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R.083709.001		2017-12-15

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PROJECT TITLE            CSC - Domestic Hot Water System Retrofit

PROJECT NUMBER        R.083709.001

PROJECT DATE            2017-10-05

CSC

SEALS PAGE

Section 00 01 07

Domestic Hot Water

System Retrofit

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Consultant :



END OF SECTION

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## PART 1 - GENERAL

### 1.1 SCOPE OF WORK

- .1 Work include but is not limited to:
  - .1 Removal of existing domestic water mixing valves.
  - .2 Piping revision to combine floor and upper level water supply system into one.
  - .3 Review proposed mixing valves selection and suitability for the application. Engage services of the mixing valves manufacturer to review existing piping layout and fixtures load to establish best selection for mixing valve.
  - .4 Installation of recommended by the manufacturer valves.
  - .5 Modification of existing piping to accommodate new HI-LO mixing valves.
  - .6 Relocation of domestic hot water recirculation pump.
  - .7 Restoration of thermal insulation jacketing and identification of piping system
  - .8 Commissioning and testing of the new valves and new piping connections.
  - .9 Preparation of AS BUILDS and O&M Manuals

### 1.2 MINIMUM STANDARDS

- .1 Material shall be new and work shall conform to the standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2015 (NBCC), National Fire Code of Canada 2015(NFC) all applicable Provincial and Municipal Codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

### 1.3 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).
-

#### 1.4 FEES, PERMITS AND CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

#### 1.5 COST BREAKDOWN

- .1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Divisions indicating task, labour and material cost.

#### 1.6 EXAMINATION

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Be aware of high complexity of the building structure and layout, mechanical and electrical system layout and congestion as well as building function and operation. Allow for 2 x 6hr session for all contractor's personnel employed on this project to get familiar with building layout and services affected by this contract location.

#### 1.7 FIRE SAFETY REQUIREMENTS

- .1 Comply with the National Building Code of Canada 2015 (NBCC) for fire safety in construction and the National Fire Code of Canada 2015 (NFC) for fire prevention, firefighting and life safety in building in use.
    - .1 Retain all fire safety documents and standards on site.
  - .2 Welding and cutting:
    - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative and as addressed in NBCC 2015 and NFC 2015. Store flammable liquids in approved CSA containers. No open flame shall be used unless authorized by the Departmental Representative.
    - .2 At least 1 week prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
      - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
-

.3 A fire watcher shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 15m may be ignited by conduction or radiation.

- .3 Where work requires interruption of fire alarms or fire suppression, extinguishing or protection systems:
- .1 Provide watchman service; In general, watchman service is defined as an individual conversant with Fire Emergency Procedures, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
  - .2 Retain services of manufacturer for fire protection systems on daily basis, to and protect all devices relating to:
    - .1 Modification of fire alarms, fire suppression, extinguishing or protection systems; and/or, cutting welding, soldering or other construction activities which might activate fire protection systems.

#### 1.8 TEMPORARY UTILITIES

- .1 Existing services required for the work may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
  - .2 Temporary services required for work may be available without charge where there is capacity to do so, and at the discretion of the Departmental Representative. Mechanical and Electrical connections in accordance with applicable codes. Connections and disconnection's to/from services shall be at the contractors expense and responsibility.
  - .3 Notify the Departmental Representative and utility companies of intended interruption of services, obtain requisite permission.
  - .4 Give the Departmental Representative 1 week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.
-

#### 1.9 SCAFFOLDS WORK PLATFORMS

- .1 Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.
- .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
- .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.

#### 1.10 SIGNS

- .1 Provide common-use signs related to traffic
- .2 No advertising will be permitted on this project.

#### 1.11 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas including stairs, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2 The building must remain operational during construction. The contractor shall agree to install proper site separation and identification in order to maintain "Time and Space" at all time throughout the life of the project and when CSC Building Operations staff requires access to equipment to operate the building, proper coordination must exist.

#### 1.12 CONTRACTOR USE OF PREMISES

- .1 Contractor shall limit use of premises for Work storage and access.
  - .2 Coordinate use of premises under direction of Departmental Representative.
  - .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
-

#### 1.13 DUST CONTROL

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
- .2 Where shafts are accessible to occupants during regular hours (e.g. occupied offices), plywood cover is to be affixed to wall to prevent access to shaft.
- .3 Maintain and relocate protection until such work is complete.
- .4 Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

#### 1.14 PROTECTION

- .1 Protect finished work against damage until take-over.
- .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .3 Protect operatives and other users of site from all hazards.

#### 1.15 REMOVED MATERIALS

- .1 Unless otherwise specified materials for removal become the Contractor's property and shall be taken from site.
- .2 Remove and dispose equipment selected by Departmental representative.

#### 1.16 BUILDING SMOKING ENVIRONMENT

- .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.
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1.17 PRECEDENCE

- .1 Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

## PART 1 - GENERAL

### 1.1 ADMINISTRATIVE

- .1 Attend project meetings throughout the progress as scheduled and administered by Departmental Representative.
- .2 The Departmental Representative will provide physical space and make arrangements for meetings.
- .3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .5 Departmental Representative will chair meeting and prepare and distribute minutes.

### 1.2 PRECONSTRUCTION MEETING

- .1 Within 10 days after award of Contract, request meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
  - .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
  - .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
  - .4 Agenda to include:
    - .1 Appointment of official representative of participants in the Work.
    - .2 Schedule of Work: in accordance with Section 01 32 16.
    - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
    - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 35 13.
    - .5 Delivery schedule of specified equipment in accordance with Section 01 35 13.
    - .6 Site security in accordance with Sections 01 35 13.
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- .7 Health and safety in accordance with Section 01 35 29.06.
- .8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .9 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.
- .10 Maintenance manuals in accordance with Section 01 78 00.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

### 1.3 PROGRESS MEETINGS

- .1 Attend progress meetings throughout the progress of the Work at the call of Departmental Representative. Allow time to attend weekly meetings.
  - .2 Contractor, major subcontractors, Departmental Representative are to be in attendance.
  - .3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
  - .4 Agenda to include the following:
    - .1 Review, approval of minutes of previous meeting.
    - .2 Review of Work progress since previous meeting.
    - .3 Field observations, problems, conflicts.
    - .4 Problems which impede construction schedule.
    - .5 Review of off-site fabrication delivery schedules.
    - .6 Corrective measures and procedures to regain projected schedule.
    - .7 Revision to construction schedule.
    - .8 Progress schedule, during succeeding work period.
    - .9 Review submittal schedules: expedite as required.
    - .10 Maintenance of quality standards.
    - .11 Review proposed changes for affect on construction schedule and on completion date.
    - .12 Other business.
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PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

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## PART 1 - GENERAL

### 1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

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## 1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

## 1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

## 1.4 PROJECT MILESTONES

- .1 Project milestones form interim project specific targets for Project Schedule.

## 1.5 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
  - .2 Departmental Representative will review and return revised schedules within 5 working days.
  - .3 Revise impractical schedule and resubmit within 5 working days.
  - .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.
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## 1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Plumbing.
  - .6 Electrical.
  - .7 Controls.
  - .8 Testing and Commissioning.

## 1.7 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

## 1.8 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

## PART 2 - PRODUCTS

### 2.1 NOT USED

- .1 Not used.

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.



PART 1      GENERAL

1.1            ADMINISTRATIVE

- .1      Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2      Do not proceed with Work affected by submittal until review is complete.
- .3      Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4      Where items or information is not produced in SI Metric units converted values are acceptable.
- .5      Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6      Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7      Verify field measurements and affected adjacent Work area co-ordinated.
- .8      Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9      Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10     Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work.
- .3 Allow 7 days for Departmental Representative's review of each submission.
- .4 Adjustments made on shop drawings by Departmental Representative is not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .7 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Setting or erection details.

- .2 Capacities.
- .3 Performance characteristics.
- .4 Standards.
- .8 After Departmental Representative's review, distribute copies.
- .9 Supplement standard information to provide details applicable to project.
- .10 If upon review by Departmental Representative and/or Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .11 The review of shop drawings by Department Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that Department Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### 1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

## PART 1 - GENERAL

### 1.1 PURPOSE

- .1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

### 1.2 DEFINITIONS

- .1 "Contraband" means:
    - .1 An intoxicant, including alcoholic beverages, drugs and narcotics.
    - .2 Tobacco or associated tobacco products.
    - .3 An igniting device, lighter or matches.
    - .4 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization.
    - .5 An explosive or a bomb or a component thereof.
    - .6 Currency over any applicable prescribed limit, \$25.00 when possessed by an inmate without prior authorization.
    - .7 Any item not described in paragraphs 1.2.1.1 to 1.2.1.6 that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
  - .2 "Unauthorized Smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.
  - .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
  - .4 "CSC" means Correctional Service Canada.
  - .5 "Director" means Director, Warden or Superintendent of the Institution as applicable.
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- .6 "Construction Employees" means persons working for the General Contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the project manager from Public Works and Government Services Canada.
- .8 "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.
- .9 "Construction Limits" means the area as shown on the contract drawings that the Contractor will be allowed to work. This area may or may not be isolated from the security area of the Institution.
  - .1 Building PP43 and surrounded area within 150m radius.

### 1.3 PRELIMINARY PROCEEDINGS

- .1 Prior to the commencement of work, the Contractor shall meet with the Departmental Representative and Director or his/her representative to:
  - .1 Discuss the nature and extent of all activities involved in the Project.
  - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 Contractor shall:
  - .1 Ensure that all Construction Employees are aware of the security requirements.
  - .2 Ensure that a copy of the security requirements is always prominently on display at the job site.
  - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all Construction Employees.

### 1.4 CONSTRUCTION EMPLOYEES

- .1 Submit to the Departmental Representative and Director a list of the names with date of birth of all Construction Employees to be employed on the construction site and a CPICS security clearance form for each employee.
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- .2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC Institutions are not valid at this Institution.
- .3 The Departmental Representative or Director may require that facial photographs may be taken of Construction Employees and these photographs may be displayed at appropriate locations in the Institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all Construction Employees. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the Construction Employees clothing at all time while Construction Employees are in the institution.
- .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
  - .1 Appear to be under the influence of alcohol, drugs or narcotics.
  - .2 Behave in an unusual or disorderly manner.
  - .3 Are in possession of contraband.
- .6 Smoking is prohibited anywhere on CSC property.

#### 1.5 VEHICLES

- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.
  - .2 The Departmental Representative or Director may limit at any time the number and type of vehicles allowed within the Institution.
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- .3 Drivers of delivery vehicles for material required by the project will not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The Departmental Representative or Director may require that these vehicles be escorted by Institutional Staff or Commissioners while in the Institution.
- .4 If the Departmental Representative or Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter shall be locked when not in use.

#### 1.6 PARKING

- .1 Parking areas) to be used by Construction Employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

#### 1.7 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor must have his/her own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material, equipment or tools.

#### 1.8 TELEPHONES

- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the Institution unless prior approval of the Director is received.
  - .2 The Departmental Representative or Director will ensure that approved telephones, facsimile machine and computers with internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an internet connection to unauthorized personnel.
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- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, are not permitted within the Institution unless approved by the Departmental Representative or Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.
- .4 The Departmental Representative or Director may approve but limit the use of two way radios.

#### 1.9 WORK HOURS

- .1 Work hours within the Institution are: Monday to Friday 07:30 hrs. to 16:00 hrs.
- .2 Work will not be permitted during weekends and statutory holidays without the permission of the Departmental Representative or Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

#### 1.10 OVERTIME WORK

- .1 No overtime work will be allowed without permission of the Departmental Representative or Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such as the completion of a concrete pour or work to make the construction safe and secure, the Contractor shall advise the Departmental Representative and Director as soon as this condition is known and follow the directions given by the Director. Costs to the Crown for such events may be attributed to the Contractor.
  - .2 When overtime work, weekend, or statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his/her designate, to maintain the security surveillance. The Departmental Representative may post extra staff for inspection of construction activities. The actual cost of this extra staff may be subject to reclamation by the Crown.
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#### 1.11 TOOLS AND EQUIPMENT

- .1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.
  - .2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above.
  - .3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
  - .4 Store all tools and equipment in approved secure locations.
  - .5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor. Scaffolding shall be secured and locked when not erected and when erected, will be secured in a manner agreed upon with the Institutional designate.
  - .6 All missing or lost tools or equipment shall be reported immediately to the Departmental Representative and Director.
  - .7 The Departmental Representative or Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
    - .1 At the beginning and conclusion of every construction project.
    - .2 Weekly, when the construction project extends longer than a one week period.
    - .3 The Contractor may be subject to random checks by security staff to ensure proper storage and security of tools throughout the project.
  - .8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The Contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.
  - .9 If propane or natural gas is used for heating the construction, the Institution will require that an employee of the Contractor supervise the construction site during non-working hours.
-

- .10 If torches or grinders are required tools to perform Work, Contractor must complete a Hot Work Permit as supplied by CSC. Completed original forms) are copied and posted on the work site in a conspicuous location. Original documents are to remain with the Institutional Fire Chief.

#### 1.12KEYS

- .1 Security Hardware Keys:
- .1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
  - .2 The Security Maintenance Officer (SMO) will provide a receipt to the Contractor for security hardware keys.
  - .3 The Contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.
- .2 Other Keys:
- .1 The Contractor will use standard construction cylinders for locks for his/her use during the construction period.
  - .2 The Contractor will issue instructions to his/her employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
  - .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
    - .1 Prepare an operational keying schedule.
    - .2 Accept the operational keys and cylinders directly from the lock manufacturer
    - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
- .3 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the Security Maintenance Officer (SMO) and open doors as required by the Contractor. The Contractor shall issue instructions to his/her employees advising them that all security keys shall always remain with the CSC construction escort.

#### 1.13SECURITY HARDWARE

- .1 Turn over all removed security hardware to the Departmental Representative or Director of the Institution for disposal or for safekeeping until required for re-installation.
-

#### 1.14PRESCRIPTION DRUGS

- .1 Employees of the Contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

#### 1.15SMOKING RESTRICTIONS

- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
- .3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

#### 1.16CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on Institutional Property.
  - .2 Discovery of Contraband on the construction site and the identification of the persons) responsible for the Contraband shall be reported immediately to the Departmental Representative and Director.
  - .3 Contractors shall be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of Contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
  - .4 Presence of arms and ammunition in vehicles of Contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.
-

#### 1.17SEARCHES

- .1 All vehicles and persons entering Institutional property may be subject to search.
- .2 When the Departmental Representative or Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of Contraband or unauthorized items, he/she may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of Contraband drug residue.

#### 1.18ACCESS TO AND REMOVAL FROM INSTITUTION PROPERTY

- .1 Construction personnel and commercial vehicles will not be admitted to the Institution after normal working hours, unless approved by the Departmental Representative and Director.

#### 1.19MOVEMENT OF VEHICLES

- .1 Escorted commercial vehicles will be allowed to enter or leave the Institution through the vehicle access gate during the hours specified in para 1.9.
  - .2 Construction vehicles shall not leave the Institution until an inmate count is completed.
  - .3 The Contractor shall advise the Departmental Representative and Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
  - .4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC Staff or Commissioners working under the authority of the Director.
  - .5 Commercial Vehicles will only be allowed access to Institutional Property when their contents are certified by the Contractor or his/her representative as being strictly necessary to the execution of the construction project.
-

- .6 Vehicles shall be refused access to Institutional Property if, in the opinion of the Director, they contain any article which may jeopardize the security of the Institution.
- .7 Private vehicles of Construction Employees will not be allowed within the security wall or fence of medium or maximum security Institutions without the permission of the Director.
- .8 With prior approval of the Departmental Representative and Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.
- .9 With the approval of the Departmental Representative and Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

#### 1.20MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

- .1 Subject to the requirements of good security, the Departmental Representative or Director will permit the Contractor and his/her employees as much freedom of action and movement as is possible.
  - .2 However, notwithstanding paragraph above, the Departmental Representative or Director may:
    - .1 Prohibit or restrict access to any part of the Institution.
    - .2 Require that in certain areas of the Institution, either during the entire construction project or at certain intervals, Construction Employees only be allowed access when accompanied by a member of the CSC security staff.
  - .3 During the lunch and coffee/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.
-

#### 1.21SURVEILLANCE AND INSPECTION

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among Construction Employees and maintained throughout the construction project.

#### 1.22STOPPAGE OF WORK

- .1 The Departmental Representative or Director may request at any time that the Contractor, his/her employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The Contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.
- .2 The Contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

#### 1.23CONTACT WITH INMATES

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his/her security clearance revoked.
- .2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this Contract.

#### 1.24COMPLETION OF CONSTRUCTION PROJECT

- .1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.
-

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

PART 1      GENERAL

1.1          REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Ontario:
  - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2016.
- .3 National Building Code of Canada (NBC):
  - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .4 Fire Protection Engineering Services, HRSDC:
  - .1 FCC No. 301, Standard for Construction Operations

2.1          RELATED SECTIONS

- .1 Refer to the attached NMS sections as required:
  - .1 Section 01 33 00 - Submittal Procedures
  - .2 Section 02 81 01 - Hazardous Materials
  - .3 Section 02 85 00.03 - Mould Remediation Maximum Precautions
  - .4 Section 02 87 00 - Guano Remediation

3.1          ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 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.
- .3 Submit one (1) copy of Contractor's authorized representative's work site health and safety inspection reports daily to Departmental Representative and/or Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.



- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS's - Material Safety Data Sheets and all other documentation required by Workplace Hazardous Materials Information System (WHMIS). Alternatively, submit Safety Data Sheets (SDS's) as required by Globally Harmonized System (GHS) as administered by Health Canada.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven (7) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within seven (7) days after receipt of comments from Departmental Representative.
- .8 Departmental Representative 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.
- .9 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 and/or Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

#### 4.1 FILING OF NOTICE

- .11 File Notice of Project with Provincial authorities prior to beginning of Work.
- .12 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written or oral acknowledgement to an inspector of the Ministry of Labour nearest to the workplace of operation.
- .13 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

5.1 SAFETY ASSESSMENT

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

6.1 MEETINGS

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

7.1 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section and all applicable provincial and federal regulation.

8.1 PROJECT/SITE CONDITIONS

- .2 Work at site will involve contact with:
  - .1 Biohazard Materials
- .3 Work at site may involve working at heights elevated above seven (7) feet and accessible only by ladder or lift.

9.1 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.

10.1 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 Contractor will be responsible and assume the role as Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor for the Construction for only their scope and areas of work as defined and described in this project specification.
- .4 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.

#### 11.1 COMPLIANCE REQUIREMENTS

- .5 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.
- .6 Comply with Occupational Health and Safety Regulations, 1996.
- .7 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### 12.1 UNFORSEEN HAZARDS

- .8 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.
- .9 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety Coordinator and/or Safety Officer and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

#### 13.1 HEALTH AND SAFETY COORDINATOR

- .10 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Coordinator must:
  - .1 Have site-related working experience specific to activities associated with lead, asbestos, confined space, hot pipes, and working at heights.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

14.1 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.

15.1 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.

16.1 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.

END OF SECTION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Equipment and system adjust and balance.

### 1.2 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

### 1.3 ACCESS TO WORK

- .1 When required by Departmental Representative, allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
  - .2 Co-operate to provide reasonable facilities for such access.
-

#### 1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

#### 1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

#### 1.6 REPORTS

- .1 Submit 2 copies of inspection and test reports to Departmental Representative.

#### 1.7 EQUIPMENT AND SYSTEMS

- .1 Submit testing, commissioning, adjusting and balancing reports for:
    - .1 Tempered water mixing system.
-

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 NOT USED

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## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 Within text of specifications, reference may be made to reference standards.
- .2 Conform to these standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.
- .5 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

### 1.2 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.



- .4 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

### 1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

### 1.4 METRIC SIZED MATERIALS

- .1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.
- .2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.
- .3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.
- .4 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

### 1.5 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
  - .2 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.
-

#### 1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.

#### 1.7 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.

#### 1.8 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

#### 1.9 CO-ORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
  - .2 Be responsible for coordination and placement of openings, sleeves and accessories.
-

#### 1.10 CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

#### 1.11 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

#### 1.12 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

#### 1.13 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
  - .2 Prevent electrolytic action between dissimilar metals and materials.
  - .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
  - .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
-

- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause splitting or cracking of material to which anchorage is made are not acceptable.

#### 1.14FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

#### 1.15PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

#### 1.16EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by Departmental Representative.
  - .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.
-

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

## PART 1 - GENERAL

### 1.1 ACTION AND INFORMATIONAL

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Existing mixing valves and valves housing.
  - .1 Existing domestic water piping and piping enclosures, furring or housing.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Temporary protective measures.
  - .7 Method of reinstatement
  - .8 Date and time work will be executed including date of final completion.

### 1.2 MATERIALS

- .1 Required for original installation.

### 1.3 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
  - .2 After uncovering, inspect conditions affecting performance of Work.
  - .3 Beginning of cutting or patching means acceptance of existing conditions.
  - .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
  - .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.
-

#### 1.4 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .3 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .4 Employ qualified installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .5 Restore work with new products in accordance with requirements of Contract Documents.
- .6 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.
- .7 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

#### PART 2 - PRODUCTS

##### 2.1 NOT USED

- .1 Not Used.

#### PART 3 - EXECUTION

##### 3.1 NOT USED

- .1 Not Used.

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PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
  - .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
  - .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
  - .4 Provide on-site locked secure containers for collection of waste materials and debris.
  - .5 Remove waste material and debris from site at end of each working day.
  - .6 Dispose of waste materials and debris off site.
  - .7 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
  - .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
  - .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
  - .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
  - .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
-



## 1.2 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .10 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

## PART 2 – PRODUCTS

### 2.1 NOT USED

- .1 Not Used.
-

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

## PART 1 - GENERAL

### 1.1 Regulations

- .1 Comply with the Environmental Protection Act, Ontario Regulations O. Reg. 102/04 and O. Reg. 103/94 for waste management programs on construction and demolition projects.

### 1.2 Definitions

- .1 Waste Audit (WA): Relates to projected waste generation. Involves measuring and estimating quantity and composition of waste, reasons for waste generation, and operational factors which contribute to waste.
- .2 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

### 1.3 Waste Audit (WA)

- .1 Conduct a "waste audit" to determine the waste generated during demolition or construction operations, prepare written "waste reduction workplan" and implement procedures to reduce, reuse and recycle materials to the extent possible.

### 1.4 Waste Reduction Workplans (WRW)

- .1 Within ten days of Award of Contract, submit for review by the Departmental Representative a detailed "Waste Reduction Workplan" for the project. Include procedures for disposal of demolition and construction waste materials.

### 1.5 Source Separation Program

- .1 Provide a "source separation program" to disassemble and collect in an orderly fashion the materials identified in the "waste audit" that were designated for "alternative disposal" from "general waste" stream.
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#### 1.6 Construction Personnel Briefing

- .1 All construction personnel shall be fully briefed on the waste management workplan and shall be required to conform to it for all aspects of the work. The contractor shall be responsible for the enforcement of this requirement. The Departmental Representative reserves the right to require the dismissal from the site personnel who fail to comply with the requirements of the waste management workplan.

#### 1.7 Storage Handling and Protection

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Ensure emptied containers are sealed and stored safely.

#### 1.8 Records

- .1 Submit complete records of all removals from the site to the Departmental Representative for both "materials designated for alternative disposal" and "general waste" including:
  - .1 Time and date of removal
  - .2 Description of material and quantities by weight in kilograms.
  - .3 Proof that materials have been received at an Approved Waste Processing Site or certified Waste Disposal Site as required.

#### 1.9 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling.

### PART 2 – PRODUCTS

#### 2.1 NOT USED

- .1 Not Used.
-

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Domestic Hot Water	WASTE MANAGEMENT AND	Page 3
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### PART 3 - EXECUTION

#### 3.1 Application

- .1 Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

## PART 1 - GENERAL

### 1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final "hard" copies and one digital copy of maintenance manuals and commissioning documentation in official language of the contract.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

### 1.2 FORMAT

- .1 Organize data in the form of an instructional manual.
  - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
  - .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
  - .4 Cover: Identify each binder with type or printed title 'Project Record Documents; list title of project and identify subject matter of contents.
-

- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide scaled AutoCAD files in dwg (drawings and pdf (drawings and O&M Manuals) format. Forward digital documents on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

### 1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
    - .1 Date of submission; names,
    - .2 Addresses, and telephone numbers of Contractor with name of responsible parties;
    - .3 Schedule of products and systems, indexed to content of volume.
  - .2 For each product or system:
    - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
  - .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
  - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
  - .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
-

#### 1.4 AS-BUILDS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Amendments and addenda.
  - .4 Change Orders and other modifications to the Contract.
  - .5 Site and Supplemental Instructions.
  - .6 Reviewed shop drawings, product data, and samples.
  - .7 Field test records.
  - .8 Inspection certificates.
  - .9 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

#### 1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, provided by Departmental Representative.
-



- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.

#### 1.6 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
  - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
  - .3 Include installed colour coded wiring diagrams.
-

- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

#### 1.7 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
-

- .5 Obtain receipt for delivered products and submit prior to final payment.

#### 1.8 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

#### 1.9 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

#### 1.10 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
  - .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
  - .3 Store components subject to damage from weather in weatherproof enclosures.
-

- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

#### 1.11 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 Except for items put into use with Departmental Representative permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.
- .3 Assemble warranty information in binder and submit upon acceptance of work. Organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .4 Respond in a timely manner to written notification of required construction warranty repair work.

#### PART 2 - PRODUCTS

##### 2.1 NOT USED

- .1 Not Used.
-

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

## PART 1 - GENERAL

### 1.1 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of interim completion.

### 1.2 QUALITY CONTROL

- .1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Departmental Representative, and provide written report that demonstration and instructions have been completed.
- .2 Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Report shall give time and date of each demonstration and training, with list of persons present.

### 1.3 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation.
- .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

### 1.4 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
  - .2 Verify that designated O&M personnel are present.
-

#### 1.5 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting,, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

#### 1.6 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Ensure reasonably expected sufficient amount of time required for instruction of each item of equipment or system.

### PART 2 - PRODUCTS

#### 2.1 NOT USED

- .1 Not Used.

### PART 3 - EXECUTION

#### 3.1 NOT USED

- .1 Not Used.

## PART 1 - GENERAL

### 1.1 General

- .1 CX is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. CX is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
    - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
    - .2 Ensure appropriate documentation is compiled into the O&M manuals.
    - .3 Effectively train O&M staff.
  - .2 Contractor shall arrange and pay for the services of the Equipment manufacturer's representative to assist the contractor in CX process, operating equipment and systems, troubleshooting and making adjustments as required.
    - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
    - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
  - .3 Commissioning process shall include, but is not be limited to:
    - .1 HI-LO mixing valves for domestic water system.
  - .4 Design Criteria: as per Departmental Representative requirements to meet Project functional and operational requirements.
  - .5 Acronyms:
    - .1 CX - Commissioning.
    - .2 O&M - Operation and Maintenance.
    - .3 PI - Product Information.
    - .4 PV - Performance Verification.
    - .5 TAB - Testing, Adjusting and Balancing.
-



## 1.2 Commissioning Overview

- .1 CX to be performed by independent company, employed and paid by the Contractor.
  - .1 Equipment Manufacturer's representative must be included in commissioning process. Arrange for Mixing valves Manufacturer's representative presence, pay all costs.
- .2 CX to be a line item of Contractor's cost breakdown.
- .3 CX activities supplement field quality and testing procedures described in relevant technical sections.
- .4 CX is conducted in concert with activities performed during stage of project delivery. CX identifies issues in Planning and Design stages which are addressed during Construction and CX stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. CX activities includes transfer of critical knowledge to facility operational personnel.
- .5 Departmental Representative will issue Interim Certificate of Acceptance when:
  - .1 Completed CX documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

## 1.3 Non-conformance to Performance Verification Requirements

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during CX, correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Departmental Representative, to ensure effective performance. Costs for
  - .2 Cost for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.
-

#### 1.4 Pre CX-Review

- .1 Before Construction:
  - .1 Review contract documents, confirm in writing to Departmental Representative the following.
    - .1 Adequacy of provisions for CX.
    - .2 Aspects of design and installation pertinent to success of CX.

#### 1.5 Conflicts

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

#### 1.6 Submittals

- .1 Submittals: in accordance with Section 01 33 00- Submittal Procedures.
  - .2 Submit no later than 1 week after award of Contract:
    - .1 Name of Contractor's CX agent.
  - .3 CX to develop project specific and submit for review draft CX documentation.
    - .1 CX test procedure description.
    - .2 CX test check form
    - .3 Final CX report
  - .4 Preliminary CX schedule.
    - .1 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 4 weeks prior to start of CX.
    - .2 Submit proposed CX procedures to Departmental Representative there not specified and obtain written approval at least 8 weeks prior to start of CX.
    - .3 Provide additional documentation relating to CX process required by Departmental Representative.
-

#### 1.7 Commissioning Documentation

- .1 Departmental Representative to review and approve CX documentation.
- .2 Provide completed and approved CX documentation to Departmental Representative.

#### 1.8 Commissioning Schedule

- .1 Provide detailed CX schedule as part of construction schedule in accordance with 01 32 16.07 - Construction Progress Schedules Bar (GANTT) Chart.
- .2 Provide adequate time for CX activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of CX reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

#### 1.9 Commissioning Meetings

- .1 Purpose of the meetings: to resolve issues, monitor progress, identify deficiencies related to CX. Allow for 2 CX meetings at discretion of Departmental Representative.
  - .1 CX to chair the meeting and provide minutes of the meeting summary

#### 1.10 Starting and Testing

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

#### 1.11 Witnessing of Starting and Testing

- .1 Provide 4 days notice prior to commencement.
  - .2 Departmental Representative to witness of start-up and testing.
-

- .3 Contractor's CX Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### 1.12Manufacturer's Involvement

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative .
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .2 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .3 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### 1.13Procedures

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and CX.
  - .2 Conduct start-up and testing in following distinct phases:
    - .1 Included in delivery and installation:
      - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .3 Visual inspection of quality of installation.
    - .1 Start-up: follow accepted start-up procedures.
    - .2 Operational testing: document equipment performance.
    - .3 System PV: include repetition of tests after correcting deficiencies.
-

- .4 Post-substantial performance verification: to include fine-tuning.
- .4 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .5 Document requires tests on approved PV forms.
- .6 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.
- .7 Subject new equipment/systems to specified start-up procedures.

#### 1.14Start up Documentation

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
  - .2 Start-up documentation to include:
    - .1 Factory and on-site test certificates for specified equipment.
    - .2 Pre-start-up inspection reports.
    - .3 Signed installation/start-up check lists.
    - .4 Start-up reports,
    - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.
-

#### 1.15 Operation and Maintenance of Equipment and Systems

- .1 After start-up, operate and maintain equipment and system. maintenance program and submit Departmental Representative for approval before implementation.
- .2 With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

#### 1.16 Test Results

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

#### 1.17 Start of Commissioning

- .1 Notify Departmental Representative at least 4 days prior to start of CX.
- .2 Start CX after elements of building affecting start-up and performance verification of systems have been completed.

#### 1.18 Commissioning Performance Verification

- .1 Carry out CX:
    - .1 Under actual accepted simulated operating conditions, over entire operating range, in all modes.
    - .2 On independent systems and interacting systems.
  - .2 CX procedures to be repeatable and reported results are to be verifiable.
  - .3 Follow equipment manufacturer's operating instructions.
-

#### 1.19 Witnessing Commissioning

- .1 Departmental Representative may witness activities and verify results.

#### 1.20 Authorities Having Jurisdiction

- .1 Where specified start-up, testing or verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 weekdays of test and with CX report.

#### 1.21 Extrapolation of Results

- .1 Where CX of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

#### 1.22 Extent of Verification

- .1 Provide manpower and instrumentation to verify up to 100 % of reported results.
  - .2 Number and location to be at discretion of Departmental Representative.
  - .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
  - .4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
-

- .5 Perform additional commissioning until results are acceptable to Departmental Representative.

#### 1.23 Sundry Checks and Adjustments

- .1 Make adjustments and changes which becomes apparent as CX proceeds.

#### 1.24 Deficiencies Faults, Defects

- .1 Correct deficiencies found during start-up Representative.
- .2 Report problems, faults or defects affecting CX to Departmental Representative in writing. Stop CX until problems are rectified. Proceed with written approval from Departmental Representative.

#### 1.25 Completion of Commissioning

- .1 Upon completion of CX leave systems in normal
- .2 Except for warranty and seasonal verification activities specified in CX specifications, complete CX prior to issuance of Interim Certificate of Completion.
- .3 CX to be considered complete when contract CX deliverables have been submitted and accepted by 1 Departmental Representative.

#### 1.26 Activities Upon Completion of Commissioning

- .1 When changes are made to baseline components or system settings established during CX process, provide updated CX form for affected item.

#### 1.27 Maintenance Materials, Spare Parts, Special Tools

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.
-



#### 1.28Performance Verification Tolerances

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

#### 1.29Departmental Representative's Performance Testing

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

### PART 2 - PRODUCTS

#### 2.1 NOT USED

- .1 Not Used.

### PART 3 - EXECUTION

#### 3.1 NOT USED

- .1 Not Used.

## PART 1 - GENERAL

### 1.1 EQUIPMENT REQUIREMENTS AND INSTALLATIONS

- .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.
  - .3 Equipment drains: pipe to floor drains.
  - .4 Install equipment, rectangular cleanouts and similar items parallel to, or perpendicular to, building lines.
  - .5 Provide new materials and equipment of proven design, quality and or current models with published ratings for which replacement parts are readily available.
  - .6 The word "provide" shall mean "supply and install".
  - .7 Uniformity:
    - .1 Use product of one manufacturer unless otherwise specified, for equipment or material of the same type of classification.
    - .2 Installation:
      - .1 Unless otherwise specified, follow manufacturer's recommendations for safety, adequate access for inspection, maintenance and repairs.
      - .2 Permit equipment maintenance and disassembly with minimum disturbance to connecting piping and duct systems without interference with building structure or other equipment.
    - .3 Lubrication:
      - .1 Provide accessible lubricating means for bearings, including permanent lubrication "Lifetime" bearings. Extended grease nipples to be supplied.
  - .8 Site condition:
    - .1 Drawings indicate approximate location of equipment and services. Perform site measurements prior to installation. Do not scale drawings.
-

.2 To avoid interference closely coordinate installation of mechanical services and equipment with other trades. Advise of any possible interference in timely fashion. Do not proceed with system or equipment installation without Departmental Representative's instruction. In case that system has to be relocated within 1000mm radius from anticipated location, no additional charge or credit will be expected and approved.

.3 Prepare and submit for review, set of interference drawings for each area affected by this contract.

.4 Review contract instruction and specification for work restriction and phasing. The work will be conducted in fully occupied and functional building. Any interruptions and shut downs to be kept to minimum.

#### 1.2 ANCHOR BOLTS AND TEMPLETS

- .1 Provide, locate and set all anchor bolts and fastening devices and equipment.

#### 1.3 TRIAL USAGE

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Tempered water mixing system.

#### 1.4 PROTECTION OF OPENINGS

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

#### 1.5 CUTTING PATCHING CORE DRILLING AND SURFACE RESTORATION

- .1 All cutting, patching, core drilling and surface restoration by Division responsible for the work. Each Division shall clearly mark extent of work required for this trade and coordinate the work.
    - .1 Scan section of floor or wall for presence of any conduits wires, pipes and structural obstruction prior to cutting procedure.
-

#### 1.6 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 In accordance with Section 01 79 00.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Where specified elsewhere in appropriate Division, manufacturers to provide demonstrations and instructions.
- .4 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections. If specific requirements are not listed, allow for two separate 2 hours demonstration sessions.

#### 1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 In addition to transmittal letter referred to in Section 01 33 00. Use "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
  - .1 In case such a template is not provided Contractor shall create one and provide sample for review prior to shop drawings submission.
  - .2 Shop drawings without the "Shop Drawing Submittal Title Sheet" without job specific equipment selection and without contractor review stamp will not be reviewed.

#### 1.8 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.

#### 1.9 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
-

#### 1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and 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 off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Deliver material required for same day installation.
  - .3 Replace defective or damaged materials with new.

#### 1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

### PART 2 - PRODUCTS

#### 2.1 NOT USED

- .1 Not used.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable for 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 and after receipt of written approval to proceed from Departmental Representative.

### 3.2 PAINTING REPAIRS AND RESTORATIONS

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.

### 3.4 PROTECTION

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

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## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 ASTM International
  - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 Health Canada/Workplace Hazardous Materials System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 CSA International
  - .1 CSA B64 Series-11(R2016), Backflow Preventers and Vacuum Breakers.
  - .2 CSA B79-08(R2013), Commercial and Residential Drains and Cleanouts.
  - .3 CAN/CSA-B356-10(R2015), Water Pressure Reducing Valves for Domestic Water Supply Systems.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, dimensions construction and assembly details and accessories.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.

### 1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 35 13 and 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.

### 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

## PART 2 - PRODUCTS

### 2.1 PIPING

- .1 Domestic cold,hot and recirculating systems within the building
  - .1 Above ground: copper tube, hard drawn, type L: to ASTM B 88M

### 2.2 FITTINGS

- .1 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .2 Cast copper, solder type: to ANSI/ASME B16.18.
- .3 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

### 2.3 JOINTS

- .1 Rubber gaskets, 1.6 mm thick: to AWWA C111.
  - .2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
-



- .3 Solder: lead free.
- .4 Teflon tape: for threaded joints.
- .5 Dielectric connections between dissimilar metals: dielectric fitting, clinger with thermoplastic

#### 2.4 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 NPS 2 and under, screwed:
  - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable

#### 2.5 BALL VALVES

- .1 NPS 2 and under, soldered:
    - .1 To ANSI/ASME B16.18, Class 150.
    - .2 Bronze body, chrome plated brass or stainless steel ball, PTFE and PTFE seat, steel brass gland lever handle, with NPT to copper adaptors.
  - .2 NPS 2 and under, screwed:
    - .1 To ANSI/ASME B16.18, Class 150.
    - .2 Bronze body, chrome plated brass or stainless steel ball, PTFE and PTFE seat, brass gland steel lever handle
-

## 2.6 TEMPERED WATER MIXING SYSTEM

- .1 High - Low Temperature Control System, shall consisting of a high capacity and a low capacity ASSE 1017 certified Teflon Lined Thermostatic Mixing Valve with an ASSE 1003 certified DialSet Pressure Regulating Valve manifolded to allow low demand to be controlled by the low capacity Mixing Valve. Upon demand for hot water increases, the large capacity Mixing Valve shall be added to the system output by the DialSet Pressure Regulating Valve. The system shall have internal isolation ball valve / check valves to prevent crossflow thermal migration and to allow replacement of major components without shutting the entire system down. It shall have a recirculation port connection to provide a place for an optional recirculation system to be connected. A digital temperature indicator for the mixed output shall be provided. The temperature control system shall have a tamper-proof adjustable output from 110° F to 150° F. It shall have a cold water inlet, a hot water inlet, and a controlled mixed water temperature outlet.
- .2 High - Low Temperature Control System model shall be selected by the Manufacturer after review of the drawings and after conducting flow calculation re-verification. Unit selection data sheet shall be included with unit shop drawings.
- .3 Arrange and pay all cost for Unit Manufacturer representative to be present and witness CX procedure and conform proper Temperature Control System

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories 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.
-

### 3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### 3.3 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada, provincial codes, and local authority having jurisdiction.
- .2 Install pipes in accordance with Section 25 05 05 - Installation of Pipework supplemented as specified herein.
- .3 Install in accordance with manufacturer's instructions and as specified.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Install CWS piping below and away from HWS and HWR and other hot piping. Arrange pipe layout to keep piping of CWS at as low temperature as possible.
- .6 disconnect existing domestic water pipes connection to existing mixing valves. Provide new HI-LO mixing valve and re-connect piping. Pipe arrangement as per manufacturer written instructions. Modify piping layout to suit new equipment location.
  - .1 Be aware about necessary pipe modification to combine low level and mezzanine level piping into one system.
  - .2 Mixing valve manufacturer to review pipe layout, connected fixtures load and provide recommended piping connections layout and sizes.

### 3.4 VALVES

- .1 Allow for new set of valves to isolate all new equipment with ball valves.
  - .2 Balance recirculation system using lockshield globe valves. Mark set drawings on completion.
-

### 3.5 TEMPERED WATER MIXING SYSTEM

- .1 Veriify design and install in accordance with ASSE 1017
- .2 Install Thermometers, Pressure gauges and Regulators in all location required by Mixing system manufacturer and where shown on the drawings.
- .3 Provide explanatory signage. Identify unit with clear distinguishing between HI and LO. Signage to inform maintenance staff of operating requirements, indicate safety and emergency precautions and warn of hazards and improper operations.

### 3.6 PERFORMANCE VERIFICATION

- .1 Verify system performance after pressure and leakage tests and flushing are completed.
- .2 Verify that flow rate and pressure are same as recorded before equipment replacement.
- .3 Verify performance of temperature controls.
- .4 Verify compliance with safety and health requirements.
- .5 Confirm water quality consistent with supply standards, and ensure no result of flushing or cleaning.

### 3.7 TESTING AND ADJUSTING

- .1 Simulate reverse flow and back-pressure conditions to test operation.
  - .1 Verify visibility of discharge from open ports.

### 3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.

## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.

### 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

### 1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

## PART 2 - PRODUCTS

### 2.1 NOT USED

- .1 Not Used.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.
-

### 3.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.
- .4 As indicated on the drawings remove components from existing tempered water mixing system and replace with ones that provide adequate performance and operation of tempered water mixing system.

### 3.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

### 3.4 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.
  - .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
  - .3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
  - .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.
-

### 3.5 AIR VENTS

- .1 Install manual or automatic if indicated air vents at high points in piping systems.
- .2 Install isolating valve at each automatic air valve.
- .3 Install drain piping to approved location and terminate where discharge is visible.

### 3.6 DIELECTRIC COUPLINGS

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

### 3.7 PIPEWORK INSTALLATION

- .1 Lead free soldered joints or screwed fittings jointed with Teflon tape.
  - .2 Protect openings against entry of foreign material.
  - .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
  - .4 Assemble piping using fittings manufactured to ANSI standards.
  - .5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
    - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
  - .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
  - .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
-

- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible and as indicated.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated or as per good practise and industry standards.
- .14 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless otherwise indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ball valves at branch take-offs for isolating purposes except where otherwise specified.
- .15 Check Valves:
  - .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.
- .16 Install concealed pipework so as to minimize furring space, maximize headroom, conserve space.

### 3.8 SLEEVES

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
  - .2 Material: schedule 40 black steel pipe.
  - .3 Construction: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
-



- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:
  - .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
  - .2 Other floors: terminate 25 mm above finished floor.
  - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
  - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
  - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
  - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
  - .4 Ensure no contact between copper pipe or tube and sleeve.

### 3.9 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

### 3.10 FLUSHING OUT OF PIPING SYSTEMS

- .1 Before start-up, clean interior of piping systems in accordance with requirements as specified in relevant sections of each Division.
  - .2 Unless otherwise noted follow the following procedure:
    - .1 Flush after pressure test for a minimum of 2h.
  - .3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.
-

### 3.11PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.
  - .1 Maintain test pressures as indicated below unless specified for higher pressures in relevant sections of each Division.
  - .2 Hydraulically test hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Provide written tests report.
- .6 Conduct tests in presence of Departmental Representative.
- .7 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .8 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

### 3.12EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Departmental Representative.
  - .2 Request written approval 10 days minimum, prior to commencement of work.
  - .3 Be responsible for damage to existing plant by this work.
  - .4 Ensure daily clean-up of existing areas.
-

### 3.13CLEANING

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B31.1-2016, Power Piping.
- .2 ASTM International
  - .1 ASTM A125-96(2013)E1, Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
  - .3 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Health Canada, Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP-58-2009, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Submit shop drawings for:
    - .1 Bases, hangers and supports.
    - .2 Connections to equipment and structure.
- .4 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Manufacturers Instructions:
  - .1 Provide manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

### 1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 35 13 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

### 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
    - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
    - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.
    - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
    - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
-

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP-58.

.2 Performance Requirements:

.1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified Section 23 05 48.

## 2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP-58 and ASME B31.1.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

## 2.3 PIPE HANGERS

- .1 Finishes:
    - .1 Pipe hangers and supports: galvanized or painted with zinc-rich paint after manufacture.
    - .2 Use electro-plating galvanizing processor hot dipped galvanizing process.
    - .3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
  - .2 Upper attachment structural: suspension from lower flange of I-Beam:
    - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
      - .1 Rod: 9 mm UL listed.
    - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, to MSS SP-58 and MSS SP-69.
  - .3 Upper attachment structural: suspension from upper flange of I-Beam:
    - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, to MSS SP-69.
    - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut
-

- .4 Upper attachment to concrete:
  - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
  - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed approved to MSS SP-69.
- .5 Hanger rods: threaded rod material to MSS SP 58:
  - .1 Ensure that hanger rods are subject to tensile loading only.
  - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
  - .3 Do not use 22 mm or 28 mm rod.
- .6 Pipe attachments: material to MSS SP-58:
  - .1 Attachments for steel piping: carbon steel black
  - .2 Attachments for copper piping: copper plated black steel.
  - .3 Use insulation shields for hot pipework.
  - .4 Oversize pipe hangers and supports.
- .7 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A563.
  - .1 Finishes for steel pipework: galvanized.
  - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated or epoxy coated.
- .8 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.

#### 2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized or black carbon steel to MSS SP-58, type 42, UL listed
- .2 Copper pipe: carbon steel copper plated to MSS SP-58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

#### 2.5 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
-

.1 64 kg/m<sup>3</sup> density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-69.

## 2.6 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

## 2.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

## 2.8 HOUSE-KEEPING PADS

.1 Where required provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment footprint; chamfer pad edges.

## 2.9 SUPPLEMENTARY STRUCTURAL STEEL MEMBERS

.1 In case the building structural elements are not adequate, provide all required supplementary structural steel members required to achieve suitable hanger and support system.

.1 All supplementary members shall be all welded shop fabricated construction.

.1 Submitt fabrication drawings for review.

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## PART 3 - EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### 3.2 INSTALLATION

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Clamps on riser piping:
  - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
  - .2 Bolt-tightening torques to industry standards.
  - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
  - .4 Cast iron pipes: install below joint.
- .3 Clevis plates:
  - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .5 Use approved constant support type hangers where:
  - .1 Vertical movement of pipework is 13 mm or more,
  - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.

### 3.3 HANGER SPACING

- .1 Plumbing piping: to most stringent requirements of Canadian Plumbing Code Provincial Code authority having jurisdiction.
  - .2 Fire protection: to applicable fire code.
  - .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
-

- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6	Within 300 mm of each elbow.		
	Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
	up to 1-1/4	2.4 m	1.8 m
	1-1/2	3.0 m	2.4 m
	2	3.0 m	2.4 m
	2-1/2	3.7 m	3.0 m
	3	3.7 m	3.0 m
	3-1/2	3.7 m	3.3 m
	4	3.7 m	3.6 m
	5	4.3 m	
	6	4.3 m	
	8	4.3 m	
	10	4.9 m	
	12	4.9 m	

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- .7 Pipework greater than NPS 12: to MSS SP 69.

### 3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

### 3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
-

- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

### 3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
  - .1 sure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

### 3.7 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports

### 3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
  - .1 NFPA 13-2016 Installation of Sprinkler Systems.
- .2 National Building Code of Canada (NBCC) 2015.

### 1.2 DEFINITIONS

- .1 Priority Two (P2) Buildings: buildings in which life safety is paramount concern. It is not necessary that P2 buildings remain operative during or after an earthquake.
- .2 SRS: acronym for Seismic Restraint System.

### 1.3 LIMITATIONS

- .1 Each trade shall be responsible for all applicable seismic restraint systems for all systems and equipment forming part of their respective contracts. All trades shall coordinate SRS design and implementation.

### 1.4 SYSTEM DESCRIPTION

- .1 This section covers design, supply and installation of complete SRS for all systems, equipment specified for installation on this project. This includes cooling towers, piping, auxiliary mechanical equipment and systems, both vibration isolated and statically supported.
- .2 SRS to be fully integrated into, compatible with:
  - .1 Noise and vibration controls specified elsewhere in this project specification.
  - .2 Structural, mechanical, electrical design of project.
- .3 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.
- .4 Design to be done and certify by Professional Engineer specializing in design of SRS and registered in Province of Ontario.

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#### 1.5 QUALITY ASSURANCE

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06.

#### 1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
  - .1 Submittals to include: Full details of design criteria and system components and installation.
- .2 Submit additional copy of shop drawings and product data to Departmental Representative for review by all parties having interest in SRS design.
- .3 Provide detailed drawings of all seismic control measures for equipment and piping.

#### 1.7 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

#### 1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

#### 1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

## PART 2 - PRODUCTS

### 2.1 SRS Manufacturer

- .1 SRS to be from one manufacturer regularly engaged in production of same.
  - .1 Entire SRS system shall be supplied by same manufacturer.

### 2.2 General

- .1 SRS to provide gentle and steady cushioning action and avoid high impact loads.
- .2 SRS to restrain seismic forces in all directions.
- .3 Fasteners and attachment points to resist same load as seismic restraints.
- .4 SRS of Piping systems to be compatible with:
  - .1 Expansion, anchoring and guiding requirements.
  - .2 Equipment vibration isolation and equipment SRS.
- .5 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.
- .6 Attachments to RC structure:
  - .1 Use high strength mechanical expansion anchors.
  - .2 Drilled or power driven anchors not permitted.

### 2.3 SRS for Static Equipment, Systems

- .1 Floor mounted equipment, systems:
    - .1 Anchor equipment to equipment supports.
    - .2 Anchor equipment supports to structure.
    - .3 Use size of bolts scheduled in approved shop drawings.
  - .2 Suspended equipment, systems:
    - .1 Use one or combination of following methods:
      - .1 Install tight to structure.
      - .2 Cross-brace in all directions.
      - .3 Brace back to structure.
      - .4 Slack cable restraint system.
    - .2 SRS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
-

- .3 Hanger rods to withstand compressive loading and buckling.

## 2.4 SRS for Vibration Isolated Equipment

- .1 Suspended equipment, systems:
  - .1 Use one or combination of following methods:
    - .1 Slack cable restraint system.
    - .2 Brace back to structure via vibration isolators and snubbers.
- .2 Piping systems:
  - .1 Fire protection systems: to NFPA 13.
  - .2 All piping systems: hangers longer than 300 mm; brace at each hanger.
  - .3 To be compatible with requirements for anchoring and guiding of piping systems.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- .1 Seismic control measures to meet requirements of NBC.
  - .2 Attachment points and fasteners:
    - .1 To withstand same maximum load that seismic restraint is to resist and in all directions.
  - .3 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment. Install SRS at least 25 mm from equipment,
  - .4 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
  - .5 Miscellaneous equipment not vibration-isolated:
    - .1 Bolt to structure use vibration isolation rubber washers.
  - .6 Co-ordinate design and execution of SRS with actual building conditions and building elements installation.
  - .7 Co-ordinate connections with all disciplines.
-

- .8 New SRS system installation applies to new equipment only.

### 3.2 SITE VISIT

- .1 Manufacturer to visit site and provide written certification that installation is in accordance with manufacturer's instructions and submit report to Departmental Representative.
- .2 Provide Departmental Representative with notice 24 h in advance of visit.
- .3 Make adjustments and corrections in accordance with written report.

### 3.3 TESTING

- .1 Upon completion and acceptance of certification, hand over to Departmental Representative complete set of construction documents, revised to show "as-built".



## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
  - .2 CAN/CGSB-24.3-92, Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
  - .1 NFPA 13-2016, Standard for the Installation of Sprinkler Systems.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
  - .1 Samples to include nameplates, labels, tags, lists of proposed legends.

### 1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements:
    - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
-

## 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.

### 2.2 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 or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
-

### 2.3 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
  - .1 Sprinklers: to NFPA 13.

### 2.4 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: 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 Other pipes: pressure sensitive plastic-coated cloth vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
  - .7 Colours and Legends:
    - .1 Where not listed, obtain direction from Departmental Representative.
    - .2 Colours for legends, arrows: to following table:
-

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

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.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Water	Green	WATER
Tempered Water	Green	TEMPERED WATER

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## 2.5 LANGUAGE

.1 Identification in English

## PART 3 - EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### 3.2 TIMING

- .1 Provide identification only after painting has been completed.

### 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.
-

### 3.4 LOCATION OF IDENTIFICATION ON PIPING SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, 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, confined spaces, at entry and exit points, and at access openings.
- .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, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification 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 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 Definitions:
  - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
  - .1 Electrical installation: To CSA C22.1-2015.
  - .2 Ontario Building Code - 2012.
  - .3 Ontario Electrical Safety Code - 2015.
  - .4 CAN/ULC - S524 - 14 Standard for the Installation of Fire Alarm Systems.
  - .5 CAN/ULC - S537 - 13 Standard for Verification of Fire Alarm Systems.
  - .6 National Building Code - 2015.

### 1.2 MOUNTING HEIGHTS

- .1 Install Electrical equipment at the following heights unless indicated otherwise.
  - .1 Local Switches: 1200mm.
  - .2 Wall Receptacles.
    - .1 General: 400mm.
    - .2 Above Counters: 175mm.
  - .3 Panelboards: 1800mm FROM TOP.
  - .4 Telecommunication outlets: 400mm.

### 1.3 DEMOLITION

- .1 Contractor to co-ordinate with other trades to ensure that Electrical equipment and feeders associated with mechanical equipment and/or is located in walls being demolished is also being removed.
  - .2 Existing equipment shows as relocated to be cleaned and made operational by this contractor prior to its relocation.
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#### 1.4 EQUIPMENT SHUT DOWN

- .1 Any shutdown that may be required of existing equipment, must have prior approval from the Departmental Representative.

#### 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, dimensions construction and assembly details and accessories.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.

#### 1.6 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 35 13 and 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.

#### 1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
-

## PART 2 – PRODUCTS

### 2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

### 2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction or inspection authorities before delivery to site and submit such approval

### 2.3 EQUIPMENT REQUIREMENTS AND INSTALLATIONS

- .1 Unions or flanges: provide for ease of maintenance and disassembly.
  - .2 All fixtures and devices to be installed in accordance with the latest edition of all local codes.
  - .3 Install equipment, rectangular cleanouts and similar items parallel to, or perpendicular to, building lines.
  - .4 Provide new materials and equipment of proven design, quality and or current models with published ratings for which replacement parts are readily available.
  - .5 The word "provide" shall mean "supply, install and connect". .
  - .6 The word "remove" shall mean "disconnect, remove and dispose, repair and finish to match the existing surface affected by this work, make safe remaining services or feeds".
-



- .7 The word "relocate" shall mean " disconnect, remove, reinstall in new location and reconnect, extend the feeds to suit the new location, repair and finish to match the existing surface affected by this work, start- up and commission "
- .8 Uniformity:
  - .1 Use product of one manufacturer unless otherwise specified, for equipment or material of the same type of classification.
  - .2 Installation:
    - .1 Unless otherwise specified, follow code and manufacturer's recommendations for safety, adequate access for inspection, maintenance and repairs.
    - .2 Permit equipment maintenance and disassembly with minimum disturbance and interference with building structure or other equipment.
- .9 Site condition:
  - .1 Drawings indicate approximate location of equipment and services. Perform site measurements prior to installation. Do not scale drawings.

#### 2.4 IDENTIFICATION

- .1 Identify with Lamacoid nameplates all electrical equipment shows on the drawings and/or mentioned in the specification such as motors, switches, starters, panel boards, transformers, controls, and special receptacles , regardless of whether or not the electrical equipment was furnished under this section of the specification.
  - .2 Unless otherwise specified, nameplates shall be rigid lamacoid, minimum 1.5mm thick with black letters engraved on a white background. Nameplates to be neatly placed, and square to surrounding building or equipment lines, and fastened in place with mechanical fasteners (screws or pop rivets) as reviewed by Departmental Representative.
  - .3 Provide neatly typed updated circuit directories in a plastic holder on the inside door of new panel boards, with copy in manual.
  - .4 Identify all pull and junction boxes, with P-Touch Label identification, indicating source panel and circuit numbers.
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- .5 Identify all receptacles and switches with P-Touch labels, black lettering on transparent tape, indication source panel and circuit number. Labels to be located on the front of coverplate.

## 2.5 ELECTRIC MOTORS AND WIRING

- .1 The Electrical Contractor shall be responsible to supply all motor started, except on pre-wired packaged equipment, disconnect switches for all motors for the projects, and all wiring to starters and motors except where shown or noted otherwise. Equipment requiring connection to an electrical power source shall be CSA or Hydro approved for use at location of installation. The mechanical contractor shall supply and install all low voltage control wiring within 'EMT' conduit for a complete and operating installation unless otherwise specified.

## 2.6 WIRING

- .1 All wiring to be copper, R90 XLPE, Stranded with 'Brady Label' making sleeves at each end, unless otherwise noted on drawings. Wiring to be colour coded as per code. Minimum wire size to be No.12 for power and lighting.
- .2 Leave adequate lengths of wire in junction boxes for connections to equipment.
- .3 'Bx' Wiring in walls only
- .4 Run a green insulated ground wire sized as per code in all conduit runs. Do not rely on conduit as ground.

## 2.7 CONDUITS

- .1 Each length of conduit to be new and bear CSA Stamp of approval.
  - .2 All conduits run above the suspended ceiling to be 'EMT'.
  - .3 Provide nylon pullropes in all empty conduit runs.
-

## 2.8 OUTLET BOXES

- .1 Electro-Galvanized Steel coating.
- .2 Minimum 37mm DEEP 100 mm square or octagonal as required.
- .3 Equip with plaster rings deep enough for wall finish material to fit over the box and within 6mm of the cover opening.

## 2.9 PULL BOXES

- .1 Provide pull boxes where runs exceed 30 meters in length and have more than 2-90° Bends.

## 2.10 WIRING DEVICES

- .1 Receptacles:
  - .1 Duplex receptacles, CSA type 5-15R 125 Volt, 15 A 'U' Ground with Following with the following features.
  - .2 Receptacles of specification grade.
  - .3 Receptacles of one manufacturer throughout project.
  - .4 Ivory urea moulded housing.
  - .5 Suitable for No.12 AWG for back and side wiring.
  - .6 Break-off links for use as split receptacles.
  - .7 Eight (8) Back wired entrances, Four (4) side wiring screws.
  - .8 Double wipe contacts and riveted grounding contacts.

## 2.11 SWITCHES

- .1 To CSA C22.2 No.111.
  - .2 15A, 347 Volt Single Pole, 2 Way switches, as indicated.
  - .3 Manually operated general purpose A/C Switches with the following features.
    - .1 Terminal holes approved for No.10 AWG Wire
    - .2 Silver Alloy Contacts.
    - .3 Urea or melamine moulding for parts subject to carbon tracking.
    - .4 Suitable for back and side wiring.
    - .5 Ivory Toggle
-

- .4 Toggle operated locking fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity loads.
- .5 Switches of one manufacturer throughout.

#### 2.12 CIRCUIT BREAKERS

- .1 Provide circuit breakers in panel board as indicated.
- .2 Branch circuit breakers quick make, quick break, ambient compensated, common trip on all multiple pole breakers, trip indicating clearly shown by breaker handle taking position midway between on and off.

#### 2.13 DISCONNECT SWITCHES

- .1 Fusible, and non-fusible, horsepower rated disconnect switches, size as indicated, in CSA Enclosures as follows:
  - .1 Enclosure Type 1: general indoor use and service rooms.
  - .2 Enclosure Type 2R: general indoor sprinklered areas
- .2 Provision for padlocking in on-off off switch position.
- .3 Mechanically interlocked door to prevent opening when handle is in ON position.
- .4 Fuse holders: suitable without adaptors, for type and size of fuse indicated.
- .5 Quick-make, quick-break action.
- .6 ON-OFF switch position indication on switch enclosure cover.

#### 2.14 COVER PLATES

- .1 Polished stainless steel cover plates, thickness 1.0mm for wiring devices mounted in a flush mounted box.
  - .2 Install cover plates only after painting and other work is finished.
  - .3 Install suitable common cover plates where wiring devices are grouped.
-

- .4 Cover plates for wiring devices. Communication outlet coverlets provided by system contractor
- .5 Cover plates from one manufacturer throughout project.

### PART 3 - EXECUTION

#### 3.1 SCOPE OF WORK

- .1 Disconnection and removals of all existing electrical equipment which becomes unused or is presently unused.
- .2 Reconnection of all electrical components being removed and replaced.
- .3 Modification and addition to power distribution system.