paintwork to match the original paint.

#### Restore finishes that have been damaged too extensively to be merely primed and touched up, to new condition.

## Special Tools

### Provide a list of special tools required with details for use or cross-reference to O&M manuals and up-loadable to the Region’s CMMS (Maximo).

### Provide one set of special tools required to service equipment as recommended by the manufacturer(s) and in accordance with Section 01780 – Contract Closeout.

## Equipment and Maintenance Data

### Refer to Section 01780 – Contract Closeout.

### Operation data to include:

#### Control schematics for each system including environmental controls.

#### Description of each system and its controls.

#### Description of the operation of each system at various loads together with reset schedules and seasonal operational variances as described in the Contract Documents. *[Consultant to ensure such details are in the Contract Documents]*

#### System description and Operation instruction for each system and each component.

#### Description of actions and contingency plan to be taken in event of equipment failure.

#### Valves schedule and flow diagram.

#### Colour coding chart.

#### All other required information as detailed in the equipment information template and electronically up-loadable to the CMMS (Maximo) as defined by Section 01425 - Computerized Maintenance Management System Data Requirements and Section 01430 – Operation and Maintenance Data.

### Maintenance data shall include:

#### Servicing, maintenance, operation and trouble shooting instructions for each item of equipment.

#### Manufacturer’s recommended spare parts list.

#### Data shall include job plans, preventative maintenance requirements and schedules of tasks, frequency, tools required and estimated task time.

#### Data shall include safety procedures pertaining to operating and maintaining the equipment.

### Performance data shall include:

#### Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete (refer to Section 01810 – Equipment Testing and Facility Commissioning).

#### Equipment performance verification test results.

#### Special performance data as specified in the Contract Documents. *[Consultant to ensure such details are in the Contract Documents]*

#### Testing, adjusting and balancing reports.

### Additional data:

#### Prepare and insert any additional data into the operation and maintenance manual when need for such inclusion becomes apparent during demonstrations and instructions specified above.

#### Operation and Maintenance Manual and Maintenance Summary: Provide an Operation and Maintenance Manual and Maintenance Summary in conformance with the requirements of the Region’s Standards for Operating Manuals. Refer to Design Guideline Section 30 – Operation Manual Guideline and its appendices.

## Equipment Tagging

### All equipment to be tagged in accordance with Section 01080 – Process Equipment Location Tagging and the requirements of the individual specification sections.

## Equipment Installation

### Permit equipment maintenance and disassembly by use of unions, mechanical couplings or flanges to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.

### Provide accessible means for lubricating equipment including permanent lubricated "lifetime" bearings.

### Pipe drain lines to drains.

### Line-up equipment, conduits, piping, rectangular cleanouts and floor drains, and similar items with building walls wherever possible.

### Unions or other plain end pipe connectors are indicated in the Contract Documents where necessary. Additional unions may be used to facilitate installation.

### For equipment and piping system requiring disinfection , provide equipment and/or systems that permit the proper disinfection in accordance with the MOECC’s Watermain Disinfection Procedure and Section 01750 – Disinfection and Testing of Water Retaining Structures and Process Piping. [Consultant to ensure all valves and other equipment allows for proper disinfection of pipework in accordance with MOCC procedures].

## Pipe and Supports

### Fabricate hangers, supports and braces in accordance with ANSI B31.1-2012.

### Set inserts in position in advance of concrete work.

### Support pipes from structural members. Where structural bearings do not exist or inserts are not in suitable locations, suspend hangers from steel channels or angles. Provide supplementary structural members. Submit anchorage system for review.

### Use adjustable clevis type hanger or U bolts on all sizes of pipes unless otherwise specified in the Contract Documents. Use U bolts with lock nut type anchor system to secure pipes. Adjust U bolts to allow for movement of pipe on axis due to expansion/contraction with minimal lateral movement.

### Place support within 450 mm of each horizontal elbow. Mild steel wall hooks may be used to support non-expanding piping. Provide riser clamps as indicated in the Contract Documents.

### On un-insulated copper piping, use copper hangers.

### Adjust hanger rods to equalize load.

## Sleeves

### Provide pipe sleeves at points where pipes pass through building walls.

### Provide sleeves of CPVC construction.

### Sizes:

#### Provide 6 mm of clearance all around and between sleeve and pipes unless otherwise indicated in the Contract Documents.

#### Where piping passes below footings, provide minimum clearance of50 mm between sleeve and pipe.

#### Backfill up to underside of footing with concrete of same strength as footing.

### Terminate sleeves flush with surface of walls.

### Fill voids around pipes. Remove plastic sleeves.

#### Ensure that there is no contact between copper tube or pipe and ferrous sleeve.

#### Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint.

#### Use mechanical compression seals where indicated on the Contract Drawings.

### Temporarily plug all openings during construction.

## Escutcheons and Plates

### Provide on pipes passing through finished walls, partitions, floors and ceilings.

### Use split type with set screws for ceiling or wall mounting.

### Inside diameter shall fit around finished pipe. Outside diameter shall cover opening or sleeve.

### Where sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.

### Secure to pipe or finished surface but not to insulation.

## Fire Stopping Preparation

### Provide fire stopping material and installation within annular space between pipes and adjacent to one-hour fire rated walls.

### Uninsulated heated pipes that are subject to movement must be wrapped with non-combustible smooth material in order to permit the pipe to move without damaging fire stopping material.

### Insulated pipes: Ensure the integrity of the insulation and vapour barrier at fire separation.

## Dielectric Couplings

### Provide dielectric couplings wherever pipes of dissimilar metals are joined.

### Provide felt or rubber gaskets to prevent contact between dissimilar metals.

## Cutting and Remedial Work

### Set sleeves and mark openings in building walls, floors and ceilings. Assume full responsibility for laying out the mechanical work and for any damage caused by incorrectly located equipment and mechanical services. Verify that sleeve locations and sizes shown on the Contract Drawings are suitable for the equipment supplied.

### Coordinate cutting and remedial work with building structural framing.

## Trial Usage

### Obtain written permission from the manufacturer to start and test permanent equipment and systems prior to acceptance by the Consultant.

### The Consultant may use equipment and systems for test purposes prior to acceptance. Supply labour, material and instruments required for testing. All equipment will be tested by the Contractor.

### Protect equipment and systems openings from dirt, duct and other foreign materials during test usage.

## Testing and Commissioning

### Refer to Section 01810 – Equipment Testing and Facility Commissioning and all individual Specification Sections for additional requirements.

### Fully coordinate all testing and commissioning activities in accordance with Section 01810 – Equipment Testing and Facility Commissioning. Ensure that the Consultant and the Region’s representatives are notified in advance as required, so that they are in attendance for all testing and commissioning activities.

## Demonstration and Training

### Refer to Section 01820 – Demonstration and Training and all individual Specification Sections for additional requirements.

### In addition, provide specialized instructions by respective manufacturers as may be required to fully illustrate any particular system or component.

### Instruct designated Region’s personnel to ensure full comprehension for a minimum of one Working Day for the mechanical systems. *[Consultant to coordinate this with Section 01820 – Demonstration and Training.]*

## Shop Drawings and Product Data

### Submit shop drawings and Product data in accordance with Section 01300 – Submittals.

### Shop drawings and Product data shall show:

#### Mounting arrangements.

#### Operating and maintenance clearances (for example, access door swing spaces).

### Shop drawings and Product data shall be accompanied by:

#### Detailed drawings of bases, supports, and anchor bolts.

#### Acoustical sound power data, where applicable.

#### Points of operation on performance curves.

#### Manufacturer’s certification as to the current model production.

#### Certification of compliance to the applicable codes as described in the individual Specification Sections.

## Permits, Fees and Inspections

### Execute all work in accordance with all applicable rules, by-laws and regulations. Give all necessary notices, obtain all necessary permits, pay all required fees and furnish any certificates necessary as evidence that the Work conforms with the rules and regulations of all authorities having jurisdiction, including but not limited to the authorities identified at 1.3 above, at no additional cost to the Region. Carry out all changes and alterations required by an authorized inspector of any authority having jurisdiction at no additional cost to the Region. Advise the Consultant of any such changes.

## Cleaning

### Clean the interior and exterior of all systems including strainers and filters. Vacuum the interior of ductwork and air handling units before turning the system over to the Region. Refer to Section 01740 – Cleaning for additional requirements.

### Refer to Section 01780 – Contract Closeout for additional requirements.

## As-Built Drawings

### Site Records:

#### The Consultant will provide one set of reproducible mechanical drawings. The Contractor shall provide sets of white prints as required for each phase of the Work. Mark thereon all changes as work progresses and as changes occur including Change Orders (this shall include changes to existing mechanical systems, control systems and low voltage control wiring).

#### On a weekly basis, transfer information to reproducibles, revising reproducibles to show all Work as it is actually installed.

#### Use different coloured waterproof ink for each service.

#### Make all contract records available at the Site, for reference purposes and inspection at all times.

### As built drawings:

#### Prior to the start of Testing, Adjusting and Balancing (TAB) and commissioning, finalize production of as built drawings.

#### Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

#### Submit to the Consultant for approval and make corrections as directed by the Consultant.

#### TAB shall be performed using as built drawings.

#### Submit completed reproducible as built drawings with Operating and Maintenance Manuals.

### Submit copies of as built drawings for inclusion in the final TAB report.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

# PRODUCTS (NOT USED)

# EXECUTION (NOT USED)

**END OF SECTION**