

PWGSC
SAINT-AUGUSTIN BOATHOUSE
REPLACEMENT OF THE NON-POTABLE WATER TREATMENT SYSTEM

PWGSC : R.078137.001

MECHANICAL/ELECTRICITY SPECIFICATIONS
PROJECT # : 35772TTA



AUTHORIZED FOR TENDER
November 3, 2017

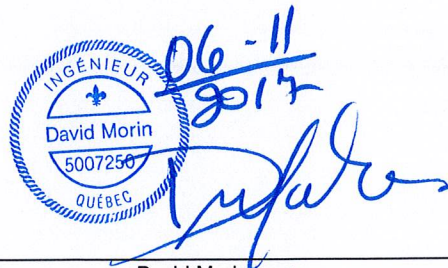
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DIVISION 00 **GENERAL REQUIREMENTS**

Section 00 01 10	Table of Contents	1
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DIVISION 01 **GENERAL REQUIREMENTS**

Section 01 11 01	Summary of Work	2
Section 01 33 00	Submittal Procedures	8
Section 01 35 29.06	Health and Safety Requirements	6
Section 01 35 43	Environmental Procedures	3
Section 01 41 00	Regulatory Requirements	2
Section 01 45 00	Quality Control	4
Section 01 61 00	Common Product Requirements	8
Section 01 73 00	Execution Requirements	4
Section 01 74 11	Cleaning	4
Section 01 78 00	Closeout Submittals	9
Section 01 91 13	General Commissioning (CX) Requirements	4

DIVISION 22 **PLUMBING**

Section 22 05 00	Common Work Results for Plumbing	7
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DIVISION 26 **ELECTRICAL**

Section 26 05 00	Common Work Results – Electrical	10
Section 26 05 20	Wire and Box Connectors 0-1000 V	2
Section 26 05 21	Wires and Cables (0-1000 V)	2
Section 26 05 29	Hangers and Supports for Electrical Systems	3
Section 26 05 32	Outlet Boxes, Conduit Boxes and Fittings	3
Section 26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	5

PART 1 - GENERAL

1.1 WORK COVERED BY
CONTRACT DOCUMENTS

.1 Work includes the following, but are not necessarily limited :

.1 Mechanical

- .1 Dismantling and modification of existing plumbing facilities.
- .2 Supply and installation of an new non-potable water tank.
- .3 Supply and installation of new pressure water system.
- .4 Supply and installation of an water treatment system.
- .5 Temporary water supply.
- .6 The identification work.
- .7 Related work required for this project.

.2 Electricity

- .1 Connecting the new pressure water system and water treatment system.
- .2 Related work required for this project.

1.2 WORK BY OTHERS

.1 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

PART 2 - PRODUCTS

.1 Not used.

PART 3 - EXECUTION

- .1 All electrical services (heating, ltghting, power outlets, sanitary devices, etc.) must be operational at all times during construction.
- .2 The power and water interruption should be minimized permission of Departmental Representative is required before interruption.
- .3 The contractor must develop the work areas to ensure the safety of workers and user; work zones are demarcated with red ribbons with inscription "danger".

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing.

Section 26 05 00 - Common Work Results - For Electrical

Section 26 05 20 - Wire and Box Connectors 0-1000 V

Section 26 05 21 - Wires and Cables (0-1000 V)

Section 26 05 29 - Hangers and Supports for Electrical Systems

Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings

Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 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 are 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.

1.3 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 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Québec, Canada.

- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 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.
- .7 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.
- .8 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 Materials and manufacturing details.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Characteristics such as power, speed or capacity.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit one (1) electronic copie of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Submit one (1) electronic copie of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification

requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.12 Submit one (1) electronic copie of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.13 Submit one (1) electronic copie of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.14 Submit one (1) electronic copie of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.15 Delete information not applicable to project.

.16 Supplement standard information to provide details applicable to project.

.17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, shop drawing 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.

- .18 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that Departmental 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.

1.4 SAMPLES

- .1 Submit for review one (1) sample as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.

- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.6 PROGRESS
PHOTOGRAPHS

- .1 Submit progress photographs when asked by Departmental Representative.

1.7 CERTIFICATES
AND TRANSCRIPTS

- .1 Immediately after reception of Notice of Acceptance of Offer, submit Workers' Compensation Board status documents.

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 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing
- Section 26 05 00 - Common Work Results - For Electrical
- Section 26 05 20 - Wire and Box Connectors 0-1000 V
- Section 26 05 21 - Wires and Cables (0-1000 V)
- Section 26 05 29 - Hangers and Supports for Electrical Systems
- Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings
- Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Quebec
 - .1 An Act Respecting Occupational Health and Safety, R.S.Q. 1997 (updated April 1, 2016).

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .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 to Departmental Representative, once a week, one (1) copy of Work site and safety inspection report, made by Contractor's authorized representative.
- .4 Submit copies of reports or directions, once a week, issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations. Ensure that all employees become aware and know how to apply it.
- 1.4 FILING OF NOTICE .1 File notice of project with authorities prior to beginning of work.
- 1.5 SAFETY ASSESSMENT .1 Perform site specific safety hazard assessment related to project.
- 1.6 MEETINGS .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- 1.7 REGULATORY REQUIREMENTS .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.
- 1.8 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.

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| <u>1.9 RESPONSIBILITY</u> | <ul style="list-style-type: none">.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work..2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan. |
|
 | |
| <u>1.10 COMPLIANCE REQUIREMENTS</u> | <ul style="list-style-type: none">.1 Comply with Occupational Health and Safety Act, Industrial and Commercial Establishments Regulation, R.R.Q..2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations. |
|
 | |
| <u>1.11 UNFORSEEN HAZARDS</u> | <ul style="list-style-type: none">.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing. |
|
 | |
| <u>1.12 HEALTH AND SAFETY CO-ORDINATOR</u> | <ul style="list-style-type: none">.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:<ul style="list-style-type: none">.1 Have site-related working experience specific to activities associated..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.

1.13 POSTING OF
DOCUMENTS

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

1.14 CORRECTION OF
NON-COMPLIANCE

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

1.15 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.

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 DEFINITIONS

- .1 Environmental Pollution and Damage:
presence of chemical, physical, biological
elements or agents which adversely affect
human health and welfare; unfavourably
alter ecological balances of importance to
human life; affect other species of
importance to humankind; or degrade
environment aesthetically, culturally
and/or historically.
- .2 Environmental Protection:
prevention/control of pollution and
habitat or environment disruption during
construction. Control of environmental
pollution and damage requires
consideration of land, water, and air;
biological and cultural resources; and
includes management of visual aesthetics;
noise; solid, chemical, gaseous, and
liquid waste; radiant energy and
radioactive material as well as other
pollutants.

1.2 FIRES

- .1 Fires and burning of rubbish on site is
not permitted.

1.3 DISPOSAL OF
WASTES

- .1 Do not bury rubbish and waste materials on
site.
- .2 Do not dispose of waste or volatile
materials, such as mineral spirits, oil or
paint thinner into waterways, storm or
sanitary sewers.
- .3 All materials that must be removed from
the site become the property of the
Contractor.

- .4 Provide off-site and places predetermined safe, the facilities to store and sort waste and dry materials are to be reused or transported off-site.
- .5 The Contractor shall proceed with the progressive removal outside the site to the allowed sites of materials that are not reused. The stocking of waste is prohibited.
- .6 Material that are not recycled must be disposed of by the Contractor at sites authorized by the Ministère du Développement durable, de l'Environnement et des Parcs (MDDELCC).

1.4 WORK ADJACENT
TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 No cleaning of equipment is allowed in the water.
- .3 No discharging dry materials, waste or debris in streams.
- .4 Do not discharge chemicals (eg, existing chemical tank contents) into sewers or drainage from building or watercourse.

1.5 VEHICLES

- .1 Vehicles and machinery must be switched off when not used.

1.6 SPILL KIT

- .1 Provide on site a spill kit for the whole duration of the work.
- .2 If a spill occurs an environmental report must be completed and forwarded to Ms Josée Sirois (josee.sirois@tc-gc.ca) and to Department Representative, when spill; photos of the incident management must accompany the environmental report.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

ENVIRONMENTAL REPORT

NOTE: To be completed by the surveyor as soon as a dangerous situation is identified

Incident:			No.:
Date:		Time:	Witness name:
Nature of the incident:		Site of the incident:	
Possible cause of the incident:			
Spill quantity: (if applicable)			
Description of the incident: (use the following page if more space is needed)			
Contacted persons: (use the following page if more space is needed)			
Name	Title	Phone	Time
Reason for the delay: (if applicable)			
Description of the intervention: (use the following page if more space is needed)			
Person in charge:			
Signature:			

Description of the incident: (suite)

Description of the intervention : (suite)

Contacted persons : (suite)

Name	Title	Phone	Time

(Section to be completed at the end of the intervention)

Incident :	No. :
Date of the incident :	
Description of the measures taken:	
Quantity of recovered material:	
Disposal area of recovered material: (manifests number, if applicable)	
Description of the environmental damage incurred:	
Corrective measures established to prevent a similar situation from occurring:	
Written by : _____	

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing
- Section 26 05 00 - Common Work Results - For Electrical
- Section 26 05 20 - Wire and Box Connectors 0-1000 V
- Section 26 05 21 - Wires and Cables (0-1000 V)
- Section 26 05 29 - Hangers and Supports for Electrical Systems
- Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings
- Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCES AND
CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.3 HAZARDOUS
MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.

- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.4 SMOKE FREE

- .1 Comply with smoking restrictions and municipal by-laws.

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 RELATED
SECTIONS

.1 Section 22 05 00 - Common work results for
Plumbing

Section 26 05 00 - Common Work Results -
For Electrical

Section 26 05 20 - Wire and Box Connectors
0-1000 V

Section 26 05 21 - Wires and Cables (0-
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for Electrical Systems

Section 26 05 32 - Outlet Boxes, Conduit
Boxes and Fittings

Section 26 05 34 - Conduits, Conduit
Fastenings and Conduit Fittings

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 will order 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 INDEPENDENT
INSPECTION AGENCIES

- .1 If required Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

1.6 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, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

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 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing
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- Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 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.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 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.

1.4 AVAILABILITY

- .1 Immediately upon receipt of the notice of acceptance, review product delivery requirements and anticipate foreseeable supply delays for 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.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

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 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .5 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

- .6 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .7 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .8 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 will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

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- 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, of 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 co-operation 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. Co-ordinate 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 spalling or cracking of material to which anchorage is made are not acceptable.

1.14 FASTENINGS -
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.

1.15 PROTECTION OF
WORK IN PROGRESS

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

1.16 EXISTING
UTILITIES

- .1 When it comes to making connections to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .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 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing
- Section 26 05 00 - Common Work Results - For Electrical
- Section 26 05 20 - Wire and Box Connectors 0-1000 V
- Section 26 05 21 - Wires and Cables (0-1000 V)
- Section 26 05 29 - Hangers and Supports for Electrical Systems
- Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings
- Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .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 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.3 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching. Realize a photographic report.
- .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.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

- | | | |
|--|----|--|
| <u>1.6 WASTE
MANAGEMENT AND
DISPOSAL</u> | .1 | Separate waste materials for reuse and recycling. |
| | | |
| <u>1.7 SEQUENCE OF WORK</u> | .1 | The contractor shall execute the work to avoid interruption of water and electrical device. |
| | .2 | The contractor must provide 100L per week of projected works of temporary water. Connect to the building network with the existing's equipment's. The building must be kept operational. |
| | .3 | The interruption of electricity must be minimized. Notify Departmental Representative before interruption and obtain approval. |

PART 2 - PRODUCTS

- | | | |
|---------------------|----|-----------|
| <u>2.1 NOT USED</u> | .1 | Not Used. |
|---------------------|----|-----------|

PART 3 - EXECUTION

- | | | |
|---------------------|----|-----------|
| <u>3.1 NOT USED</u> | .1 | Not Used. |
|---------------------|----|-----------|

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 22 05 00 - Common work results for Plumbing
- Section 26 05 00 - Common Work Results - For Electrical
- Section 26 05 20 - Wire and Box Connectors 0-1000 V
- Section 26 05 21 - Wires and Cables (0-1000 V)
- Section 26 05 29 - Hangers and Supports for Electrical Systems
- Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings
- Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 PROJECT
CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris; the location of the containers must be approved by Department Representative.

- .6 Provide and use marked separate bins for recycling.
- .7 Clean interior areas prior to start of finishing 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.

1.3 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.
- .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,
unless approved by Departmental
Representative.

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Remove dirt and other disfiguration from exterior surfaces.
- .8 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .9 Sweep and wash clean paved areas.
- .10 Clean equipment and fixtures to sanitary condition.
- .11 Clean roofs, downspouts, and drainage systems.
- .12 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .13 The evacuation of the container site is under the contractor's responsibility.

1.4 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Upon substantial completion of the work, all construction / demolition debris and containers shall be evacuated from the site and transported off site. The Contractor is responsible for transporting the waste for reuse, recycling or destruction in accordance with environmental standards.

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 RELATED
SECTIONS

.1 Section 22 05 00 - Common work results for
Plumbing

Section 26 05 00 - Common Work Results -
For Electrical

Section 26 05 20 - Wire and Box Connectors
0-1000 V

Section 26 05 21 - Wires and Cables (0-
1000 V)

Section 26 05 29 - Hangers and Supports
for Electrical Systems

Section 26 05 32 - Outlet Boxes, Conduit
Boxes and Fittings

Section 26 05 34 - Conduits, Conduit
Fastenings and Conduit Fittings

1.2 SUBMITTALS

.1 Submittals: in accordance with Section
01 33 00 - Submittal Procedures.

.2 Prepare instructions and data using
personnel experienced in maintenance and
operation of described products.

.3 Copy will be returned after final
inspection, with Departmental
Representative's comments.

.4 Revise content of documents as required
prior to final submittal.

.5 Two weeks prior to Substantial Performance
of the Work, submit to the Departmental
Representative, four final copies of
operating and maintenance manuals in
English and French.

- .6 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.
- .7 Furnish evidence, if requested, for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.3 FORMAT

- .1 Organize data as 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.

1.4 CONTENTS - EACH
VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 List 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 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 specified in Section 01 45 00 - Quality Control.

1.5 AS-BUILTS AND
SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.

- .6 Field test records.
- .7 Inspection certificates.
- .8 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.

1.6 RECORDING
ACTUAL SITE
CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, 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: 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: 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 Addenda and change orders.

1.7 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 co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .13 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.9 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved 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.

- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .9 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.10 PRE-WARRANTY
CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

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 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems.
- .2 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 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 Effectively train O&M staff.
- .2 Contractor assists 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.

1.3 COMMISSIONING OVERVIEW

- .1 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .2 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Equipment, components and systems have been commissioned.
 - .2 O&M training has been completed.

1.4 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 unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs 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.

1.5 PRE-CX REVIEW

- .1 Before Construction, review contract documents, confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.

- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
 - .3 Before start of Cx:
 - .1 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .2 Ensure "As-Built" system schematics are available.
- 1.6 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.
- 1.7 PROCEDURES
 - .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.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
- 1.8 START OF COMMISSIONING
 - .1 Notify Departmental Representative at least 14 days prior to start of Cx.
 - .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

<u>1.9 WITNESSING COMMISSIONING</u>	.1	Departmental Representative to witness activities and verify results.
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<u>1.10 COMPLETION OF COMMISSIONING</u>	.1	Upon completion of Cx leave systems in normal operating mode.
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PART 2 - PRODUCTS

<u>2.1 NOT USED</u>	.1	Not Used.
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PART 3 - EXECUTION

<u>3.1 NOT USED</u>	.1	Not Used.
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PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 26 05 00 - Common Work Results -
For Electrical
- Section 26 05 20 - Wire and Box Connectors
0-1000 V
- Section 26 05 21 - Wires and Cables (0-
1000 V)
- Section 26 05 29 - Hangers and Supports
for Electrical Systems
- Section 26 05 32 - Outlet Boxes, Conduit
Boxes and Fittings
- Section 26 05 34 - Conduits, Conduit
Fastenings and Conduit Fittings

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section
01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and
signed by professional engineer registered
or licensed in Province of Quebec, Canada.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied
by:
 - .1 Detailed drawings of bases, supports,
and anchor bolts.
 - .2 Acoustical sound power data, where
applicable.
 - .3 Points of operation on performance
curves.
 - .4 Manufacturer to certify current model
production.
 - .5 Certification of compliance to
applicable codes.

- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures : use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

- .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
 - .1 Finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY,
STORAGE, AND
HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- .1 Not used

PART 3 - EXECUTION

3.1 PAINTING
REPAIRS AND
RESTORATION

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

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

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- | | | |
|--|----|---|
| <u>3.3 FIELD QUALITY CONTROL</u> | .1 | Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS. |
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 | | |
| <u>3.4 PROTECTION</u> | .1 | Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system. |
|
 | | |
| <u>3.5 ASEISMIC AND ANTI-VIBRATION SYSTEMS</u> | .1 | <p>This section is a performance specification pertaining to the following items:</p> <ul style="list-style-type: none">.1 Supply and installation of aseismic restraint devices compliant with applicable codes and standards..2 Calculations, design and verification of the aseismic restraint devices for the entire works. Hiring an engineer to perform these tasks is mandatory..3 Requirements for the qualification of the engineer:<ul style="list-style-type: none">.1 The engineer, hereafter referred to as "Qualified Engineer", must be an active member of "Ordre des ingénieurs du Québec" or OIQ, as well as a expert in the fields of earthquake engineering and seismic protection of building electromechanical systems..2 The resume of the Qualified Engineer must be provided upon request..3 At the beginning of the project, the contractor must provide to the Departmental Representative a letter confirming that the qualified engineer has been hired to assess seismic risks, design and verify the required seismic protection system must |

- be provided.
- .4 The completion of a seismic risks assessment relating to building electromechanical systems, including load calculations, in compliance with the requirements of Section 4 of the "Code de construction du Québec" or CCQ.
 - .5 The design of a seismic protection system compliant with the requirements of the CCQ and recognized practices, as described in the engineering documents produced by the ASHRAE, the SMACNA, the FEMA and suppliers of seismic protection systems, such as Mason, Kinetics, etc.
 - .6 The drafting of an official comprehensive report on the assessment of seismic risks, including seismic load calculations and the means to address them.
 - .7 The production of specifications for a seismic protection system and its components, including the types of anchors and braces, as well as installation locations.
 - .8 The preparation of instructions to the Contractor for the supply and installation of the seismic and anti-vibration devices.
 - .9 A verification of the installation of seismic protection devices in order to ensure that it met the design requirements.
 - .10 The drafting of an end-of-project report confirming that the seismic protection system was installed in compliance with installation and CCQ requirements.

- .2 Execution of the seismic protection work required by the Qualified Engineer and to the latter's satisfaction.
- .3 The Qualified Engineer's fees and the costs related to the supply and installation of the seismic protection devices must be included in the bid.

PART 1 - GENERAL

1.1 SCOPE OF WORK

- .1 Electrical works include, but are not limited to:
 - .1 Drawings and general contract terms, including general and special clauses together with specification sections of Division 01 - General Requirements.
 - .2 All Division 26 - Electrical works.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.10-10, Construction Code, chapter V - Electrical.
 - .2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 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.

1.4 DESIGN
REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.

- .2 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.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English and French.
- .4 Use one nameplate or label for both languages.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data in accordance with the Work Hazardous Materials Information System (WHMIS).
- .3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
- .4 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

- .5 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide equipment and material certified by an accredited organization.
 - .2 Where certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

1.6 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.7 DELIVERY,
STORAGE AND
HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after acceptance of offer notice.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

1.8 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

1.9 OPERATING
INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND
EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.2 WIRING
TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.3 EQUIPMENT
IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates: lamicoïde 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high Letters

- .3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.
- .5 Nameplates for terminal cabinets, junction and pull boxes to indicate system and/or voltage characteristics.
- .6 Disconnects: indicate equipment being controlled, disconnect number and panelboard number including circuit(s) used.

2.4 WIRING
IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

2.5 CONDUIT AND
CABLE
IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green

- .4 With a big indelible marker, indicate on cover the source (panel) and circuit number(s) of any conductor contained in junction or pull boxes, when they are located in non-finished or ceiling spaces.

2.6 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.2 NAMEPLATES AND
LABELS

- .1 Ensure manufacturer's nameplates, certification labels and identification nameplates are visible and legible after equipment is installed.

3.3 LOCATION OF
OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

3.4 MOUNTING
HEIGHTS

- .1 Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, check with competent persons starting before installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Panelboards: top of box at 1830 mm.

3.5 CO-ORDINATION
OF PROTECTIVE
DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY
CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

- .3 Provide upon completion of work, load balance report as directed in PART 1 – SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 – Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .4 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.7 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

3.8 PENETRATIONS AND OPENINGS

- .1 Make all penetrations and openings.
- .2 Execute all penetrations in concrete floors and walls with a drill.
- .3 Seal all conduit and wire runs through walls and floors with a material having the same fire resistance as the opened partitioning.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Materials and installation for wire and box connectors.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18.1-98 (R2013),
Outlet Boxes, Conduit Boxes, Fittings
and Associated Hardware.
 - .2 CSA C22.2 No.65-93(R2013), Wire
Connectors.
- .2 National Electrical Manufacturers
Association (NEMA)

1.3 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all
packaging materials at appropriate
recycling facilities.
- .3 Collect and separate for disposal
packaging material in appropriate bins for
recycling in accordance with Waste
Management Plan.
- .4 Divert unused wiring materials from
landfill to metal recycling facility as
approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper, sized to fit copper conductors as required.
- .2 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

PART 1 - GENERAL

1.1 Related
Sections

- .1 Section 26 05 20 - Wire and Box Connectors
- 0-1000 V.

1.2 References

- .1 CSA C22.2 No .0.3-96, Test Methods for
Electrical Wires and Cables.

1.3 Product Data

- .1 Submit product data in accordance with
Section 01 33 00 - Submittal Procedures.

1.4 Waste
Management and
Disposal

- .1 Separate and recycle waste materials in
accordance with the Waste Reduction
Workplan.
- .2 Collect and separate plastic, paper
packaging and corrugated cardboard in
accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place
in designated area for recycling.

PART 2 - PRODUCTS

2.1 Building Wires

- .1 Conductors: stranded for 10 AWG and
larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with
1000 V insulation of chemically cross-
linked thermosetting polyethylene material
rated RW90.

PART 3 - EXECUTION

3.1 Installation of
Building Wires

.1 Install wiring as follows:

.1 In conduit systems in accordance with
Section 26 05 34.

PART 1 - GENERAL

1.1 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material in appropriate bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 SUPPORT
CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

- .3 Fasten exposed conduit or cables to building construction or support system using clamps.
 - .1 One-hole steel clamps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel clamps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .4 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .5 For surface mounting of two or more conduits use channels at 2.5 m on center spacing.
- .6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

- .10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

PART 1 - GENERAL

1.1 References .1 CSA C22.10-10, Construction Code, Chapter
V - Electrical.

1.2 Waste
Management and
Disposal .1 Separate and recycle waste materials in
accordance with the Waste Reduction
Workplan.
.2 Collect and separate plastic, paper
packaging and corrugated cardboard in
accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 Outlet and
Conduit Boxes
General .1 Size boxes in accordance with CSA C22.10-
10.
.2 102 mm square or larger outlet boxes as
required for special devices.
.3 Gang boxes where wiring devices are
grouped.
.4 Blank cover plates for boxes without
wiring devices.
.5 Combination boxes with barriers where
outlets for more than one system are
grouped.

2.2 Sheet Steel
Outlet Boxes .1 Electro-galvanized steel single or multi
gang flush device boxes for flush
installation, minimum size 76 x 50 x 38 mm

or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 Fittings - General

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 Installation

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18.1-98 (R2013), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45.1-M2007 (R2012), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2013), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984 (R2006), Rigid PVC (Unplasticized) Conduit.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

1.3 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Place materials defined as hazardous or toxic waste in designated containers.

PART 2 - PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2.5 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene, stranded, 5 mm,
withstanding a 5 kN pull force.

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 datasheets.

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in
exposed locations and cause minimum
interference in spaces through which they
pass.
- .2 Conceal conduits except in mechanical and
electrical service rooms and in unfinished
areas.
- .3 Use rigid galvanized steel conduit where
specified.
- .4 Use electrical metallic tubing (EMT)
except where specified otherwise.
- .5 Use rigid PVC conduits where indicated.
- .6 Use liquid tight flexible metal conduit
for connection to motors or vibrating
equipment.
- .7 Minimum conduit size for lighting and
power circuits: 19 mm.

- .8 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.

- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

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