

.1 Submitted by: \_\_\_\_\_  
Name of Company

.2 Submitted To: City of Clarence-Rockland  
1560 Laurier Street  
Rockland, ON K4K 1P7

Attention: Mr. Gerald Lalonde

.3 BID

.1 I/We having examined the site and conditions prevailing, agree, for the following Stipulated Sum, to supply all necessary labour, materials, plant, equipment and services for the execution and completion of the Work in accordance with the Contract Documents prepared by HSP Inc., the Consultants, including all Addenda thereto which are acknowledged hereinafter, for the construction of:

Bourget Landfill Reconfiguration  
Lalonde Road, Bourget, ON.

for the all inclusive sum of:

\$ \_\_\_\_\_

.2 The Harmonized Sales Tax (HST) is not included in the above Bid Price.

.4 COMPLETION DATE

.1 By completing the information below, I/We will waive substantial completion by June 30, 2017 in lieu of the proposed schedule below. Leaving this area blank will confirm acceptance of substantial completion by June 30, 2017.

\_\_\_\_\_ (insert number of weeks) successive

weeks from a start date of \_\_\_\_\_ (insert starting date).

.5 Performance Bond Letter

.1 I/We enclose herewith a letter from a Surety Company, certifying that I/We can obtain a 25% Performance Bond and a 25% Labour and Materials Bond on the work, if successful in obtaining the Contract.

.6 Certified Cheque or Letter of Credit

.1 I/We enclose herewith a Bid Bond or a certified cheque in the amount of 10% of the bid price payable to the City of Clarence-Rockland.

.7 Agreement

I/We the undersigned, offer to perform the Work in strict accordance with the full intent of the following documents:

A. The AGREEMENT BETWEEN OWNER AND CONTRACTOR, latest Edition of Canadian Standard Construction Document CCDC 2 2008.

B The GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT, Canadian Standard Construction Document CCDC 2 2008.

C The SUPPLEMENTARY GENERAL CONDITIONS.

D The CONTRACT DOCUMENTS.

E The following ADDENDA issued by the Consultant as amendments to the aforementioned Contract Documents which I/WE THE UNDERSIGNED, list herein below:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

ADDENDUM NO:

DATED:

Signed and sealed this \_\_\_\_\_ day  
of \_\_\_\_\_ A.D.20\_\_\_\_\_.

Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: (    ) \_\_\_\_\_

FAX: (    ) \_\_\_\_\_

Email: \_\_\_\_\_

**END OF SECTION**

This is the Appendix “B” referred to in the Instructions to Bidders and forms part of the Contract Documents for this Project and includes a complete list of Sub-Contractors proposed by ME/US for use on the WORK.

<u>Division or Section</u>	<u>Name of Sub Contractors</u>
Site Services	_____
Excavation & Backfill	_____
Paving	_____
Landscaping	_____
Concrete - Foundation	_____
Fabric Dome Structure	_____
Carpentry - framing	_____
- finish	_____
Windows	_____
Doors	_____
Drywall	_____
Insulation	_____
Painting	_____
Plumbing	_____
Heating/Ventilation	_____
Electrical	_____
Flooring	_____
Roofing	_____
Fencing	_____

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Work of this Contract comprises general construction of a new roundabout, a new scale house, a new Household Hazardous Waste (HHW) building, and various utility services, located at the Bouget Landfill on Lalonde Road in Bourget, Ontario.

**1.2                CONTRACT METHOD**

- .1        Construct Work under stipulated price contract CCDC 2.

**1.3                WORK BY OTHERS**

- .1        Co-operate with other Contractors in carrying out their respective works and to carry out instructions from the Consultant.

**1.4                WORK SEQUENCE**

- .1        Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2        Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3        Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4        Maintain fire access/control.

**1.5                CONTRACTOR USE OF PREMISES**

- .1        Limit use of premises for Work to allow:
  - .1        Owner occupancy.
  - .2        Work by other contractors.
  - .3        Public usage.
- .2        Co-ordinate use of premises under direction of Owner.
- .3        Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .4        At completion of operations, condition of existing work: equal to or better than that which existed before new work started.

**1.6                OWNER OCCUPANCY**

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

- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

### **1.7 EXISTING SERVICES**

- .1 Where Work involves breaking into or connecting to existing services, give Owner 48 hours notice throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.
- .2 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .3 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .4 Record locations of maintained, re-routed and abandoned service lines.
- .5 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

### **1.8 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Site Instructions.
  - .8 Other Modifications to Contract.
  - .9 Field Test Reports.
  - .10 Copy of Approved Work Schedule.
  - .11 Health and Safety Plan and Other Safety Related Documents.
  - .12 Other documents as required.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                REFERENCES**

- .1        Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2-2008, Stipulated Price Contract.
- .2        Project Supplementary Conditions

**1.2                CASH ALLOWANCES**

- .1        Refer to CCDC 2, GC 4.1.
- .2        Include in Contract Price specified cash allowances.
- .3        Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage and other authorized expenses incurred in performing Work.
- .4        Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.
- .5        Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.
- .6        Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.
- .7        Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.
- .8        Amount of each allowance, for Work specified is as follows:
  - .1        Include testing allowance of \$6,000.00 for granular compaction testing, for asphalt compaction, and for other testing as requested by Consultant or Owner.

**1.3                CONTINGENCY ALLOWANCE**

- .1        Refer to CCDC 2, GC 4.2.
- .2        Include in Contract Price contingency allowance of \$50,000.00.
- .3        Do not include in Contract Price, additional contingency allowances for products, installation, overhead or profit.
- .4        Expenditures under contingency allowance will be authorized in accordance with procedures provided in CCDC 2, GC 6.1 - Changes CCDC 2, 6.2 Change Order and CCDC 2, 6.3 Change Directive.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                REFERENCES**

- .1        Owner/Contractor Agreement.
- .2        Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2, Stipulated Price Contract.

**1.2                APPLICATIONS FOR PROGRESS PAYMENT**

- .1        Refer to CCDC 2.
- .2        Make applications for payment on account monthly as Work progresses.
- .3        Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4        Invoices and schedules shall be submitted to the Consultant no later than the 25<sup>th</sup> of each month to cover the monthly costs to the end of same month.

**1.3                SCHEDULE OF VALUES**

- .1        Refer to CCDC 2.
- .2        Provide schedule of values supported by evidence as Consultant may reasonably direct and when accepted by Consultant, be used as basis for applications for payment.
- .3        Include statement based on schedule of values with each application for payment.
- .4        Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Consultant may reasonably require to establish value and delivery of products.

**1.4                PROGRESS PAYMENT**

- .1        Refer to CCDC 2.
- .2        Consultant will issue to Owner, no later than 10 working days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Consultant determines to be due. If Consultant amends application, Consultant will give notification in writing giving reasons for amendment.

**1.5                SUBSTANTIAL PERFORMANCE OF WORK**

- .1        Refer to CCDC 2.
- .2        Prepare and submit to Consultant a comprehensive list of items to be completed or corrected and apply for a review by Consultant to establish Substantial Performance of



Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion which Owner agrees to accept separately is substantially performed. Failure to include items on list does not alter responsibility to complete Contract.

- .3 No later than 10 working days after receipt of list and application, Consultant will review Work to verify validity of application, and no later than 5 working days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.
- .4 Consultant: state date of Substantial Performance of Work or designated portion of Work in certificate.
- .5 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Consultant, establish reasonable date for finishing Work.

## **1.6 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK**

- .1 Refer to CCDC 2.
- .2 After issuance of certificate of Substantial Performance of Work:
  - .1 Submit application for payment of holdback amount.
  - .2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.
- .3 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of holdback amount.
- .4 Where holdback amount has not been placed in a separate holdback account, Owner shall, 10 calendar days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.
- .5 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

## **1.7 PROGRESSIVE RELEASE OF HOLDBACK**

- .1 Refer to CCDC 2.
- .2 Where legislation permits, if Consultant has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner shall pay

holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.

- .3 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

## **1.8 FINAL PAYMENT**

- .1 Refer to CCDC 2, GC 5.7.
- .2 Submit application for final payment when Work is completed.
- .3 Consultant will, no later than 10 working days after receipt of application for final payment, review Work to verify validity of application. Consultant will give notification that application is valid or give reasons why it is not valid, no later than 5 working days after reviewing Work.
- .4 Consultant will issue final certificate for payment when application for final payment is found valid.

**END OF SECTION**

Approved: 2006-06-30

**Part 1            General**

**1.1                ADMINISTRATIVE**

- .1     Schedule and administer project meetings throughout the progress of the work at the call of Consultant or Owner.
- .2     Prepare agenda for meetings.
- .3     Provide physical space and make arrangements for meetings.
- .4     Preside at meetings.
- .5     Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .6     Reproduce and distribute copies of minutes within five working days after meetings and transmit to meeting participants and affected parties not in attendance.
- .7     Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2                PRECONSTRUCTION MEETING**

- .1     Within 10 calendar days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2     Contractor and Owner will be in attendance.
- .3     Establish time and location of meeting and notify parties concerned minimum 5 working days before meeting.
- .4     Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5     Agenda to include:
  - .1     Appointment of official representative of participants in the Work.
  - .2     Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3     Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4     Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5     Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
  - .6     Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7     Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Monthly progress claims, administrative procedures, photographs, hold backs.
- .11 Appointment of inspection and testing agencies or firms.
- .12 Insurances, transcript of policies.

### **1.3 PROGRESS MEETINGS**

- .1 During course of Work, schedule progress meetings as requested by Owner or Consultant.
- .2 General Contractor, and Owner are to be in attendance.
- .3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 working days after meeting.
- .4 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

**END OF SECTION**

Approved: 2006-06-30

## **Part 1            General**

### **1.1                DEFINITIONS**

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

### **1.2                REQUIREMENTS**

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

### **1.3 SUBMITTALS**

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

### **1.4 PROJECT MILESTONES**

- .1 Set project milestones form interim targets for Project Schedule.
  - .1 Excavation completed within [ ] working days of Award of Contract date.
  - .2 Substructure completed within [ ] working days of Award of Contract date.
  - .3 Superstructure completed within [ ] working days of Award of Contract date.
  - .4 Building closed-in and weatherproofed within [ ]working days of Award of Contract date.
  - .5 Interior finishing and fitting, mechanical, and electrical work completed within [ ] working days of Award of Contract date.
  - .6 Interim Certificate (Substantial Completion) within [ ] working days of Award of Contract date.

### **1.5 MASTER PLAN**

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

### **1.6 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes has minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Excavation.
  - .6 Backfill.
  - .7 Building foundation
  - .8 Load-Bearing Walls.
  - .9 Cladding and Roofing.

- .10 Interior Architecture (Walls, Floors and Ceiling).
- .11 Plumbing.
- .12 Lighting.
- .13 Electrical.
- .14 Piping.
- .15 Controls.
- .16 Heating, Ventilating, and Air Conditioning.
- .17 Site Works
- .18 Testing and Commissioning.

#### **1.7 PROJECT SCHEDULE REPORTING**

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

#### **1.8 PROJECT MEETINGS**

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

**END OF SECTION**

Approved: 2009-12-31

**Part 1            General**

**1.1                REFERENCES**

- .1        CCDC 2.

**1.2                ADMINISTRATIVE**

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

**1.3                SHOP DRAWINGS AND PRODUCT DATA**

- .1        Refer to CCDC 2 GC 3.10.
- .2        Submissions include:
  - .1        Date and revision dates.
  - .2        Project title and number.
  - .3        Name and address of:
    - .1        Subcontractor.
    - .2        Supplier.



- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .3 After Consultant's review, distribute copies.
- .4 Submit 2 prints or an electronic copy of shop drawings for each major component and as the Consultant may reasonably request.
- .5 Submit 2 copies or an electronic copy, 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.
- .6 Submit 2 copies of test reports for requirements requested and as requested by Consultant.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .7 Submit 2 copies of certificates for requirements requested and as requested by Consultant.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .8 Submit 2 copies of manufacturers instructions for requirements requested and as requested by Consultant.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .9 Submit 2 copies of Manufacturer's Field Reports for requirements requested and as requested by Consultant.

- .10 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .11 Submit 2 copies of Operation and Maintenance Data for requirements requested and as requested by Consultant.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

#### **1.4 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract. City of Clarence-Rockalnd to be additionally named on the policy

**END OF SECTION**

Approved: 2006-09-30

**Part 1            General**

**1.1                REFERENCES**

- .1        Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2-2008, Stipulated Price Contract.

**1.2                INSPECTION**

- .1        Refer to CCDC 2, GC 2.3.

**1.3                INDEPENDENT INSPECTION AGENCIES**

- .1        Independent Inspection/Testing Agencies will be engaged by the Contractor for purpose of inspecting and/or testing portions of Work.
- .2        Allocated costs: to Section 01 21 00 - Allowances.
- .3        Provide equipment required for executing inspection and testing by appointed agencies.
- .4        Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5        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 Consultant at no cost to the Contract. Pay costs for re-testing and re-inspection.

**1.4                ACCESS TO WORK**

- .1        Allow inspection/testing agencies access to Work.
- .2        Co-operate to provide reasonable facilities for such access.

**1.5                PROCEDURES**

- .1        Notify appropriate agency and Consultant 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.

**1.6                REJECTED WORK**

- .1        Refer to CCDC, GC 2.4.

- .2 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 Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Consultant 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 Consultant.

#### **1.7 REPORTS**

- .1 Submit 2 copies of inspection and test reports to Consultant.
- .2 Provide copies to subcontractor of work being inspected or tested.

#### **1.8 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 Consultant and may be authorized as recoverable.

#### **1.9 MILL TESTS**

- .1 Submit mill test certificates as requested.

#### **1.10 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment, balancing, and commissioning reports for all mechanical and electrical systems.

**END OF SECTION**

Approved: 2006-06-30

**Part 1            General**

**1.1                SUBMITTALS**

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

**1.2                INSTALLATION AND REMOVAL**

- .1        Provide temporary utilities controls in order to execute work expeditiously.
- .2        Remove from site all such work after use.

**1.3                DEWATERING**

- .1        Provide temporary drainage and pumping facilities to keep excavations and site free from standing water, if required.

**1.4                WATER SUPPLY**

- .1        Provide continuous supply of potable water for construction use. There is no potable water service available at the site.

**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 non-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        Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5        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.
- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters.
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.
- .9 Pay costs for maintaining temporary heat, when using permanent heating system.
- .10 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.
- .11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

## **1.6 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 10 lx.
- .4 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. Replace lamps which have been used for more than 3 months.

## **1.7 TEMPORARY COMMUNICATION FACILITIES**

- .1 Provide and pay for temporary telephone, fax, data hook up, line(s), and equipment necessary for own use.

**1.8 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

**END OF SECTION**

Approved: 2006-06-30

## **Part 1            General**

### **1.1                REFERENCES**

- .1    Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2, Stipulated Price Contract.
- .2    Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.
  - .2        CGSB 1.59, Alkyd Exterior Gloss Enamel.
- .3    Canadian Standards Association (CSA International)
  - .1        CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CSA-0121, Douglas Fir Plywood.
  - .3        CAN/CSA-S269.2, Access Scaffolding for Construction Purposes.
  - .4        CAN/CSA-Z321, Signs and Symbols for the Occupational Environment.

### **1.2                SUBMITTALS**

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

### **1.3                INSTALLATION AND REMOVAL**

- .1    Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2    Identify areas which have to be gravelled to prevent tracking of mud.
- .3    Indicate use of supplemental or other staging area.
- .4    Provide construction facilities in order to execute work expeditiously.
- .5    Remove from site all such work after use.

### **1.4                SCAFFOLDING**

- .1    Scaffolding in accordance with CAN/CSA-S269.2.
- .2    Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

### **1.5                HOISTING**

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



- .2 Hoists and cranes to be operated by qualified operator.

#### **1.6 SITE STORAGE/LOADING**

- .1 Refer to CCDC 2, GC 3.12.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

#### **1.7 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

#### **1.8 OFFICES**

- .1 Provide office heated to 15 degrees C, lighted 500 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 Site office.
  - .1 Insulate building and provide heating system to maintain 15 degrees C inside temperature at -20 degrees C outside temperature.
  - .2 Install electrical lighting system to provide min 500 lx using surface mounted, shielded commercial fixtures.
  - .3 Maintain in clean condition.

#### **1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

#### **1.10 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

### **1.11 CONSTRUCTION SIGNAGE**

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Consultant and Owner.
- .2 Construction sign 4' x 8', of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.
- .3 Indicate on sign, name of Owner, Consultant, and Contractor, of design style approved by Consultant.
- .4 Signs and notices for safety and instruction must adhere to laws and regulations of the Place of Work. Graphic symbols to CAN/CSA-Z321.
- .5 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Consultant.

### **1.12 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Consultant.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Provide snow removal during period of Work.

### **1.13 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2 Execution.**

**2.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**END OF SECTION**

Approved: 2006-03-31

## **Part 1            General**

### **1.1                REFERENCES**

- .1        Canadian General Standards Board (CGSB)
  - .1        CGSB 1.59, Alkyd Exterior Gloss Enamel.
  - .2        CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.
- .2        Canadian Standards Association (CSA International)
  - .1        CSA-O121, Douglas Fir Plywood.

### **1.2                INSTALLATION AND REMOVAL**

- .1        Provide temporary controls in order to execute Work expeditiously.
- .2        Remove from site all such work after use.

### **1.3                HOARDING**

- .1        Erect temporary site enclosure utilizing existing snow fence wired to rolled steel "T" bar fence posts on centre or approved equivalent. Provide two lockable truck gates. Maintain fence in good repair.
- .2        Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

### **1.4                GUARD RAILS AND BARRICADES**

- .1        Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2        Provide as required by governing authorities.

### **1.5                WEATHER ENCLOSURES**

- .1        Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2        Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3        Design enclosures to withstand wind pressure.

### **1.6                DUST TIGHT SCREENS**

- .1        Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2        Maintain and relocate protection until such work is complete.

**1.7 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.8 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.9 FIRE ROUTES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.10 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.

**1.11 PROTECTION OF BUILDING FINISHES**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                REFERENCES**

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

**1.2                QUALITY**

- .1 Refer to CCDC 2.
- .2 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.
- .3 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.
- .4 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .5 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .7 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 Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

### **1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

### **1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Owner. Unload, handle and store such products.

### **1.6 MANUFACTURER'S INSTRUCTIONS**

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

- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will 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 QUALITY OF WORK**

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

#### **1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

#### **1.9 REMEDIAL WORK**

- .1 Refer to CCDC 2 and Section 01 73 00 - Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .3 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 EXISTING UTILITIES**

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



Approved: 2006-03-31

**Part 1            General**

**1.1                SUBMITTALS**

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

**1.2                MATERIALS**

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

**1.3                PREPARATION**

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

**1.4 EXECUTION**

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

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                REFERENCES**

- .1        Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2, Stipulated Price Contract.

**1.2                PROJECT CLEANLINESS**

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

**1.3                FINAL CLEANING**

- .1        Refer to CCDC 2, GC 3.14.
- .2        When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3        Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris [other than] [including] that caused by Owner or other Contractors.
- .6 Remove waste materials from site at regular times or dispose of as directed by Consultant. Do not burn waste materials on site.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 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.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .19 Clean roofs, downspouts, and drainage systems.
- .20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .21 Remove snow and ice from access to building.

**END OF SECTION**

Approved: 2009-06-30

## **Part 1            General**

### **1.1                REFERENCES**

- .1    Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2, Stipulated Price Contract.
- .2    Canadian Environmental Protection Act (CEPA)
  - .1        SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

### **1.2                ADMINISTRATIVE REQUIREMENTS**

- .1    Acceptance of Work Procedures:
  - .1        Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1            Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2            Request Consultant's inspection.
  - .2        Consultant's Inspection:
    - .1            Consultant and Contractor to inspect Work and identify defects and deficiencies.
    - .2            Contractor to correct Work as directed.
  - .3        Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1            Work: completed and inspected for compliance with Contract Documents.
    - .2            Defects: corrected and deficiencies completed.
    - .3            Equipment and systems: tested, adjusted, and balanced and fully operational.
    - .4            Certificates required by governing bodies: submitted.
    - .5            Operation of systems: demonstrated to Owner's personnel.
    - .6            Commissioning of mechanical systems: completed and copies of final Commissioning Report submitted to Consultant.
    - .7            Underground storage tank inspection documentation, registration, forms in accordance with CEPA SOR/2008-197 or Provincial authority.
    - .8            Work: complete and ready for final inspection.
- .4    Final Inspection:
  - .1        When completion tasks are done, request final inspection of Work by Consultant, and Contractor.
  - .2        When Work incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.

- .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
  - .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
  - .2 Refer to CCDC 2: when Work deemed incomplete by Consultant, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

### **1.3 FINAL CLEANING**

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

**END OF SECTION**

Approved: 2009-06-30

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Environmental Protection Act (CEPA)
  - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Consultant to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .2 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .3 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

**1.4                FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

## **1.6 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, at site for Consultant, one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications/instructions to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.



- .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

## **1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

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

## **1.8 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

- .1 Include regulation, control, stopping, shut-down, and emergency instructions.
- .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Underground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
- .16 Additional requirements: as specified in individual specification sections.

## **1.9 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

## **1.10 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.

- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items.
  - .1 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Include approved listings in Maintenance Manual.

#### **1.11 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Consultant.

#### **1.12 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten working days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .5 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .6 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems, alarm systems.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Procedure and status of tagging of equipment covered by extended warranties.
  - .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .7 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .8 Written verification to follow oral instructions.

- .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

### **1.13 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Purpose of warranty tag is to provide the Owner with the contact details and equipment details so as to be able to call for warranty service while staying at the piece of equipment.
- .5 Indicate following information on tag:
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.
  - .4 Contact name and number.
  - .5 Warranty period.
  - .6 Inspector's signature.
  - .7 Construction Contractor's information.

**END OF SECTION**

Approved: 2006-09-30

## **Part 1           General**

### **1.1               RELATED SECTIONS**

- .1       [\_\_\_\_].

### **1.2               REFERENCES**

- .1       Canadian Standards Association (CSA International)
  - .1       CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2       CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3       CSA O121, Douglas Fir Plywood.
  - .4       CSA O151, Canadian Softwood Plywood.
  - .5       CSA O153, Poplar Plywood.
  - .6       CAN/CSA-O325.0, Construction Sheathing.
  - .7       CSA O437 Series, Standards for OSB and Waferboard.
  - .8       CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada

## **Part 2           Products**

### **2.1               MATERIALS**

- .1       Formwork materials:
  - .1       For concrete without special architectural features, use wood and wood product formwork materials to CSA O437 Series.
  - .2       For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
- .2       Pan forms: removable.
- .3       Tubular column forms: round, internally treated with release material.
- .4       Form ties:
  - .1       For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
  - .2       For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .5       Form liner:
  - .1       Plywood: Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, Poplar to CSA O153.
  - .2       Waferboard: to CAN/CSA-O325.0.

- .6 Form release agent: [non-toxic,] [biodegradable,] [low VOC,] [\_\_\_\_].
- .7 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene.

### **Part 3 Execution**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Engineer approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .9 Use 25mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, where indicated.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as required.
- .11 Construct forms for architectural concrete, and place ties as suited.
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 2 days for walls and sides of beams.
  - .2 2 days for columns.
  - .3 14 days for beam soffits, slabs, decks and other structural members, or 5 days when replaced immediately with adequate shoring to standard specified for falsework.
  - .4 2 days for footings.
- .2 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**



Approved: 2006-09-30

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        [\_\_\_\_].

**1.2                MEASUREMENT PROCEDURES**

- .1        No measurement will be made under this Section.
  - .1        Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

**1.3                REFERENCES**

- .1        Canadian Standards Association (CSA International)
  - .1        CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CSA-A23.3, Design of Concrete Structures.
  - .3        CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
- .2        Reinforcing Steel Institute of Canada (RSIC)
  - .1        RSIC, Reinforcing Steel Manual of Standard Practice.

**1.4                SUBMITTALS**

- .1        Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3        Submit shop drawings including placing of reinforcement and indicate:
  - .1        Bar bending details.
  - .2        Lists.
  - .3        Quantities of reinforcement.
  - .4        Sizes, spacings, locations of reinforcement and mechanical splices if approved by Engineer, with identifying code marks to permit correct placement without reference to structural drawings.
- .4        Detail lap lengths and bar development lengths to CSA-A23.3.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Substitute different size bars only if permitted in writing by Engineer.

- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.
- .6 Welded steel wire fabric: to ASTM A185/A185M.
  - .1 Provide in flat sheets only.
- .7 Welded deformed steel wire fabric: to ASTM A497/A497M.
  - .1 Provide in flat sheets only.
- .8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .9 Mechanical splices: subject to approval of Engineer.

## **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

## **Part 3 Execution**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineer.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

**END OF SECTION**

Approved: 2006-12-31

## **Part 1            General**

### **1.1                RELATED SECTIONS**

- .1        [\_\_\_\_].

### **1.2                REFERENCES**

- .1        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2        Canadian Standards Association (CSA International)
  - .1        CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CSA A283, Qualification Code for Concrete Testing Laboratories.
  - .3        CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1        CSA-A3001, Cementitious Materials for Use in Concrete.

### **1.3                ACRONYMS AND TYPES**

- .1        Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
  - .1        Type GU or GUb - General use cement.
  - .2        Type MS or MSb - Moderate sulphate-resistant cement.
  - .3        Type MH or MHb - Moderate heat of hydration cement.
  - .4        Type HE or Heb - High early-strength cement.
  - .5        Type LH or LHb - Low heat of hydration cement.
  - .6        Type HS or HSb - High sulphate-resistant cement.
- .2        Fly ash:
  - .1        Type F - with CaO content less than 8%.
  - .2        Type CI - with CaO content ranging from 8 to 20%.
  - .3        Type CH - with CaO greater than 20%.
- .3        GGBFS - Ground, granulated blast-furnace slag.

### **1.4                DESIGN REQUIREMENTS**

- .1        Performance : in accordance with CSA-A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### **1.5                SUBMITTALS**

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

- .2 Submit testing, inspection results and reports for review Engineer and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for review by Engineer on following items:
  - .1 Hot weather concrete.
  - .2 Cold weather concrete.
  - .3 Curing.
  - .4 Finishes.
  - .5 Formwork removal.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
  - .1 Modifications to maximum time limit must be agreed to Engineer, laboratory representative and concrete producer as described in CSA A23.1/A23.2.
  - .2 Deviations to be submitted for review by Engineer.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Waste Management and Disposal:
  - .1 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .2 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Cement: to CAN/CSA-A3001, Type GU.
- .2 Water: to CSA-A23.1.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.

- .4 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to ASTM C494, ASTM C1017. Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .5 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 30 MPa at 28 days.

## **2.2 MIXES**

- .1 Performance Method for specifying concrete: to meet Engineer performance criteria in accordance with CAN/CSA-A23.1/A23.2 and on the drawings.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Obtain Engineer's approval before placing concrete.
  - .1 Provide 24 hours notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Engineer's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Engineer.

### **3.2 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Engineer.
  - .2 Where approved by Engineer, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Engineer.
  - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Engineer before placing of concrete.
  - .5 Check locations and sizes of sleeves and openings shown on drawings.
  - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
  - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
  - .2 With approval of Engineer, grout anchor bolts in holes drilled after concrete has set. Drilled holes to be to manufacturers' recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with epoxy grout.
- .4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .5 Finishing and curing:
  - .1 Finish concrete in accordance with CSA-A23.1/A23.2.
  - .2 Use procedures as reviewed by Engineer or those noted in CSA-A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces.
  - .4 Provide float swirl-trowelled finish unless otherwise indicated.
  - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance in accordance with CSA-A23.1/A23.2

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct following test in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
  - .1 Concrete pours.

- .2 Slump tests.
- .3 Air.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Engineer for review in accordance with CSA-A23.1/A23.2.
- .3 Non-Destructive Methods for Testing Concrete: in accordance with CSA-A23.1/A23.2.
- .4 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

**END OF SECTION**

Approved: 1999-12-16

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        Section 03 30 00 - Cast-in-Place Concrete.

**1.2                REFERENCES**

- .1        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-25.20 , Surface Sealer for Floors.
- .2        Canadian Standards Association (CSA)
  - .1        CSA-A23.1 , Concrete Materials and Methods of Concrete Construction.

**1.3                PERFORMANCE REQUIREMENTS**

- .1        Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2        Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

**1.4                PRODUCT DATA**

- .1        Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .3        Include application instructions for concrete floor treatments .

**1.5                ENVIRONMENTAL REQUIREMENTS**

- .1        Electrical power:
  - .1        Provide sufficient electrical power to operate equipment normally used during construction.
- .2        Work area:
  - .1        Make the work area water tight protected against rain and detrimental weather conditions.
- .3        Temperature:
  - .1        Maintain ambient temperature of not less than 10 C from 2 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .4        Moisture:



- .1 Ensure concrete substrate is within moisture limits prescribed by manufacturer.
- .5 Safety:
  - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .6 Ventilation:
  - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
  - .2 Provide continuous ventilation during and after coating application.

## **Part 2 Products**

### **2.1 CURING COMPOUNDS**

- .1 Select low VOC curing compounds.

### **2.2 CONCRETE STAINS**

- .1 Select low VOC concrete stains.

### **2.3 MIXES**

- .1 Mixing, ratios and application in accordance with manufacturer=s instructions.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on drawings.

### **3.2 PREPARATION OF EXISTING SLAB**

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges.
- .2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete.

### **3.3 APPLICATION**

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Clean overspray. Clean sealant from adjacent surfaces.

**3.4 PROTECTION**

- .1 Protect finished installation in accordance with manufacturer's instructions.

**END OF SECTION**

Approved: 2003-12-31

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1        Materials and installation for concrete floor hardeners, slip resistant coatings, and sheet curing materials.

**1.2                RELATED SECTIONS**

- .1        Section 01 33 00 - Submittal Procedures.
- .2        Section 01 51 00 - Temporary Utilities.

**1.3                REFERENCES**

- .1        Health Canada - Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).

**1.4                SUBMITTALS**

- .1        Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Include application instructions for slip resistant coating.

**1.5                WASTE MANAGEMENT AND DISPOSAL**

- .1        Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2        Dispose of unused chemical additive materials at an official hazardous materials collections site.
- .3        Unused chemical additive materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .4        Fold up metal banding, flatten and dispose for recycling.

**1.6                ENVIRONMENTAL REQUIREMENTS**

- .1        Electrical power
  - .1        Sufficient electrical power to operate equipment normally used during construction.
- .2        Work area
  - .1        Water tight protection against rain and detrimental weather conditions.
- .3        Temperature

- .1 Maintain ambient temperature of not less than 10 degrees C from 2 days before installation to at least 48 hours after completion of Work and maintain relative humidity not higher than 40% during same period.
- .2 Maintain substrate temperature at [10] degrees C minimum.
- .4 Moisture:
  - .1 Ensure concrete substrate is within moisture limits prescribed by manufacturer.
- .5 Safety:
  - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .6 Ventilation:
  - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
  - .2 Provide continuous ventilation during and after coating application.

**Part 2 Products**

**2.1 SLIP RESISTANT ABRASIVE AGGREGATE**

- .1 As provided by manufacturer.

**2.2 COLOURING AGENT**

- .1 Non-metallic type cement colouring agent, colour selected by Owner.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verify that slab surfaces are ready to receive Work.

**3.2 HARDENING**

- .1 Apply slip resistant coating on floor surfaces. Apply in strict accordance with manufacturer's written instructions.

**3.3 PROTECTION**

- .1 Protect finished installation until floor treatment has completely cured.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            CSA Group
  - .1            CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
  - .2            CAN/CSA-A179, Mortar and Grout for Unit Masonry.
  - .3            CAN/CSA-A371, Masonry Construction for Buildings.
- .2            International Masonry Industry All-Weather Council (IMIAC)
  - .1            Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for masonry and include product characteristics, performance criteria, physical size, finish and limitations.
- .3            Installer Instructions: provide manufacturer's installation instructions, including storage, handling, safety and cleaning.

**1.4                CLOSEOUT SUBMITTALS**

- .1            Submit manufacturer's instructions for care, cleaning and maintenance of prefaced masonry units for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.5                EXTRA MATERIALS**

- .1            Submit manufacturer's instructions in accordance with Section 01 78 00 - Closeout Submittals covering maintenance requirements and parts catalogue, with cuts and identifying numbers.

**1.6                DELIVERY, STORAGE AND HANDLING**

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

- .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect material from nicks, scratches, and blemishes.
- .3 Keep materials dry until use except where wetting of bricks is specified.
- .4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
- .5 Replace defective or damaged materials with new.

## **1.7 SITE CONDITIONS**

- .1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.
- .2 Weather Requirements: to CAN/CSA-A371 and to IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- .3 Cold weather requirements:
  - .1 To CAN/CSA-A371 with following requirements.
    - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
    - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.
    - .3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.
    - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
  - .2 Hot weather requirements:
    - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
    - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
  - .3 Spray mortar surface at intervals and keep moist for maximum of 3 days after installation.

## **1.8 WARRANTY**

- .1 For Work in this Section 04 05 00 - Common Work Results for Masonry, 12 months warranty period is extended to 24 months.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Masonry materials are specified elsewhere in related Sections:
  - .1 Section 042113.

**Part 3 Execution**

**3.1 INSTALLERS**

- .1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

**3.2 EXAMINATION**

- .1 Examine conditions, substrates and work to receive work of this Section.
- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation after unacceptable conditions have been remedied.
- .3 Verification of Conditions:
  - .1 Verify that:
    - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of brick.
    - .2 Field conditions are acceptable and are ready to receive work.
    - .3 Built-in items are in proper location, and ready for roughing into masonry work.
  - .2 Commencing installation means acceptance of existing substrates.

**3.3 PREPARATION**

- .1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations.
- .2 Establish and protect lines, levels, and coursing.
- .3 Protect adjacent materials from damage and disfiguration.

**3.4 INSTALLATION**

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

**3.5 CONSTRUCTION**

- .1 Exposed masonry:
  - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CAN/CSA-A165, in exposed masonry and replace with undamaged units.
- .2 Jointing:

- .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
- .3 Cutting:
  - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
  - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:
  - .1 Build in items required to be built into masonry.
  - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks:
  - .1 Except in cold weather, wet bricks having initial rate of absorption exceeding 1 g/minute/1000 mm<sup>2</sup>: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
  - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Provision for movement:
  - .1 Leave 3 mm space below shelf angles.
  - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .7 Loose steel lintels:
  - .1 Install loose steel lintels. Center over opening width.
- .8 Control joints:
  - .1 Construct continuous control joints.
- .9 Movement joints:
  - .1 Build-in continuous movement joints.

### **3.6 SITE TOLERANCES**

- .1 Tolerances in notes to CAN/CSA-A371 apply.

### **3.7 FIELD QUALITY CONTROL**

### **3.8 CLEANING**

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



**3.9 PROTECTION**

- .1 Temporary Bracing:
  - .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
  - .2 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
  - .1 Keep masonry dry using waterproof, non staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
  - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1        CSA Group
  - .1        CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CAN/CSA-A179, Mortar and Grout for Unit Masonry.
  - .3        CAN/CSA-A371, Masonry Construction for Buildings.
  - .4        CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .2        International Masonry Industry All-Weather Council (IMIAC)
  - .1        Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for masonry mortar and grout and include product characteristics, performance criteria, physical size, finish and limitations.
- .3        Manufacturers' Instructions: submit manufacturer's installation instructions.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect masonry mortar and grout from nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.

**1.5                SITE CONDITIONS**

- .1        Ambient Conditions: maintain materials and surrounding air temperature to:
  - .1        Minimum 5 degrees C prior to, during, and 48 hours after completion of masonry work.

- .2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.
- .2 Weather Requirements: CAN/CSA-A371, and International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Cement:
  - .1 Portland Cement: to CAN/CSA-A3000, Type GU - General use hydraulic cement (Type 10) gray colour.
  - .2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S.
  - .3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S.
  - .4 Packaged Dry Combined Materials for mortar: to CAN/CSA-A179, Type S, using gray colour cement.
- .3 Aggregate: supplied by one supplier.
  - .1 Fine Aggregate: to CAN/CSA-A179.
  - .2 Course Aggregate: to CAN/CSA-A179.
- .4 Water: clean and potable.
- .5 Lime:
  - .1 Quick Lime: to CAN/CSA-A179,
  - .2 Hydrated Lime: to CAN/CSA-A179.

### **2.2 MORTAR MIXES**

- .1 Mortar for exterior masonry above grade:
  - .1 Load Bearing: type S based on property specifications.
  - .2 Non-Load Bearing: N based on property specifications.
- .2 Following applies regardless of mortar types and uses specified above:
  - .1 Mortar for calcium silicate brick and concrete brick: type O based on proportion specifications.
  - .2 Mortar for stonework: type N based on property specifications.
  - .3 Mortar for grouted reinforced masonry: type S based on property specifications.

### **2.3 MORTAR MIXING**

- .1 Mix mortar ingredients in accordance with CAN/CSA-A179 in quantities needed for immediate use.
- .2 Maintain sand uniformly damp immediately before mixing process.

- .3 Do not use anti-freeze compounds including calcium chloride or chloride based compounds.
- .4 Do not add air entraining admixture to mortar mix.
- .5 Use a batch type mixer in accordance with CAN/CSA-A179.
- .6 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .7 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.
- .8 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 5 degrees C.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

#### **3.2 PREPARATION**

- .1 Plug clean-out holes with brick. Brace masonry for wet grout pressure.

#### **3.3 CONSTRUCTION**

- .1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise.

#### **3.4 MIXING**

- .1 All pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes.
- .2 Clean all mixing boards and mechanical mixing machine between batches.
- .3 Mortar must be weaker than the units it is binding.
- .4 Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

#### **3.5 MORTAR PLACEMENT**

- .1 Install mortar to requirements of CAN/CSA-A179.
- .2 Remove excess mortar from grout spaces.

**3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.7 PROTECTION**

- .1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1        CSA Group
  - .1        CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CAN/CSA-A179, Mortar and Grout for Unit Masonry.
  - .3        CAN/CSA-A370, Connectors for Masonry.
  - .4        CAN/CSA-A371, Masonry Construction for Buildings.
  - .5        CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
  - .6        CSA S304.1, Design of Masonry Structures.
  - .7        CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .2        Reinforcing Steel Institute of Canada (RSIC)
  - .1        Reinforcing Steel Manual of Standard Practice

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for anchorage and reinforcing materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3        Manufacturers' Instructions: submit manufacturer's installation instructions.

**1.4                SITE MEASUREMENTS**

- .1        Make site measurements necessary to ensure proper fit of members.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect anchorage and reinforcing materials from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Bar reinforcement: Steel to CAN/CSA-A371 and CSA G30.18, Grade 400.
- .2 Connectors: to CAN/CSA-A370 and CSA S304.1.
- .3 Corrosion protection: to CSA S304.1, galvanized to CSA S304.1 and CAN/CSA-A370.
- .4 Fasteners: installed post-construction:
  - .1 Screw Shields and Plugs: water-resistant, install in mortar joints.
  - .2 Bolts and Screws: size and type to suit application, locate where indicated.
  - .3 Nails: case-hardened cut or spiral nails, size and type to suit fastening application.
  - .4 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with manufacturers use, load and hold recommendations.
  - .5 Adhesives: epoxies, mastics and contact cements for fastening applications, use in accordance with manufacturers' recommendations.
- .5 Ties: hot dip galvanized to CAN/CSA-A370 Table 5.2 steel finish.
  - .1 Corrugated to: CAN/CSA-A370.
  - .2 Joint Reinforcement Ties: to CAN/CSA-A370:
    - .1 Single Wythe Joint Reinforcement: truss type:
      - .1 Steel wire, hot dip galvanized: to ASTM A641.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Fabricate connectors in accordance with CAN/CSA-A370.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for anchorage and reinforcing materials installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 PREPARATION**

- .1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

### **3.3 INSTALLATION**

- .1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371, CSA A23.1/A23.2 and CSA S304.1 unless indicated otherwise.
- .2 Supply and install additional reinforcement to masonry as required for seismic resistance.

### **3.4 BONDING AND TYING**

- .1 Tie masonry veneer to backing in accordance with OBC, CSA S304.1, CAN/CSA-A371 and as indicated.
- .2 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with CAN/CSA-A370 and CAN/CSA-A371.
  - .1 Install horizontal joint reinforcement 400 mm on centre.
  - .2 Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
  - .3 Place joint reinforcement continuous in first and second joint below top of walls.
  - .4 Lap joint reinforcement ends minimum 150 mm.
  - .5 Connect joint corners and intersections with strap anchors 400 mm on centre.

### **3.5 LATERAL SUPPORT AND ANCHORAGE**

- .1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.

### **3.6 MOVEMENT JOINTS**

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**



**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            CSA Group
  - .1            CAN/CSA-A371, Masonry Construction for Buildings.
  - .2            CAN/CSA-ISO 14021, Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for masonry accessories and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4                SITE MEASUREMENTS**

- .1            Make site measurements necessary to ensure proper fit of members.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect [masonry accessories] from [nicks, scratches, and blemishes].
  - .3            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                MOISTURE CONTROL**

- .1            Weep Hole Vents: PVC, colour white.

**2.2                FLASHINGS**

- .1            Sheet metal:
  - .1            Finish: manufacturer powder paint.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry accessories installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION: MOISTURE CONTROL**

- .1 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

**3.3 INSTALLATION: FLASHINGS**

- .1 Build in flashings in masonry in accordance with CAN/CSA-A371.
  - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings, and at base of cavity wall and where cavity is interrupted by horizontal members or supports and as shown on drawings. Install flashings under weep hole courses and as indicated.
  - .2 In cavity walls and veneered walls, carry flashings from front edge of exterior masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
    - .1 For masonry backing embed or bond flashing 25 mm in joint.
    - .2 For concrete backing, insert or bond flashing into reglets.
    - .3 For wood frame backing, staple flashing to walls behind water resistive paper, and lap joints.
    - .4 For gypsum board and glass fibre faced sheathing backing, bond to wall using manufacturer's recommended adhesive.
  - .3 Lap joints 150 mm and seal with adhesive.
- .2 Form flashing (end dams) at lintels, sills and wall ends to prevent water from travelling horizontally past flashing ends.
- .3 Install vertical flashing where outer veneer returns at window or door jambs, to prevent contact of veneer with inner wall.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

1 General

1.1 REFERENCES

- .1 CSA Group
  - .1 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units.
  - .2 CAN/CSA-A371, Masonry Construction for Buildings.
  - .3 CSA S304.1, Design of Masonry Structures.

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for concrete masonry units and include product characteristics, performance criteria, physical size, finish and limitations.

1.1 QUALITY ASSURANCE

- .1 Test Reports: submit certified test showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.1 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .1 Offload concrete unit masonry packages using equipment that will not damage the surfaces.
  - .2 Do not use brick tongs to move or handle masonry.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Do not double stack cubes of concrete unit masonry.
  - .3 Cover masonry units with non-staining waterproof membrane covering.
  - .4 Allow air circulation around units.
  - .5 Installation of wet or stained masonry units is prohibited.
  - .6 Keep concrete unit masonry in individual cardboard packaging provided by manufacturer until units are ready to be installed.
  - .7 Store and protect concrete unit masonry from nicks, scratches, and blemishes.

.8 Replace defective or damaged materials with new.

## 2 Products

### 2.1 MATERIALS

.1 Standard concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1) .

.1 Dimensions Nominal: 200 mm wide x 200 mm high x 400 mm long.

### 2.1 REINFORCEMENT

.1 Reinforcement in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

### 2.2 CONNECTORS

.1 Connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

### 2.3 FLASHING

.1 Flashing: in accordance with Section 04 05 23 - Masonry Accessories.

### 2.4 MORTAR MIXES

.1 Mortar and mortar mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

### 2.5 GROUT MIXES

.1 Grout and grout mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

### 2.6 CLEANING COMPOUNDS

.1 Use low VOC products.

.2 Compatible with substrate and acceptable to masonry manufacturer for use on products.

.3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

### 2.7 TOLERANCES

.1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA-A165.1, supplemented as follows:

.1 Maximum variation between units within specific job lot not to exceed 2 mm.

.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.

.3 Out of square tolerance not to exceed 2 mm.

## 3 Execution

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete unit masonry installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 PREPARATION

- .1 Protect adjacent finished materials from damage due to masonry work.

### 3.3 INSTALLATION

- .1 Concrete block units:
  - .1 Bond: [running] [stack].
  - .2 Coursing height: [200] mm for one block and one joint.
  - .3 Jointing: [concave] [raked] [flush] where exposed or where paint or other finish coating is specified.
- .2 Architectural concrete unit masonry:
  - .1 Bond: [running] [stack].
  - .2 Coursing height: [200] mm for one block and one joint.
  - .3 Jointing: [concave] [raked] [flush] where exposed or where paint or finish coating is specified.
- .3 Prefaced concrete block units:
  - .1 Bond: [running] [stack].
  - .2 Coursing height: [200] mm for one block and one joint.
  - .3 Jointing: provide [concave] joints.
  - .4 Clean block faces using soft cloths before mortar hardens rake to [10] mm depth. After completion of block laying fill joints with pointing mortar then point to provide concave joints. Repeat cleaning of faces.
- .4 Special Shapes:
  - .1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
  - .2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
  - .3 End bearing: not less than [200] mm [as indicated on drawings].
  - .4 Install special [site cut] shaped units.
- .5 Acoustical Concrete Unit Masonry:
  - .1 Bond: [running] [stack].
  - .2 Coursing height: [200] mm for one block and one joint.
  - .3 Jointing: [concave] [raked] [flush] where exposed or where paint or finish coating is specified.

### 3.4 REINFORCEMENT

- .1 Install reinforcing in accordance with Section [04 05 19 - Masonry Anchorage and Reinforcing ].

### 3.5 CONNECTORS

- .1 Install connectors in accordance with Section [04 05 19 - Masonry Anchorage and Reinforcing].

### 3.6 FLASHING

- .1 Install flashings: in accordance with Section [04 05 23 - Masonry Accessories].

### 3.7 MORTAR PLACEMENT

- .1 Place mortar in accordance with Section [04 05 12 - Masonry Mortar and Grout].

### 3.8 GROUT PLACEMENT

- .1 Place grout in accordance with Section [04 05 12 - Masonry Mortar and Grout].

### 3.9 CONSTRUCTION

- .1 Cull out masonry units, in accordance with CAN/CSA-A165 and [reviewed] [approved] range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.
- .2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.
- .3 Construct masonry walls using [running] [stack] bond unless otherwise noted.
- .4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.
- .5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.
- .6 Install movement joints and keep free of mortar where indicated.
- .7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.
- .9 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .10 Tamp units firmly into place.
- .11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.

- .12 Tool exposed joints concave [weathered/raked for interior work]; strike concealed joints flush.
- .13 After mortar has achieved initial set up, tool joints.
- .14 Do not interrupt bond below or above openings.

### 3.10 REPAIR/RESTORATION

- .1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

### 3.11 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection: in accordance with Section [04 05 00 - Common Work Results for Masonry] supplemented as follows:
  - .1 Concrete masonry units will be sampled and tested by independent testing agency appointed and paid by [Departmental Representative] [DCC Representative] [Consultant] in accordance with CSA S304.1.
  - .2 Noise reduction between two rooms will be tested by independent testing agency appointed and paid by [Departmental Representative] [DCC Representative] [Consultant] in accordance with ASTM E336.
  - .3 Notify inspection agency minimum of 24 hours in advance of requirement for tests.
- .2 Manufacturer's Field Services: in accordance with Section [04 05 00 - Common Work Results for Masonry].

### 3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 11 - Cleaning].
  - .1 Leave Work area clean at end of each day.
  - .2 Standard Concrete Unit Masonry:
    - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
  - .3 Architectural Concrete Unit Masonry:
    - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
  - .4 Prefaced Concrete Unit Masonry:
    - .1 Clean masonry as work progresses using soft, clean cloths, within few minutes after laying. Upon completion, when mortar has set so that it will not be damaged by cleaning, clean with soft sponge or clean cloths, brush, and clean water. Polish with soft, clean cloths.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].

- .3 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.13 PROTECTION

- .1 Brace and protect concrete unit masonry in accordance with Section [04 05 00 - Common Work Results for Masonry].

**END OF SECTION**



Approved: 2010-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

.1            [\_\_\_\_\_].

**1.2                REFERENCES**

.1            CSA International

- .1            CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2            CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3            CSA S16, Design of Steel Structures.
- .4            CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5            CSA W59, Welded Steel Construction (Metal Arc Welding).

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

.2            Product Data:

- .1            Submit manufacturer's instructions, printed product literature and data sheets for stairs and include product characteristics, performance criteria, physical size, finish and limitations.

.3            Shop Drawings:

- .1            Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2            Indicate materials, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

**1.4                DELIVERY, STORAGE AND HANDLING**

.1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3            Storage and Handling Requirements:

- .1            Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                MATERIALS**

- .1     Steel sections and plates: to CSA G40.20/G40.21, Grade 300W (plate), 350W (sections).
- .2     Steel pipe: to ASTM A53/A53M standard weight, paint finish.
- .3     Welding materials: to CSA W59.
- .4     Welding electrodes: to CSA W48 Series.
- .5     Bolts and anchor bolts: to ASTM A307.
- .6     Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

**2.2                FABRICATION**

- .1     Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2     Where possible, fit and shop assemble work, ready for erection.
- .3     Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

**2.3                FINISHES**

- .1     Shop coat primer:

**2.4                SHOP PAINTING**

- .1     Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2     Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3     Clean surfaces to be field welded; do not paint.

**2.5                ANGLE LINTELS**

- .1     Steel angles: prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2     Weld or bolt back-to-back angles to profiles as indicated.
- .3     Finish:.

**2.6                PIPE RAILINGS/HANDRAILS**

- .1     Steel pipe: OBC required outside diameter, formed to shapes and sizes as indicated.
- .2     Shop coat prime interior railings after fabrication.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied

**3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
  - .1 Primer:

**3.3 PIPE RAILINGS**

- .1 Install pipe railings to stairs.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

Approved: 2010-12-31

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            CSA International
  - .1            CSA B111, Wire Nails, Spikes and Staples.
  - .2            CSA O121, Douglas Fir Plywood.
  - .3            CSA O141, Softwood Lumber.
  - .4            CSA O151, Canadian Softwood Plywood.
  - .5            CAN/CSA-O325.0, Construction Sheathing.
- .2            National Lumber Grades Authority (NLGA)
  - .1            Standard Grading Rules for Canadian Lumber.

**1.3                MAINTENANCE MATERIALS SUBMITTALS**

- .1            Extra Stock Materials:
  - .1            Provide electrical equipment backboards for mounting electrical equipment as required. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

**1.4                QUALITY ASSURANCE**

- .1            Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2            Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3            Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.
- .4            Sustainable Standards Certification:
  - .1            Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

**1.5                DELIVERY, STORAGE AND HANDLING**

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

- .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
  - .1 Board sizes: "Standard" or better grade.
  - .2 Dimension sizes: "Standard" light framing or better grade.
  - .3 Post and timbers sizes: "Standard" or better grade.
- .3 Panel Materials:
  - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
    - .1 Urea-formaldehyde free.
  - .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
    - .1 Urea-formaldehyde free.
  - .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.
    - .1 Urea-formaldehyde free.
- .4 Wood Preservative:
  - .1 Surface-applied wood preservative: clear or 5% pentachlorophenol solution, water repellent preservative.
  - .2 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer.
  - .3 Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.

### **2.2 ACCESSORIES**

- .1 Fasteners: to CAN/CSA-G164, for exterior work.
- .2 Nails, spikes and staples: to CSA B111.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied

#### **3.2 PREPARATION**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

#### **3.3 INSTALLATION**

- .1 Comply with requirements of OBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .4 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .5 Use caution when working with particle board. Use dust collectors and high quality respirator masks.
- .6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .7 Countersink bolts where necessary to provide clearance for other work.

#### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

Approved: 2014-12-31

**Part 1           General**

**1.1               RELATED REQUIREMENTS**

- .1       Section [\_\_\_\_\_].

**1.2               REFERENCES**

- .1       CSA Group
  - .1       CSA B111], Wire Nails, Spikes and Staples.
  - .2       CSA B149 PACKAGE, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .2       Underwriters Laboratories of Canada (ULC)
  - .1       CAN/ULC-S702, Standard for Mineral Fibre Insulation for Buildings.

**1.3               DELIVERY, STORAGE AND HANDLING**

- .1       Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [with manufacturer's written instructions.
- .2       Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3       Storage and Handling Requirements:
  - .1       Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2       Replace defective or damaged materials with new.

**Part 2           Products**

**2.1               INSULATION**

- .1       Batt and blanket mineral fibre: to CAN/ULC-S702.
  - .1       Thickness: as indicated.

**Part 3           Execution**

**3.1               INSULATION INSTALLATION**

- .1       Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2       Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3       Do not compress insulation to fit into spaces.

- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .5 Do not enclose insulation until it has been inspected and approved by Consultant.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**



Approved: 2014-12-31

## **Part 1           General**

### **1.1               REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CSA Group
  - .1 CSA B149 PACKAGE, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S702, Standard for Mineral Fibre Insulation for Buildings.
  - .2 CAN/ULC-S703, Standard for Cellulose Fibre Insulation (CFI) for Buildings.

### **1.2               DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

### **1.3               SITE CONDITIONS**

- .1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .2 Ventilation:
  - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Protection:
  - .1 Provide temporary enclosures to prevent dust from contaminating air beyond application area.
  - .2 Protect adjacent surfaces and equipment from damage by fall-out, and dust.

## **Part 2           Products**

### **2.1               MATERIALS**

- .1 Mineral fibre insulation: to CAN/ULC-S702, asbestos-free mineral fibre.

- .1 Type 5 - blowing wool, suitable for application by means of pneumatic equipment.
- .2 Containment fabric:
  - .1 Polyethylene: to CAN/CGSB-51.34, 0.15 mm thick.
- .3 Vapour retarder: in accordance with Section 07 26 00 - Vapor Retarders.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for loose fill insulation application in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied

#### **3.2 LOOSE FIBRE INSTALLATION**

- .1 Pack loose fibre insulation in walls between studding, above ceiling between joists to provide minimum thermal resistance value RSI.
- .2 Ensure wall, roof, ceiling areas exposed to outside air are insulated.
- .3 Ensure unobstructed air circulation to eave vents.
- .4 Keep insulation minimum 75 mm from heat emitting devices and recessed light fixtures.

#### **3.3 LOOSE FIBRE VERTICAL INSTALLATION: POLYETHYLENE SYSTEM**

- .1 Install polyethylene containment fabric over studs in accordance with Section 07 26 00 - Vapor Retarders.
- .2 Caulk and seal joints and edges.
- .3 Ensure wall areas exposed to outside air are insulated.

#### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

**END OF SECTION**

Approved: 2014-12-18

## **Part 1           General**

### **1.1               RELATED REQUIREMENTS**

- .1       Section [\_\_\_\_\_].

### **1.2               REFERENCES**

- .1       Canadian General Standards Board (CGSB)
  - .1       CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

### **1.3               DELIVERY, STORAGE AND HANDLING**

- .1       Deliver, store and handle materials in accordance with with manufacturer's written instructions.
- .2       Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3       Storage and Handling Requirements:
  - .1       Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2       Replace defective or damaged materials with new.

## **Part 2           Products**

### **2.1               SHEET VAPOUR BARRIER**

- .1       Polyethylene film: to CAN/CGSB-51.34, [0.10] [0.15] mm thick.

### **2.2               ACCESSORIES**

- .1       Joint sealing tape: air resistant pressure sensitive adhesive tape, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2       Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.
- .3       Staples: minimum 6 mm leg.

## **Part 3           Execution**

### **3.1               EXAMINATION**

- .1       Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for vapour retarder installation in accordance with manufacturer's written instructions.
  - .1       Inform Consultant of unacceptable conditions immediately upon discovery.

- .2 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on warm side of exterior [wall] [ceiling] [and floor] assemblies prior to installation of [gypsum board] to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

### **3.3 EXTERIOR SURFACE OPENINGS**

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

### **3.4 PERIMETER SEALS**

- .1 Seal perimeter of sheet vapour barrier as follows:
  - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
  - .2 Lap sheet over sealant and press into sealant bead.
  - .3 Install staples through lapped sheets at sealant bead into wood substrate.
  - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### **3.5 LAP JOINT SEALS**

- .1 Seal lap joints of sheet vapour barrier as follows:
  - .1 Attach first sheet to substrate.
  - .2 Apply continuous bead of sealant over solid backing at joint.
  - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
  - .4 Install staples through lapped sheets at sealant bead into wood substrate.
  - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### **3.6 ELECTRICAL BOXES**

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
  - .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
  - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

### **3.7 CLEANING**

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

**END OF SECTION**

Approved: 2012-12-31

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            American Society of Mechanical Engineers (ASME)
  - .1            ASME B18.6.3, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
- .2            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-93.2, Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use.
  - .2            CAN/CGSB-93.3, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.
  - .3            CAN/CGSB-93.4, Galvanized and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.
  - .4            CAN/CGSB-93.5, Installation of Metal Residential Siding, Soffits and Fascia.
- .3            CSA International
  - .1            CSA B111-[1974(R2003)], Wire Nails, Spikes and Staples.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures].
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for metal siding and include product characteristics, performance criteria, physical size, finish and limitations.
- .3            Shop Drawings:
  - .1            Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, and related work.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect metal siding from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 ALUMINUM CLADDING COMPONENTS**

- .1 Soffit: to CAN/CGSB-93.2, Type B.
  - .1 Colour: white colour.
  - .2 Profile: flat sheet 'V' crimped for stiffness, preformed with elongated slits and small perforations.
  - .3 Fascia and exposed trim: to CAN/CGSB-93.2, Type C, Class 1.
    - .1 Colour:white colour.
    - .2 Profile: manufacturer's standard as indicated.
    - .3 Pattern: plain surface.

### **2.2 STEEL CLADDING AND COMPONENTS**

- .1 Strip siding: to CAN/CGSB-93.4, vertical.
  - .1 Finish coating: Class [F1S] [F2S].
  - .2 Colour: colour selected by owner.
  - .3 Profile: as indicated on drawings.

### **2.3 FASTENERS**

- .1 Nails: CSA B111. Screws: ASME B18.6.3. Purpose made.

### **2.4 CAULKING**

- .1 Sealants: in accordance with manufacturer recommendations.

### **2.5 SHEATHING PAPER**

- .1 Exterior wall sheathing paper: to CAN/CGSB-51.32, single ply.

### **2.6 ACCESSORIES**

- .1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material as cladding, with fastener holes pre-punched.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.

- .1 Inform Consultant of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### **3.3 INSTALLATION**

- .1 Install cladding in accordance with CGSB 93.5, and manufacturer's written instructions.
- .2 Install one layer exterior wall sheathing paper horizontally by stapling lapping edges 150 mm.
- .3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.
- .4 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .5 Install soffit and fascia cladding as indicated.
- .6 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .7 Attach components in manner not restricting thermal movement.
- .8 Caulk junctions with adjoining work with sealant.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by preformed metal siding installation.

**END OF SECTION**



Approved: 2007-12-31

## **Part 1           General**

### **1.1               RELATED REQUIREMENTS**

- .1       Section [\_\_\_\_\_].

### **1.2               REFERENCES**

- .1       Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1       CSDMA, Recommended Specifications for Commercial Steel Doors and Frames,
  - .2       CSDMA, Selection and Usage Guide for Commercial Steel Doors.
- .2       National Fire Protection Association (NFPA)
  - .1       NFPA 80, Standard for Fire Doors and Fire Windows.
  - .2       NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- .3       Underwriters' Laboratories of Canada (ULC)
  - .1       CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .2       CAN/ULC-S702, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
  - .3       CAN/ULC-S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
  - .4       CAN4-S104, Standard Method for Fire Tests of Door Assemblies.
  - .5       CAN4-S105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

### **1.3               SYSTEM DESCRIPTION**

- .1       Design Requirements:
  - .1       Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
  - .2       Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
  - .3       Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 for ratings specified or indicated.
  - .4       Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104 and listed by nationally recognized agency having factory inspection services.

### **1.4               ACTION AND INFORMATIONAL SUBMITTALS**

- .1       Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2       Provide product data: in accordance with Section 01 33 00 - Submittal Procedures

- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware, fire rating and finishes.
  - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, fire rating finishes.
  - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

## **Part 2 Products**

### **2.1 DOOR CORE MATERIALS**

- .1 Honeycomb construction:
  - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m<sup>3</sup> minimum sanded to required thickness.
  - .2 Stiffened: face sheets insulated core.
    - .1 Fibreglass: to CAN/ULC-S702, semi-rigid density 24 kg/m<sup>3</sup>.
      - .1 Expanded polystyrene: CAN/ULC-S701, Type [\_\_\_\_], density 16 to 32 kg/m<sup>3</sup>.
      - .2 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m<sup>3</sup>.
- .3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

### **2.2 ADHESIVES**

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

### **2.3 PRIMER**

- .1 Touch-up prime CAN/CGSB-1.181.

## **2.4 PAINT**

- .1 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

## **2.5 ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .3 Door bottom seal: door sweep on exterior doors.
- .4 Fire labels: metal rivited.
- .5 Make provisions for glazing as indicated and provide necessary glazing stops.
  - .1 Design exterior glazing stops to be tamperproof.

## **2.6 FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Blank, reinforce, drill and tap frames for mortised, templated hardware, [electronic hardware] using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .4 Protect mortised cutouts with steel guard boxes.
- .5 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .6 Manufacturer's nameplates on frames and screens are not permitted.
- .7 Conceal fastenings except where exposed fastenings are indicated.
- .8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .9 Insulate exterior frame components with polyurethane insulation.

## **2.7 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

## **2.8 FRAMES: WELDED TYPE**

- .1 Welding in accordance with CSA W59.

- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Securely attach lead to inside of frame profile from return to jamb soffit (inclusive) on door side of frame only.

## **2.9 FRAMES: KNOCKED-DOWN TYPE**

- .1 Ship knocked-down type frames unassembled.
- .2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames.
- .3 Securely attach floor anchors to inside of each jamb profile.

## **2.10 FRAMES: SLIP-ON TYPE**

- .1 Ship slip-on type frames unassembled.
- .2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames and manufacturers' instructions.
- .3 Provide slip-on frames with manufacturers' proprietary design of wall anchorage comprising single, adjustable tension type per jamb and provision for secure attachment of each jamb base to stud runners.

## **2.11 DOOR FABRICATION GENERAL**

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: honeycomb construction. Interior doors: honeycomb construction.
- .3 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .4 Reinforce doors where required, for surface mounted hardware. Provide flush top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .5 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .6 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-

Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

- .7 Manufacturer's nameplates on doors are not permitted.

## **2.12 DOORS: HONEYCOMB CORE CONSTRUCTION**

- .1 Form face sheets for exterior doors from sheet steel with honeycomb core laminated under pressure to face sheets.
- .2 Form face sheets for interior doors from sheet steel with temperature rise rated core laminated under pressure to face sheets.

## **2.13 THERMALLY BROKEN DOORS AND FRAMES**

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION GENERAL**

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

### **3.3 FRAME INSTALLATION**

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of air barrier.

**3.4 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

**3.5 FINISH REPAIRS**

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors with metallic paste filler and sand to a uniform smooth finish.

**3.6 GLAZING**

- .1 Install glazing for doors, frames in accordance with Section 08 80 50 - Glazing.

**END OF SECTION**

Approved: 2006-09-30

## **Part 1            General**

### **1.1                RELATED REQUIREMENTS**

- .1        Section [\_\_\_\_\_].

### **1.2                REFERENCES**

- .1        Canadian Standards Association (CSA International).
  - .1        CSA A440.2-[98], Energy Performance of Windows and Other Fenestration Systems.
  - .2        CSA O115-[M1982(R2001)], Hardwood and Decorative Plywood.
  - .3        CAN/CSA O132.2 Series-[90(R1998)], Wood Flush Doors.
  - .4        CAN/CSA-O132.5-[M1992(R1998)], Stile and Rail Wood Doors.
  - .5        CAN/CSA-Z808-[96], A Sustainable Forest Management System: Guidance Document.
  - .6        CSA Certification Program for Windows and Doors [00].
- .2        National Fire Protection Association (NFPA).
  - .1        NFPA 80-[1999], Standard for Fire Doors and Fire Windows.
  - .2        NFPA 252-[1999], Standard Method of Fire Tests of Door Assemblies.
- .3        Underwriters' Laboratories of Canada (ULC).
  - .1        CAN-4S104M-[80(R1985)], Fire Tests of Door Assemblies.
  - .2        CAN4-S105M-[85 (R1992)], Fire Door Frames Meeting the Performance Required by CAN4-S104.

### **1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Product Data:
  - .1        Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Shop Drawings:
  - .1        Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2        Indicate door types and cutouts for lights, sizes, core construction, transom panel construction and cutouts.

### **1.4                DELIVERY, STORAGE, AND HANDLING**

- .1        Storage and Protection:
  - .1        Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
  - .2        Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.

- .3 Protect doors from scratches, handling marks and other damage. Wrap doors.
- .4 Store doors away from direct sunlight.

## **Part 2 Products**

### **2.1 FIRE RATED WOOD DOORS**

- .1 Wood doors: tested in accordance with CAN4-S104 to achieve rating as scheduled.

### **2.2 WOOD FLUSH DOORS**

- .1 Solid core: to CAN/CSA-O132.2.1.
  - .1 Construction:
    - .1 Solid particleboard core: stile and rail frame bonded to particleboard core construction.
    - .2 Solid wood core:
      - .1 Glued block core.
      - .3 Solid, wood block, lined core: with two core liners:
        - .1 Glued block
  - .2 Face Panels:
    - .1 Hardwood; veneer grades
    - .2 Hardboard:moulded face.
    - .3 Laminated plastic: with hardwood plywood subface.
- .2 Hollow core: to CAN/CSA-O132.2.2.
  - .1 Construction: [ladder core] [mesh or cellular core] with lock blocks, [7-ply construction].
  - .2 Face Panels:
    - .1 Hardboard face panels:moulded face.
    - .2 Laminated plastic: with hardwood plywood subface.

### **2.3 STILE AND RAIL DOORS**

- .1 Fabricate doors as indicated to CAN/CSA-O132.5.
- .2 Construction:
  - .1 Residential grade: to CAN/CSA-O132.5, interior construction.
- .3 Type: raised panel door.

### **2.4 TRANSOM AND SIDE PANELS**

- .1 Construction: to match adjacent door.
- .2 Meeting edges of doors and transom panels: [checked] [square].

### **2.5 FABRICATION**

- .1 Vertical edge strips [to match face veneer].



- .2 Prepare doors for glazing.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

#### **3.2 INSTALLATION**

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install labelled fire rated doors to NFPA 80.
- .3 Install doors and hardware in accordance with manufacturer's printed instructions [and CAN/CSA-O132.2 Series, Appendix A].
- .4 Adjust hardware for correct function.
- .5 Install glazing in accordance with Section 08 80 50 - Glazing.
- .6 Secure transom and side panels by means of concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

#### **3.3 ADJUSTMENT**

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

#### **3.4 CLEANING**

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

Approved: 2010-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-12.1-[M90], Tempered or Laminated Safety Glass.
  - .2            CAN/CGSB-12.2-[M91], Flat, Clear Sheet Glass.
  - .3            CAN/CGSB-12.3-[M91], Flat, Clear Float Glass.
  - .4            CAN/CGSB-12.4-[M91], Heat Absorbing Glass.
  - .5            CAN/CGSB-12.6-[M91], Transparent (One-Way) Mirrors.
  - .6            CAN/CGSB-12.8-[97], Insulating Glass Units.
  - .7            CAN/CGSB-12.8-[97] (Amendment), Insulating Glass Units.
  - .8            CAN/CGSB-12.9-[M91], Spandrel Glass.
  - .9            CAN/CGSB-12.10-[M76], Glass, Light and Heat Reflecting.
  - .10           CAN/CGSB-12.11-[M90], Wired Safety Glass.
  - .11           CAN/CGSB-12.12-[M90], Plastic Safety Glazing Sheets.
  - .12           CAN/CGSB-12.13-[M91], Patterned Glass.
- .2            Glass Association of North American (GANA)
  - .1            GANA Glazing Manual - [2008].
  - .2            GANA Laminated Glazing Reference Manual - [2009].

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3            Shop Drawings:

**1.4                CLOSEOUT SUBMITTALS**

- .1            Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2            Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.6 AMBIENT CONDITIONS**

- .1 Ambient Requirements:
  - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
  - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Design Criteria:
  - .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
    - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .2 Flat Glass:
  - .1 Float glass: to CAN/CGSB-12.3,
  - .2 Sheet glass: to CAN/CGSB-12.2,
  - .3 Wired glass: to CAN/CGSB-12.11,
    - .1 Type 1-polished both sides (transparent).
    - .2 Wire mesh styles 3-square.
- .3 Insulating Glass Units:
  - .1 Insulating glass units: to CAN/CGSB-12.8, double unit,
    - .1 Inert gas fill: argon.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
  - .1 Verify that openings for glazing are correctly sized and within tolerance.
  - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
  - .3 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .4 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PREPARATION**

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

**3.3 INSTALLATION: MIRRORS**

- .1 Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.
- .2 Set mirrors with clips. Anchor rigidly to wall construction.
- .3 Set in frame.
- .4 Place plumb and level.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
    - .1 Remove traces of primer, caulking.
    - .2 Remove glazing materials from finish surfaces.
    - .3 Remove labels.
    - .4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by glazing installation.

**END OF SECTION**

Approved: 2010-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

.1            [\_\_\_\_\_].

**1.2                REFERENCES**

.1            ASTM International

- .1            ASTM C475, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2            ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.
- .3            ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .4            ASTM C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .5            ASTM C1280, Standard Specification for Application of Gypsum Sheathing.
- .6            ASTM C1396/C1396M, Standard Specification for Gypsum Wallboard.

.2            Canadian General Standards Board (CGSB)

- .1            CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3            Underwriters' Laboratories of Canada (ULC)

- .1            CAN/ULC-S102-[07], Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

**1.3                DELIVERY, STORAGE AND HANDLING**

.1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3            Storage and Handling Requirements:

- .1            Store gypsum board assemblies materials level indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2            Protect from weather, elements and damage from construction operations.
- .3            Handle gypsum boards to prevent damage to edges, ends or surfaces.
- .4            Replace defective or damaged materials with new.

#### **1.4 AMBIENT CONDITIONS**

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Standard board: to ASTM C1396/C1396M regular, Type X, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
- .2 Steel drill screws: to ASTM C1002.
- .3 Vinyl mouldings: mouldings for joint treatment of vinyl-faced gypsum board, as supplied by gypsum board manufacturer.
- .4 Polyethylene: to CAN/CGSB-51.34, Type 2.
- .5 Joint compound: to ASTM C475, asbestos-free.

#### **2.2 FINISHES**

- .1 Texture finish: asbestos-free standard white texture coating and primer-sealer, recommended by gypsum board manufacturer.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

#### **3.2 ERECTION**

- .1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C1280.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

### 3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to wood framing using screw fasteners. Maximum spacing of screws 300 mm on centre].
  - .1 Single-Layer Application:
    - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.
    - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
  - .2 Double-Layer Application:
    - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
    - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
    - .3 Apply base layers at right angles to supports unless otherwise indicated.
    - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

### 3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.
- .2 Install access doors to electrical and mechanical fixtures specified in respective sections.
  - .1 Rigidly secure frames to furring or framing systems.
- .3 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .4 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:

- .1 Levels of finish:
  - .1 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .5 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .6 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .7 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .8 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .9 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .10 Remove ridges by light sanding or wiping with damp cloth.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

**END OF SECTION**



Approved: 2014-12-31

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            ASTM International
  - .1            ASTM F1066, Standard Specification for Vinyl Composition Floor Tile.
- .2            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-25.20, Surface Sealer for Floors.
  - .2            CAN/CGSB-25.21 Detergent-Resistant Floor Polish.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for resilient tile flooring and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Replace defective or damaged materials with new.

**1.5                SITE CONDITIONS**

- .1            Ambient Conditions:
  - .1            Maintain air temperature and structural base temperature at flooring installation area above 20 degrees C for 48 hours before, during and for 48 hours after installation.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Vinyl composition tile: to ASTM F1066, Composition 1 - non asbestos Class 3 - surface patterned, plain, in standard colour selected by Owner.
- .2 Finish:
  - .1 Factory prefinished.
- .3 Resilient base: to vinyl colour, selected by Owner.
- .4 Primers and adhesives: recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
  - .1 Flooring adhesives:
  - .2 Cove base adhesives:

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient tile flooring installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 SUB-FLOOR TREATMENT**

- .1 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .3 Prime plywood sub-floor to flooring manufacturer's printed instructions.

### **3.3 TILE APPLICATION**

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.
- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .4 Install flooring to square grid pattern with joints aligned.

- .5 As installation progresses, and after installation, roll flooring in 2 directions with 45 kg minimum roller to ensure full adhesion.
- .6 Cut tile and fit neatly around fixed objects.
- .7 Install feature strips and floor markings where indicated. Fit joints tightly.
- .8 Install flooring in pan type floor access covers. Maintain floor pattern.
- .9 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .10 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .11 Install metal edge strips at unprotected or exposed edges where flooring terminates.

### **3.4 BASE APPLICATION**

- .1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 300 mm each leg. Wrap around toeless base at external corners.
- .8 Install toeless type base before installation of carpet on floors.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Clean flooring base surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Clean floor and base surface to flooring manufacturer's instructions. In carpeted areas clean base surface before carpet installation.

**END OF SECTION**

Approved: 2005-06-30

**Part 1            General**

**1.1                SUMMARY**

- .1 Section Includes:
  - .1 Material and installation of site applied paint finishes to new interior surfaces, including site painting of shop primed surfaces.

**1.2                REFERENCES**

- .1 Master Painters Institute (MPI)
  - .1 MPI Architectural Painting Specifications Manual.
- .2 National Fire Code of Canada - [1995]

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit product data and instructions for each paint and coating product to be used.
  - .2 Submit product data for the use and application of paint thinner.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading:
  - .1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
  - .1 Identify products and materials with labels indicating:
    - .1 Manufacturer's name and address.
    - .2 Type of paint or coating.
    - .3 Compliance with applicable standard.
    - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
  - .1 Provide and maintain dry, temperature controlled, secure storage.
  - .2 Store materials and supplies away from heat generating devices.
  - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Waste Management and Disposal:
  - .1 Place materials defined as hazardous or toxic in designated containers.
  - .2 Ensure emptied containers are sealed and stored safely.
  - .3 Unused paint materials must be disposed of at official hazardous material collections site.
  - .4 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
  - .5 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
  - .6 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
  - .7 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
    - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
    - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
    - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
    - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
    - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
  - .8 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

## 1.5 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces
  - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
  - .3 Provide continuous ventilation for seven days after completion of application of paint.
  - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

- .5 Provide minimum lighting level of 300 Lux on surfaces to be painted.
- .2 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
  - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .3 Additional interior application requirements:
  - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Provide paint materials for paint systems from single manufacturer.
- .2 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
  - .1 Water-based.
  - .2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
  - .3 Manufactured without compounds which contribute to smog in the lower atmosphere.
- .3 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

### **2.2 COLOURS**

- .1 Submit proposed Colour Schedule to Owner for review.
- .2 Colour schedule will be based upon selection of three base colours. No more than five colours will be selected for entire project and no more than two colours will be selected in each area.
- .3 Selection of colours from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection based on limited range.

### **2.3 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .3 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 GENERAL**

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

**3.3 EXAMINATION**

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

**3.4 PREPARATION**

- .1 Protection:
  - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
  - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
  - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by vacuuming wiping with dry, clean cloths or compressed air.
  - .2 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
  - .3 Use trigger operated spray nozzles for water hoses.
  - .4 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes.
- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted Consultant

### 3.5

#### **APPLICATION**

- .1 Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
  - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
  - .4 Brush out immediately all runs and sags.
  - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.



- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

### **3.6 SITE TOLERANCES**

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

### **3.7 RESTORATION**

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust. Avoid scuffing newly applied paint.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                SUBMITTALS**

- .1        Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Shop drawings; submit drawings.
- .3        Shop drawings to show:
  - .1        Mounting arrangements.
  - .2        Operating and maintenance clearances.
- .4        Shop drawings and product data accompanied by:
  - .1        Detailed drawings of bases, supports, and anchor bolts.
  - .2        Acoustical sound power data, where applicable.
  - .3        Points of operation on performance curves.
  - .4        Manufacturer to certify current model production.
  - .5        Certification of compliance to applicable codes.
- .5        Closeout Submittals:
  - .1        Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2        Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
  - .3        Operation data to include:
    - .1        Control schematics for systems including environmental controls.
    - .2        Description of systems and their controls.
    - .3        Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4        Operation instruction for systems and component.
    - .5        Description of actions to be taken in event of equipment failure.
    - .6        Valves schedule and flow diagram.
    - .7        Colour coding chart.
  - .4        Maintenance data to include:
    - .1        Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2        Data to include schedules of tasks, frequency, tools required and task time.
  - .5        Performance data to include:
    - .1        Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2        Equipment performance verification test results.
    - .3        Special performance data as specified.

- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
  - .2 Make changes as required and re-submit as directed by Consultant.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

## **1.2 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

## **1.3 MAINTENANCE**

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

**Part 2 Products**

**Part 3 Execution**

**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

- .1 Clean interior and exterior of all systems including strainers.

**3.3 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
  - .1 All required pressure and flow tests dictated by 2012 OBC.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.4 DEMONSTRATION**

- .1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

**3.5 PROTECTION**

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

**END OF SECTION**

Approved: 2008-12-31

## **Part 1        General**

### **1.1            REFERENCES**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .2 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
  - .1 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### **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 00 - Closeout Submittals.

### **1.3            DELIVERY, STORAGE AND HANDLING**

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

### **1.4            PIPE INSULATION**

- .1 All hot/warm water pipe shall be insulated to table 6.8.3A of ASHREA 90.1 2010 which requires 1" insulation thickness for 1" diameter pipe and 1-1/2" thickness of insulation for 1-1/2" to 4" diameter pipe.
- .2 Cold water lines to be insulated using same table to avoid condensation.
- .3 All insulation shall be protected with a plastic jacket and the piping shall be identified.

## **1.5 HEAT TRACE**

- .1 Applicable for indoor or underground water pipes. Should any pipe be exposed to the outdoor environment or be buried less than 4 feet underground or located within a crawl space, or in a non-heated area, heat tracing shall be installed.

## **Part 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 Buried or embedded: copper tube, soft annealed, type K or L: to ASTM B88M, in long lengths and with no buried joints.

### **2.2 FITTINGS**

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: 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: roll grooved to CSA B242.

### **2.3 JOINTS**

- .1 Rubber gaskets: to AWWA C111.
- .2 Solder: 95/5 tin-antimony copper alloy
- .3 Teflon tape: for threaded joints.
- .4 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
- .5 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

### **2.4 SWING CHECK VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To MSS-SP-80, Class 125

### **2.5 BALL VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 INSTALLATION**

- .1 Install in accordance with 2012 OBC.
- .2 Assemble piping using fittings manufactured to ANSI standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Buried tubing:
  - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
  - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

**3.3 VALVES**

- .1 Isolate equipment, fixtures and branches with 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: As per OBC requirements.

**3.5 FLUSHING AND CLEANING**

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial potable water guidelines. If results are not met, repeat flushing testing. Contractor to pay for repeat of flushing and 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 pressure booster systems are operating properly.
- .4 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.

### **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 Bring HWS storage tank up to design temperature slowly.
  - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
  - .5 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 HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .4 Sterilize HWS and HWC 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 11 - Cleaning.

**END OF SECTION**

Approved: 2008-12-31

## **Part 1            General**

### **1.1                REFERENCES**

- .1    ASTM International Inc.
  - .1    ASTM D2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  - .2    ASTM D2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2    Canadian Standards Association (CSA International)
  - .1    CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3    Green Seal Environmental Standards (GSES)
  - .1    Standard GS-36, Commercial Adhesives.
- .4    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).

### **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 piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.3                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2    Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3    Store at temperatures and conditions recommended by manufacturer.

## **Part 2            Products**

### **2.1                MATERIAL**

- .1    Adhesives and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

## **2.2 PIPING AND FITTINGS**

- .1 For buried and above ground DWV piping to:
  - .1 CAN/CSA B1800.

## **2.3 JOINTS**

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

## **Part 3 Execution**

### **3.1 APPLICATION**

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

### **3.2 INSTALLATION**

- .1 Install in accordance with Ontario Building Code and local authority having jurisdiction.

### **3.3 TESTING**

- .1 Pressure test buried systems before backfilling.
- .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 cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .4 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

### **3.5 CLEANING**

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

**END OF SECTION**

Approved: 2008-12-31

**Part 1            General**

**1.1                REFERENCES**

- .1    Canadian Standards Association (CSA International)
  - .1        CAN/CSA C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.
  - .2        CAN/CSA-C191, Performance of Electric Storage Tank Water Heaters for Household Service.

**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 domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1        Provide drawings.
  - .2        Indicate:
    - .1            Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

**1.3                CLOSEOUT SUBMITTALS**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

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

**1.5                WARRANTY**

- .1    Contractor hereby warrants domestic water heaters in accordance with CCDC2, but for number of years specified for each product.

**Part 2 Products**

**2.1 ELECTRIC WATER HEATER**

- .1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 with immersion type elements, and surface mounted or immersion type adjustable thermostats.

**2.2 ANCHOR BOLTS AND TEMPLATES**

- .1 Provide seismic restraint to tank.in accordance with Part 4 of the 2012 OBC.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's recommendations.

**3.3 CLEANING**

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

**END OF SECTION**

Approved: 2008-12-31

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series, Plumbing Fixtures.
  - .2 CAN/CSA-B125.3, Plumbing Fittings.
  - .3 CAN/CSA-B651, Accessible Design for the Built Environment.
- .2 Green Seal Environmental Standards (GSES)
  - .1 Standard GS-36, Commercial Adhesives.

**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 Provide drawings.

**1.3                CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 78 00 - 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, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

## **Part 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 Fixtures in any one location to be product of one manufacturer and of same type.
- .5 Trim in any one location to be product of one manufacturer and of same type.
- .6 Fixture piping:
  - .1 Hot and cold water supplies to fixtures:
    - .1 Chrome plated flexible supply pipes with handwheel stop, reducers, escutcheon.
    - .2 Waste:
      - .1 Brass P trap with clean out on fixtures not having integral trap.
      - .2 Chrome plated in exposed places.
- .7 Chair carriers:
  - .1 Factory manufactured floor-mounted carrier systems for wall-mounted fixtures.

## **Part 3 Execution**

### **3.1 APPLICATION**

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

### **3.2 INSTALLATION**

- .1 Mounting heights:
  - .1 Standard: to manufacturer's recommendations.
  - .2 Barrier free: to most stringent OBC or 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 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 11 - Cleaning.
    - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

Approved: 2008-12-31

## **Part 1            General**

### **1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series, Plumbing Fixtures.
  - .2 CAN/CSA-B125.3, Plumbing Fittings.
  - .3 CAN/CSA-B651, 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 00 - 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, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

## **Part 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 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 Fixture piping:
  - .1 Hot and cold water supplies to each fixture:
    - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
    - .2 Waste:
      - .1 Brass P trap with clean out on each fixture not having integral trap.
      - .2 Chrome plated in all exposed places.
- .8 Chair carriers:
  - .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

### **Part 3 Execution**

#### **3.1 APPLICATION**

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

#### **3.2 INSTALLATION**

- .1 Mounting heights:
  - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
  - .2 Physically handicapped: to comply with most stringent of either OBC or 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 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.

**3.4 CLEANING**

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

**END OF SECTION**

Approved: 2008-12-31

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series, Plumbing Fixtures.
  - .2 CAN/CSA-B125.3, Plumbing Fittings.

**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 including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - 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, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**Part 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 Number, locations: architectural drawings to govern.

- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Fixture piping:
  - .1 Hot and cold water supplies to each fixture.
    - .1 Copper supply pipes each with handwheel stop, reducers, escutcheon.
  - .2 Waste:
    - .1 Brass P trap with cleanout on each fixture not having integral trap.
    - .2 Chrome plated in all exposed places.

### **Part 3 Execution**

#### **3.1 APPLICATION**

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

#### **3.2 INSTALLATION**

- .1 Mounting heights:
  - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

#### **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 Checks:
  - .1 Aerators: operation, cleanliness.
  - .2 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 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Shop drawings to show:
  - .1        Mounting arrangements.
  - .2        Operating and maintenance clearances.
- .3        Shop drawings and product data accompanied by:
  - .1        Detailed drawings of bases, supports, and anchor bolts.
  - .2        Acoustical sound power data, where applicable.
  - .3        Points of operation on performance curves.
  - .4        Manufacturer to certify current model production.
  - .5        Certification of compliance to applicable codes.
- .4        Closeout Submittals:
  - .1        Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2        Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
  - .3        Operation data to include:
    - .1        Control schematics for systems including environmental controls.
    - .2        Description of systems and their controls.
    - .3        Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4        Operation instruction for systems and component.
    - .5        Description of actions to be taken in event of equipment failure.
    - .6        Valves schedule and flow diagram.
    - .7        Colour coding chart.
  - .4        Maintenance data to include:
    - .1        Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2        Data to include schedules of tasks, frequency, tools required and task time.
  - .5        Performance data to include:
    - .1        Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2        Equipment performance verification test results.
    - .3        Special performance data as specified.

- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
  - .2 Make changes as required and re-submit as directed by Consultant.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

## **1.2 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

## **1.3 MAINTENANCE**

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
  - .1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.



- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

**Part 2 Products**

**Part 3 Execution**

**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

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

**3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.4 DEMONSTRATION**

- .1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

**3.5 PROTECTION**

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

**END OF SECTION**

Approved: 2005-12-31

## **Part 1        General**

### **1.1            SUMMARY**

- .1    TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .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    TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
  - .1    Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.
  - .2    National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
  - .3    Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.
- .2    Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .3    Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .4    Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .5    Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .6    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 (AABC, NEBB, or TABB), 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 PRE-TAB REVIEW**

- .1 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

#### **1.7 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

#### **1.8 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

#### **1.9 START OF TAB**

- .1 Start TAB when building is essentially completed, including:
- .2 Installation of ceilings, doors, windows, other construction affecting TAB.
- .3 Application of weatherstripping, sealing, and caulking.
- .4 Pressure, leakage, other tests specified elsewhere Division 23.
- .5 Provisions for TAB installed and operational.
- .6 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 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire, smoke, volume control dampers installed and open.

- .6 Coil fins combed, clean.
- .7 Access doors, installed, closed.
- .8 Outlets installed, volume control dampers open.
- .3 Liquid systems:
  - .1 Flushed, filled, vented.
  - .2 Correct pump rotation.
  - .3 Strainers in place, baskets clean.
  - .4 Isolating and balancing valves installed, open.
  - .5 Calibrated balancing valves installed, at factory settings.
  - .6 Chemical treatment systems complete, operational.

#### **1.10 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 HVAC systems: plus 5 %, minus 5 %.
  - .2 Hydronic systems: plus or minus 10 %.

#### **1.11 ACCURACY TOLERANCES**

- .1 Measured values accurate to within plus or minus 2 % of actual values.

#### **1.12 INSTRUMENTS**

- .1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .2 Calibrate within 3 months of TAB.

#### **1.13 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

#### **1.14 TAB REPORT**

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.
- .3 Submit 3 copies of TAB Report to Consultant for verification and approval, in English in D-ring binders, complete with index tabs.

#### **1.15 VERIFICATION**

- .1 Reported results subject to verification by Consultant.
- .2 Provide personnel and instrumentation to verify up to 50 % of reported results.
- .3 Number and location of verified results as directed by Consultant.

- .4 Pay costs to repeat TAB as required to satisfaction of Consultant.

#### **1.16 SETTINGS**

- .1 After TAB is completed to satisfaction of Consultant, 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.

#### **1.17 COMPLETION OF TAB**

- .1 TAB considered complete when final TAB Report received and approved by Consultant.

#### **1.18 AIR SYSTEMS**

- .1 Standard: TAB to most stringent of TAB standards.
- .2 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB.
- .3 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .4 Locations of equipment measurements: to include as appropriate:
  - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .5 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

#### **1.19 OTHER TAB REQUIREMENTS**

- .1 General requirements applicable to work specified this paragraph:
  - .1 Qualifications of TAB personnel: as for air systems specified this section.
  - .2 Quality assurance: as for air systems specified this section.
- .2 Building pressure conditions:
  - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not used.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Operating dampers for mechanical forced air ventilation and air conditioning systems.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A653/A653M-[04a], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .2 Indicate the following:
    - .1 Performance data.
    - .2 Size
    - .3 Weight.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
- .3 Closeout Submittals
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.4 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Certificates:
  - .1 Catalogue or published ratings those obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 MULTI-LEAF DAMPERS**

- .1 Parallel blade type as indicated.
- .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seal extruded aluminum frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: Bluebox- see Electrical specifications.

### **2.2 BACK DRAFT DAMPERS**

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, spring assisted, as indicated.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper, as required
- .5 Ensure dampers are observable and accessible.



**3.3 FIELD QUALITY CONTROL**

- .1 Verification requirements in accordance with good practice include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Low-emitting materials.

**3.4 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Roof and wall exhausters.

**1.2 REFERENCES**

- .1 Air Movement and Control Association (AMCA)
  - .1 AMCA Publication 99, Standards Handbook (Revised 2003).
  - .2 AMCA 300, Reverberant Room Method for Sound Testing of Fans.
  - .3 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 American National Standards Institute (ANSI)
  - .1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force. Provide confirmation of testing.
  - .2 Capacity: as indicated on schedule.
- .2 Statically and dynamically balanced. Constructed to AMCA 99.
- .3 Sound ratings: comply with AMCA 301, tested to AMCA 300.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Include :
  - .1 Fan performance curves showing specified point of operation.
  - .2 Sound rating data.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
- .4 Closeout Submittals
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse/recycling.

## **1.6 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
  - .1 Bearings and seals.
  - .2 Addresses of suppliers.
  - .3 List of specialized tools necessary for adjusting, repairing or replacing.

## **Part 2 Products**

### **2.1 WALL EXHAUSTERS**

- .1 Sidewall Propellar fan units, direct driven.
  - .1 Spun aluminum housings, complete with resilient mounted motor and fan.
  - .2 12 mm mesh 2.0 mm diameter aluminum birdscreen.
  - .3 Motorized gasketed aluminum backdraft dampers.
  - .4 Disconnect switch within fan housing.

- .5 Stainless steel securing bolts and screws.
- .2 Eisenheiss coated wheel for fume service with motor out of air stream.
- .3 Housings:
  - .1 Provide with rubber or neoprene grommets for wiring passages, integral attachment collar, or angle ring mounted to mating flanged wall sleeve with full gasketing.
  - .2 Discharge pattern: away from building.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.

**3.3 ANCHOR BOLTS AND TEMPLATES**

- .1 Size anchor bolts to withstand seismic acceleration and velocity forces.

**3.4 CLEANING**

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

**END OF SECTION**

Approved: 2005-12-31

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, intakes and gooseneck hoods.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)
  - .1 ANSI/NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- .5 Society of Automotive Engineers (SAE)

**1.3 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .2 Indicate following:
    - .1 Pressure drop.
    - .2 Face area.
    - .3 Free area.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.
- .3 Test Reports:
  - .1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

## **1.5 QUALITY ASSURANCE**

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

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturers instructions.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse/recycling.

## **Part 2 Products**

### **2.1 ADJUSTABLE LOUVRES**

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: extruded aluminum alloy 6063-T5.
- .3 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .4 Screen: 19 mm mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.
- .5 Louvers: As Specified on drawings
- .6 Operator: As Specified on drawings.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

**3.3 CLEANING**

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

**END OF SECTION**

Approved: 2011-12-31

## **Part 1        General**

### **1.1            REFERENCES**

- .1 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)
  - .1 ANSI/ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- .2 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
  - .1 ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems.
- .3 CSA International
  - .1 CAN/CSA-C656, Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.

### **1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for heat pumps and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings in accordance with Section 01 33 00 - Submittal Procedures.

### **1.3            CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for heat pumps for incorporation into manual.

### **1.4            DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect heat pumps from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.



## **Part 2 Products**

### **2.1 DESCRIPTION**

- .1 Heat pumps: to EPS 1/RA/2, CSA approved and with ARI or CSA certification seal.

### **2.2 DRAIN PANS**

- .1 Design and construct condensate drain pans under indoor coils so that no water can accumulate and install to allow for easy cleaning.

### **2.3 AIR-SOURCE HEAT PUMP**

- .1 General:
  - .1 Three component unit consisting of refrigerant compressor section, outdoor unit and indoor coil.
- .2 Refrigeration piping:
  - .1 Between outdoor unit, compressor section and indoor coil, complete with refrigerant metering devices and valves.
- .3 Accessories:
  - .1 Indoor heat/cool automatic thermostat.
  - .2 Outdoor thermostat to monitor outside air temperature and provide for proper use of supplementary heating.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for heat pumps installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Install where indicated and in accordance with manufacturer's instructions.
- .2 Install outdoor units at ground level on concrete housekeeping pad.
- .3 Secure with hold-down bolts in accordance with manufacturer's recommendations.
- .4 Make duct connections through flexible connections.
- .5 Level unit with fans running. Align duct work. flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.
- .6 Make piping connections.
- .7 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

**3.3 DRAIN PANS**

- .1 Install so that no water can accumulate. Arrange easy access for cleaning.
- .2 Include internal or external trap for proper draining.

**3.4 START-UP AND COMMISSIONING**

- .1 Have manufacturer certify installation.
- .2 Have manufacturer present during start-up and certify performance.
- .3 Submit written start-up and commissioning reports to Consultant.

**3.5 CLOSEOUT ACTIVITIES**

- .1 Manufacturer to deliver verbal and written instructions to operating personnel.

**3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.7 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by heat pumps installation.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section [\_\_\_\_\_].

**1.2 REFERENCES**

- .1 Definitions:
  - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
  - .1 CSA Group
    - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
    - .2 CAN/CSA-C22.3 No.1-10, Overhead Systems.
    - .3 CAN3-C235-[83(R2010)], Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
    - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams [under plexiglass] [in glazed frames] and locate [as indicated].
  - .1 Electrical distribution system in main electrical room.
  - .2 Electrical power generation and distribution systems in power plant rooms.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building [under plexiglass] [in glazed frames] at fire alarm control panel and annunciator.
- .5 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit 3 number of copies of 600 x 900mm minimum size drawings authority having jurisdiction.
- .6 If changes are required, notify Consultant of these changes before they are made.
- .6 Certificates:
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment or material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.
- .7 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work [and electrical system and instrumentation testing], as described in PART 3 - FIELD QUALITY CONTROL.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
  - .4 Post instructions where directed.
  - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions].
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors and in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

### **2.2 MATERIALS AND EQUIPMENT**

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

### **2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

### **2.4 WIRING TERMINATIONS**

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

## 2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: lamicoïd [3] mm melamine, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
  - .2 Sizes as follows:

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

- .2 Labels: embossed plastic labels with [6] mm high letters unless specified otherwise.
- .3 Wording on nameplates to be approved Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

## 2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.7 CONDUIT AND CABLE IDENTIFICATION

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

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red

Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

**2.8 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint indoor switchgear and distribution enclosures light gray.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

**3.2 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

**3.3 NAMEPLATES AND LABELS**

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

**3.4 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: plastic sized for free passage of conduit, and protruding 100 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**3.5 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
  - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

### **3.6 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 300 mm.
  - .5 Wall mounted telephone and interphone outlets: 1500 mm.
  - .6 Television outlets: 300 mm.
  - .7 Wall mounted speakers: 2100 mm.

### **3.7 CO-ORDINATION OF PROTECTIVE DEVICES**

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

### **3.8 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.



- .2 Conduct following tests in accordance with Section [01 45 00 - Quality Control].
  - .1 Power [generation] [distribution] system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Systems: 120v interconnected fire alarm PA system
  - .6 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Consultant.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.9 SYSTEM STARTUP**

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

### **3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            [\_\_\_\_\_].

**1.3                PRODUCT DATA**

- .1            Provide product data in accordance with Section [01 33 00 - Submittal Procedures].

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets] [crates] [padding] [packaging materials] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal].

**Part 2            Products**

**2.1                BUILDING WIRES**

- .1            Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2            Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .3            Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V.
- .4            Neutral supported cable: 1 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS90 Insulation.

**2.2                TECK 90 CABLE**

- .1            Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2            Conductors:
  - .1            Grounding conductor: copper.
  - .2            Circuit conductors: copper, size as indicated.
- .3            Insulation:
  - .1            Cross-linked polyethylene XLPE.
  - .2            Rating: 600V.
- .4            Inner jacket: polyvinyl chloride material.
- .5            Armour: interlocking galvanized steel.
- .6            Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables at 100mm centers.
  - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
  - .1 Watertight approved for TECK cable.

### **2.3 ARMOURED CABLES**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90 - lead sheath over cable assembly and under armour].
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Type: [ACWU90] [PVC] [flame retardant] jacket over [thermoplastic] armour and compliant to applicable Building Code classification for this project [wet locations].
- .5 Connectors: anti short connectors.

### **2.4 NON-METALLIC SHEATHED CABLE**

- .1 Non-metallic sheathed copper cable type: NMD90XLPE size as indicated.

## **Part 3 Execution**

### **3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical].
- .2 Perform all tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

**3.3 INSTALLATION OF TECK90 CABLE (0 -1000 V)**

- .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by staples

**3.4 INSTALLATION OF NON-METALLIC SHEATHED CABLE**

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

**1.1                RELATED REQUIREMENTS**

- .1    Section [\_\_\_\_\_].
- .2    CSA Group
  - .1    CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .2    CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
  - .3    CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Certificates: obtain inspection certificate of compliance covering high voltage stress from Consultant and include it with as-built drawings.

**1.3                CLOSEOUT SUBMITTALS**

- .1    Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2    Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1    Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2    Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

**3.2 INSTALLATION**

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## **Part 1        General**

### **1.1            REFERENCES**

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

### **1.2            ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.3            CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for [grounding equipment] for incorporation into manual.

### **1.4            DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2        Products**

### **2.1            EQUIPMENT**

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as required.
- .3 Rod electrodes: copper clad steel 19 mm diameter by minimum 3m long.
- .4 Plate electrodes: galvanized steel surface area 0.2 m<sup>2</sup>, minimum 1.6 mm thick.
- .5 Grounding conductors: bare stranded copper, tinned, soft annealed, size as required.
- .6 Insulated grounding conductors: green, copper conductors, size as required
- .7 Ground bus: copper, complete with insulated supports, fastenings, connectors.

- .8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

#### **3.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at one] end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Install grounding resistance bank where required.
- .11 Connect building structural steel and metal siding to ground.
- .12 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.



- .13 Bond single conductor, metallic armoured cables to cabinet at supply end, and load end.
- .14 Ground secondary service pedestals.

### **3.3 MAINTENANCE HOLES**

- .1 Install conveniently located grounding stud, electrode, size stranded copper conductor in each maintenance hole.
- .2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

### **3.4 ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod electrodes and make grounding connections.
- .5 Bond separate, multiple electrodes together.
- .6 Use size 2/0AWG copper conductors for connections to electrodes.
- .7 Make special provision for installing electrodes that will give [acceptable] resistance to ground value where rock or sand terrain prevails. Ground as indicated.

### **3.5 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

### **3.6 GROUNDING BUS**

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.
- .2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

### **3.7 COMMUNICATION SYSTEMS**

- .1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:
  - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
  - .2 Sound, fire alarm, security systems, intercommunication systems as indicated.

### **3.8 PERMAFROST**

- .1 Bond non-current carrying metal parts together with size 1/0 AWG copper equipotential conductor. Run conductor from separate lug or service neutral bar to, but not necessarily limited to, following indoor systems and equipment:
  - .1 Hot water heating system.
  - .2 Main water pipe.
  - .3 Main building drain.
  - .4 Oil line.
  - .5 Telephone, radio/tv, emergency and fire alarm lead-in or service conduits, near panels.
  - .6 Make connections to pipes on building side of main valves and tanks. Connect jumpers across boilers to supply and return hot water heating pipes.
- .2 Drive three -19 mm diameter x 3 m copper clad ground rods at least 1.8 m apart in original undisturbed ground. If rods will not penetrate permafrost, drive at angle not more than 60 degrees from vertical, and in same direction. Rods must be driven, not trenched.
- .3 Install ground wire from service neutral bar to rods and where buried use bare copper not smaller than size 1 AWG strand or size 4 AWG solid, and at least 640 mm below ground. Bond ground conductor, or short tap from it, to outside metal sheathing of building close to power service conduit. Use lug or cast clamp, with bronze or plated bolt, nut and washers (not sheet metal screw or wood screw). Remove paint from sheathing for good contact. Conduit is required only on outside wall of building. Indoors, run bare and fasten as specified for equipotential bonding wire.
- .4 Install electrode interconnections where metal parts, circuits or grounding conductors and/or electrodes are in proximity to lightning rod conductors.

### **3.9 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

### **3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            Canadian Standards Association (CSA International)
  - .1            CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2            Waste Management and Disposal:
  - .1            Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                OUTLET AND CONDUIT BOXES GENERAL**

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

**2.2                GALVANIZED STEEL OUTLET BOXES**

- .1            One-piece electro-galvanized construction.
- .2            Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3            Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48mm.
- .4            102mm square or octagonal outlet boxes for lighting fixture outlets.
- .5            Extension and plaster rings for flush mounting devices in finished plaster and tile walls.

**2.3                MASONRY BOXES**

- .1            Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

## **2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

## **2.5 CONDUIT BOXES**

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

## **2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE**

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63mm with two double clamps to take non-metallic sheathed cables.

## **2.7 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

## **2.8 SERVICE FITTINGS**

- .1 'High tension' receptacle fitting made of 2 piece stainless steel with brushed aluminum housing finish for 1 duplex receptacles. Bottom plate with two knockouts for centered or offset installation.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 CSA International
  - .1 CAN/CSA-Z809-08, Sustainable Forest Management.
- .2 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .3 Insulated Cable Engineers Association, Inc. (ICEA)
- .4 Sustainable Forestry Initiative (SFI)
  - .1 SFI-2010-2014 Standard.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for [cables] and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect cables from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 CABLE PROTECTION**

- .1 [38 x 140] mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

## **2.2 MARKERS**

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.
- .2 Cedar post type markers: to CAN/CSA-Z809 or FSC, pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.
  - .1 Nameplate: aluminum anodized 89 x 125 mm, 1.5mm thick mounted on cedar post with mylar label 0.125 mm thick with words Cable, Joint or Conduit with arrows to indicate change in direction.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

### **3.2 DIRECT BURIAL OF CABLES**

- .1 After sand bed in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 150mm clearance from each side of trench to nearest cable.
  - .1 Do not pull cable into trench.
- .2 Include offsets for thermal action and minor earth movements.
  - .1 Offset cables 150 mm minimum for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Underground cable splices not acceptable.
- .4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .5 Cable separation:
  - .1 Maintain 150 mm minimum separation between cables of different circuits.
  - .2 Install treated planks on lower cables 0.6m minimum in each direction at crossings.

### **3.3 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

### **3.4 MARKERS**

- .1 Mark cable every 150 m along duct runs and changes in direction.
- .2 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .3 Install cedar post type markers.
- .4 Lay concrete markers flat and centred over cable with top flush with finish grade.

### **3.5 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
  - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
  - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
  - .1 After installing cable but before terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
  - .1 Ensure that terminations and accessory equipment are disconnected.
  - .2 Ground shields, ground wires, metallic armour and conductors not under test.
  - .3 High Potential (Hipot) Testing.
    - .1 Conduct hipot testing at manufacturer's recommendations.

- .4 Leakage Current Testing:
  - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
  - .2 Hold maximum voltage for specified time period manufacturer.
  - .3 Record leakage current at each step.
- .7 Provide Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.7 PROTECTION**

- .1 Repair damage to adjacent materials caused by cables installation.

**END OF SECTION**



**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No. 100-04, Motors and Generators.
  - .2 CSA C22.2 No. 145-M1986(R2004), Motors and Generators for Use in Hazardous Locations.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC M1-7-1992, Standard for Motors and Generators.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction and include: product characteristics, performance criteria, physical size, horsepower, watt rating, limitations and finish.
- .3 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Indicate dimensions, recommended installation procedure, wiring diagrams, sizes and location of mounting bolt holes and recommended support method.
- .4 Quality Assurance Submittals:
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .5 Closeout Submittals:
  - .1 Provide maintenance data for fractional horsepower motors for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .2 Collect, package and store expired motors for either recycling or rebuilding and return to recycler or rebuilder.

**Part 2            Products**

**2.1                NOT USED**

**Part 3            Execution**

**3.1                MANUFACTURER'S INSTRUCTIONS**

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

**3.2                INSTALLATION**

- .1            Install wiring, flexible connections and grounding.
- .2            Check rotation before coupling to driven equipment.

**3.3                CLEANING**

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

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    American National Standards Institute (ANSI)
  - .1        ANSI C39.1-1981, Requirements, Electrical Analog Indicating Instruments.
- .2    CSA International
  - .1        CAN3-C17-M84(R2008), Alternating - Current Electricity Metering.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for [metering and switchboard instruments] and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2        Include meter, outline dimensions, panel drilling dimensions and installation cutout template.

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section [with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1        Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect metering from [nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                METER**

- .1    Single-phase kilowatt-hour] energy meter: to CAN3-C17.
- .2    [Single-phase kilowatt, kilovar, demand indicating recording meter: to CAN3-C17.
- .3    Combination energy and demand meter: to CAN3-C17.
- .4    Accuracy: 3%.
- .5    'S' socket, bottom connected, round outdoor] weatherproof.
- .6    Register: self-contained, range, pulse contacts for transmitting signal.
- .7    Allow for remote sensing.

## **2.2 METER SOCKET**

- .1 Weatherproof meter sockets to suit meters with automatic current transformer.

## **2.3 METER CABINET**

- .1 Sheet steel CSA enclosure with meter backplate, to accommodate meters, test terminal block and associated equipment, factory installed and wired.

## **2.4 TEST TERMINAL BLOCKS**

- .1 Test terminal blocks: as required.

## **2.5 SHOP INSTALLATION**

- .1 Install meters in separate compartment of switchboard.
- .2 Ensure adequate spacing between current transformers installed on each phase.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metering and switchboard instruments installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

### **3.2 METERING INSTALLATION**

- .1 Install meter in location free from vibration and shock.
- .2 Make connections in accordance with diagrams.
- .3 If applicable, ensure power factor corrective equipment connected on load side of meter.
- .4 Connect meter cabinets to ground.
- .5 Locate meters within 9 m of instrument transformers.
  - .1 Use 32 mm conduit for interconnections.
  - .2 Use separate conduit for each set of current transformer connections, exclusive for metering.

### **3.3 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00 - Common Work Results for Electrical and in accordance with manufacturer's recommendations.

- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metering and switchboard instrument installation.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .3            Shop Drawings:
  - .1            Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario Canada.
  - .2            Include on drawings:
    - .1            Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

**1.3                CLOSEOUT SUBMITTALS**

- .1            Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2            Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect panelboards from nicks, scratches, and blemishes.
  - .3            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                PANELBOARDS**

- .1            Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250V panelboards: bus and breakers rated for 200A interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel.
- .11 Isolated ground bus.
- .12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

## **2.2 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

## **2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplate for each panelboard size 4 engraved [as indicated].
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.
- .5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

**3.2 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section[06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by panelboards installation.

**END OF SECTION**



**Part 1            General**

**1.1                REFERENCES**

- .1    CSA International
  - .1    CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2    CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3    CSA C22.2 No.55-M1986(R2008), Special Use Switches.
  - .4    CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for [wiring devices] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1    Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

**1.3                CLOSEOUT SUBMITTALS**

- .1    Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2    Operation and Maintenance Data: submit operation and maintenance data for [wiring devices] for incorporation into manual.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1    Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2    Store and protect wiring devices from nicks, scratches, and blemishes.
  - .3    Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 SWITCHES**

- .1 15 A, 120 V, single pole, three-way, switches to: CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

**2.2 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
  - .1 Ivory urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
  - .1 [vory urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

**2.3 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, vertically brushed, 1 mm thick cover plates, plastic ivory cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

- .6 Weatherproof spring-loaded cover plates complete with gaskets for single receptacles or switches.

## **2.4 SOURCE QUALITY CONTROL**

- .1 Cover plates from one manufacturer throughout project.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

### **3.2 INSTALLATION**

- .1 Switches:
  - .1 Install single throw switches with handle in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
  - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
  - .1 Install suitable common cover plates where wiring devices are grouped.
  - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    CSA International
  - .1    CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for [circuit breakers] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
- .4    Certificates:
  - .1    Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    - .1    Production certificate of origin must be submitted to Consultant for approval.
  - .2    Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3    Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Consultant. Unless complying with this requirement, Consultant reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
  - .4    Production certificate of origin must contain:
    - .1    Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
    - .2    Licensed dealer's name and address and person of distributor responsible for Contractor's account.
    - .3    Contractor's name and address and person responsible for project.
    - .4    Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
- .5    Sustainable Design Submittals:

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store circuit breakers off ground, indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation [with temperature compensation for 40 degrees C ambient].
- .3 Common-trip breakers: with single handle for multi-pole applications.

### **2.2 THERMAL MAGNETIC BREAKERS [DESIGN A]**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant.

### **3.2 INSTALLATION**

- .1 Install circuit breakers [as indicated].

### **3.3 CLEANING**

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

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

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    CSA International
  - .1        CAN/CSA C22.2 No.144-M91(R2006), Ground Fault Circuit Interrupters.
- .2    National Electrical Manufacturers Association (NEMA)
  - .1        NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1        Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4    Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Consultant and certificate that system as installed meets criteria specified.

**1.3                CLOSEOUT SUBMITTALS**

- .1    Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2    Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1        Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.



## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.
- .2 Components comprising ground fault protective system to be of same manufacturer.

### **2.2 BREAKER TYPE GROUND FAULT INTERRUPTER**

- .1 Single pole ground fault circuit interrupter for 15A, 120V, 1 phase circuit c/w test and reset facilities.

### **2.3 GROUND FAULT PROTECTOR UNIT**

- .1 Self-contained with 15A, 120V circuit interrupter and duplex receptacle complete with:
  - .1 Solid state ground sensing device.
  - .2 Facility for testing and reset.
  - .3 CSA Enclosure flush mounted with stainless steel face plate.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for ground fault circuit interrupters installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

### **3.2 INSTALLATION**

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors [including neutral] through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

### **3.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Arrange for field testing of ground fault equipment Contractor before commissioning service.
- .3 Demonstrate simulated ground fault tests.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 CSA Group
  - .1 CAN/CSA-C22.2 No.4-04(R2009 ), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
  - .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for [disconnect switches - fused and non-fused] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions].
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 DISCONNECT SWITCHES**

- .1 Fusible, Non-fusible disconnect switch in CSA enclosure, as indicated.
- .2 Provision for padlocking in off switch position by 3 locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

- .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

## **2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed Consultant.

### **3.2 INSTALLATION**

- .1 Install disconnect switches complete with fuses if applicable.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1        CSA International
  - .1        CSA C22.2 No.14-10, Industrial Control Equipment.
- .2        National Electrical Manufacturers Association (NEMA)
  - .1        NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for [contactors] and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3                CLOSEOUT SUBMITTALS**

- .1        Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2        Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.
- .3        Include operating information required for start-up, synchronizing and shut-down of generating units.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect contactors from nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                CONTACTORS**

- .1        Contactors: to CSA C22.2 No.14.

- .2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. [Half size contactors not accepted].
- .3 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .4 Mount in CSA NEMA Enclosure 1 unless otherwise indicated.
- .5 Include following options in cover:
  - .1 Hand-Off-Auto selector switch.

## **2.2 EQUIPMENT IDENTIFICATION**

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Size 4 nameplate indicating name of load controlled

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install contactors and connect power wires and auxiliary control devices.
- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.3 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by contactor installation.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
  - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
  - .1 ASTM F1137-00(2006)] Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)

**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 datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review and approval Consultant.
  - .3 Photometric data to include: VCP Table where applicable spacing criterion.
  - .4 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
  - .5 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

**1.3                QUALITY ASSURANCE**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.

## **Part 2 Products**

### **2.1 FINISHES**

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

### **2.2 OPTICAL CONTROL DEVICES**

- .1 As indicated on drawings.

### **2.3 LUMINAIRES**

- .1 As indicated on drawings or approved alternate.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install flexible or rigid conduit for luminaires as indicated.

### **3.3 LUMINAIRE SUPPORTS**

- .1 For suspended ceiling installations support luminaires independently of ceiling in accordance with local inspection requirements.

### **3.4 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.



**END OF SECTION**

Approved: 2010-12-31

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section [ ].

**1.2 REFERENCES**

- .1 CSA International
  - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA A3000, Cementitious Materials Compendium.
- .2 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation
  - .1 OPSS 1004, Material Specification for Aggregates - Miscellaneous.
  - .2 OPSS 1010, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
  - .1 Pay costs of relocating services.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Site Quality Control Submittals: submit in accordance with Section 1 45 00 - Quality Control].
  - .1 Submit testing results and report as described in PART 3 - FIELD QUALITY CONTROL.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular A, B Type II to OPSS 1010.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Evaluation and Assessment:
  - .1 Before commencing work establish locations of buried services on and adjacent to site.

### 3.2 PREPARATION

- .1 Temporary erosion and sedimentation control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Protection of in-place conditions:
  - .1 Protect excavations from freezing.
  - .2 Keep excavations clean, free of standing water, and loose soil.
  - .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
  - .4 Protect buried services that are required to remain undisturbed.
- .3 Removal:
  - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
  - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

### 3.3 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.
- .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
  - .1 Stockpile topsoil on site for later use.
- .3 Excavate as required to carry out work.
  - .1 Do not disturb soil or rock below bearing surfaces.
  - .2 Notify Consultant when excavations are complete.
  - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
  - .4 Excavation taken below depths shown Consultant's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .4 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
  - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .5 Excavate for slabs and paving to subgrade levels.

- .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

### **3.4 FIELD QUALITY CONTROL**

- .1 Testing of materials and compaction of backfill will be carried out by testing laboratory designated by Consultant.
- .2 Not later than 48 hours before backfilling or filling with approved material, notify Consultant to allow compaction tests to be carried out by designated testing agency.

### **3.5 BACKFILLING**

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .2 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as fill.
  - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Placing:
  - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
- .5 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .6 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

### **3.6 GRADING**

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Consultant.
  - .1 Grade to be gradual between finished spot elevations shown on drawings.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

Approved: 2003-12-31

## **Part 1           General**

### **1.1               RELATED SECTIONS**

- .1       Section 01 33 00 - Submittal Procedures.

### **1.2               REFERENCES**

- .1       American Society for Testing and Materials (ASTM)
  - .1       ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

## **Part 2           Products**

### **2.1               MATERIALS**

- .1       Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2       Flat and elongated particles of coarse aggregate: to OPSS.
- .3       Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1       Natural sand.
  - .2       Manufactured sand.
  - .3       Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4       Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1       Crushed rock.
  - .2       Gravel [and crushed gravel] composed of naturally formed particles of stone.
  - .3       Light weight aggregate, including slag and expanded shale.

## **Part 3           Execution**

### **3.1               PREPARATION**

- .1       Topsoil stripping
  - .1       Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
  - .2       Begin topsoil stripping of areas after area has been cleared of brush, trees and grasses and removed from site.
  - .3       Strip topsoil to depths as indicated in geotechnical report.

- .4 Stockpile in locations as directed by Engineer. Stockpile height not to exceed 2 m.
- .2 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Stockpiling
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Engineer. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer.
  - .6 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .7 Do not cone piles or spill material over edges of piles.
  - .8 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Engineer.

**END OF SECTION**

Approved: 2006-06-30

## **Part 1        General**

### **1.1        RELATED SECTIONS**

- .1        [    ].

### **1.2        DEFINITIONS**

- .1        Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2        Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3        Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4        Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5        Grubbing consists of excavation and disposal of stumps and roots to not less than specified depth below existing ground surface.

### **1.3        STORAGE AND PROTECTION**

- .1        Prevent damage to natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses which are to remain.
  - .1        Repair damaged items to approval of Engineer.
  - .2        Replace trees designated to remain, if damaged, as directed by Engineer.

## **Part 2        Products**

### **2.1        MATERIALS**

- .1        Soil Material for Fill:
  - .1        Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
  - .2        Remove and store soil material for reuse.

**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PREPARATION**

- .1 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
  - .1 Notify Engineer immediately of damage to or when unknown existing utility lines are encountered.
- .2 Notify utility authorities before starting clearing and grubbing.
- .3 Keep roads and walks free of dirt and debris.

**3.3 CLEARING**

- .1 Clearing includes cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, brush, rubbish occurring within cleared areas.
- .2 Clear as indicated by cutting at height of not more than 300mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000mm above ground surface.
- .3 Cut off unsound branches on trees designated to remain as directed by Engineer.

**3.4 CLOSE CUT CLEARING**

- .1 Close cut clearing to ground level.
- .2 Cut off unsound branches on trees designated to remain as directed by Engineer.

**3.5 UNDERBRUSH CLEARING**

- .1 Clear underbrush from areas as indicated at ground level.

**3.6 GRUBBING**

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.



- .2 Grub out stumps and roots to not less than 300 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 1000 mm in greatest dimension.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

### **3.7 REMOVAL AND DISPOSAL**

- .1 Remove cleared and grubbed materials off site.

### **3.8 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of Engineer

### **3.9 CLEANING**

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

**END OF SECTION**

Approved: 2006-06-30

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            [    ].

**Part 2            Products**

**2.1                NOT USED**

- .1            Not Used.

**Part 3            Execution**

**3.1                TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1            Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2            Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3            Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2                STRIPPING OF TOPSOIL**

- .1            Ensure that procedures are conducted in accordance with applicable Provincial and Municipal requirements.
- .2            Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3            Handle topsoil only when it is dry and warm.
- .4            Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by disposal.
- .5            Remove brush from targeted area by non-chemical means and dispose of through disposal.
- .6            Strip topsoil to depths as indicated.
  - .1            Avoid mixing topsoil with subsoil.
- .7            Pile topsoil in berms in locations as directed by Engineer.
  - .1            Stockpile height not to exceed 2.5 - 3m.

- .8 Dispose of unused topsoil off-site.
- .9 Protect stockpiles from contamination and compaction.

### **3.3 PREPARATION OF GRADE**

- .1 Verify that grades are correct and notify Engineer if discrepancies occur. do not begin work until instructed by Engineer.
  - .1 Grade area only when soil is dry to lessen soil compaction.
  - .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

### **3.4 PLACING OF TOPSOIL**

- .1 Spread topsoil during dry conditions in uniform layers not exceeding 200 mm, over unfrozen subgrade free of standing water.
- .2 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .3 Cultivate soil following spreading procedures.

### **3.5 CLEANING**

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

**END OF SECTION**

Approved: 2000-12-05

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 31 11 00 - Clearing and Grubbing.
- .2            Section 31 23 33.01 - Excavation, Trenching and Backfilling.

**1.2                EXISTING CONDITIONS**

- .1            Known underground and surface utility lines and buried objects are as indicated on site plan.
- .2            Refer to dewatering in Section 31 23 33.01 - Excavating Trenching and Backfilling.

**1.3                PROTECTION**

- .1            Protect and/or transplant existing bench marks, buildings, pavement, surface or underground utility lines which are to remain. If damaged, restore to original or better condition unless directed otherwise.
- .2            Maintain access roads to prevent accumulation of construction related debris on roads.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Engineer.

**Part 3            Execution**

**3.1                GRADING**

- .1            Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2            Slope rough grade away from building as indicated.
- .3            Grade ditches to depth as indicated.
- .4            Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .5            Compact filled and disturbed areas to corrected maximum dry density, as follows:
  - .1            95 % under paved and walk areas.
- .6            Do not disturb soil within branch spread of trees or shrubs to remain.

**3.2 SURPLUS MATERIAL**

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site.

**END OF SECTION**

Approved: 2006-09-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_].

**1.2                REFERENCES**

**1.3                DEFINITIONS**

- .1            Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1            Rock : solid material in excess of 1.00 m ; and which cannot be removed by means of heavy duty mechanical excavating equipment. Frozen material not classified as rock.
  - .2            Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2            Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3            Topsoil:
  - .1            Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2            Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4            Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5            Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6            Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7            Unsuitable materials:
  - .1            Weak, chemically unstable, and compressible materials.
  - .2            Frost susceptible materials:
    - .1            Fine grained soils with plasticity index less than 10 when tested to ASTM D4318,
    - .2            Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8            Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## **1.4 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation Work, notify applicable authorities having jurisdiction establish location and state of use of buried utilities and structures. authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .6 Record location of maintained, re-routed and abandoned underground lines.
  - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Consultant
  - .2 Where required for excavation, cut roots or branches.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when compared to OPSS standards.

## **Part 3 Execution**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### **3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.

### **3.4 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act

### **3.5 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

### **3.6 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services.
- .2 Place bedding and surround material in unfrozen condition.

### **3.7 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Consultant has inspected and approved installations.



- .2 Consultant has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
  - .3 Do not use backfill material which is frozen or contains ice, snow or debris.
  - .4 Place backfill material in uniform layers not exceeding 200 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
  - .5 Backfilling around installations:
    - .1 Place bedding and surround material as specified elsewhere.
    - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
    - .3 Place layers simultaneously on both sides of installed Work to equalize loading.

### **3.8 RESTORATION**

- .1 Reinstate lawns to elevation which existed before excavation.
- .2 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .3 Clean and reinstate areas affected by Work as directed by Consultant.
- .4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

Approved: 2006-12-31

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            [    ].

**1.2                REFERENCES**

- .1            American Society for Testing and Materials International (ASTM)
  - .1            ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2            ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3            ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
- .2            Canadian Standards Association (CSA International)
  - .1            CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2            Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3            Granular base: material to Section 31 05 16 - Aggregate Materials

**Part 3            Execution**

**3.1                GRADE PREPARATION**

- .1            Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2            Place fill in maximum 150 mm layers and compact to at least 95% of maximum dry density to ASTM D698.

**3.2                GRANULAR BASE**

- .1            Place granular base material to lines, widths, and depths as indicated.
- .2            Compact granular base in maximum 150 mm layers to at least 95% of maximum density to ASTM D698.

### **3.3 CONCRETE**

- .1 Obtain Engineer's approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging with 10 mm radius edging tool.

### **3.4 EXPANSION AND CONTRACTION JOINTS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals according to OPSD's.
- .2 Install expansion joints at intervals of 6 m.

### **3.5 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound.
- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

### **3.6 BACKFILL**

- .1 Allow concrete to cure for 5 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Engineer.
  - .1 Compact and shape to required contours.

### **3.7 CLEANING**

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

**END OF SECTION**

Approved: 2009-12-31

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            [    ].

**1.2                REFERENCES**

- .1            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-1.5-[99], Low Flash Petroleum Spirits Thinner.
  - .2            CAN/CGSB 1.74-[01], Alkyde Traffic Paint.

**1.3                CLOSEOUT SUBMITTALS**

- .1            Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2            Operations and Maintenance Data: submit information on materials relative to work of this Section for inclusion in operations and maintenance manual

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Paint:
  - .1            To MPI -EXT 2.1B, Alkyd zone/traffic marking.
  - .2            Paints: in accordance with MPI recommendation for surface conditions.
  - .3            Colour: to MPI listed, yellow.
- .2            Thinner: to MPI listed manufacturer.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions have been rectified.

**3.2 EQUIPMENT REQUIREMENTS**

- .1 Paint applicator: approved pressure type [mobile] with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.

**3.3 APPLICATION**

- .1 Pavement markings: Lay out pavement markings.
- .2 Unless otherwise approved by Consultant, apply paint only when air temperature is above 10 degrees C, wind speed is less than 30 km/h and no rain is forecast within next 4 hours.
- .3 Paint lines: of uniform colour and density with sharp edges.
- .4 Thoroughly clean distributor tank before refilling with paint of different colour.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.5 PROTECTION OF COMPLETED WORK**

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

**END OF SECTION**

Approved: 2006-09-30

**Part 1            General**

**Part 2            Products**

**2.1                TOPSOIL**

- .1      Topsoil for seeded areas : mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1      Contain no toxic elements or growth inhibiting materials.
  - .2      Finished surface free from:
    - .1      Debris and stones over 50 mm diameter.
    - .2      Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .3      Consistence: friable when moist.

**2.2                SOIL AMENDMENTS**

- .1      Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

**Part 3            Execution**

**3.1                TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1      Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2      Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3      Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2                STRIPPING OF TOPSOIL**

- .1      Begin topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.
- .2      Strip topsoil to depths as discovered.
  - .1      Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3      Stockpile in locations as directed by Engineer.

- .1 Stockpile height not to exceed 2 m.
- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.
- .5 Protect stockpiles from contamination and compaction.

### **3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Engineer and do not commence work until instructed by Engineer.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
  - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  - .2 Remove debris which protrudes more than 75 mm above surface.
  - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
  - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Spread topsoil in uniform layers not exceeding 150 mm.
- .2 For sodded areas keep topsoil 15 mm below finished grade.
- .3 Spread topsoil to following minimum depths after settlement.
  - .1 135mm for sodded areas.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment.
  - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

### **3.6 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required off site.

**3.7 CLEANING**

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

**END OF SECTION**



Approved: 2011-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section [\_\_\_\_].

**1.2                MEASUREMENT AND PAYMENT**

- .1        Payment for seeding will be made at unit price bid per square metre of actual surface measurements taken and computed by Consultant. Areas of blending into existing turf grass will not be measured for payment.

**1.3                REFERENCES**

- .1        Canada Green Building Council (CaGBC)
  - .1        LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
  - .2        LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for seed, and fertilizer.
  - .2        Submit 2 copies of WHMIS MSDS in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures].
- .3        Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements:
  - .1        Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
  - .2        Fertilizer must be dry.
- .3        Storage and Handling Requirements:

- .1 Store fertilizer off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

## **1.6 WARRANTY**

- .1 For seeding, 12 months warranty period is extended to 1 full growing season.
- .2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, 1 full growing season.
- .3 End-of-warranty inspection will be conducted by Consultant.

## **Part 2 Products**

### **2.1 GRASS SEED**

- .1 Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
  - .1 Grass seed mixture
    - .1 Mixture composition:
      - .1 52% Creeping Red Fescue.
      - .2 10% Kentucky Bluegrass
      - .3 35% Perennial Ryegrass
      - .4 3% White Clover
  - .2 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.
  - .3 Free of impurities that would inhibit germination and growth.
  - .4 Water for required irrigation will be supplied by the contractor.

### **2.2 FERTILIZER**

- .1 To Canada "Fertilizers Act" and Regulations.
- .2 Complete synthetic fertilizer with guaranteed minimum analysis as specified.

## **Part 3 Execution**

### **3.1 SEED BED PREPARATION**

- .1 Do not perform work under adverse field conditions as determined by Consultant.
- .2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .3 Verify that grades are correct. If discrepancies occur, notify Consultant and commence work when instructed by Consultant.
- .4 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated to tolerance of plus or minus 15 mm, surface draining naturally.
- .5 Cultivate fine graded surface approved by Consultant] to 25 mm depth immediately prior to seeding.

### **3.2 SEED PLACEMENT**

- .1 For mechanical seeding:
  - .1 Mechanical landscape drill seeder ("Brillion" type or equivalent) which accurately places seed at specified depth and rate and rolls in single operation.
- .2 For manual seeding:
  - .1 Use manually operated drop seeder ("Cyclone" type or equivalent).
  - .2 Use manually operated, water ballast, landscaping type, smooth steel drum roller.
- .3 Blend applications 150 mm into adjacent grass areas to form uniform surfaces.
- .4 Sow half of required amount of seed in one direction and remainder at right angles as applicable.
- .5 Incorporate seed by light raking in cross directions.
- .6 Consolidate mechanically seeded areas by rolling area if soil conditions warrant or if directed by Consultant with equipment approved by Consultant immediately after seeding.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Consultant.

### **3.4 PROTECTION**

- .1 Erect plastic snow fence around newly seeded areas sufficient to protect against deterioration due to pedestrian or other traffic.

### **3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of seed application until acceptance by Consultant:
  - .1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
  - .2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
  - .3 Adjust protection barrier as necessary to protect against deterioration due to pedestrian or other traffic as needed.

### **3.6 FINAL ACCEPTANCE**

- .1 Seeded areas will be accepted by Consultant provided that:
  - .1 Areas are uniformly established free of rutted, eroded, bare or dead spots and extent of weeds apparent in grass is acceptable.
- .2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

### **3.7 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period.
  - .1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.
  - .2 Repair and reseed dead or bare spots to satisfaction of Consultant.

**END OF SECTION**

Approved: 2011-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section [\_\_\_\_\_].

**1.2                REFERENCES**

- .1            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2            CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .2            CSA International
  - .1            CAN/CSA G401, Corrugated Steel Pipe Products.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials in accordance with manufacturer's recommendations.
  - .2            Store and protect pipes from damage.
  - .3            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                CORRUGATED STEEL PIPE**

- .1            Corrugated steel pipe: to CAN/CSA-G401.

**2.2                GRANULAR BEDDING [AND BACKFILL]**

- .1            Granular bedding and backfill material to OPSS and following requirements:
  - .1            Crushed pit run or screened stone, gravel or sand.
  - .2            Gradations to be within limits specified when tested to OPSS

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe culvert installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.3 TRENCHING**

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**3.4 BEDDING**

- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 Place 200 mm minimum thickness of granular A material on bottom of excavation and compact to 95% minimum SPDD.
- .3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding, free from sags or high points.
- .4 Place bedding in unfrozen condition.

**3.5 LAYING CORRUGATED STEEL PIPE CULVERTS**

- .1 Begin pipe placing at downstream end.
- .2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.
- .3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
- .4 Lay paved invert or partially lined pipe with longitudinal centre line of paved segment coinciding with flow line.

### **3.6 JOINTS: CORRUGATED STEEL CULVERTS**

- .1 Corrugated steel pipe:
  - .1 Match corrugations or indentations of coupler with pipe sections before tightening.
  - .2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.
  - .3 Insert and tighten bolts.
  - .4 Repair spots where damage has occurred to spelter coating.

### **3.7 BACKFILLING**

- .1 Backfill around and over culverts as indicated or as directed by Consultant.
- .2 Place granular backfill material in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .3 Compact each layer to 95% SPDD taking special care to obtain required density under haunches.
- .4 Place backfill in unfrozen condition.

### **3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**