PROJECT TITLE: Correctional Service of Canada - Drumheller Institution - Natural Gas Main and Valve Restoration, Drumheller, Alberta_
PROJECT NUMBER: R.090801

PERMIT TO PRACTICE
SNC-LAVALIN INC. ENGINEERING, DESIGN AND PROJECT MANAGEMENT
RM SIGNATURE: Ken Jones
RM APEGA ID #: M47562
DATE: March 26, 2021
PERMIT NUMBER: P009643
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Signature and Seal
Ken Jones (P.Eng.)
SNC Lavalin Inc.

END OF SECTION

SECTION TITLE

END OF SECTION

LIST OF DRAWINGS (BOUND SEPARATELY)

Mechanical

M-01	Gas Schematic Existing
M-06	Gas Schematic Phase 1 and 2 Renovation
M-07	Existing Gas Plan
M-08	Phase 1 Renovation Gas Plan
M-09	Phase 2 Renovation Gas Plan
M-10	Associated Works and Details

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of a replacement of the existing main gas lines and valves inside of an outdoor below grade vault and the valve tree inside of the Central Heating Plant gas room, located at the Drumheller Medium Security Federal Correction Institution.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for all work as required.

1.2 CONTRACT METHOD

.1 Construct Work under single stipulated price contract.

1.3 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.

.2 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.

1.4 WORK SEQUENCE

.1 Construct Work in stages to accommodate Correctional Service Canada's continued use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate project completion with Departmental Representative during construction.

.3 Construct Work in stages to provide for continuous Correctional Service Canada (CSC) usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.4 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, for access, to allow:

.1 Correctional Service Canada occupancy.

.2 Work by other contractors.

.3 Public usage.

.2 Co-ordinate 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.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 CORRECTIONAL SERVICE CANADA OCCUPANCY

.1 Correctional Service Canada will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Correctional Service Canada usage.

1.7 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.1 AltaGas Utilities require the contractor to contact Alberta One Call prior to the commencement of any Work.

.2 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power, plumbing, and communications services. Adhere to approved schedule and provide notice to affected parties.

.3 Provide temporary services to maintain critical building and tenant systems.

.4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.5 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings.

.5 List of Outstanding Shop Drawings.

.6 Change Orders.

.7 Other Modifications to Contract.

.8 Field Test Reports, Systems Components List c/w Commissioning Verification Forms and Check Sheets and Commissioning Issues/Resolution Log.

.9 Copy of Approved Work Schedule.

.10 Health and Safety Plan and Other Safety Related Documents.

.11 Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

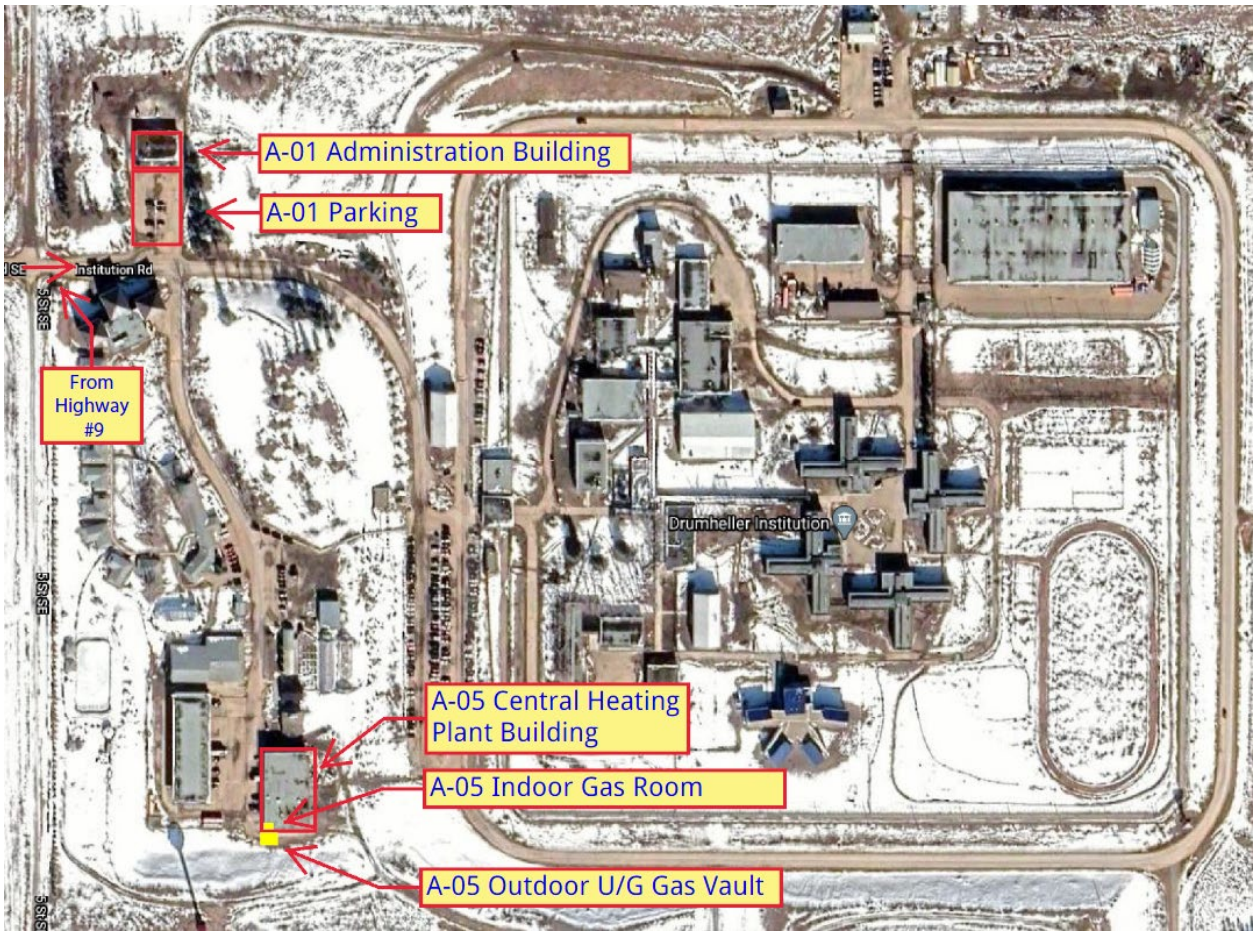
.1 Not used.

END OF SECTION

PROJECT TITLE: Correctional Service of Canada - Drumheller Institution - Natural Gas Main and Valve Restoration, Drumheller, Alberta
PROJECT ADDRESS: Drumheller Institution, Highway 9 South of the Drumheller main road, Drumheller, Alberta

Parking & Check-In Location: Building A-01 Parking

Site Location: Building A-05 Central Heating Plant Building & Outdoor Vault



END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Service interruptions to the natural gas system to be coordinated with and approved by Departmental Representative. Submit natural gas system shutdown plan and schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.

.3 Provide for personnel traffic.

1.5 SPECIAL REQUIREMENTS

.1 Carry out all Work from 08:00 to 16:00 hours. Any Work outside of these hours to be approved by the Departmental Representative prior to commencement.

.2 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.

.3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.4 Keep within limits of work and avenues of ingress and egress.

.5 Ingress and egress of Contractor vehicles at site is limited to one.

1.6 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 Security clearances:

.1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.

.2 Completion and submission of Gate Memo and Electronic Item Registry, Tool Register and Covid-19 Screening Questions is required prior to entry to the worksite, including the bidders' site visit. Note required minimum notice requirements.

.3 Obtain requisite clearance, as instructed, for each individual required to enter premises.

.4 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

.5 Contractor's personnel will require satisfactory RCMP initiated security screening in order to complete Work in premises and on site.

.6 Refer to 01 14 00.01 Appendix 1 – Security Requirements & Gate Memo for CSC Institutional Entry Requirements.

.7 Refer to 01 14 00.02 Appendix 2 – Electronic Item Registry

.8 Refer to 01 14 00.03 Appendix 3 – Tool Register

.9 Refer to 01 14 00.04 Appendix 4 – Covid-19 Screening Questions

.3 Security escort:

.1 Personnel employed on this project must be escorted when executing work in all areas.

.2 Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.

.3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 24 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.

.4 Late cancellation of an escort will incur a 3-hours charge for each escort booked.

1.7 COVID-19 PROTOCOLS

.1 Ensure Contractor's personnel employed on site become familiar with and obey the site protocols related to COVID-19.

.2 Contractor's personnel must undergo COVID-19 risk/symptom screening prior to each admittance to site. Contractor to keep records of all personnel screenings, to include personnel names, dates of entry to site, and answers to COVID-19 symptom screening questions. This information is to be made available to the Departmental Representative

upon requested for use for contract tracing. Provide a sample screening questionnaire to the Departmental Representative for approval at least 14 days prior to site mobilization.

.3 COVID 19 risk/symptom screening questions to include, but are not limited to:

.1 Did the person travel outside of Canada in the past 14 days?

.2 Has the person tested positive for COVID-19 or had close contact with a confirmed case of COVID-19 without wearing appropriate PPE?

.3 Is the person experiencing a fever, cough, sore throat, runny nose, or shortness of breath?

.4 Social distancing of 2m to be maintained as possible based on the nature of the work being performed.

.5 Contractor's personnel are to be equipped with face coverings which are to be worn at all times while they are on site.

.6 Contractor's personnel to be equipped with hand sanitizer station and hand washing station.

1.8 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Correctional Service Canada / Service cor Canada
Prairie Region / Région des Prairies

Your file / Votre référence

2021-03-25

Our file / Notre référence

CSC Institutional Entry Requirement Guidelines

Drumheller Institution

Gate Memo Requests:

- Gate memos are required for site entry and can be issued in two ways:
  - A Gate Memo Request can be submitted for the duration of an individual consultant/contractor's site visit or portion of work.
    - **Please note that if you complete your scope of work and leave, but have to return to address deficiencies and the gate memo has expired then another gate memo request must be sent in to the institution for approval. This approval process can take up to ten business days.**
  - A Gate Memo Request can also be submitted for an individual consultant/contractor for the entirety of the project. For example if your portion of the work is long in duration, or you are required to be on site for the entire time the project is ongoing, simply list the date of entry as the proposed project start date, and list the proposed project end date in the date of departure. That way you will have access to the site for the duration of the project. This will also save time if a contractor is repeatedly coming back to site by ensuring that Gate Memo information (listed below), CSC forms, and ID scans do not have to be resubmitted for entry unless the individuals requesting to be on site for a particular company have changed.
    - **Please note that only contractors/consultants that actually have to be on site long term will have this request approved.**

The Gate Memo information that is required for submission, and the format it is required to be submitted in is listed on the next page.

Gate Memo Request
1. The Official Company Name:
2. Date of Entry:
3. Date of Departure:
4. Monday to Friday Workday Hours Start Time:
5. Monday to Friday Workday Hours Finish Time:
6. List of all staff attending site:
7. Federal or Provincial photo ID for each person:
8. Electronic Item Registry Completed:
9. Commissionaires Required:
10. Description of Work and location:
MINIMUM of 10 business days notice

Work Start Time and Finish Time:

- Regular working hours for the institution for consultants and contractors is 08:00 to 16:00. These times may be altered slightly to stagger contractor entry to ensure that Covid-19 protocols on site are adhered to.

Listing Staff Attending Site:

- Please list names as shown on a piece of valid government ID. No nicknames or hyphenated names.

Federal or Provincial Photo ID for Each Person:

- This can be a scan or a picture of the ID. Only the photo side is required. The scanned ID must be valid. Outdated ID will not be accepted.

Electronic Registration Form & Mobile Phone Use:

- An Electronic Item Registry form or CSC 1467 form is required to bring in any electronics that are essential to completing a contractors or consultants scope of work. If the requested electronics do not pertain to your work at hand, for example an extra laptop, etc… they will not be approved.
  - **Please ensure the company name is listed beside each individuals name on all 1467 forms.**
- Mobile phones being brought onto the property will either be accompanied by an approved 1467 form or be secured in a lock box when the consultant or contractor is signing in through the main gate and going through security. NO mobile phones are permitted to be left in vehicles while on CSC Institutional Property.

Escort/Commissionaire Requirements:

- One commissionaire will be required for every individual, or group of individuals working on site in a specified, pre-determined location. The specified locations are the locations submitted by the consultant/contractor in the gate memo requests. Groups or crews working together must stay together at all times, within the specified and pre-approved location they are working. This is to ensure the group is visible to the Commissionaires, and to ensure the safety of the consultant/contractor.

- **Please note that it can take up to three business days to schedule commissionaires. This request can only be made once the institution has approved site entry.**

Description of Work and Location:

- Provide the scope of work and location of said work in as much detail as possible. This allows the institution to review the proposal in a timely manner.
- If there are any security, administrative, or operational disturbances due to any type of work, planned, or otherwise or if access/egress to the site, or specific areas of the site is affected in any way, the contractor will have to give the institution seven business days notice to see if arrangements can be made to accommodate the contractor. Please inform the project lead as soon as possible to ensure the seven-day waiting period does not affect any planned or ongoing work.

Tool List:

- A formal tool list is provided by CSC. This list must be filled out and brought to the institution for review prior to any work being carried out.
  - Because the tool list is specific to an individual site visit, it must be brought with them to site every time tools are required to complete their scope of work. The assigned Commissionaire will look over the tool list to ensure all tools listed on the form correspond to what is being brought into the institution, as well as check the list again once the consultant/contractor leaves to ensure nothing was lost on site.
    - **If a tool fails and needs to be replaced this will have to be reflected on the tool list as soon as possible, and submitted to the Commissionaire for inspection.**
    - **If a tool is lost on site it is required that it be reported immediately to either a Commissionaire or site staff. This is very important as any tools left on site pose a security risk.**

Equipment List:

- A formal equipment list is not provided by CSC but all heavy equipment and vehicles that are working on site will need to be reported to CSC through a simple email, or the company can use an in house formal equipment list. The make and model of all equipment brought to site is required and will need to be submitted for review ten working days prior to the commencement of work. This information can be sent in with the initial Gate Memo Request.

Safety Policy:

- A copy of a company's Corporate Safety Policy as well as a Site Specific Health and Safety Plan (SSHASP) from each contractor working on site is required for review by the institution prior to the commencement of work.
  - **This can take up to ten business days to be reviewed so it is encouraged that both forms be submitted as soon as possible.**

Site Entry Protocol During the Covid-19 Pandemic:

- CSC Covid-19 Protocols are in effect. Please ensure that all Covid-19 rules are followed while on site including making sure all appropriate PPE (Personal Protective Equipment) is worn. Covid-19 rules and mandatory PPE are listed below:

  - **A Covid-19 Screening Form is provided by CSC that must be filled out and submitted daily before work can begin. Please ensure the form is completed in full upon arrival and submitted to your assigned escort.**

  - **Visitors must follow all of the applicable regulatory and health and safety requirements relating to COVID-19 including the frequent washing of hands (when possible) and also ensuring a minimum social distance of 2 meters (6 feet) is followed (when possible) while on site.**

  - **Contractors and Consultants must follow all applicable measures from the Canadian Construction Association – COVID-19 – Standardized Protocols for All Canadian Construction Sites, 26 May 2020 (or latest edition).**

  - **Each visitor must bring their own PPE (masks, gloves, safety glasses or face shields) and will be wearing medical style safety masks and safety glasses or face shields (home made and/or cloth masks are not approved.) while on site. Gloves are not mandatory but may be required to be worn at the institutions request. If a visitor is asked to wear any of the mentioned PPE and it is not available, none will be provided for them from CSC, and the visitor will be asked to leave the site until the appropriate PPE is procured.**

- Once a consultant or contractor arrives at the Drumheller Institution, they will go directly to Building A-01. This is the first building to the left when they enter the site. Please ensure upon entering Building A-01 that the 2 meter social distancing rule is followed. If that is not possible, please wait outside Building A-01 to sign in until the 2 meter social distancing rule can be adhered to.
- Visitors will meet with their assigned escort (CSC employee or Commissionaire) in the sign in area and sign in.
- If your work area is in the minimum security area of the institution then the contractor or consultant, along with their escort can make their way to their work area after signing in at Building A-01. If they are working in the medium security area of the institution then they will be escorted to the Building B-01 (Main Gate) to sign in again, and go through security, then make their way to their work area.

Correctional Service Canada | Service correctionnel Canada

PROTECTED PROTÉGÉ **B** **ONCE COMPLETED UNE FOIS REMPLI**

NOTE : Reference Document - CD 566-1
NOTA : Document de référence - DC 566-1

PUT AWAY ON FILE
CLASSER AU DOSSIER

▶ Original = 3280-8

ELECTRONIC ITEM REGISTRY AND AUTHORIZATION

REGISTRE ET AUTORISATION DES APPAREILS ÉLECTRONIQUES

Official Visitor Name (print)
Nom du visiteur officiel (en lettres moulées)

Date (YYAA-MM-DJ)

Name of Institution – Nom de l'établissement

Period of Authorization :
Durée de l'autorisation :

☐ One time only – Une fois seulement

☐ From – De _____ To – À _____

TYPE OF ELECTRONIC DEVICE – TYPE D'APPAREIL ÉLECTRONIQUE

Cell Phone Téléphone cellulaire	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	
BlackBerry Appareil BlackBerry	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	
Tablet Tablette électronique	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	
E-Reader Lecteur de livres numériques	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	
Laptop Ordinateur portatif	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	
Other Device Autre appareil	Make – Marque :	
	Cell phone # – N° de téléphone cellulaire :	( )
	Device serial number – N° de série de l'appareil :	
	Other – Autre :	

I understand that the use of electronic item(s) is related to official duties, i.e. medical purposes/other use as authorized by the Institutional Head or delegate and that inmates are **not** to have access to it.
Je comprends que l'utilisation de ces appareils électroniques est liée à mes fonctions officielles, c.-à-d. à des fins médicales/autres utilisations autorisées par le directeur de l'établissement ou son délégué et que les détenus ne peuvent **pas** y avoir accès.

I, _____ ,hereby agree to abide by the above and understand that immediate notification is required
Official Visitor's Signature
in the event that the device goes missing.

Je, _____ , par la présente, m'engage à respecter ce qui est énoncé précédemment et à signaler
Signature du visiteur officiel
immédiatement la disparition de ces appareils, s'il y a lieu.

AUTHORIZATION – AUTORISATION

Institutional Head Name (print)
Nom du Directeur de l'établissement (en lettres moulées)

▶ Signature

Date (YYAA-MM-DJ)

DISTRIBUTION

Copy – Copie 1 =	RHQ Security – Sécurité à l'AR
Copy – Copie 2 =	SIO – ARS
Copy – Copie 3 =	AWO – DAO
Copy – Copie 4 =	Infopoint

01 14 00.03 - Work Restrictions Appendix 3 Tool Register

Correctional Service Canada | Service correctionnel Canada

TOOL REGISTER
REGISTRE DES OUTILS

PUT AWAY ON FILE - CLASSER AU DOSSIER

DATE Y-A M D-J	NAME NOM	COMPANY COMPAGNIE	TOOLS OUTILS	TIME IN HEURE D'ARRIVÉE	TIME OUT HEURE DE DÉPART

CSC/SCC 765 (R-94-06)

7530-21-909-1103

01 14 00.04_Covid-19 Screening Questions

Correctional Service Canada | Service correctionnel Canada

PROTECTED **B** ONCE COMPLETED

COVID-19: Screening Questions

To help us prevent the spread of COVID-19, we ask you to read this carefully and answer the questions below. Please act accordingly following the screening questions. For questions about symptoms, please refer to the list of symptoms in the box to the right.

If 'yes' is answered to any of questions 1-4, do not enter the site, contact your manager (employees only) and the local public health authority.

1.	**Are you currently experiencing any symptoms?**	☐ Yes	☐ No
2.	**Has anyone in your household experienced any symptoms in the past 14 days?** (Note: if the symptomatic person in your household has received a negative COVID-19 test result, please answer 'no')	☐ Yes	☐ No
3.	**In the past 14 days, have you been identified as a close contact of someone with suspected or confirmed COVID-19?**	☐ Yes	☐ No
4.	**Have you travelled outside Canada in the past 14 days or been in contact with anyone who has travelled outside Canada in the past 14 days?**	☐ Yes	☐ No

Examples of symptoms include the new onset of:

- A new or worsening cough
- Shortness of breath or difficulty breathing
- Temperature equal to or over 38°C
- Feeling feverish
- Chills
- Fatigue or weakness
- Muscle or body aches
- Headache
- New loss of smell or taste
- Gastrointestinal symptoms (abdominal pain, diarrhea, vomiting)
- Feeling very unwell

If **NO** to all of the above:

5.	**Have you experienced any symptoms since you were last in the site?**	☐ Yes **See questions below.**	☐ No **You may enter the site.**

ONLY COMPLETE THIS SECTION IF YOU ANSWERED YES TO QUESTION 5.

5a.	**When was your symptom onset date?**		(yyyy-mm-dd)
5b.	**Has it been at least 10 days since your symptoms started?**	☐ Yes **Continue to 5c.**	☐ No **Do not enter the site, contact your manager (employees only) and the local public health authority.**
5c.	**Have you been symptom free for at least 48 hours?**	☐ Yes **You may enter the site.**	☐ No **Do not enter the site, contact your manager (employees only) and the local public health authority.**

Name (Print)	Signature	Date (YYYY-MM-DD)

2021-02-22

Part 1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a 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 10 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.3 Schedule of submission of shop drawings, samples, and colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences.

.5 Delivery schedule.

.6 Site security.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.8 Departmental Representative provided products.

.9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.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 During course of Work and 2 weeks prior to project completion, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work and a Departmental Representative are to be in attendance.

.3 Notify parties minimum 7 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.

.5 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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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/phases (not including holidays or other nonworking periods) required to complete activity or another 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 involve 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.

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, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.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 targets for Project Schedule.

.1 Interim Certificate (Substantial Completion) within 13 weeks of Award of Contract date.

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 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.

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 Vault Infill Works.
.6 Concrete and Associated Groundworks.
.7 Fencing and Bollards.
.8 Natural Gas Piping (2 Phases).
.9 Testing and Commissioning.
.10 Supplied equipment long delivery items.

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, 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.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

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 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.

1.2 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 Submit drawings stamped and signed by professional engineer registered or licensed in Province of 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.

.1 Allow 10 working days for Departmental Representative’s review of each submission.

.1 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.

.1 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.

.4 Accompany submissions with transmittal letter, 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.

.5 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 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.6 After Departmental Representative’s review, distribute copies.

.7 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.1 Submit electronic copies 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.

.8 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.9 Submit electronic copies 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.

.10 Submit electronic copies of manufacturer’s 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.

.11 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

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

.13 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.14 Delete information not applicable to project.

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

.16 If upon review by Departmental Representative, 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.

.17 The review of shop drawings by Public Services and Procurement Canada (PSPC) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PSPC 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 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.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.

1.4 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard copy of colour digital photography in jpg format, fine resolution monthly with progress statement.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 4 locations.

.1 Viewpoints and their location as determined by Departmental Representative.

.4 Frequency of photographic documentation: weekly.

.1 Upon completion of: services before concealment, of Work.

1.5 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of Alberta

.1 Occupational Health and Safety Act – June 2018 or (Latest Edition)

.2 Occupational Health and Safety Code – January 2019

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit 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 found in work plan.

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, weekly.

.4 Submit copies of reports or directions issued by Federal and Provincial 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 5 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.

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

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

1.6 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

.3 The Health and Safety Plan must include any applicable health and safety requirements forthcoming from provincial or federal regulations concerning COVID19.

1.7 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta Reg.

.2 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.

1.9 UNFORSEEN HAZARDS

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

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.10 POSTING OF DOCUMENTS

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

1.11 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 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.

END OF SECTION

Part 1 General

1.1 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, Department 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 Design-Builder in event of non-conformance.

1.2 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.

1.3 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 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 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.

.6 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.7 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.4 TRANSPORTATION

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

.2 Transportation cost of products supplied by Departmental Representative will be paid for by Departmental Representative. Unload, handle and store such products.

1.5 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.

1.6 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.

1.7 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.

1.8 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform if there is interference. Install as directed by Departmental Representative.

1.9 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.

1.10 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.

1.11 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 dipped 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.

1.12 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.

1.13 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.

1.14 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and building occupants.

.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.

END OF SECTION

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 Correctional Service Canada or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris off site.

.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.

1.2 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 Correctional Service Canada 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 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative and Correctional Service Canada to review and discuss PSPC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.

.2 PSPC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced. The overall waste diversion goal for this project is 80 percent.

.3 Specific material target percentages for reuse and/or recycling:

- .1 Metals: 90%.
- .2 Mechanical - HVAC: 75%.
- .3 Mechanical - plumbing piping: 90%.

.4 Target percentage goals are achievable for waste diversion. Contractor to review and confirm Departmental Representative's Waste Audit acceptable values.

.5 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.

.6 Protect environment and prevent environmental pollution damage.

1.2 REFERENCES

.1 Definitions:

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
- .2 Class III: non-hazardous waste - construction renovation and demolition waste.
- .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
- .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
- .5 Inert Fill: inert waste - exclusively asphalt and concrete.
- .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.

.7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.12 Separate Condition: refers to waste sorted into individual types.

.13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

.14 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled. Refer to Schedule A.

.15 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.

.16 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.

.17 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.

.2 Reference Standards:

.1 Public Services and Procurement Canada (PSPC)

.1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.

.2 CRD Waste Management Market Research Report (available from PSPC's Environmental Services).

.3 Sustainable Development Strategy 2007-2009: Target 2.1 Environmentally Sustainable Use of Natural Resources.

.1 Real Property projects over $1 million and in communities where industrial recycling is supported, implementation of CRD waste management practices will be completed, with waste materials being reused or recycled.

.2 Contractually ensure resources used in construction or maintenance are consumed and recovered in a sustainable manner.

1.3 DOCUMENTS

.1 Post and maintain in visible and accessible area at job site, one copy of following documents:

.1 Waste Reduction Workplan (Schedule B).

.2 Waste Source Separation Program.

.3 Schedules B completed for project.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:

.1 1 electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.

.2 1 electronic copy of Cost/Revenue Analysis Workplan (CRAW): Schedule E.

.3 1 electronic copy of Waste Source Separation Program (WSSP).

.3 Prepare and submit on weekly basis, throughout project or at intervals agreed to by Departmental Representative the following:

.1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.

.2 Updated Waste Materials Tracking form (Schedule D).

.3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.4 Submit prior to final payment the following:

.1 Waste Diversion Report, indicating final quantities by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials (See Schedule C).

.2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.5 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.

.2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.

.3 WRW should include but not limited to:

.1 Applicable regulations.

.2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.

.3 Destination of materials identified.

.4 Deconstruction/disassembly techniques and schedules.

.5 Methods to collect, separate, and reduce generated wastes.

.6 Location of waste bins on-site.

.7 Security of on-site stockpiles and waste bins.

.8 Protection of personnel, sub-contractors.

.9 Clear labelling of storage areas.

.10 Training plan for contractor and sub-contractors.

.11 Methods to track and report results reliably (Schedule D).

.12 Details on materials handling and removal procedures.

.13 Recycler and reclaimer requirements.

.14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.

.15 Requirements for monitoring on-site wastes management activities.

.4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.5 Post WRW or summary where workers at site are able to review content.

.6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

1.6 WASTE SOURCE SEPARATION PROGRAM (WSSP)

.1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.

.2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.

.3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.5 Locate containers to facilitate deposit of materials without hindering daily operations.

.6 Provide training for sub-contractors and workers in handling and separation of materials for reuse and/or recycling.

.7 Locate separated materials in areas which minimizes material damage.

.8 Clearly and securely label containers to identify types/conditions of materials accepted and assist sub-contractors and workers in separating materials accordingly.

.9 Monitor on-site waste management activities by conducting periodic site inspections to verify state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.

.10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

1.7 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

1.8 WASTE PROCESSING SITES

.1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.9 QUALITY ASSURANCE

.1 After award of Contract, a mandatory site examination will be held for this Project for Contractor responsible for construction, renovation demolition/deconstruction waste management.

.1 Date, time and location will be arranged by Departmental Representative.

.2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting. Written bi-weekly Waste Diversion Report summary to be provided by Waste Management Coordinator (refer to the Waste Diversion Report form in Schedule C and Waste Materials Tracking form in Schedule D).

1.10 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect structural components not removed and salvaged materials from movement or damage.

.4 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

.5 Protect surface drainage, mechanical and electrical from damage and blockage.

.6 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.7 Separate and store materials produced during project in designated areas.

.8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off site processing facility for separation.

.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

.4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.11 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.12 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW and WSSP.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of salvaged/recovered/reusable/recyclable materials is not permitted.

3.4 WASTE DIVERSION REPORT

.1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:

.1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.

.2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Workplan and explain variances.

.1 Supporting documentation.

.2 Waybills and tracking forms.

.3 Description of issues, resolutions and lessons learned.

3.5 WASTE REDUCTION WORKPLAN (WRW)

.1 Schedule B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (units) Projected	Actual	(5) Recycled Amount (unit) Projected	Actual	(6) Material(s) Destination
Wood and Plastics Material Description							
Chutes							

Warped Pallet Forms							
Plastic Packaging							
Card- board Packaging							
Other							
Wood							
Metal							
Other							

3.6 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Schedule E - Cost/Revenue Analysis Workplan (CRAW)

(1) Material Description	(2) Total Quantity (unit)	(3) Volume (cum)	(4) Weight (cum)	(5) Disposal Cost/Credit $(+/-)	(6) Category Sub-Total $(+/-)
Wood					
Steel					
		(7) Cost (-) / Revenue (+)			$

3.7 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule G - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Alberta	Alberta Environmental Protection Petroleum Plaza, South Tower 9915 – 108th Street Edmonton AB T5K 2G8	403-427-2739	
	Alberta Special Waste Management Corporation Pacific Plaza, Suite 610, 10909 Jasper Avenue NW Edmonton AB T5J 3L9	403-422-5029	403-428-9627

3.8 SCHEDULES

.1 Following Schedules are attached to this Specification:

.1 Waste Reduction Workplan Form - Schedule B.

.2 Cost/Revenue Analysis Workplan - Schedule E.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor’s inspection and submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative's Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted, balanced and fully operational.

.4 Operation of systems: demonstrated to Correctional Service Canada's personnel.

.5 Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Departmental Representative.

.6 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Environmental Protection Act (CEPA)

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review warranty requirements, manufacturer's installation instructions.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 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.

.1 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.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on CD.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Departmental Representative and 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 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.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.6 PROJECT RECORD DOCUMENTS

.1 Maintain, 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 Report, System Components List c/w Commissioning Verification Forms and Check Sheets and Commissioning Issues/Resolution Log

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.1 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.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.2 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 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.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.8 FINAL SURVEY

.1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 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.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 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 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.

.14 Include test and balancing reports as specified in Section 01 91 13 - General Commissioning (Cx) Requirements.

.15 Additional requirements: as specified in individual specification sections.

1.10 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

.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.

.5 MAINTENANCE MATERIALS

.1 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 site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

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

.2 Extra Stock 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 site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

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

.3 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 site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.4 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

.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 for review by Departmental Representative.

1.12 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 Departmental Representative 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, submit upon acceptance of work and 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 Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, pumps, motors.

.3 Provide list for each warranted equipment, item, and feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

1.14 RECORD OF SERVICE WORK

.1 Specific Requirements

.1 Scope of Work

.1 Provide a record of service work for each service call request made during the warranty period.

.2 Submittal Format

.1 Each time service work is performed, record the following:

.1 Date and time service call request was made by the Departmental Representative

.2 Date and time service call was first responded to by the service company

.3 Name of Service Company and personnel assigned to the service call

.4 Description of the system behavior prompting a service call request

.5 Description of the specific equipment or components requiring maintenance

.6 Description of the work required to be performed to resolve the service request

.7 Summary of material and time spent required to resolve the service request

.8 Time and date of service call completion

.3 Submittal Procedure

.1 Consolidate all Records of Service Work one month before the end of the warranty period and provide to the Departmental Representative for inclusion in the Operations and Maintenance Manual

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's and Correctional Service Canada personnel two weeks prior to date of final inspection.

.2 Correctional Service Canada: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:

.1 Verify conditions for demonstration and instructions comply with requirements.

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation.

.4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.4 Demonstration and Instructions:

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled agreed upon times, at the equipment location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:

.1 23 11 23 – Natural Gas Piping – 2 hours of instruction

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two 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 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Correctional Service Canada's personnel.

.2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Acronyms:

.1 AFD - Alternate Forms of Delivery, service provider.
.2 BOD – Basis of Design
.3 BMM - Building Management Manual.
.4 CA – Commissioning Authority
.5 Cx - Commissioning.
.6 EMCS - Energy Monitoring and Control Systems.
.7 O&M - Operation and Maintenance.
.8 OPR – Owner's Project Requirements
.9 PI - Product Information.
.10 PV - Performance Verification.
.11 TAB - Testing, Adjusting and Balancing.

1.2 DEFINED TERMS

.1 The definitions of this section are not meant to supersede definitions of the Building Code, Standards, or Contract documents and apply only to these Contract Documents.

.2 Basis of Design means documentation of the primary thought processes and assumptions behind design decisions that were made to meet the owner's project requirements (OPR). The basis of design describes the systems, components, conditions, and methods chosen to meet the OPR.

.3 Commissioning means the coordination of all activities related to the design, construction, start-up, verification, performance testing, and optimization of equipment and systems to ensure that the facility operates in conformity with the design intent.

.4 Commissioning Authority means an individual or company identified by an owner to lead the commissioning team in the implementation of the commissioning process.

.5 Commissioning Check Sheets means the forms used to document the inspections, tests, etc., performed during the commissioning process.

.6 Commissioning Plan means the overall document that outlines the organization, scheduling, resources, activities, documentation, etc., pertaining to the commissioning process.

.7 Design Intent means the performance that a design is intended to achieve in order to meet the OPR and BOD.

.8 Functional Performance Testing means a full range of tests under actual load, conducted to verify that specific systems, subsystems, components, and interfaces between systems to confirm given criteria. These tests are typically used to verify that a sequence op operation is correctly implemented and that the design intent has been met. They are typically performed after equipment is placed in full operation.

.9 Integrated Systems Testing means work that is performed by the Integrated Testing Coordinator after commissioning is complete to prove that individual systems operate and perform to the design intent and specification together with other commissioned systems.

.10 Owner's Project Requirements means a dynamic document that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the owner. The OPR should cite the specific measurable goals for the owner's objective to the greatest extent possible.

.11 Performance Testing means the full range of tests and checks carried out to determine whether components, subsystems, systems, and interfaces between systems function in accordance with the design intent. Performance testing includes modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

.12 Third Party means an individual/contractor who is independent of the design team and general contractor and authorized by the owner to act as a commissioning authority.

1.3 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:

.1 Equipment start-up, testing, adjusting, balancing, and performance verification, and general quality control checking shall be provided by the installing Contactor independent and separate from Commissioning Activities.

.2 All specified Action and Information and Closeout Submittals of other Sections shall be provided separately from any Commissioning activity or Commissioning Submittal.

.3 Complete and submit all Action and Information and Closeout Submittals prior to performing Commissioning activities.

.4 Commissioning documentation shall be submitted separately from the submittals required by other Sections.

.2 Cx 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 BMM.

.3 Effectively train O&M staff.

.3 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.

.4 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.4 COMMISSIONING OVERVIEW

.1 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.

.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 Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components, systems, and integrated systems have been fully commissioned and functional as per design intent to meet contract specification and project functional and operational requirements.

.3 O&M training session for Operational and Maintenance staff has been completed.

.4 Final O&M and Training Manual has been received, reviewed and approved by Departmental Representative for suitability.

.5 Successful completion of life safety support systems tests and after meeting all requirements of the authority having jurisdiction.

1.5 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.

1.6 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents confirm by writing 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 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems are complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.7 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.

1.8 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Submit no later than 4 weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 4 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 4 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.9 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

.2 Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.10 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 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.

1.11 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage CA to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 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.

1.13 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days' notice prior to commencement.

.2 Departmental Representative to witness start-up and testing.

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

1.14 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Departmental Representative.

.3 Arrange for Departmental Representative to witness tests.

.4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

.2 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.

.3 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.

.4 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.

1.15 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 and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 Maintain Commissioning Issues/Resolutions Log during operational testing.

.5 System PV: include repetition of tests after correcting deficiencies.

.6 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document required tests on approved PV forms.

.5 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 removed from site and replaced with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.16 START-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 Correctional Service Canada to repeat start-up at any time.

1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.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.

1.18 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.

1.19 START OF COMMISSIONING

.1 Notify Departmental Representative and Correctional Service Canada at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.20 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.21 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under 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.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.22 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.23 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate 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 days of test and with Cx report.

1.24 COMMISSIONING CONSTRAINTS

.1 Since access into secure or sensitive areas will be very difficult in occupied, operational facilities, it is necessary to complete Cx of weather, and seasonal sensitive equipment

and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.25 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather 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.

1.26 EXTENT OF VERIFICATION

.1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.

.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.

1.27 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative's approval.

.2 Repetition of second verification again fails to receive approval.

.3 Departmental Representative deems Contractor's request for second verification was premature.

1.28 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.29 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Record deficiencies in Commissioning Issues/Resolutions Log.

.3 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.

1.30 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.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 Departmental Representative.

1.31 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.

1.32 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

1.33 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.34 OCCUPANCY

.1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.35 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.36 PERFORMANCE 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.

1.37 DEPARTMENTAL 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.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Underwriters' Laboratories of Canada (ULC)

.2 Canadian Standards Association (CSA)

.1 CSA Z320-11 – Building Commissioning Standard

1.2 GENERAL

.1 Provide fully functional:

.1 Systems, equipment and components meet user's functional requirements before date of acceptance and operate consistently at peak efficiencies and within specified energy budgets under normal loads.

.2 Facility user and O&M personnel have been fully trained in aspects of installed systems.

.3 Optimized life cycle costs.

.4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

.1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to O&M, process and administration of Cx.

.4 Describes process of verification of how built works meet Departmental Representative design requirements.

.5 Produces a complete functional system prior to issuance of Certificate of Occupancy.

.6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 Overview of Cx.

.2 General description of elements that make up Cx Plan.

.3 Process and methodology for successful Cx.

.4 Acronyms:

.1 CA – Commissioning Authority

.2 Cx - Commissioning.

.3 BMM - Building Management Manual.

.4 EMCS - Energy Monitoring and Control Systems.

.5 MSDS - Material Safety Data Sheets.

.6 PI - Product Information.

.7 PV - Performance Verification.

.8 TAB - Testing, Adjusting and Balancing.

.9 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.3 DEVELOPMENT OF 100% CX PLAN

.1 95% Cx Plan to be completed by the Departmental Representative and transmitted to the contractor.

.2 Cx Plan to be 100% completed within 4 weeks of award of contract to take into account:

.1 Approved shop drawings and product data.

.2 Approved changes to contract.

.3 Contractor's project schedule.

.4 Cx schedule.

.5 Contractor's, sub-contractor's, suppliers' requirements.

.6 Project construction team's and Cx team's requirements.

.3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.4 REFINEMENT OF CX PLAN

.1 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Approved design and construction changes.

.2 Revise, refine and update every 4 weeks during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.2 Project Manager will select Cx Team consisting of following members:

.1 PSPC Design Quality Review Team: during construction, may conduct periodic site reviews to observe general progress.

.2 Departmental Representative: ensures Cx activities are carried out to ensure delivery of a fully operational project including:

.1 Define the Basis of Design

.2 Review and approval of Cx documentation from an operational perspective.

.3 Monitoring Cx activities, training, development of Cx documentation.

.4 Witnessing, certifying accuracy of reported results.

.5 Witnessing and certifying TAB and other tests.

.6 Developing BMM.

.7 Ensuring implementation of final Cx Plan.

.8 Ensuring implementation of Training Plan.

.9 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.

.10 Protection of health, safety and comfort of occupants and O&M personnel.

.11 Work closely with members of Cx Team.

.3 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:

.1 Integration of Cx activities into project schedule.

.2 Testing.

.3 TAB.

.4 Performance of Cx activities.

.5 Delivery of training and Cx documentation.

.6 Assigning one person as point of contact with Departmental Representative and PSPC Cx Manager for administrative and coordination purposes.

.4 Contractor's Cx agent implements specified Cx activities including:

.1 Prepare 100% Cx Plan.

.2 Update Cx plan throughout Cx activities.

.3 Hold Cx meetings.

.4 Verify the Basis of Design.

.5 Demonstrations.

.6 Training.

.7 Testing.

.8 Preparation, submission of test reports.

.9 Preparation, submission of commissioning reports.

.5 Facility Operations and Maintenance Staff:

.1 Attend commissioning meetings and training sessions.

.2 Support the commissioning process.

1.6 CX PARTICIPANTS OVERVIEW

.1 Employ the following Cx participants to verify performance of equipment and systems:

.1 Installation contractor/subcontractor:

.1 Equipment and systems except as noted.

.2 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

.3 Ensure that Cx participant:

.1 Could complete work within scheduled time frame.

.2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:

.1 Natural gas Pressure Reducing Valves, Pressure Relief Valves, Meters and Pressure Gauges.

.2 Changes to control strategies beyond level of training provided to O&M personnel.

.4 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 21 days prior to starting date of Cx for review and approval.

1.7 RESPONSIBILITY OF THE MECHANICAL CONTRACTOR

.1 Provide start-up for all natural gas equipment and systems, except for the building automation control system.

.2 Assist and cooperate with the TAB contractor and CA by:

.1 Putting all plumbing equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

.2 Providing pressure taps according to the Construction Documents for TAB and commissioning testing.

.3 Prepare a preliminary schedule for Division 23 piping systems testing, flushing, purging and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.

.4 Notify the CA depending on protocol, when piping systems testing, flushing, purging, cleaning, start-up of each piece of equipment and TAB will occur. Be responsible to notify the CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

.5 The above shall include the following systems: Natural Gas and propane systems.

1.8 RESPONSIBILITIES OF THE TAB CONTRACTOR

.1 Six weeks prior to starting TAB, submit to the Departmental Representative the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Departmental Representative will approve the site technician's qualifications for this project.

.2 Submit the outline of the TAB plan and approach for each system and component to the CA and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.

.3 The submitted plan will include:

.1 Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.

.2 All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

.3 Discussion of what notations and markings will be made on the piping drawings during the process.

.4 Final test report forms to be used.

.5 Detailed step-by-step procedures for TAB work for each system and issue

.6 List of all flow, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

.7 Details of how total flow will be determined.

.8 The identification and types of measurement instruments to be used and their most recent calibration date.

.9 Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.

.10 Details regarding specified deferred or seasonal TAB work.

.11 Details of any specified false loading of systems to complete TAB work.

.12 Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

.13 Plan for formal progress reports (scope and frequency).

.14 Plan for formal deficiency reports (scope, frequency and distribution).

.4 A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and Departmental Representative at least twice a week.

.5 Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.

.6 Provide the CA with any requested data, gathered, but not shown on the draft reports.

.7 Provide a final TAB report for the CA with details, as in the draft.

.8 Conduct functional performance tests and checks on the original TAB as specified for TAB in Section 23 05 93.

1.9 EXTENT OF CX

.1 Commission mechanical systems and associated systems:

.1 Natural Gas System:

.1 Pressure Reducing Valves, Isolation Valves, Pressure Relief Valves, Meters, Pressure Gauges, Piping.

.2 Associated Systems:

.1 Concrete Slab, Additional Groundworks, Bollards, Enclosure.

.2 Review Preventative Maintenance Program

.3 Review Standard Operating Procedures (SOP)

.4 Review Contractor's and sub-contractor's as built drawings.

1.10 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:

.1 Warranties.

.2 Project record documentation.

.3 Inventory of spare parts, special tools and maintenance materials.

.4 Maintenance Management System (MMS) identification system used.

.5 WHMIS information.

.6 MSDS data sheets.

1.11 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx Specifications.

.2 Startup, pre-Cx activities and documentation for systems, and equipment.

.3 Completed installation checklists (ICL).

.4 Completed product information (PI) report forms.

.5 Completed performance verification (PV) report forms.

.6 Completed Commissioning Issues/Resolutions Log.

.7 Results of Performance Verification Tests and Inspections.

.8 Description of Cx activities and documentation.

.9 Description of Cx of integrated systems and documentation.

.10 Tests of following witnessed by Departmental Representative:

.1 Pressure Reducing Valves

.2 Isolation Valves

.3 Pressure Relief Valves

.4 Meters

.5 Pressure Gauges

.11 Tests performed by Owner/User.

.12 Training Plans.

.13 Cx Reports.

.14 Prescribed activities during warranty period.

.4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.

1.12 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:

.1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.

.2 Departmental Representative to use approved check lists.

.3 Include completed documentation with Cx report.

.4 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections.

.5 Include completed documentation in Cx report.

.2 Pre-Cx activities - MECHANICAL:

.1 Natural Gas equipment and systems:

.1 "Bump" each item of existing and new gas fired equipment in its "stand-alone" mode.

.2 At this time, complete pre-start-up checks and complete relevant documentation.

.3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

.4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.

1.13 START-UP

.1 Start up components, equipment and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:

.1 Pressure Reducing Valves

.2 Isolation Valves

.3 Pressure Relief Valves

.4 Meters

.5 Pressure Gauges

.6 Overall Natural Gas System including existing and new equipment.

.3 Performance Verification (PV):

.1 Approved Cx Agent to perform.

.1 Repeat when necessary until results are acceptable to Departmental Representative.

.2 Use procedures modified generic procedures to suit project requirements.

.3 Departmental Representative to witness and certify reported results using approved PI and PV forms.

.4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.

.5 Departmental Representative reserves right to verify up to 30% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

1.14 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative.

.2 Departmental Representative to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 Departmental Representative to witness, certify reported results of, Cx activities.

.5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.15 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

.1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative.

.2 Tests to be witnessed by Departmental Representative and documented on approved report forms.

.3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.

.4 Departmental Representative reserves right to verify percentage of reported results.

.5 Integrated systems to include:

.1 Natural Gas System and associated systems

.6 Identification:

.1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Contractor, Project Manager and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PSPC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.16 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 PERFORMANCE VERIFICATION (PV) REPORT

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.19 COMMISSIONING ISSUES/RESOLUATIONS LOG

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.20 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

.1 Because of risk assessment, complete Cxof , weather and seasonal-sensitive equipment and systems prior to heating season.

1.21 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review: 4 weeks after contract award, and before construction starts.

.3 Cx agents' credentials: 4 weeks after award of contract.

.4 Cx procedures: 4 weeks after award of contract.

.5 Cx Report format: 4 weeks after contract award.

.6 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.

.7 Notification of intention to start TAB: 21 days before start of TAB.

.8 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.9 Notification of intention to start Cx: 21 days before start of Cx.

.10 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.

.11 Identification of deferred Cx.

.12 Implementation of training plans.

.13 Cx reports: immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.

.3 In Cx schedule for verification of performance in all seasons (actual or simulated) and wear conditions.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Departmental Representative, Contractor, and Contractor's Cx agent will monitor progress of Cx against this schedule.

1.22 CX REPORTS

.1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.23 ACTIVITIES DURING WARRANTY PERIOD

.1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:

.1 Fine tuning of natural gas system

1.24 TESTS TO BE PERFORMED BY DEPARTMENTAL REPRESENTATIVE/USER

.1 None is anticipated on this project.

1.25 TRAINING PLANS

.1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.26 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.2 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative’s approval.

1.3 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

1.4 COMMISSIOING ISSUES/RESOLUTIONS LOG

.1 Commissioning Issues/Resolutions Log to be used to track issues identified by Cx agent during the commissioning process:

.1 Cx agent to assign a tracking number, name, description and record the date that the issue was identified.

.2 Cx agent to assign issue resolution responsibility to the appropriate contractor and record the date of notification.

.3 Contractor to action and communicate the resolution action to the Cx agent for addition to the log.

.4 Cx agent to verify that the issue has been resolved.

.5 Date of resolution to be recorded by the Cx agent.

.6 Contractor to ensure all identified issues are resolved prior to completion of the commissioning process.

.7 Completed log to be provided to the Departmental Representative for approval.

1.5 SAMPLES OF COMMISSIONING FORMS

.1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.

.2 Revise items on Commissioning forms to suit project requirements.

.3 Samples of Commissioning forms will be attached to this section.

.4 The following systems components list identifies the components to be commissioned and the relevant sample commissioning PV forms:

.1 Table 1.5.4.1 – Systems Components List

Component	**Pre-Functional Performance Verification Forms**	**Functional Performance Verification Forms**
Pressure Regulating Valves	Gas Piping & Valving Pre-Functional Test Report	PRV Functional Test Report
Pressure Relief Valves	Gas Piping & Valving Pre-Functional Test Report	Pressure Relief Valve Functional Test Report
Isolation Valves	Gas Piping & Valving Pre-Functional Test Report	Isolation Valve Functional Test Report
Piping	Gas Piping & Valving Pre-Functional Test Report	N/A
Natural Gas Meter	Gas Piping & Valving Pre-Functional Test Report	Gas Meter Functional Test Report
Pressure Gauges	Gas Piping & Valving Pre-Functional Test Report	Pressure Gauge Functional Test Report
Accessibility	Gas Piping & Valving Pre-Functional Test Report	N/A
Concrete Slab	Concrete Slab Pre-Functional Test	N/A

	Report	
Additional Groundworks	Additional Groundworks Pre-Functional Test	N/A
Bollards	Bollards Pre-Functional Test	N/A
Enclosure	Enclosure Pre-Functional Report	N/A

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

.1 When additional forms are required but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.

.1 Additional commissioning forms to be in same format as provided by Departmental Representative

1.7 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

.1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.

.2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.3 Confirm operation as per design criteria and intent.

.4 Identify variances between design and operation and reasons for variances.

.5 Verify operation in specified normal and emergency modes and under specified load conditions.

.6 Record analytical and substantiating data.

.7 Verify reported results.

.8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.

.9 Submit immediately after tests are performed.

.10 Reported results in true measured SI unit values.

.11 Provide Departmental Representative with originals of completed forms.

.12 Maintain copy on site during start-up, testing and commissioning period.

.13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 91 51 - Building Management Manual (BMM).

1.8 LANGUAGE

.1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Gas Piping & Valving Pre-Functional Test Report

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Pipe supports installed to suit CSA B149.1 requirement	☐	
Pipe fittings complete and pipes properly supported	☐	
Pipes properly labeled to suit CSA B149.1 requirement and specifications	☐	
Confirm all flanged joints are square and true	☐	
Confirm all painting is completed to suit specification	☐	
Pressure Reducing Valves Installed	☐	
Pressure Relief Valves Installed	☐	
Pressure Relief Valves Verified Open	☐	
Isolation valves installed	☐	
Gas meter installed	☐	
Pressure gauges installed	☐	
Confirm that all valves are installed in the correct flow direction	☐	
Confirm Vendor manuals are available for all system components	☐	

Gas Piping & Valving Pre-Functional Test Report

SNC·LAVALIN

All valves and accessories are installed in an easily accessible location	☐	
Purging and cleaning plan submitted and approved	☐	
Piping system properly purged, cleaned, and temporary piping removed	☐	
Piping pressure tested according to contract documents	☐	
No leaking apparent around pipe fittings	☐	
Valve labels permanently affixed	☐	
Valves installed in proper direction	☐	
Valves installed in normal position (normally open or normally closed) as indicated on mechanical drawings	☐	
No apparent leaks on valves	☐	
Valves stroke fully and easily, and spanning is calibrated	☐	
Pressure gauge readings are as expected	☐	
Confirm flanged piping has been used where specified	☐	

Additional Groundworks Pre-Functional Test

SNC·LAVALIN

Owner:			
Project:		**P.N.:**	
Location:		**Tag:**	
Description:			
Checked By:		**Date:**	
Verified By:		**Date:**	

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Structural Backfill			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm structural backfill compaction percentages	☐	
Confirm groundworks are level	☐	
Confirm gravel installation dimensions and general installation quality	☐	
Inspect area for general cleanliness	☐	
Inspect asphalt repairs (if required), ensure asphalt is level and joints are sealed	☐	

Bollard Pre-Functional Test

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Pipe diameter			
Paint Specification			
Reflective Tape Specification			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm bollard number and dimensions	☐	
Confirm bollard buried depth	☐	
Inspect paint and confirm colour	☐	
Inspect reflective tape installation	☐	
Confirm bollards to not hinder access to enclosure	☐	

Enclosure Pre-Functional Test

SNC·LAVALIN

Owner:			
Project:		**P.N.:**	
Location:		**Tag:**	
Description:			
Checked By:		**Date:**	
Verified By:		**Date:**	

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Chain link fence fabric			
Fence posts/braces/rails			
Tension Wire			
Tension bar			
Gates			
Grounding Rod			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm fence dimensions	☐	
Confirm fence fabric tension testing	☐	
Inspect tension wire installation	☐	
Confirm gate swing direction and obstruction free operation	☐	
Confirm equipment can be freely accessed from within the enclosure	☐	
Confirm padlock operation	☐	

Concrete Slab Pre-Functional Test

SNC·LAVALIN

Owner:			
Project:		**P.N.:**	
Location:		**Tag:**	
Description:			
Checked By:		**Date:**	
Verified By:		**Date:**	

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Concrete Mix			
Rebar Specification			
Sealing Compounds			
Curing Compounds			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm installation of foam	☐	
Confirm slab thickness	☐	
Confirm slab size	☐	
Confirm concrete mix design	☐	
Confirm concrete mix quality tests	☐	
Confirm rebar specification	☐	
Confirm bearing capacity of material below and to perimeter of the concrete slab	☐	
Confirm concrete finishing material specification	☐	

Gas Meter Functional Test

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm meter is located so that it can be easily read	☐	
Confirm meter pressure rating	☐	
Confirm meter size and capacity	☐	
Confirm meter end connections	☐	
Confirm installation of isolation valves and meter bypass	☐	
Confirm meter calibration certificate	☐	
Confirm gas system operates within the gas meter flow range	☐	
Perform test point flow check at three set-points	☐	
No leaking apparent	☐	

Isolation Valve Operational Test Report

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm valve pressure rating	☐	
Confirm valve size	☐	
Confirm valve end connections	☐	
Confirm valve material	☐	
Confirm valve closes	☐	
Confirm valve fully opens	☐	
Confirm gas supply is isolated	☐	
No leaking apparent	☐	
Confirm valve is in its normal position i.e. normally open or normally closed	☐	

Pressure Gauge Functional Test

SNC·LAVALIN

Owner:			
Project:		**P.N.:**	
Location:		**Tag:**	
Description:			
Checked By:		**Date:**	
Verified By:		**Date:**	

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Ensure gauge is located such that it can be easily read	☐	
Confirm gauge pressure rating	☐	
Confirm gauge size and capacity	☐	
Confirm gauge end connections	☐	
Confirm installation of gauge isolation valve	☐	
Confirm gauge calibration certificate	☐	
Confirm gas system operates within the gauge pressure range	☐	
Perform test point pressure check at three set-points	☐	
No leaking apparent	☐	

Pressure Relief Valve Functional Test

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm valve pressure rating	☐	
Confirm valve size	☐	
Confirm valve end connections	☐	
Confirm valve material	☐	
Check pressure settings	☐	
Set pressure set-point	☐	
Alter flowrate and confirm pressure set-point is maintained	☐	
Confirm failure mode as per specification	☐	
No leaking apparent	☐	

Pressure Regulating Valve Functional Test

SNC·LAVALIN

Owner:

Project: **P.N.:**

Location: **Tag:**

Description:

Checked By: **Date:**

Verified By: **Date:**

Technical Data:

	SPECIFIED	SHOP DRAWINGS	INSTALLED
Manufacturer			
Model #			
Serial Number			
Type/Class			
Flow (m3/s)			
Static Pressure (Pa)			

Installation Checks:

	OK?	COMMENTS
Perform visual inspection	☐	
Confirm valve pressure rating	☐	
Confirm valve size	☐	
Confirm valve end connections	☐	
Confirm valve material	☐	
Check pressure controller settings	☐	
Set pressure set-point	☐	
Confirm control valve closes	☐	
Confirm control valve fully opens	☐	
Confirm pressure set-point is maintained	☐	
Alter flowrate and confirm pressure set-point is maintained	☐	
Confirm failure mode as per specification	☐	
No leaking apparent	☐	

SNC·LAVALIN

01 91 33.02 Commissioning Forms Appendix 2 - Issues/Resolutions Log

Commissioning Issues Log

Issue Number	Issue	Issue Description	Date Identified	Contractor Responsibility	Date Contractor Notified	Action Taken	Issue Resolution (Open / Closed)	Resolution Date
1.1	**Enter the issue name here.**	Enter a detailed description of the issue here.	Date.	Enter the contractor responsible for corrective action here.	Date.	Enter a description of the corrective action taken.	Is the issue currently open or closed?	Enter the date of resolution here.

Part 1 General

1.1 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.2 INSTRUCTORS

.1 Departmental Representative will provide:

.1 Descriptions of systems.

.2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-Up, operation, shut-down of equipment, components and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.3 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis and trouble-shooting.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.4 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 Management Manual.

.5 TAB and PV Reports.

.3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

.1 Transparencies for overhead projectors.

.2 Multimedia presentations.

.3 Manufacturer's training videos.

.4 Equipment models.

1.5 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 2 hours in length.

.3 Training to be completed prior to acceptance of revised systems in the facility.

1.6 SYSTEM DEMONSTRATION AND TRAINING REQUIREMENTS

.1 General Requirements:

.1 This section supplements the System Demonstration and Training requirements of:

.1 Section 01 79 00 – Demonstration and Training

.2 Supplemental System Demonstration and Training Plan Requirements

.1 Submittal Procedure:

.1 Submit one (1) copy to the Commissioning Authority for review a minimum of twenty (20) working days prior to the first planned training session date.

.2 Incorporate the Commissioning Authority’s comments into the System Demonstration and Training Plan prior to submitting for the Departmental Representative’s review.

.2 Format:

.1 Make revisions to the System Demonstration and Training Plan as required by the Commissioning Authority.

.3 Acceptance Criteria:

.1 The System and Demonstration Training Plan shall be considered complete upon written acceptance by the Commissioning Authority.

.3 Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

.4 The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

.5 Training shall occur after functional testing is complete, unless approved otherwise by the Departmental Representative.

.6 Duration of Training: The mechanical contractor shall provide training on each piece of equipment.

.7 The TAB contractor shall have the following training responsibilities:

.1 TAB shall meet for one day with facility staff after completion of TAB and instruct them on the following:

.1 Go over the final TAB report, explaining the layout and meanings of each data type

.2 Discuss any outstanding deficient items in design

.3 Discuss any temporary settings and steps to finalize them for any areas that are not finished

.4 Other salient information that may be useful for facility operations, relative to TAB

1.7 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities,

.2 Coordination among instructors,

.3 Quality of training, training materials,

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

1.8 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Functional requirements.

.2 Review of system layout, equipment, components and controls.

.3 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.4 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

.5 Maintenance and servicing.

.6 Trouble-shooting diagnosis.

.7 Inter-Action among systems during integrated operation.

.8 A review of the written Operation and Maintenance Manuals with an emphasis on the safe and proper operating requirements, preventative maintenance, and special tools needed and spare parts inventory suggestions.

.9 Discussion of relevant health and safety issues and concerns

.10 Discussion of warranties, guarantees, and emergency contact information

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Acronyms:

.1 BMM - Building Management Manual.

.2 Cx - Commissioning.

.3 HVAC - Heating, Ventilation and Air Conditioning.

.4 PI - Product Information.

.5 PV - Performance Verification.

.6 TAB - Testing, Adjusting and Balancing.

.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.4 GENERAL INFORMATION

.1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.

.2 Summary of mechanical systems installed and commissioned - as indicated in Section 1.4 of BMM.

.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.

.3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.

.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.

.5 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.

.6 Operating and maintenance manual - Section 3.2 of BMM.

.7 Final commissioning plan as actually implemented.

.8 Completed commissioning checklists.

.9 Commissioning test procedures employed.

.10 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.

.11 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:

.1 Recommended maintenance procedures and schedule.

.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:

.1 General:

.1 Finalized commissioning plan.

.2 WHMIS information manual.

.3 Approved "as-built" drawings and specifications.

.4 Procedures used during commissioning.

.5 Cross-Reference to specification sections.

.2 Mechanical:

.1 Installation permits, inspection certificates.

.2 Piping pressure test certificates.

.3 TAB and PV reports.

.4 Charts of valves.

.5 Copies of posted instructions.

.2 Assist Departmental Representative with preparation of BMM.

1.7 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Departmental Representative's approval before starting Work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CAN/CSA O86-14, Engineering Design in Wood.

.3 CSA O121-17, Douglas Fir Plywood.

.4 CSA O151-17, Canadian Softwood Plywood.

.5 CSA O153-13, Poplar Plywood.

.6 CAN/CSA O325.0-16, Construction Sheathing.

.7 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.

.8 CSA S269.1-16, Falsework and Formwork.

.9 CAN/CSA S269.3-M92 (R2013), Concrete Formwork.

.2 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701-17, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in formwork liners and coatings and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with 01 35 29.06 - Health and Safety Requirements.

.3 Submit shop drawings for formwork.

.1 Prepare Shop Drawings in accordance with CSA S269.1 for formwork and falsework.

.4 Sustainable Design Submittals:

.1 Low-Emitting Materials:

.1 Submit listing of form release agents used in building, comply with VOC and chemical component limits or restriction requirements.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 61 00 – Common Product Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and according to 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, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect formwork from damages.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Materials and resources in accordance with Division 01.

.2 Verification requirements in accordance with Division 01.

.3 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, CSA O153, CAN/CSA O86, CSA O437 Series.

.2 Rigid insulation board: to CAN/ULC-S701.

.4 Form ties:

.1 For concrete not designated 'Architectural': removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes minimum 25 mm diameter in concrete surface.

.5 Form release agent: Proprietary, nonvolatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non-petroleum containing, biodegradable, low VOC, non-toxic.

.6 Falsework materials: to CSA S269.1.

.7 Sealant: to Section 03 35 00 – Concrete Finishing.

Part 3 Execution

3.1 EXAMINATION

.1 Before starting this work, examine work done by others which affects this work.

.2 Notify the Departmental Representative of any conditions which would prejudice proper completion of this work.

.3 Commencement of work implies acceptance of existing conditions.

3.2 FABRICATION AND ERECTION

.1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Do not place shores and mud sills on frozen ground.

.6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.7 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.8 Align form joints and make watertight.

.1 Keep form joints to minimum.

.9 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

.13 Arrange forms to allow removal without removal of principal shores, where these are required to remain in place.

.14 Provide falsework to ensure stability of formwork. Prop or strengthen all previously constructed parts liable to be overstressed by construction loads.

.15 Check and readjust formwork to required lines and levels during placing of concrete.

3.3 INSERTS/EMBEDDED ITEMS/OPENINGS

.1 Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through concrete members.

.2 Accurately locate and set in place items which are to be cast directly into concrete.

.3 Coordinate work of other Sections and co operate with trades involved in forming openings, slots, recesses, chases, and setting sleeves, bolts, anchors and other inserts.

.4 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

.5 Close temporary ports or openings with tight fitting panels, flush with inside face of forms, neatly fitted so no leakage occurs and to provide uniform surface on exposed concrete.

3.4 TOLERANCE

.1 Construct formwork to produce concrete with dimensions, lines and levels within the following tolerances. Tolerances are not cumulative.

.2 Deviation from vertical line: 6mm in 3m, 9mm in 6m and 20mm in 12m or more.

.3 Deviation from flat surface, for walls and floors: 3mm in 3m.

.4 Deviation from horizontal line: 6mm in 3m.

.5 Deviation of linear building lines from drawings and position of columns, walls and partitions: 5 mm.

.6 Deviation in cross sectional dimensions of columns and beams, and in thickness of slabs and walls: plus, or minus 6mm.

3.5 FIELD QUALITY CONTROL

.1 Inspect and check completed formwork, falsework, shoring and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties and parts are secured.

.2 Inform Departmental Representative when formwork is complete and has been cleaned, to allow for inspection. Departmental Representative's inspection will be for verification that earth bottoms are clean, that forms are clean and free from debris.

3.6 REMOVAL AND RESHORING

.1 Remove formwork when concrete has reached 75 % of its 28-day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.2 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Space reshoring in each principal direction at not more than 1500 mm apart.

.4 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 Measure reinforcing steel in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.

.2 No measurement made under this Section.

.1 Include reinforcement costs in items of concrete work in Section 03 30 00.09 - Cast-In-Place Concrete.

1.2 REFERENCE STANDARDS

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.2 ASTM International (ASTM)

.1 ASTM A1064/A1064M-18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 CSA Group (CSA)

.1 CSA A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA A23.3-14, Design of Concrete Structures.

.3 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.

.4 CSA G40.20/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2018, Manual of Standard Practice.

.5 National Research Council Canada (NRC)

.1 National Building Code of Canada 2019 – Alberta Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Section 01 31 19 - Project Meetings, convene pre-installation meeting one week prior to beginning of concrete works.

.1 Ensure site supervisor, Departmental Representative and key personnel attend.

.1 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit 2 copies of WHMIS Safety Data Sheet (SDS) in accordance with Sections 01 35 29.06 - Health and Safety Requirements.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Alberta, Canada.

.1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.

.2 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Departmental Representative, with identifying code marks to permit correct placement without reference to drawings.

.3 Detail lap lengths and bar development lengths to CAN/CSA A23.3, unless otherwise indicated in drawings.

.4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.

.4 Quality Assurance Submittals:

.1 Submit in accordance with PART 2 - SOURCE QUALITY CONTROL.

.2 Mill Test Report: upon request, submit to the Departmental Representative a certified copy of mill test report of reinforcing steel.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by the Departmental Representative

.2 Reinforcing steel: billet steel, grade 400 deformed bars to CSA G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.4 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.

.5 Welded steel wire fabric:

.1 Plain in accordance ASTM A1064/A1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.

.2 Finish:

.1 Galvanized: Fabricated from galvanized wire Class A coating in accordance with ASTM A641/A641M.

.3 Provide in flat sheets only.

.6 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.

.7 Concrete Bricks: specifically designed for support of reinforcing bars earth forms. Broken concrete blocks and wood supports are not acceptable.

.8 Tie wire: 1.5 mm diameter annealed wire

.1 Use epoxy coated tie wire where Galvanized steel is used.

.9 Mechanical splices: subject to approval of the Departmental Representative

.10 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with to CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

.5 All bending shall be done cold with a suitable machine accurately producing all lengths, depths and radii shown on the bending details.

.6 After initial fabrication, reinforcing steel shall not be re-bent or straightened unless so indicated on the drawings.

.7 Heating of reinforcing steel will not be permitted.

.8 Locate reinforcing splices not indicated on drawings at points of minimum stress.

.9 Fabricate within the following tolerances:

.1 Sheared length: ±25mm.

.2 Depth of truss bars: plus 0, minus 10mm.

.3 Stirrups, ties and spirals: ±10mm.

.4 Other bends: ±25mm.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of supplied material.

Part 3 Execution

3.1 EXAMINATION

.1 Before starting this work, examine work done by others which affects this work.

.2 Notify the Departmental Representative of any conditions which would prejudice proper completion of this work.

.3 Commencement of work implies acceptance of existing conditions.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by the Departmental Representative.

.2 When field bending authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.

.2 Place reinforcing steel as indicated on placing drawings in accordance with CSA A23.1/A23.2.

.3 Chair slab reinforcing not further apart than 1.2m in either direction unless noted otherwise.

.4 Adequately support reinforcing and secure against displacement within tolerances permitted.

.5 Place reinforcing steel to provide concrete cover required by CAN/CSA A23.1.

.6 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 Apply thick even film of mineral lubricating grease when paint is dry.

.7 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.8 Maintain cover to reinforcement during concrete pour.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.2 CSA International

.1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Provide two copies of WHMIS Safety Data Sheet (SDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements. WHMIS SDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.

.2 Include application instructions for concrete floor treatments.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.2 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based, clear.

.2 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.3 Surface sealer: acrylic carnuba wax.

.4 Surface sealers are not manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium and their compounds.

2.3 CURING COMPOUNDS

.1 Select water-based, curing compounds.

2.4 MIXES

.1 Mixing ratios in accordance with manufacturer's written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings.

3.2 PREPARATION OF EXISTING SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.

.2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.

.3 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.

.4 Use protective clothing, eye protection and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

.1 Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.

.2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.

.3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.

.4 Clean over spray. Clean sealant from adjacent surfaces.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: in accordance with 01 74 21 – Construction-Demolition Waste Management and Disposal.

3.5 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

- .1 ASTM C260, “Air Entrainment Admixtures for Concrete,”
- .2 ASTM A641/A641M-19, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .3 ASTM A775/A775M-19, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 ASTM A884/A884M-19 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
- .5 ASTM A1064/A1064M - 18a Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .6 ASTM C920-18 Standard Specification for Elastomeric Joint Sealants.
- .7 ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 CSA Group (CSA)

- .1 CSA-A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CAN/CSA A23.3-19, Design of Concrete Structures
- .3 CAN/CSA-A3000-18, Cementitious Materials Compendium (consists of A3001, A3002, A3003, A3004 and A3005).
- .4 CAN/CSA-G30.18-09(R2019), Carbon-Steel Bars for Concrete Reinforcement.

.3 National Research Council Canada (NRC)

- .1 National Building Code of Canada 2019 – Alberta Edition.

.4 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC-2018, Manual of Standard Practice.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS Safety Data Sheet (SDS)
  - .1 Submit 2 copies of WHMIS SDS.

.3 Provide inspection and testing results reports for review by the Departmental Representative and do not proceed without written approval when deviations from mix design or parameters found.

.4 Concrete hauling time: provide for review by The Departmental Representative deviations exceeding maximum allowable time of 90 minutes for concrete delivered to site of Work and discharged after batching.

.5 Quality Assurance Submittals:

.1 Mill Test Report: upon request, submit to the Departmental Representative a certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 At least 4 weeks prior to beginning Work, inform of source of fly ash.

.1 Changing source of fly ash without written approval of Departmental Representative is prohibited.

1.3 QUALITY ASSURANCE

.1 Provide to the Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.2 Quality Control Plan: provide written report to the Departmental Representative verifying compliance concrete in place meets performance requirements.

.3 Testing shall conform to CAN/CSA-A23.2.

1.4 INSPECTION AND TESTING

.1 Notify Departmental Representative at least 48 business hours before complete formwork and concrete reinforcement will be ready for inspection.

.2 Allow ample time for inspection and corrective work, if required, before scheduling concrete placement.

.3 Concrete sampling, inspection and testing is to be performed by an Inspection and Testing Firm appointed and paid by the Departmental Representative.

.4 Provide free access to all portions of work and cooperate with appointed firm.

.5 Submit proposed mix design of each class of concrete to Departmental Representative and Inspection and Testing Firm for review prior to commencement of work.

.6 Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.

.7 Notify Inspection and Testing Firm before placing concrete, in ample time to permit scheduling.

.8 Three concrete test cylinders will be taken for every 75m3 or less of each class of concrete placed.

.9 At least three test cylinders will be taken daily for each class of concrete placed. Record shall include atmospheric and concrete temperatures.

.10 One additional test cylinder will be taken during cold weather concreting and be cured on job site under same conditions as concrete it represents.

.11 One slump test and one air content test will be taken for each set of test cylinders taken.

.12 Additional slump tests may be taken as necessary to verify quality of concrete.

.13 Testing of concrete will be performed in accordance with CAN/CSA A23.2. Test results will be issued to Contractor and Departmental Representative.

.14 Pay costs for retesting required due to defective materials or workmanship.

.15 Contractor may arrange and pay for additional tests for use as evidence to expedite construction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 90 minutes maximum after batching.

.1 Modifying maximum time limit without receipt of prior written agreement from The Departmental Representative and concrete producer as described in CSA A23.1/A23.2 is prohibited.

.2 Deviations submitted for review by the Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Packaging Waste Management: in accordance with Section 01 74 19 - Waste Management and Disposal.

1.6 AMBIENT CONDITIONS

.1 Placing concrete during rain or weather events damaging to concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.

.3 Cold weather protection:

.1 Maintain protection equipment, in readiness on Site.

.2 Use such equipment when ambient temperature below 10°C, or when temperature may fall below 10°C before concrete cured.

.3 Placing concrete upon or against surface at temperature below 10°C is prohibited.

.4 Hot weather protection:

.1 Protect concrete from direct sunlight when ambient temperature above 27°C.

.2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.

.5 Protect from drying.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 2 - Prescription: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

.2 To CSA A23.3-19 Design of Concrete Structures

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by the Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland Cement: GU unless noted otherwise in drawings.

.2 Supplementary cementing materials: with minimum 30 % F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3001.

.3 Admixture:

.1 Chemical to ASTM C494/C494M, including:

.1 High Range Water Reducing Admixture.

.2 Others as specified in drawings

.2 Air Entrainment to ASTM C260

.4 Fine Aggregate: conforming to Normal Density Fine Aggregate, CAN/CSA A23.1.

.5 Coarse Aggregate: conforming to Normal Density Coarse Aggregate, CAN/CSA A23.1, Group I, 20 5mm.

.6 Coarse Aggregate for Toppings: conforming to Normal Density Coarse Aggregate, CAN/CSA A23.1 M, Group I, 14 - 5mm.

.7 Aggregate: Ensure that no aggregates are used which may undergo volume change due to alkali reactivity, moisture retention or other causes. Confirm suitability of aggregate with a petrographic analysis if deemed necessary by the Departmental Representative.

.8 Water: clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material conforming to CSA A23.1/A23.2.

.9 Reinforcing bars:

.1 Billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.

.10 Welded steel wire fabric:

.1 Plain in accordance ASTM A1064/A1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.

.2 Finish:

.1 Galvanized: Fabricated from galvanized wire having Class A coating in accordance with ASTM A1064/A1064M.

.11 Materials specified in Section 03 10 00 Concrete Forming and Accessories.

.12 Other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: Refer to Section 23 05 00 – Common Work Results for HVAC Article 1.6.

.2 Alternative 2 - Prescriptive Method for specifying concrete: Departmental Representative's concrete mix in accordance with CSA A23.1/A23.2.

.1 Ensure materials used in concrete mix have been submitted for testing and meet requirements of CSA A23.1/A23.2.

.2 Concrete supplier to proportion concrete mix for normal or HVSCM including:

.1 Cement type: GU unless noted otherwise in Drawings

.2 Minimum compressive strength at 28 days age:

.1 Exterior slab-on-grade: 35 MPa

.2 Concrete piles, pile caps, grade beams: 35 MPa

.3 Class of exposure:

.1 Exterior slab-on-grade: C-1

.2 Concrete piles, pile caps, grade beams: F-1

.4 C-1 concrete to have <1500 coulombs within 91 days chloride ion penetrability required as per Table 2 in CSA A23.1.

.5 Intended application: As noted in Drawings.

.6 Admixture:

.1 Chemical to ASTM C494/C494M, including:

.1 High Range Water Reducing Admixture.

.2 Air Entrainment to ASTM C260

.7 Supplementary cementing materials: with minimum 30 % Type F fly ash replacement, by kg/$m^3$of total cementitious material.

.8 Aggregate: Normal-density, maximum size 20mm.

.9 Maximum water/cement ratio: 0.45 unless noted otherwise

.10 Air content category: 1 per Table 4 of CSA A23.1.

.11 Use accelerating admixtures in cold weather only when approved by Departmental Representative. If approved, use of admixtures will not relax cold weather placement and curing requirements. Do not use calcium chloride.

.12 Use set retarding admixture during hot weather only when approved by Departmental Representative.

.13 All admixtures are subject to the approval of the Departmental Representative. List all proposed admixtures in mix design submission. Do not change or add admixtures to approved design mixes without Departmental Representative's approval.

Part 3 Execution

3.1 EXAMINATION

.1 Before starting this work, examine work done by others which affects this work.

.2 Notify the Departmental Representative of any conditions which would prejudice proper completion of this work.

.3 Commencement of work implies acceptance of existing conditions.

3.2 PREPARATION

.1 Provide The Departmental Representative 48-hours' notice before each concrete pour.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Concrete delivery and handling to facilitate placing with minimum of re-handling,and without damage to existing structure or Work.

.4 Protect previous Work from staining.

.5 Clean and remove stains prior to application of concrete finishes.

3.3 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, water stops, joint fillers and other inserts required built-in.

.2 Sleeves and openings minimum 100 mm x 100 mm not indicated, reviewed by The Departmental Representative

.3 Handling equipment shall be kept free from hardened concrete or foreign material and cleaned at frequent intervals.

.4 Ensure all anchors, seats, plates and other items to be cast into concrete are securely placed and will not interfere with concrete placement.

.5 Maintain accurate records of cast in place concrete items. Record date, location of pour, quantity, air temperature and test samples taken.

.6 Ensure reinforcement, inserts, embedded parts, formed expansion and control joints and are not disturbed during concrete placement.

.7 Prepare set concrete by removing all laitance and loose materials and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

.8 Place concrete continuously between present construction and control joints.

.9 Vibrate concrete using the appropriate size equipment as placing proceeds in strict accordance with CAN/CSA-A23.1. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.

.10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solidly with approved non shrink grout.

.11 Do not place concrete if carbon dioxide producing equipment has been in operation in the building during the 6 hours preceding the pour. This equipment shall not be used during placing or for 12 hours after placing. During placing and curing concrete, surfaces shall be protected by formwork or an impermeable membrane from direct exposure to carbon dioxide, combustion gases or drying from heaters.

.12 Honeycomb or embedded debris in concrete is not acceptable.

.13 Remove and replace defective concrete.

3.4 FINISHES

.1 Formed surfaces exposed to view in accordance with Departmental Representative requirements and in accordance with Clause 7.6 of CSA A23.1.

.2 Hardened floor finish: Concrete densifier and chemical hardener compound shall be a ready-to-use, water-based, colourless liquid formulated with chemically reactive raw materials that meets the maximum VOC content limits of 100 g/L for sealers as required by the South Coast Air Quality Management District requirements, as well as the 400 g/L VOC maximum required by the U.S. EPA Architectural Coatings Rule.

.3 Equipment pads: provide smooth trowelled surface.

.4 Pavements, walks, curbs and exposed site concrete:

.1 Screed to plane surfaces and use magnesium, wood or aluminum floats.

.2 Provide round edges and joint spacings using standard tools.

.3 Trowel smooth and provide lightly brushed non-slip finish.

3.5 CONTROL JOINTS

.1 Cut control joints in slabs on at maximum grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.6 EXPANSION AND ISOLATION JOINTS

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

.2 Fill all expansion joints with a two-component polyurea sealant meeting the formulation and performance characteristics of Blome Sealant 73 as manufactured by Blome International, O'Fallon, MO (800) 886-3455. Install in accordance with the latest Blome Sealant 73 data sheet and good industry practice.

3.7 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

.2 Cure concrete surfaces in accordance with CSA A23.1/A23.2, Clause 7.7 Table 19, curing type depending on concrete type, application and weather.

.3 Curing shall meet requirements specified for each concrete finish.

.4 Submit curing plan to the Departmental Representative upon request.

3.8 SEALING APPLICATION

.1 Refer to structural specifications, or structural details.

3.9 SITE TOLERANCES

.1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.10 DEFECTIVE CONCRETE

.1 Concrete not meeting the requirements of the Specifications and Drawings shall be considered defective concrete.

.2 Concrete not conforming to the lines, detail and grade specified herein or as shown on the Drawings shall be modified or replaced at the Contractor's expense and to the satisfaction of the Departmental Representative. Finished lines, dimensions and surfaces shall be correct and true within tolerances specified herein and in the Formwork Section of these Specifications.

.3 Concrete not properly placed resulting in excessive honeycombing, and all honeycombing and other defects in critical areas of stress shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Departmental Representative.

.4 To conform to the strength requirements, the average of all tests shall exceed the specified strength. When five or more tests of the same class of concrete are available, the average of any five consecutive tests shall be equal to, or greater than the specified strength, and no strength test shall fall more than 3.5 MPa below the specified strength. If any of the criteria of the above clause are not met, the Departmental Representative shall have the right to require one or more of the following:

.5 Changes in mix proportions for the remainder of the work.

.6 Cores drilled and tested from the areas in question as directed by the Departmental Representative and in accordance with CAN/CSA-A23.2. The test results shall be indicative of the strength of the in-place concrete.

.7 Load testing of the structural elements. The changes in the mix proportions and the testing shall be at the Contractor's expense.

.8 Concrete failing to meet the strength requirements of this specification shall be strengthened or replaced at the Contractor's expense and the satisfaction of the Departmental Representative.

3.11 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by the Contractor.

3.12 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate cleaning area for tools to limit water use and runoff.

.4 Waste Management: in accordance with 01 74 21 – Construction-Demolition Waste Management and Disposal.

.1 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location posing health or environmental hazard is prohibited.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 National Research Council Canada (NRCC)

.1 Alberta Building Code (ABC)

.2 National Energy Code of Canada (NECB)

1.2 DEFINED TERMS

.1 The definitions of this section are not meant to supersede definitions of the Building Code, Standards, or Contract Documents and apply only to these Contract Documents.

.2 *Acceptable Manufacturer* means the listed manufacturer may bid on the work providing that their submittals meet the requirements of the Contract Documents.

.3 *Acceptable Material* means the listed material shall form part of the specified requirements for its type of product and sets the standard regarding performance, quality of material and workmanship. In addition to products named in the specification Sections as *acceptable materials*, all equipment, fixtures and products named on the mechanical drawings shall be deemed to be *acceptable materials*. When an *acceptable material* is identified in conjunction with a referenced standard, the requirements set by the *acceptable material* and the referenced standard shall be deemed to supplement each other.

.4 *As-built Drawing or Document* means a document that reflects the installed, fabricated, constructed, or commissioned condition of an item or project based on information provided by another party and not verified by the professional engineer.

.5 *As Indicated* means the item is to be as specified or shown as per the drawings.

.6 *Contract Documents* means all documents including the engineering and architectural drawings and specifications as defined in the construction contracts for constructing the building.

.7 *Deferred Work* means work which the Departmental Representative, and Contractor agree, or out of necessity, simply cannot be completed in a timely manner and is therefore excluded from the calculation in determining whether *substantial performance* of a contract has been reached.

.8 *Deficient Work* means work that has been performed, but performed incorrectly or to an inadequate standard, not performed as specified, or damaged prior to turnover to the Departmental Representative.

.9 *Equipment Start-up* means work that is performed by the Contractor in conjunction with the equipment Manufacturer to get the systems ready for *commissioning* or *testing*.

.10 *Furnish* means supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.

.11 *Incomplete Work* means work specified in the *Contract Documents* that has not been performed or completed.

.12 *Install* means unloading, temporary storage, unpacking, assembly, erecting, placing, anchoring, applying working to dimension, finishing curing, protecting, cleaning, and similar operations.

.13 *Operation and Maintenance Manual* means a collection of information containing all necessary technical information on building systems for the building Departmental Representative/user to carry out maintenance and operation.

.14 *Provide* means to furnish and install, complete and ready for the intended use.

.15 *Ready for Use for the Purpose Intended* means the system or equipment is safe, code compliant, functionally complete, and ready to be turned over to the building Departmental Representative. The specific definition of *ready for use for the purpose intended* is project specific and is the discretion of the Departmental Representative.

.16 *Record Drawing or Document* means a professional document prepared by a professional engineer to record design changes to an initial design for which he or she has accepted responsibility and which represents the final design of the project. Typically issued or retained as verification that on-site conditions are in accordance with the final design.

.17 *Samples* means physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

.18 *Seasonal Testing* means testing of equipment and systems that have been functionally tested during winter or summer conditions and require retesting during the opposite conditions.

.19 *Shop Drawings means* drawings, diagrams, illustrations, schedules, performance charts, brochures, product data, and other data specifically prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate details of portions of the work. *Shop Drawings* do not form part of the Contract Documents.

.20 *Submittals* means items required by the *Contract Documents* to be submitted by the Contractor, such as requests for payment, progress reports, *Shop Drawings*, manufacturer's literature on equipment, reports, schedules. *Submittals* are normally used by the registered professional of record to aid in ascertaining whether the work substantially complies in all material respects with the plans and supporting documents prepared by the registered professional of record.

.21 *Testing* means work that is performed by the Contractor during installation to prove the quality and workmanship before the equipment or systems are put "on-line".

.22 *Warranty Work* means completed work that requires completion after the date of a substantial performance and is discovered prior to expiry of the contract warranty period.

.23 *Work* means any activity, duty or function defined by the *Contract Documents*, the Alberta Building Code, work carried out on or about the construction site or on, in or about a building.

1.3 ABBREVIATIONS

.1 AABC – Associated Air Balance Council

.2 ABC – Alberta Building Code

.3 AHU – Air Handling Unit

.4 ANSI – American National Standards Institute

.5 ASTM – American Society for Testing of Materials

.6 ASHRAE – American Society of Heating Refrigeration and Air Conditioning Engineers

.7 ASME – American Society of Mechanical Engineers

.8 BAS – Building Automation System

.9 CEMA – Canadian Electrical Manufacturers Association

.10 CGA – Canadian Gas Association

.11 CGSB – Canadian General Standards Board

.12 CSA – Canadian Standards Association

.13 FM – Factory Mutual Engineering Corporation

.14 HVAC – Heating, Ventilation, and Air Conditioning

.15 IAO – Insurer's Advisory Organization of Canada

.16 MERV – Minimum Efficiency Reporting Value

.17 NECB – Model National Energy Code for Buildings

.18 NBC – National Building Code

.19 NC – Noise Criteria

.20 NFPA – National Fire Protection Association

.21 NEMA – National Electrical Manufacturers Association

.22 OH&S – Occupational Health and Safety

.23 PPE – Personal Protective Equipment

.24 RC – Room Criteria (for noise measurement)

.25 SMACNA – Sheet Metal and Air Conditioning Contractors National Association

.26 ULC – Underwriter’s Laboratory of Canada

1.4 INTENT

.1 This Section specifies the common requirements for the work of Division 23 supplemented by the requirements of Division 01.

.2 Mechanical Division Contract Documents

.1 The mechanical Division Contract Documents shall be read in conjunction with the manufacturer’s installation instructions.

.3 Mechanical Drawings

.1 The mechanical drawings are not detailed installation instructions and do not show every pipe or duct elbow, fitting, valve, or system component required by the specifications or show the exact required routing of the services unless specifically indicated.

.2 The intended purpose of the mechanical drawings is to show, graphically, quantities and locations of tagged equipment, and how the products interface with other materials and products.

.3 The mechanical drawings are diagrammatic and only approximately to scale even when scales are indicated. Do not scale from the mechanical drawings in order to determine dimensions or distances.

.4 Mechanical Specifications

.1 The intent of the mechanical specifications is to define the quality and types of materials and workmanship upon which the contract is based.

.2 The mechanical specifications shall be read in conjunction with the mechanical drawings.

.3 Where codes or standards are referenced in the mechanical specifications, conform to the date or version of the code or standards referenced by the provincial building code in effect at the time of the submission of bids unless a specific date or edition is referenced.

.5 Contract Document Discrepancies

.1 Review the entire set of Contract Documents (i.e. drawings and specifications of all Divisions) prior to bidding on the work.

.2 Where a specific requirement is identified in any portion of the Contract Documents (plan drawing, specifications, equipment schedules, details, sections, schematics, etc.) it shall be considered as a requirement of the Contract Documents regardless of whether it appears, or is represented consistently elsewhere in the Contract Documents.

.3 Where a discrepancy exists between portions of the Contract Documents:

.1 Submit a written request for clarification during the tendering phase.

.2 If a written request for clarification is not received by the Departmental Representative, or if there is insufficient time for the Departmental Representative to provide a written clarification of the design intent by means of an Addendum, include the cost for BOTH requirements inclusive of all affected trades. Do not choose to carry the cost of one interpretation over the other.

.3 The Departmental Representative reserves the right to clarify the design intent once a discrepancy within the Contractor Documents has been identified at no additional cost to the Departmental Representative.

.4 Work that has taken place relating to the discrepancy without first requesting clarification of the design intent is subject to removal and replacement at no additional cost to the Departmental Representative.

.5 A credit shall be provided for work or equipment deemed to be unnecessary after the design intent is confirmed by the Departmental Representative.

.6 Delegated Design Responsibilities to the Contractor:

.1 Where design responsibilities are specifically delegated to the Contractor in the Contract Documents:

.1 The services shall be provided by a proper licensed professional.

.2 Documents shall bear such professional's written approval when submitted to the Departmental Representative.

.3 The Departmental Representative shall be entitled to rely on the adequacy, accuracy, and completeness of the services, certifications, or approvals performed or provided by such design professionals.

.4 The licensed designer's signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by the Designer.

1.5 SUSTAINABILITY REQUIREMENTS

.1 All equipment shall meet the mandatory requirements of the National Energy Code for Buildings (NECB).

1.6 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 The requirements of this Section supplement that required by Division 01.

.2 Acceptable Materials

.1 Where a list of Acceptable Materials is indicated for a given product, alternate materials may not be used unless added by Addendum or other formal change to the contract.

.2 Acceptable materials provided by manufacturers other than the specific material or equipment indicated in the equipment schedules on the drawing shall meet all specified performance parameters including but not limited to materials, weights, dimensions, control parameters, electrical requirements, etc. Additional work required by another Division as the result of a product option or substitution is the responsibility of the Contractor.

.3 Alternative materials to those specified may be considered for acceptance during the solicitation period, at the discretion of the Departmental Representative.

.4 Each request for acceptance of a proposed substitution or alternative product must be accompanied by detailed catalogue and engineering data, fabrication information, and performance characteristics to permit the Departmental Representative to make an informed decision.

1.7 GENERAL SAMPLE REQUIREMENTS

.1 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Label each sample indicating their intended use

.3 Indicate any deviations from the Contract Documents

.2 Submittal Procedure

.1 Submit one (1) sample to the Departmental Representative at the time of Shop Drawing review or as required.

.3 Required Samples

.1 Refer to the requirements of each Section.

.4 Acceptance Criteria

.1 A sample shall be considered approved upon written indication by the Departmental Representative.

1.8 GENERAL INFORMATION DOCUMENT REQUIREMENTS

.1 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Indicate all parameters using metric (SI) units.

.3 File Format: Portable document format (PDF) file (complete with content index and embedded bookmarks based on required format Sections).

.4 Organize the content of the submittal as follows:

.1 General Information

.1 Date the document was issued

.2 Name of company responsible for issuing the document including contact information for associated personnel

.3 Purpose of the document

.4 Other general information pertinent to the understanding of the document

.2 Technical Information

.1 As required based on the nature of the document

.2 Submittal Procedure

.1 Submit one (1) complete copy to the Departmental Representative for review at the time of Shop Drawing submittal.

.2 Include a copy of the report in the Operation and Maintenance Manuals.

.3 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.9 GENERAL SHOP DRAWING REQUIREMENTS

.1 The Contractor's Responsibility with Respect to Shop Drawings

.1 The Contractor shall be solely responsible for ensuring that all product information contained in the Shop Drawing is completely compliant with the Contract Documents prior to submitting to submitting for the Departmental Representative's review.

.1 The Contractor shall be responsible for correcting all products or materials found to be non-compliant with the requirements of the Contract Documents at such time they are discovered.

.2 The Contractor shall thoroughly review all Shop Drawings including those prepared by Subcontractor's, Sub-Subcontractor's, and Engineers retained by the Contractor to ensure:

.1 Their formatting is compliant with the Contract Document requirements

.2 The product information is compliant with the Contract Documents

.3 The materials and equipment are constructible

.4 Any deviances in parameters (such as dimensions, weight, electrical characteristics, performance parameters, etc.) with respect to the basis of design equipment indicated in the Drawing Schedules or specifications will not result in additional costs to other trades.

.5 They have been coordinated and verified that the components fit and work together in accordance with the design intent

.3 Where professional design services or certifications are delegated to a responsible design professional retained by the Contractor, the properly licensed responsible design professional's signature and seal shall appear on all related Shop Drawings.

.4 Contract Document Deviance Summary

.1 Should it be impossible for the Contractor, a Subcontractor, or a Supplier to provide products and materials that are compliant with the requirements of the Contract Documents, the Contractor shall prepare a Contract Document Deviance Summary Sheet and attach it to the front page of the Shop Drawing submittal.

.2 The Contract Document Deviance Summary shall include:

.1 An explanation of why it is not possible to the meet the requirements of the Contract Documents with evidence supporting this claim (i.e. a letter or correspondence from the base-specified equipment supplier, etc.).

.2 A list of specific performance parameters/functionality that cannot be met.

.3 A summary of the Contractor's recommended substitute products or materials.

.4 A written description of all pertinent changes, deviations or substitutions from the requirements of the Contract Documents.

.5 The Shop Drawing for the Contractor's recommended alternate product or material (from an Approved Manufacturer when possible) that best matches the performance criteria for the specified equipment that otherwise meets the requirements of the Contract Documents.

.6 A list of other deviations from the Contract Documents that will result of using the alternate material or equipment including, but not limited to:

.1 Space requirements

.2 Equipment weights

.3 Electrical parameters

.4 Control or functionality

.7 Indication as to whether the alternate product or material will have a cost implication (including that of other trades which may be affected)

.1 Where the alternate product is deemed to affect the cost of the work (as either a credit or an extra), the Contractor shall prepare a quotation identifying the cost impact

(including all affected trades) and include it in the Shop Drawing submission.

.2 The Departmental Representative's review of the Shop Drawings

.1 The purpose of the Departmental Representative's review of the Shop Drawings is to:

.1 Provide a secondary review of the information provided by the Contractor to check if the specified closeout submittal requirements are met (i.e. format, type of content, maintenance requirements, etc.)

.2 Review supplemental information about the products and materials being provided by the Contractor to assist the Departmental Representative in performing their Field Reviews.

.2 The Departmental Representative's review of the Shop Drawings is not:

.1 An indication that the Shop Drawing has been reviewed by the Departmental Representative for compliance with the Contract Documents.

.2 An indication that deviances of product parameters such as dimensions, quantities, weight, electrical characteristics, performance parameters, etc. are acceptable and will not result in additional costs to other trades.

.3 The Departmental Representative's review of Shop Drawings that have been stamped as 'Reviewed', or 'Reviewed as Noted', that contain deviations from the Contract Document requirements, regardless of whether they were accompanied by the Contractor's Contract Document Deviance Summary, shall not be deemed as an acknowledgement or approval of the deviation.

.4 The Departmental Representative's review of Shop Drawings produced by a licensed professional retained by the Contractor shall be for the purpose of checking for general conformance with the design parameters provided for the purpose of defining the Design Delegate's scope of work and responsibilities in the Contract Documents.

.5 Departmental Representative's Shop Drawing Comments

.1 Shop Drawings submitted for the Departmental Representative's review will be stamped using one of the four responses below and returned to the Contractor:

.1 Reviewed

.2 Reviewed as Noted

.3 Revise and Submitted

.4 Not Reviewed

.2 Shop Drawings marked as 'Reviewed' indicate that the Departmental Representative has reviewed the information provided, but not necessarily that the information is in accordance with the Contract Documents which is the sole responsibility of the Contractor.

.3 Shop Drawings marked as 'Reviewed as Noted' indicate that the Departmental Representative has reviewed the information provided, but not necessarily that the information is in accordance with the Contract Documents which is the sole responsibility of the Contractor. Shop Drawing marked as 'Reviewed as Noted' do not need to be resubmitted

and are noted only to provide general comments to the Contractor such as reminders of related information contained in the Contract Documents such as site coordination that needs to take place and other general information that is not expected to affect the project cost.

.4 Shop Drawings marked as 'Revise and Resubmit' indicate that the Departmental Representative happened to notice information that was not compliant with the requirements of the Contract Documents and therefore must be revised and resubmitted.

.5 Shop Drawings marked as 'Not Reviewed' indicate that the Departmental Representative does not need to review the information.

.6 The Contractor shall not perform any portion of the work for which Shop Drawings, mock-ups, samples or similar product data submittals are required until the respective submittal has been stamped by the Departmental Representative as either 'Reviewed' or "Reviewed as Noted'.

.7 Where the Departmental Representative's review of the shop drawing or Contract Document Deviance Summary results in the need to revise the Contract Documents, the Departmental Representative shall issue a written Change Order.

.1 If the Contractor believes that a comment made by the Departmental Representative on a shop drawing marked as 'Reviewed as Noted' will result in additional costs, the Contractor shall notify the Departmental Representative immediately.

.3 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Indicate all parameters using metric (SI) units.

.3 File Format: Portable document format (PDF) file (complete with content index and embedded bookmarks based on required format Sections).

.4 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.5 Each Shop Drawing submittal shall include a cover sheet prepared by the submitting Contractor that MUST include the following:

.1 Project Name

.2 Departmental Representative's Project Number

.3 Descriptive title of the Shop Drawing

.4 Contractor's Shop Drawing tracking number

.5 Number of pages under title page

.6 Brief description of Shop Drawing contents (including equipment tags that match those shown on the drawings)

.7 Specification Section number relating to the Shop Drawing

.8 Name and phone number of Contractor or Sub-Contractor responsible for ensuring that the information contained in the Shop Drawing is compliant with the Contract Documents

.9 Name and phone number of the equipment supplier responsible for the technical details of the Shop Drawing who may be contacted by Departmental Representative to discuss the submittal details (Providing this information may prevent the need for a Shop Drawing to be stamped as 'Revise and Resubmit')

.10 Contractor's stamp, signed by Contractor's authorized representative certifying review and approval of submissions, verification of field measurements and compliance with Contract Documents

.11 A blank area no smaller than 200 mm wide x 125 mm high for exclusive use by Departmental Representative for stamps and review comments

.6 Shop Drawings shall include the following general information as a minimum in addition to that required by individual Sections:

.1 Associated equipment tag and functional descriptor

.2 Installation instructions

.3 Manufacturer certification of current model production

.4 Certification of compliance to applicable codes and standards

.5 Required operating and maintenance clearances

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

.7 Performance based on specified set-point parameters

.8 Electrical information including (but not limited to): voltage, phase, frequency, full-load amps, horsepower, current, and power factors.

.9 Weight and dimensions

.4 Submittal Procedure

.1 Submit one (1) copy of each Shop Drawing to the Departmental Representative as required by each Section and for all tagged equipment on the drawings and specifications.

.2 Thoroughly review the content of each Shop Drawing and stamp it to indicate it is compliant with the Contract Documents prior to submission to the Departmental Representative. The Contractor's stamp indicates they have verified it is in strict accordance with the requirements of the Contract Documents.

.3 Shop Drawings that are not submitted according to the Submittal Procedure, or not in accordance with the Submittal Format, are subject to being returned without review by Departmental Representative. Shop Drawings that are rejected due to a failure to comply with the specification requirements shall be resubmitted allowing the full ten (10) working day review period from the date of the re-submittal.

.1 The Contractor shall be responsible for submitting Shop Drawings in accordance with the specification requirements in order to not adversely affect the Construction Schedule.

.4 Where the Departmental Representative has stamped Shop Drawings as 'Revise and Resubmit', make the required changes and/or provide the requested information and resubmit.

.1 Allow an additional ten (10) working days (as a minimum) for the Departmental Representative to do a review of the Revise and Resubmit Shop Drawings.

.2 Allow sufficient time in the Construction Schedule for Shop Drawing review including sufficient time for subsequent reviews of Shop Drawings that have been noted as "Revise and Resubmit".

.5 Departmental Representative's Timely Review of Shop Drawings

.1 Allow a minimum of ten (10) working days between the date of submission to the Departmental Representative and the requested return date for the Departmental Representative's review.

.1 Shop Drawings that indicate a desired return date less than the minimum specified review duration may not be achievable and shall not considered a construction delay caused by the Departmental Representative if the target return date is not met.

.2 Refrain from submitting a large amount of Shop Drawings over a short period of time or in large groups. If this occurs, the Departmental Representative reserves the right to indicate the required amount of time in order to do a proper review of the Shop Drawings. Adequate time for the Departmental Representative to do a thorough review of the Shop Drawings shall be allowed for in the construction schedule and extensions to the review period shall not be deemed as an unforeseen extension to the construction schedule.

1.10 GENERAL TEST REPORT REQUIREMENTS

.1 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Indicate all parameters using metric (SI) units.

.3 File Format: Portable document format (PDF) file (complete with content index and embedded bookmarks based on required format Sections).

.4 Organize the content of the submittal as follows:

.1 General Information

.1 Date the test was performed

.2 Name of company performing the test including contact information for associated personnel

.3 Purpose of the test

.4 Information on equipment used for the test including records of equipment calibration

.5 Other general information pertinent to the understanding of the test

.2 Technical Information

.1 As required based on the nature of the test

.2 Submittal Procedure

.1 Submit one (1) complete copy to the Departmental Representative for review no later than ten (10) working days after testing.

.2 Include a copy of the report in the Operation and Maintenance Manuals.

.3 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.11 GENERAL MANUFACTURER'S EQUIPMENT START-UP REPORT REQUIREMENTS

.1 General Requirements

.1 Provide a report issued by the equipment manufacturer (or authorized representative) providing a record that the equipment has been set up properly, checked for safety, and is ready to be put into operation.

.2 Coordinate timing of manufacturer's equipment start-up with the work of other trades.

.2 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Indicate all parameters using metric (SI) units.

.3 File Format: Portable document format (PDF) file (complete with content index and embedded bookmarks based on required format Sections).

.4 Organize the content of the submittal as follows:

.1 General Information

.1 Date the equipment set-up was performed

.2 Name of company performing the work and contact information for associated personnel

.2 Technical Information

.1 Content and organization in accordance with the manufacturer's standards

.3 Submittal Procedure

.1 Submit one (1) complete copy to the Departmental Representative for review no later than ten (10) working days after equipment setup.

.2 Include a copy of the manufacturer's equipment start up report in the Operation and Maintenance Manuals.

.4 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.12 GENERAL CERTIFICATION REPORT REQUIREMENTS

.1 General Requirements

.1 Provide a report issued by the recognized authority certifying the specified parameters or code requirements have been met.

.2 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.2 Indicate all parameters using metric (SI) units.

.3 File Format: Portable document format (PDF) file (complete with content index and embedded bookmarks based on required format Sections).

.4 Organize the content of the submittal as follows:

.1 General Information

.1 Date the system was reviewed by the certifying agent

.2 Name of company of the certifying agent and contact information for associated personnel

.2 Technical Information

.1 Description of the specific requirements that need to be met for certification

.2 Signature of the certifying agent stating the system is compliant with the project or code requirements

.3 Submittal Procedure

.1 Submit one (1) complete copy to the Departmental Representative for review no later than ten (10) working days after review of the certifying agent.

.2 Include a copy of the certification report in the Operation and Maintenance Manuals.

.4 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.13 GENERAL OPERATION AND MAINTENANCE MANUAL REQUIREMENTS

.1 General Requirements

.1 The work of Division 23 shall be incorporated into the Operation and Maintenance Manual requirements of this Section.

.2 Submit Operation and Maintenance Manuals three times throughout the duration of the project in accordance with Submittal Format below.

.2 Submittal Format

.1 Submittal Content Requirements

.1 Submittal #1: Format Review

.1 Submittal Format: Indexed .pdf file

.2 Submittal Timeline: Submit after all information of Section 1 – Mechanical Systems has been prepared (see General Manual Format)

.3 Submittal Instructions: Provide placeholders for all other information not included in this submittal

.4 Required information:

.1 All formatting including cover text for each binder, wording of each tab, and directories

.2 All information required by Section 1 – Overview

.2 Submittal #2: Pre-TAB Review

.1 Submittal Format: Indexed .pdf file

.2 Submittal Timeline: Submit a minimum of 15 working days prior to commencement of TAB

.3 Submittal Instructions:

.1 Information required by any Section may be submitted at this time providing that it is complete

.4 Required information:

.1 All information from Submittal #1

.2 All information required by Section #2

.3 All information required by Section #3

.3 Submittal #3: Final Submission Review

.1 Submittal Format: Indexed .pdf file and one (1) physical copy

.2 Submittal Timeline: Submit after acceptance of Substantial Performance

.3 Submittal Instructions:

.1 Ensure the cover text for each binder has been approved prior to preparing the physical copies

.4 Required information:

.1 Provide all information required by this Section

.2 Physical Copy Assembly Requirements

.1 Prepare using 219 x 279mm text pages, expanding post binders with durable green-colour cloth covers connected to spine with piano hinges.

.2 Prepare binder cover with printed title "OPERATION AND MAINTENANCE MANUAL – MECHANICAL", title of project, and subject matter of binder when multiple binders are required.

.3 Internally subdivide the binder contents with permanent page dividers, logically organized as described in the format Section below; with tab titling clearly printed on reinforced laminated plastic tabs.

.4 Provide additional binders as required to store all of the required information.

.3 General Manual Format

.1 Section 1 - Overview

.1 Index:

.1 Complete O&M Manual index (for all mechanical binders)

.2 Include this tab at the beginning of each binder when multiple binders are used

.2 Directory:

.1 Directory listing names, addresses, and telephone numbers the Departmental Representative, Contractors, Subcontractors, and all equipment suppliers

.3 Drawings:

.1 List of all mechanical Contract Document Drawings

.2 List of all drawings produced by Design Delegates (i.e. Fire Protection Engineer, etc.)

.4 Description of Systems:

.1 Written description for each major mechanical system related to the scope of work.

.5 Identification:

.1 Systems and Equipment Identification Directory required by Section 23 05 53 – Identification for HVAC Piping and Equipment

.2 Valve Tag Directory required by Section 23 05 53 – Identification for HVAC Piping and Equipment

.2 Section 2 – Tests & Reports

.1 Permits:

.1 All permits obtained for the project

.2 All permit inspection reports

.2 Manufacturer's Equipment Start-Up Reports:

.1 All Manufacturer's Equipment Start-Up Reports required by each Section

.3 System Test Reports:

.1 All System Test Reports required by each Section

.4 Testing Adjusting & Balancing Reports:

.1 All TAB reports required by Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

.2 Final operational set-points for field-adjustable devices

.5 Commissioning Reports:

.1 Documentation required by Division 01.

.6 Certificates

.1 Declaration of Extended Warranties (where required by each Section)

.3 Section 3 – Product Data

.1 Shop Drawings:

.1 All Shop Drawings and product data as required by each Section (separate each product with an indexed tab)

.2 Maintenance Data:

.1 Installation instructions

.2 Servicing, maintenance, operation, and trouble-shooting instructions for each Shop Drawing as appropriate

.3 Detailed schedule and description of preventive maintenance and lubrication tasks organized by the following categories: Daily, Weekly, Monthly, Semi-annually and Annually and including the tools required

.4 Descriptive text that provides instruction on actions to be taken in event of equipment failure

.5 Recommended spare parts

.6 Spare Parts Delivery Transmittal as required by this Section

.3 System Demonstration and Training:

.1 System Demonstration and Training Report for mechanical systems

.3 Submittal Procedure

.1 Submit Operation and Maintenance Manuals (O&Ms) three times throughout the project as follows:

.1 Submittal #1: Format Review

.2 Submittal #2: Pre-TAB Review

.3 Submittal #3: Final Submission Review

.2 Include all content from previous review submittals, including required revisions in subsequent review submittals.

.4 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.14 CONTRACTOR MARKED-UP AS-BUILT DOCUMENT REQUIREMENTS

.1 General Requirements

.1 Provide Contractor marked-up As-Built Drawings for **ALL** Contract Document drawings including those prepared by Design Delegate professionals (when present).

.1 Submit a copy of each drawing in the Contractor As-Built Document Submittal even if that drawing does not contain Contractor mark-ups.

.2 Accessibility

.1 Contractor Marked-up As-Built Drawings shall be available to the Departmental Representative for review at all times throughout Construction.

.3 Format during Construction

.1 Contractor Marked Up As-Built Drawings may be maintained in either hard-copy or digital format during construction but must be submitted digitally in accordance with the Submittal Format requirements below.

.4 Accuracy

.1 Maintain a complete set of Contractor As-Built Documents from the beginning of the Work through to its completion updating them daily as a minimum.

.2 Store Contractor As-Built Documents separate from other documents being used for construction.

.3 Incorporate all changes and variances to the Contract Documents including:

.1 Contractor initiated changes due to site coordination

.2 Addenda

.3 Change Orders
.4 Site Instructions
.5 Instructions though Requests for Information
.6 Shop Drawing comments
.7 Product substitutions or alternates that deviate from the equipment schedules
.8 Sample and Mock-up comments
.9 Existing systems that are affected by demolition or renovation work
.10 Changes made as required by Manufacturer's installation instructions
.11 Changes made as part of Testing, Adjusting, and Balancing
.12 Changes made as part of System Start-up
.13 Changes made as part of System Commissioning

.5 Specific Information Required

.1 Ensure the following specific information is clearly indicated on the Contractor As-Built Drawings:

.1 Measured horizontal and vertical dimensions for all underground service mains referenced to grid lines or suitable building feature (including where services leave the building perimeter).
.2 All information relating to concealed conditions
.3 Field changes of dimension and detail
.4 Pertinent installation details not shown in the Contract Document Drawings
.5 Updated Contractor Drawing equipment schedules showing installed product details and parameters (manufacturer, model, performance parameters, capacity, etc.) data differs from the base specification shown on the Drawings
.6 Other specific As-Built requirements specified throughout Division 23
.7 Location of:

.1 Access door locations and sizes

.2 Submittal Format

.1 Contractor As-Built Documents shall be submitted in PDF format.
.2 Note entries in red text and deletions in blue.
.3 Ensure entries are clear and legible, complete, and accurate.

.1 Contractor As-Built Drawings shall not contain notes or other markings that are not indicative of as-built conditions.

.4 The Contractor shall mark each As-Built Drawing with a stamp in the bottom right hand corner, or in the title block, that reads, "AS-BUILT DRAWINGS AS RECORDED BY THE CONTRACTOR" (Signature of Contractor) (date) or equivalent text that indicates that the Contractor has incorporated all required information into the drawing set

.3 Submittal Procedure

.1 Upon request by the Contractor, the Departmental Representative will provide a full set of the Contract Document Drawings (excluding the drawings produced by the Fire Protection Engineer or other drawings prepared by the Contractor) in .PDF format for the Contractor's use in preparing the marked-up As-Built Drawings

.2 After the Work has been completed and after the deficiencies have been corrected and signed-off as complete, the Contractor shall sign and date each As-Built Drawing (including those where no changes have occurred)

.3 Scan the entire set of marked-up As-Built Drawings in .PDF format and submit to the Departmental Representative for review.

.1 Marked-up As-Built Drawings that are submitted in an alternate format, are missing required information, are incomplete, or that do not bear the Contractor's signature and date indicating accuracy of the information, are subject to be rejected and declared incomplete.

.2 Incorporate comments made by the Departmental Representative and resubmit for additional review as requested

.4 Include a copy of the original Contractor marked-up As-Built Drawings in the Operation and Maintenance Manuals

.4 Acceptance Criteria

.1 The submittal shall be considered complete upon the Departmental Representative's written acceptance of the documentation.

1.15 GENERAL SPARE PARTS REQUIREMENTS

.1 General Requirements

.1 Prepare a Spare Parts Delivery Transmittal that identifies all of the spare parts required by each Section

.2 Provide beside each spare part line item a signature field for the Contractor and the Departmental Representative

.3 Submit Spare Parts in advance of Substantial Completion

.2 Submittal Format

.1 Submit in accordance with the requirements of Division 01.

.3 Submittal Procedure

.1 After delivery of Spare Parts, the Contractor and the Departmental Representative shall both sign the Transmittal to indicate delivery and acceptance of the materials

.2 Provide quantities of Spare Parts in accordance with the requirements of each Section.

.3 Submit one (1) completed copy of the Spare Parts Delivery Transmittal to the Departmental Representative in advance of Substantial Completion.

.4 Insert one (1) completed copy of the Spare Parts Delivery Transmittal in the Operation and Maintenance Manuals in advance of Operation and Maintenance Manuals Review Submittal.

.4 Acceptance Criteria

.1 The delivery of Spare Parts shall be considered complete upon submitting a Spare Parts Delivery Transmittal that has been signed by both the Contractor and Departmental Representative.

1.16 GENERAL SYSTEM DEMONSTRATION AND TRAINING REQUIREMENTS

.1 General Requirements

.1 Provide System Demonstration and Training Report in accordance with Division 01 supplemented by the requirements of this Section

.2 Scope

.1 Provide system demonstration and training for each item of equipment and system including start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance

.3 Quality Assurance

.1 Provide competent instructors thoroughly familiar with the system for which demonstration and training are being provided.

.2 Provide training sessions that are project specific.

.4 Timing

.1 Arrange for System Demonstration and Training after:

.1 Equipment and systems are fully operational and have been tested, adjusted, and balanced

.2 All sequences of operation have been verified by the Contractor to be functioning in accordance with the Contract Documents for each mode of operation

.2 System Demonstration and Training may be performed over the course of multiple days as required based on the amount of work required and availability of those involved.

.1 Where System Demonstration and Training is completed in multiple sessions, a System Demonstration and Training Report shall be provided for each session

.5 Materials

.1 Supply all necessary tools, equipment and personnel to facilitate complete system demonstration

.2 Provide visual and audio equipment aids as required to perform training.

.3 Provide each trainee with a copy of the System Demonstration and Training Plan at the start of the session as an agenda.

.1 Coordinate the number of trainees that will be attending in advance of training.

.6 Execution

.1 The training sessions shall follow the outline in the Table of Contents of the Operation and Maintenance Manual and refer to the location of the information in the Manual for reference.

.2 System Demonstration and Training shall start with classroom-like sessions followed by hands-on training for each piece of equipment.

.1 Provide any pertinent equipment to facilitate the session including overhead projectors, slides, and video/audio material.

.3 If the equipment or system should fail to operate in accordance with the Contract Documents during the training session, the nature of the failure shall be noted in the System Demonstration and Training Report and the session shall be rescheduled after the issue(s) have been corrected if determined to be necessary by the Departmental Representative

.4 The Contractor shall determine the appropriate trade, manufacturer's representative, or combination of people who shall run each session.

.1 When a Commissioning Authority is present on the project, the Contractor shall coordinate with them to determine who will lead the System Demonstration and Training sessions

.5 Where the Contractor has used systems to maintain an environment at the worksite during the construction process, include lessons learned and information gathered on the operations of the systems

.6 Training topics shall include:

.1 A review of the written Operation and Maintenance Manuals with an emphasis on the safe and proper operating requirements, preventative maintenance, and special tools needed and spare parts inventory suggestions.

.2 Demonstration of start-up and operation of equipment (in all control modes), shut-down, seasonal changeover procedures and emergency procedures

.3 Discussion of relevant health and safety issues and concerns

.4 Discussion of warranties, guarantees, and emergency contact information

.5 Common troubleshooting problems and solutions

.6 Discussion of any peculiarities of equipment installation or operation

1.17 SUBSTANTIAL COMPLETION

.1 General Requirements

.1 The substantial completion requirements of this Section apply to the Work of Division 23.

.2 The substantial completion requirements of this Section shall supplement and be read in conjunction with the substantial completion requirements of Division 01.

.3 The substantial completion requirements of this section are not intended to identify every specific requirement for Substantial Completion, but rather to provide the Contractor with the general criteria that will be used to evaluate whether the work is substantially complete.

.1 The Departmental Representative reserves the right to identify additional specific criteria for substantial completion based on the nature of the project and the risks to the Departmental Representative.

.2 The Contractor shall be responsible for requesting clarification of any additional substantial completion requirements in advance of the

Application for Substantial Completion to ensure if there are any other specific requirements in terms of completed work before applying for Substantial Completion.

.2 Application for Substantial Completion

.1 When the Contractor is of the opinion that the Work of Divisions 23 meets the requirements for Substantial Completion as defined by this Section and elsewhere in the Contract Documents, the Contractor shall prepare and submit to the Departmental Representative the following:

.1 A statement indicating the Contractor's belief that the state of the Work meets the substantial performance requirements of this Section

.2 A list of *Deficient Work*, as previously identified by the Departmental Representative, that is yet to be corrected along with a schedule of when the corrective work will take place

.3 A list of proposed *Deferred Work* along with a schedule of when the *Deferred Work* will take place

.4 A list of *Incomplete Work*

.2 Acceptance of the Contractor's list of *Deficient Work*, *Deferred Work*, and *Incomplete Work* shall not alter the requirements of the Contract Documents or be misconstrued as the Departmental Representative's acceptance that work not identified is accepted as complete or in accordance with the Contract Documents.

.3 The Contractor shall allow a minimum of 10 working days after the Application for Substantial Completion for the Departmental Representative to review the application documents against the substantial completion requirements, perform a final field review of the work, and to prepare a written response for the Application.

.1 If rejection of the Application for Substantial Completion could negatively impact pre-determined occupancy, partial occupancy, or other scheduled dates that are critical to the Contractor or Departmental Representative, the Contractor shall be responsible for incorporating additional time into the construction schedule to allow for a proper Substantial Completion application and review process based on the complexity of the work and importance of the project deadlines.

.3 The work shall be considered Substantially Complete when all of the following general and specific requirements have been met:

.1 General requirements:

.1 The products of the work are *Ready for the Purpose Intended* as determined by the Departmental Representative.

.2 *Deficient Work* is minor (in the opinion of the Departmental Representative) and may be corrected safely and with minimal disruption to building operations and occupants after the work is turned over.

.3 *Deferred Work* (including post-occupancy TAB and/or commissioning) has been identified by the Contractor in writing and collectively agreed to be treated as such by the Departmental Representative and Contractor.

.4 There is no *Incomplete Work* in the opinion of the Departmental Representative.

.5 Substantial Completion requirements identified in other specification Sections have bees satisfied.

.6 The Departmental Representative has indicated in writing that the work is deemed to be substantially complete.

.2 Specific Requirements for Substantial Completion

.1 As a minimum, the following must be complete prior to application for Substantial Completion

.1 All work relating to building code requirements is complete and all related closeout documents have been submitted and accepted as complete by the Departmental Representative.

.2 All work relating to life-safety is complete and all related closeout documents have been submitted and accepted as complete by the Departmental Representative.

.3 All work relating to start-up, testing, adjusting, and balancing is complete and all related closeout documents have been submitted and accepted as complete by the Departmental Representative.

.4 All work relating to commissioning is complete and all related closeout documents have been submitted and accepted as complete by the Departmental Representative.

.5 All Contractor Marked-Up As-Built Document Requirements have been submitted and accepted as complete by the Departmental Representative.

.6 The Final Submission Review of the Operation and Maintenance Manuals has been submitted and accepted as complete by the Departmental Representative.

1.18 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Shop Drawings

.1 Shop drawings for all equipment required in Division 23.

1.19 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Certification Reports

.1 Contractor’s Declaration of Warranty

.2 Information Documents

.1 System Demonstration and Training Plan

.2 System Demonstration and Training Report

.3 Record of Service Work

.3 Operation and Maintenance Manuals Content

.1 Operation and Maintenance Manuals requirements where specified in Division 23

.4 Contractor As-Built Markups Content

.1 Contractor As-Built Markup requirements where specified in Division 23

.5 Spare Parts

.1 Spare parts requirements where specified in Division 23

1.20 CONTRACTOR'S DECLARATION OF WARRANTY

.1 General Requirements

.1 Submit in accordance with the requirements of Division 01 supplemented by the requirements of this Section.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a signed statement indicating full warranty for the Work and equipment provided by the Contractor and the Contractor's Sub-Contractors in accordance with the warranty requirements specified in Division 01 or a required by the specifications of Divisions 23.

.2 Submittal Format

.1 Include the following:

.1 Approved date of Substantial Performance

.2 Description of all work and equipment covered by the warranty

.3 Warranty end date

.4 Name of the Contractor Company carrying the warranty

.5 Name and signature of the Contractor's employee having authority to warranty the work

.6 Where Extended Warranties are required, provide a clear description of the applicable systems or equipment the Extended Warranty applies to

.3 Submittal Procedure

.1 Include a copy of all Declaration of Warranties in the Operation and Maintenance Manual.

1.21 SYSTEM DEMONSTRATION AND TRAINING PLAN

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a written plan describing the details of the System Demonstration and Training execution.

.2 Submittal Format

.1 Organize the System Demonstration and Training Plan as follows:

.1 Desired date of training (coordinated by the Contractor with other training activities)

.2 Training Agenda: Detailed list of topics that will be discussed during training session(s)

.3 Sample sign-in sheet

.4 List of visual/audio aids that will be used for training

.5 Names of training personnel

.6 Description of Departmental Representative staff from facilities who should be present for the training

.3 Submittal Procedure

.1 Submit one (1) copy to the Departmental Representative for review a minimum of fifteen (15) working days prior to the first planned training session date.

.2 Schedule System Demonstration and Training during regular work hours or at alternate times approved by the Departmental Representative

.3 Make any revisions to the System Demonstration and Training Plan as required by the Departmental Representative for resubmission prior to performing system demonstration and training.

1.22 SYSTEM DEMONSTRATION AND TRAINING REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a report showing that System Demonstration and Training has been completed satisfactorily to the Departmental Representative.

.2 Submittal Format

.1 Organize the System Demonstration and Training Plan as follows:

.1 The format and training agenda shall be in accordance with the HVAC Commissioning Process, ASHRAE Guideline 1-1989R, 1996 are an equivalent standard

.2 The date and time the training took place

.3 Name of training personnel

.4 The agenda for the training session updated to include any other important topics discussed

.5 A copy of the sign-in sheet indicating each person who was present (including the Departmental Representative, Contractor, and Commissioning Lead representatives as applicable)

.6 A list of any materials that have (or will be) turned over to the Departmental Representative to supplement the training session (videos, literature, etc.)

.7 Lessons learned and information gathered on the operations of the systems used to maintain an environment at the worksite during the construction phase

.8 Any supplemental information requested to be inserted into the Operation and Maintenance Manuals during the session

.9 A statement prepared by the Contractor, signed by both the Contractor and Departmental Representative, indicating that the training session has been satisfactorily completed

.3 Submittal Procedure

.1 Submit one (1) copy to the Departmental Representative for review no later than ten (10) working days after the date of each training session.

.2 Insert one (1) complete copy of the final System and Demonstration and Training Report in the Operation and Maintenance Manuals.

.3 Acceptance Criteria:

.1 System Demonstration and Training shall be considered complete upon submission of the signed statement of completion signed by the Departmental Representative for each of the training sessions indicated in the System Demonstration and Training Plan.

1.23 RECORD OF SERVICE WORK

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a record of service work for each service call request made during the warranty period.

.2 Submittal Format

.1 Each time service work is performed, record the following:

.1 Date and time service call request was made by the Departmental Representative

.2 Date and time service call was first responded to by the service company

.3 Name of Service Company and personnel assigned to the service call

.4 Description of the system behavior prompting a service call request

.5 Description of the specific equipment or components requiring maintenance

.6 Description of the work required to be performed to resolve the service request

.7 Summary of material and time spent required to resolve the service request

.8 Time and date of service call completion

.3 Submittal Procedure

.1 Consolidate all Records of Service Work one month before the end of the warranty period and provide to the Departmental Representative for inclusion in the Operations and Maintenance Manual

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EQUIPMENT ACCESS

.1 Access for Maintenance

.1 Coordinate the timing of the work with other trades to ensure that the minimum required maintenance space (for servicing, lubrication, disassembly, and removal of equipment or components) is maintained.

.1 The Contractor shall be responsible for remedial work required where the work of one Sub-Contractor infringes on the required access space for equipment due to inadequate coordination or planning

.2 The required access area for maintenance shall be the greater value between the minimum dimensions recommended by the manufacturer, dimensions indicated on the drawings, or dimensions required by the specifications.

.1 Regardless of published minimum requirements for maintenance access, coordinate and install the systems so that equipment can be maintained in a safe manner.

.2 The Departmental Representative reserves the right to determine if equipment can be maintained in a safe manner.

.3 Ensure that equipment requiring maintenance is clearly within view and is easily reachable for operating, inspecting, adjusting and servicing without the need for special tools or removal of obstructing equipment.

3.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with the manufacturer’s requirements, and that of Division 01.

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

.3 Storage and Handling Requirements:

.1 Store materials off ground in a dry location and in accordance with the manufacturer's recommendations in clean, dry, well-ventilated area

.2 Store and protect materials from nicks, scratches, and blemishes

.3 Replace defective or damaged materials with new

3.3 PAINTING

.1 Provide painting in accordance with the requirements of the specification for architectural touch-ups, piping and valving, pipe supports and bollards.

.2 Apply a minimum of one coat of corrosion resistant primer paint and two coats finishing paint suitable for outdoor use to all piping, ferrous supports and site fabricated equipment in accordance with the requirements of section 23 05 15 Common Installation Requirements for HVAC Pipework.

.3 Provide system identification in accordance with the requirements of Section 23 05 53 – Identification for HVAC Piping and Equipment.

.4 Submit shop drawings for paint(s) in accordance with Division 1 and Division 23 requirements.

3.4 REPAIRS AND RESTORATION

.1 Restore finishes that have been damaged throughout the course of construction to new condition.

3.5 CLEANLINESS

.1 Clean the construction site daily in accordance with the requirements of Division 01.

.2 Cleanliness During Construction:

.1 Clean concealed areas (i.e. above ceiling spaces) as required to maintain dust-free surfaces on equipment and services

.3 Final Cleaning:

.1 Clean the exterior surfaces of all equipment

.2 Clean the interior surfaces of all equipment with maintenance access doors or panels

3.6 WASTE MANAGEMENT

.1 Remove, store, or reuse construction waste in accordance with the requirements of Division 01.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Perform demolition and renovation work in accordance with this Section and the requirements of Division 01.

.2 Cease work and notify the Departmental Representative immediately if hazardous materials are discovered during the work (other than those previously identified).

.3 Take precautions to protect existing equipment from being damaged

.1 The Contractor shall be responsible for remedial work to repair damage caused to existing equipment to remain.

.4 Where demolition is required, completely remove all associated materials and equipment including piping, ducting, wiring, tubing, supports, controls, etc. unless indicated otherwise.

.5 Confirm piping is completely drained or evacuated prior to demolition.

1.2 HANDLING OF DEMOLISHED MATERIALS IDENTIFIED FOR REUSE OR TURN-OVER TO THE DEPARTMENTAL REPRESENTATIVE

.1 Where materials or equipment have been identified for reuse, carefully remove, store, and protect them in accordance with the requirements of Division 01.

.2 Where materials or equipment have been identified for turn-over to the Departmental Representative, carefully remove them, and turn over to the Departmental Representative in accordance with the requirements of Division 01.

1.3 RENOVATION WORK IN AN OCCUPIED OR PARTIALLY OCCUPIED BUILDING

.1 The boundary of the mechanical renovation work is not necessarily limited to the general area of renovations identified by a zone boundary on the plan drawings.

.1 Affected services may pass through occupied areas outside of the renovation zone boundary including on floors above or below the general renovation area, or where the source equipment is located.

.2 Where mechanical systems serve other occupied areas of the building that need to remain operational during the work, provide a Service Interruption Strategy Report.

1.4 PHASED RENOVATIONS OF MECHANICAL SYSTEMS

.1 Perform phased renovations of mechanical systems in accordance with the phasing requirements of Division 01 and as noted on mechanical drawings and specifications.

.2 The Contractor shall bear and include all costs associated with the safe execution of the phased work without adversely affecting the operation or environmental conditions of other occupied areas of the building. These costs may include provision of temporary services not explicitly defined in the Contract Documents, system by-passes, temporary equipment, or other work required in order to execute the work.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Information Documents

.1 Existing Condition Site Survey

.2 Service Interruption Strategy Report

1.6 EXISTING CONDITION SITE SURVEY

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Conduct a site review of the existing mechanical equipment to identify any variances between actual conditions and information shown on the drawings illustrating existing systems

.2 Submittal Format

.1 Mark up a copy of the drawings or provide a list of all deviations or conditions that will affect the cost of the work for the work specified

.2 Provide supplemental drawings, sketches, or pictures to illustrate the conditions

1.7 SERVICE INTERRUPTION STRATEGY REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Division 01 and Section 23 05 00 – Common Work Results for HVAC.

.2 Do not shut down any mechanical services until approved by the Departmental Representative or the Authority Having Jurisdiction (for life-safety services).

.1 Coordinate service shut-downs with the Departmental Representative each time prior to completing the work

.3 Coordinate the Service Interruption Strategy for all life safety systems with the Departmental Representative, the Fire Protection Engineer, and the Authority Having Jurisdiction.

.2 Specific Requirements

.1 Scope of Work

.1 Where demolition work is required in an occupied or partially occupied building and the work affects the services of these spaces, provide a detailed overview of the strategy proposed for ensuring continuous operation of non-renovated areas during temporary service shut-downs.

.2 Submittal Format

.1 Indicate the following:

.1 A description of the systems which will be affected by the work

.2 Strategies for maintaining service of mechanical systems to areas outside of the renovation boundary (i.e. isolation valves that will be closed, temporary services required, etc.)

.3 The planned /requested date(s) of the shut-down

.4 The expected duration the system or service will be shut-down

.5 Identify any unknown factors that may pose a risk for being able to provide continuous service for occupied areas

.6 Where phased renovations are required, provide strategies for each phase

.7 Valve tag numbers of isolation valves that are required to be closed during the service shut-down

.8 Measures that will be taken to ensure the safety of the building occupants during the shut-down period

.3 Submittal Procedure

.1 Revise the proposed strategies as required to suit the requirements of the Departmental Representative.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide all materials and equipment as required to perform the work of this Section.

Part 3 Execution

3.1 SELECTIVE DEMOLITION IN OCCUPIED BUILDINGS

.1 Perform demolition in occupied (or partially occupied) buildings in accordance with the requirements of Division 01.

.2 Strictly follow the Departmental Representative's standards and guidelines for construction and demolition in an occupied when provided.

.3 Remove, store, or reuse construction waste in accordance with Division 01.

3.2 WORK SCHEDULE

.1 Perform work during times in accordance with the requirements of Division 01.

.2 Work may be suspended at any time at the Departmental Representative's discretion due to safety issues or work adversely affecting the occupied areas of the building.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating

.2 CAN/CSA B149.1, Natural Gas and Propane Installation Code Handbook

.3 ULC-S115-2018, Standard Method of Fire Tests of Firestop System

1.2 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Shop Drawings

.1 Shop drawings for all equipment indicated in this Section

1.3 SHOP DRAWINGS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

1.4 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Test Reports

.1 Pipe Pressure Test Reports

.2 Pipe Cleaning Report

.2 Operation and Maintenance Manuals Content

.3 Contractor As-Built Markups Content

1.5 PIPE PRESSURE TEST REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a pipe pressure test report for the following piped systems:

.1 Natural Gas Piping

.2 Conditions of Test

.1 Isolate equipment and other system components not rated to withstand the testing pressure

.3 Performance Requirements

.1 Perform pressure test at a minimum of 150% or the intended system operating pressure

.2 Maintain test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

1.6 PIPE CLEANING REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC

.2 Specific Requirements

.1 Scope of Work

.1 Provide a pipe cleaning report for the following piped systems:

.1 Natural Gas Piping

1.7 OPERATION AND MAINTENANCE MANUALS

.1 General Requirements

.1 Incorporate the requirements of this Section in to the Operation and Maintenance Manuals in accordance with Section 23 05 00 – Common Work Results for HVAC

1.8 CONTRACTOR AS-BUILT DOCUMENTS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC

.2 Specific Requirements

.1 In addition to the general requirements for Contractor As-Built Documents Markups indicated in Section 23 05 00 – Common Work Results for HVAC, indicate the following:

.1 Location of

.1 Piping not shown on plan drawings including vent piping

Part 2 Products

2.1 MATERIAL

.1 Paint: colour “dark yellow”, zinc-rich to CAN/CGSB-1.181 suitable for outdoor use. Refer to Section 23 05 53 - Identification for HVAC Piping and Equipment.

.2 Fire Stopping: in accordance with ULC-S115-2018.

2.2 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.

2.3 SLEEVES

.1 Where sleeves pass through:

.1 PVC drain line piping to CSA-B182.1., gasket bell joints.

2.4 DIELECTRIC COUPLINGS

.1 Compatible with system, to suit pressure rating of system.

.2 Construction:

.1 NPS 2 and under: brass adapters or bronze valves

.2 Over NPS 2: isolating flanges

2.5 VALVES

.1 Refer to Section 23 11 23 – Natural Gas Piping.

2.6 ESCUTCHEONS

.1 One piece type with set screws.

.2 Chrome or nickel plated brass or type 302 stainless steel.

Part 3 Execution

3.1 CONNECTING TO EXISTING PIPED SYSTEMS

.1 Connect into existing piping systems in accordance with Section 23 05 05 – Selective Demolition for HVAC.

3.2 PIPEWORK INSTALLATION

.1 Support piping in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install so that equipment can be isolated and removed without interruption of any other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may not be used.

.7 Install exposed piping, equipment and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework so as to minimize furring space, maximize headroom, conserve space.

.9 Group piping wherever possible.

.10 Ream pipes, remove scale and other foreign material before assembly.

.11 Provide for thermal expansion as indicated and specified.

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 systems, equipment, components.

3.4 SLEEVES

.1 Provide sleeves in the following locations:

.1 All penetrations through masonry walls

.2 All penetrations though fire rated walls where required by fire-stopping system

.2 Use annular fins continuously welded at mid-point at:

.1 Foundation walls

.2 Where sleeves extend above finished floors

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.4 Provide 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Sleeve Termination:

.1 Walls: terminate flush with finished surface

.6 Sealant:

.1 Foundation walls: LinkSeal.

.2 Elsewhere:

.1 Provide space for firestopping

.2 Maintain fire rating integrity

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler suitable as firestopping.

.4 Ensure no contact between copper pipe or tube and sleeve

3.5 DIELECTRIC COUPLINGS

.1 Locations: where dissimilar metals are joined.

3.6 VALVES

.1 Refer to Section 23 11 23 – Natural Gas Piping.

3.7 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Sizes:

.1 Outside diameter to cover opening or sleeve

.2 Inside diameter to fit around pipe or outside of insulation if so provided

3.8 FLUSHING OUT OF PIPING SYSTEMS

.1 Purge piped systems in accordance with CAN/CSA B149.1.

3.9 TESTING – PIPED SYSTEMS

.1 Refer to Section 23 08 16 – Cleaning and Start-Up of HVAC Piping Systems.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1, Power Piping

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A125, Standard Specification for Steel Springs, Helical, Heat-Treated

.2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

.3 ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture

.2 MSS SP69, Pipe Hangers and Supports - Selection and Application

.3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices

.4 National Research Council Canada (NRCC)

.1 National Plumbing Code of Canada (NPC)

1.2 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 SP58.

.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 in accordance with MSS SP58.

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Shop Drawings

.1 Shop drawings for all equipment indicated in this Section

1.4 SHOP DRAWINGS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 - Common Work Results for HVAC.

.2 Specific Requirements

.1 In addition to the general Shop Drawing requirements indicated in Section 23 05 00 - Common Work Results for HVAC indicate the following:

.1 Any applicable load calculations

1.5 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Operation and Maintenance Manuals Content

.2 Contractor As-Built Markups Content

1.6 OPERATION AND MAINTENANCE MANUALS

.1 General Requirements

.1 Incorporate the requirements of this Section in to the Operation and Maintenance Manuals in accordance with Section 23 05 00 - Common Work Results for HVAC.

1.7 CONTRACTOR AS-BUILT DOCUMENTS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 - Common Work Results for HVAC.

.2 Specific Requirements

.1 In addition to the general requirements for Contractor As-Built Documents Markups indicated in Section 23 05 00 - Common Work Results for HVAC, indicate the following:

.1 Location of:

.1 Floor-mounted structural supports for overhead pipe/equipment racks

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with the following:

.1 MSS SP58

.2 ANSI B31.1

.3 SMACNA Seismic Restraint Manual

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports unless otherwise noted: Hot dipped galvanized, zinc-plated, cadmium-plated, or prime plated

.2 Ensure steel hangers in contact with copper piping are copper-plated or epoxy coated

.2 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel galvanized

.2 Attachments for copper piping: copper plated black steel

.3 Use insulation shields for pipework

.4 Oversize pipe hangers and supports

.3 Adjustable clevis: material to MSS SP69, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.4 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.

.5 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: cadmium plated or prime plated

.2 Finishes for copper, glass, brass or aluminum pipe work: black, with formed portion plastic coated

.6 Pipe rollers

.1 Finish: Malleable iron or cast iron

.2 Material: Cast iron roll and roll stand with carbon steel rod to MSS SP69

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: cadmium plated or prime painted carbon steel to MSS SP58, type 42.

.2 Copper pipe: carbon steel copper plated or epoxy coated to MSS SP58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.5 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel hot dipped galvanized for outdoor use.

.2 Submit structural calculations with shop drawings.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with the 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 pipe is 13 mm or more
- .2 Transfer of load to adjacent hangers or connected equipment is not permitted

.6 Use variable support spring hangers for first four hangar points on piping connected with flexible connections to vibration isolated equipment.

3.3 HANGER SPACING

.1 Plumbing piping: to the most stringent requirements of the Authority Having Jurisdiction, Provincial Code, and the National Plumbing Code of Canada.

.2 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.3 Within 300 mm of each elbow.

.4 Space hangers for copper and steel pipe in accordance with the following table:

Pipe Size: NPS	Maximum Spacing (m)	Rod diameter (mm)
up to 1-1/4	2.4	10
1-1/2	2.4	10
2	3.0	10
2-1/2	3.0	10
3	3.6	10
4	3.6	12
6	4.3	16
8	4.3	16
10	4.3	20
12	4.3	20
14	6.1	25
16	6.1	25
18	6.1	25

.5 Pipework greater than NPS 12: to MSS SP69.

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.

.4 Double-nut all attachments to hanger rods for piping over NPS ¾.

3.5 PIPE 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 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

.3 Where horizontal pipe movement is between 13 mm and 25 mm, ensure that hanger length is at least 300mm long, use adjustable clevis hangers, offset pipe hanger and support so that rod hanger is vertical in the hot position.

.4 Where horizontal pipe movement is greater than 25 mm, use pipe roller supports.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure 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 TESTING – THERMAL EXPANSION COMPENSATION DEVICES

.1 General Requirements

.1 Verify expansion compensation ability under extreme initial and design conditions (temperature & flow).

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 24.3 – Standards for Pipe Identification

.2 Canadian Standards Association (CSA)

.1 CSA B149.1, Natural Gas and Propane Installation Code

.3 Workplace Hazardous Materials Information System (WHMIS)

1.2 EXISTING IDENTIFICATION SYSTEMS

.1 When modifying a portion of an existing system, provide identification that matches that of the existing otherwise provide identification in accordance with the requirements of this section.

1.3 PIPING IDENTIFICATION SYSTEMS GOVERNED BY CODES AND STANDARDS

.1 Where identification of systems are governed by Codes or specified to be in accordance with a specific Standard, the requirements of those Codes or Standards shall take precedence over the requirements of this section.

.2 Applicable Codes and Standards that supersede the requirements of this section include, but are not limited to:

.1 Natural Gas: to CSA/CGA B149.1 or authority having jurisdiction

1.4 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Information Documents

.1 Systems and Equipment Identification Directory

.2 Shop Drawings

.1 Shop drawings for all equipment indicated in this Section

1.5 SYSTEMS AND EQUIPMENT IDENTIFICATION DIRECTORY

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a directory showing the nomenclature used for all mechanical system and service identification.

.2 Submittal Format

.1 List of all tagged equipment (on both the drawings and specifications) with the following:
  .1 Short description of equipment function
  .2 Equipment tag number that will appear on the nameplates
  .3 Description of the equipment location
.2 List of all piping and ductwork system with the following:
  .1 Short description of system function
  .2 The following identification information for each system:
    .1 The label identification nomenclature
    .2 The symbols that will be used (flow arrow, etc.)
    .3 Actual dimensions of text and arrows
    .4 Identification colors/banding etc.
.3 Provide a reduced scale, color drawing showing a typical example sample of:
  .1 An equipment nameplate
  .2 The actual identification of a distribution system as it will appear as applied on site
  .3 Sample of above-ceiling equipment markers that will be used

1.6 SHOP DRAWINGS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

1.7 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Operation and Maintenance Manuals Content

.2 Contractor As-Built Markups Content

1.8 OPERATION AND MAINTENANCE MANUALS

.1 General Requirements

.1 Incorporate the requirements of this Section in to the Operation and Maintenance Manuals in accordance with Section 23 05 00 – Common Work Results for HVAC.

1.9 CONTRACTOR AS-BUILT DOCUMENTS

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 In addition to the general requirements for Contractor As-Built Documents Markups indicated in Section 23 05 00 – Common Work Results for HVAC, indicate the following:

.1 Location of all tagged equipment provided in the specifications but not already shown on the plan drawings

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 to be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: Manufacturer's name, model, size, serial number, capacity

2.2 LAMINATED PLASTIC NAMEPLATES

.1 Colours:

.1 Black letters, white background (except where required otherwise by applicable codes)

.2 Construction:

.1 3 mm thick laminated plastic matte finish, with square corners, letters accurately aligned and machine engraved into core

.3 Lettering Sizes:

.1 Terminal cabinets, control panels: 8 mm high lettering

.2 Equipment in Mechanical Rooms or Outdoors: 20 mm high lettering

.3 Equipment located elsewhere: 12 mm high lettering

2.3 PIPING SYSTEMS IDENTIFICATION

.1 Stencils: With clean cut symbols and letters of following size:

.1 20-30 mm Outside Diameter of Insulation or Pipe: 15 mm high letters

.2 40-50 mm Outside Diameter of Insulation or Pipe: 20 mm high letters

.3 65-150 mm Outside Diameter of Insulation or Pipe: 30 mm high letters

.4 Over 150mm Outside Diameter of Insulation or Pipe: 65 mm high letters

.5 Equipment: 65 mm high letters

.6 Flow arrowhead height to match letter height

.2 Stencil Paint: Semi-gloss enamel, black color

.3 Identify contents by legend and pictogram (where required) and direction of flow by arrows using stencilled painted markings.

.4 Pictograms:

.1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations

.2 Including:

.1 Radiation hazard.

.2 Biohazard.

.5 Legend:

.1 Block capital letters

.6 Arrows showing direction of flow:

.1 Use double-headed arrows where flow is reversible

.7 Legends:

.1 Where not listed, obtain direction from Departmental Representative

.2 Legends for piping systems:

Background Color	Legend Arrows
Yellow	Black
Green	White
Blue	White
Red	White

.8 Background color marking and legends for piping systems (based on General Paint Custom Colors)

System	Paint Code No.	Color	Legend
Gas Lines, Handrails, & Valve Handles	4798-A	Dark Yellow	-

2.4 VALVE IDENTIFICATION

.1 Valve Tags: tags with 12 mm high lettering and brass jack chain for fastening to valve. Following types of valve tags are acceptable:

.1 Brass tags: 40 mm diameter.

.2 Plastic tags: 50 mm x 50 mm

.3 Anodized aluminum tags: 40 mm diameter

Part 3 Execution

3.1 GENERAL INSTALLATION

.1 Submit samples of identification system for Departmental Representative review prior to installation.

.2 Provide identification only after all painting has been completed.

.3 Provide ULC or CSA registration plates as required by respective agency.

.4 Identify all equipment listed on equipment schedules on drawings and specifications with laminated plastic nameplates.

3.2 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces

.3 Protection

.1 Do not paint, insulate or cover in any way

3.3 PIPING IDENTIFICATION SYSTEMS

.1 Apply piping identification systems to all piping except piping that is located in non-accessible chases and furred-in spaces.

.2 Locate piping identification as follows:

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 15m 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 (1.5 sq. m or less) through which piping passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

.3 Identification shall be easily observable from normal operating areas and maintenance access locations.

.1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

.4 Additional requirements for particular piping systems:

.1 Natural gas and propane gas:

.1 Paint outdoor piping system yellow to CAN/CGAB149.1 with suitable outdoor paint.

.2 Apply legend and flow arrows to CAN/CGAB149.1.

3.4 VALVES, CONTROLLERS

.1 Tag all valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE Standard 111, Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems

.2 National Environmental Balancing Bureau (NEBB)

.1 NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems

1.2 ABBREVIATIONS

.1 TAB – Testing, adjusting, and balancing

.2 TAB Agency – An independent entity certified to perform testing and balancing work.

.3 TABB – Testing, Adjusting, and Balancing Bureau

.4 NEBB – National Environmental Balancing Bureau

1.3 GENERAL REQUIREMENTS

.1 Intent

.1 The general intent of testing, adjusting, and balancing (TAB) is to:

.1 Verify proper and safe operation

.2 Determine actual point of performance

.3 Evaluate qualitative and quantitative performance of equipment and systems

.4 Adjust and regulate equipment and systems to meet specified performance requirements under normal, emergency, and special control mode conditions

.5 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges

.2 Coordination:

.1 Schedule TAB (including verification and re-verification) into project construction schedule to ensure that TAB has been verified as complete well in advance of Substantial Completion

.2 Perform TAB of each system independently unless interlocked with other systems

.3 Operation of Systems for TAB During Construction:

.1 Operate systems for length of time required for TAB and as that required for TAB verification

.4 Special TAB Considerations:

.1 Full Departmental Representative Occupancy: Departmental Representative will occupy the site and existing building during entire TAB period. Cooperate with Departmental Representative during TAB operations to minimize conflicts with Departmental Representative's operations.

.5 Commissioning:

.1 Perform TAB and provide required reports independently from any commissioning exercises

.2 The Tab Agency shall cooperate with the Commissioning Agent and perform the required services in accordance with the requirements of Division 01

1.4 QUALITY ASSURANCE

.1 TAB Procedures

.1 TAB of systems and equipment that are regulated by codes shall be to the satisfaction of Authority Having Jurisdiction.

.2 Perform TAB in accordance with the following Standards supplemented by the procedures defined by this Section:

.1 ANSI/ASHRAE Standard 111, Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems and its associated addenda and errata.

.3 TAB procedures and submittal documentation shall be performed in accordance with the standards defined by the applicable TAB association and *ANSI/ASHRAE Standard 111, Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.*

.4 Where TAB of systems or system components are not covered by standard TAB procedures or defined by Section, the TAB Agency shall develop and document an appropriate procedure and include it in the Pre-TAB Report.

.2 Measurement Accuracy Tolerances

.1 Calibration:

.1 Calibration of instruments shall be in accordance with the TAB association procedures

.2 Accuracy of Measurement Tool and Measurements:

.1 Pressure Differentials: Capable of measuring to at least two decimal places

.3 Performance Accuracy Tolerances

.1 Provide TAB as required in order to achieve design performance values within the following tolerances:

.1 Natural Gas Flow Rates: ± 10%

1.5 REQUIRED TAB DOCUMENTATION AND MEASUREMENTS

.1 The following defines the required TAB data and measurements for inclusion in the TAB Report.

.2 General Data Requirements

.1 Provide the following TAB data for each item of equipment with an equipment tag:

.1 Equipment Tag

.2 Equipment Location

.3 Equipment Manufacturer

.4 Equipment Model Number

.5 Equipment Serial Number

.6 Date TAB was performed

.3 Natural Gas System Data Requirements

.1 Provide the following TAB data:

.1 Pressure Reducing Valves (natural gas) (refer to plan drawings for locations):

.1 Pressure upstream pressure of valve

.2 Pressure downstream pressure of valve

.2 Pressure Relief Valves (natural gas) (refer to plan drawings for locations):

.1 Activation pressure

.3 Natural Gas Piping Systems:

.1 Pressure and duration of pressure test

.2 Test results

.3 Location/description of piping tested

1.6 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals:

.1 Information Documents

.1 Pre-TAB Execution Report

1.7 PRE-TAB EXECUTION REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a report identifying procedures that will be used for the execution of each Closeout Submittal of this Section.

.2 Submittal Format

.1 TAB Qualifications

.1 TAB association membership certifications for the TAB Agency

.2 Documentation of successful experience of personnel performing TAB

.3 Names of all personnel performing TAB

.4 TAB association membership certifications for the personnel performing TAB

.2 TAB Schedule

.1 Anticipated start of TAB

.2 Anticipated completion date of TAB

.3 Scheduled date of Post-Occupancy TAB

.3 Strategies and Procedures

.1 A listing of equipment and systems that will undergo TAB (as required by the Required TAB Documentation and Measurements)

.2 A description of the stand procedures used by the applicable TAB Standard

.3 Additional TAB procedures developed by the TAB Agency for systems or system components without previously established TAB Standards

.4 Sample TAB forms showing the format the required TAB Data will appear in

.4 Instrumentation

.1 A description of the instrumentation that will be used for TAB

1.8 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Test Reports

.1 TAB Report

.2 Operation and Maintenance Manuals Content

.3 Contractor As-Built Markups Content

1.9 TAB REPORT

.1 General Requirements

.1 Submit in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

.2 Specific Requirements

.1 Scope of Work

.1 Provide a TAB report containing a complete record of all final parameter set-point for all equipment requiring TAB

.2 Submittal Format

.1 Title Page:

.1 TAB Agency name

.2 TAB Agency address

.3 TAB Agency contact information

.4 Project name

.5 Project location

.6 Project Engineer
.7 Project Contractor
.8 Project altitude
.9 Report date

.2 Table of Contents

.3 Performance Guaranty:
.1 Certification Statement
.2 Name, signature, and certification numbered of applicable TAB Agency membership

.4 General TAB Overview:
.1 Description of test conditions at the time of TAB
.2 Description of the procedures used to perform TAB
.3 Notable characteristics of system
.4 A list of items or issues that do not meet design tolerances with information that may be considered for resolving the deficiencies

.5 Instrument List:
.1 Instrument type
.2 Instrument manufacturer
.3 Instrument model number
.4 Instrument serial number
.5 Instrument range
.6 Instrument calibration date

.6 Required TAB Documentation and Measurements

.3 Submittal Procedure
.1 Do not submit in-progress TAB reports unless requested by the Departmental Representative.

.4 Verification
.1 After TAB is complete and accurately documented in the TAB Report, arrange for verification of the data.
.2 The TAB Agency shall conduct the verification in the presence of:
.1 The Departmental Representative
.2 The Authority Having Jurisdiction (for all life-safety systems)
.3 The Commissioning Agent
.3 If emergency power has been provided for the operation of any item of equipment, verification shall be conducted on both normal and emergency power.
.4 The Departmental Representative shall select specific TAB data for verification of accuracy of reported values.
.5 Selected data shall be limited to the extent of measurements that can be verified over 8-hours.

.6 If the verified measurements differ from those documented in the TAB Report by more than the permitted tolerances, the verification measurement shall be noted as "FAILED."

.7 If the number of "FAILED" verification measurements is greater than 10 percent of the total measurements checked during verification, the TAB shall be considered incomplete.

.5 Re-verification

.1 If TAB is incomplete due to failed verification of data:

.1 The TAB Agency shall:

.1 Recheck all measurements and make adjustments as required to complete and correct the TAB

.2 Update the TAB Report with the new values, and

.3 Resubmit the TAB Report and request a second verification.

.2 Bear costs to repeat TAB verification as required until complete.

1.10 COMPLETION OF TAB

.1 TAB shall be considered complete when:

.1 The Pre-TAB Report is complete and has been submitted

.2 The TAB Report is complete and has been completed

.3 The Post-Occupancy TAB Report is complete and has been submitted

.4 All required TAB data has been provided

Part 2 Products

2.1 SECTION NOT USED

Part 3 Execution

3.1 GENERAL TAB PROCEDURES

.1 Timing of TAB:

.1 Perform TAB activities in accordance with the standard construction activity timeline as indicated by the applicable TAB association

.2 Provide adequate time within the Construction schedule to perform TAB allowing for multiple TAB exercises as required in order to meet the specified performance parameters

.2 Coordination of TAB:

.1 Coordinate TAB activities with the work of other Divisions

.2 Coordinate TAB activities with the Commissioning Agent

.3 Pre-TAB Requirements:

.1 Systems Perform TAB after:

.1 Mechanical systems are completely installed, and equipment start-up has been performed

.2 Piped systems have been purged, filled, vented, and chemically treated

.2 Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to perform TAB

.3 Identify any deficiencies that would prevent proper completion of the TAB work prior to performing TAB

.4 Post-TAB Requirements:

.1 Leave systems in proper working order

.2 Mark valve position indicators, valve locks, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings

.5 TAB of Systems with Equipment that Operate In Parallel and in Tandem:

.1 Where systems contain multiple items of equipment for full or partial backup (i.e. pumps, fans, air-handling units, etc), that operate in parallel and in tandem under normal operation:

.1 Perform TAB for normal operation (with multiple units running)

.2 Perform TAB separately for each individual item of equipment operating alone

.2 Provide separate TAB data for multiple-unit operation as well as stand-alone operation for each item of equipment

END OF SECTION

Part 1 General

1.1 GASEOUS FUEL SYSTEMS

.1 Operation tests:

.1 Measure gas pressure at gas meter outlet and at inlets and outlets of pressure regulating valves.

.2 Verify details of temperature and pressure compensation at meter.

.3 Verify settings, operation, venting of high and low pressure cut-outs, pressure relief valves, alarms.

.4 Check terminals of vents for gas pressure regulators.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with 23 05 00 – Common Work Results for HVAC.

.2 Operations and Maintenance Manuals

.1 Include the following documentation in the Operations and Maintenance Manuals as required by 23 05 00 – Common Work Results for HVAC (in addition to the general requirements of that section).

.1 System Test Reports

.1 Gaseous Fuel System Test (Pressure Test)

.2 Pressure Regulating Valve tests

.3 Pressure Relief Valve tests

.2 Performance Data

.1 Provide the final operating set-point for the following equipment:

.1 Pressure Regulating Valves

.2 Pressure Relief Valves

.3 Commissioning Reports

.1 As required by Section 01 91 13 – General Commissioning (CX) Requirements

.4 System Demonstration and Training

.1 Provide documentation used during System Demonstration and Training for all products/systems related to this section.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Intent

.1 The intent of this Section is to define the start-up and testing requirements for Division 23.

.1 Refer to other Sections for additional start-up and testing requirements.

.2 Respect to Testing, Adjusting, and Balancing (TAB)

.1 The requirements of this Section shall supplement the requirements of Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.

.2 Perform the work of this Section prior to the TAB Contractor's work required by Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.

1.2 COMMISSIONING REQUIREMENTS

.1 The requirements of this section shall apply in additional to commissioning activities or documentation required by other Sections.

.2 Where commissioning services are required by other Sections:

.1 Perform Start-up and Testing in advance of system commissioning.

.2 Perform the work of this Section in accordance with Division 1 commissioning requirements.

.3 The submittals required by this Section shall be provided to the Departmental Representative independently of Commissioning submittal documentation.

.4 All Action and Information Submittals and Closeout Submittals of this Section shall be submitted to both the Departmental Representative and Commissioning Authority.

.5 Mechanical system start-up and testing shall be performed in coordination with, and in the presence of the Commissioning Authority.

.6 Mechanical system start-up and testing shall be considered complete when indicated as such by both the Departmental Representative and the Commissioning Authority.

1.3 QUALITY ASSURANCE

.1 Coordination of Start-up and Testing Activities

.1 Coordinate start-up and testing activities with trade Sub-Contractors to ensure that Closeout Submittal documents represent the final state of conditions at project turn-over.

.2 Repeat Testing

.1 Repeat start-up and testing work of this and other Sections as required until the equipment is functioning in accordance with the Contract Document

requirements and all closeout submittals have been submitted and accepted as complete by the Departmental Representative.

.3 Inconsistencies Between Closeout Submittals information and System Performance

.1 Systems that are determined to be not performing in accordance with either the data provided in the Closeout Submittal test reports or in accordance with the Contract Documents after project turn-over and before the end of warranty period are subject to Contractor adjustment, modifications and retesting.

.1 Where adjustment, modifications, and retesting are required:

.1 Provide updated Closeout Submittal documents to the Departmental Representative indicating the final state of conditions after the work has taken place.

.2 Include a copy of the updated Closeout Submittal documents in the Operations and Maintenance Manual.

1.4 CLOSEOUT SUBMITTALS

.1 Provide the following Closeout Submittals:

.1 Operation and Maintenance Manuals Content

1.5 OPERATION AND MAINTENANCE MANUALS

.1 General Requirements

.1 Incorporate the requirements of this Section in to the Operation and Maintenance Manuals in accordance with Section 23 05 00 – Common Work Results for HVAC.

1.6 SYSTEM DEMONSTRATION AND TRAINING

.1 General Requirements

.1 Provide system demonstration and training for the work of this Section in accordance with the requirements of Section 23 05 00 – Common Work Results for HVAC.

1.7 SUBSTANTIAL COMPLETION

.1 Refer to Section 23 05 00 – Common Work Results for HVAC for requirements for Substantial Completion.

.2 Deferred Testing

.1 Deferred testing shall not be considered as such until the following conditions are met:

.1 A list of proposed deferred testing activities has been provided by the Contractor

.2 A schedule for when the proposed deferred testing will be completed

.3 Approved as deferred testing by the Departmental Representative

Part 2 Products

2.1 TESTING EQUIPMENT

.1 Provide testing instrumentation as required to complete start-up and testing.

.1 Provide 2-way radios to facilitate testing.

.2 Instrumentation Accuracy Tolerances:

.1 One higher order of magnitude than the equipment or system being tested.

.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

.1 Test each system independently and then in unison with other related systems.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

- .1 ANSI B109.1 Diaphragm-Type Gas Displacement Meters (Under 500 Cubic Feet Per Hour Capacity)
- .2 ANSI B109.2 Diaphragm-Type Gas Displacement Meters (500 Cubic Feet Per Hour Capacity and Over)
- .3 ANSI B109.3 Rotary-Type Gas Displacement Meters

.2 American Society of Mechanical Engineers (ASME)

- .1 ASME B16.5, Pipe Flanges and Flanged Fittings
- .2 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings
- .3 ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
- .4 ASME B18.2.1, Square and Hex Bolts and Screws Inch Series

.3 American Society for Testing and Materials International (ASTM)

- .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings
- .2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
- .3 ASTM B32, Specification for Solder Metal
- .4 ASTM B75M, Standard Specification for Seamless Copper Tube [Metric]
- .5 ASTM B837, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems

.4 Canadian Standards Association (CSA)

- .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel

.5 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)

- .1 CAN/CSA B149.1, Natural Gas and Propane Installation Code Handbook
- .2 CAN/CSA B149.2, Propane Storage and Handling Code

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Safety Data Sheets (SDS)

1.2 QUALITY ASSURANCE

.1 Pre-Installation Meeting:

- .1 Convene pre-installation meeting in accordance with Section 01 32 16.07-Construction Progress Schedules - Bar (GANTT) Chart.
  - .1 Verify project requirements.
  - .2 Review installation conditions.
  - .3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

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

1.3 SUSTAINABILITY REQUIREMENTS

.1 All equipment shall meet the mandatory requirements of the National Energy Code for Buildings (NECB).

1.4 ACTION AND INFORMATION SUBMITTALS

.1 Provide the following Action and Information Submittals in accordance with 23 05 00 – Common Work Results for HVAC:

.1 Shop Drawings

.1 Shop drawings for all equipment indicated in this Section.

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

.2 Product Data:

.3 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.4 Indicate on manufacturers catalogue literature following: valves.

.5 Submit WHMIS MSDS and indicate VOC's for adhesive and solvents during application and curing.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with 23 05 00 – Common Work Results for HVAC.

.2 Operations and Maintenance Manuals

.1 Include the following documentation in the Operations and Maintenance Manuals as required by 23 05 00 – Common Work Results for HVAC (in addition to the general requirements of that section).

.1 Permits

.1 Gas permit

.2 System Test Reports

.1 Natural Gas System

.3 Commissioning Reports

.1 As required by Section 01 91 13 – General Commissioning (CX) Requirements

.4 Shop Drawings

.1 Provide Contractor and Departmental Representative-reviewed Shop Drawings for each product of this section.

.5 Maintenance Data

.1 Provide Manufacturer’s start-up, installation, and troubleshooting instructions for each product of this section

.2 Provide a list of spare parts recommended by the Manufacturer for each product of this section.

.3 As-Built Drawings

.1 Indicate the following specific information on the Contractor's marked-up As-Built Drawings as required by 23 05 00 – Common Work Results for HVAC (in addition to the general requirements of that section). This list is not intended to define all of the information required to be shown on As-Built drawings but rather to remind the Contractor to show commonly-missed items.

.1 Location of:

.1 Relief vents

.2 Routing of:

.1 Vent piping

Part 2 Products

2.1 ABOVE GROUND PIPING

.1 Pipe:

.1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:

.1 NPS ½ to 2, screwed.

.2 NPS 2 ½ and over, plain end.

.2 Copper tube: to ASTM B75M.

.2 Jointing Material

.1 Screwed fittings: pulverized lead paste.

.2 Welded fittings: to CSA W47.1.

.3 Flange gaskets: non-metallic flat.

.4 Soldered: to ASTM B32.

.3 Fittings

.1 Steel pipe fittings, screwed, flanged or welded:

.1 Malleable iron: screwed, banded, Class 150.

.2 Steel pipe flanges and flanged fittings: to ASME B16.5.

.3 Welding: butt-welding fittings.

.4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.

.5 Bolts and nuts: to ASME B18.2.1.

.6 Nipples: schedule 40, to ASTM A53/A53M.

.2 Copper pipe fittings, screwed, flanged or soldered:

.1 Cast copper fittings: to ASME B16.18.

.2 Wrought copper fittings: to ASME B16.22.

2.2 BURIED PIPING

.1 Pipe

.1 Polyethylene to CAN/CSA B-137.4

.2 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless

.2 Fittings

.1 Polyethylene pipe: thermo-fusion weld type to CAN/CSA B-137.4.1.

.2 Steel pipe: welded fittings: to CSA W47.1.

.3 Steel pipe covering

.1 Polyethylene “yellow jacket” covering with plastic shrink-wrapped or “polyken” tape wrapped joints and fittings.

.4 Pipe Sleeve

.1 PVC drain line piping to CSA-B182.1., gasket bell joints.

2.3 ISOLATION VALVES

.1 Trunnion Ball Type for piping 50mm dia. and smaller:

.1 CSA certified, ULC/CGA approved 1380 kPa (200psi) rated, 1/4 turn, operator lever/wrench, full bore carbon steel body, ENP plated ball, stainless steel stem, screwed ends, API 6D compliant, API607/6FA Fire Safe compliant.

.2 Plug or Ball Type for piping 65mmdia.and larger:

.1 CSA certified, ULC/CGA approved 1380 kPa (200psi) rated, 1/4 turn, operator lever/wrench, full bore carbon steel body, ENP plated ball, stainless steel stem, raised faced flanged ends, API 6D compliant, API607/6FA Fire Safe compliant.

2.4 PRESSURE REGULATORS

.1 Certified to the requirements of CAN/CGA B149.1.

.2 Capacity to suit load and pressures indicated.

.3 Vented Type: spring-loaded self-operated design, tight closing, selected for facility gas pressure and piping pressure loss, and connected equipment load at full firing rate plus 20% spare, and complete with:

.1 1035 kPa (150 psi) rated wrought carbon steel body finished with corrosive resistant epoxy enamel, paint suitable for outdoor use;

.2 Aluminum diaphragm and spring case with Nitrile rubber diaphragm, disc, and body O-ring;

.3 Throttling type, high flow rate, tight shut-off relief valve selected to protect equipment downstream of regulator in coordination with regulator capacity.

2.5 PRESSURE RELIEF VAVLES

.1 Certified to the requirements of CAN/CGA B149.1.

.2 Capacity to suit load and pressures indicated.

.3 Pilot self-operated design, throttling type, tight closing, selected for facility gas pressure and piping pressure loss, and connected equipment load at full firing rate:

.1 1035 kPa (150 psi) rated aluminium body and spring case finished with corrosive resistant epoxy enamel, paint suitable for outdoor use;

.2 Aluminum diaphragm and spring case with Nitrile rubber diaphragm, disc, and body O-ring;

2.6 NATURAL GAS METER

.1 Certified to ANSI B109.1, ANSI B109.2 and Measurement Canada accredited.

.2 Capacity to suit load and pressures indicated.

.3 Diaphragm Type: seamless molded convoluted diaphragm, lubrication free bearings and bushings.

2.7 PRESSURE GAUGE

.1 Certified to the requirements of CAN/CGA B149.1.

.2 Capacity to suit load and pressures indicated.

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 datasheet.

3.2 PIPING

.1 Install in accordance with Section 23 05 15 – Common Installation Requirements for HVAC Pipework, CAN/CSA B149.1, and applicable Provincial/Territorial Codes, supplemented as specified.

.2 Install drip points:

.1 At low points in piping system.

.2 At connections to equipment.

.3 Install buried piping inside pipe sleeve where indicated.

.4 Paint: colour “dark yellow”, zinc rich to CAN/CGSB-1.181, suitable for outdoor use.

.5 Supports to be installed to suit CSA B149.1, corrosion resistant, hot dipped galvanized or equivalent.

3.3 PRESSURE REGULATORS

.1 Install to the requirements of CAN/CGA B149.1.

3.4 VALVES

.1 Install valves with stems upright or horizontal unless otherwise approved by Departmental Representative.

.2 Install for easy of accessibility and maintenance.

.3 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

.4 Paint valves located outdoors to match piping, paint to suit requirements of Division 20.

3.5 PURGING

.1 Purge after pressure test in accordance with CAN/CGA B149.1.

3.6 PRE-START-UP INSPECTIONS

.1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.

.2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.7 CLEANING AND START-UP

.1 In accordance with requirements of CAN/CGA B149.1.

3.8 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.

.2 Pressure and duration of test to be in accordance with CAN/CSA B149.1

.3 Record and submit results, including branch tested, test details and results

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

.3 Schedule site visits to review work at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

.2 Twice during progress of work at 25% and 60% complete.

.3 Upon completion of work, after cleaning is carried out.

.3 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

.4 Performance Verification:

.1 Refer to Section 23 08 01- Performance Verification of Mechanical Piping Systems.

3.9 ADJUSTING

.1 Purging: purge after pressure test in accordance with CAN/CSA B149.1.

.2 Pre-Start-Up Inspections:

.1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.

.2 Check gas trains, entire installation is approved by authority having jurisdiction.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A90/A90M-09, Standard Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

.4 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.6 ASTM F1664-08, Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.

.7 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-138.1-19, Fabric for Chain Link Fence.

.2 CAN/CGSB-138.2-19, Steel Framework for Chain Link Fence.

.3 CAN/CGSB-138.3-19, Installation of Chain Link Fence.

.4 CAN/CGSB-138.4-19, Gates for Chain Link Fence.

.5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA Group (CSA)

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A3000-13, Cementitious Materials Compendium.

.4 Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual – 2019.

.5 United States Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 61 00 – Common Product Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect fence and gate materials from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00.09 - Cast-in-Place Concrete (Short Form).

.1 Nominal coarse aggregate size: 20-5.

.2 Compressive strength: 20 MPa minimum at 28 days.

.3 Additives: fly ash to CSA A3000.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

.1 Wire Size: 4.8 mm (min) (6 Gauge)

.2 Size of mesh: 50.8 mm

.3 Height of fence fabric: 2500 mm

.4 Barbed edges top and bottom

.5 Average mass of zinc coating to be not less than 610 g/m2 of uncoated wire

.6 Breaking tensile strength to be 10,000 N·min.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe.

.1 Posts shall be spaced a maximum of 2.5 m apart.

.2 Line post minimal size shall be 73 mm O.D. 8.6 kg/m.

.3 Strain post minimum size shall be 114.3 mm O.D. 15.92 kg/m. Strain posts shall be spaced not more than 60 m apart.

.4 Corner and gate post minimum size shall be 143.3 mm O.D. 21.0 kg/m.

.5 Bottom and top rails shall be 42.2 mm O.D. minimum, 3.4 kg/m.

.6 Galvanized steel arms shall be provided on all posts where barbed wire is to be installed.

.4 Top and bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire, fittings shall be of galvanized steel.

.5 Tie wire fasteners shall be 3.7 mm diameter (9 gauge) galvanized steel wire to secure chain link fabric to bottom rail, top rail and line posts at 300 mm spacing.

.6 Tension bar: to ASTM A653/A653M, 5 x 20 x 2500 mm minimum galvanized steel.

.7 Tension bar bands shall be 3 mm x 20 mm minimum galvanized steel and spaced vertically at 300 mm o.c.

.8 Where nuts and bolts are required for fastening, nuts shall face compound exterior and be torqued tight.

.9 Gates: to CAN/CGSB-138.4.

.10 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

.1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.

.2 Fasten fence fabric to gate with twisted selvage at top.

.3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.

.4 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.

.5 Galvanized steel arms shall be provided on gate posts where barbed wire is to be installed.

.11 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel

.1 Tension bar bands: 5 x 20 mm minimum.

.2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.

.3 Overhang tops to provide waterproof fit, to hold top rails and an outward projection to hold barbed wire overhang.

.4 Include projection with clips or recesses to hold 3 rows of tension wire spaced 100 mm apart.

.5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal. Projection oriented to the institution side.

.6 Turnbuckles to be drop forged.

.12 Organic zinc rich coating: to CAN/CGSB-1.181.

.13 Grounding rod: 3m long.

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1.

.2 For pipe: 550 g/m^{2}minimum to ASTM A90.

.3 For barbed wire: to CAN/CGSB-138.2.

.4 For other fittings: to ASTM A123/A123M.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representation 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 PREPARATION

.1 Grading:

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

.1 Provide clearance between bottom of fence and ground surface of 30mm to 50 mm.

3.3 ERECTION OF FENCE

.1 Erect fence along lines as indicated and to CAN/CGSB-138.3.

.2 Excavate post holes to dimensions indicated.

.3 Space line posts maximum 2.5 m apart, measured parallel to ground surface.

.4 Space straining posts at equal intervals not to exceed 60 m.

.5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.

.6 Install corner post where change in alignment exceeds 10 degrees.

.7 Install end posts at end of fence and at buildings.

.1 Install gate posts on both sides of gate openings.

.8 Place concrete in post holes then embed posts into concrete to depths indicated.

.1 Extend concrete 50 mm above ground level and slope to drain away from posts.

.2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.9 Install fence fabric after concrete has cured, minimum of 5 days. Wire mesh shall be continuous from top to bottom and shall be applied on the institutional compound side of the posts.

.10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.

.1 Install braces on both sides of corner and straining posts in similar manner.

.11 Install overhang tops and caps.

.12 Install top and bottom rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Wire mesh shall be continuous from top to bottom and shall be applied on the institutional compound side of the posts. Fence fabric shall be pulled taut before fixing in place. Tautness, when fixed in place, is to be established by pull tests. The application of a 12 kg perpendicular pull at the midpoint of the mesh panel (midpoint of posts/rails) shall show a displacement of no more than 30 mm from the fence at rest plane. Stretch tightly to tension and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 300 mm intervals.

.1 Give tie wires minimum two twists.

.16 Install barbed wire strands and clip securely to lugs of each projection.

.17 Install grounding rods as indicated.

3.4 INSTALLATION OF GATES

.1 Install gates in locations as indicated.

.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Determine position of centre gate rest for double gate.

.1 Cast gate rest in concrete as directed.

.2 Dome concrete above ground level to shed water.

.4 Install gate stops where indicated.

3.5 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.

.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION