AME Group
Consulting Professional Engineers

CFIA Willingdon Green Laboratory and Domestic Water Re-Piping Project No. M10074

MECHANICAL SPECIFICATION

ISSUED FOR TENDER

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Project No. 000b-247-12
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Part 1 General

1.1 SECTION INCLUDES

.1 Documents and terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Work by other parties.

.5 Premises usage.

1.2 RELATED SECTIONS

.1 Section 01 78 10 - Closeout Submittals.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 RELATED DOCUMENTS

.1 All other Division 01 specification sections.

.2 Division 01 sections describe requirements applicable to all Sections within Divisions 02 to 49 inclusive.

1.4 WORDS AND TERMS

.1 Refer to and acknowledge other words, terms, and definitions in CCDC 14 Definitions.

1.5 COMPLEMENTARY DOCUMENTS

.1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leaves doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.

.2 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.

.3 Locate devices with primary regard for convenience of operation and usage.

.4 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.6 CODES

.1 Perform work in accordance with the National Building Code for Canada 2010, Workers' Compensation Board of B.C., and any other applicable provincial or local code. In any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.0

.3 Meet or exceed requirements of specified standards, codes and referenced documents.

1.7 DESCRIPTION OF THE WORK

.1 Work of this Contract comprises renovation and replacement of the damaged domestic water piping identified on the mechanical drawings. Patching and refinishing (painting) of all required openings in the ceilings and walls to replace the pipes. All new piping which penetrates a fire rated system must be firestopped.

.2 Division of the Work among Subcontractors and suppliers or vendors is solely the Contractor's responsibility. Neither the Owner nor Consultant assumes any responsibility to act as an arbiter to establish subcontract terms between sectors or disciplines of work.

.3 Environmental requirements:

.1 Use only environmentally responsible materials and products with no VOC emissions or minimum VOC emissions of indoor off-gassing contaminants for improved indoor air quality – subject to the Departmental Representative's approval of submitted MSDS Product Data sheets.

.2 Use materials and products containing the highest percentage of recycled and recovered materials practicable – consistent with maintaining cost effective satisfactory levels of competition.

.3 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

1.8 CONTRACT METHOD

.1 Construct Work under single, stipulated price contract.

.2 Relations and responsibilities between Contractor, Subcontractors, Construction Manager, and Suppliers, assigned by the Owner are as defined in Conditions of Contract documents.

.3 Assume responsibility for assigned contracts as Subcontracts forming part of the Work.

.4 Contract Documents were prepared by the Consultants for the Owner. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Consultants accept no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.

.5 For purposes of reference in these Contract Documents, the term "Contractor" shall mean the party in contract with the Owner.

1.9 WORK SEQUENCE

.1 Construct Work in to accommodate Owner's usage requirements during the construction period, coordinate construction schedule and operations with Consultant and Government representative.

.2 Coordinate Progress Schedule and with Owner use during construction.

.3 Maintain fire access, means of egress, building accessibility and control of fire protection equipment at all times during construction.

1.10 REGULATORY REQUIREMENTS

.1 Organize, obtain and pay for – Any required permits, Certificates, and Licenses required by regulatory municipal, provincial or federal authorities to complete the work

.2 Provide inspection authorities with plans and information required for issue of acceptance certificates.

.3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

1.11 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

.3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

1.12 CONTRACTOR USE OF PREMISES

.1 Use of site:

.1 Exclusive and complete for execution of work.

.2 Assume responsibility for assigned premises for performance of this work.

.3 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Department Representative.

.2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with any indicated phasing or sequencing.

.3 Do not unreasonably encumber the site with materials or equipment.

.4 Use only indicated elevators, including schedule restrictions, for moving workers and material. Refer to section 01 14 00.

.1 Protect walls of passenger elevators, to approval of Department Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.13 HOURS OF WORK

.1 The Contractor shall determine his hours of work based upon meeting the project completion schedule. This may include night time and weekend hours.

.2 Note that the CFIA Facility's normal operation hours are 0730 to 1630 hours Monday to Friday. All construction work conducted during this period will be subject to restrictions as outlined in Sections 01 14 00 and 01 51 00.

1.14 DOCUMENTS REQUIRED

.1 Maintain 1 copy of each of the following at the job site:

.1 Contract drawings.
.2 Contract specifications.
.3 Addenda to Contract documents.
.4 Copy of approved work schedule.
.5 Reviewed/approved shop drawings.
.6 Change orders.
.7 Other modifications to Contract.
.8 Field test reports.
.9 Reviewed/approved samples.
.10 Manufacturers' installation and application instructions.
.11 One set of record drawings and specifications for "as-built" purposes.
.12 National Building Code of Canada 2010.
.13 Current construction standards of workmanship listed in technical Sections.
.14 Building Safety Plan.

1.15 EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work as directed in Section 01 14 00.

1.16 CUTTING AND PATCHING

.1 Cut existing surfaces as required to accommodate new work.

.2 Remove items so shown or specified.

.3 Do not cut, bore, or sleeve load-bearing members without approval by a Structural Engineer.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Fit work airtight to pipes, sleeves, ducts and conduits.

.6 Conceal pipes, ducts and wiring in raised floor, wall and ceiling construction of finished areas except where indicated otherwise.

.7 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.

.8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.

1.17 ACCEPTANCE OF SUBSTRATES

.1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the Departmental Representative. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

1.18 QUALITY OF WORK

.1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.

.2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2010 and Construction Standards as specified herein.

.3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.19 WORKS COORDINATION

.1 Coordinate work of sub-trades:

.1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.

.2 Convene meetings between subcontractors with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

.1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

.2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.

.1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.

.2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.

.3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.

.4 Publish minutes of each meeting.

.5 Plan and coordinate work in such as way to minimize quantity of service line offsets.

.6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.

.4 Work cooperation:

.1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.

.2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.

.3 Ensure disputes between subcontractors are resolved.

.5 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

.6 Maintain efficient and continuous supervision.

1.20 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 In accordance with Section 01 33 00, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.

.2 **Allow sufficient time for the following:**

.1 Review of product data.

.2 Approval of shop drawings.

.3 Review of re-submission.

.4 Ordering of approved material and/or products. Refer to individual technical sections of specifications.

1.21 PROJECT MEETINGS

.1 Departmental Representative will arrange project meetings and assume responsibility for setting times and distributing minutes.

.2 The contractor will provide the meeting facilities, record the meeting minutes and issue meeting agenda 3 days prior to the meeting to Departmental Representative for review and distribution.

1.22 AS-BUILT DOCUMENTS

.1 The Departmental Representative will provide 2 sets of drawings and 2 sets of specifications for "as-built" purposes.

.2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

.3 Refer to Section 01 78 10.

1.23 TESTING AND INSPECTIONS

.1 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.

.1 Mill tests and certificates of compliance.

.2 Tests specified to be carried out by Contractor under the Departmental Representative's supervision.

.2 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.

.3 Contractor shall furnish labour and facilities to:

.1 Notify Departmental Representative in advance of planned testing.

.4 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.5 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

.6 The Departmental Representative may require, and pay for, additional inspection and testing serviced not included in Paragraph 1.26.1.

.7 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

1.24 CLEANING

.1 Refer to Section 01 74 00.

.2 Daily conduct cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.

.3 Ensure cleanup of the work areas each day after completion of work.

.4 Clean interior building areas when ready to receive finish painting and continue cleaning on an as-needed basis until building is sufficiently completed or ready for occupancy.

.5 In preparation for interim and final inspections:

.1 Examine all sight-exposed interior and exterior surfaced and concealed spaces.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces, including glass and other polished surfaces.

.6 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.

1.25 DUST CONTROL

.1 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.

.2 Protect furnishings and equipment within work area with 0.102 mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

.3 Maintain and relocate protection until such work is complete.

1.26 ENVIRONMENTAL PROTECTION

.1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.

.2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.

.3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

1.27 BUILDING SMOKING ENVIRONMENT

.1 Smoking within the building is not permitted.

.2 Smoking is not permitted within 30 metres of air intakes or doors.

.3 Smoking is not permitted anywhere on the CFIA property.

1.28 SYSTEM OF MEASUREMENT

.1 The metric system of measurement (SI) will be employed on this Contract.

1.29 FAMILIARIZATION WITH SITE

.1 Before submitting tender, visit site – as indicated in tender documents and become familiar with all **conditions likely to affect the cost of the work.**

1.30 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Connecting to existing services.

.2 Special scheduling requirements.

1.2 RELATED SECTIONS

.1 Section 01 53 00 - Temporary Construction.

.2 Section 01 33 00 - Submittal Procedures.

1.3 FACILITY ORIENTATION OUTLINE DOCUMENT

.1 All construction staff shall become thoroughly familiar with all provisions and requirements of the “Facility Orientation Outline for Construction and Service Contractors”, issued for information only, and contained in Appendix ‘A’ of this specification. Where conflicts exist between orientation outline document and these specifications, the specifications shall prevail.

1.4 ACCESS AND EGRESS

.1 Design, construct and maintain temporary staff and construction worker “access to” and “egress from” existing building, including hoarding and scaffolding.

.2 Provide hoarding and scaffolding plan for Departmental Representative to review 5 business days prior to installation.

1.5 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 and provide for personnel and vehicle access.

.3 Where security is reduced by work, provide temporary means to maintain security as per Departmental Representative’s direction and as specified.

.4 Closures: protect work temporarily until project is completed.

.5 All portions of the existing building will be occupied by government staff during entire construction period.

.6 Coordinate with Departmental Representative in scheduling operations to minimize conflict and to facilitate use of space.

1.6 EXISTING SERVICES

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

.2 Where Work involves breaking into or connecting to existing services, give the Consultant, 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work.

.1 Keep duration of interruptions to a minimum.

.2 Perform interruptions after normal working hours of occupants, preferably on weekends.

.3 Construct barriers in accordance with Section 01 53 00.

.4 Optimize and plan shut-downs so that services are restored in time for normal facility operation hours. Coordinate all shut-downs with utility providers and facility users.

.5 Contractor shall be held responsible for damages to facility equipment as the result of service shut-downs.

.6 Contractor shall be held responsible for any and all unscheduled shut-downs of building utilities and services.

.7 Contactor will not be allowed to connect to Owner's existing data and communication services.

.8 Submit a "Fire Alarm Bypass" request to Departmental Representative 72 hours in advance for approval.

.9 Obtain permissions from Departmental Representative for access to restricted areas and labs outside the construction zones, 72 hours in advance for approval.

.10 Construction crews are not allowed to use existing washrooms in the building. Refer to Section 01 51 00.

.11 Government employees have the priority for using the existing loading bay from 8:00 am to 4:00 pm, Monday to Friday. The Contractor has the priority for using the loading bay after business hours and during weekends.

1.7 SITE RESTRICTIONS

.1 Avoid disturbing the front yard in order to prevent damage to underground services, plant materials and non-compacted soil conditions.

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

.3 Ingress and egress of Contractor vehicles at site is limited to delivery of material only.

.4 Delivery of materials shall not interfere with building's operation.

1.8 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is NOT permitted within the existing buildings, anywhere on the CFIA site, or within 30 Metres of air intakes or doors.

1.9 NOISE GENERATION

.1 Means and procedures of controlling and isolating excessive or disturbing noise affecting government and staff-occupied areas shall be the responsibility of the Contractor and approved by the Departmental Representative.

.2 All vibration generating activity will be prohibited during the hours of 7:30 am to 5:00 pm Monday to Friday.

1.10 SECURITY CONTROL

.1 All regular and incidental workers as well as visitors on official business will be required to “sign in upon arrival at site” and “sign-out” upon departure on forms authorized by Departmental Representative.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples.

.3 Certificates and transcripts.

1.2 RELATED SECTIONS

.1 Section 01 78 10 - Closeout Submittals.

.2 Other sections requesting submittals.

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 GENERAL

.1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specified requirements for submissions are specified in individual technical sections.

.2 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.3 Where items or information is not manufactured or produced in SI Metric units, converted values within the metric measurement tolerances are acceptable.

.4 Review submittals prior to submission to Consultant. 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.

.5 Notify Departmental Representative's, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.6 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Departmental Representative's review of submission unless Departmental Representative gives written acceptance of specific deviations.

.7 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative.

.8 Notify Departmental Representative in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.

.9 **Do not proceed with work until relevant submissions are reviewed and approved by the Departmental Representative.**

.10 Verify field measurements and affected adjacent Work are coordinated.

.11 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.12 Keep one reviewed copy of each submission on site.

1.4 SUBMISSION REQUIREMENTS

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow ten (10) days for Departmental Representative's review of each submission. Unless noted.

.4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.

.6 Accompany submissions with [duplicate] 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.

.7 Submissions shall 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 other parts of the Work.

.8 After Consultant's review, distribute copies.

1.5 SHOP DRAWINGS

.1 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.

.2 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.3 Delete information not applicable to project.

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

.5 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, signed electronic copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and re-submission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.6 SHOP DRAWINGS REVIEW

.1 Review of shop drawings by Public Works and Government Services Canada is for the sole purpose of ascertaining conformance with the general concept.

.2 This review shall not mean that Public Works and Government Services Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.

.3 This review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and Contract documents.

.4 Without restricting the generality of the foregoing, the Contractor is responsible for:

.1 Dimensions to be confirmed and correlated at the job site.

.2 Information that pertains solely to fabrication processes or to techniques of construction and installation.

.3 Coordination of the work of all sub-trades.

1.7 PRODUCT DATA

.1 Product data: manufacturers' catalogue sheets, MSDS sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.

.2 Delete information not applicable to project.

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

.4 Cross-reference product data information to applicable portions of Contract documents.

.5 Submit 2 copies of product data.

1.8 SUBMISSION SCHEDULE

.1 Coordinate Schedule of Submissions with Critical Path Construction Schedule. Identify all time sensitive items.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Safety requirements and adherence.

1.2 REFERENCES

.1 Workers Compensation Act

.2 Government of Canada.

- .1 Canada Labour Code – Part II.
- .2 Canada Occupational Health and Safety Regulations.

.3 National Building Code of Canada (NBC):

- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.4 Canadian Standards Association (CSA):

- .1 CSA S269, Falsework for Construction Purposes.
- .2 CSA S269.2, Access Scaffolding for Construction Purposes.
- .3 CSA S350, Code of Practice for Safety in Demolition of Structures.

.5 Fire Commissioner of Canada (FCC):

- .1 FCC No. 301, Standard for Construction Operations.
- .2 FCC No. 302, Standard for Welding and Cutting.

.6 American National Standards Institute (ANSI):

- .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Province of British Columbia:

- .1 Workers Compensation Act Part 3 Occupational Health and Safety.
- .2 Occupational Health and Safety Regulation.

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

.3 Refer to the following sections as required:

- .1 Shop drawings and samples: Section 01 33 00
- .2 Temporary facilities: Section 01 51 00
- .3 Selective Demolition: Section 02 41 19

1.4 WORKERS' COMPENSATION BOARD COVERAGE

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.5 COMPLIANCE WITH REGULATIONS

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.6 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00.

.2 Submit the following:

- .1 Health and Safety Plan.
- .2 Copies of reports or directions issued by federal and provincial health and safety inspectors.
- .3 Copies of incident and accident reports.
- .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .5 Procedures.

.3 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedure, and provide comments to the Contractor within 10 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review upon request.

.4 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.

.5 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:

- .1 Be construed to imply approval by the Departmental Representative.
- .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

.6 Submit site-specific Health and Safety Plan: Within seven (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.

.7 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Consultant and Owner on a weekly basis.

.8 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.9 Submit copies of incident and accident reports.

.10 Submit Material Safety Data Sheets (MSDS) to Consultant.

.11 The Owner will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 5 days after receipt of comments from Owner.

.12 Owners 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.

.13 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 Consultant.

.14 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

.15 File Notice of Project with Provincial authorities prior to commencement of Work.

1.7 RESPONSIBILITY

.1 The "Contractor" according applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

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

.3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province Territory having jurisdiction. Advise Consultant verbally and in writing.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site at night time as deemed necessary to protect site against entry.

1.9 REGULATORY REQUIREMENTS

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.10 WORK PERMITS

.1 Obtain any required permit related to Project before start of work.

1.11 HEALTH AND SAFETY PLAN

.1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor’s safety policy.

.2 Identification of applicable compliance obligations.

.3 Definition of responsibilities for project safety/organization chart for project.

.4 General safety rules for project.

.5 Job-specific safe work procedures.

.6 Inspection policy and procedures.

.7 Incident reporting and investigation policy and procedures.

.8 Occupational Health and Safety Committee/Representative procedures.

.9 Occupational Health and Safety meetings.

.10 Occupational Health and Safety communications and recordkeeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must b performed as part of the work.

.3 List hazardous materials to be brought on site as required by work.

.4 Indicate Departmental Representative and administrative control measures to be implemented at the site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by works.

.6 Identify personnel and alternates responsible for site safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review f Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.12 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.

.2 Regulatory agencies applicable to work and as per legislated regulations.

.3 Local emergency resources.

.4 Departmental Representative.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendance, of the nature and location of the emergency.

.2 Evacuate all workers safely.

.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.

.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.

.6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

.1 Work at high angles.

.2 Work in confined spaces or where there is a risk of entrapment.

.3 Work with hazardous substances.

.4 Underground work.

.5 Work on, over, under and adjacent to water.

.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routs to provide quick and unimpeded exit.

1.13 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.

.2 In conjunction with Departmental Representative, schedule to carry out work during “off hours” when tenants have left the building.

.3 Provide adequate means of ventilation in accordance with Section 01 51 00.

1.14 ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

.1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.

.2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.15 ELECTRICAL LOCKOUT

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety or workers for every event where work must be done on any electrical circuit or facility.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.16 OVERLOADING

.1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.17 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1.

1.18 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CAN/CSA-S269.2.

1.19 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with provincial regulations.

1.20 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

1.21 FIRE SAFETY AND HOT WORK

.1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grind with equipment which produces sparks.

1.22 FIRE SAFETY REQUIEMENTS

.1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at location other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction, if such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

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

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractors' work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

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

.2 Provide copies to subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.8 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications, Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups 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.

.5 If requested, Departmental Representative will assist in preparing scheduling fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

.2 Refer to Divisions 21, 22, 23, 26, 27, and 28 for definitive requirements.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Temporary utilities.

.2 Salvaging products for reuse.

1.2 RELATED SECTIONS

.1 Section 01 53 00 - Temporary Construction.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Salvage and assist in recycling products for potential reuse.

.3 Remove from site all such work after use.

.4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.4 WATER SUPPLY

.1 Owner will provide continuous supply of potable water for construction use.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

- .1 Facilitate progress of Work.
- .2 Protect Work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Ventilating:

- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.5 Permanent heating system of building, may be used when available. Be responsible for damage to heating system if use is permitted.

.6 Ensure date of Substantial Performance of the Work and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

.1 Owner will provide a source for, and pay the costs of temporary power during construction for temporary lighting and operating of power tools, to a maximum supply available in the immediate construction area.

.2 The Contractor must provide and pay for temporary power for electric cranes and other equipment requiring temporary power in excess of above noted requirements.

.3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Consultant provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract.

1.7 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone and high speed internet hook up, lines and equipment necessary for own use and use of Consultant.

1.8 SANITARY FACILITIES

.1 Contractor shall provide temporary portable toilets for construction workers on site. Locate where indicated on site plan and maintain in a sanitary, safe and secure manner. Remove from site and make good at completion of Project.

1.9 HEATING AND VENTILATION

.1 Do not begin work until arrangements have been made with the Departmental Representative for protection of on-floor heating, ventilating and air conditioning.

.2 If there is any dirt in the heating and ventilation system at the completion of work, it will be the Contractor's responsibility to return system to its original state in accordance with the Departmental Representative's directions.

.3 Prevent dust and odour migration to other occupied areas.

.1 Do not deactivate HVAC system to occupied floors. Purge air from construction floors only when directed by Departmental Representative, where dust and fumes will be generated.

.2 Upon completion of project ensure all filters in new or altered HVAC system have been fitted with new filters. For any new equipment issue Departmental Representative with filter exchange requirements, including filter specifications and frequency of exchange.

1.10 SCAFFOLDING

.1 Construct and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required.

1.11 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Sub-contractors for their use of hoists.

.2 Hoists shall be operated by qualified operator.

1.12 ELEVATORS

.1 Government employees have exclusive priority on use of the elevator during normal operational hours, 0730 to 1630 hours Monday to Friday. Contractor has priority of usage between 1630 and 0730 weekdays and anytime during weekends.

.2 The elevator corridor in front of the solvent storage room will be used by both facility staff and the Contractor. Maintain this area in a clean, orderly and safe condition at all times.

.3 Install 12 mm plywood protection panels to entire interior of elevator cab. Protect elevator cab and entrances from damage and dirt at all times. At completion of Project, remove protection panels, make good to all damage and leave in "as new" condition.

1.13 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by the Departmental Representative.

1.14 SIGNS AND NOTICES

.1 Signs and notices for safety and instruction shall be in both official languages or graphic symbols conforming to CAN/CSA-Z321.

.2 Maintain approved signs and notices in good condition for duration of Project, and dispose of off site on completion of Project when directed by Departmental Representative.

1.15 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadway

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

.5 At completion of Project: Remove and dispose of all debris, thoroughly clean and restore site to condition found at commencement of Work. Repair and make good to all damage caused by construction activities.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Dust tight barriers.

.2 Protection for off-site and public property.

.3 Protection of applied finishes and surrounding Work.

1.2 REFERENCES

.1 CAN/CSA-Z271 “Safety Code for Suspended Elevating Platforms”.

.2 Occupational Health and Safety Act of British Columbia.

.3 Workers’ Compensation Board of British Columbia.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

Part 2 PRODUCTS

2.1 DUST TIGHT BARRIERS

.1 Provide dust tight barriers and screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Ensure dust tight barriers have adequate air circulation and temperature conditions for the work being performed inside of barrier.

.3 Maintain and relocate protection until such work is complete.

2.2 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

2.3 PROTECTION OF APPLIED FINISHES

.1 Provide protection for finished and partially finished surfaces and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Consultant locations and installation schedule three (3) days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

2.4 PROTECTION OF SURROUNDING WORK

.1 Provide protection for finished and partially finished Work from damage.

.2 Provide necessary cover and protection.

.3 Be responsible for damage incurred due to lack of or improper or inappropriate protection.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Within text of each specification, 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 a question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor 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 it precaution against oversight or error. Remove and replace defective products and 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 AVAILABILITY

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

.2 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.

.3 Keep exposed fastenings to a minimum, space evenly and install neatly.

.4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.4 STORAGE AND PROTECTION

.1 Store and protect Products in accordance with manufacturers' written instructions.

.2 Store with seals and labels intact and legible.

.3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product.

.4 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

.5 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

.6 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.5 TRANSPORTATION AND HANDLING

.1 Transport and handle Products in accordance with manufacturer's written instructions.

.2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

.3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.6 MANUFACTURER'S WRITTEN INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect Products in accordance with manufacturer's written instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.

.3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 CONCEALMENT

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

.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.9 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Consultant of conflicting installation. Install as directed.

1.11 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.

1.12 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.

1.13 EXISTING UTILITIES

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

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

END OF SECTION

Part 1 General

1.1 REFERENCES

Part 2 Products

2.1 CLEANING MATERIALS

.1 Cleaning Agents and Materials: Low VOC content.

Part 3 Execution

3.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site.

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

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

.2 Provide and use clearly marked, separate bins for recycling.

.3 Refer to Section 01 35 23.

.5 Remove waste material and debris from site and deposit in appropriate waste container at end of each working day.

.6 Dispose of waste materials and debris at Owner designated dumping areas.

.7 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of enclosure 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.

3.2 CLEANING PRIOR TO ACCEPTANCE

.1 Prior to applying for Substantial Performance of the Work, 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 materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.8 Clean lighting reflectors, lenses, and other lighting surfaces.

.9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.10 Clean and polish surface finishes, as recommended by manufacturer.

.11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.13 Remove dirt and other disfiguration from exterior surfaces.

.14 Clean and sweep roofs, gutters, areaways, and sunken wells.

.15 Sweep and wash clean paved areas.

.16 Clean equipment and fixtures to a sanitary condition; replace filters of mechanical equipment.

.17 Clean roof surfaces, down-spouts, and drainage components.

.18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.19 Remove snow and ice from access to facilities.

3.3 FINAL PRODUCT CLEANING

.1 Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

.2 Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

.3 Replace filters of operating equipment.

.4 Remove waste and surplus materials, rubbish, and construction facilities from the site.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Inspections and declarations.

.2 Closeout submittals

.3 Operation and maintenance manual format.

.4 Recording actual site conditions.

.5 Record (as-built) documents and samples.

.6 Record documents.

.7 Warranties and bonds.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 INSPECTIONS AND DECLARATIONS

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

.1 Notify Consultant in writing of satisfactory completion of Inspection and that corrections have been made.

.2 Request Consultant's Inspection.

.2 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by authorities having jurisdiction have been submitted.

.5 Operation of systems have been demonstrated to Owner's personnel.

.6 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work Owner, Consultant, and Contractor. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request a second inspection.

.5 Declaration of Substantial Performance: when Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.

.6 Commencement of Warranty Periods: the date of Substantial Performance of the Work shall be the date for commencement of the warranty period.

.7 Commencement of Lien Periods: the date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period, unless required otherwise by the lien legislation applicable at the Place of the Work.

.8 Final Payment: When Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.

.9 Payment of Hold-back: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of hold-back amount.

1.4 CLOSEOUT SUBMITTALS

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

.2 Copy will be returned after final inspection, with Consultant's comments.

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

.4 Two (2) weeks **prior** to Substantial Performance of the Work, submit to the Consultant, one (1) “draft” copy of operating and maintenance manuals in digital and hard copy format.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

1.5 OPERATION AND MAINTENANCE MANUAL FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8.5 x 11 inch with spine and face pockets labeled with Project Name and substantial completion date.

.3 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.4 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.

.5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.6 Text: Manufacturer's printed data, material data safety sheets, maintenance instructions and product warranties.

.7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.6 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

- .1 date of submission;
- .2 names, addresses, and telephone numbers of Consultants , Contractor, and Sub-Contractors with name of responsible parties; and
- .3 Letters of Assurance for all Registered professionals and supporting Professionals
- .4 Municipal Inspection Reports
- .5 Fire Alarm and Sprinkler Verification Reports
- .6 Schedule of products and systems, indexed to content of volume.
  - .1 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts
  - .2 Include All Material Safety Data Sheets
  - .3 Product Information Sheets - Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.
  - .4 Product maintenance requirements and frequency of maintenance
  - .5 Manufacturers and Trade Warranties
  - .6 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.7 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including code compliance certificate life safety systems performance certificate pressure vessel acceptance.

.8 Training:

1.7 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Consultant.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

.4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:

.1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.3 Field changes of dimension and detail.

.4 Changes made by change orders.

.5 Details not on original Contract Drawings.

.6 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

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

1.8 RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for Consultant Owner one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store as-built documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label as-built documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document "AS-BUILT DOCUMENTS" in neat, large, printed letters.

.4 Maintain as-built documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.

.5 Keep as-built documents and samples available for inspection by Consultant.

1.9 RECORD DOCUMENTS

.1 Mark revised documents as "RECORD DOCUMENTS". Include all revisions, with special emphasis on mechanical, electrical, structural steel, and reinforced concrete.

.2 Submit completed record documents to Owner Consultant on a CD-ROM, accompanied by three (3) hard copy sets.

1.10 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 78 10, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

.2 Inaccurate or neglectful information shall become a liability of the Contractor.

1.11 WARRANTIES AND BONDS

.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 (10) days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittals.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Alteration project procedures.

.2 Removal of designated building equipment and fixtures.

.3 Removal of designated construction.

.4 Disposal of materials Storage of removed materials.

.5 Identification of utilities.

.6 Refer to items scheduled at end of section as indicated.

1.2 RELATED SECTIONS

.1 Section 01 74 00 Cleaning and Waste Processing

1.3 PRECAUTIONS

.1 Should material resembling spray or trowel applied asbestos or any other designated substance be encountered in the course of demolition, stop work, take preventative measures and notify the Departmental Representative immediately. Do not proceed until written instructions have been received.

1.4 ALTERATION PROJECT PROCEDURES

.1 Materials: As specified in Product sections; match existing Products and work for patching and extending work.

.2 Employ original skilled and experienced installer to perform alteration work.

.3 Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original specified condition.

.4 Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified renewed condition for each material, with a neat transition to adjacent finishes.

.5 Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

.6 When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Consultant for review.

.7 Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition; to Consultant for review request instructions from Consultant.

.8 Patch or replace portions of existing surfaces which are damaged, lifted, discoloured, or showing other imperfections.

.9 Finish surfaces as specified in individual Product sections.

.10 Prevent debris from blocking drainage which must remain in operation.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate demolition removal sequence and location of salvageable items; location and construction of temporary work.

1.6 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

1.7 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Record Documentation: Accurately record actual locations of capped utilities, subsurface obstructions, and underground services.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code for demolition work, dust control, products requiring electrical disconnection reconnection.

.2 Obtain required permits from authorities.

.3 Do not close or obstruct egress width to any building or site exit.

.4 Do not disable or disrupt building fire or life safety systems.

.5 Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

.6 Unless otherwise specified, carry out demolition work in accordance with Workers' Compensation Board of B.C. latest regulations.

1.9 PROJECT CONDITIONS

.1 Conduct demolition to minimize interference with adjacent and occupied building areas.

.2 Cease operations immediately if structure appears to be in danger and notify Consultant. Do not resume operations until directed.

Part 2 Execution

2.1 PREPARATION

.1 Erect and maintain temporary partitions to prevent spread of dust, odours, and noise to permit continued Owner occupancy.

.2 Protect existing materials and furnishing which are not to be demolished.

.3 Prevent movement of structure; provide bracing and shoring.

.4 Mark location and termination of utilities.

.5 Provide appropriate temporary signage including signage for exit or building egress.

2.2 DEMOLITION

.1 Conduct demolition to minimize interference with adjacent structures and interior operations.

.2 Conduct operations with minimum interference with public and owner. Maintain protected egress routes and access at all times.

.3 Disconnect remove, cap, and identify designated utilities within demolition areas.

.4 Demolish in an orderly and careful manner. Protect existing supporting structural members.

.5 Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

.6 Remove materials as Work progresses. Upon daily completion of Work, leave areas in clean condition.

.7 Remove temporary Work.

2.3 CUTTING, FITTING, AND PATCHING

.1 Execute cutting, fitting and patching required to make work fit properly together.

.2 Fit work tight to pipes, ducts and conduits, with adequate provision for expansion and contraction.

.3 Each specification section shall include cutting and patching for that section, unless otherwise specified, and as required.

2.4 Disposal of Materials

.1 Recycle material where ever possible, drywall can be recycled at New West Gypsum Recycling, 210, 19860 Langley ByPass, Langley, BC. 1-604-534-9925.

END OF SECTION

Part 1 GENERAL

1.1 Related Work

.1 Fire stopping and smoke seals within mechanical assemblies (i.e. inside ducts, dampers) are specified in Division 23.

.2 Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing

.1 Firestop Systems and Components

1.2 Definition

.1 Firestopping: A sealing or stuffing material or assembly placed in spaces between building materials to arrest the movement of smoke, heat, gases, or fire through wall or floor openings

1.3 System Description

.1 Firestopping systems installed to resist spread of fire and passage of smoke and other gases at penetrations through fire resistance rated floor and wall assemblies, materials, and components.

.2 Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

.3 Expansion joints in walls and floors.

.4 Openings and penetrations in fire-rated partitions or walls containing fire doors.

.5 Openings around structural members which penetrate floors or walls.

1.4 Scope of Work

.1 Engage the services of Supporting Registered Professional in the area of Fire Protection Engineering.

.2 Provide engineering and selection of firestopping materials and installation methods to meet the requirements of the contract documents.

.3 The Fire Protection Engineer shall work very closely with the project stakeholders and specifically but not exclusively with the consultant, sub consultants, firestopping manufacturer, firestopping installer, and the contractor.

.4 The Fire Protection Engineer shall organize and attend pre-installation conference meeting.

.5 The Fire Protection Engineer shall produce and/or assemble all required documentation/submittals.

.6 The Fire Protection Engineer shall provide site reviews and reports to ensure proper installation of firestops.

.7 The Fire Protection Engineer shall provide a final site review and report certifying that all firestopping systems are installed as indicated on the shop drawings.

1.5 Administrative Requirements

.1 Coordination: Coordinate with all other work having a direct bearing on work of this section.

.2 Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops."

.3 Test Requirements: CAN/ULC-S115-11, "Standard Method of Fire Tests of Through Penetration Fire Stops".

1.6 Submittals

.1 Submit samples in accordance with Section 01 33 00, Submission Procedures.

.2 Submit shop drawings of all proposed firestopping systems.

.3 A Schedule S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional (SRP). See AIBC/APEGBC Practice Note 16.

.4 Submit duplicate samples showing actual fire-stop material proposed for project.

.5 Submit manufacturer's specification and product data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions.

.6 Manufacturer's engineering judgement identification number and drawing details when no ULC or cUL system is available for an application. Engineered judgement must include both project name and contractor's name who will install firestop system as described in drawing.

.7 System Design Listings: Submit system design listings, including illustrations from a qualified testing and inspection agency that is applicable for each firestop configuration.

.8 A Schedule S-C: Assurance of Professional Field Review and Compliance by Supporting Registered Professional (SRP). See AIBC/APEGBC Practice Note 16

1.7 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 Construction/ Demolition Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 PRODUCTS

2.1 Materials

.1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

.2 For all products refer to current code NBC 2010 and current CAN/ ULC codes.

.3 Fire stopping and smoke seal systems: in accordance with CAN/ ULC-S115-11, "Standard Method of Fire Tests of Through Penetration Fire Stops".

.4 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN/ ULC-S115-11 and not to exceed opening sizes for which they are intended.

.5 Fire-stop system rating: 45 minutes between floors.

.6 Service penetration assemblies: certified by ULC in accordance with CAN/ ULC-S115-11 and listed in ULC Guide No. 40 U19

.7 Service penetration fire-stop components: certified by ULC in accordance with CAN/ ULC-S115-11 and listed in ULC Guide No. 40 & 19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.

.8 Fire-resistance rating of installed fire-stopping assembly not less than the fire-resistance rating of surrounding floor and wall assembly.

.9 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.

.10 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations.

.11 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.12 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.13 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.14 Sealants for vertical joints: non-sagging.

.15 Mortar type material for sealing of redundant existing utility holes in slab and at concrete and masonry.

.16 Silicone type material for service penetrations.

.17 Mineral wool type materials at areas requiring re-entry.

.18 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

Part 3 EXECUTION

3.1 Preparation

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

.3 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer’s instructions.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.5 Remove incompatible materials which may affect bond.

3.2 Application

.1 Apply primer and materials to manufacturer's written instructions.

.2 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping in accordance with ULC certification and manufacturer’s instructions.

.3 Apply firestopping material in sufficient thickness to achieve rating to uniform density and texture.

.4 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.6 Tool or trowel exposed surfaces to a neat finish.

.7 Remove excess compound promptly as work progresses and upon completion.

3.3 Inspection

.1 Notify Departmental Representative when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 Quality Assurance

.1 Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years experience.

.2 A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

.3 Firestop systems do not re-establish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

.4 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgement derived from similar ULC or cUL system design or other tests will be submitted to the necessary authorities having jurisdiction for their review and approval prior to installation. Engineer judgement drawings must follow requirements set forth by the International Firestop Council.

.5 Contractor Qualifications: Company specializing in performing the work of this section and as follows:

.1 FM approved in accordance with FM standard 4991 - Approval of Firestop Contractors

.2 FCIA member in good standing

.3 Licensed by the province or local authority where applicable

.4 Successfully completed not less than five (5) comparable scale projects

.6 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.

.7 A single qualified firestopping contractor shall be responsible for all firestopping.

.8

3.5 Mock-up

.1 Submit Mock-ups in accordance with Section 01 33 00, Provide mock-up of applied firestopping assemblies and receive sign off from Fire Protection Engineer.

.2 Retain and maintain accepted mock-ups during construction in undisturbed condition as a standard for judging completed work.

.3 Approved mock-up may remain as part of the Work.

3.6 Regulatory Requirements

.1 Conform to applicable code for fire resistance ratings and surface burning characteristics.

.2 Provide certificate of compliance from architect indicating approval of materials used.

3.7 Delivery, Storage, and Protection

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Deliver firestopping products in original, unopened containers with labels intact and legible, identifying product and manufacturer.

.3 Store and handle firestopping materials to manufacturer's instructions.

3.8 Schedule

.1 Firestop and smoke seal at:

.1 All Concrete floor penetrations: 45min.

.2 Stair walls: 2 hours.

.3 Room to room partitions: 3/4 hour to penetrating metallic pipe and conduit.

.4 Room to room partitions: 3/4 hour to penetrating non-metallic pipe and conduit.

.5 Floors, all abandoned and existing utility holes in floor slabs (Telephone, power & piping).

.6 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.7 Intersection of fire-resistance rated masonry and gypsum board partitions.

.8 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.9 Openings and sleeves installed for future use through fire separations.

.10 Around mechanical and electrical assemblies penetrating fire separations.

END OF SECTION

Part 1 GENERAL

1.1 Section Includes

.1 Preparing substrate surfaces.

.2 Sealant and joint backing.

.3 Structural sealant for glazing assemblies.

1.2 RELATED SECTIONS

.1 Section 07 84 00 - Firestopping: Sealants required in conjunction with firestopping

1.3 REFERENCES

.1 ASTM C509-06 - Elastomeric Cellular Preformed Gasket and Sealing Material.

.2 ASTM C834-05 - Latex Sealants.

.3 ASTM C919-08 - Use of Sealants in Acoustical Applications.

.4 ASTM C920-08 - Elastomeric Joint Sealants.

.5 ASTM C1184-05 - Structural Silicone Sealants.

.6 ASTM C1193-05a - Guide for Use of Joint Sealants.

.7 ASTM C1311-02 - Solvent Release Sealants.

.8 ASTM C1330-02(2007) - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

.9 ASTM C1401-07 - Guide for Structural Sealant Glazing.

.10 ASTM C1481-00(2006) - Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS).

.11 ASTM E330-02 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

.12 CGSB-19-GP-5M-1984 - Sealing Compound, One Component, Acrylic Base, Solvent Curing.

.13 CGSB-19-GP-14M-76 - Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.14 CAN/CGSB-19.13-M87 - Sealing Compound, One-component, Elastomeric, Chemical Curing.

.15 CAN/CGSB-19.17-M90 - One-Component Acrylic Emulsion Base Sealing Compound.

.16 CAN/CGSB-19.22-M89 - Mildew-Resistant Sealing Compound for Tubs and Tiles.

.17 CAN/CGSB-19.24-M90 - Multi-component, Chemical Curing Sealing Compound.

.18 SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.3 Sealant and substrate materials to be minimum 5˚C.

.4 Should it become necessary to apply sealants below 5˚C, consult sealant manufacturer and follow their recommendations.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 Construction/ Demolition Waste Management and Disposal.

1.6 PERFORMANCE REQUIREMENTS

.1 Sealant Design: Design structural sealant to withstand specified loads without breakage, loss, failure of seals, product deterioration, and other defects.

.2 Design installed sealant to withstand:

.1 Movement and deflection of structural support framing.

.2 Water and air penetration.

1.7 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.

.2 Coordinate the work with all sections referencing this section.

1.8 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colour availability.

1.9 QUALITY ASSURANCE

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.11 WARRANTY

.1 Section 01 78 10: Closeout Submittals

.2 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.

.3 Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

Part 2 Products

2.1 SEALANTS

.1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Urethanes One Part

.1 Self-Levelling to CAN/ CGSB-19.13, Type 1,colour as selected.

.2 Urethane One Part

.1 Non-Sag to CAN/ CGSB-19.13, Type 2, MCG-2-40, colour as selected.

.3 Silicones One Part

.1 To CAN/ CGSB-19.13

.2 To CAN/ CGSB-9.22 (Mildew resistant)

.4 Acoustical Sealant

.1 To CAN/ CGSB-19.21

.5 Butyl

.1 To CGSB 19-GP-14M

.6 Acrylic Latex One Part

.1 To CGSB 19-17

.7 Preformed Compressible and Non-Compressible back-up materials.

.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.

.1 Extruded closed cell foam backer rod.

.2 Size: oversize 40 to 50%

.2 Neoprene or Butyl Rubber

.1 Round solid road, Shore A hardness 70

.3 High Density Foam

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond Breaker Tape

.1 Polyethylene bond breaker tape, which will not bond to sealant.

2.3 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior façade of building: Sealant type: one component urethane, non-sag.

.2 Coping joints and coping-to-façade joints & flashing joints: Sealant type: butyl.

.3 Interior control and expansion joints in floor surfaces: Sealant type: one component urethane self-levelling.

.4 Countertops (e.g. sinks, urinals, basins, vanities): Sealant type: silicone, mildew resistant.

.5 Exposed interior control joints in drywall: Sealant type: acrylic latex.

.6 Concealed joints in sound attenuated walls and ceilings: Sealant type: acoustic.

.7 Colour of sealants: selected by Departmental Representative from manufacturer's standard range to match adjacent surfaces.

.8 Joint cleaner: xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil, grease, and other matter which may impair work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coating unless tests have been performed to ensure compatibility in materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

.6 Verify that joint backing and release tapes are compatible with sealant.

.7 Protect elements surrounding the work of this section from damage or disfiguration.

3.2 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

3.3 BACK UP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.4 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.5 INSTALLATION

.1 Sealant

.1 Apply sealant in accordance with manufacturer's written instruction.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.2 Apply sealant in continuous beads.

.3 Apply sealant using gun with proper size nozzle.

.4 Use sufficient pressure to fill voids and joints solid.

.5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.6 Tool exposed surfaces before skinning begins to give slightly concave shape.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 Curing

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

.9 Cleanup

.1 Clean adjacent surfaces immediately and leave work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses,

.3 Remove masking tape after initial set of sealant.

3.6 FIELD QUALITY CONTROL

.1 Joint Sealants: Perform adhesion tests in accordance with manufacturer's written instructions and ASTM C1193, Method A - Field-Applied Sealant Joint Hand Pull Tab.

.2 Remove sealants failing adhesion test, clean substrates, reinstall sealants and perform retesting.

3.7 CLEANING

.1 Section 01 74 00: Cleaning installed work.

.2 Clean adjacent soiled surfaces.

3.8 PROTECTION OF FINISHED WORK

.1 Remove masking tape and excess sealant.

.2 Protect sealants until cured, remove temporary glass supports.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Gypsum board and joint treatment.

.2 Acoustic insulation.

.3 Cementitious backer board.

.4 Light gauge metal stud wall framing.

.5 Metal channel framing for ceiling and bulkheads.

.6 Furring and framing for plumbing walls, conduit and mechanical ducts.

1.2 REFERENCES

.1 ANSI A118.9-1999(R2005) - Cementitious Backer Units.

.2 ASTM C475/C475M-02 (R2007) - Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C 473 Standard Test Methods for physical testing of gypsum panel products.

.4 ASTM C514-04 - Nails for the Application of Gypsum Board.

.5 ASTM C557-03e1 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.6 ASTM C645-08a - Non-Structural Steel Framing Members.

.7 ASTM C665-06 - Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.8 ASTM C754-07 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.

.9 ASTM C840-08 - Application and Finishing of Gypsum Board.

.10 ASTM C1002-07 - Steel Self-Piercing, Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.11 ASTM C1047-05 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.12 ASTM C1278/C1278M-07a - Fiber-Reinforced Gypsum Panel.

.13 ASTM C1288-99(2004) e1 - Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.

.14 ASTM C1325-08 - Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

.15 ASTM C1396/C1396M-06a - Gypsum Board.

.16 ASTM E90-04 - Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions and Elements.

.17 CAN/CGSB-71.25-M88 - Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.18 CAN/ULC-S101-07 - Methods of Fire Endurance Tests of Building Construction and Materials.

.19 CAN/ULC-S102-07 - Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.20 CAN/ULC-S702-97 - Thermal Insulation Mineral Fibre for Buildings.

.21 GA-214-07 (Gypsum Association) - Recommended Levels of Gypsum Board Finish.

.22 GA-216-07 (Gypsum Association) - Application and Finishing of Gypsum Panel Products.

.23 GA-600-06 (Gypsum Association) - Fire Resistance Design Manual.

.24 GA-801-07 (Gypsum Association) - Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors.

.25 ULC - Fire Resistance Directory.

1.3 QUALITY ASSURANCE

.1 Provide gypsum board materials that coply with the following limits for surface burning charcterisitcis when tested as per ASTM E 84:

.1 Flame spread: 25, maximum.

.2 Smoke development: 450, maximum.

Part 2 Products

2.1 Paperless Gypsum Board

.1 Gypsum wallboard faced with FRP glass mats in lieu of paper producing moisture and mold resistance when tested by the appropriate ASTM procedures.

.2 Physical properties of 12.7mm thick board

.1 Thickness: 12.7mm

.2 Width: 1219mm

.3 Length: 2438mm

.4 Edges: Tapered

.5 Surfacing: Coasted glass mat on face, back and long edges.

.6 Flexural Strength, Parallel (ASTM C 473, ASTM C 1177): Not less than 80 pounds

.7 Flexural Strength, Perpendicular (ASTM C 473, ASTM C 177): Not less than 100 pounds

.8 R-Value: Not less than 0.26

.9 Water Absorption: Less than 5% of weight

.3 Physical properties of fire-rated board, where required.

.1 Thickness: 12.7mm

.2 Width: 1219mm

.3 Length: 2438mm

.4 Type: C

.5 Edges: Tapered

.6 Surfacing: Coasted glass mat on face, back and long edges.

.7 Flexural Stregth, Parallel (ASTM C 473, ASTM C 1177): Not less than 80 pounds

.8 Felxural Strength, Perpendicular (ASTM C 473, ASTM C 177): Not less than 100 pounds

.9 R-Value: Not less than 0.26

.10 Water Absorption: Less than 5% of weight

.11 Mold resistance (ASTM D 3273): 10, in a test as manufactured.

2.2 ACCESSORIES

.1 Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

.2 Corner Beads: ASTM C1047 GA-216; Metal corner bead. bead.

.3 Edge Trim: ASTM C1047 GA-216; Type U casing bead Control joint.

.4 Joint Materials: ASTM C475. GA-216.

.1 Reinforcing tape, adhesive, and water.

.2 Joint compound: Asbestos-free dust-controlled;

.5 Gypsum Board Fasteners: #6 screws at 12” o.c. maximum.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings instructed by the manufacturer.

3.2 GYPSUM BOARD INSTALLATION

.1 Install gypsum board in accordance with ASTM C840 GA-216 and GA-600 manufacturer's written instructions.

.2 Erect single layer standard gypsum board in most economical direction horizontal vertical, with ends and edges occurring over firm bearing.

.3 Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

.4 Use screws when fastening gypsum board to metal furring or framing.

.5 Use nails or screws when fastening gypsum board to wood furring or framing. Staples may only be used when securing the first layer of double layer applications.

.6 Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular parallel to framing or furring members. Use fire rated gypsum backing board for fire rated partitions and ceilings.

.7 Double Layer Applications: Secure second layer to first with fasteners, adhesive and sufficient support to hold in place. Apply adhesive in accordance with manufacturer's written instructions.

.8 Place second layer perpendicular parallel to first layer. Offset joints of second layer from joints of first layer.

.9 Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.

.10 Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

.11 Place control joints consistent with lines of building spaces as indicated as directed.

.12 Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.

.13 Install backing board over metal studs plywood sheet gypsum board in accordance with manufacturer's written instructions.

.14 Apply gypsum board to curved walls in accordance with GA-216. .

3.3 JOINT TREATMENT

.1 Finish in accordance with ASTM C840 or GA-214 Level 4 finish.

3.4 TOLERANCES

.1 Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Removal and reinstallation of acoustic ceilings to accommodate the plumbing upgrades.

.2 Replacement of existing damaged ceiling tiles.

1.2 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies

.2 Division 15 Heating, Ventilating, and Air-Conditioning (HVAC) Air Outlets and Inlets Air diffusion devices in ceiling system.

.3 Division 16 Electrical Light fixtures in ceiling system.

.4 Division 28 – Electronic Safety and Security Section 28 31 00 - Fire Alarm: Fire alarm components in ceiling system.

1.3 REFERENCES

.1 ASTM C635/C635M-09 - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.2 ASTM C636/C636M-08 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

.3 ASTM C665-06 - Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.4 ASTM E580/E580M-09a - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

.5 ASTM E1264-08e1 - Classification of Acoustical Ceiling Products.

.6 CAN/CGSB-92.1-M89 - Sound Absorptive Prefabricated Acoustical Units.

.7 CAN/ULC-S702-09 - Thermal Insulation Mineral Fibre for Buildings.

.8 CISCA (Ceilings and Interior Systems Contractors Association) – Ceiling Systems Handbook.

.9 ULC - Fire Resistance Directory.

1.4 SYSTEM DESCRIPTION

.1 Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360. Install all seismic restraints in accordance to ASTM E580.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Sequencing:

.1 Sequence work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

.2 Install acoustic units after interior wet work is dry.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials: Provide 5% of total acoustic unit area of extra tile

1.7 QUALITY ASSURANCE

.1 Single source responsibility: Provide acoustical panel units, technical panel units and grid components by a single manufacturer.

.2 Conform to CISCA requirements.

.3 Grid Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.4 Acoustic Unit Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Acoustic tile and panels shall conform to CAN/ULC S102 and comply with CAN/CGSB-02.1 for Class A products.

.1 Flame Spread 25 or less

.2 Smoke Developed 50 or less.

.2 Seismic Restraint

.1 Install suspension system to confirm to seismic restraint requirements for NBC 2010 building code. Seismic restraint provisions shall follow ASTM E580

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Section 01 35 23: Health and safety.

.2 Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40% prior to, during, and after acoustic unit installation.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

.2 Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

.3 Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

.4 Store ceiling components in a dry interior location in their cartons prior to installation to avoid damage. Store cartons in a flat, horizontal position. The protectors between the panels should not be removed until installation.

.5 Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees F or greater than 86 degrees F. Panels must not be exposed to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.

.6 Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

1.11 WARRANTY

.1 Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

.1 Acoustical Panels: Sagging and warping

.2 Grid System: Rusting and manufacturer's defects

.2 Warranty Period:

.1 Ten (10) years from date of substantial completion.

.3 The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

Part 2 Products

2.1 CEILING TILES

.1 New Square edged 610mm x 1219mm x 15.9mm, for imperial grid, wet-formed mineral fibre acoustical tile units covered with scrubbable non-perforated white vinyl membrane suitable for Class 100 clean rooms and possessing the following characteristics:

.1 CAC rating: 40

.2 Light reflectance: 0.80

.3 ASTM E 1264 classification: Type IV, Form 2, Pattern E

.4 30-year system performance guarantee against visible sag, mold/mildew growth, and bacterial growth

.5 Flame spread: 25 or under (UL labeled) as per ASTM E 1264.

.2 Employ ULC approved hold-down clips in Type ‘CT1” acoustical tile assembly.

2.2 ACCESSORIES

.1 Gasket for Perimeter Moldings: Closed cell rubber sponge tape at office perimeters.

.2 Touch-up Paint: Type and colour to match acoustic and grid units.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Resilient sheet flooring in Men's, Women's, and HC washrooms.

1.2 REFERENCES

.1 ASTM E84-08a - Test Method for Surface Burning Characteristics of Building Materials.

.2 ASTM F1913-04 - Vinyl Sheet Floor Covering Without Backing.

.3 CAN/ULC-S102.2-07 - Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colours available; and .

.3 Shop Drawings: Indicate seaming plan, borders, patterns, and .

.4 Samples:

.1 Submit two (2) samples, 6x6 inch in size illustrating colour and pattern specified.

1.4 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Installation Data: Manufacturer's special installation requirements including special procedures, perimeter conditions requiring special attention.

1.5 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials: Provide 20 sq ft of flooring,

1.7 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 14000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience approved by the manufacturer.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code for flame/smoke rating requirements of / in accordance with CAN/ULC-S102.2 ASTM E84.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect roll materials from damage by storing on end. .

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Store materials for three days prior to installation in area of installation to achieve temperature stability.

.2 Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

Part 2 Products

2.1 PRODUCTS - SHEET FLOORING

.1 Homogeneous single layered vinyl floor covering

.2 Minimum thickness: 2.0mm

.3 Material meets ASTM F 1913

.4 Class 1 Fire Performance ASTM E 648

.5 Chemical resistance to ASTM F 925

2.2 ACCESSORIES

.1 Square edge cove cap to match flooring colour

.2 Cove former to all floor wall junctions

.3 Butterfly corners to all outside corners

.4 Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

.5 Primers and Adhesives: As recommended by flooring manufacturer.

.6 Edge Strips: aluminum carpet joiner at doors

.7 Wall base: 4” high continuous flash cove with at all walls.

.8 Can’t Strip: Metal Plastic.

.9 Sealer: Types recommended by flooring manufacturer.

.10 Welding Rods to match floor colour

Part 3 Execution

3.1 EXAMINATION

.1 Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 PREPARATION

.1 Prepare concrete utilizing ASTM F 710

.2 Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

.3 Prohibit traffic until filler is cured.

.4 Vacuum clean substrate.

.5 Apply primer to concrete surfaces.

3.3 INSTALLATION - SHEET FLOORING

.1 Install sheet flooring to manufacturer instructions.

.2 Spread only enough adhesive to permit installation of materials before initial set.

.3 Set flooring in place, press with heavy roller to attain full adhesion.

.4 Lay flooring full size sheets in each room without seams.

.5 Install sheet flooring parallel to length width of room. Provide minimum of 1/3 full roll width.

.6 Terminate flooring at centreline of door openings where adjacent floor finish is dissimilar.

.7 Install edge strips at unprotected or exposed edges, and where flooring terminates. Secure metal strips before after installation of flooring with stainless steel screws. Secure resilient strips by adhesive.

.8 Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

.9 Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

3.4 CLEANING

.1 Section 01 74 00: Cleaning installed work.

.2 Remove access adhesive from floor, base, and wall surfaces without damage.

.3 Clean and seal floor and base surfaces in accordance with manufacturer's written instructions.

3.5 PROTECTION OF FINISHED WORK

.1 Prohibit traffic on floor finish for 48 hours after installation.

3.6 SCHEDULES

.1 Washrooms 128, 137, 138, 232, 233 and 253.

.2 Colour: Light Grey

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Surface Preparation and Field or Factory Application of Paints and Coatings to the following items:

- .1 Gypsum walls, ceilings, and bulkheads
- .2 Mechanical, Louvers, Drains, Vents
- .3 Exposed Conduit, pipes, hangers and brackets

1.2 RELATED SECTIONS

.1 Section 09 21 16: Gypsum Board Assemblies

.2 Mechanical Drawings and Specifications

1.3 SUBMITTALS AND MOCK UPS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data on all finishing products.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years experience.

.3 All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

.4 All paint manufacturers and products used shall be as listed under the Approved Product List section of the MPI Painting Manual unless otherwise noted in this section.

1.5 REGULATORY REQUIREMENTS

.1 Conform to WCB, Worksafe BC requirements for finishes

1.6 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Product requirements.

.2 Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

.3 Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and written instructions for mixing and reducing.

.4 Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's written instructions.

1.7 Waste Management and Disposal:

.1 Paint and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable Provincial government departments having jurisdiction.

.2 All waste materials shall be separated and recycled. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.4 Empty paint cans are to be dry prior to disposal or recycling (where available).

.5 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

.5 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

.2 Conform to the latest edition of Industrial Health and Safety Regulations issued by applicable authorities having jurisdiction in regard to site safety (ladders, scaffolding, ventilation, etc.).

.3 Conform to requirements of local authorities having jurisdiction in regard to the storage, mixing, application and disposal of all paint and related waste materials. Refer to Waste Management and Disposal.

1.9 PROTECTION

.1 Adequately protect other surfaces from paint and damage and make good any damage caused by failure to provide suitable protection, but this section will not be responsible for any damage caused by others.

.2 Furnish sufficient drop cloths, shields and protective equipment to prevent spray of dropping from fouling surfaces not being painted and in particular, surfaces within the paint storage and preparation area.

.3 Cotton waste, cloths and material, which may constitute a fire hazard, shall be placed in closed metal containers and removed from the site daily.

.4 Remove all surface hardware, electrical plates, fittings, fastenings etc. Prior to painting operation. These items shall be carefully stored, cleaned, and replaced on completion of work in each area.

Part 2 Products

2.1 FINISHES

.1 Refer to schedule at end of section for MPI finish specification including surface finish for Architectural items.

.2 Architectural colour to match existing and a test area must be approved, once dry, by Consultant and Departmental Representative.

.3 If colour is not specified or unclear for element consult the Consultant before proceeding.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that surfaces substrate conditions are ready to receive work as instructed by the product manufacturer.

.2 Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

.3 Test shop applied primer for compatibility with subsequent cover materials.

.4 Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

.1 Plaster and Gypsum Wallboard: 12 percent.

3.2 PREPARATION

.1 Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

.2 Correct defects and clean surfaces which affect work of this section.

.3 Remove existing coatings that exhibit loose surface defects.

.4 Seal with shellac and seal marks which may bleed through surface finishes.

.5 Interior surfaces: Where required seal with shellac or other recommended sealer/stain blocker and seal marks which may bleed through surface finishes.

.6 Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

.7 Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

.8 Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

.9 Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

3.3 APPLICATION

.1 Apply products to MPI and/or manufacturer instructions.

.2 Do not apply finishes to surfaces that are not dry.

.3 Apply each coat to uniform finish.

.4 Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

.5 Sand wood and metal lightly between coats to achieve required finish.

.6 Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

.7 Allow applied coat to dry before next coat is applied.

.8 Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

.9 Prime concealed surfaces of interior and exterior woodwork with primer paint.

.10 Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.4 CLEANING

.1 Promptly as the work proceeds and on the completion of the work, remove all paint where spilled, splashed or splattered. During the progress of the work keep the premises free from any unnecessary accumulation of tools, equipment, surplus material and debris. At the conclusion of the work leave the premises neat and clean to the satisfaction of the Engineer.

3.5 MAINTENANCE AND SURPLUS MATERIALS

.1 At project completion provide (1 gallon) of each type and color of paint from same production run in unopened cans, properly labeled and identified for Owner's later use in maintenance. Store where directed by Owner.

.2 Provide the General Contractor, maintenance, product data, colours and finishes for each MPI system used for inclusion into the manuals.

3.6 SCHEDULE

.1 The following titles, grades and code numbers refer to those listed in the Master Painters Specification Manual.

.2 Interior Gypsum Board Walls

.1 RIN 9.2B G3 DSD2 High Performance Architectural Latex

.3 Gypsum ceilings, and bulkheads

.1 RIN 9.2B G1 DSD2 High Performance Architectural Latex

.4 Interior Conduit, pipes, hangers and brackets, louvers, vents, drains and interior steel

.1 INT 5.1B W.B. light industrial coating over W.B. primer

.1 Primer 1 coat MPI 107 “site applied”

.2 Two (2) coats MPI 151 G3 Light Industrial Coating

END OF SECTION

1. GENERAL

1.1 Summary

.1 Section Includes:

.1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.2 References

.1 American Water Works Association (AWWA)

.2 Public Works and Government Services Canada (PWGSC)

.1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-03.

.3 Underwriters' Laboratories of Canada (ULC)

1.3 General

.1 Provide a fully functional facility:

.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 Owner 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 Cx - Commissioning.

.2 BMM - Building Management Manual.

.3 EMCS - Energy Monitoring and Control Systems.

.4 MSDS - Material Safety Data Sheets.

.5 PI - Product Information.

.6 PV - Performance Verification.

.7 TAB - Testing, Adjusting and Balancing.

.8 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.

1.4 Development of 100% Cx Plan

.1 Cx Plan to be 95% completed before added into Project Specifications.

.2 Cx Plan to be 100% completed within 8 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 Contractors, sub-contractors, suppliers' requirements.

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

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

1.5 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.

1.6 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 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.

.2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:

.1 Review of Cx documentation from operational perspective.

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

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

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

.5 Work closely with members of Cx Team.

.3 Departmental Representative is responsible for:

.1 Organizing Cx.

.2 Monitoring operations Cx activities.

.3 Witnessing, certifying accuracy of reported results.

.4 Witnessing and certifying TAB and other tests.

.5 Developing BMM.

.6 Ensuring implementation of final Cx Plan.

.7 Performing verification of performance of installed systems and equipment.

.8 Implementation of Training Plan.

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

.1 Testing.

.2 TAB.

.3 Performance of Cx activities.

.4 Delivery of training and Cx documentation.

.5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.

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

.1 Demonstrations.

.2 Training.

.3 Testing.

.4 Preparation, submission of test reports.

.6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:

.1 Receiving facility.

.2 Day-To-Day operation and maintenance of facility.

1.7 Cx Participants

.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 Equipment manufacturer: equipment specified to be installed and started by manufacturer.

.1 To include performance verification.

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

.4 Specialist Cx agency:

.1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.

.5 Client: responsible for intrusion and access security systems.

.6 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 Modify ventilation rates to meet changes in off-gassing.

.2 Changes to heating or cooling loads beyond scope of EMCS.

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

.4 Redistribution of electrical services.

.5 Modifications of fire alarm systems.

.6 Modifications to voice communications systems.

.7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 1month prior to starting date of Cx for review and approval.

1.8 Extent of Cx

.1 Commission mechanical systems and associated equipment:

.1 Plumbing systems:

.1 For all plumbing systems that are part of this project scope of work, refer to drawings for more information.

1.9 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.

.7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.10 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 Results of Performance Verification Tests and Inspections.

.7 Description of Cx activities and documentation.

.8 Description of Cx of integrated systems and documentation.

.9 Training Plans.

.10 Cx Reports.

.11 Prescribed activities during warranty period.

1.11 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 Departmental Representative will monitor all of these pre-start-up inspections.

.4 Include completed documentation with Cx report.

.5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.

.6 Departmental Representative will monitorsome of these inspections and tests.

.7 Include completed documentation in Cx report.

.2 Pre-Cx activities - MECHANICAL:

.1 Plumbing systems:

.1 "Bump" each item of equipment in its "stand-alone" mode.

.2 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.

1.12 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.

.3 Departmental Representative to monitor all of these start-up activities.

.1 Rectify start-up deficiencies to satisfaction of Departmental Representative.

.4 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 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.13 Cx Activities and Related Documentation

.1 Departmental Representative to monitor Cx activities.

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

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

1.14 Deliverables Relating to Administration of Cx

.1 General:

.1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.15 Cx Schedules

.1 Prepare detailed critical path 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: 14 days after contract award, and before construction starts.

.3 Cx agents' credentials: 21 days before start of Cx.

.4 Cx procedures: 2 months after award of contract.

.5 Cx Report format: 2 months after contract award.

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

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

.8 Notification of intention to start Cx: 14 days before start of Cx.

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

.10 Identification of deferred Cx.

.11 Implementation of training plans.

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

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

1.16 Cx Reports

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

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

1.17 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 plumbing systems.

1.18 Training Plans

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

1.19 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.

END OF SECTION

1. GENERAL

1.1 Summary

.1 Section Includes:

.1 This Section specifies roles and responsibilities of Commissioning Training.

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 Scheduling

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 3 hours in length.

.3 Training to be completed prior to acceptance of facility.

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

END OF SECTION

1. GENERAL

1.1 References

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)

.1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 ASTM International Inc.

.1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A536-84(2004) e1, Standard Specification for Ductile Iron Castings.

.3 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric).

.3 American National Standards Institute/American Water Works Association (ANSI)/ (AWWA)

.1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International)

.1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02a, Butterfly Valves.

.2 MSS-SP-70-06, Gray Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71-05, Gray Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.8 National Research Council (NRC)/Institute for Research in Construction

.1 NRCC 38728, National Plumbing Code of Canada (NPC) - 1995.

1.2 Action and Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

1.3 Delivery, Storage and Handling

.1 Packaging Waste Management: remove for reuse of pallets, crates, paddling, and packaging materials. Place materials defined as hazardous or toxic in designated containers.

.2 Handle and dispose of hazardous materials in accordance with CEPA, and Regional and Municipal regulations.

2. PRODUCTS

2.1 Piping

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type K: to ASTM B88M.

2.2 Fittings

.1 Bronze pipe flanges and flanged fittings, Class 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

2.3 Joints

.1 Rubber gaskets, 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 Gate Valves

.1 NPS 2 and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23 - Valves - Bronze.

.2 NPS 2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23 - Valves - Bronze.

.3 NPS 2 1/2 and over flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 24 - Valves - Cast Iron.

2.5 Globe Valves

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23 - Valves - Bronze.

.2 Lockshield handles: as indicated.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23 - Valves – Bronze.

.2 Lockshield handles: as indicated (all balancing valves on recirculation loop to be Lockshield handles type, refer to 3.3.2).

2.6 Swing Check Valves

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23 - Valves - Bronze.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23 - Valves - Bronze.

.3 NPS 2 1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 24 - Valves - Cast Iron: Gate, Globe, Check.

2.7 Ball Valves

.1 NPS 2 and under, screwed:

.1 Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE, steel lever handle as specified Section 23 05 23 - Valves – Bronze.

.2 NPS 2 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23 - Valves - Bronze.

2.8 Butterfly Valves

.1 NPS 2-1/2 and over, lug:

.1 To MSS-SP-67, Class 200.

.2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.

.3 Gear operated.

.2 NPS 2-1/2 and over, grooved ends:

.1 Class 300 psig CWP, bubble tight shut-off, bronze body EPDM coated ductile iron disc with integrally cast stem.

.2 Operator:

.1 Gear operated.

3. EXECUTION

3.1 Application

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

3.2 Installation

.1 Install in accordance with NPC and local authority having jurisdiction.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.3 Valves

.1 Isolate equipment, fixtures and branches with gate or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 Pressure Tests

.1 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 Flushing and Cleaning

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, and then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Provincial potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 Pre-Start-Up Inspections

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that air chambers, expansion compensators are installed properly.

3.7 Disinfection

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative.

3.8 Start-Up

.1 Timing: start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.

.4 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.9 Performance Verification

.1 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB domestic water system in accordance with Section 23 05 93 - Testing, Adjusting and Balancing.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 References

.1 ASTM International Inc.

.1 ASTM B32-08, Standard Specification for Solder Metal.

.2 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).

.3 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).

.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 Green Seal Environmental Standards (GSES)

.1 Standard GS-36-00, Commercial Adhesives.

.4 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 Action and Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 Delivery, Storage and Handling

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, and packaging materials in accordance with Section 01 74 00 – Cleaning and Waste Processing.

2. PRODUCTS

2.1 Copper Tube and Fittings

.1 Above ground sanitary and vent Type DWV to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.2 Solder: tin-lead, 50:50 type 50A to ASTM B32.

2.2 Cast Iron Piping and Fittings

.1 Above ground sanitary and vent: to CAN/CSA-B70.

.1 Joints:

.1 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

3. EXECUTION

3.1 Application

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

3.2 Installation

.1 Install in accordance with National Plumbing Code and local authority having jurisdiction.

3.3 Testing

.1 Pressure test all new piping.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 Performance Verification

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 Summary

.1 Section Includes:

.1 Materials and installation for plumbing specialties and accessories.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 23 - Health and Safety

.3 Section 01 45 00 - Quality Control.

.4 Section 01 74 00 – Cleaning and Waste Processing

.5 Section 01 78 10 - Closeout Submittals.

1.2 References

.1 American Society for Testing and Materials International (ASTM).

.1 ASTM A126-95 (2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.

.2 Canadian Standards Association (CSA International).

.1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.

.2 CSA-B79-94 (R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.

.3 CSA-B356-00, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.4 Plumbing and Drainage Institute (PDI).

.1 PDI-WH201-92, Water Hammer Arresters Standard.

1.3 Submittals

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Shop Drawings:

.1 Submit shop drawings.

.4 Instructions: submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals, include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.4 Quality Assurance

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting prior to beginning work of this Section and on-site installations.

.1 Review installation and substrate conditions.

.2 Co-ordination with other building subtrades.

.3 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 23 - Health and Safety.

1.5 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials to metal recycling facility as approved by Departmental Representative.

.5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

2. PRODUCTS

2.1 Floor Drains

.1 Floor Drains and Trench Drains: to CSA B79.

.2 Refer to drawings for floor drains specification.

2.2 Non-Freeze Wall Hydrants

.1 Surface mount or recessed with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Chrome plated.

2.3 Water Hammer Arrestors

.1 Stainless steel or copper construction, bellows piston type: to PDI-WH201.

2.4 Back Flow Preventers

.1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type, double check valve assembly, back flow preventer with intermediate atmospheric vent or vacuum breaker.

2.5 Vacuum Breakers

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric hose connection laboratory faucet intermediate as indicated.

2.6 Pressure Regulators

.1 Capacity: as indicated.

.1 Inlet pressure: 1034 kPa.

.2 Outlet pressure: 413 kPa.

.3 Capacity: L/s.

.2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.

.3 NPS2 and over, semi-steel bodies, Class 250, flanged: to ASTM A126, Class B.

.4 Semi-steel spring chambers with bronze trim.

2.7 Water Make-Up Assembly

.1 Complete with backflow preventer pressure gauge on inlet and outlet, pressure reducing valve to CSA B356, pressure relief valve on low pressure side and gate valves on inlet and outlet.

2.8 Trap Seal Primers

.1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

2.9 Strainers

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS2 and under, bronze body, screwed ends, with brass cap.

.3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap.

3. EXECUTION

3.1 Manufacturer's Instructions

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

3.2 Installation

.1 Install in accordance with National Plumbing Code of Canada, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 Water Hammer Arrestors

.1 Install on branch supplies to r group of fixtures.

3.4 Back Flow Preventors

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain or service sink.

3.5 Trap Seal Primers

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, to approval of Departmental Representative.

.3 Install soft copper tubing to floor drain.

3.6 Strainers

.1 Install with sufficient room to remove basket.

3.7 Water Make-Up Assembly

.1 Install on valved bypass.

.2 Pipe discharge from relief valve to nearest floor drain.

3.8 Start-Up

.1 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.9 Testing and Adjusting

.1 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removeability of strainer.

.5 Clean out baskets.

.5 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.6 Access doors:

.1 Verify size and location relative to items to be accessed.

.7 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.8 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.9 Pressure regulators, PRV assemblies:

.1 Adjust settings to suit locations, flow rates, pressure conditions.

.10 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

.11 Commissioning Reports:

.12 Training:

.1 Demonstrate full compliance with Design Criteria.

END OF SECTION

1. GENERAL

1.1 References

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-B45 Series-02 (R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.2 Action And Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Indicate fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Factory-set water consumption per flush at recommended pressure.

.3 (For water closets, urinals): minimum pressure required for flushing.

.4 Shop Drawings:

.1 Submit shop drawings for all washroom fixtures.

1.3 Closeout Submittals

.1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.4 Delivery, Storage and Handling

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse and return of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 00 – Cleaning and Waste Processing.

2. PRODUCTS

2.1 Manufactured Units

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Refer to mechanical drawings for detailed fixture specifications.

3. EXECUTION

3.1 Application

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

3.2 Installation

.1 Mounting heights:

.1 Standard: to manufacturer's recommendations, measured from finished floor.

.2 Wall-hung fixtures: as indicated on architectural drawings, measured from finished floor.

.3 Barrier free: to most stringent NBCC and CAN/CSA B651.

3.3 Adjusting

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Adjust flush valves to suit actual site conditions.

.4 Adjust urinal flush timing mechanisms.

.5 Set controls of automatic flush valves for WCs and urinals, as applicable, to prevent unnecessary flush cycles.

.3 Checks:

.1 Water closets, urinals: flushing action.

.2 Aerators: operation, cleanliness.

.3 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 References

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-B45 Series-02 (R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.2 Action and Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 Closeout Submittals

.1 Provide maintenance data in accordance with Section 01 78 10 - Closeout Submittals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.4 Delivery, Storage and Handling

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse and return of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 00 - Cleaning and Waste Processing.

1.5 PRODUCTS

1.6 Manufactured Units

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures to be product of one manufacturer.

.6 Trim to be product of one manufacturer.

.7 Refer to mechanical drawings for detailed fixtures specifications.

2. EXECUTION

2.1 Application

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

2.2 Installation

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: as indicated on architectural drawings, measured from finished floor.

.3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

2.3 Adjusting

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

2.4 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 References

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME B1.20.1-1983 (R2006), Pipe Threads, General Purpose (Inch).

.2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.

.2 ASTM International

.1 ASTM A276-08, Standard Specification for Stainless Steel Bars and Shapes.

.2 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B283-08a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).

.4 ASTM B505/B505M-08a, Standard Specification for Copper-Base Alloy Continuous Castings.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

.1 MSS-SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.

.2 MSS-SP-80-2008, Bronze Gate Globe, Angle and Check Valves.

.3 MSS-SP-110-1996, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.2 Action and Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings.

1.3 Closeout Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

1.4 Maintenance Material Submittals

.1 Extra Materials/Spare Parts:

.1 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size, minimum 1.

.2 Discs: one for every 10 valves, each size. Minimum 1.

.3 Stem packing: one for every 10 valves, each size. Minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

1.5 Delivery, Storage and Handling

.1 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, Cleaning and Waste Processing.

2. PRODUCTS

2.1 Materials

.1 Valves:

.1 Except for specialty valves, to be single manufacturer.

.2 Products to have CRN registration numbers.

.3 **All valves in sizes 2-1/2" diameter and bigger are to be strictly "butterfly gear operated valves". No other type of the valves will be acceptable, regardless of what rest of the this specification calls for.**

.2 End Connections:

.1 Connection into adjacent piping/tubing:

.1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.

.2 Copper tube systems: solder ends or (Depending on pipe size) grooved ends to ANSI/ASME B16.18.

.3 Lockshield Keys:

.1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

.4 Gate Valves:

.1 Requirements common to gate valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Connections: screwed with hexagonal shoulders.

.4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.

.5 Packing: non-asbestos.

.6 Handwheel: non-ferrous.

.7 Handwheel Nut: bronze to ASTM B62.

.2 NPS 2 and under, rising stem, split wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem.

.3 Operator: handwheel or lockshield.

.3 NPS 2 and under, rising stem, solid wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Operator: handwheel.

.4 NPS 2 and under, rising stem, solid wedge disc, Class 150:

.1 Body: with long disc guides, screwed or union bonnet.

.2 Operator: handwheel.

.5 Globe Valves:

.1 Requirements common to globe valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Connections: screwed with hexagonal shoulders.

.4 Pressure testing: to MSS SP-80. Tests to be hydrostatic.

.5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.

.6 Handwheel: non-ferrous.

.7 Handwheel Nut: bronze to ASTM B62.

.2 NPS 2 and under, composition disc, Class 125:

.1 Body and bonnet: screwed bonnet.

.2 Disc and seat: renewable rotating PTFE disccomposition to suit service conditions, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.

.3 Operator: handwheel lockshield.

.3 NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.

.3 Operator: handwheel.

.4 NPS 2 and under, plug disc, Class 150, screwed ends:

.1 Body and bonnet: union bonnet.

.2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A276, loosely secured to stem.

.3 Operator: handwheel.

.5 Angle valve, NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.

.3 Operator: handwheel.

.6 Check Valves:

.1 Requirements common to check valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Connections: screwed with hexagonal shoulders.

.2 NPS 2 and under, swing type, bronze disc, Class 125:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.3 NPS 2 and under, swing type, bronze disc:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.4 NPS 2 and under, swing type, composition disc, Class 200:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.

.5 NPS 2 and under, horizontal lift type, composition disc, Class 150:

.1 Body: with integral seat, union bonnet ring with hex shoulders, cap.

.2 Disc: renewable PTFE no. 6 composition rotating disc in disc holder having guides top and bottom, of bronze to ASTM B62.

.6 NPS 2 and under, vertical lift type, bronze disc, Class 125:

.1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

.7 Silent Check Valves:

.1 NPS 2 and under:

.1 Body: cast high tensile bronze to ASTM B62 with integral seat.

.2 Pressure rating: Class 125.

.3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.

.4 Disc and seat: renewable rotating disc.

.5 Stainless steel spring, heavy duty.

.6 Seat: regrindable.

.8 Ball Valves:

.1 NPS 2 and under:

.1 Body and cap: cast high tensile bronze to ASTM B62.

.2 Pressure rating: Class125 steam.

.3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders solder ends to ANSI.

.4 Stem: tamperproof ball drive.

.5 Stem packing nut: external to body.

.6 Ball and seat: replaceable stainless steel hard chrome solid ball and Teflon seats.

.7 Stem seal: TFE with external packing nut.

.8 Operator: removable lever handle.

.9 **Butterfly Valves:**

.1 **NPS 2 1/2 through NPS 6, 2068 kPa with grooved ends.**

.1 **Body: cast bronze, with copper-tube dimensioned grooved ends.**

.2 **Disc: elastomer coated ductile iron with integrally cast stem.**

.3 **Operator: gear operated.**

3. EXECUTION

3.1 Installation

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.2 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 References

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.1-05, Cast Iron Pipe Flanges and Flanged Fittings.

.2 ASTM International Inc.

.1 ASTM A49-01(2006), Standard Specification for Heat-Treated Carbon Steel Joint Bars.

.2 ASTM A126-04, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

.3 ASTM A536-84 (2004)e1, Standard Specification for Ductile Iron Castings.

.4 ASTM B61-08, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.

.6 ASTM B85/B85M-08, Standard Specification for Aluminum-Alloy Die Castings.

.7 ASTM B209-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

.1 MSS SP-61-03, Pressure Testing of Steel Valves.

.2 MSS SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS SP-82-1992, Valve Pressure Testing Methods.

.5 MSS SP-85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 Action and Informational Submittals

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheets for valves and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings.

1.3 Closeout Submittals

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

1.4 Delivery, Storage and Handling

.1 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse and return of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 00 – Cleaning and Waste Processing.

1.5 Maintenance Material Submittals

.1 Extra Materials/Spare Parts:

.2 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size, minimum 1.

.2 Discs: one for every 10 valves, each size, minimum 1.

.3 Stem packing: one for every 10 valves, each size, minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.3 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

2. PRODUCTS

2.1 Material

.1 Valves:

.1 Except for specialty valves, to be of single manufacturer.

.2 **All valves in sizes 2-1/2" diameter and bigger are to be strictly "butterfly gear operated valves". No other type of the valves will be acceptable, regardless of what rest of the this specification calls for.**

.2 Standard specifications:

.1 Gate valves: MSS SP-70.

.2 Globe valves: MSS SP-85.

.3 Check valves: MSS SP-71.

.3 Requirements common to valves, unless specified otherwise:

.1 Body, bonnet: cast iron to ASTM B209 Class B, ductile iron to ASTM A536 Grade 65-45-12.

.2 Connections: flanged ends plain face with 2 mm raised face with serrated finish to ANSI B16.1.

.3 Inspection and pressure testing: to MSS SP-82.

.4 Bonnet gasket: non-asbestos.

.5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.

.6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.

.7 Gland packing: non-asbestos.

.8 Handwheel: die-cast aluminum alloy to ASTM B85/B85M or malleable iron to ASTM A49. Nut of bronze to ASTM B62.

.9 Identification tag: with catalogue number, size, other pertinent data.

.4 All products to have CRN registration numbers.

2.2 Gate Valves

.1 NPS 2 1/2-8, outside screw and yoke (OS&Y), rising steam bronze or iron trim, solid wedge disc:

.1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut. Class 125.

.2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection.

.3 Seat rings: renewable bronze screwed into body.

.4 Stem: nickel-plated steel or manganese-bronze.

2.3 Globe Valves

.1 NPS 2 1/2 - 10, OSY:

.1 Body: with multiple-bolted bonnet.

.2 WP: 860 kPa steam, 1.4 MPa CWP.

.3 Bonnet-yoke gasket: non-asbestos.

.4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.

.5 Seat ring: renewable, regrindable, screwed into body.

.6 Stem: bronze to ASTM B62.

.7 Operator: manual gear.

.8 Bypass: complete with union and NPS globe valve as Section 23 05 23 - Valves - Bronze.

2.4 Bypasses for Gate and Globe Valves

.1 Locations: on valves as indicated.

.2 Position of bypass valve on main valves.

.3 Size of bypass valve:

.1 Main valve up to NPS 8: NPS 3/4.

.2 Main valve NPS 10 and over: NPS 1.

.4 Type of bypass valves:

.1 On gate valve: globe, with bronze disc, bronze trim, to Section 23 05 23 - Valves - Bronze. Pressure rating to match main valve.

.2 On globe valve: globe, with c bronze disc, bronze trim, to Section 23 05 23 - Valves - Bronze. Pressure rating to match main valve.

2.5 Valve Operators

.1 Install valve operators as follows:

.1 Handwheel: on valves except as specified (gear operated).

.2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in boiler rooms and mechanical equipment rooms.

2.6 Check Valves

.1 Swing check valves, Class 125:

.1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Grooved or flanged ends: plain faced with smooth finish.

.1 Up to NPS 16: ductile iron ASTM A536 Grade 65-45-12.

.2 NPS 18 and over: cast iron to ASTM A126 Class C.

.2 Ratings:

.1 NPS 2 1/2 - 12: 860 kPa steam; 1.4 MPa CWP.

.2 NPS 14 - 16: 860 kPa steam; 1.03 MPa CWP.

.3 NPS 18 and over: 1.03 MPa CWP.

.3 Disc: rotating for extended life.

.1 Up to NPS 6: stainless steel type 316.

.2 NPS 8 and over: bronze-faced cast iron.

.4 Seat rings: renewable bronze to ASTM B62 screwed into body.

.5 Hinge pin, bushings: stainless steel.

.2 Swing check valves, NPS 2 1/2 - 8 Class 250:

.1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin.

.2 Flanged ends: 2 mm raised face with serrated finish.

.3 Rating: 250 psi steam; 500 psi CWP.

.4 Disc: rotating for extended life.

.1 Up to NPS 3: bronze to ASTM B61.

.2 NPS 4 - 8: iron faced with ASTM B61 bronze.

.5 Seat rings: renewable bronze to ASTM B61, screwed into body.

.6 Hinge pin, bushings: renewable, bronze to ASTM B61.

.7 Hinge: galvanized malleable iron.

.8 Identification tag: fastened to cover.

2.7 Silent Check Valves

.1 Construction:

.1 Body: malleable or ductile iron with integral seat.

.2 Pressure rating: Class 125, WP = 860 kPa.

.3 Connections: grooved ends.

.4 Disc: stainless steel renewable rotating disc.

.5 Seat: renewable, EPDM.

.6 Stainless steel spring, heavy duty.

3. EXECUTION

3.1 Installation

.1 Install rising stem valves in upright position with stem above horizontal.

3.2 Cleaning

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.2 Clean installed products in accordance to manufacturer's recommendation.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

END OF SECTION

1. GENERAL

1.1 Summary

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 Qualifications of Tab Personnel

.1 Submit names of personnel to perform TAB to [Departmental Representative] within [21] days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.4 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.5 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.6 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.7 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 Purpose of Tab

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 Exceptions

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 Co-Ordination

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 Start-Up

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures.

1.7 Operation of Systems During Tab

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.8 Start of Tab

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start-up when provisions for TAB are installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating, balancing and other valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

1.9 Accuracy Tolerances

.1 Measured values accurate to within plus or minus 2% of actual values.

1.10 Instruments

.1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system.

.3 Calibrate within [3] months of TAB. Provide certificate of calibration to Departmental Representative.

1.11 Submittals

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.12 Tab Report

.1 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.2 Submit [6] copies of TAB Report to Departmental Representative for verification and approval, in English in a D-ring binder, complete with index tabs.

1.13 Verification

.1 Reported results subject to verification by Departmental Representative.

.2 Provide personnel and instrumentation to verify up to [30]% of reported results.

.3 Number and location of verified results as directed by Departmental Representative

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative

1.14 Settings

.1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.15 Completion of Tab

.1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.16 Post-Occupancy Tab

.1 Participate in systems checks twice during Warranty Period - #1 approximately [3] months after acceptance and #2 within [1] month of termination of Warranty Period.

2. PRODUCTS

2.1 Not Used

.1 Not used.

3. EXECUTION

3.1 Not Used

.1 Not used.

END OF SECTION

1. GENERAL

1.1 Summary

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533-2004, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547-2003, Mineral Fiber Pipe Insulation.

.7 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.5 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 Definitions

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 Action and Informational Submittals

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.3 Shop Drawings:

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

1.5 Quality Assurance

.1 Qualifications:

.2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards member of TIAC.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 23 - Health and Safety.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

2. PRODUCTS

2.1 Fire And Smoke Rating

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.

.1 Insulation: to ASTM C533 .

.2 Design to permit periodic removal and re-installation.

2.3 Insulation Securement

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19mm wide, 0.5 mm thick.

2.4 Cement

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or Air drying on mineral wool, to ASTM C449/C449M.

2.5 Vapour Retarder Lap Adhesive

.1 Water based, fire retardant type, compatible with insulation.

2.6 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 Outdoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/m5.

2.8 Jackets

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint.

.3 Minimum service temperatures: -20 degrees C.

.4 Maximum service temperature: 65 degrees C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: mm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.2 Canvas:

.1 220 and 120 gm/m5 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

.3 Aluminum:

.1 To ASTM B209.

.2 Thickness: 0.50 mm sheet.

.3 Finish: corrugated.

.4 Joining: longitudinal and circumferential slip joints with 50 mm laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5mm thick at 300 mm spacing.

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 Pre-Installation Requirement

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.4 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 Removable, Pre-Fabricated, Insulation and Enclosures

.1 Application: at expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: aluminum PVC.

3.5 Installation of Elastomeric Insulation

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 Piping Insulation Schedules

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.TIAC Code: A-1.

.1 Securements: SS bands at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.2 TIAC Code: A-3.

.1 Securements: SS bands at 300 mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.3 TIAC Code: A-6.

.1 Insulation securements.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code.

.4 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: A-2.

.1 Insulation securements.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.6 Thickness of insulation as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Domestic Hot Water Recirculation and temperature gate		A-1	25	38	38	38	38	38
Lab Hot and Recirculate Water	up to 59	A-1	25	38	38	38	38	38
Make-up Water		A-3	25	25	25	25	25	25
Domestic Potable Cold Water		A-3	25	25	25	25	25	25
Lab Cold Water		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Exposed in mechanical rooms: PVC jacket.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Outdoors: water-proof aluminum jacket.

.6 Finish attachments: SS screws, at 150 mm on centre.

.7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 Cleaning

.1 Proceed in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

APPENDIX A – Epoxy Lining

Designation: F2831 – 12

An American National Standard

Standard Practice for Internal Non Structural Epoxy Barrier Coating Material Used in Rehabilitation of Metallic Pressurized Piping Systems[1]

This standard is issued under the fixed designation F2831; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This standard is intended to establish the minimum criteria necessary for use of a mechanically mixed, blended, epoxy barrier coating (AWWA Class I) that is applied to the interior of ½ in. to 36 in. metallic pipe or tube used in pressurized piping systems for corrosion protection and to improve flow rates. There is no restriction as to the developed length of the piping system other than the method of application ("blow through", spin cast or hand sprayed) and the characteristics of the epoxy coating being applied but the manufacturer's engineer shall be consulted for any limitations associated with this product, process and its application for the end user.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1600 Terminology for Abbreviated Terms Relating to Plastics

D3359 Test Methods for Measuring Adhesion by Tape Test

D3363 Test Method for Film Hardness by Pencil Test

D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

D4752 Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub

D4414 Practice for Measurement of Wet Film Thickness by Notch Gages

F412 Terminology Relating to Plastic Piping Systems

2.2 *AWWA Standard:*[3]

AWWA C210 – Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

AWWA Rehabilitation of Water Mains ; Manual of Water Supply Practices M28, Appendix

2.3 *NSF Standard:*[4]

NSF/ANSI 61 – Drinking Water System Components – Health Effects

NSF/ANSI 14 Plastic Piping System Components and Related Materials

2.4 *Society of Protective Coatings Standards:*[5]

SSPC-SP 1 – Solvent Cleaning S

SSPC-SP 6/NACE No. 3 – Commercial blast cleaning

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412 and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 *Definitions:*

3.2.1 *accredited certifying organization, n*—an agency accredited by an independent and authoritative conformity assessment body (ANSI, ISO/ICC or equivalent) to operate a material and product listing and labeling (certification) system that is accepted by the Authority Having Jurisdiction.

3.2.2 *AWWA class 1 linings, n*—Non-structural systems, such as traditional CML and epoxy. (See AWWA Rehabilitation of Water Mains.)

3.2.3 *listed (third- party certified), adj*—equipment or materials included in a list published by a listing agency (accredited conformity assessment body) that maintains periodic inspection on current production of listed equipment or materials and whose listing states either that the equipment or material complies with approved standards or has been tested and found suitable for use in a specified manner.

[1] This practice is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.67 on Trenchless Plastic Pipeline Technology.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, http://www.awwa.org.

[4] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

[5] Available from Society for Protective Coatings (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 15222-4656, http://www.sspc.org.

*A Summary of Changes section appears at the end of this standard.

3.2.4 *metallic piping, n*—a tubular shape made of metal, intended to convey fluids or gas. Usually semi-rigid or rigid metal such as galvanized steel, galvanized wrought iron black steel, stainless steel, copper, brass or similar metal piping systems.

4. Material Requirements

4.1 When applied to potable water systems, epoxy barrier coatings shall be evaluated, tested and certified for conformance to NSF/ANSI 61, Section 5 for the intended application, field or factory or the health effects portion of NSF/ANSI 14 by an accredited certifying organization.

4.2 Epoxy barrier coatings shall be prepared for application using mechanically engineered metering and mixing methods to ensure mixing and dispensing controls to manufacturer's specifications.

4.3 Epoxy barrier coatings shall be listed and identified for the type of application ("blow through", spin cast or hand sprayed).

5. Significance and Use

5.1 This practice is for use by designers and specifiers, regulatory agencies, owners, contractors, and inspection organizations who are involved in rehabilitation of pressurized piping systems.

6. Coating Application

6.1 *General*—The epoxy coating shall be applied in accordance with the manufacturer's recommendations. Application shall be by blow through, airless-spray or centrifugal-wheel equipment or manufacturer-certified equal. "Blow through" application shall be limited to 6-in. diameter pipe and shall be applied from small diameter to large. Spin cast applications shall be pre-planned in accordance with the manufacturer's recommendations, which are dependent on pipeline diameter, length and architecture and shall be applied at change of diameter both ways. Random spool pieces of pipe shall be installed within the network architecture for subsequent third party inspection when required or specified by owners or their designated representatives.

6.2 *Piping preparation*—Prior to abrasive blast cleaning, surfaces shall be inspected and, if required, cleaned according to SSPC-SP 1 to remove oil, grease, or other foreign matter. Only solvents approved by the epoxy coating manufacturer shall be used. Preheating of metallic type piping to remove oil, grease, mill scale, water, and ice may be used provided the pipe is preheated in a uniform manner to avoid distorting the pipe. All leaks in the piping system shall be repaired in accordance with the manufacturer's recommendations prior to coating.

6.3 *Abrasive blast cleaning*—The interior of the piping system surfaces shall be abrasive blast cleaned to achieve a clean metal surface conforming to SSPC-SP 6/NACE. No. 3 Abrasive blast cleaning and coating shall only be performed when the metal temperature is more than 5 °F (2.9°C) above dew point. When required to meet the standard, or as required by manufacturer's instructions, the cleaning process shall be conducted both ways, from small diameter to large and from large diameter to small, to ensure all foreign material on the wall of the pipe is removed.

6.4 *Pipe Cleaning*—A description of the quality and cleanliness of the pipe to be coated shall be required. When viewed without magnification, the cleaned surface shall be free of all visible oil, grease, dirt, mill scale, rust and previously applied coatings. Evenly dispersed, very light shadows, streaks, and discolorations caused by stains of mill scale, rust and old coatings shall be permitted to remain on no more than 33 percent of the surface to be coated. The manufacturer's instructions shall require that the details of the visual observation of the cleaned pipe to be recorded.

6.5 *Interior cleaning*—If abrasives or other loose foreign matter has entered the interior of the piping system, then clean, dry, oil-free compressed air shall be used to remove the loose foreign matter in a manner that does not adversely affect the cleaned surface. Alternatively, vacuum cleaning or other methods may be used in place of compressed air.

6.6 *Coating thickness*—The minimum coating thickness shall be recommended by the coating manufacturer but shall be greater than 0.01 in. (0.2454 mm). The coating thickness shall be determined in the field via a wet film thickness gauge, meeting Practice D4414-Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages.

6.7 Coating material preparation. Coating material preparation shall be in accordance with the manufacturer's recommendation. Application shall be performed when the temperature is more than 5°F (2.8°C) above dew point. The temperature of the mixed coating material shall not be lower than 50°F (10°C). The temperature of the piping system during application shall conform to the recommendations of the coating manufacturer.

6.8 *Cure*—The coating manufacturer shall be consulted as to the proper cure time and methods but The minimum cure time, cure temperature and flushing requirements shall be in accordance with certification and listing requirements appropriate for the application. For potable water applications, minimum cure time, cure temperature and flushing requirements shall be in accordance with the NSF/ANSI 61 certification and listing requirements for the epoxy.

6.9 *Field Testing*—At completion of installation, the pipe spool pieces randomly inserted into the piping network prior to coating shall be removed for third party inspection and reporting for proper coating thickness and adhesion. A visual inspection at of the entrance and exit points shall also be made by a qualified, third-party inspector. CCTV shall be used to inspect pipe diameters of sizes 2 inches and above and a hand held bore scope used on ½ to 2 in. (4 foot maximum length of inspection). Also at completion of installation an air test or hydrostatic test shall be conducted on the piping system. An air test of 150 psig or hydrostatic test of 1 ½ times the normal working pressure shall be put on the system for a minimum of one hour to assure there are no leaks or observed drop in pressure. In addition the completed system shall be flow tested and the piping system shall be required to meet the minimum flow rates as specified in the model codes (UPC, IPC, NSPC, NPC) adopted by the local jurisdiction.

TEST METHODS

7. General Requirements

7.1 *Minimum Coating Thickness*—The minimum coating thickness shall be as specified by the manufacturer but shall be not less than that specified in section 6.6 of the standard. Testing in accordance with 8.1 shall verify performance of the epoxy barrier coating material at the minimum thickness. .

7.2 Samples: Six test samples shall be prepared for each piping material specified by the manufacturer. Each of the samples shall be coated according to the manufacturer's installation instructions and allowed to cure for 24 hours at room temperature. The samples shall be subjected to the test specified in 8.2-8.4.

8. Performance Requirements

8.1 *Thickness Verification Test*—A test assembly shall be set up for coating utilizing five 10 ft lengths of 1-in. diameter pipe with fittings attached to simulate actual installation. The test assembly pipes and fittings shall be coated in accordance with the coating tables in the manufacturer's installation instructions. The coated pipes and fittings shall be allowed to dry at room temperature for at least 24 h. The thickness of the coating shall be measured at the inlet and outlet ends of the test assemblies and the last fitting shall be removed and axially sectioned for thickness testing along its length. The coating thickness shall be equal to or greater than the minimum coating thickness specified by the manufacturer. A mathematical evaluation of the coating tables in the manufacturer's installation instructions shall be performed, based on the test results for the 1-inch pipe, to establish that the minimum coating will be provided. Maximum thicknesses are determined on an average basis and are addressed in NSF/ANSI 61.

8.2 *Pull-off Strength Test*—A sample shall be tested for resistance to pull-off of the epoxy barrier coating in accordance with Test Method D4541. On metallic surfaces, such as copper, steel or brass, the minimum pull-force without loss of coating adhesion shall be 2500 psi.

8.3 *Immersion Test*—A sample shall be tested in accordance with AWWA C210. The sample shall display no blistering, peeling or disbondment of the epoxy barrier coating.

8.4 *Adhesion Test*—A sample shall be tested in accordance with Test Method D3359. The adhesion of the coating to the piping material shall meet a minimum rating of 4A when tested to Method A of the standard.

8.5 *Curing*—The epoxy shall be cured per the manufacturer's specifications. Upon completion of the curing process, the sample shall meet the requirements of either Test Method D4752 for the solvent rub test or Test Method D3363 for the pencil hardness test.

8.6 *Visual Inspection*—During visual inspection of the coated pipe or samples using CCTV, bore scope or other visual aids, the coating shall exhibit an even application with no signs of blisters, sags, uncoated metal, delamination, ringing, cuts or occlusions. In the event of such discrepancies the manufacturer's engineer shall be consulted to provide the owner with respect to corrective action.

9. Quality Control

9.1 The epoxy components shall be manufactured under an approved quality control program with inspections at least once annually by an inspection agency accredited by the International Accreditation Service (IAS). A full re-test of all performance requirements shall be required at a minimum of once every 5 years. Epoxy coatings used with potable water piping systems shall have chemical extraction test annually verifying continued compliance with Section 5 of NSF/ANSI 61.

9.2 All applicators/contractors shall be trained and certified by the manufacturer prior to any application.

9.3 All equipment used by the applicators/contractors shall also be certified by the manufacturer and be subject to annual calibration.

10. Product Marking

10.1 All epoxy containers shall bear the following markings, affixed by label:

10.2 Manufacturer's name or trademark,

10.3 Certified to ASTM F2831, and,

10.4 Internally coated pipe and tubing shall be permanently and legibly marked at each outlet and on the outside of exposed pipe with the following markings applied at 20-ft intervals: Manufacturer's name or trademark and coating designation and material with prohibition on the use of flame and heat to repair any part of system.

11. Product Information

11.1 The minimum barrier coating wall thickness, pipe sizes that can be coated and piping material that can be coated shall be in accordance with the manufacturer's specifications.

11.2 Product shall be installed in accordance with the manufacturer's instructions, and the requirements of the applicable codes and reference standards in Section 2. The installation instructions shall also specify the certification requirements for the installing contractor.

11.3 The installation instructions shall include a description of the methods of field cutting, application, finishing and testing.

11.4 The installation instructions shall include a requirement that all leaks in the piping system be repaired prior to coating.

11.5 The installation instructions shall include a requirement for labelling the system to indicate that an epoxy coating has been applied to the piping. The labeling shall include a prohibition on the use of flame or heat to repair any part of the piping system.

12. Keywords

12.1 epoxy barrier coating; non structural; rehabilitation

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F2831–11) that may impact the use of this standard.

(1) 8.1 was revised.