SPECIFICATIONS

for

City of Niagara Falls
Municipal Service Centre Renovation

3200 Stanley Ave, Niagara Falls, ON L2E 6S4

March 17th, 2021

1100 South Service Rd., Suite #417
Stoney Creek, ON L8E 0C5

THE CORPORATION OF THE CITY OF NIAGARA FALLS

REQUEST FOR TENDER – CONTRACTOR SERVICES

RFT12-2021
CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

CLOSING DATE: Wednesday, April 14, 2021 at 1:45 p.m. local time

PART A

Instructions to Bidders

Pre-Qualified Bidders are invited to submit their bid for the **City of Niagara Falls Municipal Service Centre Renovation** all in accordance with this Request for Tender - Contractor Services. This RFT is posted on the City of Niagara Falls website at www.niagarafalls.ca/bids.

Only Pre-Qualified Bidders are eligible to submit a bid for the City of Niagara Falls Municipal Service Centre Renovation. The Pre-qualified Bidders list is posted on the City of Niagara Falls website at www.niagarafalls.ca/bids under RFPQ33-2020. Pre-qualified Bidders received a Pre-Qualification Notice of their pre-qualification for this project.

Mandatory Site Meeting Pre-Qualified Bidders

The purpose of this Mandatory Site Meeting is for Pre-Qualified Bidders to become fully aware of the conditions which shall be met in performing the work. In submitting a Tender, the Pre-Qualified Bidder acknowledges that they have satisfied themself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labour, water, electric power, roads, physical conditions at the site, ground conditions and contours and the character of equipment and facilities needed during the prosecution of the Work.

Questions **will not** be answered at this meeting. All questions need to be sent via email as per instructions in the following section.

Attendance is mandatory and attendance will be taken promptly at the scheduled meeting time. Individuals will be asked to line up and state their name and the organization they belong to, which will be recorded by a Procurement Division representative.

Due to the pandemic, the City will be holding three (3) separate mandatory site meetings to accommodate current restrictions. Pre-Qualified Bidders have been sent notification of their prescribed meeting times, to be held on **Wednesday, March 24, 2021**. Bidders shall meet in the front of the public entrance of the existing building. **Only one (1) representative from the Pre-Qualified Bidder's company shall be permitted access. Sub-contractors will not be permitted to attend.**

Attendees **must**:

- Maintain a two (2) meter distance with others.
- Be in accordance with the Niagara Region's Face Covering By-Law, a face covering (supplied by the Bidder) must be worn by all individuals while inside buildings, below is a link to the Niagara Region's Face Covering By-Law: https://www.niagararegion.ca/health/covid-19/mask-bylaw.aspx
- Wear a high visibility safety vest (supplied by the Bidder)
- Wear safety boots or shoes that have a CSA Green triangle (supplied by the Bidder)
- Wear a hard hat (supplied by the Bidder)

INSTRUCTIONS TO BIDDERS

- Complete the COVID Screening questionnaire on the day of the prescribed site meeting, prior to entering the facility. The screening portal is available at: https://surveys.niagarafalls.ca/s3/Self-Screening-Assessment-Tool-v2. Pre-qualified Bidders are to complete the online screening. Appendix D – COVID Screening Questions are available for reference only. Hard copies of the screening will not be accepted at the meeting.
  * If an attendee answered yes to any of these questions, to prevent the potential spread of COVID-19 and/or other illnesses, that attendee **will not** be permitted to enter the building at this time.

Questions Regarding this RFT
Questions regarding this RFT must be submitted in writing only to Jessica Curno, Procurement Agent, e-mail jcurno@niagarafalls.ca no later than **Tuesday, March 30, 2021 at 2:00 p.m. local time.**

Questions received later than this stated time and date may not be acknowledged or answered.

Addenda
All addenda to this RFT will be posted on the City's Bid Opportunities webpage: www.niagarafalls.ca/bids. It is the Bidder's sole responsibility to check this webpage to avail themselves of any posted addenda. Tenders submitted that do not include the first page, completed and signed, of all posted addenda will be rejected.

Addenda will not be posted until after the date for questions has closed. The deadline for addenda issuance will be **Wednesday, April 7th, 2021 at 2:00 p.m.** If the City determines that it is necessary to issue an addendum after the deadline, the City may extend the submission deadline.

Tender Submission
All Bidders must submit **(one) 1 submission**, sealed in envelopes using the attached mailing labels and submitted to the Municipal Service Centre, 3200 Stanley Avenue by **Wednesday, April 14, 2021 at 1:45 p.m. local standard time** (hereinafter referred to as the "closing time").

THE CORPORATION OF THE CITY OF NIAGARA FALLS
REQUEST FOR TENDER – CONTRACTOR SERVICES
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INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

THE CORPORATION OF THE CITY OF NIAGARA FALLS
REQUEST FOR TENDER – CONTRACTOR SERVICES
RFT12-2021
CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

INSTRUCTIONS TO BIDDERS

1. **Definitions**
   Throughout this Request for Tender – Contractor Services, unless inconsistent with the subject matter or context:
   a) City and Owner shall mean The Corporation of the City of Niagara Falls.
   b) Lead Consultant shall mean **ARC Engineering Inc.**
   c) RFT and Request for Tender shall mean the Request for Tender issued by The Corporation of the City of Niagara Falls.
   d) The word Tender and shall mean the Tender received from the Bidder by the City, in response to the RFT.
   e) The word Contractor shall mean the successful Bidder.
   f) The word Contract shall refer to the Contract Agreement executed by the City and the successful Bidder. (except for the title CCDC 2 Stipulated Price Contract 2008).

2. **Named Parties**
   For the purposes of this Request for Tender (RFT) the following parties are identified:

   Owner: The Corporation of the City of Niagara Falls, the "City"
   City's Contract Administrator: Jim Huppunen, Facility Project Manager
   Lead Consultant: Art Rebek, ARC Engineering Inc.
   Architect: Emilio Raimondo, Raimondo + Associates Inc.
   Electrical: Keith Seguin, Sequin Engineering Inc.
   Structural: Al Antonio, ACA Engineering Services Ltd.
   Environmental: Shayne Chesney, Ontario Environmental Safety Network

   Contact for Inquiries: Jessica Curno, Procurement Agent, e-mail jcurno@niagarafalls.ca

3. **Additional Insured**
   The following parties are identified to be included as additional insured for this project:

   The Corporation of the City of Niagara Falls
   ARC Engineering Inc.
   Raimondo + Associates Inc.
   Seguin Engineering Inc.
   ACA Engineering Services Ltd.
   Ontario Environmental Safety Network

TENDER SUBMISSION PROCEDURE

The following policy regarding the submission of Tenders will be applicable for this project. Bidders are requested to adhere strictly to the instructions concerning submission.

1. Tenders should include all required pages and must be signed by the Bidder, in ink, where stated on Appendix A: Form of Tender page (s) and on any other pages so stated.

INSTRUCTIONS TO BIDDERS

2. Tenders received later than the time specified will not be accepted, regardless of the postal seal date. Tenders delivered by mail or courier must have the Tender description and Tender number clearly stated on the exterior of the envelope or package. The City assumes no responsibility for the Tenders delivered by mail or courier.

3. Tenders shall be submitted in the two envelopes using the attached labels for Tender envelopes, as follows:

   a) The first envelope (smaller white envelope) shall contain:

      Appendix B - Agreement to Bond, duly signed and sealed (no copies or facsimiles will be accepted). "Agreement to Bond" must be on the form provided as *Appendix B*. The City will accept the Surety providers Agreement to Bond as long as it meets the requirements of Appendix B and is an original duly signed and sealed.

      Tender deposit in the form of a certified cheque or Bid Bond in the amount of **$150,000.00** is required. The Form of Bid Bond that is acceptable is a Bid Bond using CCDC220 or the same format and content as in CCDC220 or other form used by a Surety Company, authorized by Law to do Business in the Province of Ontario, and acceptable to the Owner. The Bid Bond shall be valid for a minimum of the acceptance period stated in the Tender document.

   b) The second envelope shall contain submissions which must be in the following sequence:

      1) Appendix A: Form of Tender
      2) Addenda issued (if any)
      3) Appendix C: Sub-Contractor Form
      4) Certificate of Insurance - Contractor
      5) Contractor Safety Program Checklist
      6) WSIB Certificate

      Please note that the RFT specifications shall not be included in the second envelope. In the event the first envelope does not contain the proper documents the second will not be opened.

4. The following Documents shall form this Contract as noted on Appendix A – Form of Tender.

   i) **PART A** – Instructions to Bidders - pages 1 to 22

   ii) **PART B** – Stipulated Price Contract CCDC 2 2008 - pages 1 to 30
   (not part of this document)

   - This Contract utilizes the Standard Construction Document CCDC 2 2008. Also the various sections of this RFT take precedence over the CCDC 2 2008 document. As the Standard Construction CCDC 2 2008 is under copyright, Contractors must obtain their own copy from a local Construction Association Office.

iii) **PART C** - Supplementary Conditions to CCDC 2 Stipulated Price Contract, 2008 - pages 1 to 58

iv) Addenda, issued during the Tendering period.

v) Appendices A, B, C and D

vi) Certificate of Insurance – Contractor

vii) WSIB

viii) Drawings

ix) Specifications

5. **Tender Deposit**

a) Tender submissions shall be accompanied by a deposit in the form of a certified or Bid Bond in the amount as specified under section 3(a), made payable to "The Corporation of the City of Niagara Falls". The Form of Bid Bond that is acceptable is a Bid Bond using CCDC220 or the same format and content as in CCDC220 or other form used by a Surety Company, authorized by Law to do Business in the Province of Ontario, and acceptable to the Owner. The Bid Bond shall be valid for a minimum of the acceptance period stated in the Tender document.

Bid Bond Tender Deposit:

Bid Bonds will not be returned as they expire at the end of the acceptance period stated in the Tender document. Bidders are particularly requested to note that No Interest shall be paid for the Tender deposits required and retained by the City in Connection with this tendering procedure.

6. **Agreement to Bond**

Bidders shall include with their Tender submission Appendix C: Agreement to Bond form attached to this RFT, indicating that a Bonding Company licensed in the Province of Ontario undertakes and consents to issue a Performance Bond and a Labour and Material Payment Bond in favour of the City upon the awarding of the Contract. The said Bonds deposited with the City shall be held by the City to secure the due performance and observance of the Contract and the payment of all creditors as required by the Contract.

BIDDER REQUIREMENTS

1. **Notification of Potential Bidders Not Guaranteed**

The City posts notification of all RFT and other opportunities on its Internet webpage www.niagarafalls.ca/bids. Bidders are to review this webpage to inform themselves of any requests for Tenders, etc. The City shall not guarantee that previous successful Bidders or

INSTRUCTIONS TO BIDDERS

any potential Bidders shall be notified by any means electronic or otherwise of any RFT or other opportunity. It is the responsibility of any potential Bidder to check this Web Page to avail themselves of any RFT or other opportunity.

2. **Questions Regarding Possible Discrepancies**
If a Bidder finds discrepancies, ambiguities or omissions in the Contract Documents, or should be in doubt as to their meaning, he shall notify the Owner at once, who will have prepared and posted on the website a written addendum to all Bidders. All addenda are to be incorporated in the Tender and will be become part of the Contract. Neither the Owner nor the additional insured will be responsible for any other explanations or interpretations of the proposed Contract Documents.

3. **Tender Submission and Correspondence in English**
Tender must be prepared in English and Bidders must be able to converse and correspond fluently in English directly or through an interpreter supplied by and at the total cost to the Bidder.

4. **Form of Tender Pages – Appendix A**
   a) Bidders must complete all required spaces and sign where indicated on the Appendix A: Form of Tender.
   b) Bidders must attach all required documents to the Appendix A: Form of Tender pages.
   c) The Appendix A: Form of Tender pages must be signed by an Officer of the Bidder's Company who has authority to bind the Company.
   d) All taxes to be extra to the unit prices stated on the Form of Tender.
   e) By submitting a Tender in response to this RFT, the Bidder thereby acknowledges that offers contained within its Tender shall be irrevocable and remain open for acceptance by the City for a period of not less than ninety (90) days from the closing date and time specified in this RFT.

5. **Adherence to Requirements**
The Bidder is requested to adhere strictly to all requirements and complete all sections of this RFT including all appendices and addendums. Failure to do so may be sufficient cause for rejection of the Tender submission.

6. **Liability for Errors**
While the City has used considerable efforts to ensure an accurate representation of information in this RFT, the information contained in this RFT is supplied solely as a guideline for Bidders. The information is not guaranteed or warranted to be accurate by the City, nor is it necessarily comprehensive or exhaustive. Nothing in this RFT is intended to relieve Bidders from forming their own opinions and conclusions with respect to the matters addressed in this RFT.

7. **Collusion**
By submitting a Tender, a Bidder certifies that the Tender has been prepared independently and without collusion with any other Bidder.

8. **Conflicts of Interest**
   a) In its Proposal, the Bidder must disclose to the City any potential conflict of interest

that might compromise the performance of the service. If such a conflict of interest does exist, the City may, at its discretion, refuse to consider the said Proposal.

b) The Bidder must also disclose whether it is aware of any City employee, City Council member or member of a City agency, or commission thereof, having a financial interest in the Bidder and the nature of that interest. If such an interest exists or arises during the award of the City may, as its discretion, refuse to consider the Bidder's submission or withhold the awarding of any Contract to the Bidder until the matter is resolved to the City's sole satisfaction.

9. **Anti-Lobbying Restrictions and Required Disclosure**

a) Bidders, their company staff members, or anyone involved in preparing their Tender submission must not engage in any form of political or other lobbying whatsoever with respect to this project or seek to influence the outcome of the RFT and subsequent procurement process. This anti-lobbying restriction extends to all City Staff and elected Council members of the City.

b) In the event of any such lobbying, the City shall reject any Tender submission by that Bidder without further consideration and terminate that Bidder's right to continue in the RFT and any subsequent procurement process. All correspondence or contact by interested parties with the City must be directly and only with the Contact for Inquires identified in this RFT. It should be duly noted by all Bidders that this anti-lobbying restriction extends from the release date of this RFT through to the date and time when the City formally awards the Contract. Any lobbying undertaken during this timeframe by any Bidder or the Bidder's company staff members, or anyone involved with their Tender submission may result in immediate disqualification from the process. This anti-lobbying restriction is not meant to affect the day-to-day operations of the City, its Staff and the elected Council of the City that may necessarily include contact with potential Bidder to this RFT regarding other business.

c) This section shall not be intended to disallow any meetings, interviews or clarifications requested or authorized by the City, its authorized Staff, the City's representative for this work or their authorized designates.

10. **Bidder's Expenses**

Bidders are solely responsible for their own expenses in preparing and submitting a Tender and for subsequent meeting or negotiations with the City, if any. If the City elects to reject all Tenders received, the City will not be liable to any Bidder for any claims, whether for costs or damages incurred by the Bidder in preparing the Tender submission, loss of anticipated profit in connection with any final Contract, or any other matter whatsoever.

11. **Examination of Drawings, Specifications, and Work Site**

Bidders shall carefully examine all Contract Documents and inspect the work site in order to satisfy themselves by personal examination as to all conditions and materials affecting the Contract and as to the detailed requirements of the construction. Bidders must not rely upon any verbal confirmation or any estimate or representations, made by an officer, servant or employee of the City.

INSTRUCTIONS TO BIDDERS

12. **Erasures and Alterations**
    Any erasures, alterations or cross-outs must be initialed in ink by the Bidder. Failure to do so shall result in the rejection of Bidder's Tender submission by the City.

13. **Public Comment or Promotion of Tender Submission**
    Except for Bidder's interviews, meetings or presentations specifically authorized or arranged by the City contact person or authorized designate, neither Bidders nor their representatives shall make any public comment, respond to questions in a public forum, or carry out any activities to publicly promote or advertise their submission, or their interest or participation in the Tender and subsequent procurement processes (if any) without the City's prior written consent, which consent may be arbitrarily withheld or delayed.

14. **Adjustments to Tender Submissions After Closing Date**
    No adjustments by any Bidders to their Tender submissions will be permitted after the stated closing date for this RFT, except as otherwise provided herein.

15. **Conditional Tenders**
    Tenders which are incomplete, conditional, obscure, contain additions not called for, or contain agreements, contracts or obligations from the Tender's company or parent company, erasures, or contain alterations irregularities of any kind, shall be rejected.

16. **Unbalanced Tenders**
    Each item in the Form of Tender shall be a reasonable price for such work, as is the custom of the trade. Tenders that contain prices which appear to be so unbalanced or out of line with the custom of the trade as likely to affect adversely the interests of the City, may be rejected.

17. **Prices**
    All prices, as Tendered, are to remain in effect for the duration of the Contract. If it is deemed necessary, at the request of the Contractor and subject to approval by the City Representative, the Contract is to be extended for a period not exceeding six months; the Contractor agrees that the Contract prices shall remain in effect until completion of the Contract.

18. **Irrevocability and Firm Prices**
    Tender submissions received from Bidders are to be irrevocable and open for acceptance for a period of not less than ninety (90) days after the closing date stated in this RFT. The prices stated on the Form of Tender shall remain firm for the duration of the Contract period.

19. **Escalation Clauses**
    Tenders containing an escalation clause of any kind shall be rejected.

20. **Harmonized Sales Tax**
    The Harmonized Sales Tax shall be shown as a separate item on the Contractor Form of Tender and be included in the total Tendered price. The Harmonized Sales Tax registration number must also be shown on the Form of Tender, at the designated location, below the Bidder's signature. The Contractor will be required to pay Harmonized Sales Tax on

purchases which he/she makes under any Contract resulting from this RFT. Bidders are instructed to include this tax in the prices Tendered herein. The Contractor shall make allowances for the savings which may accrue due to the Ontario Harmonized Sales Tax and the City expects that these savings will be deducted from the dollar value of the Contract.

21. **Workplace Safety & Insurance Board Requirements**

a) The contractor must be in good standing with all the provisions of the Workplace Safety and Insurance Board (WSIB) and shall furnish the City with a **"letter in good standing"** from the WSIB prior to the start of any work. Following substantial completion of the work as determined by the City, the Contractor must furnish the City with a **"Certificate of Clearance"** from the WSIB. For work of long duration the Contractor must supply the City with a **"Certificate of Clearance"** every 90 days. Progress payments will not be paid by the City unless a valid **"Certificate of Clearance"** is supplied to the City. Final payment to the Contractor will not be made unless this certificate is received from the Contractor.

b) A Contractor who operates under an "Independent Operator Status" must supply the City with a document from the WSIB that clearly states that the WSIB has deemed that the successful Contractor is classified as an independent operator as defined under the provisions as issued by the Workplace Safety & Insurance Board. Such document shall be required for each subsequent work under this Contract and updated if the work covered under the Contract resulting from this RFT is of an intermittent nature involving the same or different types of work over a determined period of time. The successful Contractor will not be permitted to start any work under the Contract until such document is received by the City.

c) **Contractor Safety Program**
The Contractor must, if requested by the City Representative, complete the forms and requirements of the City's Contractor Safety Program. The instructions and forms of the City's Contractor Safety Program are posted on the City's Bid Opportunities webpage at www.niagarafalls.ca/bids.

22. **Workplace Safety and Insurance Board Certificate**
The successful Bidder shall obtain and submit to the City's Contractor Administrator a certificate from the Workplace Safety and Insurance Board, pursuant to the General Provisions, stating that the successful Bidder has complied with the requirements of the *Workers' Compensation Act* as of the Contract signing date. A similar certificate must be produced prior to the issuing of the Total Performance Certificate covering the Contractor's standing as of the Contract completion date.

23. **Health & Safety**

a) All work performed under a Contract resulting from this RFT must be carried out in accordance with the terms and conditions of the **OCCUPATIONAL HEALTH & SAFETY ACT, R.S.O. 1990,** as amended. The City reserves the right to obtain the Health and Safety records from the appropriate Ontario Government Ministry of the selected Contractor and may determine its selection of the successful Contractor based upon these records.

b) Pre-Start Health and Safety Review:
A Pre-Start Health and Safety Review means the production of a report as required by O. reg. 528/00 amending Section 7 of the Regulations for Industrial Establishments of the Occupational Health and Safety Act, R.S.O. 1990 as amended. When required by the City, the successful Contractor shall provide a Pre-Start Health and Safety Report.

24. **W.H.M.I.S. Requirements**
The successful Contractor must supply a supplier label and appropriate Material Safety Data Sheet under the W.H.M.I.S. legislation and Hazardous Protection Act for all controlled products to be supplied as a result of this RFT. Any controlled good supplied without appropriate data sheet and proper labeling will not be accepted and will be returned at the sole cost to the successful Contractor.

25. **Insurance Documentation**
Commercial General Liability Insurance
The Bidder shall, at their expense obtain and keep in force during the term of the Agreement, Commercial General Liability Insurance satisfactory to the City and underwritten by an insurer licensed to conduct business in the Province of Ontario. The policy shall provide coverage for Bodily Injury, Property Damage and Personal Injury and shall include but not be limited to:

a) A limit of liability of not less than $5,000,000/occurrence.
b) Add the City as an additional insured with respect to the operations of the Named Insured
c) The policy shall contain a provision for cross liability in respect of the Named Insured
d) Non-owned automobile coverage with a limit not less than $2,000,000 and shall include contractual non-owned coverage
e) Products and completed operations coverage
f) Broad Form Property Damage
g) Contractual Liability
h) The Policy shall not contain any exclusions of liability for damage to property, building or land, arising from the removal or weakening of support of any property, building or land whether such support is natural or otherwise.
i) The Policy shall be written on an “occurrence basis”. ‘Claims Made’ insurance policies will not be permitted.

Automobile Liability Insurance
The Bidder shall maintain automobile liability insurance **covering third party property damage and bodily injury liability (including accident benefits) as may be required by Applicable Laws** on all Owned and Leased Automobiles to a limit of **Two million ($2,000,000)** throughout the term of this **Agreement/Purchase Order. Five million ($5,000,000) is required if Heavy Equipment is to be used as to completed the work or project.**

Provisions
Prior to issuance of an **Agreement** and prior to the commencement of any work, the Proponent shall forward **certified Certificates of Insurance forms attached (no**

substitutes or omissions will be accepted) evidencing **the above noted** insurance with the executed Agreement. These Certificates shall state that coverage will not be suspended, voided, cancelled, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail to the City.

All policies listed above to remain in force until final acceptance of the work described herein by the City.

It is also understood and agreed that in the event of a claim any deductible or self-insured retention under this policy of insurance shall be the sole responsibility of the Contractor and that this coverage shall be primary insurance. Any insurance or self-insurance maintained by the City shall be considered excess of the Contractor's insurance.

26. **Sub-Contractors or Service Providers**
    a) The Contractor shall be solely responsible for the payment of every sub-contractor or service provider employed, engaged, or retained by it for the purpose of providing the services as described herein. The Contractor shall coordinate the services of its sub-contractors and service providers in a manner acceptable to the City, and ensure that they comply with all the relevant requirements of the said services. The Contractor shall be liable to the City for all costs or damages arising from acts, omissions, negligence or willful misconduct of its sub-contractors or service providers.

    b) The Contractor shall be responsible for its own staff resources and for the staff resources of any sub-contractors and third-party service providers. Personnel assigned by the Contractor to perform or produce the Services or any part of it may, in the sole discretion of the City, be required to sign non-disclosure agreement(s) satisfactory to the City before being permitted to perform such services.

27. **Goods and Materials Suitable for Use**
    The Bidder warrants that any goods, materials, articles or equipment to be supplied under or pursuant to any Contract resulting from this RFT, that is or are to be made or used for a particular purpose, will be fit and suitable for that purpose.

28. **New Goods and Materials Only**
    Unless otherwise stated all goods supplied as a result of this RFT shall be new only, never used, of the latest manufacture and not re-manufactured.

29. **Origin of Goods and Materials**
    Wherever possible, the goods, materials, articles or equipment, specified or called for in or under this RFT shall be of Canadian origin and manufacture.

30. **Warranties and Covenants**
    The Contractor will represent, warrant and covenant to the City, and acknowledge that any service or supply, as a result of this RFT, will be strict accordance with the functional and technical requirements set out in this RFT.

31. **Removal and Disposal**
    a) All materials as specified herein to be removed and disposed shall be removed by the

Contractor and disposed of in a manner that is satisfactory to the City. The entire job site shall be left in an orderly and appropriate condition upon the completion of the work.

b) It is the responsibility of the successful Bidder and/or their agent to ensure, where the removal of material is required that all material is disposed of in a manner that meets or exceeds all Federal, Provincial, Regional and Municipal Acts and Regulations, as amended.

32. **Coordination of Services**
The Contractor will be responsible for coordinating the response to, and involvement of, all other required services or facility suppliers, including Natural Gas, Hydro, Telephone, Water, and all other services and any related fees.

33. **Licences, Permits, Locates and Approvals**
Prior to the commencement of work the successful Bidder shall, at his own expense, be responsible for obtaining, maintaining and keeping available for inspection, all Provincial, Municipal and any other licenses, building and other permits, or approvals, necessary to permit them, their employees or company to carry out the requirements of this agreement.

34. **Compliance with Laws and Acts**
The Contractor shall comply with all Federal, Provincial and Municipal Laws, statutes, regulations and bylaws, relevant to this RFT including but not limited to:
- The Construction Act, R.S.O. 1990, c. C.30
- The Occupational Health and Safety Act, R.S.O. 1990, c. 0.1, as amended.
- Workplace Safety and Insurance Act, effective January 1, 1998, as amended
- The Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M.56, as amended.
- Highway Traffic Act, R.S.O. 1990, c. H.8, as amended
- Employment Standards Act, 2000, S.O. 2000, c. 41, as amended
- Accessibility for Ontarians with Disabilities Act (AODA) 2005. Third party contractors who deliver goods and services on behalf of the City are required to ensure they meet the legislative requirements of the AODA's Integrated Accessibility Standard, as per Ontario Regulation 191/11, Section 7.

35. **Third Party Software**
Where the City is in possession of software containing or constituting confidential proprietary information belonging to third parties, the successful Bidder shall not, except in the usual incidental manner genuinely necessary for the intended use of such software on the equipment of the City;

a) analyse, copy, decompile, disassemble, translate, convert, reverse engineer or duplicate any physical embodiment or part thereof, or permit any person to do so; or

b) divulge to any unauthorized person the ideas, concepts or techniques, or make any other improper use, of such software.

c) The successful Bidder shall fully defend, save harmless and indemnify the City from and against any loss or damages suffered by the City as a result of any failure by the

successful Bidder, its officers, directors, partners, contract personnel, agents and employees or any of them to comply with the provisions hereof.

d) Should the successful Bidder include third party components within the documents, expertise, design and any other aspect of the Tender submitted to the City, the successful Bidder must secure the rights to use and repackage third party components and pass on those rights to the City without additional charges.

e) The City will own all intellectual property rights, including (without limitation) copyright, in and to all deliverables provided by the successful Bidder and its sub-consultants.

36. **Patents, Intellectual Property Rights, Copyright, Trademarks, Technology Rights**
By submitting a Tender, the Bidder warrants that the information contained in its Tender does not infringe any Patents, intellectual property rights, Copyright, Trademarks, Technology Rights of any third party and agrees to defend The Corporation of the City of Niagara Falls at the Bidder's own expense, in all suits, actions or proceedings in which the City of Niagara Falls is made a defendant for actual or alleged infringement of any Canadian or foreign letters patent, intellectual property rights, copyright trademarks, technology rights or any other related rights to the above resulting from the City of Niagara Fall's contractual relationship with the Bidder and the Bidder's use of any or all technologies, methodologies, strategies in providing the services required herein. The Bidder further agrees to pay and discharge any and all judgments or decrees which may be rendered in any such suit, action or proceeding against the City of Niagara Falls. The Bidder agrees to indemnify and hold harmless the City of Niagara Falls from any and all license, royalty and proprietary fees or costs, including legal costs, which may arise out of the City of Niagara Fall's contractual relationship with the Bidder and the Bidder's use of any or all technologies, methodologies, strategies in providing the services required herein. It is expressly agreed by the Bidder that these covenants are irrevocable and perpetual.

37. **Freedom of Information**
Any information including all work as described in this RFT, service or product details, prices, statements, and any other information provided by the Bidder shall be kept strictly confidential and release of same, except for any details regarding this Tender document stated in a Report to the Council of the City, shall only be granted in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M.56 as amended.

38. **Omission & Mis-statements**
a) All pages of this RFT and the Contract, shall be taken together to explain each other, and to make the whole consistent; and if it be found that anything has been omitted or misstated, which is necessary for the proper performance and completion of any part of the work contemplated, the Contractor shall, at the Contractor's own expense, and without making any extra claim, therefore, execute the same as if it has been properly described, and the correction of any such omission or mis-statement shall not be deemed to be an addition to, or deviation from the works hereby contracted for; nor shall such decision or correction entitle the Contractor to any extension of time for the completion of the Contract.

INSTRUCTIONS TO BIDDERS

b) It is to be understood that the complete RFT containing all documents and drawings as posted on the City's Bid Opportunities Web Page (www.niagarafalls.ca/bids) shall constitute the RFT. Any Tenders received that have clauses or any wording or figures, statistics, numbers, quantities or any other items that have been changed or altered in any way shall be rejected and not accepted by The Corporation of the City of Niagara Falls.

39. **Withdrawal of Tender**

Bidders shall be permitted to withdraw their unopened Tender after the Tender has been delivered to the City Clerk at any time up to the official **closing time** by submitting a written request from the Bidder to the Manager of Procurement, prior to the time specified for the Tender closing. The City reserves the right to withdraw, at its discretion, this RFT at any time and shall not be liable for any expense, cost, loss or damage incurred or suffered by any Bidder as a result of such withdrawal.

40. **Agreement with Terms**

By submitting a Tender the Bidder agrees to all the terms and conditions of this RFT. Bidders who have obtained this RFT and any addenda electronically must not alter any portion of this RFT. To do so will invalidate the Tender and the Bidder's delivered Tender submission will be rejected.

41. **Waiver of Rights in Tender Submission and Indemnity**

a) Each Bidder acknowledges and agrees that the City is likely to receive, and be required to deal with, multiple Tender submissions, all of which may contain or disclose information considered by their Bidders to be of special, unique, secret or proprietary nature, and that such information and the manner in which the City may use it may be entitled or subject to protection under any of Canada's intellectual property laws, the Competition Act, Municipal Freedom of Information and Privacy Protection Act or the common law relating to unfair competition.

b) The City will not accept any Tender submission that is subject to a reservation by the Bidder of any such rights, and each Bidder, by virtue of submitting a Tender submission pursuant to this RFT, expressly waives any and all protection to which the Bidder might otherwise be entitled in respect of that Tender submission under all of the foregoing laws, and expressly releases the City and its staff, as well as the qualified Bidders from any claims, actions, suits and proceedings whatsoever for the infringement of any intellectual property right or for the use of any secret or proprietary information disclosed to the City in that Tender submission.

c) Each Bidder shall indemnify and save harmless The Corporation of the City of Niagara Falls and its staff, against all claims, actions, suits and proceedings brought by any person in respect of the infringement or alleged infringement of any patent, copyright, trademark or industrial design or the use or misuse in connection with their Tender submission, including any and all costs incurred by the City.

42. **Rights of the City**

(a) The City reserves the right, in its absolute discretion to accept a Tender which it deems most advantageous to itself and the right to reject any Tenders, in each case without

giving any notice. The lowest or any Tender will not be accepted. In no event will the City be responsible for the costs of the preparation of the submission of a Tender.

(b) Tenders which contain conditions or otherwise fail to conform to the Instructions to Bidders may be disqualified or rejected. The City may, however, in its sole discretion, reject or retain for its consideration Tenders, which are non-conforming because they do not contain the content or form required by the Instructions to Bidders or for the failure to comply with the process for submission set out in these instructions to the Bidders.

(c) Except as expressly and specifically permitted in the Instructions to Bidders, no Bidder shall have any claim for any compensation of any kind whatsoever, as a result of participating in this RFT process and by submitting a Tender each Bidder shall be deemed to have agreed that it has no claim.

43. **Rights to Tender Submission**
Upon receipt of the Bidder's Tender submission, the City shall retain the right to determine the use of the said submission for its own purposes. Bidders shall not use their Tender submission for any other purposes whatsoever, including revealing any content of their Tender submission or making copies for other agencies, firms or companies not being a legal part or division of the Bidder's company, unless permission for any such use is received in writing by the Bidder from the Corporation of the City of Niagara Falls. Bidders must make a request in writing to the City for the intended use of their Tender submission for any other purposes than as stated herein.

44. **Ownership and Disclosure of Tender Submission**
The documentation comprising any Tender submitted in response to this RFT, along with all correspondence, documentation and information provided to the City by any Bidder in connection with, or arising out of this RFT, once received by the City:

a) Shall become the sole and unfettered property of the City and may be appended to the Agreement with the Successful Bidder;

b) Shall become subject to the Municipal Freedom of Information and Protection of Privacy Act ("MFIPPA"), and may be released, pursuant to that Act.

Because of MFIPPA, prospective Bidders are advised to identify in their Tender submission any scientific, technical, commercial, proprietary or similar confidential information, the disclosure of which could cause them injury.

45. **Limitation and Waiver of Damages**
The Bidder, by submitting a Tender, agrees that it will not claim damages, for whatever reason, relating to the RFT or any resulting Contract or in respect of the competitive process. The Bidder, by submitting a Tender, also waives any claim for loss of profits if no Agreement is made between the Bidder and the City.

46. **Protection of the City**
The successful Contractor shall at all times well and truly save, defend, keep harmless and

fully indemnify the City and its servants, employees and agents, from and against all actions, suits, claims, demands, loss, costs, charges, damages and expense, brought or made against or incurred by the City, its servants, employees or agents, in any way relating to goods, materials, articles or equipment, supplied, or the supplying thereof, or work or services, performed, or the performing thereof, pursuant to this RFT, or relating to inventions, copyrights, trademarks or patents, or rights thereto, used in supplying such goods, materials, articles, equipment, or in performing such work or services or arising out of the subsequent use or operation of such goods, materials, articles, equipment or work.

47. **Confidentiality of Information**
Except as noted, all communications between the Bidders and the City regarding this RFP shall be treated as confidential, commencing the date of issuance of the RFP to and after the receipt and opening of Proposals. The City, in its sole and unfettered discretion, may at any time reject any Proposal from a Bidder without further consideration and terminate that Bidder's right to continue in the RFP process in the event of any breach of confidentiality by the Bidder.

EVALUATION AND AWARD

1. **Order of Precedence**
In the event of any inconsistency or conflict in the contents of the following documents, such documents shall take precedence and govern in the following descending order:
- Contract (in form CCDC2 2008) as issued by the City in supplementary conditions thereto.
- Addenda to the RFT (if any)
- The RFT including all appendices and attachments.
- The Bidder's submission.

2. **Reasons for Rejection of the Bidders Submission:**
a) All Appendix A: Form of Tender pages not completed and not signed by the Bidder in the stated place.
b) All required pricing and information not stated on the Appendix A: Form of Tender *pages* and any other pages of this RFT.
c) Any erasures, alterations or cross-outs must be initialed in ink by the Bidder.
d) All Addenda requirements not included.
e) The first page of all Addenda, completed and signed by the Bidder, not included.
f) All other reasons as stated in this Request For Tender – Contractor Services.

3. **Vendor Performance**
The Corporation may, in its sole discretion, reject a Tender submission if a Bidder:
a) has, at any time, threatened, commenced or engaged in legal claims or litigation against the Corporation;
b) is involved in a claim or litigation initiated by the Corporation;
c) previously provided goods or services to the Corporation in an unsatisfactory manner;
d) has failed to satisfy an outstanding debt to the Corporation;
e) has a history of illegitimate, frivolous, unreasonable or invalid claims;
f) provides incomplete, unrepresentative or unsatisfactory references; or

g) has engaged in conduct that leads the Corporation to determine that it would not be in the Corporation's best interests to accept the Tender submission.

4. **Suspension of Activity**

a) All Bidders are advised and put on notice that notwithstanding anything else contained in this RFT that all Bidders are forewarned and advised that if the City chooses not to proceed with the RFT process or any subsequent procurement process or any stage including, without limitation, the completion of the RFT process, the commencement, implementation or completion of any Tender process or other procurement process and/or the award, negotiation or the finalization of any Agreement or Contract and that accordingly, all Bidders acknowledge and agree that if any such processes are suspended, terminated or cancelled at any time or times during any stage of the RFT or subsequent procurement process (if any) by the City, then the Bidders shall have no claim against the City for any costs, expenses, losses including loss of profits, liabilities or damages whatsoever.

b) The City reserves the right to exercise complete and unfettered discretion in all aspects of the conduct of the RFT and any subsequent procurement process, the assessment and evaluation of Tender submissions, including the determination of criteria and the selection, if any, of a successful Bidder, without incurring any liability whatsoever to any Bidder, including any liability for costs, expenses, losses or damages, and without giving any reasons therefore.

c) Without limiting the generality of the foregoing, the City, in its sole and unfettered discretion, reserves the right to change the dates, schedules and deadlines set out in this RFT, or to change the scope of the project, or to cancel the RFT or the project, without stating reasons therefore and accordingly the City also reserves the right to accept or to reject any or all of the Tender submissions and the City reserves the right to proceed as, in its sole and unfettered discretion, following receipt of the Tender submissions, including, without limitation, issuing a second or more, or a modified RFT for the project or entering into contract negotiations with any Bidder.

d) The lowest priced Tender submission received will not necessarily be accepted.

e) The issuance of this RFT and the receipt of any Tender submission by any Bidder do not commit the City to award a Contract or to pay any costs incurred in the preparation of any Tender by any Bidder, or in any Bidder’s attendance at any meetings with the City.

5. **Contractor**

The Bidder shall bid on all items under the Appendix A: Form of Tender. The City Representative will deal only with the Contractor, whose name is shown in the Agreement, or his appointed Representative. This Contract, if awarded, will be awarded to only one Bidder.

6. **Inducements**

Any Bidder who offers any kind of a reward to any person having influence over the

administration of this Tender during the administration of the Tender shall have their Tender disqualified.

7. **Tender Opening Procedure and Tender Results**
To assist in the containment of COVID-19 the City has suspended all public openings. Tenders will be opened the same day that is stated for the closing of the RFT.

Unofficial results, of the Total Tender Amount (including HST), will be posted on the City's website before the end of business that day.

8. **Decision by City**
The Bidder agrees by submitting a Tender submission in response to this RFT that the City has no obligation to reveal its decision in selecting a successful Bidder.

9. **Contract Award**
No announcement concerning information about any Tender submission received by the City or about the evaluation process of the City in determining a successful Bidder (if any) will be made until a Report is issued to City Council recommending an award. Any notification of award shall be in accordance with the Municipal Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. M.56 as amended.

10. **Execution of Contract**
The successful Bidder shall be notified in writing of the acceptance of their Tender submission and shall be bound to execute the Agreement with the Corporation within two weeks of Contract award. Date of Contract award shall be taken as the date on which the successful Bidder is notified in writing of the acceptance of the Tender submission by the City.

The successful Bidder must submit the following to the City Contractor Administrator within two weeks of the Contract award:

a) A Performance Bond which complies with the requirements of the conditions of the Contract for **50%** of the Contract price. The said Performance Bond shall include maintenance of the work for a period of **one year** from the date of completion thereof.

b) A Labour and Material Payment Bond which complies with the requirements of the conditions of the Contract for **50%** of the Contract price. The said Labour and Material Payment Bond shall be in effect for a period of **one year** from the date of completion thereof.

c) (i) A certified copy of all required Insurance Policies which complies with the requirements of the Contract conditions for a minimum amount of Five Million Dollars ($5,000,000.00), including all endorsements.

(ii) A Certificate of Insurance.

d) A letter from Workplace Safety and Insurance Board certifying that the Contractor is in good standing with the Board. A "letter of good standing" must be re-submitted throughout the Contract every 90 days.

11. **Examination of Records**
The Bidder agrees that the City of Niagara Falls or any of their duly authorized representatives shall, until the expiration of three (3) years after the final payment under this Contract, have access to and the right to examine any directly pertinent books, documents and records of the Bidder involving transactions related to this Contract.

12. **Additional Requirements**
Corporation of the City of Niagara Falls reserves the right to add or delete items listed herein following award of any Contract resulting from this RFT. Unit prices stated by the Bidder shall apply.

13. **City not Employer**
The Bidder agrees that the Corporation of the City of Niagara Falls is not to be understood as the employer to any successful Contractor nor to such Contractor's personnel or staff for any work, services, or supply of any products or materials that may be awarded as a result of this RFT. Also, in accordance the *Occupational Health and Safety Act,* **the successful Contractor herewith agrees to be the "constructor" as defined under this Act.**

14. **Agreement in Writing Only**
No verbal arrangement or agreement, relating to the goods, materials, articles, equipment, work or services, specified or called for under this RFT, will be considered binding, and every notice, advice or other communication pertaining thereto, must be in writing and signed by Contact for Enquiries.

15. **Payment Schedule**
a) A payment schedule satisfactory to the City shall form part of the contract governing the required service. No fees or reimbursable expenses shall become payable to the Contractor pursuant to the Contract other than pursuant to one or more signed schedules.

b) The Contractor shall submit invoices in such detail as may be required by the City, and the City reserves the right to require further proof or documentation from the Contractor in respect of services performed or expenses incurred by the Contractor and the Contractor shall provide, without delay, such further proof or documentation.

c) Invoices must be submitted to the Accounts Payable Department, City Hall, 4310 Queen St., Niagara Falls, ON L2E 6X5.

d) If the City does not approve of the Services which are the subject of the invoice, the City shall advise the Contractor in writing of the reasons for non-approval and the Contractor shall remedy the problem at no additional cost to the City before the City shall be obliged to pay the invoice or any part of it, as the case may be.

e) The Contractor shall be solely responsible for the payment of all personnel (including without limitation sub-respondents and their respective personnel) made available by it and used for performance of any of the Services. Payments shall be made net thirty (30) days from date of receipt of invoice and completion of the services required to the complete satisfaction of the City.

f) The City shall not pay the final invoice to the Contractor for the work, services, products or materials stated in this RFT until the City is fully satisfied that all terms and conditions stated in this RFT and all work, service performed, products or materials delivered shall be deemed to have been completed, installed or delivered to the complete satisfaction of the City.

16. **Extension of Contract**
The time period duration of any Contract resulting from this RFT may be extended for a specific period, provided that both the City and the successful Contractor agree to such extension. The City may notify the successful Contractor at any time to seek an extension.

17. **Failure to Execute Contract**
Failure by the successful Bidder to execute the Agreement with the City and to deposit with the City the said Bonds, certified copies of all required Insurance Policies and a Workplace Safety and Insurance Board letter within the specified times as provided herein shall be just cause for the annulment of the Contract award and the forfeiture of the Tender deposit to the Corporation, not as a penalty, but as liquidated damages sustained.

18. **Standards and Legislation: Failure to Comply**
The successful Bidder may be required to provide written documentation that all materials proposed meet Municipal, Provincial and Federal Government standards, legislation, and laws. Also, the successful Bidder must comply with all laws, legislation, regulations, and provisions of the Federal, Provincial, Municipal Governments or any government agency as they pertain to the work described herein. Failure by the successful Bidder to comply with these laws, legislation, regulations and provisions shall be just cause for the City, at its discretion, to stop performance of the Contract resulting from this RFT, until such times as the successful Contractor complies with these laws etc.

Also, the City may, at its discretion, award the Contract to any other contractor or may re-issue the RFT. The City may assess against the Contractor any damages whatsoever as a result of failure to comply.

19. **Failure to comply with all Tender Terms**
Failure to comply with all terms, specifications, requirements, conditions and general provisions of this RFT, to the satisfaction of the City, shall be just cause for the cancellation of the Contract award. The City shall then have the right to award this contract to any other contractor or to re-issue the RFT. The City shall assess against the Contractor any damages whatsoever as a result of failure to perform. In addition, the City may, at its discretion, stop the performance of this Contract until such time as the Contractor complies with all the provisions of this Contract.

INSTRUCTIONS TO BIDDERS

20. **Termination for Convenience of the City**
The City of Niagara Falls, upon giving thirty (30) days written notice (unless a longer period is given) may terminate the Contract, in whole or in part, when it is in the best interest of the City of Niagara Falls. To the extent that the Contract is for services and is so terminated, the City shall be liable only for payment in accordance with the payment provisions of the Contract for services rendered prior to the effective date of termination.

21. **Termination**
Nothing herein shall be construed as giving the Contractor the right to perform the services contemplated under the Contract beyond the time when such services become unsatisfactory to the City of Niagara Falls; and in the event that the Contractor shall be discharged before all the services contemplated hereunder have been completed, or the services are for any reason terminated, stopped or discontinued because of the inability of the Contractor to serve under the Contract, the Contractor shall be paid only for that portion of the said services which shall have been satisfactorily completed at the time of termination.

22. **Removal from Bidders List**
The City reserves the right to remove from its list of Bidders, for an indeterminate period, the name of any Bidder who fails to execute a Contract or for unsatisfactory performance on any previous or current contract held with the City or if the Bidder is currently involved in or responsible for litigation of any kind against the City.

THE CORPORATION OF THE CITY OF NIAGARA FALLS

PART C

SUPPLEMENTARY CONDITIONS TO

CCDC 2 STIPULATED PRICE CONTRACT, 2008

Rev 1 MSC Date: 9 March 2021

Note to users:

(1) This version of the Corporation of the City of Niagara Falls Supplementary Conditions to CCDC2-2008 is only intended for use with contracts that are subject to the *Construction Act*, R.S.O. 1990, c. C.30, as amended, which came into force on July 1, 2018, and was further amended on December 6, 2018, and again on October 1, 2019. Accordingly, these supplementary conditions are only to be used where the following conditions are met:

(i) there was either:

a. no procurement process (e.g. request for quotation, request for qualifications, request for proposals, or a call for tenders) for the award of this contract; or

b. the first procurement process associated with this Project was commenced after October 1, 2019; and

(ii) the *Work* to be performed under this contract is not maintenance or general repair work, but is instead any of the following, or a combination thereof:

a. an alteration, addition or capital repair to the *Place of the Work*;
b. the construction, erection or installation at the *Place of the Work,* including the installation of industrial, mechanical, electrical or other equipment at the *Place of the Work* that is essential to the normal or intended use of the *Place of the Work*; or
c. the complete or partial demolition or removal of any building structure or works at the *Place of the Work*.

The standard Construction Document CCDC 2 Stipulated Price Contract, 2008, English version, consisting of the Agreement between the *Owner* and *Contractor*, Definitions and General Conditions are hereby made part of these *Contract Documents* with amendments and additions as follows:

AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE A-1 THE WORK

1. Delete Article A-1.3 and replace with the following:

    "1.3 commence the *Work* on May 17, 2021 and, subject to an adjustment in *Contract Time* as provided for in the *Contract Documents* and approved by the *Owner*, attain *Substantial Performance of the Work* on or before September 1, 2021 and attain *Total Completion of the Work* on or before October 1, 2021."

ARTICLE A-5 PAYMENT

2. In subparagraph A-5.1.1, delete "...in the amount certified by the *Consultant*..." and replace with "...in the amount certified by the *Owner*...".

3. Delete subparagraph A-5.1.2 in its entirety and replace it with the following:

    ".2 upon *Substantial Performance of the Work*, as certified by the *Consultant*, or the *Owner* and *Contractor* jointly, and on the 61st day after the publication of the certificate of *Substantial Performance of the Work*, there being no claims for lien registered against the title to the *Place of the Work* issued in accordance with the *Act*, pay the *Contractor* the unpaid balance of the holdback together with such *Value Added Taxes* as may be applicable to such payment, less any amount stated in the *Owner*'s *Notice of Non-Payment*, and"

4. Delete subparagraph A-5.1.3 in its entirety and replace it with the following:

    ".3 upon receipt of the final certificate for payment from the *Owner*, and on the 61st day after the date on which the *Contractor* completes the *Work*, there being no claims for lien registered against the title to the *Place of the Work*, pay the *Contractor* the unpaid balance of the *Contract Price* together with such *Value Added Taxes* as may be applicable to such payment."

5. Delete paragraph A-5.3.1. in its entirety and replace it with:

    ".1 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award by arbitration or court, interest on such unpaid amounts shall also become due and payable until payment at the prime rate of interest quoted by Scotiabank for prime business loans."

6. Add new Article A-5.4 as follows:

"5.4 The *Contractor* shall have no claim for interest on invoiced amounts which have not been certified by the *Owner*."

ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING

7. Delete the text of ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING (retaining the provision for the addresses of the *Owner*, *Contractor* and *Consultant*) and replace it with the following:

"6.1 *Notices in Writing* between the parties or between them and the *Consultant* shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier or if sent during normal business hours by e-mail during the transmission of which no indication of failure of receipt is communicated to the sender, and addressed as set out below. Such *Notices in Writing* will be deemed to be received by the addressee on the next business day if sent by e-mail after normal business hours or if sent by overnight commercial courier. Such *Notices in Writing* will be deemed to be received by the addressee on the fifth *Working Day* following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by *Notice in Writing* to the other party setting out the new address in accordance with this article. *Notices in Writing* to the *Owner* shall be delivered to the *Owner*'s Facilities Project Manager at the address below and to Legal Services at legalservices@niagarafalls.ca."

8. Add new Article A-6.2 as follows:

"6.2 Notwithstanding the provisions of Article A-6.1, documents and notices that are to be given or that may be given under the *Construction Act* shall be given in accordance with section 87 of the *Construction Act*. In accordance with Rule 16.06.1(1) of the *Rules of Civil Procedure* (Ontario), the *Owner*, *Contractor* and *Consultant* consent to receiving documents and notices given under the *Construction Act,* except written notices of lien, by email to the email addresses set out in Article A-6.1, as amended from time to time in writing, which emails shall contain the following information:

(a) The sender's name, address, telephone number, and e-mail address;

(b) The date and time of transmission; and,

(c) The name and telephone number of a person to contact in the event of a transmission problem."

ARTICLE A-9 TIME OF THE ESSENCE / LIQUIDATED DAMAGES

9. Add new **ARTICLE A-9 TIME OF THE ESSENCE/LIQUIDATED DAMAGES** as follows:

"9.1 It is agreed that one of the reasons the *Contractor* was selected by the *Owner* for this *Contract* is the *Contractor*'s representation and warranty that it will attain *Substantial Performance of the Work* within the *Contract Time* stated in Article A-1 of this *Contract*. The *Contractor* acknowledges that it has been advised by the *Owner* that it is critical to the *Owner* that *Substantial Performance of the Work* is achieved within the *Contract Time*. The *Contractor* agrees that time is of the essence in the performance of the *Contractor*'s obligations under this *Contract*.

9.2 The *Contractor* further acknowledges its understanding that the *Owner* is responsible and must account to the citizens, visitors, and partners of the City of Niagara Falls. A failure by the *Contractor* to attain *Substantial Performance of the Work* within the *Contract Time* will result in damages to the *Owner* and to citizens, visitors and partners of the City of Niagara Falls, which would be difficult or impractical to quantify but would nevertheless have a significant negative impact on the *Owner* and its ability to provide the services the *Owner* is obliged to provide to the citizens, visitors and partners of the City of Niagara Falls.

9.3 Given the significance of the requirement for the *Contractor* to achieve *Substantial Performance of the Work*, as described in Article A-10.2, the *Contractor* further agrees that, without limiting the *Owner*'s entitlement to any additional or other damages, in the event that it fails to achieve *Substantial Performance of the Work* within the *Contract Time*, the *Owner* will incur substantial damages and the extent of such damages shall be incapable or very difficult of accurate measurement. Nonetheless, the parties acknowledge that as of the effective date of this *Contract*, the amount of liquidated damages set forth in subparagraph 9.4 below represents a good faith estimate on the part of the parties as to the actual potential damages that the *Owner* would suffer because of late completion of the *Project*. It is expressly acknowledged and agreed by and between the parties that the amount of such liquidated damages does not include any penalty. Notwithstanding the foregoing, where the *Project* is delayed beyond the *Contract Time*, the *Owner* shall be entitled to (i) the liquidated damages as calculated pursuant to Article A-9.4, or (ii) in the event that the *Contractor* claims that this liquidated damages provision is invalid or unenforceable and the *Contractor* prevails on such a defence, the damages arising from the delay

suffered by the *Owner* including, without limitation, consequential, special, incidental, and indirect damages, costs and other expenses incurred or suffered by the *Owner*.

9.4 The *Owner* shall require that the *Contractor* pay to the *Owner* (or have deducted from *Contract* payments) liquidated damages at the per diem rate of One Thousand Dollars ($1,000) for each calendar day of delay beyond the prescribed date for *Substantial Performance of the Work* until *Substantial Performance of the Work* is achieved and certified, pursuant to the terms of the *Contract*.

9.5 Liquidated damages will be assessed as incurred and reflected as deductions from amounts that may be due under any applications for payment pending at the time that such liquidated damages are assessed. All liquidated damages not deducted from payments prior to final payment shall be deducted from the final payment to be made by the *Owner* to the *Contractor* pursuant to GC 5.7 FINAL PAYMENT, and any amount of liquidated damages in excess of the final payment amount, shall be paid by the *Contractor* to the Owner, within 30 days following a written demand by the *Owner* for such payment.

9.6 The liquidated damages payable under this paragraph are in addition to and without prejudice to any other remedy, action or any other alternative claim that may be available to the *Owner*."

DEFINITIONS

10. **Definition 4. Consultant**

Add at the end of the definition:

The *Consultant* may be an employee of the *Owner* or the Engineer and/or Architect referenced in the *Contract Documents*. For this *Contract*, the *Consultant* will be ARC Engineering Inc. and the *Consultant's* representative will be Howard Roberts.

11. **Definition 20. Substantial Performance of the Work**

Delete the definition for *Substantial Performance of the Work* and replace it with the following:

"*Substantial Performance of the Work* means:

(a) has satisfied the requirements for being substantially performed in accordance with Section 2(1) and Section 2(2) of the *Construction Act*,

provided that, for the purposes of Section 2(2) of the *Construction Act*, interruption of *Work* caused by the winter season shall not be interpreted to mean that the *Work* cannot be completed expeditiously; and

(b) for the purposes of Section 2(2), the *Work* shall not be considered "ready for use" until the following requirements have been met:

.1 the complete system has been in trouble free operation for a period of not less than 14 consecutive days, uninterrupted;

.2 all operating manuals have been submitted to the *Owner*; and

.3 instructions and/or training, if applicable, have been provided to the *Owner's* staff to enable the *Owner* to operate the facility."

12. **Definition 25. Work**

Delete the definition of *Work* and replace it with the following:

"*Work* means all labour, material, *products*, articles, fixtures, services, supplies and acts required to be done, furnished or performed by the *Contract Documents*, including those that can reasonably be inferred from or is incidental to same based on the judgment of a good, competent, and experienced *Contractor*."

13. **Definition 26. Working Day**

Add the following to the definition:

The term "Business Day" shall be understood to have the same meaning as *Working Day*, except that Business Days shall also exclude designated holidays recognized by the *Owner*.

14. **Definition 27. Construction Act**

Add new Definition 27 for the *Construction Act* as follows:

"**27. Construction Act**

Construction Act shall mean the *Construction Act*, R.S.O. 1990, c. C.30, as amended, and all regulations passed under it that are enforceable as of the date of execution of this *Contract*. For certainty, the first procurement process for the *Project* (*i.e.* the "improvement" as that term is defined in the *Construction Act*) was commenced on or after October 1, 2019."

15. **Definition 28. Adjudication**

Add new Definition 28 for *Adjudication* as follows:

"**28. Adjudication**

Adjudication means construction dispute interim adjudication as defined under the *Construction Act*."

16. **Definition 29. 'Construction Schedule' or 'construction schedule'**

Add new Definition 29 for *Construction Schedule* or 'construction schedule' as follows:

"**29. Construction Schedule or 'construction schedule'**

Construction Schedule or 'construction schedule' means the schedule referred to in GC 3.5.1.1."

17. **Definition 30. Final Pre-Invoice Submission Meeting**

Add new Definition 30 for *Final Pre-Invoice Submission Meeting* as follows:

"**30. Final Pre-Invoice Submission Meeting**

Final Pre-Invoice Submission Meeting has the meaning given to it in GC 5.7.2."

18. **Definition 31. Force Majeure**

Add new Definition 31 for *Force Majeure* as follows:

"**31. Force Majeure**

Force Majeure means any cause, beyond the reasonable control of the affected party, other than bankruptcy or insolvency, which prevents the performance by a party of any of its obligations under the *Contract* and the event of *Force Majeure* did not arise from a party's default or active commission or omission and could not be avoided or mitigated by the exercise of reasonable effort or foresight. *Force Majeure* includes labour disputes unrelated to a contractor's association or union to which the *Contractor* is a member or to which the *Contract* is otherwise bound, fire, unusual delay by common carriers or unavoidable casualties, civil disturbance, acts, orders, decrees, legislation, regulations or directives of any government or other public authority, acts of a public enemy, war, riot, sabotage, blockage embargo, lightning, earthquake, abnormal weather, declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19) or acts of God."

19. **Definition 32. Intellectual Property**

Add new Definition 32 for *Intellectual Property* as follows:

"**32. Intellectual Property**

Intellectual Property means all domestic and foreign intellectual property rights including, without limitation: (i) patents, applications for patents and reissues, divisions, continuations, renewals, extensions and continuations-in-part of patents or patent applications, (ii) copyrights, copyright registrations and applications for copyright registration and all related rights and including all moral rights, (iii) mask works, mask work registrations and applications for mask work registrations, (iv) designs, design registrations, design registration applications and integrated circuit topographies, (v) trade names, business names, corporate names, domain names, website names and world wide web addresses, common law trade-marks, trade-mark registrations, trade mark applications, trade dress and logos, and the goodwill associated with any of the foregoing, (vi) trade secrets, proprietary information, know-how, technology, inventions, processes, discoveries, data, including computer data, business ideas, drawings, and specifications, and (vii) the right to commence legal proceedings with respect to the past or present infringement of the foregoing, including the right to recover all damages and profits, as provided for herein."

20. **Definition 33. Notice of Non-Payment**

Add new Definition 33 for *Notice of Non-Payment* as follows:

"**33. Notice of Non-Payment**

Notice of Non-Payment means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under the *Construction Act*, as applicable to the circumstances."

21. **Definition 34. OHSA**

Add new Definition 34 for *OHSA* as follows:

"**34. OHSA**

OHSA means the *Occupational Health and Safety Act*, R.S.O, 1990, c. O.1, as amended, including all regulations thereto."

22. **Definition 35. Payment Period**

Add new Definition 35 for *Payment Period* as follows:

"**35. Payment Period**

Payment Period means the fixed segments of time determined by the *Owner* and the *Contractor*, at the first pre-construction meeting, for which the *Contractor* shall be entitled to claim payment for *Work* performed during such period. In the event that the *Owner* and the *Contractor* do not fix the segment of time for each *Payment Period* at the first pre-construction meeting, then the *Payment Period* shall be a one (1) month period during which work was performed, with the start and end dates of the *Payment Period* deemed to be the first (1st) calendar day of the month and the last calendar day of the month, respectively."

23. **Definition 36. Pre-Invoice Submission Meeting**

Add new Definition 36 for *Pre-Invoice Submission Meeting* as follows:

"**36. Pre-Invoice Submission Meeting**

Pre-Invoice Submission Meeting has the meaning given to it in GC 5.2.1."

24. **Definition 37. Proper Invoice**

Add new Definition 37 for *Proper Invoice* as follows:

"**37. Proper Invoice**

Proper Invoice means a "proper invoice" as that term is defined in Section 6.1 of the *Construction Act*, with the minimum requirements set out in Exhibit "1" to these Supplementary Conditions."

25. **Definition 38. Proper Invoice Submission Date**

Add new Definition 38 for *Proper Invoice Submission Date* as follows:

"**38. Proper Invoice Submission Date**

Proper Invoice Submission Date has the meaning given to it in GC 5.2.2."

26. **Definition 39. Restricted Period (Adjudication)**

Add new Definition 39 for *Restricted Period (Adjudication)* as follows:

"**39. Restricted Period (Adjudication)**

Restricted Period (Adjudication) means the (inclusive) period of time between November 15 in one calendar year to January 2, in the next calendar year, of any given year throughout the duration of the *Contract*."

27. **Definition 40. Restricted Period (Proper Invoice)**

Add new Definition 40 for *Restricted Period (Proper Invoice)* as follows:

"**40. Restricted Period (Proper Invoice)**

Restricted Period (Proper Invoice) means the (inclusive period of time between December 10 to December 28 in any given year throughout the duration of the *Contract*."

28. **Definition 41. Request for Information**

Add new Definition 41 for *Request for Information* as follows:

"**41. Request for Information**

Request for Information or *RFI* means written documentation sent by the *Contractor* to the *Owner* or to the *Owner's* representative or to the *Consultant* requesting written clarification(s) and/or interpretation(s) of the *Drawings* and/or *Specifications*, *Contract* requirements and/or other pertinent information required to complete the *Work* of the *Contract* without applying for a change or changes to the *Work*."

29. **Definition 42. Total Completion of the Work**

Add new Definition 42 for *Total Completion of the Work* as follows:

"**42. Total Completion of the Work**

Total Completion of the Work means that the *Work* performed under the *Contract* has passed all required inspections and testing to the satisfaction of the *Owner* and has satisfied the requirements for deemed completion in accordance with Section 2(3) of the *Construction Act*."

30. **Definition 43. Warranty Holdback**

Add new Definition 43 for *Warranty Holdback* as follows:

"**43. Warranty Holdback**

Warranty Holdback has the meaning given to it under GC 12.3.7."

31. **Definition 44. Warranty Period**

Add new Definition 44 for *Warranty Period* as follows:

"**44. Warranty Period**

Warranty Period has the meaning given to it under GC 12.3.4."

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS

32. Add the following to the end of GC 1.1.6:

"Neither the organization nor the arrangement of the *Contract Documents* shall oblige the *Consultant* or the *Owner* to settle disputes among the *Subcontractors* and *Suppliers* regarding the limits of responsibility."

33. Add the following to the end of GC 1.1.7:

"The *Drawings* are, in part, diagrammatic and are intended to convey the scope of the *Work* and indicate general and appropriate locations, arrangement and sizes of fixtures, equipment and outlets. The *Contractor* shall obtain more accurate information about the locations, arrangement and sizes from studying and coordination of the *Drawings* and shall become familiar with conditions and spaces affecting these matters before proceeding with the *Work*. Where site conditions require minor changes in indicated locations and arrangements, the *Contractor* shall make such changes at no additional cost to the *Owner*."

34. Delete GC 1.1.7.1 in its entirety and replace it with the following:

"1.1.7.1 the order of priority of documents, from highest to lowest, shall be:

- Project Specific Supplementary Provisions to CCDC 2, if any
- Supplementary Conditions to CCDC 2

- Agreement between the Owner and the Contractor
- Definitions
- General Conditions
- *Contractor*'s Submission
- Technical Specifications
- Working Blocks
- *Drawings*"

35. Delete GC 1.1.8 in its entirety and replace with the following:

"1.1.8 The *Owner* shall provide the *Contractor*, without charge, an electronic version of the *Drawings* and *Specifications* to perform the *Work*. Should the *Contractor* require hardcopies, they may be obtained at the *Contractor's* expense from the *Owner*."

36. Delete GC 1.1.9 in its entirety and replace it with the following:

"1.1.9 The *Intellectual Property* in the *Specifications, Drawings*, models and copies thereof furnished by the *Consultant* are owned by the *Consultant* or the *Owner* depending on the contractual rights between the *Owner* and the *Consultant,* with the exception of the signed *Contract* sets, which shall belong to each party to the *Contract*. All *Specifications, Drawings* and models furnished by the *Consultant* are to be used by the *Contractor* only with respect to the *Work* and are not to be used for or on other projects. These *Specifications, Drawings* and models are not to be copied or altered in any manner by the *Contractor* with the written authorization of the *Consultan*t or the *Owner* depending on the contractual rights between the *Owner* and *Consultant*."

37. Add a GC 1.1.11 as follows:

"1.1.11 One set of signed *Contract Documents* shall be retained by each of the *Owner* and the *Contractor*."

38. Add a new GC 1.1.12 as follows:

"1.1.12 If an item is shown on one document, and it can be reasonably inferred that it was intended to include work not shown on other related documents, the *Contract Price* shall nevertheless include for the cost of that item of work, unless the *Owner* agrees otherwise."

39. Add a new GC 1.1.13 as follows:

"1.1.13 Wherever in the *Contract* a provision is made for the giving or issuing of any notice, consent, approval, certificate or determination by any person, unless otherwise specified, such notice, consent, approval, certificate or

determination shall be in writing and shall not be unreasonably withheld or delayed."

GC 1.2 LAW OF THE CONTRACT

40. Delete GC 1.2.1 in its entirety and replace it with the following:

"1.2.1 This *Contract* shall be governed by and constituted in accordance with the laws in force in the Province of Ontario excluding any conflict of laws principles. The parties hereby irrevocably attorn to the exclusive jurisdiction of the courts of the Province of Ontario for any legal proceedings arising out of this *Contract* or the performance of the obligations hereunder.

1.2.2 The *Construction Act* and all regulations passed under it that are enforceable as of the date of execution of this *Contract* apply to this *Contract*."

GC 1.4 ASSIGNMENT

41. Delete GC 1.4.1 in its entirety and replace it with the following:

"1.4.1 Neither party to the *Contract* shall assign the *Contract* or a portion thereof without the written consent of the other, which consent, in the case of the *Owner*, is at the sole discretion of the *Owner*. In the event of an assignment of the *Contract* by the *Contractor*, such assignment shall not relieve the *Contractor* from its obligations and liabilities hereunder."

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.2 ROLE OF THE CONSULTANT

42. In the first sentence of GC 2.2.7, delete the words "Except with respect to GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER,".

43. Add the following to the end of GC 2.2.13:

"If, in the opinion of the *Contractor*, a *Supplemental Instruction* requires an adjustment in the *Contract Price* or *Contract Time*, the *Contractor* shall, within 10 *Working Days* of receipt of *Supplemental Instruction*, advise the *Consultant* by *Notice in Writing*. Failure to provide *Notice in Writing* within the time stipulated shall be deemed an acceptance of the *Supplemental Instruction* by the *Contractor* without any change to the *Contract Price* or *Contract Time*."

44. Delete GC 2.2.17 and replace it with the following:

"2.2.17 All certificates will be issued by the *Owner* upon the recommendation of the *Consultant*."

45. Add new GC 2.2.19 as follows:

"2.2.19 If the *Owner* has appointed one of its own employees as the "*Consultant*" under this *Contract*, any reference to the *Consultant* shall mean the *Owner* and all responsibilities assigned to the *Consultant* under this *Contract* shall be performed by the *Owner* unless the *Owner* provides otherwise in writing."

GC 2.3 REVIEW AND INSPECTION OF THE WORK

46. Throughout GC 2.3.2, delete the word "reasonable" everywhere it appears and replace it with "at least 3 *Working Days*".

47. Add new GC 2.3.8 as follows:

"2.3.8 It is the responsibility of the *Contractor* to schedule notifications and inspections required by authorities having jurisdiction such that the notifications can be properly received, and the inspections can be properly undertaken without causing a delay in the *Work*. The *Contractor* shall be responsible for any delay in the *Work* caused by the *Contractor*'s failure to properly schedule the required notifications and inspections and shall not be entitled to any extension of the *Contract Time* due to such failure."

48. Add new GC 2.3.9 as follows:

"2.3.9 Where standards of performance are specified and the *Work* does not comply with the specified standard of performance, the deficiency in the *Work* shall be corrected as directed by the *Consultant*. Subsequent testing to ensure that the standard of performance has been attained (including re-testing by *Owner*), shall be carried out at the *Contractor's* expense and shall not be paid from the cash allowances pursuant to GC 4.1."

GC 2.4 DEFECTIVE WORK

49. Add new GC 2.4.1.1 and 2.4.1.2 as follows:

"2.4.1.1 The *Contractor* shall rectify, in a manner acceptable to the *Owner* and the *Consultant*, all defective *Work* and deficiencies throughout the *Work*, whether or not they are specifically identified by the *Consultant* or the *Owner*.

2.4.1.2 The *Contractor* shall prioritize the correction of any defective *Work* which, in the sole discretion of the *Owner*, adversely affects the day to day operation of the *Owner*."

PART 3 EXECUTION OF THE WORK

GC 3.1 CONTROL OF THE WORK

50. Add new GC 3.1.3 as follows:

"3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the *Contractor* shall verify, at the *Place of the Work*, all relevant measurements and levels necessary for the proper and complete fabrication, assembly and installation of the *Work* and shall further, carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included, or exact locations are not apparent, the *Contractor* shall immediately notify the *Consultant* in writing and obtain written instructions from the *Consultant* before proceeding with any part of the affected *Work*."

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

51. Delete GC 3.2.2.2 in its entirety.

52. Add new GC 3.2.3.4 as follows:

"3.2.3.4 Subject to GC9.4 CONSTRUCTION SAFETY, for the *Owner*'s own forces and for other contractors, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation of the *Place of the Work*, including all the responsibilities of the "constructor" under OHSA."

53. Add new GC 3.2.7 and 3.2.8 as follows:

"3.2.7 Entry by the *Owner's* own forces and by other contractors, placing, installation, application and connection of the *Work* by the *Owner's* own forces or by other contractors on and to the *Work* shall not mean acceptance of the *Work* and shall not relieve the *Contractor* of its responsibility to complete the *Work* or to provide and maintain the warranties specified in the *Contract Documents*.

3.2.8 Placing, installation, application and connection of *Work* by *Owner's* own forces or by other contractors shall in no way relieve the *Contractor* of its responsibility to maintain, oversee, and manage health and safety at the *Place of the Work* as "constructor" for the *Project* pursuant to GC 9.4.1."

GC 3.4 DOCUMENT REVIEW

54. Delete GC 3.4.1 in its entirety and replace it with the following:

"3.4.1 The *Contractor* shall review the *Contract Documents* and any error, inconsistency or omission or has any doubt as to the meaning or intent of any part thereof the *Contractor* may reasonably discover shall immediately be brought to the attention of the *Consultant* by means of an *RFI*. Such review by the *Contractor* shall comply with the standard of care described in GC 3.14.1 of the *Contract*. Except for its obligation to make such review and report the result, the *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the *Contractor* shall not proceed with the *Work* affected until the *Contractor* has received corrected or missing information from the *Consultant*."

55. Add new GC 3.4.2 and 3.4.3 as follows:

"3.4.2 Upon receipt of an *RFI*, the *Consultant* will provide written instructions or explanations. Neither the *Owner* nor the *Consultant* will be responsible for oral instructions. If the *Contractor* fails to provide an *RFI* to the *Consultant* regarding such discrepancy or omission, the *Contractor* shall be deemed to have accepted all responsibility for the correction of any deficiencies resulting from such failure and shall not be entitled to an adjustment in the *Contract Price* or *Contract Time* for the correction.

3.4.3 Notwithstanding the foregoing, errors, inconsistencies and/or omissions shall not include lack of reference on the *Drawings* or in the *Specifications* to labour and/or *Products* that are required or normally recognized within respective trade practices as being necessary for the complete execution of the *Work*. The *Contractor* shall not use RFIs as described in paragraphs 3.4.1 and 3.4.2 issued during execution of the *Work* in and of themselves to establish a change and/or changes in the Work pursuant to Part 6 - CHANGES IN THE WORK. In the event an RFI or the cumulative effect of RFIs leads to what the *Contractor* considers to be a change in the *Work*, then the procedure under Part 6 - CHANGES IN THE WORK shall be followed."

GC 3.5 CONSTRUCTION SCHEDULE

56. Delete GC 3.5.1 in its entirety and replace it with the following:

"3.5.1 The *Contractor* shall:

.1 within 7 *Working Days* of award of this *Contract*, and at any time as requested by the *Owner*, submit to the *Owner* and the *Consultant* for their approval, a baseline construction schedule in a form acceptable to the *Owner* indicating the critical path for the *Project*, the schedule of operations,

the proposed methods of construction and sequence of the *Work* and the time the *Contractor* proposes to complete the various components of *Work* within the *Contract Time* (the "**Construction Schedule**").The *Construction Schedule* will include activity sequences and durations, special allocation of labour and materials, processing of working *Drawings* and samples, delivery of *Products* involving long lead time procurement and usage and occupancy requirements of the *Owner* of those portions of the *Work* having usage or occupancy priority and any other schedule requirements set out in the *Contract Documents*. Where the *Contractor* fails to deliver a *Construction Schedule* in accordance with this GC 3.5.1.1, or the *Construction Schedule* delivered by the *Contractor* is not approved by the *Owner* or the *Consultant*, the *Owner* may, in its sole discretion, delay the commencement of the *Work*, at the *Contractor*'s cost and expense, until such time as the *Contractor* delivers an approved *Construction Schedule*. For certainty, for the purposes of GC 6.5 – DELAYS, any delay caused by the *Contractor*'s breach of this GC 3.5.1.1, shall be deemed to be delay caused by the Contractor under GC 6.5.6;

.2 during performance of the *Work* and in accordance with the controls and reporting requirements in the *Contract Documents*, provide for the *Owner* and *Consultant*'s review and approval progress reports updating the *Construction Schedule* and reporting on the progress achieved, percentage of completion, schedule status and financial status with areas of immediate concern highlighted;

.3 if the *Construction Schedule* is affected by the issuance of a *Change Order*, the *Contractor* shall submit an updated *Construction Schedule*, if requested by the *Consultant* or *Owner*, within 7 Working Days of the request. This updated *Construction Schedule* shall show how the *Contractor* proposes to perform the balance of the *Work* such that the *Contractor* shall complete the *Work* within the *Contract Time* as amended by the *Change Orders*.

37. Add a new GC 3.5.2 to 3.5.7 as follows:

"3.5.2 For the duration of the *Project*, the *Contractor* shall provide progress reports as described in GC 3.5.1.2 for review and approval by the *Owner* as required by the *Contract Documents* and in any event no less than every 30 calendar days.

3.5.3 If the *Contractor* fails to complete a major activity, critical event or milestone by the date indicated in the latest update to the *Construction Schedule* and such failure is anticipated to extend the *Contract Time* or completion of milestones, the *Contractor* shall within 7 calendar days of such failure submit an updated *Construction Schedule* with a narrative clearly indicating how the *Contractor* intends to correct the non-performance, the delay, and perform the *Work* within the *Contract Time* accepted by the *Owner* pursuant to the *Construction Schedule*.

3.5.4 If, at any time it should reasonably appear to the *Owner* or the *Consultant* that the actual progress of the *Work* is behind the *Construction Schedule* or is likely to become behind the *Construction Schedule* and notice of such opinion is given to the *Contractor*; or the *Contractor* has noticed slippage in the *Construction Schedule*, then the *Contractor* shall take appropriate steps to cause the actual progress of the *Work* to conform to the *Construction Schedule* and shall produce and present to the *Owner* and the *Consultant* a recovery plan demonstrating how the *Contractor* will achieve the recovery of the *Construction Schedule*.

3.5.5 Actions by the *Contractor* to complete the *Work* within the *Contract Time* (and milestones) shall not be justification for an adjustment to the *Contract Time* or *Contract Price* unless such failure is due to a delay in accordance with the provisions of GC 6.5 - DELAYS.

3.5.6 The *Owner* may, at no additional cost to the *Owner*, order the *Contractor* to increase *Construction Equipment*, labour force or working hours if the *Contractor* fails to:

.1 complete a milestone activity by its scheduled completion date; or

.2 satisfactorily perform the *Work* as necessary to prevent delay to the overall completion of the *Work*,

but only to the extent required to return to the agreed upon *Construction Schedule*.

3.5.7 In the event of a conflict between the *Contractor's* performance of the *Work* and the *Owner's* requirements to operate an operational facility, the operation of the facility shall always take precedence."

GC 3.6 SUPERVISION

57. Add new GC 3.6.3 and 3.6.4 as follows:

"3.6.3 The *Contractor's* appointed representatives shall be satisfactory to the *Owner* and must be maintained on the job full time until all deficiencies have been corrected and completion of all *Work* under the *Contract* has been reached. Applications to replace any appointed representatives during the *Work* of this *Contract* or prior to completion will not be considered except for valid reason.

3.6.4 The *Owner* may, at any time during the course of the *Work*, request the replacement of an appointed representative where the grounds for the request involve conduct which jeopardizes the safety of the *Owner's* operations. Immediately upon receipt of the request, the *Contractor* shall make arrangements to appoint an acceptable replacement."

GC 3.7 SUBCONTRACTORS AND SUPPLIERS

58. Add the following to the end of GC 3.7.2:

> "In the event that the *Contractor* wishes to change any of its *Subcontractors* or *Suppliers*, the *Contractor* shall advise the *Consultant* in writing giving the reasons for the change. No change may be made without prior written approval of the *Owner*. Any change made by the *Contractor* without such approval will be a default of the *Contractor*'s contractual obligations."

59. Add the following to the end of GC 3.7.5:

> "...unless specifically required to do so in the *Contract Documents*."

60. Add new GC 3.7.7 as follows:

> "3.7.7 The *Contractor* shall provide the *Owner* with:
>
> (i) a copy of any written notices of *Adjudication* the *Contractor* receives;
>
> (ii) notice of the date on which the adjudicator relating to such *Adjudication* receives documents under section 13.11 of the *Construction Act*; and
>
> (iii) the adjudicator's determination of the *Adjudication* under section 13.13 of the *Construction Act*.
>
> The *Contractor* shall ensure its contracts with *Subcontractors* and *Suppliers* and the contracts with sub-subcontractors (of every tier) contain equivalent obligations to this GC 3.7.7 and the *Contractor* shall forthwith upon receipt provide to the *Owner* any notices of *Adjudication* and related information it receives. The *Contractor* shall be liable to and indemnify the *Owner* for any losses, damages, costs, claims and proceedings the *Owner* incurs, suffers or receives as a result of the *Contractor*'s failure to comply with its obligations under this GC 3.7.7."

GC 3.8 LABOUR AND PRODUCTS

61. In GC 3.8.3, delete the words"...*Contractor's* employee's..." and replace with "...*Contractor's* employees, *Subcontractors*', *Suppliers'* and their respective employees..."

62. Add the following to the end of GC 3.8.3:

> "The *Consultant* shall have the right to order the removal of any person employed by the *Contractor* or its *Subcontractors* or *Suppliers* from performance of the *Work* for failure to comply with this requirement."

63. Add new GC 3.8.4 to 3.8.15 as follows:

"3.8.4 If the *Consultant* or the *Owner* determines that any worker, including employees of *Subcontractors*, employed at the *Project* is "incompetent" as defined under the OHSA or exhibits unacceptable conduct, of which the *Consultant* shall be the sole judge, the *Consultant* shall provide *Notice in Writing* to the *Contractor* and the *Contractor* shall immediately remove the worker or employee from the *Place of the Work*. Such worker or employee shall not return to the *Place of the Work* without the prior written authorization from the *Consultant*.

3.8.5 The *Contractor* shall ensure that all materials and *Products* are delivered to the *Place of the Work* in original containers and packages with labels and seals intact and visible for inspection. The *Contractor* shall ensure that all materials and *Products* are secure and protected from inclement weather and, where necessary, stored at the temperature required by and in accordance with the manufacturer's requirements.

3.8.6 Manufactured *Products* which are specified by their proprietary names or by part or catalogue numbers must be provided. No substitute for the *Products* specified will be allowed unless approval of substitute *Products* are authorized by the *Owner* in writing.

3.8.7 The *Contractor* shall use and install all proprietary *Products* in strict accordance with the manufacturers' printed instructions. The *Contractor* shall provide to the *Consultant* a copy of the manufacturers' printed instructions and supplementary directions prior to use or installation of the proprietary *Products*.

3.8.8 Whenever more than one *Product* is specified for one use, the *Contractor* may select for this use any of the *Products* so specified unless the *Specifications* or *Drawings* indicate otherwise. The *Contractor* shall assume all responsibility for liabilities and additional costs that may arise as a result of his choice to use one of the named *Products*.

3.8.9 Subject to GC 3.8.6, after the acceptance of a tender, the *Contractor* may apply to the *Consultant* to substitute as a "reviewed equivalent", another *Product* or group of *Products*. Such application shall be in writing and shall indicate reasons why the *Contractor* has proposed the substitution (e.g. significant delay in delivery, strikes, unavailability, improved quality or field service, amount of contract cost reduction, etc.). The *Contractor's* application for a substitution shall be accompanied by sufficient descriptive and technical information, specifications, references and samples for the *Consultant* to thoroughly compare the proposed substitute *Product* or group of *Products* with that specified.

3.8.10 The *Consultant's* assessment of proposed substitutions shall include, but not be limited to, criteria such as quality and durability, performance, ease of operation, safety features, technical support, service and parts,

availability and estimated cost of warranty and adherence to minimum specifications. Failure to comply with this requirement to the *Consultant's* satisfaction may result in rejection of the proposed substitution due to insufficient information or time to evaluate the proposal. All applications and submissions related to the proposed substitution shall only be made by the *Contractor* and not by a *Subcontractor* or *Supplier***.**

3.8.11 The approval or rejection of a proposed substitution shall be at the discretion of the *Consultant* whose decision shall be final. Regardless of the *Consultant's* decision on a proposed substitution, the *Contractor* shall bear all the responsibility for any additional costs of the *Owner* and the *Consultant* related to their review of the proposed substitution.

3.8.12 Acceptance by the *Consultant* of a "reviewed equivalent" shall apply to this *Contract* only.

3.8.13 The *Contractor* shall assume all responsibility for liabilities and additional costs that may subsequently arise as a result of its proposed substitution being accepted by the *Consultant*.

3.8.14 Any design, changes to the *Work*, or changes to the *Contract Time* necessitated by the use of substituted *Products* shall be at the expense of the *Contractor*. The *Contractor* shall be responsible for assuring the proper fit and matching of all substituted *Products* to the surrounding *Work*."

GC 3.11 USE OF THE WORK

64. Add new GC 3.11.3, 3.11.4, and 3.11.5 as follows:

"3.11.3 If working or storage areas in addition to areas provided at the *Place of the Work* are required, the *Contractor* shall be responsible for, at its own expense, making arrangements to obtain such additional areas, whether adjacent to the *Place of the Work* or not, and for obtaining all permits and making rental payments that may be required for such additional areas.

3.11.4 Upon completion of the *Contract*, the *Contractor* shall provide the *Consultant* with two copies of a release, in a form satisfactory to the *Owner*'s legal counsel, signed by each property owner upon whose land the *Contractor* has entered for any purpose in conjunction with the *Contract*.

3.11.5 The *Owner* shall have the right to enter and occupy the *Place of Work* in whole, or in part, for the purpose of:

.1 operating its business before *Total Completion of the Work*; and

.2 placing fittings and equipment or for other uses before *Substantial Performance of the Work*, if, in the opinion of the *Consultant* and

Contractor, such entry or occupation does not prevent or substantially interfere with the *Contractor* in completion of the *Contract* within the *Contract Time*.

Such entry or occupation shall not be considered as acceptance of the *Work*, or in any way relieve the *Contractor* from responsibility to complete the *Contract*."

GC 3.13 CLEAN-UP

65. Add new GC 3.13.4 and 3.13.5 as follows:

"3.13.4 If the *Contractor* fails to properly clean the *Place of the Work* within 24 hours of receiving *Notice in Writing* to do so, the *Owner* may complete the cleaning and the *Contractor* shall be responsible for all costs incurred by the *Owner* in so doing.

3.13.5 As a condition precedent to receiving final payment, the *Contractor* shall repair any damage to the *Place of the Work* caused by the *Contractor*'s transportation in and out of the *Place of the Work*, failing which the *Contractor* shall be responsible for all costs incurred by the *Owner* to the complete the repairs."

***NEW* GC 3.14 PERFORMANCE BY CONTRACTOR**

66. Add new GC 3.14 – PERFORMANCE BY CONTRACTOR as follows:

"**GC 3.14 PERFORMANCE BY CONTRACTOR**

3.14.1 In performing its services and obligations under the *Contract*, the *Contractor* shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The *Contractor* acknowledges and agrees that throughout the *Contract*, the *Contractor's* obligations, duties and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of care in respect of any *Products*, personnel, or procedures which it may recommend to the *Owner*.

3.14.2 The *Contractor* further represents, covenants and warrants to the *Owner* that:

.1 the personnel it assigns to the *Project* are appropriately experienced;

.2 it has sufficient staff of qualified and competent personnel to replace its appointed representatives, subject to the *Owner's* approval, in the event of death, incapacity, removal or resignation;

.3 there are no pending, threatened or anticipated claims that would have a material effect on the financial ability of the *Contractor* to perform the *Work*; and,

.4 the *Contractor's* workload is not overextended such that would have an adverse effect on the *Contractor's* ability to perform the *Work*."

PART 4 ALLOWANCES

GC 4.1 CASH ALLOWANCES

67. In GC 4.1.2 add the following to the end of the paragraph:

"The maximum markup for the *Contractor*'s overhead and profit on a cash allowance shall be five percent (5%)."

68. In GC 4.1.3, after the word "authorized" add the words "in writing".

69. In the first sentence of GC 4.1.4., delete the words "plus an amount for overhead and profit on the excess as set out in the *Contract Documents*."

-and-

in the second sentence of GC 4.1.4, delete the words "but not for the *Contractor*'s overhead and profit on such amount."

-and-

delete the third sentence of GC 4.1.4 in its entirety.

70. Delete GC 4.1.5 in its entirety and replace it with the following:

"4.1.5 The unexpended total cash allowance amount will be deducted from the final certificate of payment."

71. Add new GC 4.1.8 as follows:

"4.1.8 The *Contractor* may be required by the *Contract Documents* or by the *Owner* or *Consultant* during the *Work* to obtain bids from three or more bidders, at no additional cost to the *Owner*, for portions of the *Work* for which payment is made from Cash Allowances. Any procurement and subsequent award pursuant to this GC 4.1.8 shall be made in consultation with the *Owner* and in accordance with the *Owner's* purchasing practices."

GC 4.2 CONTINGENCY ALLOWANCE

72. Delete GC 4.2 – CONTINGENCY ALLOWANCE in its entirety, including all subparagraphs thereunder.

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

73. Delete GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER, including all subparagraphs thereunder and all references throughout the *Contract* made to GC 5.1 in its entirety.

GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

74. Delete GC 5.2.1 and replace it with the following:

"5.2.1 Applications for payment shall be dated the last day of each *Payment Period*. Within 10 calendar days of the end of each *Payment Period*, a representative of each of the *Contractor*, *Owner*, and the *Consultant* shall attend a meeting to discuss and review the work completed during the *Payment Period*, including quantities, if applicable (the "**Pre-Invoice Submission Meeting**"). In the event that the scheduled date for the *Pre-Invoice Submission Meeting* is not a *Working Day*, the *Pre-Invoice Submission Meeting* shall occur on the next *Working Day*. The *Contractor* shall bring with it to the *Pre-Invoice Submission Meeting* the following:

.1 a draft form of application for payment;

.2 the schedule of values in accordance with GC 5.2.6;

.3 an up-to-date *Change Order* log;

.4 *Subcontractor* and *Supplier* invoices and supporting materials;

.5 receipts for reimbursable expenses (if any);

.6 any visual documentation (photos, videos, diagrams) evidencing the progress of the *Work*; and

.7 any other documents reasonably required by the *Contract Documents*, the *Owner* or *Consultant*."

75. Delete GC 5.2.2 and replace it with the following:

"5.2.2 Within 5 calendar days following the *Pre-Invoice Submission Meeting*, the *Contractor* shall deliver its application for payment to the *Owner* and to the

Consultant in accordance with GC 5.2.8 for *Work* performed during a *Payment Period* (the "**Proper Invoice Submission Date**"), subject to the following:

.1 if the fifth (5th) calendar day following the *Pre-Invoice Submission Meeting*, to which an application for payment relates falls on a calendar day that is not a *Working Day*, the *Proper Invoice Submission Date* shall be deemed to fall on the next *Working Day*."

76. Amend GC 5.2.3 by adding the following to the end of that paragraph:

"but no amount claimed shall include *Products* delivered to the *Place of the Work* unless the *Products* are free and clear of all security interests, liens, and other claims of third parties."

77. Delete GC 5.2.5 and replace with the following:

"5.2.5 The schedule of values shall be supported by such evidence as the *Consultant* may reasonably direct and when accepted by the *Owner*, shall be used as the basis for applications for payment, unless it is found to be in error."

78. In GC 5.2.7 add the following to the end of the paragraph:

"The *Owner* shall not be obligated to pay for any *Products* not yet incorporated into the *Work* but may do so at the *Owner's* sole discretion. The *Contractor* shall deliver the *Products* to a site approved by the *Consultant* and the *Contractor* shall, in advance of receipt of the shipment of the *Products*, arrange for adequate, secure storage facilities. Such *Products* shall remain at the risk of the *Contractor* who shall be responsible for any loss, damage, theft, improper use, or destruction of the *Products* however caused. Advance payments for *Products* made by the *Owner* shall not constitute acceptance of the *Products* by the *Owner*."

79. Add new GC 5.2.8 to 5.2.13 as follows:

"5.2.8 Applications for payment submitted under GC 5.2.2 shall be given in accordance with the following requirements:

.1 Applications for payment shall be given to the *Owner* at **jhuppunen@niagarafalls.ca and costclerk@niagarafalls.ca** with a copy to the *Consultant*, unless the *Consultant* advises otherwise in writing;

.2 Applications for payment shall be given during the hours of 9:00 a.m. to 4:00 p.m. (EST) on the *Proper Invoice Submission Date*;

.3 If an application for payment is given after 4:00 p.m. (EST) on the applicable *Proper Invoice Submission Date*, the application for payment will not be considered or reviewed by the *Owner* and *Consultant* until the next *Proper Invoice Submission Date*, at which point the *Proper Invoice* will be deemed to have been given to the *Owner* and the *Consultant*. Should the *Owner* decide to accept an application for payment submitted after 4:00 p.m. (EST) on the applicable *Proper Invoice Submission Date* (which the *Owner* is under no obligation to do), such acceptance shall not be construed as a waiver of any of its rights or waive or release the *Contractor*'s obligations to strictly comply with the requirements prescribed in this GC 5.2.8;

.4 If an application for payment is given before the *Proper Invoice Submission Date*, the application for payment will not be considered or reviewed by the *Owner* and *Consultant* until the applicable *Proper Invoice Submission Date*, at which point the application for payment will be deemed to have been received by the *Owner Consultant* for the purpose of review and evaluation;

.5 Notwithstanding any other provision of this *Contract*, the *Contractor* shall not deliver an application for payment, for consideration as a *Proper Invoice* by the *Owner*, during the *Restricted Period (Proper Invoice)*;

.6 The parties consent to the giving and receiving of *Proper Invoices* electronically and in accordance with the requirements of this GC 5.2.8.

5.2.9 The *Owner* reserves the right, in its sole, absolute and unfettered discretion, to permit the *Contractor* to correct an error or minor irregularity in an application for payment that the *Contractor* purported to be a *Proper Invoice* and gave to the *Owner* in accordance with GC 5.2.2. The *Owner* shall be under no obligation to exercise the right conferred to it under this GC 5.2.9.

5.2.10 The requirements of GC 5.2.1 and 5.2.2 are of the essence.

5.2.11 The *Contractor* shall prepare and maintain current as-built drawings which shall consist of the *Drawings* and End Result Specification, including but not limited to architectural, structural, mechanical, electrical, cabling, shop drawings, single-line diagrams and any other graphical representations, and shall be maintained by the *Contractor* and made available to the *Consultant* for review with each *Proper Invoice*.

5.2.12 The *Contractor*'s actual expense for bonds, if required, shall be included in the first *Proper Invoice* and paid by the *Owner*, provided that the *Proper Invoice* includes respective invoices as proof of payment."

GC 5.3 PROGRESS PAYMENT

80. Delete GC 5.3 in its entirety and replace it with the following:

"5.3.1 After receipt by the *Owner* and the *Consultant* of an application for payment, submitted in accordance with GC 5.2.2:

.1 the *Owner* and the *Consultant* will assess whether all of the criteria for a *Proper Invoice* are satisfied and, if not, the *Owner* may issue a *Notice of Non-Payment* (Form 1.1), in accordance with GC 5.3.2, setting out why the application for payment does not meet the requirements for a *Proper Invoice*; and

.2 upon the receipt of a *Proper Invoice*, the *Consultant* will either:

(a) recommend to the *Owner*, copying the *Contractor*, that a certificate for payment in the amount applied for in the *Proper Invoice* be issued, or

(b) make a finding that such other amount is properly due under the *Proper Invoice*, and shall notify the *Owner* and prepare and submit to the *Owner* a draft *Notice of Non-Payment* (Form 1.1) with reasons for the proposed amendment, which the *Owner* may accept or amend prior to issuance in accordance with GC 5.2.9.

.3 subject to GC 5.3.2, the *Owner* shall make payment to the *Contractor*, on account as provided in Article A-5 of the Agreement – PAYMENT, on the 28th calendar day after receipt of a *Proper Invoice,* unless such 28th calendar day lands on a day that is other than a *Working Day*, in which case payment shall be made on the next *Working Day* after such 28th day.

5.3.2 In the event that the application for payment delivered by the *Contractor* does not include the requirements for a *Proper Invoice* or where the *Owner* disputes the amount claimed as payable in the *Proper Invoice*, then the *Owner* may issue a *Notice of Non-Payment* (Form 1.1) refusing payment to the *Contractor* of the full amount of the application for payment or such other amount as the *Owner* determines in its sole discretion.

5.3.3 Where the *Owner* has delivered a *Notice of Non-Payment*, the *Owner* and the *Contractor* shall first engage in good faith negotiations to resolve the

dispute. If within 10 calendar days following the issuance of a *Notice of Non-Payment*, the *Owner* and the *Contractor* cannot resolve the dispute, either party may issue a notice of *Adjudication* in the applicable form prescribed under the *Construction Act*.

5.3.4 The amounts disputed and described under the *Notice of Non-Payment* shall be held by the *Owner* until all disputed amounts of the *Proper Invoice* have been resolved. Any portion of the *Proper Invoice* which is not the subject of the *Notice of Non-Payment* shall be payable within the time period set out the *Construction Act*, provided no claims for lien and no written notices of lien have been delivered to the *Owner*.

5.3.5 The *Owner* reserves the right to retain amounts to ensure correction or replacement of deficient work done or unacceptable product provided. The *Owner*'s obligation to pay under GC 5.3.2.1 or GC 5.3.4 is subject to any rights conferred on the *Owner* at law or under this *Contract* to withhold payment, backcharge or set-off against payment.

5.3.6 Subject to the *Construction Act*, any amounts payable to the *Owner* by the *Contractor* pursuant to the *Contract Documents*, may be retained out of any monies due, or which may become due, from the *Owner* to the *Contractor* under the *Contract* or, if the *Contractor* becomes insolvent, under any other contract between the *Contractor* and the *Owner*, and may be recovered from the *Contractor* or its sureties, or any or either of them, as a debt due to the *Owner*. In addition, the *Owner* shall have full authority to retain monies if circumstances arise which may indicate the advisability of so doing, though the sum to be retained may be unascertained. For greater clarity any amounts payable to the *Owner* by the *Contractor* pursuant to the *Contract Documents*, or any deductions, retainage or withholdings the *Owner* is entitled to make pursuant to the *Contract Documents*, shall entitle the *Owner* to refuse to pay all or any portion of the amounts payable under *Proper Invoices* on account of such amounts payable, deductions, retainage or withholdings."

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

81. Add the following to the end of GC 5.4.2:

"The *Consultant* will consider costs of supplying specified spare parts, maintenance manuals, "as-built" drawings, warranty certificates and test results in determining whether or not the *Work* is substantially performed."

82. Add new GC 5.4.4 as follows:

"5.4.4 Upon receipt of the certificate described in GC 5.4.2.2, the *Contractor* shall publish, in a construction trade newspaper in the area of the location of the

Work, a copy of the certificate of *Substantial Performance of the Work* within three (3) Working Days of receiving a copy of the certificate signed by both the *Owner* and the *Contractor*, and the *Contractor* shall provide suitable evidence of the publication to the *Consultant* and the *Owner*. If the *Contractor* fails to publish such certificate of *Substantial Performance of the Work* in accordance with the timeline specified in this GC 5.4.4, the *Owner* shall be at liberty to publish said certificate and back-charge the *Contractor* its reasonable costs for doing so."

GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

83. Add new subparagraphs 5.5.1.3 and 5.5.1.4 as follows:

"5.5.1.3 submit a release letter, releasing the *Owner* from all further claims relating to the *Contract* for all *Work* performed up to and including the date of *Substantial Performance of the Work*, in a form satisfactory to the *Owner*'s legal counsel. The *Contractor* shall also provide a list itemizing, if applicable, all outstanding and unsettled claims by the *Contractor*. The release letter shall be in a form satisfactory to the *Owner*'s legal counsel.

5.5.1.4 submit a satisfactory Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB).

84. Delete GC 5.5.2 and replace it with the following:

"5.5.2 After receipt of an application for payment of the holdback amount from the *Contractor*, the receipt of any additional documents as the *Owner* or *Consultant* may require, and upon satisfying itself that the application for payment is a *Proper Invoice*, the *Owner*, upon the recommendation of the *Consultant* will issue a certificate for payment of the statutory holdback amount. Where after thirty (30) days following the publication of the certificate of *Substantial Performance of the Work*, pursuant to GC 5.4.4, the value of the *Work* remaining to be complete under the *Contract*, plus the estimated cost to repair any remaining deficiencies, exceeds the amount of the unpaid balance of the *Contract Price* (as determined by the *Payment Certifier*, acting reasonably), the *Owner* may publish a notice of non-payment of holdback in accordance with the *Act* (Form 6) and retain an amount from the holdback to supplement the unpaid value of the *Contract Price* to secure the correction of deficiencies and completion of the *Work*."

85. Delete GC 5.5.3 in its entirety.

86. Delete the first and second sentences in GC 5.5.4 and replace it with the following:

"Subject to the preservation of any claims for lien or the receipt by the *Owner* of any written notices of lien in respect to the *Project*, the holdback amount authorized by the certificate for payment of the holdback amount is due and payable on the 61st calendar day following publication of the certificate of *Substantial Performance of the Work* referred to in GC 5.4.3.2."

GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK

87. add the following as new GC 5.6.4:

"5.6.4 For release of holdback on subcontract *Work* which is 100% complete prior to the release of holdback contemplated under GC 5.5 – PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK, the *Contractor* may make an application to the *Owner* and the *Consultant* by written request for a review by the *Owner* and *Consultant* to determine the date of completion of the subcontract and shall submit such supporting material as the *Owner* and *Consultant* may, in their discretion require, including:

.1 Description of the scope of *Work* included in the subcontract.

.2 Declaration of Last Supply by the *Subcontractor* or *Supplier* as prescribed in subsection 31(5) of the *Construction Act* (Form 7).

.3 Certificate of Completion of Subcontract as prescribed in subsection 33(1) of the *Construction Act* (Form 8).

.4 the extent of all additions to or deductions from the *Work* of the *Subcontractor* or the *Supplier* as a result of *Change Orders* or *Change Directives*,

.5 a letter or certificate from WSIB for the *Contractor*, the *Subcontractor* or *Supplier* concerned, and any other *Subcontractors* or *Suppliers* who have provided any services to the *Subcontractor* or *Supplier* concerned stating that the *Subcontractor* or *Supplier* has paid all assessments to WSIB up to the date of application for partial release of holdback covering the *Work* of the *Subcontractor* or *Supplier*;

.6 a statutory declaration made by the *Subcontractor* or the *Supplier* in the form of CCDC 9B-2001 Document;

.7 *Contractor's* written acknowledgement to the *Owner* that the requirements of the *Contract Documents* will not be altered by early release of the holdback of the completed subcontracts;

.8 Confirmation by the bonding company that it has been notified of the intent to claim early release of holdback and does not object; and

.9 sufficient evidence to the *Owner's* reasonable satisfaction that, as of the date of the *Contractor*'s application, no claims for lien have been preserved against the *Place of the Work* that have not been vacated by the posting of security, discharged, or otherwise addressed in accordance with GC 5.10 – CONSTRUCTION LIENS."

88. Add new GC 5.6.5 as follows:

"5.6.5 The *Owner* shall not be obligated to release any holdback for the *Work* of a *Subcontractor* or *Supplier* prior to *Substantial Performance of the Work*. When the *Owner* agrees to release the holdback amount retained for subcontracted work, or for *Products* supplied, the *Contractor* shall, within 30 calendar days of receipt of such payment, submit to the *Owner* written confirmation of payment of such holdback to the applicable *Subcontractor* or *Supplier*. If the *Contractor* fails to submit such written confirmation, the *Owner* may withhold from any amount due or which may become due to the *Contractor* the amount of the released holdback until such written confirmation is received or until payment becomes due for the holdback to the *Contractor*, whichever is earlier."

GC 5.7 FINAL PAYMENT

89. Delete GC 5.7 in its entirety and replace it with the following:

"5.7.1 A final certificate for payment will be issued by the *Owner* at the end of the *Warranty Period*, as may be extended in accordance with the *Contract Documents*, and such final certificate for payment shall include payment of the warranty holdback amount withheld in accordance with the *Contract Documents*, less any deductions made in accordance with the *Contract Documents*.

5.7.2 Immediately following the end of the *Warranty Period*, the *Contractor*, *Owner*, and *Consultant* shall attend a meeting to discuss and review the work completed during the final *Payment Period*, and more generally, the total performance of the *Work* under the *Contract*, including work related to and required under the *Warranty Period* (the "**Final Pre-Invoice Submission Meeting**"). In the event that the scheduled date for the *Final Pre-Invoice Submission Meeting* is not a *Working Day*, the *Pre-Invoice Submission Meeting* shall occur on the next *Working Day*, or on another day agreed to by the *Contractor* and the *Owner* in writing. The *Contractor* shall bring with it to the *Final Pre-Invoice Submission Meeting* the following:

.1 any documents the *Contractor* is required to bring to the *Pre-Invoice Submission Meeting* as stipulated in the *Contract Documents*; and

.2 any other documents reasonably required by the *Owner* or *Consultant*.

5.7.3 No later than 5 calendar days prior to the *Final Pre-Invoice Submissions Meeting*, the *Contractor* will, if it has not already been provided, submit to the *Consultant*, the following documentation:

.1 all closeout documentation required by the *Contract Documents*, including, but not limited to, warranties, manuals, guarantees, as-built drawings and all other relevant literature from suppliers and manufacturers including, but not limited to, where applicable:

a. Equipment, maintenance and operations manuals;

b. Equipment specifications, data sheets and brochures, parts lists and assembly drawings, performance curves and other related data;

c. Line drawings, value charts and control sheets sequences with description of the sequence of operations;

d. Warranty documents;

e. Service and maintenance reports;

f. *Specifications*;

g. Shop drawings;

h. Testing results; and

i. Commissioning and quality assurance documentation.

5.7.4 The documents referenced in GC 5.7.3 shall constitute requirements for the *Proper Invoice* for final payment.

5.7.5 The *Contractor* shall submit an application for final payment within 5 calendar days following the conclusion of the *Final Pre-Invoice Submission Meeting* to which the final application for payment relates (the "**Final Proper Invoice Submission Date**"), subject to the following:

.1 if the fifth calendar day following the conclusion of the *Final Pre-Invoice Submission* falls on a calendar day that is not a *Working Day*, the *Final Proper Invoice Submission Date* shall be deemed to fall on the next Working Day.

5.7.6 After receipt by the *Owner* and the *Consultant* of an application for payment, submitted in accordance with GC 5.7.5:

.1 the *Owner* and the *Consultant* will assess whether all of the criteria for a *Proper Invoice* are satisfied and, if not, the *Owner* may issue a

Notice of Non-Payment (Form 1.1), in accordance with GC 5.7.7, setting out why the application for payment does not meet the requirements for a *Proper Invoice*; and

.2 upon the receipt of a *Proper Invoice*, the *Consultant* will either:

(a) recommend to the *Owner*, copying the *Contractor*, that a certificate for payment in the amount applied for in the *Proper Invoice* be issued, or

(b) make a finding that such other amount is properly due under the *Proper Invoice*, and shall notify the *Owner* and prepare and submit to the *Owner* a draft *Notice of Non-Payment* (Form 1.1) with reasons for the proposed amendment, which the *Owner* may accept or amend prior to issuance in accordance with GC 5.2.9.

5.7.7 In the event that the final application for payment delivered by the *Contractor* does not include the requirements for a *Proper Invoice* or where the *Owner* disputes the amount claimed as payable in the *Proper Invoice*, then the *Owner* may issue a *Notice of Non-Payment* (Form 1.1) refusing payment to the *Contractor* of the full amount of the application for payment or such other amount as the *Owner* determines in its sole discretion."

GC 5.8 WITHHOLDING OF PAYMENT

90. Add new GC 5.8.2 as follows:

5.8.2 All amounts payable to the *Owner* by the *Contractor* in accordance with the *Contract Documents*, may be retained out of any amount due from the *Owner* to the *Contractor* under this or any other *Contract* with the *Owner*. Such amounts may also be recovered from the *Contractor* or his surety jointly or severally in any court of competent jurisdiction, as a debt due to the *Owner.* The *Owner* may withhold any estimate or certificate even if the sum to be retained is unascertained.

91. Add new GC 5.10 – CONSTRUCTION LIENS as follows:

"GC 5.10 CONSTRUCTION LIENS

5.10.1 Notwithstanding any other provision in the *Contract* and subject to the requirement to issue a *Notice of Non-Payment* (Form 1.1), the *Owner* shall not be obligated to make payment to the *Contractor*, if at the time such payment was otherwise due:

.1 a claim for lien has been registered against title to the *Place of the Work*, or delivered to the Clerk of the *Owner*, by a *Subcontractor* or

a *Supplier* of any tier that has not been vacated or discharged by the *Contractor* in accordance with the requirements of this *Contract*,

.2 if the *Owner* has received a written notice of a lien that has not been resolved by the *Contractor* through the posting of security or otherwise; or

.3 a claim for lien has been registered against title to the *Place of the Work* by the *Contractor*, that has not been vacated or discharged by the *Contractor*.

5.10.2 The *Contractor* shall give the *Owner Notice in Writing*, immediately, of all lien claims or potential lien claims the *Contractor* or his agents become aware of.

5.10.3 In the event a construction lien arising from the performance of the *Work* is preserved by a *Subcontractor* or a *Supplier* of any tier, or a written notice of a lien is given to the *Owner* by a *Subcontractor* or a *Supplier*, or a construction lien action is commenced against the *Owner* by a *Subcontractor* or a *Supplier* of any tier, or the *Contractor* has registered a claim for lien against title to the *Place of the Work*, then the *Contractor* shall, at its own expense:

.1 within 10 calendar days of registration of the a construction claim for lien, or delivery of a claim for lien by a *Subcontractor* or *Supplier* to the Clerk of the *Owner*, vacate the lien by posting security with the Ontario Superior Court in accordance with s. 44 of the *Construction Act* or procure a discharge of the lien. If the lien is merely vacated, the *Contractor* shall, if requested, undertake the *Owner*'s defence of any subsequent action commenced by a *Subcontractor* or *Supplier* in respect of the lien being claimed, at the *Contractor*'s sole expense;

.2 within 10 calendar days of receiving notice from the *Owner* of a written notice of a lien being given to the *Owner* by a *Subcontractor* or *Supplier*, post security with the Ontario Superior Court of Justice so that the written notice of a lien no longer binds the parties upon whom it was served; and

.3 satisfy all judgments and pay all costs arising from such *Subcontractor* or *Supplier* construction lien(s) and actions and fully indemnify the *Owner* against all costs and expenses arising from same, including legal costs on a full indemnity basis.

5.10.4 If, at any time, the *Owner* receives written notice of a lien or a claim for lien, the *Owner* may withhold in addition to the statutory holdback, the full amount of said claim for lien plus either: (a) $250,000 if the claim for lien is in excess of $1,000,000 or (b) 25% of the value of the claim for lien until

such lien is withdrawn or satisfied or security has been paid into or posted with the court by the *Contractor* to vacate the lien and, where necessary, any certificate of action in respect of such lien. No interest shall be payable on any payments withheld under this paragraph.

5.10.5 At the option of the *Owner* and without imposing any obligation whatsoever on the *Owner* to do so, the *Owner* may pay into court an amount sufficient to vacate any lien or written notice of a lien and, where necessary, any certificate of action in respect of such lien. In doing so, the *Owner* will be entitled to a full indemnity from the *Contractor* for costs of so doing, including legal costs on a solicitor and client basis together with all interest, costs and expenses incurred by the *Owner*.

5.10.6 The *Contractor* agrees that all costs incurred by the *Owner* relating to liens of *Subcontractors* or *Suppliers,* including legal fees on a solicitor and client basis, shall be paid by the *Contractor* to the *Owner*.

5.10.7 Where any lien claimant makes a request to the *Owner* pursuant to section 39 of the *Construction Act*, the *Contractor* shall be pay the *Owner* an administration fee of Five Hundred Dollars ($500.00) for each request made as compensation for the cost of the *Owner* of complying with the request.

5.10.8 Where an application is made by a *Subcontractor* or *Supplier* brought to the court to compel production of any particular document to a lien claimant, the *Contractor* shall indemnify the *Owner* from reasonable legal fees on a solicitor and client basis incurred in appearing on such an application and shall pay to the *Owner* its reasonable costs incurred in producing such documents to the extent that the same is made necessary under the disposition of the matter by the court.

5.10.9 Any and all fees, costs, or expenses of any nature whatsoever which are the responsibility of the *Contractor* under this GC 5.10 shall be paid by the *Contractor* to the *Owner* on demand or, at the option of the *Owner*, may be treated as payment to the *Contractor* under the *Contract* and deducted from amounts otherwise owing to the *Contractor* by the *Owner* on this or any other *Contract*."

PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

92. Add the following to the end of GC 6.1.2:

"This requirement is of the essence and it is the express intention of the parties that any claims by the *Contractor* for a change in the *Contract Price* and/or *Contract Time* shall be barred unless there has been strict compliance with PART 6 - CHANGES IN THE WORK. No verbal dealings between the parties and no implied

acceptance of alterations or additions to the *Work* and no claims that the *Owner* has been unjustly enriched by any alteration or addition to the *Work*, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for additional payment under this *Contract* or a claim for any extension of the *Contract Time*."

GC 6.2 CHANGE ORDER

93. Add the following to the end of GC 6.2.1:

"The method used to determine the amount of adjustment to the *Contract Price*, if any, for the proposed change in the *Work* shall be one of the following:

.1 negotiated lump sum,

.2 unit price, as set out in the *Contract Documents* or subsequently agreed upon in writing, or,

.3 time and materials, in accordance with paragraph 6.3.7."

94. Add new GC 6.2.3, 6.24, 6.2.5 and 6.2.6 as follows:

6.2.3 The following mark-ups (for overhead and profit combined) shall apply to *Change Orders* under GC 6.2.2:

.1 *Contracto*r's mark-up on work of *Contractor*'s own forces: 5%;

.2 *Subcontractor*'s mark-up on *Subcontractor*'s work: 5%; and

.3 *Contractor*'s mark-up on *Subcontractor*'s work: 5%, not compounded with *Subcontractor*'s mark-up.

Each percentage of markup as listed in this GC 6.2.3 shall not be cumulative and shall only be applied to the costs of the *Work*.

6.2.4 The mark-up referred to in GC 6.2.3 is intended to cover all general expenses and overhead costs incurred by the *Contractor* in relation to the change. For greater certainty, the following items of cost of the *Work* of the *Contractor* are included in the overhead and profit mark-up on changes:

.1 project management costs

.2 estimating, site supervision, safety, preparation of as-builts, coordination and administration costs

.3 warranty costs; and

.4 general clean-up and disposal costs.

Any additional cost associated with bonding and/or insurance resulting from the change shall be included in the estimate of the cost of the change or as a line item included in the costs of the change, as may be applicable, but the *Contractor* shall not be entitled to mark-up on such additional cost, if any.

6.2.5 The *Contractor* shall not be entitled to any additional compensation arising out of changes to the *Work* aside from the amounts determined and agreed to under this GC 6.2 or as provided in GC 6.3."

6.26 *Change Orders* are not valid and binding upon the *Owner* unless approved and executed in accordance with the *Owner*'s internal approval processes."

GC 6.3 CHANGE DIRECTIVE

95. Amend GC 6.3.6 in the second line by adding the word "actual" before the word "cost" and by deleting paragraph 6.3.6.3 in its entirety and replacing it with the following:

".3 The *Contractor*'s fee shall be as specified in paragraph 6.2.3 and shall only apply where the method of adjustment to be used is the time and materials method."

96. Add the following to the end of GC 6.3.9:

"The *Contractor's* proposal for adjustment of the *Contract Price*, if any, shall include a breakdown of the labour, *Construction Equipment*, *Products* and *Subcontractor Work* which is anticipated to be required by the change in the *Work*. Allowable mark-ups on labour, *Construction Equipment*, *Products* and *Subcontractor Work* shall be in accordance with GC 6.2."

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

97. Delete paragraph 6.4.1 in its entirety and replace with the following:

"6.4.1.1 Prior to the submission of its tender on which the *Contract* was awarded, the *Contractor* confirms that it carefully investigated the *Place of the Work* and carried out such tests as it deemed appropriate and, in doing so, applied to that investigation the degree of care and skill required by paragraph 3.14.1. If the *Contractor* has not conducted such careful investigation, it is deemed to assume all risk of conditions or circumstances now existing or arising in the course of the *Work* which could make the *Work* more expensive or more difficult to perform than was contemplated at the time the *Contract* was executed. No allowances will be made for additional costs and no claims by the *Contractor* will be entertained in connection with conditions which could reasonably have been

ascertained by such investigation or other due diligence undertaken prior to the execution of the *Contract*.

6.4.1.2 No claim by the *Contractor* nor any extension of the *Contract Time* will be considered by the *Owner* or the *Consultant* in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the *Contract*.

98. Add new GC 6.4.5 as follows:

"6.4.5 The *Contractor* confirms, that prior to submitting its tender for the *Project*, it may have been prevented from carefully investigating the *Place of the Work* as a result of *Force Majeure*. Understanding such limitations, the *Contractor* proceeded with its tender. The *Contractor* shall not, therefore, make any claim arising from *Force Majeure* conditions which may have prevented the *Contractor* from fulfilling its obligations under this GC 6.4."

GC 6.5 DELAYS

99. Amend GC 6.5.1 by deleting the words at the end of the fifth line following the word "for" and replacing them with "... reasonable direct costs directly flowing from the delay but excluding any consequential, indirect or special damages."

100. Amend GC 6.5.2 by:

(a) deleting the words "not issued as the result of an act or fault of the *Contractor* or any person employed or engaged by the *Contract* directly or indirectly," and replace them with "issued on account of a direct breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes by the *Owner*, the *Owner's* other contractor(s), or the *Consultant*, and relating to the *Work* or the *Place of the Work*," and

(b) deleting the last sentence and replacing it with:

"The *Contractor* shall be reimbursed by the *Owner* for reasonable direct costs directly flowing from the delay but excluding any indirect, consequential, or special damages."

101. Delete GC 6.5.3 and replace it with the following:

"6.5.3 If the performance of the *Work* or the performance of any other obligation(s) of a party to this *Contract* is delayed by *Force Majeure*, then the *Contract Time* shall be extended for such reasonable time as the *Owner* and the *Contractor* shall agree. The extension of time shall not be less than the time lost as a result of the *Force Majeure* event causing the delay, unless the *Contractor* agrees to a shorter extension. Neither party shall be entitled to payment for its costs or reimbursement of its expenses incurred by such

delays. Upon reaching agreement on the extension of the *Contract Time* attributable to the *Force Majeure* event, the *Owner* and the *Contractor* shall execute a *Change Order* indicating the length of the extension to the *Contract Time* and confirming that there are no costs payable by either party to the other for the extension of *Contract Time*."

102. Add new GC 6.5.6 as follows:

"6.5.6 If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Contractor* or anyone employed or engaged by the *Contractor* directly or indirectly, or by any cause within the *Contractor*'s control, and it is determined by the *Consultant* that such delay will result in having to extend the *Contract Time*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may decide in consultation with the *Contractor*. The *Contractor* shall reimburse the *Owner* for all reasonable costs incurred by the *Owner* as the result of such delay or delays, including all services required by the *Owner* from the *Consultant* as a result of such delay by the *Contractor* and, in particular, the cost of the *Consultant's* services during the period between the date of *Substantial Performance of the Work* stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of *Substantial Performance of the Work* achieved by the *Contractor*."

GC 6.6 CLAIMS FOR A CHANGE IN THE CONTRACT PRICE

103. In GC 6.6.1, delete the words "shall give timely *Notice in Writing*" and replace them with "shall, within 7 calendar days after the commencement of any part of the *Work* that is the subject of the claim, give *Notice in Writing*".

104. Delete GC 6.6.3 and replace it with the following:

"6.6.3 The party making the claim shall submit to the *Consultant* a detailed account of the amount claimed and the grounds upon which the claim is based. Such claim shall be submitted within a reasonable time, and in any event no later than 30 calendar days after completion of the *Work* that is the subject of the claim. Oral communications will not be binding on the *Owner*. The party making the claim must produce written evidence in support of the claim and shall not use, or attempt to use, against the other party any oral communications among the parties."

PART 7 DEFAULT NOTICE

GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

105. Amend GC 7.1.2 by adding the words "including failing or neglecting to comply with the requirements in GC 3.5..." immediately following the word "properly" in the first line.

106. Amend GC 7.1.3.1 by adding the words "and is diligently proceeding with" immediately following the word "commences".

107. Amend GC 7.1.3.2 by substituting the words "an acceptable schedule" with the words "a schedule acceptable to the *Owner*".

108. Amend GC 7.1.5.3 by substituting the words "the difference" at the end of paragraph 7.1.5.3 with the words "on the expiry of the warranty period specified in paragraph 12.3.1 for that portion of the *Work* performed by the *Contractor*, provided that such payment shall be made only in accordance with the requirements set out in GC 5.7 – FINAL PAYMENT."

109. Amend GC 7.1.5.4 by substituting the words "the difference" at the end of GC 7.1.5.4 with the words "for that portion of the *Work* performed by the *Contractor*, provided that such payment shall be made only in accordance with the requirements set out in GC 5.10 – FINAL PAYMENT."

110. Add new GC 7.1.7, 7.1.8, 7.1.9, 7.1.10, 7.1.11 and 7.1.12 as follows:

"7.1.7 The *Owner* may, if conditions arise which make it necessary for reasons other than as provided in GC 7.1.1 and 7.1.4, suspend performance of the *Work* by giving *Notice in Writing* to that effect to the *Contractor* which shall identify the reason for the suspension and the expected length of the suspension. Such suspension shall be effective in the manner specified in said notice and shall be without prejudice to any claims which either party may have against the other.

7.1.8 The *Owner*, in its sole discretion, may terminate this *Contract* at any time for any reason and without cause upon giving the *Contractor* fifteen (15) *Working Days' Notice in Writing* to that effect.

7.1.9 The *Contractor* upon receiving notice of suspension or termination from the *Owner* pursuant to GC 7.1.7 or 7.1.8 shall suspend or terminate all operations as soon as reasonably possible, or as set out in the *Owner*'s notice, except work which, in the *Contractor*'s opinion is necessary for the safety of personnel and for the care and preservation of the *Work*, the materials and plant. In the event of a suspension or termination pursuant to

GC 7.1.7 or 7.1.8, the *Contractor* shall be reimbursed by the *Owner* for the reasonable costs incurred by the *Contractor* for such protection. Subject to any directions in the notice of suspension or termination, the *Contractor* shall discontinue ordering materials, facilities and supplies and make every reasonable effort to delay delivery of existing orders and, in the event of termination, to cancel existing orders on the best terms available.

7.1.10 During the period of suspension, the *Contractor* shall not remove from the *Place of the Work* any part of the *Work*, or any *Product* or materials without the consent of the *Owner*.

7.1.11 If the *Work* is suspended for a period of 30 days or less, the *Contracto*r, upon the expiration of the period of suspension, shall resume the performance of the *Work* in accordance with the *Contract Documents*. If the suspension was not due to an act or an omission of the *Contractor*, there shall be an equitable adjustment to the *Contract Time* and the *Contract Price*. Any adjustment to the *Contract Price* shall exclude any indirect, consequential, or special damages.

7.1.12 If, after 30 days from the date of notice of suspension of the *Work*, the *Owner* and the *Contractor* agree to continue with and complete the *Work,* the *Contractor* shall resume operations and complete the *Work* in accordance with any terms and conditions agreed upon by the *Owner* and the *Contractor*."

GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

111. Amend GC 7.2.2 by adding to the end of the paragraph "unless an acceptable arrangement for an extension of the *Contract Time* is agreed to by the *Contractor* and the *Owner*."

112. Delete GC 7.2.3.1 in its entirety.

113. Amend GC 7.2.3.2 by deleting the word "*Consultant*" and replacing it with "*Owner*".

114. Delete paragraph 7.2.3.3 in its entirety and substitute new paragraph 7.2.3.3:

"the *Owner* fails to pay the *Contractor* when due the amount certified by the *Consultant* or awarded by arbitration or a *Court*, except where the *Owner* has a bona fide claim for set off, or"

115. Amend GC 7.2.3.4 by deleting the words ", except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER,".

116. Delete GC 7.2.5 in its entirety and replace it with the following:

"7.2.5 If the *Contractor* terminates the *Contract* under the conditions described in this GC 7.2, the *Contractor* shall be entitled to be paid for all *Work* performed to the date of termination. The *Contractor* shall also be entitled to recover the costs associated with termination, including the costs of demobilization, losses sustained on *Products* and construction machinery and equipment. The *Contractor* shall not be entitled to any recovery for any indirect, special or consequential losses."

117. Add new GC 7.2.6 as follows:

"7.2.6 No right on behalf of the *Contractor* to suspend the *Work* or terminate the *Contract* shall arise due to the withholding of certificates and/or payments because of the *Contractor's* failure to pay all just claims promptly or because of the registration or notice of liens against the *Place of Work*, until such claims and liens are discharged."

PART 8 DISPUTE RESOLUTION

GC 8.2 NEGOTIATION, MEDIATION, AND ARBITRATION

118. Delete GC 8.2.6 and replace it with the following:

"8.2.6 By giving a *Notice in Writing* to the other party and the *Consultant*, not later than 10 *Working Days* after the termination of the mediated negotiations under paragraph 8.2.5, either party may request that the dispute be finally resolved by arbitration under the Rules for Arbitration of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing. The dispute shall not proceed to arbitration without the consent of both parties. Where both parties consent to send the dispute to arbitration, the arbitration shall be conducted in the jurisdiction of the *Place of the Work*. If both parties do not consent to arbitration, the dispute shall be settled in the court with the appropriate jurisdiction."

119. Add new GC 8.3 – ADJUDICATION as follows:

"**GC 8.3 ADJUDICATION**

8.3.1 Notwithstanding any other provisions in the *Contract* or elsewhere in the *Contract Documents* the parties shall engage in *Adjudication* as required by, and in accordance with, the *Construction Act* and this *Contract*.

8.3.2 The following procedures shall apply to any *Adjudications* the parties engage in under the *Construction Act*:

.1 any hearings shall be held in the municipal/head offices of the *Owner* or such other venue as the parties may agree and which is acceptable to the adjudicator;

.2 the *Adjudication* shall be conducted in English;

.3 each party may be represented by counsel throughout an *Adjudication*;

.4 there shall not be any oral communications with respect to issues in dispute that are the subject of an *Adjudication* between a party and the adjudicator unless it is made in the presence of both parties or their legal representatives; and

.5 a copy of all written communications between the adjudicator and a party shall be given to the other party at the same time.

8.3.3 Any documents or information disclosed by the parties during an *Adjudication* are confidential and the parties shall not use such documents or information for any purpose other than the *Adjudication* in which they are disclosed and shall not disclose such documents and information to any third party, unless otherwise required by law, save and except the adjudicator.

8.3.4 In respect of any claim or dispute, if the *Contractor* fails to comply with any of the notice requirements set out in the *Contract Documents* then the Contractor shall be barred from advancing such claim(s) or dispute(s) and shall have no entitlement whatsoever in respect of such claim(s) or dispute(s) (including to an increase in payment under the *Contract*, or an extension of *Contract Time*) and by failing to comply with the notice requirements waives the right to make any such claim(s) or dispute(s) in an *Adjudication* or in any other form of dispute resolution available under this *Contract* or at law. This GC 8.3.4 shall operate conclusively as an estoppel and bar in the event such claims or disputes are brought in an *Adjudication* or other form of dispute resolution and the *Owner* may rely on this GC 8.3.4 as a complete defence to any such claims or disputes.

8.3.5 The parties hereby acknowledge and agree,

.1 that counterclaims, claims of set-off or the exercise or use of other contractual rights that permit the *Owner* to withhold, deduct or retain from monies otherwise owed to the *Contractor* under the *Contract* may be referred to, and included as part of, *Adjudications* under the *Construction Act*;

.2 that disputes related to the termination or abandonment of the *Contract*, as well as any disputes that arise or are advanced following the termination or abandonment of the *Contract*, shall not be referred to *Adjudication* under the *Construction Act*;

.3 that notice(s) of *Adjudication*, with respect to any dispute or claim relating to the *Project*, shall not be given, and no *Adjudication* shall be commenced following *Total Completion of the Work*, abandonment, or termination of the *Contract*;

.4 that any *Adjudication* between the *Contractor* and a *Subcontractor* or a *Supplier* that relates to an *Adjudication* between the *Owner* and the *Contractor* shall be joined together to be adjudicated by a single adjudicator, provided that the adjudicator agrees to do so, and the *Contractor* shall include a provision in each of its contracts that contain an equivalent obligation to this GC 8.3.5.4; and

.5 that, other than where the *Contractor* is obliged to commence an *Adjudication* pursuant to an undertaking under the *Construction Act*, neither the *Owner* nor the *Contractor* shall commence an *Adjudication* during the *Restricted Period (Adjudication).*"

PART 9 PROTECTION OF PERSONS AND PROPERTY

GC 9.1 PROTECTION OF WORK AND PROPERTY

120. Amend GC 9.1.1.1 by adding at the following to the end of that paragraph:

"...which the *Contractor* could not reasonably have discovered applying the degree of care and skill described in paragraph 3.14.1 to its review of the *Contract Documents*."

121. Delete GC 9.1.2 in its entirety and replace it with the following:

"9.1.2 Before commencing any work, the *Contractor* shall determine the locations of all underground utilities and structures indicated in the *Contract Documents* or that are discoverable by applying to an inspection of the *Place of Work* the degree of care and skill described in paragraph 3.14.1."

122. Add new GC 9.1.5 as follows:

"9.1.5 The *Contractor* shall neither undertake to repair and/or replace any damage whatsoever to the work of other contractors, or to adjoining property, nor acknowledge the same was caused or occasioned by the *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*.

However, where there is danger to life or public safety, the *Contractor* shall take such emergency action as it deems necessary to remove the danger."

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

123. Add new GC 9.2.10 as follows:

"9.2.10 The *Contractor* shall indemnify and hold harmless the *Owner*, the *Consultant*, their agents and employees from and against claims, demands, losses, costs, damages, actions, suits or proceedings arising out of or resulting from exposure to, or the presence of, toxic or hazardous substances or materials which were either brought on to the *Place of the Work* by the *Contractor*, or anyone for whom the *Contractor* is in law responsible, and mishandled or handled negligently or improperly or which are otherwise mishandled or handled negligently or improperly by the *Contractor*, or anyone for whom the *Contractor* is in law responsible, thereby creating exposure to toxic or hazardous substances or materials. This obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity set out in GC 12.1 INDEMNIFICATION or which otherwise exist respecting a person or party described in this paragraph."

GC 9.4 CONSTRUCTION SAFETY

124. Delete GC 9.4.1 in its entirety and replace it with the following:

"9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations, and practices required by the *OHSA*, including, but not limited to those of the "constructor", and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work*. Without limiting the foregoing, the *Contractor* shall be solely responsible for construction safety in respect of its *Consultants*, other *Consultants, Subcontractors* and *Suppliers*, the *Owner's* own forces, and other contractors, subcontractors, and suppliers during the course of the *Project*."

125. Add new paragraphs 9.4.2, 9.4.3 and 9.4.4 as follows:

"9.4.2 If at any time the *Consultant* or his authorized representative considers the *Work* to be unsafe, he may order the *Contractor* to take immediate measures to ensure adequate safety. If, in the opinion of the *Consultant*, the *Owner* or their authorized representative, the *Contractor* fails to take adequate measures, the *Consultant* or the *Owner* or their authorized representatives may order the *Work* to cease until such measures have been taken. The *Contractor* shall not be entitled to an adjustment in *Contract Price* or the *Contract Time* for such work stoppage.

9.4.3 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*:

.1 a current WSIB clearance certificate;

.2 copies of the *Contractor*'s insurance policies having application to the *Project* or certificates of insurance, at the option of the *Owner* and pursuant to GC 11.1;

.3 documentation of the *Contractor*'s in-house safety-related programs; and

.4 a copy of the Notice of Project filed with the Ministry of Labour naming itself as "constructor" under the OHSA."

9.4.4 The *Contractor* shall indemnify and save harmless the *Owner*, its agents, officers, directors, employees, consultants, successors and assigns from and against the consequences of any and all safety infractions committed by the *Contractor* under the OHSA, including the payment of legal fees and disbursements on a full indemnity basis.

9.4.5 In the event of an emergency threatening health, life or property, the *Contractor* shall take such action as may be necessary to save lives and protect persons from injury and, this being done to protect and preserve the property. The *Contractor* shall notify the *Owner* of such emergency as promptly as is practical under the circumstances."

PART 10 GOVERNING REGULATIONS

GC 10.1 TAXES & DUTIES

126. Add new GC 10.1.3 and 10.1.4 as follows:

"10.1.3 Where taxes and/or duties have increased or decreased after the time of the bid closing, the *Contractor* shall provide to the *Consultant* a detailed breakdown of such increase or decrease in costs in a form satisfactory to the *Owner*. Such statement shall be submitted no later than 30 calendar days after the completion of *Work*.

10.1.4 The *Owner* reserves the right to make deductions from regular progress payments as compensation for the estimated benefit from decreased tax or duty costs. Such deductions shall be set off from progress payments pending receipt of the statement itemizing the benefits that have resulted from the decrease in tax or duty costs at which time the final payment adjustment will be determined."

GC 10.2 LAWS, NOTICES, PERMITS AND FEES

127. Amend GC 10.2.5 by adding the words, "Subject to paragraph 3.4.1" to the beginning of the paragraph;

-and-

add the following to the end of the second sentence:

> "...and no further *Work* on the affected components of the *Contract* shall proceed until these changes to the *Contract Documents* have been obtained by the *Contractor* from the *Consultant*."

128. Amend GC 10.2.6 by adding at the following to the end of that paragraph:

"In the event the *Owner* suffers loss or damage as a result of the *Contractor*'s failure to comply with GC 10.2.5, and notwithstanding any limitations described in GC 12.1.1, the *Contractor* agrees to indemnify and to hold harmless the *Owner* and the *Consultant* from and against any claims, demands, losses, costs, damages, actions, suits or proceedings resulting from such failure by the *Contractor*."

129. Amend paragraph 10.2.7 by inserting the words “which changes were not, or could not have reasonably been known to the *Owner* or to the *Contractor*, as applicable, at the time of bid closing and which changes did not arise as a result of a public emergency or other *Force Majeure* event” to the second line, after the words “authorities having jurisdiction”.

GC 10.4 WORKER’S COMPENSATION

130. Delete GC 10.4.1 and replace it with the following:

> “10.4.1 Prior to commencing the *Work*, again with each of the *Contractor’s* applications for payment, including payment of the holdbacks amounts, and with the *Contractor’s* application for final payment, the *Contractor* shall provide evidence of compliance with worker’s compensation legislation at the *Place of the Work*, including payments due thereunder.”

131. Add new GC 10.5 – NON-RESIDENT CONTRACTORS as follows:

“GC 10.5 NON-RESIDENT CONTRACTORS

10.5.1 If the *Contractor* is non-resident in Ontario, the *Contractor* shall, immediately after being notified by the *Owner* that his tender has been accepted by the *Owner*, obtain from the Retail Sales Tax Branch a certificate showing that the *Contractor* has registered with the Retail Sales Tax Branch and shall submit such certificate to the *Owner* at the time that he furnishes bonds as required by the *Contract*.

10.5.2 In addition, wherever the *Contract Documents* require a Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB), the non-residence *Contractor* shall provide an equivalent document from its home province or state."

PART 11 INSURANCE AND CONTRACT SECURITY

GC 11.1 INSURANCE

132. Delete subparagraph 11.2.1.5 (Boiler and Machinery Insurance).

133. Add the following to the end of paragraph 11.1.2:

Confirmation of coverage with respect to general liability and automobile liability insurance required shall be provided using the City of Niagara Falls' standard Certificate of Insurance form.

134. Add paragraph 11.1.9

"The minimum limits of insurance in this GC 11 and in CCDC 41 shall be varied to provide the following:

.1 General Liability Insurance shall have a limit of five million dollars ($5,000,000) inclusive per occurrence;

.2 Automobile Liability Insurance shall have a limit of five million dollars ($5,000,000) inclusive per occurrence;

.3 For the General Liability Insurance, The Corporation of the City of Niagara Falls shall be included as additional insured; and,

.4 Coverage and limits of insurances will be provided and maintained by all Subcontractors in accordance with this paragraph."

GC 11.2 CONTRACT SECURITY

135. Delete paragraph 11.2.1 and replace it with the following:

"11.2.1 If required by the *Contract Documents*, the *Contractor* shall, prior to the execution of the *Contract* and within 7 calendar days of receiving *Notice in Writing* to do so, furnish a performance bond and labour and material payment bond which meets the requirements under GC 11.2.2."

136. Delete GC 11.2.2 and replace it with the following:

"11.2.2 The performance bond and labour and material payment bond, if required, shall:

.1 be issued by a duly licensed surety company, which has been approved by the *Owner* and is permitted under the *Construction Act*,

.2 be issued by an insurer licensed under the *Insurance Act* (Ontario) and authorized to transact a business of suretyship in the Province of Ontario;

.3 shall be in the form prescribed by the *Construction Act*;

.4 have a coverage limit of at least 50 per cent of the *Contract Price*, or such other percentage of the *Contract Price* as stated in the *Contract Documents*;

.5 extends protection to *Subcontractors*, *Suppliers,* and any other persons supplying labour or materials to the *Project*; and

.6 shall be maintained in good standing until the fulfillment of the *Contract*, including all warranty and maintenance periods set out in the *Contract Documents.*"

137. Add new GC 11.2.3 and GC 11.2.4 as follows:

"11.2.3 The bonds shall cover payment of all obligations placed upon the *Owner* as a result of the *Contractor's* default, including:

.1 Payment of all legal, architectural, mechanical, electrical and structural engineering expenses incurred by the *Owner* in determining the extent of *Work* performed and *Work* still to be performed including, without limitation, any additional *Work* required as a result of the interruption of the *Work*, and

.2 Payment of any additional expenses reasonably incurred by the *Owner* in the form of site security services, light, heat, power, etc., payable over the period between the default of the original *Contract* and commencement of the new *Contract*.

11.2.4 No claims for additional bonding will be considered unless such additional bonding has been pre-approved by the *Owner*."

PART 12 INDEMNIFICATION, WAIVER OF CLAIMS AND WARRANTY

GC 12.1 INDEMNIFICATION

138. Delete GC 12.1 in its entirety and replace it with the following:

"12.1.1 The *Contractor* shall indemnify and hold harmless the *Owner* and the *Consultant*, their subsidiaries and affiliates, their respective partners, trustees, officers, directors, agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings (hereinafter called "**Claims**"), whether in respect of claims suffered by the *Owner* or by third parties that directly or indirectly arise out of, or are attributable to, the *Contractor*'s performance of the *Contract*, attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the *Contractor* or anyone for whose acts the *Contractor* may be liable,.

12.1.2 GC 12.1 – INDEMNIFICATION shall govern over the provisions of paragraph 1.3.1 of GC 1.3 – RIGHTS AND REMEDIES."

GC 12.2 WAIVER OF CLAIMS

111. Delete GC 12.2 in its entirety and replace it with the following:

"12.2.1 Waiver of Claims by Contractor

As of the date of the final certificate for payment, the *Contractor* expressly waives and releases the *Owner* from all Claims against the *Owner* including without limitation those that might arise from the negligence or breach of contract by the *Owner* except:

.1 those made in writing prior to the *Contractor*'s application for final payment and still unsettled; and

.2 those arising from the provisions of GC 9.3 – TOXIC AND HAZARDOUS SUBSTANCES, GC 9.5 Mould, or GC 10.3 – PATENT FEES.

12.2.2 GC 12.2 – WAIVER OF CLAIMS shall govern over the provisions of paragraph 1.3.1 of GC 1.3 – RIGHTS AND REMEDIES."

GC 12.3 WARRANTY

112. Throughout GC 12.3, delete "one year' and replace it with "two years".

113. At the end of GC 12.3.1 add the words "(the "**Warranty Period**")."

114. Add the following to the end of GC 12.3.4:

"Any *Work* repaired or replaced during the *Warranty Period* shall be re-warranted for an additional two years from the date of completion of the repair or replacement. Notwithstanding the expiration of the *Warranty*

Period, the *Contractor* shall not be relieved of its obligations to correct any defects or deficiencies in the *Work* of which notice has been given to the *Contractor* prior to the expiration of the *Warranty Period*."

115. Add GC 12.3.7 to 12.3.15 as follows:

"12.3.7 If the *Contract Documents* provide, the *Owner* may holdback from each payment to the *Contractor* 2.5% of the total amount payable under each such *Proper Invoice* as security for the *Contractor*'s performance of its warranty obligations (the "**Warranty Holdback**"). In the event the *Contractor* fails to correct a defect or deficiency during the *Warranty Period* within the required time and/or fails to pay for the redesign, reconstruction and other costs related to damages arising from a defect or deficiency, the *Owner* shall be entitled, in addition to any other remedy available to the *Owner*, to use the *Warranty Holdback*, or such part of it still being held by the *Owner* to pay for the costs of remedying the defect or deficiency and any redesign, reconstruction or other costs relating to the defect or deficiency. If the costs are greater than the amount of the *Warranty Holdback*, the *Contractor* shall pay the additional costs upon receipt of an invoice from the *Owner*. Subject to section 12.3.12, the *Contractor* shall have the right to apply for the balance of the *Warranty Holdback* at the end of the *Warranty Period* or extra warranty period as described in GC 12.3.4 as a part of its application for final payment as set out under GC 5.7.

12.3.8 If the correction of the defects or deficiencies in the *Work* cannot be completed within 5 full *Working Days* following receipt of the *Notice in Writing* from the *Consultant*, the *Contractor* shall not be in default if the *Contractor*,

a) commences the correction within the five full *Working Days* following receipt of the *Notice in Writing*;

b) provides the *Owner* with an acceptable schedule for the progress of such correction; and

c) completes the correction in accordance with such schedule.

12.3.9 If the *Contractor* fails to correct the defects or deficiencies in the *Work* within the five full *Working Days* following receipt of the *Notice in Writing* from the *Consultant*, or such agreed upon schedule for such correction, the *Owner*, without prejudice to any other right or remedy the *Owner* may have, carry out such work by its own forces or by other contractors and if such work is work which the *Contractor* should have carried out at the Contractor's own expense, the *Owner* shall be entitled to recover from the *Contractor* the cost thereof or may deduct the same from any monies

due or that become due to the *Contractor*, including any *Warranty Holdback*.

12.3.10 The decision of the *Owner* shall be final as to the existence of such defects or deficiencies, the necessity of remedying same, and the remedial measures required.

12.3.11 The *Contractor* shall be responsible for the costs for inspection and testing for the correction of defects or deficiencies. The *Owner* shall have the right to deduct the cost of the inspection and testing from any monies owed to the *Contractor*."

12.3.12 The *Contractor* shall assign to the *Owner* all warranties, guarantees or other obligations for *Work*, services or *Products* performed or supplied by any *Subcontractor*, *Supplier* or other person in connection with the *Work* and such assignment shall be with the consent of the assigning party where required by law or by the terms of that party's contract. Such assignment shall be in addition to, and shall in no way limit, the warranty rights of the *Owner* under the *Contract Documents*. The *Warranty Holdback* shall not be released until all warranties and extended warranties have been transferred to the *Owner* pursuant to this GC 12.3.12.

12.3.13 In accordance with GC 3.5.4, the *Contractor* shall carry out correction of defects and deficiencies at such times as may be convenient to the *Owner*, which may require work by the *Contractor* outside of normal working hours. Additional costs for the *Work* shall be borne by the *Contractor*.

12.3.14 Any *Products* requiring excessive servicing during the *Warranty Period* (or free maintenance period if applicable) shall be considered defective and the warranty (or free maintenance period) shall be deemed to start over on the date that the defect causing such excessive servicing has been corrected.

12.3.15 The *Contractor*'s obligations under this GC 12.3 – WARRANTY shall continue notwithstanding any withholding of payment by the Owner under GC 5.8 – WITHHOLDING OF PAYMENT or the *Owner*'s performance of the *Contractor*'s obligations under this *Contract* where the *Contractor* is in default in the performance of such obligations."

116. Add New Part 13 – OTHER PROVISIONS as follows**:**

"PART 13 OTHER PROVISIONS

GC 13.1 OWNERSHIP OF MATERIALS

13.1.1 Unless otherwise specified, all materials existing at the *Place of the Work* at the time of execution of the *Contract* shall remain the property of the *Owner*. All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the *Owner*. The *Contractor* shall remove all surplus or rejected materials as its property when notified in writing to do so by the *Consultant*.

GC 13.2 CONTRACTOR DISCHARGE OF LIABILITIES

13.2.1 In addition to the obligations assumed by the *Contractor* pursuant to GC 3.7, the *Contractor* agrees to discharge all liabilities incurred by it for labour, materials, services, *Subcontractors* and *Products*, used or reasonably required for use in the performance of the *Work*, except for amounts withheld by reason of legitimate dispute which have been identified to the party or parties, from whom payment has been withheld.

GC 13.3 DAILY REPORTS/DAILY LOGS

13.3.1 The *Contractor* shall cause its supervisor, or such competent person as it may delegate, to prepare a daily log or diary reporting on weather conditions, work force of the *Contractor*, *Subcontractors*, *Suppliers* and any other forces on site and also record the general nature of *Project* activities. Such log or diary shall also include any extraordinary or emergency events which may occur and also the identities of any persons who visit the site who are not part of the day-to-day work force.

13.3.2 The *Contractor* shall also maintain records, either at its head office or at the job site, recording manpower and material resourcing on the *Project*, including records which document the activities of the *Contractor* in connection with GC 3.5, and comparing that resourcing to the resourcing anticipated when the most recent version of the *Construction Schedule* was prepared pursuant to GC 3.5.

GC 13.4 CONFIDENTIAL INFORMATION

13.4.1 In this Part, "**Confidential Information**" includes information, whether oral, written, visual, electronic, or in any other form, relating in any way to this *Contract*, which is identified as confidential or that would reasonably be considered as being confidential. Confidential Information does not include any portions of the Confidential Information that (a) at the time of disclosure was in the public domain; (b) after disclosure hereunder, is published or

otherwise becomes part of the public domain through no fault of the Contractor; or (c) is received from an independent third party who had obtained the Confidential Information lawfully and was under no obligation of secrecy or duty of confidentiality owed to the *Owner*.

13.4.2 Except as otherwise permitted in the *Contract Documents*, the *Contractor* shall keep in confidence, any Confidential Information that it now has or that may come into its possession in the course of the *Contract*, including information marked "Confidential", and shall not, without the *Owner*'s prior written consent, disclose the Confidential Information in any manner whatsoever, in whole or in part, and shall not use the Confidential Information for any purpose other than in connection with the *Project*. The *Contractor* may reveal or permit access to the Confidential Information only to *Contractor* parties who need to know the Confidential Information, who must be advised of the confidential nature of the Confidential Information, who are directed by the *Contractor* to hold the Confidential Information in confidence and who agree to be bound by and to act in accordance with the terms and conditions of the *Contract Documents*. The *Contractor* shall take all necessary precautions or measures to prevent improper access to, or use or disclosure of, the Confidential Information by such parties and agrees to be jointly and severally responsible for any breach of the *Contract* by any Contractor parties.

13.4.3 The *Contractor* acknowledges that the *Owner* is subject to the provisions of the *Municipal Freedom of Information and Protection of Privacy Act* as amended from time to time.

13.4.4 If the *Contractor* breaches any provision of this *Contract* relating to Confidential Information, it shall immediately give Notice in Writing of such breach to the *Owner* and take all necessary steps to limit the extent and impact of the breach.

13.4.5 The harm that would be suffered by the *Owner* in the event of a breach of the provisions of this *Contract* relating to Confidential Information by the *Contractor* would not be compensable by monetary damages alone. Therefore, the *Owner* shall be entitled, in addition to any other remedies, to seek an injunction against any breach or threatened breach of any such provision.

13.4.6 The provisions of this *Contract* relating to Confidential Information will remain in effect after the expiry or other termination of this *Contract*."

Canadian Standard Construction Document CCDC 41, CCDC Insurance Requirements, dated January 21, 2008 shall be considered complete except as amended and supplemented by the following supplementary conditions.

117. Confirmation of coverages noted in paragraphs 1 and 2 shall be provided using the City of Niagara Falls' standard Certificate of Insurance form.

118. Delete paragraphs 3 and 5.

119. “Broad Form” Property Insurance

.1 In the second sentence of paragraph 4, delete “(excluding flood and earthquake)” and replace with “(excluding earthquake)”.

.2 “Broad form” property insurance shall not exclude “resultant damage”.

EXHIBIT "1"

Project-Specific Requirements for a "*Proper Invoice*"

To satisfy the requirements for a *Proper Invoice*, the following criteria, as may be applicable in each case, must be included with the *Contractor*'s invoices:

(a) be in the form of a written bill, invoice, application for payment, or request for payment;

(b) be in writing;

(c) contain the *Contractor*'s name, telephone number and mailing address and contact information of the *Contractor*'s project manager;

(d) contain the title of the *Project* and the *Owner*'s contract number or purchase order number under which the *Work* was performed and the related request for qualification, tender, or request for proposal number, as applicable;

(e) contain the *Contractor*'s unique invoice number (in the case of a revised invoice also include the original invoice # and date);

(f) contain the date the written bill, invoice, application for payment, or request for payment is being issued by the *Contractor*;

(g) identify the period of time in which the services or materials were supplied to the *Owner*;

(h) reference to the provisions of the *Contract* under which payment is being sought (.g. GC 5.3 – PROGRESS PAYMENTS for progress payments, GC 5.7 – FINAL PAYMENT for final payment, etc.);

(i) a description, including quantities where appropriate, of the services or materials, or a portion thereof, that were supplied and form the basis of the *Contractor's* request for payment;

(j) the amount the *Contractor* is requesting to be paid by the *Owner*, set out in a statement based on the schedule of values approved under GC 5.2.5, separating out any statutory or other holdbacks, set-offs and HST;

(k) attach a a sworn statement that all accounts for labour, subcontracts, products, materials, construction machinery and equipment and other indebtedness which may have been incurred by the *Contractor* for the work performed and the products and materials supplied under the *Contract* and for which the *Owner* might in any way be held responsible to pay for up to and including the latest progress payment received, have been paid in full, except for amounts properly retained as holdback, that are in dispute, or as otherwise agreed upon

by the Owner and the Contractor (such Statutory Declaration may be in the form of a CCDC 9A-2018 “Statutory Declaration of Progress Payment Distribution by Contractor” or in such other form when prescribed by the Owner).;

(l) attach a current WSIB clearance certificate;

(m) attach an updated and current *Construction Schedule*;

(n) the value of *Work* and approved changes in the *Work* performed to date itemized by *Change Orders* and *Change Directives*;

(o) the amount payable for the *Work* and changes in the *Work* performed during the *Payment Period*;

(p) Remit to *Subcontractor/Supplier* Name (if different than Contractor Name);

(q) Remit to *Subcontractor/Supplier* Address (if different than Contractor Address);

(r) *Subcontractor/Supplier* accounts receivable contact email address and phone number;

(s) Daily *Contractor* work records;

(t) if requested by the *Owner* or *Consultant*, a current and valid certificate(s) of insurance as required under GC 11.1;

(u) the following statement: “Provided this Proper Invoice complies with the requirements of the Contract and the *Construction Act*, R.S.O. 1990, c. C.30, and provided no Notice of Non-Payment is issued by the Owner, payment is due within 28 days from the date the Proper Invoice is received by the Owner.”;

(v) the name, title, telephone number and mailing address of the person at the place of business of the *Contractor* to whom payment is to be directed; and

(w) for advance payment, if applicable, for *Products* not yet incorporated into the *Work*: (1) list such *Products* (and the advance payment calculations in respect thereof) as a separate line item; and (2) be supported by invoices and such other evidence as the *Consultant* may reasonably request to establish the value and delivery of such *Products*;

(x) list the lien holdback and contractual holdback amounts (if applicable) as separate line items;

(y) include the *Contractor*’s registration number for Harmonized Sales Tax (H.S.T.) and, in the case of a remittance directly to a supplier the supplier H.S.T registration number, list the total amount of H.S.T. separate from the total

amount payable and list the total amount due (total amount of H.S.T. plus the amount payable for the *Work* in the current *Payment Period*);

(z) include any testing and commissioning reports required by the *Contract Documents* in respect of the *Work* to which the *Proper Invoice* relates;

(aa) any amount claimed by the *Contractor* pursuant to GC 6.5 for delays incurred during the *Payment Period*; and

(bb) in the case of the *Contractor*'s *Proper Invoice* for final payment, sufficient evidence of the Contractor's compliance with GC 3.13 – Cleanup.

THE CORPORATION OF THE CITY OF NIAGARA FALLS

REQUEST FOR TENDER - CONTRACTOR SERVICES
RFT12-2021
CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

APPENDIX A: FORM OF TENDER

We, the undersigned have carefully examined the RFT and all addenda and herewith forming part of this Tender and have carefully examined all requirements of the RFT. We understand and accept the said RFT, and, for the prices set forth in our Tender, hereby offer to supply all materials and perform all work with our own labour, equipment, tools, apparatus and other means of work, and to complete the work in strict accordance with RFT; and have submitted our Tender at rates that include all labour, materials, overhead and profit to comply with the RFT requirements and specifications and further agree that we shall not be entitled to any payments, except by the prices as stated herein; and further agree to furnish the required Insurance documentation and Workplace Safety and Insurance Board documentation in according with this RFT and to properly complete the work within the time stated herein; and declare that no person, firm or corporation other than whose signature or signatures of whose proper officers and the seal is or are attached below, has any interest in this RFT or in the work proposed to be taken and that our Tender is made without any connection, knowledge, comparison of figures or arrangement with any other company, firm or person submitting a Tender for the same work and is in all respects fair and without collusion or fraud; and, if our Tender is accepted by the City, we will complete whatever additional work that may be required at the prices stated herein, in strict conformity with the requirements of the RFT in all respects.

We further acknowledge that we have received, duly signed and attached Addendum/Addenda No. ___ to ___ inclusive to our Tender submission, and that all changes specified in the Addendum/Addenda have been included in the prices submitted. We further agree to complete all the work and services as specified in this RFT at the prices stated to the satisfaction of the City of Niagara Falls.

We further agree that our Tender is to continue open to acceptance and irrevocable until a Purchase Order has been issued by the City for the said work/services and that within 90 (ninety) calendar days of the closing date, the City may accept our Tender without notice, whether any Tender has been previously accepted or not and, therefore, we submit our Tender for the price stated below. The person, by signing below, testifies that he/she has the authority to bind the Company.

COMPANY NAME:	
ADDRESS:	
BUSINESS PHONE:	
COMPANY E-MAIL:	
H.S.T. REGISTRATION #:	
W.S.I.B. REGISTRATION #:	

THE CORPORATION OF THE CITY OF NIAGARA FALLS

REQUEST FOR TENDER - CONTRACTOR SERVICES
RFT12-2021 - CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

APPENDIX A: FORM OF TENDER

COMPANY NAME:			
SIGNING OFFICER: (print)		**SIGNATURE:**	
I have authority to bind the company.		**DATE:**	

Price complete for all that is required including all labour, material, equipment, parts, supervision, tools and site preparation (if required), all work/service described in this Request for Tender - Contractor Services, site clean-up (if required), warranty and all other requirements.

WARRANTY PERIOD:	As Per Contract Documents

LUMP SUM PRICE	**$**
Total Allowances of $ (Specify) for work specified in Section 01 21 00. Breakdown as follows:	**$ 1,630,000.00**
Unforeseen and miscellaneous Items - Allowance - $15,000.00	
Inspections and Testing - Allowance - $15,000.00	
Contaminated Soil Removal and Disposal - Allowance - $75,000.00	
Hydro Connection/Transformer (NPEI) - Allowance - $100,000.00	
Niagara Protective Coatings - Allowance - $200,000.00	
Finish Door Hardware - Allowance - $55,000.00	
Wide Span Shelving - Allowance - $100,000.00	
Design Electronics - Allowance - $70,000.00	
New 6" Concrete Floor in Garage - Allowance - $25,000.00	
Refrigeration Energy Solutions Ltd - Mechanical Equipment - Allowance - $975,000.00	
LUMP SUM PRICE + ALLOWANCES = SUB TOTAL (BEFORE TAX)	**$**
HST (13%)	**$**
TOTAL TENDER AMOUNT	**$**

(State Total Dollar Price in writing on line above. Please print clearly)

LOWEST PRICE TENDER NOT GUARANTEED AWARD

THE CORPORATION OF THE CITY OF NIAGARA FALLS

REQUEST FOR TENDER – CONTRACTOR SERVICES

RFT12-2021

CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

APPENDIX B: AGREEMENT TO BOND

We, the undersigned, hereby agree to become bound as Surety for:

.....

.....

in a bond totaling Fifty Per Cent (50%) of the contract amount, and conforming to the Instruments of Contract attached hereto, for the full and due performance and maintenance of the works shown as described herein if the Tender for .....

.....

is accepted by the Owner. We also agree to a bond as surety for the payment of the cost of all labour and materials for an amount equal to Fifty Per Cent (50%) of the contract sum used by the Contractor in due performance of his work.

It is a condition of this Agreement that if the above mentioned Tender is accepted, application for a Performance Bond and Labour and Materials Payment Bond, must be completed with the undersigned within fourteen (14) days of acceptance of the tender related thereto, otherwise this Agreement shall be null and void.

Dated this _____ day of _____, 2021

_____
Name of Bonding Company

_____
Signature of Authorized Person Signing for Company

(Company Seal)

_____
Position

REQUEST FOR TENDER – CONTRACTOR SERVICES

RFT12-2021

CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

APPENDIX C - SUB-CONTRACTOR FORM

NAME OF BIDDER:	

Bidders shall state hereunder the names of all sub-contractors and persons to be used for the execution of all work and services as described in this RFT which shall not be performed directly by the Contractor or the Contractor's employees. Please identify the work or services that you will be using your own forces. The City reserves the right to accept or reject any sub-contractor or persons named below.

WORK OR SERVICE TO BE PERFORMED	**NAME OF SUB-CONTRACTOR OR PERSON**	**ADDRESS OF SUB-CONTRACTOR OR PERSON NAMED IN COLUMN 2**	**% OF OVERALL COST OF WORK TO BE COMPLETED BY THE SUB-CONTRACTOR**
Concrete			
Door Hardware			
Electrical			
Electrical Data/Voice Communications			
Electrical Fire Alarm			
Electrical Generator			
Excavation & Backfilling			
Roof Walkway			

REQUEST FOR TENDER – CONTRACTOR SERVICES

RFT12-2021

CITY OF NIAGARA FALLS MUNICIPAL SERVICE CENTRE RENOVATION

APPENDIX C - SUB-CONTRACTOR FORM

NAME OF BIDDER:	

WORK OR SERVICE TO BE PERFORMED	NAME OF SUB-CONTRACTOR OR PERSON	ADDRESS OF SUB-CONTRACTOR OR PERSON NAMED IN COLUMN 2	% OF OVERALL COST OF WORK TO BE COMPLETED BY THE SUB-CONTRACTOR
Masonry			
Miscellaneous Metals			
Shelving			
Structural Steel			
Flooring Treatment (Cash Allowance)	Niagara Protective Coatings	7071 Oakwood Drive Niagara Falls, ON L2G 0J3 Dean Karachi 905-356-1581	
Access Control (Cash Allowance)	Design Electronics	6913 Oakwood Drive Niagara Falls, ON L2G 0J3 Troy Malton 905-646-3333	
Mechanical Equipment (Cash Allowance)	Refrigeration Energy Solutions Ltd.	658 5th Concession West RR.R.#2 Waterdown, ON L8B 1L6 Gary Allen 905-536-3670	

Appendix D - COVID Screening Questions

Question 1:
In the past 14 days, have you traveled out of or into Canada? This does not include essential service workers who cross the border regularly for the purpose of performing an essential job or function as per the Order issued under the Quarantine Act

Question 2:
In the past 14 days, were you or someone you live with:
• Advised to consult with a Health Care Professional about COVID-19, but chose not to do so or
• Advised to get tested for COVID-19, but chose not to do so or
• Tested for COVID-19 but have not yet received the result?
This question does not pertain to those who live with someone who was tested as part of workplace surveillance

Question 3:
In the past 14 days, have you been in close contact with someone who has symptoms of COVID-19, **and**
• Has traveled to a more heavily affected area of Canada 14 days prior to symptoms appearing or
• Has had close contact with a confirmed case of COVID-19 or
• Has lived in or worked in a part of a facility known to be experiencing an outbreak of COVID-19 and had a lapse in wearing full personal protective equipment, or
• Has been tested and lab results are inconclusive, and Public Health has not released them from isolation?

Question 4:
In the past 24 hours, have you, or anyone in your household, experienced any of the following symptoms, not due to previously known chronic conditions diagnosed by a Health Care Professional?
• Fever / chills
• New cough or cough that is getting worse
• Loss of taste or smell
• Shortness of breath (while sitting/walking at a regular pace)
• Sore throat
• Runny nose / nasal congestion
• Unusual level of fatigue
• Unusual headache or long lasting – not related to other known conditions (tension type or migraine headaches)
• Nausea / vomiting, diarrhea, or loss of appetite
• Feeling unwell for an unknown reason

• Pink Eye
And
• has not received a negative COVID-19 test result with respect to those symptoms **or**
• that a Health Care Professional has diagnosed the symptoms as being caused by another illness and that COVID-19 testing is not required

1. DESCRIPTION OF WORK

.1 Work included under this Contract covers The Corporation of the City of Niagara Falls Service Centre. 3200 Stanley Avenue, Niagara Falls, ON L2E 6S4

.2 Work not included in Contract comprises those items indicated "N.I.C.", "by Owner", or "supplied by Owner".

.3 The Work to the building shall be substantially completed by September 1st, 2021.

.4 Measures must be put into place for maintenance of ongoing existing building operations (if applicable).

2. GENERAL CONDITIONS

.1 The Contractor MUST provide to the Owner, before commencing the Work, copies of Material Safety Data Sheets (MSDS) & Safety Data Sheets (SDS) for all products covered under the Ontario Health and Safety Act and Regulations, and WHMIS regulations which are to be used on or in conjunction with the Work, together with information as to how and where they are to be used.

.2 The Work for which these General Conditions are issued is governed by the Occupational Health and Safety Act and regulations for Construction Projects, Revised Statutes of Ontario, 1980 Chapter 321 as amended (Ontario reg. 213/91). The successful tenderer, upon award of a purchase order number for the work outlined, shall assume full responsibility under this legislation as the “Constructor” as defined therein.

.3 The Contractor shall ensure that the staff for which they are responsible are adequately trained and kept up to date on relevant health and safety legislation as per the Occupational Health and Safety Act and Regulations for Construction Projects. This could include but is not limited to the following: Personal Protective Equipment, Fall Protection, Travel restraint, Fall Restricting and Arrest, Overhead Protection, Fire Safety, Confined Space Entry, Ladders, Scaffolding, Elevated Work Platforms, Cranes, Hoists, Rigging, Cables, Slings, Explosive Fastening Tools, Electrical Hazards, Lock Out & Tag Out, Roofing and Excavations.

3. DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of the following:
- .1 Contract drawings/plans
- .2 Project Manual/Specifications
- .3 Addenda
- .4 Change Orders and Proposed Change Orders
- .5 Other modifications to Contract
- .6 Copy of approved work schedule
- .7 Manufacturer's installation and application instructions
- .8 All materials required for Posting by Authorities
- .9 Shop Drawings and Submittals
- .10 Field Test Reports

.11 As-Built drawings
.12 Minutes of Site Meetings

4. CONSTRUCTION SCHEDULE

.1 Contractor to provide within 14 days of award of contract a construction schedule to show weekly progress & critical path and is to include detailed co-ordination with the sub-contractors anticipated progress and a final date, refer to general instruction 44.1 Completion sub-section.

.2 Provide a schedule of submissions of shop drawings.

5. CONTRACTOR'S USE

.1 Repair grounds once work is complete, if damaged.

.2 Do not unreasonable encumber site with materials or equipment.

.3 Refer to site plan for further information.

6. CODES AND STANDARDS

.1 Perform work in accordance with Ontario Building Code and any other Codes of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
.2 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

7. PROJECT MEETINGS

.1 Within 15 days of contract award, pre-construction meeting to be held, coordinated by City.

.2 Hold project meetings in the construction office at times approved by Consultant and Owner, bi-weekly, during construction attended by General Contractor, major sub-contractors, Consultant and Owner in accordance with Niagara Region Public Health & Public Health Ontario.

.3 General Contractor to record all meeting minutes and distribute to all parties within 3 days.

.4 Items to remain from previous meetings until removed by consent of the Owner, Consultant, and Contractor.

8. EXISTING SERVICES

.1 Submit construction Schedule to and obtain approval from the Owner for any shut down or closure of active services 48 hrs., in advance. Co-ordinate for ongoing use by Owner. Adhere to approved schedule.

.2 Before commencing Work, establish location and extent of service lines in area of Work and notify Consultant of findings.

.3 Refer to mechanical, electrical, and civil drawing for service locations. Where unknown

services are encountered, immediately advise Consultant and Owner and confirm findings in writing.

.4 Protect and record locations of maintained, re-routed and abandoned service lines.

.5 Remove abandoned service lines within 2m of structure. Cap or otherwise seal lines at cut off points directed by Consultant.

9. ADDITIONAL DRAWINGS

.1 Consultant may furnish additional drawings to assist proper execution of work. These drawings will be issued for clarification only. Such drawings shall have same meaning and intent as if they were included with plans referred to in Contract documents.

10. INSTALLATION

.1 Install all materials true and plumb in accordance with drawings. Avoid interference with other trades.

11. PRODUCTS

.1 Provide as specified except with prior approval of Owner and Consultant. Reject products not meeting the Specification. Store as shipped, providing adequate protection.

12. EXAMINATION AND ACCEPTANCE

.1 Tender Documents are available on the City of Niagara Falls website at www.niagarafalls.ca/bids.

.2 In submitting bid, bidders affirmed that they did examine site for all conditions before submitting tender, and did examine the drawings of all disciplines and all tender documents thoroughly and accept them as clearly representing the Scope of Work.

.3 Examine Work of others upon which your Work depends. Application of your Work constitutes acceptance of the other trade. Failure to report deficiencies prior to application will result in making good of rejected work at your expense.

.4 Examine Work upon which your work depends. Report in writing defects in such work. Application of your work shall be deemed acceptance of work upon which your work depends.

.5 Drawings are, in part, diagrammatic and are intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of fixtures, equipment, ducts, piping, conduits and outlets and similar items. Obtain more accurate information about locations, arrangement and sizes from study and co-ordination of drawings, including shop drawings and manufacturer's literature and become familiar with conditions and spaces affecting these matters before proceeding with Work.

.6 Where job conditions require reasonable changes in indicated locations and arrangements, make such changes with approval of Consultant at no additional cost to Owner. Similarly, where existing conditions interfere with new installation and require relocation, such relocation is included in Work.

.7 Install and arrange fixtures, equipment, ducts, piping and conduit to conserve as much headroom and space as possible, and avoid interference and obstruction of access. Observe good installation practice for safety, access, maintenance and follow manufacturer's recommendations. Make changes requested to comply with these requirements at no additional cost to Owner.

.8 If requested by Consultant, and before installation, relocate equipment, services, doors, openings, furring and other work at no additional cost to Owner; providing such relocation involves only reasonable minor adjustments and reasonable advance notice is given in writing.

13. DISCREPANCIES

.1 Report discrepancies found to the Procurement Division during tender period prior to deadline as identified in the instruction to Bidders.

14. CLEANING

.1 Remove all material which may damage or be difficult to remove from your Work or adjacent surfaces. Clean your finished work.

.2 Maintain workplace in clean and orderly condition while working.

.3 Maintain Stanley Avenue access and roadway clean at all times of dust, debris, wash down daily.

15. MAINTENANCE MANUAL

.1 Provide all material regarding characteristics and maintenance of the work to the Contractor in duplicate for preparation of the Maintenance Manual under 01 00 10.

16. SAFETY

.1 Comply with the Ontario Occupational Health, Safety Act and any City of Niagara Falls policies, as amended by Bill 208 and all other applicable safety regulations, including Bill 168 – Workplace Harassment.

17. SAMPLES

.1 Where samples are specified, provide two (2) to the Contractor for review by the Consultant, clearly labelled with Project Name and sample description.

18. TEMPORARY SERVICES

.1 Provide office and storage space and sanitary facilities as defined in appropriate Section.

19. CO-ORDINATE

.1 The Contractor will co-ordinate the work of all sub-contractors, including mechanical and electrical trades.

.2 Co-ordinate work of each Section as required for satisfactory and expeditious completion of Work. Take field dimensions required. Take into account existing installations to assure best arrangements of components in available space. Consult before commencing Work in critical locations. Fabricate and erect work to suit field dimensions and field conditions.

.3 Pay cost of extra work caused by others and make up time lost as result of failure to comply with these requirements at proper time.

.4 Provide forms, templates, anchors, sleeves, inserts and accessories or other components required to be fixed to or inserted in Work. As applicable set them in place or instruct related Sections as to their location.

20. CUTTING AND PATCHING

.1 General Contractor is responsible to co-ordinate all cutting and patching required in relationship to work described under each Section including Mechanical and Electrical requirements.

.2 Use skilled mechanics in the appropriate trade and perform all cutting and patching in accordance with this specification.

.3 This applies to cutting and patching in connection with the continued operation or reactivation of existing services.

.4 All cutting and patching to be left in suitable condition for final finish.

.5 Obtain Consultants' approval before cutting, boring, or sleeving load bearing members or partitions.

.6 Removals and replacement of existing ceiling tiles will be the responsibility of Division 23 and 26 as it may affect their related work.

21. SEQUENCING/ PHASING OF WORK AND AREA AVAILABILITY

.1 Erect hoarding and safety fencing as defined in applicable Section.

.2 Control access to site after hours by gating off as defined in applicable Section.

.3 Refer to 01 11 00 for detailed breakdown.

22. RELICS & ANTIQUITIES

.1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents commemorative plaques, inscribed tablets, and similar objects found on site, shall remain property of Owner. Protect such articles and request directives from Consultant.

23. COLD WEATHER WORK

.1 Work will proceed under cold weather conditions contractor must "account and include" for the following:

.1 Provide all equipment, materials, and enclosures and all necessary power and fuel to offer complete winter protection and temporary heat.

.2 Masonry shall apply to CAN-A371-M84 Standards, noting that mortar must be maintained at a temperature of 5^0C to 50^0C until used.

.3 Reference standard for concrete and related work to CAN3-A23.1-M77, #4, ensure that all product for systems are not damaged by cold weather/ frost. Also reference Section 03 30 00, Cast in Place Concrete.

.4 Do not proceed with drywall work in unheated damp building.

24. MATERIALS, PLANT AND EQUIPMENT

.1 Materials, plant and equipment specified shall form basis of Bid and Contract. Where more than 1 brand or manufacturer is named in Specifications or on Drawings, choice is Contractors' provided requirements of Drawings and Specifications are met.

.2 Unless explicit statement is made in Bid/Contract Documents to say no substitutions will be permitted; then works "or approved alternate" are hereby deemed to apply to material, plant and equipment specified by brand or manufacturer, subject to following conditions:

a) Request for substitution is made after Contract award and in accordance with provisions for substitutions set out in the General Conditions of the Contract.

b) Proposed substitution satisfies all other indicated or specified requirements and conditions.

.3 Materials, plant and equipment shall not be damaged or defective and shall be of quality compatible with Specifications for purpose intended. If requested provide evidence as to type, source and quality. Remove and replace defective products, at own expense, regardless of previous inspections, and be responsible for delays and expenses caused thereby.

.4 Replace factory finished equipment, or parts thereof, whose paint finish is damaged and cannot be reasonably remedies by paint touch-up.

25. MATERIAL STORAGE AND HANDLING

.1 Store packaged materials in original, undamaged containers with manufacturer's labels and seals intact. Handle and store materials in accordance with manufacturers and suppliers' recommendations and in manner to prevent damage to materials during storage and handling.

26. CONCEALMENT OF WORK

.1 Conceal pipes, ducts, conduits, tubing, wiring and other items requiring concealment in floor, wall and ceiling construction of finished areas except where indicated or specified otherwise. If in doubt as to method of concealment, or intention of Contract Documents in this connection, request clarification from Architect before proceeding with work in question.

.2 Lay out mechanical and electrical work in advance of concrete placement and furring installation to allow for its proper concealment.

27. GENERAL WORKMANSHIP

.1 Do Work in accordance with industry practice for type of work unless Contract Documents stipulate more precise requirements.

.2 Do Work in neat and careful manner to retain Work plumb, square and straight.

.3 Ensure Work is properly related to form close joints and appropriately aligned junctions, edges and surfaces and is free or warp, twist, wind, wave, or other irregularities.

.4 When required by Specifications or by manufacturer's recommendations, have manufacturer, supplier or accredited agent, inspect work, which incorporates their products.

.5 Do not permit materials to come in contact with other materials whether in presence of moisture or otherwise if conditions will result in corrosion, stain or discoloration or deterioration of completed Work. Provide compatible, durable separators where such contact is unavoidable.

28. FASTENERS

.1 Supply appropriate fasteners, anchors, accessories, and adhesives required for fabrication and erection of Work.

.2 Unless specified otherwise use exposed metal fasteners and accessories of same texture, colour and finish as product being fastened.

.3 Use metal fasteners of same material as metal component being fastened, or of metal which will not generate electrolytic action and cause damage to fastener or metal component under moist conditions. In general use non-corrosive or hot dip galvanized steel anchors occurring on or in exterior wall, slab or other exterior locations, unless higher standard is indicated or specified.

.4 Fastening devices or adhesives shall be of appropriate type, used in sufficient quantity and in such manner to provide positive, permanent fastening, which will not shift, work loose or fail during occupancy of building due to vibration or other causes resulting from normal use of building. Install anchors at spacing to provide required load/stress carrying capacity. Do not use wood plugs.

.5 Lay out fasteners neatly, evenly spaced and aligned. Keep exposed fasteners to minimum.

.6 Supply adequate instructions and templates and, if necessary, supervise installation, where fasteners or accessories for your Section are required to be built into work of other Sections.

.7 Do not use fasteners which will cause spalling, cracking, or deformation or deterioration of material being fastened by or to.

.8 Do not use powder actuated fastening devices, which are used in tension, without approval. Take stringent safety precautions when using powder actuated fasteners. Use only low velocity plunger-type devices.

.9 Use adhesives specified, or if not specified, those recommended by manufacturer of materials involved, compatible with materials to be joined, and effective in forming permanent joint of adequate strength.

.10 Use screws, nails, staples, and other similar, driven fasteners suitable to materials to be joined and to conditions under which they are installed and used. Ensure that in finished work, fasteners are sized to take durable hold under stress to be encountered without damage to finished work.

.11 Do brazing or soldering to form durable connections of strength adequate to resist stresses to be encountered without deformation of elements joined. Prepare base metals and use methods and materials to ensure clean joint, and to prevent staining, corrosion, discolouration, deformation or other damage to finished Work.

.12 Do welding to CSA W59-M89 (for steel) or CSA W59.2-M91 (for aluminum) for material and methods, unless specified otherwise. Have welding performed by industry certified operatives to CSA W47.1-83 or CSA W47.2-M87.

29. ACCESSORIES

.1 Provide accessory items or materials required, such as brackets, cleats, connectors, sealants, lubricants, cleaners, protection, and similar items, whether specified or not, so that Work is complete and will perform as required.

30. DESIGN AND SAFETY REQUIREMENTS FOR TEMPORARY WORK

.1 Be responsible for professional design, erection, maintenance and removal of temporary structural and other temporary facilities. Engage and pay for registered Professional Engineering personnel skilled in appropriate disciplines to perform these functions where required by law or by the Contract Documents; and in cases where such temporary facilities and their method of construction are of such nature that Professional Engineering skill is required to produce safe and satisfactory results.

31. PROTECTION AND SAFETY

.1 Comply with requirements of Acts and Regulations with respect to health and safety including Occupational Health and Safety Act, as amended, and Workplace Hazardous Materials Information System (WHMIS) Regulation, including following:

.1 Before commencement of Work, and throughout Contract, maintain on Site, and readily accessible to all those who may be exposed to hazardous materials, list of hazardous materials proposed for use on Site or Workplace together with current Materials Safety Data Sheet (MSDS).

.2 Ensure hazardous materials used and/or supplied on Site are labelled in accordance with WHMIS requirements.

.3 Know and be aware of the procedures for safe handling, storage and use of such hazardous materials including special precautions, safe clean-up and disposal procedures. Conform to Environmental Protection Act for disposal requirements.

.4 Ensure that those who handle, and/or are exposed to, or are likely to handle or be exposed to, hazardous materials are fully instructed and trained in accordance with WHMIS requirements.

.2 Protect excavation, trenches and building from damage from rainwater, ground water, backing up of drains or sewers and other water, frost and other weather conditions. Provide sheeting, piling, shoring, pumps, equipment, temporary drainage, protective covering and enclosures. Provide necessary pumps including spare pump for keeping project free of water throughout construction period.

.3 Protect, relocate and maintain existing, active services wherever they are encountered. Wherever inactive services are encountered, cap them off and remove unwanted portion, with approval of authorities having jurisdiction or public utility concerned in manner approved by them.

.4 Load no part of structure during construction with load greater than it's calculated to bear safely when completed. Make every temporary support as strong as permanent support. Place no load on concrete structure until it has sufficient strength to safely carry such load.

.5 Adequately protect floors and roofs from drainage. Take special measures when moving heavy loads or equipment on them.

.6 Keep floors free of oils, grease or other materials likely to discolour them or affect bond applied surfaces including fumes generated by temporary heating devices. Take care not to spill or allow oil, grease, gasoline, diesel and fuel oil, chemicals and other substances to contaminate soil water on or adjacent to site. Should such contamination accidentally occur report it immediately and clean up to satisfaction of Consultant.

.7 Protect work of other Sections from damage resulting from your work.

.8 Damaged work shall be made good wherever possible by Section whose work is damaged but at expense of those causing damage.

.9 Protect glass and other finishes against heat, slag and weld splatter using suitable protective shields or covers.

.10 Prior to beginning of construction, familiarize yourself if applicable, with fire safety plan prepared by the Client in conjunction with local Fire Chief. Post fire safety plan throughout construction. Do not allow accumulation of waste that may constitute fire hazard.

.11 Conform to Construction Safety Association of Ontario's manual on Propane in construction. Watch work area for minimum of 30 minutes after hot work is completed. Provide site fire security when required by local building department and/ or municipal fire department. Ensure that water supply is adequate for fire fighting

.12 Provide and maintain in working order, suitable Underwriters' labelled fire extinguishers and locate in suitable positions, to approval of authorities having jurisdiction.

.13 Provide minimum of 3 safety helmets for Consultant and any other authorized visitors to Site if required.

.14 Protect public and those employed on Work from injury. Equipment (mobile) when not in use shall have keys removed and locked up in secure location.

32. SCAFFOLDING

.1 Erect scaffolding independent of walls. Use it in a manner as to interfere as little as possible with other Sections. When not in use, move it as necessary to permit installation of other work. Construct and maintain scaffolding in rigid, secure and safe manner. Remove it promptly when no longer required.

33. TEMPORARY CLEANING

.1 Keep site and building, including concealed spaces, free from accumulation of dirt, debris, garbage and excess material. Remove oily rags and waste from premises at close of each day, or more often if required.

34. MANUFACTURERS DIRECTIONS

.1 Except where specified otherwise, use each product in accordance with manufacturer's published or written instructions, specifications or recommendations regarding handling, storage, preparation, site conditions, ancillary products or accessories, methods of installation, protection and cleaning. Submit copy of such instructions, and indicate if and where there is discrepancy between them and requirements of specifications and obtain direction.

35. SPARE PRODUCTS

.1 Where specified in other Sections, provide spare materials and products for future repair and replacement.

.2 Ensure such materials are of same production run as those incorporated in Work.

.3 Deliver quantities required, in separate labelled containers, and store where directed.

.4 Labels shall state material description, colour, pattern and location of installation.

36. ENVIRONMENTAL PRACTICES

.1 Take active role in implementing environmentally sound business practices and producing goods and services that lessen burden on environment in production, use and final disposition. Support implementation of reduction, reuse and recycling strategies and use of environmentally sound products. Reduce or eliminate excessive packaging and promote use of environmentally responsible packaging practices.

a) Environmentally Sound Products: Product that is made, used and disposed of in a manner that significantly reduces harm it would otherwise cause environment. Product may be certified as environmentally sound because it is made in a way that improves energy efficiency, reduces hazardous by-products, uses recycled material, or because the product itself can be recycled or reuses, or in some way is environmentally benign.

b) Packaging requirements: Implement waste reduction by reducing or eliminating

excessive packaging practices.

c) Use, where appropriate, combination of packaging materials such as reusable containers, blanket wrap or cushioning material provided that all reasonable requirements of materials handling, transportation and storage are observed.

d) Packaging materials such as Kraft paper and corrugated cartons shall be made from reclaimed products to facilitate recycling of secondary materials.

e) Packaging material shall be clearly labelled to display their recycled content and recyclability.

f) Ensure that packaging materials are removed from Site and disposed of in environmentally responsible manner.

37. WASTE DISPOSAL

.1 Do not burn rubbish on Site. Obtain approval and use following off-site disposal alternatives, depending upon materials involved; burying, composting, Municipal collection or local dump or sanitary landfill site.

38. SECURITY

.1 General Contractor at their cost, is to be responsible for and provide reasonable security measures to protect the site, building and contents until the date of Substantial Performance which may include but not limited to security personal, surveillance cameras, fencing, night lighting, etc.

.2 General Contractor and Electrical Contractor to ensure existing building security and life safety systems remain in operation during construction (if applicable).

39. LINES, LEVELS AND DIMENSIONS

.1 Have registered Ontario Land Surveyor establish 1 permanent bench-mark on Site, referenced to established bench-marks by survey control points. Provide and maintain control lines and level required. Confirm and co-ordinate with the local municipal office, when setting out. Maintain record as-built survey of all new grades/ levels.

.2 Lay out work in accordance with lines, levels and dimensions indicated and/or provided on bench marks established by survey.

.3 Verify lines, levels, and dimensions. Report errors or inconsistencies in drawings and obtain direction before commencing work.

.4 Except as provided by survey, provide lines, levels, and dimensions necessary to relate your work to work of other Sections.

40. HOARDING/ FENCING/ PROTECTION/ SECURITY/ TEMPORARY ACCESS/ PARKING

.1 Provide and maintain all hoarding, safety fencing, shoring etc. necessary for the protection of workers, public and the work on other properties. Refer to contract documents for location of

required hoarding and temporary site access routes.

.2 Contractor shall be fully responsible for any cost associated to security as it is deemed necessary to site conditions.

41. SPILL RESPONSE

.1 The contractor shall have written spill response procedures and material on site to respond to pollutants and containments into the natural environment in excess of levels permitted in regulations or cause or are likely to cause an adverse effect.

43. ASBESTOS AND ASBESTOS REPORT

.1 Should the Contractor find additional asbestos containing materials, notify the Consultant and the Owner will arrange for its removal.

44. COMPLETION

.1 The intent of the Owner is to have the building Work substantially completed by September 1 2021. Total completion for all Site Work is required by October 1. 2021.

.2 Erect hoarding and safety fencing as necessary to protect the public. Maintain all required Fire Access Routes, hoard as required to provide safe travel and access.

.3 Carry out work in such a way as to avoid interference with on-going operations of the existing building. This includes, but is not limited to, site access, services, public, building occupants, control of noise and dust etc.

.4 Recognize that all existing facilities continue to operate through the course of new construction. Maintain all life safety equipment and measures in place. Refer to Drawing A0-200 for required enhanced measures.

.5 Contractors' and their employees may not enter the existing building except by prior arrangement with the Owner and security personnel or front administrative office.

END OF SECTION

1. CO-ORDINATE

.1 Conform to General Instructions.

.2 Co-ordinate all Sections of the Work.

.3 Co-ordinate with the Owner for timely inclusion of other trades, and the Work of Other Contractors.

2. TEMPORARY UTILITIES

.1 Temporary power is available by arrangements with the City of Niagara Falls as defined in Section 01 51 00 Temporary Utilities. If required.

.2 Temporary water is available by arrangements with the City of Niagara Falls as defined in Section 01 51 00 Temporary Utilities.

.3 Provide temporary heating as may be required and protection measures as defined in Section 01 51 00 Temporary Utilities.

3. TEMPORARY FACILITIES

.1 Locate construction office trailer and trade support trailers, including storage as defined in Section 01 52 00 Construction Facilities.

.2 Provide telephone and related support equipment within construction office trailer as defined in Section 01 52 00 Construction Facilities.

.3 Provide temporary sanitary facilities as defined in Section 01 52 00 Construction Facilities.

.4 Provide and pay for costs of all temporary heating and protection measures for all sections and to industry standards. Do not use installed systems without owner approval. If approval is received, clean all systems and replace all filters prior to acceptance by Owner. Contractor to make own arrangements and pay for temporary natural gas for purposes of heating building once it is enclosed.

4. TEMPORARY HEATING REQUIREMENT THROUGH WINTER CONSTRUCTION

.1 Provide any 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 not permitted.

.3 Maintain temperatures of minimum 10 degrees Celsius in areas where construction is in progress.

.4 Ventilate heated areas and keep building free of exhaust or combustion gases.

.5 Permanent heating system of building, or portions thereof, may be used when available. Be

responsible for damage hereto. Change filters. Contractor must make a formal request to do so in writing. An extended warranty of 1 year will be required.

.6 Allow for all costs associated with heating during winter months. No additional costs will be entertained.

5. WINTER CONSTRUCTION REQUIREMENTS

.1 When the Work proceeds under winter conditions, the following apply:

.1 Provide all equipment, material and enclosures and all necessary power and fuel to offer complete “winter protection” and “temporary heat” as defined in Section 01 51 00 and section 01 52 00.
.2 Masonry and related work to CAN-A371-M94, noting that mortar must be maintained at a temperature of 5ºC to 50ºC until used.
.3 Concrete and related work to CAN3-A23.1-M77.
.4 Ensure that products or systems are not damaged by cold weather.
.5 Do not proceed with drywall work in unheated, damp building.

6. HOARDING, FENCING, PROTECTION, SECURITY, TEMPORARY ACCESS, PARKING

.1 Provide site access, roads, parking and security as defined in Section 01 52 00 for Construction Facilities.

.2 Provide hoarding, fencing and related protection as defined in Section 01 56 00 for Temporary Barriers and Enclosures.

7. CLEAN-UP

.1 Maintain clean and orderly site.

.2 Provide refuse receptacles and dumping service in a location approved by the Owner.

.3 Perform final clean-up of all Sections before turning over to the Owner. Refer to Section 01 74 11 - Cleaning.

8. MAINTENANCE MANUALS

.1 Provide at the completion of the Work, 4 copies of a Maintenance Manual to the Owner. Include manufacturer's data and instructions for maintenance, adjustment, re-finishing, etc. of all materials and equipment. Include special warranty documentation and information; 3-ring binder format, indexed. Supply all information to architect for incorporation into Final Record Drawings, for computer update of Tendered Documents, to be paid for by Contractor:

.2 Consultant will withhold a sum of $5,000.00 from final payment, noted on Certificate for Payment prorated over construction time period, until such time as manuals and as-builts have been submitted and approved and training, commissioning, and demonstration are completed.

.1 The above amount is to be noted as a line item on progress draws.

9. RECORD DRAWINGS

.1 Maintain continuously a complete set of record prints, clearly indicating all significant changes from the Contract Documents which will not be visible at the conclusion of Work.

.2 Record information concurrently with construction progress. Do not conceal work until required information is recorded, and until Architect has reviewed As-built drawings.

.3 Contract Drawings and shop drawings: legibly mark each item to record actual construction including:

.1 Measure 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.

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

.1 Manufacturer, trade name, and catalogue number of each project actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and Change Orders.

.5 Other Documents: maintain manufacturer's certification, inspection certifications, required by individual specifications sections.

11. SUPERINTENDANTS

.1 Maintain competent superintendants on site full-time at all times that Work is being carried out, to the satisfaction of the Owner.

.2 The general contractor to provide one individual, suitably trained and experienced, specifically identified as the project superintendant, who will be on site at all times during construction, right through to the hand-over and completion of deficiencies. If the general contractor decides to change superintendants part-way through the project, it is to be with the agreement of the Consultant and Owner. Any replacement would have to meet the above requirements and be accepted by the Consultant and Owner.

12. SHOP DRAWINGS

.1 Thoroughly examine submitted shop drawings and indicate the contractor’s approval on them prior to submitting to the Consultants. Check all dimensions and conformance with Project Manual.

.2 Before commencing Work, prepare to the Consultant’s satisfaction a schedule for submission of all required Shop Drawings.

(See attached submittal checklist section 01 33 00).

.3 Reproductions of Consultant's drawings will not be permitted.

.4 Provide specified shop drawings to Consultant for approval or in PDF file format.

.5 Contractor must submit all shop drawings within *4 weeks* of award of contract.

13. COST BREAKDOWN

.1 Before submitting first progress claim, submit breakdown of Contract Price in detail as directed by Consultant and aggregating Contract Price. After approval by consultant, cost breakdown will be used as basis for progress payment.

.2 Include a detailed mechanical and electrical breakdown. A lump sum will not be permitted.

14. MAKING GOOD

.1 Make good any existing surfaces disturbed by any cause during construction, to a condition at least equivalent to that in place before your work was commenced.

15. CONSTRUCTION SCHEDULE

.1 Provide within 14 working days after Contract award, a schedule showing progress stages and final completion of work, all to the satisfaction of the Consultant. Completion dates for construction is to be as defined in Supplementary Conditions.

16. EXISTING UTILITIES

.1 Arrange for location of all existing utilities prior to commencing any Work on site.

.2 Verify with Owner.

17. OTHER CONTRACTORS

.1 There may be 'Other Contractors' engaged under separate contracts completing Work. The Contractor will be provided with information on that Work by Others during construction. The Contractor must co-ordinate with the Other Contractors for the completion of the project.

.2 This Contractor must examine the work of the Other Contractors upon which your work depends, advising the Consultant of any evident deficiency. Any trade applying their Work over that deficient work, shall be required to replace it at no expense to the Owner. Any trade that has a concern with the quality if any preceding work, should report their concerns immediately to the general contractor so that it can be replaces/ repaired as soon as possible so as to not delay the project schedule.

18. INSPECTION AND TESTING

.1 Arrange for all required testing and pay costs from Cash Allowance, Section 01 21 00.

.2 Testing requirements include concrete, compaction, mortar, welding of structural steel, asphalt pavement, roofing, and other items to be established by the Consultant.

.3 The cost of retesting any work found to be substandard will be paid for by the trade responsible.

.4 All test results to be forwarded electronically to applicable consultant team and Owner.

19. GEOTECHNICAL CONSULTANT

.1 Retain for Tender the services of a Geotechnical Consultant, to review excavation before placing of footings and test for compaction at Owner's approval.

.2 Pay for these services from Cash Allowance Section 01 21 00 at Owner's approval.

20. PERMITS

.1 Permits pertaining to particular trades shall be paid for by the particular sub-trade concerned. Comply with all regulations of all public authorities having jurisdiction.

.1 The cost of the Municipal Building Permit has been applied for and paid for by the Owner.

.2 Permit is now available.

END OF SECTION

Part 1 General

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

1.2 Work Covered by Contract Documents

.1 Work of this Contract comprises of City of Niagara Falls Service Centre Renovations, Niagara Falls, Ontario

1.3 Scheduling of the Work

.1 The General Contractor shall perform their work in full cooperation with other trades, and co-ordinate the schedule and sequence of all work with other trade.

.2 Refer to A1-200 series drawings for Phasing information as part of tender package (if applicable).

.3 Refer to Section 01 00 05 General Instruction for Substantial Completion Date.

1.4 Pre-ordered Products Pre-bid Work

.1 Refer to Division 23 and 26

1.5 Pre-purchased Equipment

.1 Refer to Division 23 and 26

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 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. City of Niagara Falls requires at least 10 business days notification prior to work starting in an area where staff may have to be relocated. The contractor can complete work in these areas after hours or on weekends if required. If after hours or weekends, areas must be made safe each day in order to allows staff to continue working.

.2 Maintain existing services to building and provide for personnel and vehicle access. The City of Niagara Falls Service Centre is operating at a reduced capacity; however, there is active traffic in and out of the yard area. The contractor will need to adhere to traffic flow patterns & safety requirements within the active yard area.

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

.4 The Owner will not assign sanitary facilities for use by Contractor's personnel. Contractor to provide own facilities.

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

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 EXISTING SERVICES

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

.2 During major interruptions to the Service Centre operations (i.e., Hydro shutdown), the owner will require a minimum of 10 business days notification prior to work commencement in order to relocate staff if necessary.

.3 Provide for personnel, pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

.1 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

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

1.6 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed on property.

1.7 FIRE PROTECTION

.1 General Contractor to provide and maintain temporary fire protection equipment during construction.

.2 A fire safety plan is to be posted on Site prepared in conjunction with the local Fire Department, attention to the current Fire Chief or Fire prevention officer.

.3 General Contractor and all sub-trades to regularly remove waste that may constitute a fire hazard.

.4 An adequate water supply for fire fighting is to be maintained throughout construction.

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 SECTION INCLUDES

.1 Cash allowances.

1.2 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008 Stipulated Price Contract.

.2 Project Supplementary Conditions

1.3 CASH ALLOWANCE

.1 Refer to CCDC 2, GC 4.1.

.2 Include in the Contract Price, Cash Allowances stated herein.

.3 Cash allowances, unless otherwise specified, cover net cost to the Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, and other authorized expenses incurred in performing the Work stipulated under the cash allowances but do not include any Value Added Taxes payable by the Owner.

.4 The Cash Allowances contained here in exclude the Contractors overhead and profit as this is carried in the Contract Price.

.5 The Contract Price will be adjusted by written order to provide for an excess or deficit to each cash allowance.

.6 Where costs under the Cash Allowance exceed the amount of the allowance, the Contractor will be compensated by a change order process for excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.

.7 Progress payments on accounts of work authorized under the cash allowance shall be included in the Consultant's monthly Certificate for Payment, by using an Allowance Disbursal.

.8 The Owner reserves the right to transfer or rebalance funds between cash allowances at their own discretion, without incurring any additional markups.

.9 A schedule shall be prepared by the Contractor to show when items called for under the cash allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.

.10 Carry a total Cash Allowance of $1,630,000.00 for work specified in the respective specification sections. Article GC 4.2 and 08710:

.1 Cash allowance sum of $15,000.00 for miscellaneous items and unforeseen items discovered during construction.

.2 Cash allowance sum of $15,000.00 for Inspection and Testing, which shall include but not limited to the following: a) soil samples b) fill density and compaction c) concrete strengths d) mortar strengths e) roof inspection f) structural steel.

.3 Cash allowance sum of $75,000.00 for Contaminated Soil Removal and Disposal, net of applicable taxes.

.4 Cash allowance sum of $100,000.00 for Hydro Connection/Transformer charges from NPEI, net of applicable taxes.

.5 Cash allowance sum of $200,000.00 for the supply and installation of Niagara Protective Coatings for Flooring and Mechanics Pit.

.1 NPC to prep all floors via dustless diamond grinding of edges and shot blasting of floors, route all cracks and construction joints via diamond chasing and vacuuming. Fill all cracks and joints with epoxy filler (rigid), NPC to install 2 coats of Epoxal 100 HP Colour Silver Grey at 16-18 mils thickness with texture. Net of applicable taxes.

.2 Mechanics Shop Floor:
Install a nominal 1/4" kromoquartz sld epoxy mortar system with pre filling of holes and transitions. Abrade entire floor area to receive Epoxal coating (Dry dustless surface prep, diamond grinders). Sweep, Vacuum and make ready for floor coating. (divots, holes to be filled with epoxy paste.) as per Manufacturers Specification.

.3 All floors to be cleaned & degreased by another contractor under this allowance.

.6 Cash allowance sum of $55,000.00 for the supply and installation of Finish Door Hardware, net of applicable taxes. (To be tendered to minimum 3 suppliers).

.7 Cash allowance sum of $100,000.00 for the supply and installation of Wide Span Shelving, net of applicable taxes. (To be tendered to minimum 3 suppliers).

.8 Cash allowance sum of $70,000.00 for Design Electronics Access Controls as identified on the drawings, net of applicable taxes.

.9 Cash allowance sum of $25,000.00 for the removal, supply and installation of New 6” Concrete Floor in Garage as identified on the drawings, net of applicable taxes

.10 Mechanical Cash Allowance sum of $975,000.00 to Refrigeration Energy Solutions LTD for the supply and installation of mechanical equipment, net of applicable taxes. Breakdown as follows:

.1 Demolition and removal of existing equipment and housekeeping pads including disposal bins, lifting equipment, and labour. $26,000.00

.2 HVAC Subcontractor – Fans, Dampers, Louvers, Grills, Curbs, and Ductwork. $252,000.00

.3 HVAC equipment installation c/w NG piping and combustion venting. $85,000.00

.4 Waste Oil Subcontractor. $27,000.00

.5 Gas Detection Subcontractor. $13,000.00

.6 Insulation Subcontractor. $70,000.00

.7 Refrigeration Piping. $45,000.00

.8 Controls. $152,000.00

.9 Testing & Balancing Subcontractor. $30,000.00

.10 Balance of HVAC equipment. $220,000.00

.11 Plumbing Subcontractor. $55,000.00

.11 All cash allowances exclude HST.

END OF SECTION

1. SECTION INCLUDES

.1 Schedule, form, content.

.2 Scheduled revisions

.3 Critical path scheduling

2. RELATED SECTION

1. General Work - Section 01 00 10

2. Submittal Schedule – Section 01 33 00

3. SCHEDULES REQUIRED

.1 Submit the following schedules:
.1 Construction Progress Schedule
.2 Submittal Schedule for Shop Drawings and Product Data
.3 Product Delivery Schedule

4. FORMAT

.1 Prepare schedule in the form of a horizontal bar chart.

.2 Provide a separate bar for each trade or operation.

.3 Provide horizontal time scale identifying the first work day of each week.

.4 Format for listings: The Table of Contents of this specification.

.5 Identification of listings: By Specification Subjects.

5. SUBMISSION

.1 Submit initial schedules and critical path within 14 days after award of Contract.

.2 Submit one opaque reproduction, plus two copies to be retained by the Consultant.

.3 Consultant will review schedule and return review copy within 5 days after receipt.

.4 Resubmit finalized schedule within 7 days after return of review copy.

.5 Submit revised progress schedule with each application for payment.

.6 Distribute copies of the revised schedule to:

.1 Job site office.
.2 Subcontractors.
.3 Other concerned parties.

.7 Instruct recipients to report to the Contractor within 10 days, any problems anticipated by the timetable shown in the schedule.

6. CONSTRUCTION PROGRESS SCHEDULE

.1 Include the complete sequence of construction activities.

.1 Refer to Section 01 00 05 General Instructions for Substantial Completion date.

.2 Refer to A1-200 series drawings for project phasing if applicable.

.2 Include the dates for the commencement and completion of each major elements of construction:
a) Demolition
b) Foundations
c) Masonry
d) Mechanical Rough-In
e) Electrical Rough-In
f) Mechanical Finishes
g) Electrical Finishes
h) Doors and Frames
i) Flooring
j) Painting
k) Structural Steel
l) Roofing
m) Asphalt
n) Site Services

.3 Show projected percentage of completion of each item as of the first day of the month.

.4 Indicate progress of each activity to date of submission schedule.

.5 Show changes occurring since previous submission of schedule:
.1 Major changes in scope.
.2 Activities modified since previous submission.
.3 Revised projections of progress and completion.
.4 Other identifiable changes.

.6 Provide a narrative report to define:
.1 Problem areas, anticipated delays, and the impact on the schedule.
.2 Corrective action recommended and its effect.
.3 The effect of changes on schedules of other prime contractors.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples.

.3 Certificates and transcripts.

1.2 RELATED SECTIONS

.1 Section 01 30 10 – Construction Schedule.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 74 19 – Construction/Demolition Waste Management and Disposal

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 01 79 00 - Demonstration and Training.

.6 Section 23 05 54 - Mechanical Identification.

1.3 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.4 ADMINISTRATIVE

.1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Work affected by submittal shall not proceed until review is complete.

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

.4 Where items or information is not produced in SI Metric units converted values are acceptable provided SI Metric units are shown in parenthesis.

.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 coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be 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 Works are coordinated.

.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.

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to CCDC 2 GC 3.10.

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

.3 Consultant's AutoCAD files will not be made available to contractors for use in creation of shop drawings.

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

.5 Allow 7 working days for Consultant's review of each submission.

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

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

.8 Accompany submissions with transmittal letter, in duplicate, containing:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Identification and quantity of each shop drawing, product data and sample.
.5 Other pertinent data.

.9 Submissions shall include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

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

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.10 After Consultant's review, distribute copies.

.11 Submit digital shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.

.12 Submit digital 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.

.13 Delete information not applicable to project.

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

.15 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.

.16 Reproduction of Consultant's drawings will not be permitted. For a fee paid to consultant, CAD files may be made available to assist in preparation of shop drawings.

1.6 SAMPLES

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

.2 Deliver samples prepaid to Consultant's business address.

.3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

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

.6 Make changes in samples which Consultant may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.7 MOCK-UPS

.1 Erect mock-ups in accordance with 01 33 10 Submittal checklist and 01 45 00 - Quality Control.

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 RELATED SECTIONS

.1 Section 01 33 00 - Submittal procedures.

1.2 REFERENCES

.1 Canada Labour Code (December 2010), Part 2, Canada Occupational Safety and Health Regulations.

.2 Province of Ontario

1. Occupational Health and Safety Act and Regulations for Construction Projects, Ontario regulation 213/91; December 2016.

1.3 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site-specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

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

.4 Submit copies of incident and accident reports.

.5 Submit Material Safety Data Sheets (MSDS) & Safety Data Sheets (SDS) to Consultant.

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

.7 Consultant’s review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.

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

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with the Owners' representative prior to commencement of Work.

1.7 HAZARDOUS MATERIAL AND ASBESTOS ABATEMENT

.1 All related Work will be by the Owner.

1.8 SITE CONDITIONS

.1 Refer to site condition and assessment reports for any hazardous or contaminated materials or substances present at project site. List relevant hazardous or contaminated materials or substances required by the authority having jurisdiction which needs to be included in the contractor's Health and Safety Plan.

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

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

1.9 RESPONSIBILITY

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

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

1.10 UNFORSEEN HAZARDS

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

1.11 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have minimum 2 years' site-related working experience specific to activities associated with construction.

.2 Have a working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work.

1.12 POSTING OF DOCUMENTS

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

1.13 CORRECTION OF NON-COMPLIANCE

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

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

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

1.14 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.15 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Consultant.

1.16 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 FIRES

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

1.2 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site.

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

1.3 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Wrap in burlap, trees and shrubs near construction work or storage areas and trucking lanes and encase with protective wood framework from grade level to height of 2 m.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Consultant.

1.5 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

ENVIRONMENTAL NOTES

1. This Section is intended to assist Respondents in gaining an understanding of the City of Niagara Falls requirements for potential environmental concerns.

2. The Niagara Falls Service Center Building has had impacts of petroleum hydrocarbons, volatile organic compounds (VOCs), polyaromatic hydrocarbons, (PAHs), etc. throughout the history of activities/operations onsite. Impacts have been identified for sub slab conditions within the Stores area of the building.

3. This section is provided to allow for contractors bidding to account for conditions that may be encountered during the removal of concrete, asphalt, excavation for footings/foundation and provide for appropriate personal protective equipment (PPE) for workers/persons.

4. The City will provide air quality monitoring and waste characteristic sampling of excavated materials. Air quality monitoring will be conducted on-site, real-time measurements. Waste characteristic sampling requires laboratory analysis and 5-day turnaround time for analysis results.

5. The City is providing an ‘allowance’ for environmental/occupational protection of workers, refer to section 01 21 00.

6. The Successful Respondent will require protection for worker and environment during the cutting/removal of concrete and sub slab materials.

7. Cutting/breaking/abrading of concrete requires dust control measures.

8. The City’s consultant will be available to be on-site during the removal of concrete and sub slab materials. The Contractor is to provide the City representative 48 hours’ notice of schedule/intent to remove concrete and sub slab materials.

9. The Contractor to make available dust control techniques to remove hazards due to dust and carbon monoxide.

10. Make available forced air mechanical system to remove contaminants at the source and away from workers. Concrete dust particles will require HEPA filtration at the source.

11. Provide continuous ventilation during the removal of concrete and sub slab materials.

12. All concrete, asphalt and sub slab materials removed from excavation are to be placed into separate waste container. Materials will be tested for leachate quality criteria and disposed of appropriately. Weigh bill(s) are to be forwarded to City for record purposes.

13. Materials removed from excavation, including concrete, asphalt, sub slab materials are not to be used as backfill.

14. Estimated tonnes of material to be removed & disposed under cash allowance, refer to section 01 21 00.

15. Suitable vapour barrier protection is required to be installed where concrete and sub slab materials have been removed. Minimum 15 mil vapour barrier is to be installed meeting ASTM E1745-11 Class A, B & C.

16. Follow ASTM E1643-10 (standard practice and procedure for installation of vapour retarder used in contact with earth or fill under concrete slabs). Water Vapor Permeance, ASTM E-96, with minimum Perms of 0.01perms. Pointing mastic to be applied to seams/joints to create continuous assembly.

17. Notify City/representative upon installation of vapour barrier for Engineer inspection/observation of vapour barrier. No concrete is to be poured over vapour barrier until City/representative conducts inspection/observation.

18. City/Representative will conduct air quality monitoring during concrete and sub slab removal of materials. Tests will include for carbon monoxide, % Lower Explosive Limit (%LEL), volatile organic compounds (VOCs), oxygen (O_2), Hydrogen Sulphide (H_2S), Particulate (size selective fractions). City/Representative will provide verbal results for air monitoring on-site. Exceedances for air quality will require the contractor to stop work and mitigate.

Risk Assessment

Task	Equipment	Hazard	Risk
Concrete Cutting	Quick Cut Saw (gas)	Silica dust, respirable/inhalable dust, carbon monoxide	High Risk
Concrete Breaking	Demolition hammer, pionjar (gas)	Silica dust, carbon monoxide, inhalable dust	Med Risk
Concrete Drilling	Rotary hammer	Silica dust, inhalable/respirable dust	Med Risk
Mastic Application	Caulking Gun	VOCs	Low
Removal of Sub Slab materials	excavator	Exhaust emissions, VOCs/gasoline vapours from sub slab	Med Risk

Removal of Sub Slab materials	Vacuum truck	Exhaust emissions, VOCs/gasoline vapours from sub slab	Med Risk
Exhaust emissions, VOCs/gasoline vapours from sub slab	Hand digging	VOCs/gasoline vapours from sub slab	Med Risk

Part 1 General

1.1 Section Includes

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Equipment and system adjust and balance.

1.2 Related Sections

.1 Section 01 21 00 - Allowances.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 33 10 - Submittal Checklist

.4 Section 01 78 00 - Closeout Submittals.

1.3 References

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.4 Inspection

.1 Refer to CCDC 2, GC 2.3.

1.5 Independent Inspection Agencies

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

.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 Consultant.

1.6 Access to Work

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

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

1.7 Procedures

.1 Notify appropriate agency 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 an orderly sequence so as not to cause delay in Work.

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

1.8 Rejected Work

.1 Refer to CCDC, GC 2.4.

1.9 Reports

.1 Submit 4 copies of inspection and test reports to Consultant.

.2 Provide copies to Subcontractor of work being inspected or tested and/or manufacturer or fabricator of material being inspected or tested.

1.10 Tests and Mix Designs

.1 Furnish test results and mix designs as may be requested.

.2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Consultant and may be authorized as recoverable.

1.11 Mock-ups

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups. See section 01 33 10

.2 Construct in all locations acceptable to Consultant, as specified in specific Section.

.3 Prepare mock-ups for Consultant's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.

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

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

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

1.12 Mill Tests

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

1.13 Equipment and Systems

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Temporary utilities.

1.2 RELATED SECTIONS

.1 General Work Section 01 00 10.

.2 Temporary Facilities Section 01 52 00.

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.4 DEWATERING

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

1.5 WATER SUPPLY

.1 Water supply is available from the existing building and will be provided for construction usage at no cost.

.2 Cost for connection to the existing system shall be paid for by the Contractor. The Contractor is to provide his own hoses for construction use.

.3 Do not interfere with the ongoing operation of the existing building functions.

.4 Permanent water supply system installed under this contract may be used for construction requirements with prior approval from the Consultant provided that guarantees are not affected. Make good any damage.

1.6 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 Open and burning of rubbish are not permitted on site.

1.7 POWER AND LIGHT

.1 Electrical power and lighting system supply is available from the existing building and will be provided for construction usage at no cost.

.2 Electrical power and lighting systems installed under this contact may be used for construction requirements with prior approval of Consultant provided that guarantees are not

affected. Make good damage. Replace lamps, which have been used over a period of 3 months.

1.8 HEATING & VENTILATING

.1 Construction heaters used inside building must be vented to outside or be non-flameless type. Ventilate heated areas and keep building free of exhaust or combustion gases Solid fuel salamanders not permitted.

.2 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be 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 minimum temperature of 10°C or higher where specified as soon as finishing work is commenced and maintain until acceptance of structure by Consultant.

.5 Ventilating:

.1 Prevent hazardous 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 Provide mechanical ventilation to accelerate drying out of building if necessary, to maintain schedule.

.4 Ventilate storage spaces containing hazardous or volatile materials.

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

.6 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.

.7 Permanent heating system of building, or portions thereof, may be used when available. Be responsible for damage thereto. Do not use installed systems without owner approval. If approval is received, the Contractor is to make own arrangements and pay for all fuel costs for purposes of heating building once it is enclosed during construction. Activate air system after Consultant is satisfied that system will not be damaged by freezing. Protect ducting system by disposable filters 50% effective NDS inspected daily and replaced as necessary.

.8 Upon completion of work or once the Owner is awarded partial or final occupancy for which permanent heating system is used, the Contractor must thoroughly clean and vacuum the system and replace all filters to the satisfaction of the Consultant.

.9 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 so certified by Consultant.

.10 Refer to Section 01 74 11 Cleaning for replacement of filters at time of final acceptance of work.

1.9 CONSTRUCTION OFFICE SUPPORT EQUIPMENT

.1 Provide office support equipment according to Section 01 52 00 for Construction Facilities.

1.10 SANITARY FACILITIES

.1 Provide sanitary facilities according to Section 01 52 00 for Construction Facilities.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds

.3 Parking

.4 Project identification

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Work.

.2 Section 01 51 00 - Temporary Utilities

.3 Section 01 56 00 - Temporary Barriers and Enclosures

1.3 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 1-GP-189-2000, Primer, Alkyd, Wood, Exterior.

.2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.3 Canadian Standards Association (CSA International)

.1 CAN3-A23.1-/A23.2-94, Concrete Materials and Methods for Concrete Construction/Method of Test for Concrete.

.2 CSA-0121-M1978, Douglas Fir Plywood.

.3 CAN/CSA-Z321-96, Signs and Symbols for the Occupational Environment.

1.4 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Provide, construct and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs etc. in a rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 54 50 for safety requirements for scaffolding.

1.6 HOISTING

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

.2 Hoists cranes shall be operated by qualified operator.

1.7 ELEVATORS

.1 Existing elevators may not be used for transporting construction personnel and materials unless approved by the Consultant.

.2 If permitted use is approved the Contractor is to provide protective covering for finish surfaces of cars and entrances.

1.8 SITE STORAGE / LOADING

.1 Refer to CCDC 2, GC 3.11.

1.9 ACCESS / TRAFFIC

.1 Provide and maintain access to project site as indicated in construction documents.

.2 Do not interfere with adjacent and local existing traffic patterns including such items as bus routes, drop-off/ pick-up lanes etc.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

1.10 CONSTRUCTION PARKING

.1 Parking will be permitted on site as indicated in the contract documents.

1.11 SECURITY

.1 As per Section 01 00 05 General Instructions.

1.12 CONSTRUCTION OFFICE

.1 Provide a site office heated to 22 ^{o}C, lighted to 750 lx and ventilated. Office to be located on site as indicated on the construction documents. The office is to be of sufficient size to accommodate site meetings for a minimum of ten (10) persons. Furnish with a separate area aside from meeting area for a drawing lay down table.

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors may provide their own offices as necessary and located as directed.

1.13 CONSTRUCTION OFFICE SUPPORT EQUIPMENT

.1 Provide and maintain a site telephone for the Consultants' use for the duration of construction. Pay telephones are not acceptable.

.2 Provide and maintain communication equipment with the capabilities to copy, send and receive digital documents and/or if a facsimile machine is to be utilized, a separate dedicated telephone line is to be provided.

1.14 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a 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 a manner to cause the least interference with work activities.

1.15 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Facilities to meet requirements of OHSA Regulation 213/91 (Section 29)

.3 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

.4 Existing or new facilities are not to be used by the work force.

1.16 CONSTRUCTION SIGNAGE

.1 Construction sign is as defined in Section 01 00 10 for General works.

.2 Maintain signs and notices in good condition for duration of project and dispose of off site on completion of project or earlier as directed by the Consultant.

1.17 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Consultant.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA S269.1-1975 - Falsework for Construction Purposes.

.2 FC 301 June 1982 - Standard for Construction Operations.

.3 CAN/CSA-S269.2-M87 - Access Scaffolding for Construction Purposes.

1.2 CONSTRUCTION SAFETY MEASURES

.1 Observe construction safety measures of National Building Code 2005 Part 8, Provincial Government, Workers' / Workmen's Compensation Board and municipal authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

1.3 OVERLOADING

.1 Ensure no part of Work is subjected to loading that will endanger its safety or will cause permanent deformation.

1.4 FALSEWORK

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

1.5 SCAFFOLDING

.1 Design and construct scaffolding in accordance with CSA S269.2.

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 SECTION INCLUDES

.1 Barriers

.2 Environmental Controls

.3 Traffic Controls.

.4 Fire Routes

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Works

.2 Section 01 51 00 - Temporary Utilities

.3 Section 01 52 00 - Construction Facilities

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB GP -189-2000, Primer, Alkyd, Wood, Exterior.
.2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978, Douglas Fir Plywood.

1.4 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.5 HOARDING

.1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121 or alternatively – metal fence variety by Modu-Loc with emergency access gates as shown on site plan.

.2 Apply plywood panels vertically as indicated.

.3 Provide two lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

.4 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

.5 Paint public side of site enclosure in selected colours with one coat primer to CGSB 1.189M and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.

.6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.6 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.

1.7 ENCLOSURE OF STRUCTURE

.1 Provide temporary weather tight enclosures and protection for exterior openings until permanently enclosed.

.2 Erect enclosures to allow access for installation of materials and working inside enclosure.

.3 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.4 Design enclosures to withstand wind pressure and snow loading.

1.8 DUST TIGHT SCREENS

.1 Provide and maintain dustproof and sound resistant barriers or partitions between the Work and existing occupied building, finished areas of the Work and the public.

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

1.9 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as defined in construction documents.

1.10 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 the public.

1.11 FIRE ROUTES

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

1.12 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.

1.13 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 Confirm with Consultant locations and installation schedule 3 days prior to installation.

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

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 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.3 QUALITY

.1 Refer to CCDC 2.

.2 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should any dispute arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

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

1.4 AVAILIBILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify 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.

1.5 STORAGE HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 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.

1.6 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.

1.7 MANUFACTURER'S INSTRUCTIONS

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

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

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

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify 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.

1.9 CO-ORDINATION

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

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

1.10 CONCEALMENT

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

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

1.11 REMEDIAL WORK

.1 Refer to CCDC 2.

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

1.12 LOCATION OF FIXTURES

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

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

1.13 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

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

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

1.14 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15 PROTECTION OF WORK PROGRESS

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

1.16 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/or building occupants and pedestrian and vehicular traffic.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Final cleaning.

1.2 RELATED SECTION

.1 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

.2 Section 01 77 00 – Closeout Procedures.

1.3 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.4 PROJECT CLEANLINESS

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

.2 Allow for road area in front of site to be cleaned as required, particularly during more disruptive times such as excavation and foundation work.

.3 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.

.4 Clear snow and ice from access to building, bank/pile snow in designated areas only.

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

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

.7 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

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

.9 Dispose of waste materials and debris off site.

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

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

.12 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.13 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.14 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.5 FINAL CLEANING

.1 Refer to CCDC 2, GC 3.13.

.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 including that caused by Owner or other Contractors.

.6 Remove waste materials from site at regularly scheduled times. 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 The final cleaning, prior to Substantial Performance is to be done by a competent commercial cleaning company and is to include:

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

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

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

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

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

.6 Remove dirt and other disfiguration from exterior surfaces.

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

.8 Washing of all floors but not waxing

.9 In conjunction with Owner staff, wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.10 Removal of visible labels left on materials, components and equipment.

.11 Cleaning of millwork and doors.

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

.10 Sweep and wash clean paved areas.

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

.12 Clean roofs, downspouts, and drainage systems.

.13 Remove snow and ice from access to building.

.14 General Contractor to make diligent effort to keep existing rooms not part of the project, locked and dust free.

.15 Existing furniture, school equipment, mechanical and electrical equipment to be kept free from dust and debris.

.16 Maintain cleaning until Owner occupies project area.

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 SECTION INCLUDES

.1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:

.1 Diversion of Materials.
.2 Waste Audit (WA) – Schedule A.
.3 Waste Reduction Workplan (WRW) – Schedule B.
.4 Demolition Waste Audit (DWA) – Schedule C.
.5 Cost/Revenue Analysis Workplan (CRAW) – Schedule D.
.6 Materials Source Separation Program (MSSP).
.7 Canadian Government Responsibility for Environment Resources – Schedule E.

1.2 RELATED SECTIONS

.1 Section 01 35 30 – Health and Safety Requirements
.2 Section 01 35 43 – Environmental Procedures.
.3 Section 01 35 73 – Procedures for Deconstruction of Structures

1.3 DEFINITIONS

.1 Cost/Revenue Analysis Work plan (CRAW): Based on information from Waste Reduction Work plan (WRW), and intended as financial tracking tool for determining economic status of waste management practices.

.2 Demolition Waste Audit (DWA): Relates to actual waste created from project.

.3 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.4 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

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

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

.7 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.

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

.9 Separate Condition: Refers to waste sorted into individual types.

.10 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

.11 Waste Audit (WA): Detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction or renovation project. Indicates quantities of reuse, recycling and landfill.

.12 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.13 Waste Reduction Workplan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.4 DOCUMENTS

.1 Maintain at job site, one copy of following documents:

.1 Material Source Separation Plan, (MSSP).
.2 Waste Reduction Workplan, (WRW).
.3 Waste Audit, (WA).
.4 Schedules A, B, C, D and E completed for the project.

1.5 SUBMITTALS

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

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

.1 Submit 3 copies of completed Waste Audit (WA): Schedule A.
.2 Submit 3 copies of completed Waste reduction Workplan (WRW): Schedule B.
.3 Submit 3 copies of completed Demolition Waste Audit (DWA): Schedule C.
.4 Submit 3 completed copies of Cost/Revenue Analysis Workplan (CRAW): Schedule D.
.5 Submit 3 copies of Material Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.

.1 Failure to submit could result in hold back of final payment.
.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
.3 For each material reused, sold or recycled from project, include amount [in tonnes] [quantities by number, type and size of items] and the destination.
.4 For each material land filled or incinerated from project, include amount [in tonnes] of material and identity of landfill, incinerator or transfer station.

1.6 QUALITY ASSURANCE - SITE VISIT

.1 Pre-bid site visit:

.1 Walk-through of project site prior to completion of bid submittal is mandatory.
.2 Date, time and location to be arranged by Consultant.
.3 Protection.
.4 Clear labelling of storage areas.
.5 Details on materials handling and removal procedures.
.6 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

1.7 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.8 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:

.1 Destination of materials listed.
.2 Deconstruction/disassembly techniques and sequencing.
.3 Schedule for deconstruction/disassembly.
.4 Location.
.5 Security.
.6 Protection.
.7 Clear labelling of storage areas.
.8 Details on materials handling and removal procedures.
.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

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

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

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

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.9 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

.3 Refer to OESN Environmental Waste Disposal drawing.

1.10 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Prepare CRAW: Schedule D.

1.11 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Consultant.

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

.4 Provide containers to deposit reusable and recyclable materials.

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

.6 Locate separated materials in area which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility or to users of material for recycling.

.8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Ship material to site operating under Certificate of Approval.

.2 Materials must be immediately separated into required categories for reuse or recycling.

1.12 STORAGE, HANDLING AND PROTECTION

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

.2 Unless specified otherwise, materials for removal do not become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.

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

.8 Separate and store materials produced during dismantling of structures in designated areas.

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

.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.13 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

.3 Keep records of construction waste including:

.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

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

1.14 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide temporary security measures approved by Consultant.

1.15 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

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

3.3 DIVERSION OF MATERIALS

.1 From Schedules A to D, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Consultant, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of salvaged, recovered, reusable, recyclable, material is not permitted.

3.4 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment

Ontario	Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON M4V 1P5	(416) 325-4000 (800) 565-4923
	Environment Canada Toronto, ON	(800) 668-6767

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 01 91 00 - Commissioning.

1.3 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.4 INSPECTION AND DECLARATION

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

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

.2 Request Consultant's Inspection.

.2 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

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

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

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

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

.4 Certificates required by Boiler Inspection Branch Fire Commissioner Utility companies have been submitted.

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

.6 Work is complete and ready for Final Inspection.

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

.5 SUBSTANTIAL PERFORMANCE

.1 Declaration of Substantial Performance: when Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article for specifics to application.

.2 Consultant's certificates required prior to issuance of Certificate for Substantial Completion.

.3 Full and complete information and demonstration training sessions for Owner staff to be provided by Mechanical and Electrical Contractors and their suppliers.

.4 Owner shall have the right to enter and occupy the building for the purpose of placing fittings, equipment and the like prior to Substantial Completion. Such occupancy shall not be considered acceptance of contract work.

.6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall 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: When Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to CCDC 2. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request reinspection.

.8 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with CCDC 2.

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 SECTION INCLUDES

.1 As-built, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties and bonds.

.7 Final site survey.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Work.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 77 00 - Closeout Procedures.

.4 Section 01 79 00 - Demonstration and Training.

.5 Section 01 91 00 - Commissioning.

1.3 SUBMISSION

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

.2 Provide consultant with 3 (three) full copy of manuals for review.

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

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

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

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

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

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

.9 Pay costs of transportation.

1.4 FORMAT

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

.2 Binders: vinyl, hard covered, 4 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

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

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

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

.7 Text: Manufacturer's printed data, or typewritten data.

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

.9 Provide scaled Auto CAD files in dwg format on CD.

1.5 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 Date of submission; names,

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

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

1.6 AS-BUILTS AND SAMPLES

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

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

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

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

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

.5 Keep record documents and samples available for inspection by Consultant.

1.7 RECORDING ACTUAL SITE CONDITIONS

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

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

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

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

.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 References to related shop drawings and modifications.

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

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

.2 Changes made by Addenda and change orders.

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

1.8 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 00 10 – General Work, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 00 - Commissioning.

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

1.10 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.11 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 location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

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

1.12 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

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

1.13 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 all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.14 TRAINING SESSIONS

.1 Provide and record training sessions for all mechanical and electrical systems. The training video is to be shot with HD cameras and audio and turned over to the Owner on 2 flash drives.

.2 All maintenance manuals and as built drawings are to be submitted to the Owner prior to any training sessions taking place.

.3 Contractor to operate the building until training has been completed for all mechanical and electrical systems.

1.15 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.16 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principals.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

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

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

.6 Co-execute submittals when required.

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

1.17 COMPLETE SUBMISSION

.1 All items noted above shall be submitted together as a complete package, not as individual packages.

.2 Final payments will not be made until the City of Niagara Falls receives the complete package.

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 SECTION INCLUDES

.1 Procedures for demonstration and instruction of equipment and systems to Owner's personnel.

1.2 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 01 91 00 - Commissioning.

1.3 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.

.2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.4 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.5 SUBMITTALS

.1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant's approval.

.2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.3 Give time and date of each demonstration, with list of persons present.

1.6 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation in accordance with Section 01 45 00 – Quality Control.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 00 - Commissioning and equipment and systems are fully operational.

.3 Provide one (1) copy of completed operation and maintenance manuals for use in demonstrations and instructions.

1.7 PREPARATION

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

.2 Verify that designated personnel are present.

1.8 DEMONSTRATION AND INSTRUCTIONS

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

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

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

.4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

.5 Instructional period is to be in as many sessions as required to properly disseminate information of the Owner's technical staff.

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 SECTION INCLUDES

.1 Methods for removal of existing asphalt pavement.

1.2 RELATED SECTIONS

.1 Section 02 41 16 Structure Demolition.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused asphalt materials from landfill to local facility.

Part 2 Products

2.1 EQUIPMENT

.1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

Part 3 Execution

3.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Consultant areas, depths and lines of asphalt pavement to be removed.

3.2 PROTECTION

.1 Protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Consultant at no additional cost.

3.3 REMOVAL

.1 Remove existing asphalt pavement to lines and grades as indicated.

.2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Provide for suppression of dust generated by removal process.

3.4 STOCKPILING OF MATERIAL

.1 Remove removed asphalt pavement from site.

3.5 FINISH TOLERANCES

.1 Finished surfaces in areas where asphalt pavement has been removed to be within +/- 5 mm of grade specified but not uniformly high or low.

3.6 SWEEPING

.1 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooms as required.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.

.1 Methods and procedures for demolishing, salvaging, recycling and removing site work items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

.2 Related Sections.

.1 Section 01 00 10 – General Work.
.2 Section 01 33 00 - Submittal Procedures
.3 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
.4 Section 01 45 00 - Quality Control.
.5 Section 01 35 43 - Environmental Procedures.
.6 Section 01 35 30 - Health and Safety Requirements.
.7 Section 31 23 10 - Excavating, Trenching and Backfilling.
.8 Section 33 71 75 - Underground Electrical Service.

.3 Measurement Procedures.

.1 Measure removal of asphaltic concrete pavement in square metres for each thickness specified
.2 Measure removal of Portland cement concrete pavement in square metres for each thickness specified
.3 Measure removal of base and sub-base pavement materials in square metres
.4 Measure removal of concrete and masonry foundations in cubic metres.
.5 Measure removal of masonry foundations in cubic metres in place.
.6 Measure removal of culverts, pipe sewers and drains in metres regardless of diameter. End points of measurements will be at centres of manholes or catch basins or open ends of pipes, as applicable.
.7 Measure removal of manholes and catch basins in units.
.8 Measure removal of cable duct banks regardless of number of ducts in each bank, in metres from end to end of duct bank for each size.
.9 Measure removal of fences, curbs and guard rails in metres.
.10 Payment for salvage, stockpiling, sealing, disposal, alternative disposal, recycling, excavating and backfilling and restoration will be included in above items.
.11 Measure removal of waste materials designated for alternate disposal from the site in tonnes.

1.2 REFERENCES

.1 Department of Justice Canada (Jus).

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
.2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.2 Safety Data Sheets (SDS)

.3 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.3 DEFINITIONS

.1 Demolition: rapid destruction of building following removal of hazardous materials.

.2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.

.3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.

.1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.2 Indicates quantities of reuse, recycling and landfill.

1.4 SUBMITTALS

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

.2 Shop drawings.

.1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Ontario, Canada.

.3 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.4 Certificates: submit copies of certified weigh bills, bills of lading, receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Consultant.

.1 Written authorization from Consultant is required to deviate from haulers, facilities, and receiving organizations.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial regulations.

.2 Site Meetings.

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building sub trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Arrange for site visit with Consultant to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings every two weeks.

.4 Ensure key personnel, site supervisor, project manager, and subcontractor representatives attend.

.5 Consultant will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.3 Health and Safety.

.1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Perform Work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Storage and Protection.

.1 Protect in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Protect existing items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to Consultant

.3 Remove and store materials to be salvaged, in manner to prevent damage.

.4 Store and protect in accordance with requirements for maximum preservation of material.

.5 Handle salvaged materials as new materials.

.3 Waste Management and Disposal.

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Divert excess materials from landfill to site approved by Consultant.

.3 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal, regulations.

.6 Label location of salvaged material's storage areas and provide barriers and security devices.

.7 Ensure emptied containers are sealed and stored safely.

.8 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt, and gypsum.

.9 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.6 Protect trees, plants and foliage on site and adjacent properties where indicated.

.2 Existing Conditions.

.1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction as directed by Consultant from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

1.8 SCHEDULING

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.1 Notify Consultant in writing when unforeseen delay[s] occur.

Part 2 Products

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PREPARATION

.1 Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

.4 Disconnect and Cap Designated Mechanical Services.

.1 Natural Gas Supply Lines: remove in accordance with gas company requirements

.2 Sewer and Water Lines: remove in accordance with authority having jurisdiction and securely plug to form watertight seal.

.3 Other Underground Services: remove and dispose of as indicated in accordance with Section related to Underground Electrical Service.

3.2 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

.2 Refer to OESN Report and Drawing.

3.3 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of Pavements, Curbs and Gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Consultant.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,

.5 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.

.6 Decommission water wells and monitoring wells in accordance with Municipal regulations.

.7 Remove designated trees during demolition.

.1 Obtain written approval of Consultant prior to removal of trees not designated.

.2 Grind, chip, or shred other vegetation for mulching and composting, or use as mill pulp or process fuel.

.8 Stockpile topsoil for final grading and landscaping.

.1 Provide erosion control and seeding if not immediately used.

.9 Salvage.

.1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.

.10 Disposal of Material.

.1 Dispose of materials not designated for salvage or reuse on site as instructed by Consultant.

.11 Backfill.

.1 Backfill in areas as indicated and in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

3.4 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

.1 Remove stockpiled material as directed by Consultant when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

.3 Transport material designated for alternate disposal using approved haulers, facilities, receiving organizations, in accordance with applicable regulations.

.1 Written authorization from Consultant is required to deviate from haulers, facilities and receiving organization.

.4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal Facilities: approved by Consultant.

.2 Written authorization Consultant is required to deviate from disposal facilities.

3.6 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 CLEANING

.1 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Read and be governed by conditions of the Contract and sections of Division 01.

1.2 SCOPE OF WORK

.1 Work Included

Provide all plant, labour, equipment and materials to complete the cast-in-place concrete work. The work includes, but is not limited to:
- reinforced concrete walls, beams, columns, slabs and footings
- Slab-on-grade
- patching sleeves, pockets
- grouting of column bases
- concrete toppings
- concrete housekeeping slabs

.2 Related Work Specified Elsewhere

.1 Excavating, and Backfilling – Division 31

.2 Masonry – Division 04

.3 Waterproofing – Division 07

.4 Concrete Floor Staining – Division 09

.3 Work Installed Under This Section, Supplied By Other Sections

.1 Setting of anchors and sleeves for mechanical and electrical trades – Division 21 and 26.

.2 Building in of iron and steel items – Divisions 05, 21, and 26.

.3 Setting of anchors and other hardware to be cast into the concrete – Division 05, 21 and 26.

1.3 REFERENCE STANDARDS

.1 Unless otherwise stated, the applicable provisions of these reference standards are to be considered a part of this application. Standards to be current issue.

.2 Ontario Building Code 2020 - as currently amended.

.3 C.S.A. Standard CAN3-A23.1-14, “Concrete Materials and Methods of Construction”.

.4 C.S.A. Standard CAN3-A23.2-14, “Methods of Test for Concrete”.

.5 C.S.A. Standard CAN3-A23.3-14, “Design of Concrete Structures”.

.6 C.S.A. G30.3-M1983 (R1998), “Cold-Drawn Steel Wire for Concrete Reinforcement”.

.7 C.S.A. G30.18-09 (R2014), “Carbon Steel Bars for Concrete Reinforcement”.

.8 C.S.A. A3000-13, “Cementitious Materials Compendium”.

.9 ASTM A775/A775M-16, “Standard Specification for Epoxy Coated Reinforcing Steel Bars”.

.10 ASTM C309-11, “Standard for Liquid Membrane Forming Compounds for Curing Concrete”.

.11 ASTM E1155-14, “Standard Test Method for Determining FF Floor Flatness and FL Levelness”.

.12 A.C.I. Standard 301-16, “Specifications for Structural Concrete”.

.13 A.C.I. Standard 302.1R-15, “Guide to Concrete Floor and Slab Construction”.

.14 A.C.I. Standard 303R-12, “Guide to Cast-In-Place Architectural Concrete Practice”.

.15 A.C.I. Standard 347R-14, “Guide to Formwork for Concrete”.

.16 Reinforcing Steel Institute of Canada (RSIC), “Reinforcing Steel Manual of Standard Practice” (2004).

.17 Construction Safety Act or any other regulations of the Ontario Ministry of Labour relating to the work of this section.

1.4 COORDINATION & COOPERATION

.1 Coordinate the work of this Section with the work of other sections and advise other trades when materials to be built into the forms will be required.

.2 Cooperate with other sections to ensure an uninterrupted sequence of construction.

.3 Install any items furnished by others, miscellaneous iron work, anchors, anchor bolts, pipe sleeves, hardware, etc., that are to be built into the concrete work.

.4 Form all holes and openings shown or required to accommodate the work of other trades.

.5 Make good all openings left in construction around pipes, openings for struts, anchorages, etc. for other trades or where existing concrete must be broken out.

.6 Coordinate with work of concrete staining or epoxy finish trades to ensure concrete slabs on deck are properly cured and that surface of concrete is uniform in texture, colour and appearance before and after application of stain or epoxy.

1.5 SHOP DRAWINGS

.1 Examine all drawings forming a part of this Contract and conform to the requirements of all such drawings. Confirm all dimensions respecting anchor bolt requirements with related sections.

.2 Submit shop drawings for the steel reinforcing and falsework for review by the Consultant. If such drawings are not satisfactory to the Consultant, make all required changes prior to the start of the work.

.3 Shoring and falsework drawings are to show assumed values for all loads, types and grades of materials, dimensions, sizes and connection details. Shop drawings for falsework and shoring are to be signed and sealed by a Professional Engineer, who will be responsible for the design and

implementation of these structural systems, including field review.

.4 Shop drawings for reinforcing steel shall include detailed placing drawings and bar lists as outlined in the requirements of RSIC manual of standard practice. The placing drawing will show, quantity, bar size, bar grade, length or mark number, location, and spacing of bars. Bar lists will show bar size, bar grade, length and bending dimensions.

.5 Submit one electronic .pdf copy of each shop drawing with minimum scale of 1:100.

.6 The Consultant's review of the shop drawings does not relieve this Sub-Contractor of his responsibility for ensuring that all forming systems are constructed properly and are maintained in position as long as necessary to ensure the integrity of the structure during construction.

.7 Provide dimensioned formwork drawings for any ‘exposed concrete’ or ‘architectural concrete’, showing all joints, reglets, tie locations, tie types, and panel layouts for the Architect's review and approval. Shop drawings are to be submitted well in advance of pouring the wall and work on the forming the concrete elements can only commence after the shop drawings have been approved by the Architect.

1.6 ARCHITECTURAL CONCRETE

.1 Architectural Concrete will be considered as any exposed concrete that will be exposed to view in the finished building. This includes, but is not limited to, exposed concrete columns, basement foundation walls, retaining walls, exposed slab soffits, and beams.

.2 Quality of Finish for Exposed Concrete: The quality of finish shall be such that, when the forms are stripped, it meets the standards set out below, without further finishing work other than treatment of tie holes and clean-up. This requirement is waived for smooth concrete to receive a paint finish, in which case grinding of joints and filling of voids will be permitted.

.3 Dense, concrete finishes free of defects such as deep or extreme honeycombing, inconsistencies in plane, cold joint lines and loss of fines. Minor imperfections may be acceptable. Major defects will necessitate replacement. The judgement as to what constitutes major or minor defects will be the Consultant's. Patching will not be permitted and if used, will constitute a major defect. Repairs, i.e., removal of sections of a member, may be carried out if approved by the Consultant, but the repair shall match the colour and texture of the surrounding concrete.

.4 Concrete finish shall be uniform in colour.

.5 Concrete finishes shall exhibit sharp, accurate definition at corners, arrises, reglets and the like, generally free of chipped or spalled areas and within dimensional tolerances set out in A23.1. Members shall be visually straight.

.6 Plane surfaces without protuberances, indentations, ridges or bulges.

.7 Under no circumstances shall repair to any Exposed Concrete be undertaken without the Consultant's written consent. Concrete members which are repaired without the Consultant's consent will be classified as defective and the Consultant may require their removal and replacement.

1.7 SAMPLES

.1 Construct representative samples for each type of any Architectural Concrete element that have an exposed concrete finish. The consultant will review these samples in regard to colour, finish, tie pattern, rustication, etc. The sample panels will serve as a benchmark for minimum acceptance or

rejection of all similar concrete work.

.2 Samples are to be a minimum of 2000mm wide x 3000mm high (6'-8"x10'-0") to provide proper representation of the final element with interior and exterior corners, soffits, control joints and reglets, rustication and any other special features including walls where form liners are to be employed.

.3 Panel to be constructed with specific concrete mix, forms, form release agents etc. that will be employed in the building of the final architectural concrete elements.

.4 Repeat construction of the panel as many times as necessary until approved by the consultant.

.5 At the discretion of the Consultant, samples may be part of the final structure located in a non-exposed area of the building.

1.8 DESIGN CRITERIA – FORMWORK

.1 Formwork, falsework and shoring is to be designed, erected, braced and maintained so that it will safely support:

.1 The liquid weight of the concrete.
.2 All applied construction loads, such as equipment, personnel, runways, and wind loads to which the system may be subjected.
.3 All supported loads including re-shored slabs.

.2 Follow the provisions of the Construction Safety Act as amended to-date and the recommendations of the current A.C.I. Standard 347.

.3 Refer to equipment drawings for critical dimensions. Detail forms in these areas to provide the specified requirements.

.4 Tolerances within C.S.A. Standard CAN3-A23.1 except that tolerances for equipment anchors, inserts, etc. to equipment supplier's requirements.

.5 For Exposed and Architectural Concrete the Forming Contractor shall submit shop drawings showing the dimensioned locations of all reglets, tie cones, or other architectural features to be reflected in the finished concrete element. Shop drawings are to be submitted well in advance of pouring the wall and work on the forming the concrete elements can only commence after the shop drawings have been approved by the Architect.

.6 The Forming Contractor shall only use ties approved by the Architect for all 'Exposed' and 'Architectural' concrete elements.

1.9 DESIGN CRITERIA – CONCRETE

.1 Design all concrete mixes for the compressive strength and slump requirements as specified in "Proportioning" of this section. Allow for the appropriate coefficient of variation for each strength class for the batch plant supplying the concrete.

.2 Submit mix designs for each class of concrete for review by the Consultant at least two weeks prior to the commencement of concreting.

PART 2- PRODUCTS

2.1 MATERIALS

.1 Cement - in accordance with C.S.A A3000.

.2 Aggregates:

.1 Fine and coarse aggregate materials and grading in accordance with C.S.A Standard CAN3-A23.1. Maximum size of course aggregate to suit spacing of reinforcing bars in accordance with C.S.A Standard CAN3-A23.1.

.2 Pit run gravel will not be acceptable.

.3 Use pea gravel (6 mm to 10 mm) where concentration of reinforcement requires the use of a smaller diameter aggregate and in toppings where the topping thickness is reduced below 50 minimum thickness.

.3 Admixtures:

.1 Use only those chemical admixtures and air entraining agents currently approved for use by the MTO in accordance with O.P.S.S. Form 1303, Material Specifications for Air Entraining Agents and Chemical Admixtures.

.2 Chemical admixtures shall be type 1, Water Reducing Admixtures by Grace.

.3 Admixtures to be compatible with the air entraining agent.

.4 Superplasticizer – Normal setting, high range water reducing superplasticizing admixture in accordance with ASTM C-494 WRDA by Grace, Conchem S.P.N. by Masterbuilders, Eucon-37 by Euclid Chemical or Sternflo by Sika Canada.

.5 Agilia Concrete – For all concrete walls that have form liners use Agilia concrete by Lafarge Canada.

.5 Reinforcing Steel (plain) - new deformed bars in accordance with C.S.A G30.18 with a guaranteed yield stress of 400 MPa.

.6 Reinforcing Steel (epoxy coated) - same as for item .5 with epoxy coating to ASTM A775/A775M. All shop or field cut ends to be immediately coated in accordance with ASTM A775/A775M and the MTO O.P.S.S. Form 1443.

.7 Reinforcing Steel Supports - in accordance with R.S.I.O. Manual of Standard Practice. All wires, chairs and other bar supports to be plastic or plastic-coated construction compatible with end use. All chairs supported on the formwork are to be plastic construction.

.8 Vapour Barrier – Perminator 10mil Underslab Vapour Barrier by W.R. Meadows. Provide vapour barrier in all areas where the slab-on-grade has a moisture sensitive flooring, including epoxy coated floors. Thicker barriers may be required to meet environmental concerns as described in the Consultant's drawings.

.9 Welded Wire Fabric - in accordance with C.S.A Standard G30.3.

.10 Evaporation Retardant – Use for all concrete surfaces where evaporation rate exceeds the rate of

bleeding and specifically for all floor slabs and toppings where the slab is unprotected from drying winds. Evapre by W.R. Meadows, Eucobar by Euclid Chemical Company, or equal.

.11 Sealer and Anti Dusting Agent: Sealtight Vocomp - 30 Waterbased Curing and Sealing Compound for exposed interior slabs and exterior slabs that do not have the liquid surface hardener applied. Refer to Architect's drawings for any locations.

.12 Curing Compound: - in areas where liquid Concrete Densifier and Chemical Hardener is to be applied use Med Cure Concrete Curing Compound by W.R. Meadows.

.13 Concrete Floor Hardener: -Concrete Densifier and Chemical Hardener – Liqui-Hard by W.R. Meadows.

.14 Concrete Floor Enhancer: - Bellatrix by W.R. Meadows to be used on all interior hardened floors

.15 Lumber, Plywood and other formwork materials to C.S.A. Standard CAN3-A23.1, Article 11.3, except as noted.

.1 Contact surfaces of forms for architectural concrete which will be exposed to view in the completed structure to be new, Douglas Fir Plywood, exterior grade, good one side. Good side to have phenolic resin overlay as per C.S.A O121-08.

.2 For exposed architectural concrete new exterior grade Douglas Fir plywood, good one side.

.16 Form Oil - colourless, non-staining, mineral oil, free of kerosene. For areas that employ form liners use Greenstreak No. 7000 Form Release.

.17 Form Ties:

.1 For general wall areas, removable or snap-off metal ties that after removal of forms, no metal is within one inch of the finished surface.

.2 Heavy duty ties for one sided form construction.

.3 For exposed architectural walls, metal ties with plastic cone formers to suit architectural details, together with suitable plugs. At all 'Exposed' and 'Architectural' concrete elements only ties approved by the Architect will be allowed.

.18 Grout - non-shrink, non-ferrous. M-Bed Standard by Sika Canada, CG-86 Construction Grout by W.R. Meadows, Dry Pack Grout by Euclid Chemical Company, or equal.

.19 Sawcut Sealants

.1 Shall be Tremco Dymeric caulking. Refer to Architectural drawings for any location requirements.

.20 Expansion and Control Joint Sealants

.1 Unless noted otherwise in this specification or on the Architectural drawings sealant for horizontal joints shall be Sika Duoflex S.L. or W.R. Meadows Sealtight CM-60 S.L.

.2 Unless noted otherwise in this specification or on the Architectural drawings sealant vertical joints shall be Sika Duoflex N.S. or W.R. Meadows Sealtight CM-60 N.S.

.3 Provide primers and foam backer rods as required.

.21 Joint Fillers

.1 Isolation
Joint fillers in slab on grade adjacent to foundation walls and in sidewalks, shall be asphalt impregnated fibreboard conforming to ASTM D1751-04, Meadows Fibre Expansion Joint Filler, or equal.

.22 Circular Column or Light Standard Forms - Sonotube, seamless fibre forms with plastic liner to prevent transfer of spiral markings to concrete, as manufactured by Sonoco Products, Company Poli-Permaform with plastic liner as manufactured by Perma Tubes Ltd. or approved equal. Refer to Architectural and Electrical drawings and specifications if specially shaped forms are required for Light Standard bases.

.23 Latex Bonding Agent - for bonding toppings to slabs or cast-in-place concrete items. – Latex R by Sika, Intralok by W.R. Meadows or approved equal.

.25 WaterStop: Provide flexible PVC (polyvinyl chloride) waterstop as manufactured by Greenstreak, Refer to typical details on structural drawings for style number. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field. Provide hog rings or grommets spaced at 300mm (12”) on center along length of waterstop.

.26 Form Liners: As supplied by Greenstreak, or equal.

2.2 PROPORTIONING OF CONCRETE – GENERAL

.1 Job-mixed concrete will not be allowed on this project.

.2 Provide mixed-in-transit, ready-mixed concrete in accordance with C.S.A. Standard CAN3-A23.1, obtained from a supplier approved by the Consultant for use on this project.

.3 Mix all concrete with materials so graded and proportioned to produce a plastic mass of such consistency that it will flow slowly under its own weight and which can be readily worked into corners of forms and under and around reinforcing without forming voids or honeycombed surfaces.

.4 Furnish to the Sub-Contractor, a "delivery ticket" for each batch of concrete delivered to the site, which shall be kept on record for the inspection of the Consultant. Each ticket shall show the following:

. Date and truck number
. Sub-Contractor's name
. Job designation
. Specified concrete strength, slump, air content and admixture
. Batch volume
. Time of batching

.5 For concrete mixes requiring entrained air, do not pre-mix the air entraining agent with a chemical admixture solution. Where both an air entraining agent and chemical admixture are used, dispense the two materials separately.

.6 Accelerating or retarding chemical admixtures shall only be used with the prior approval of the Consultant or at the Consultant's written request. Do not use calcium chloride or products containing calcium chloride.

.7 For fibre concrete provide fibres at a rate of 1.0kg per cubic metre of concrete. Provide a compatible

slump enhancer to ensure that no slump loss occurs with the addition of fibres.

.8 Chemical admixtures and air entraining agents shall be supplied by the same manufacturer and be compatible. Use in strict accordance with the manufacturer's directions.

.9 The compressive strength of all concrete is to be determined from test cylinders made in accordance with C.S.A. Standard CAN3-A23.2.

.10 Minimum truck load 1.5 cubic metre.

.11 Proportion the materials in accordance with the mix designs supplied under Article 1.09 of this Section to provide the following specified design strengths, slumps and air contents.

Location	Specified 28-day Concrete Strength	Slump in inches	Air Content	Exposure Class
Lean fill	7.0 MPa	125 max	nil	
Interior slab-on-grade	25 MPa	76 max.	nil	
Foundation walls and integral Columns	25 MPa	76±25	5%±1%	F-2
Footings	20 MPa	76±25	nil	
Interior suspended slabs	30 MPa	76±25	nil	
Exterior suspended slabs,	35 MPa	76±25	6%±1%	C-1
Exterior slabs-on-grade, sidewalks, curbs	32 MPa	76±25	6%±1%	C-2
Exterior retaining walls above footing level	30 MPa	76±25	5%±1%	
Slab-on-deck	25 MPa	76±25		
Toppings	30 MPa	76±25[1]	nil	

2.3 PLANT QUALITY CONTROL

.1 All materials, batching and mixing procedures are subject to test or inspection by the Consultant or representatives.

.2 Provide samples of materials as may be required at no additional cost to the Owner.

.3 Provide access to pits, batch plants, etc., as may be required by the Consultant or his designated representatives.

.4 The cost of testing in accordance with Division 01.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine and obtain all necessary measurements of previously executed and existing work which may affect the work of this section prior to commencing operations.

.2 Report any discovered discrepancies to the Consultant so that instructions can be given for the necessary remedial action.

3.2 ERECTION OF FORMS

.1 Construct all forms to have sufficient strength, stability and rigidity to prevent bulging or deflection under the liquid weight of concrete and to support in addition, all construction loads to which they may be subjected including equipment, runways and wind forces in accordance with A.C.I. Standard 347.

.2 Erect forms to the lines, dimensions and elevations shown on the drawings such that the completed work is within the tolerance limits for reinforced concrete buildings in accordance with Sub-Section 1.8 of this Section.

.3 Use new exterior grade plywood panels for all concrete exposed to view in the completed structure. Maximum two (2) re-uses in exposed areas.

.4 Provide for all openings, offsets, risers, brackets, haunches, depressions and curbs as shown or required in the formwork.

.5 For typical wall surfaces, arrange form ties such that after removal of the forms, no metal is within 25mm (1”) of the finished surface.

.6 Clean forms of all debris prior to concreting. Provide temporary openings at the base of walls, column forms and at other locations where necessary to facilitate cleaning and inspection. Place openings so that "wash water" will have a clean run to the outside of the forms.

.7 Provide 20x20mm (3/4”x3/4”) chamfers on all exposed corners of concrete, exposed to view in the finished structure unless otherwise noted on drawings.

.8 Coat forms with a non-staining mineral oil prior to the placing of reinforcing steel in accordance with C.S.A. Standard CAN3-A23.1. Where concrete surfaces are to receive a final coat of paint, plaster, etc., omit the form oil and wet down the forms just prior to concreting.

.9 Accurately and securely place anchors required for the support of mechanical or electrical equipment, hardware and miscellaneous iron which is to be cast into the concrete as supplied by other Divisions.

.10 Immediately prior to concreting, inspect all forms to ensure that they are properly placed, sufficiently rigid and tight, thoroughly clean, properly treated and free of snow, ice or other foreign materials. Do not use chemicals for snow/ice control.

.11 Formwork approved for concreting shall be properly protected until concrete is placed.

.12 Do not form openings in concrete beams, slabs, columns or walls without prior approval of the Consultant unless they are shown on the structural drawings.

.13 Set screeds with true and straight top edges to proper elevation.

.14 Install dovetail anchor slots supplied by Division 4.

.15 Refer to architectural drawings for all tie and reveal locations in exposed concrete items.

.16 Take special care when lowering plastic lined circular forms over reinforcing steel to avoid scratching or otherwise damaging the plastic liner.

.17 Field butt splice of waterstop shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at approximately 194 degrees C (380 degrees F). Follow approved

manufacturer recommendations. Lapping of waterstop, use of adhesives, or solvents shall not be allowed.

.18 Center waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 300mm (12") on center along the length of the waterstop and wire tie to adjacent reinforcing steel to ensure waterstop remains in the same plane along the wall and does not move or flop toward the wall when pouring adjacent wall.

.19 Provide reglets as required to anchor waterproofing in accordance with architectural drawings and Crystalline Capillary Waterproofing.

.20 Install form liners on forms in strict conformance with manufactures' recommendations complete with back-up strips. Ensure liners are coated with proper form release agent.

3.3 FORM REMOVAL

.1 The proper time for the removal of forms is to be approved by the Consultant. Do not remove shoring until the supported member has reached sufficient strength to support safely both its own weight and the loads on it and in no case less than 75% of the specified strength.

.2 The sequence and timing for stripping and reshoring of walls is to be based on actual field concrete strengths. Job-cured cylinders or other testing procedures such as Lok-Tests or maturity metering are to be performed by the testing company appointed by the Consultant, and the cost of such testing is to be paid by the Sub-Contractor.

.3 Job-cured cylinders, when used as an indication of in place strength, are to be cured under conditions similar to the concrete construction which the specimen represents.

.4 Remove forms in accordance with C.S.A. Standard CAN3-A23.1.

.5 Refer to A.C.I. Standard 347 for the minimum periods for which forms must be left in place.

.6 The Sub-Contractor shall be responsible for the safety of the structure before, during, and after form removal.

.8 To help avoid colour variation in exposed concrete items, the length of time between pouring and stripping shall be approximately the same for each portion of the Work.

.9 Clean form liners between castings with mild detergent and scrub brush.

3.4 REINFORCING STEEL

.1 Placing, spacing, splicing and protection of reinforcement in accordance with C.S.A. Standard CAN3-A23.3.

.2 Maintain the cover required for reinforcement as shown on the drawings. Where not specifically shown, refer to C.S.A Standard CAN3-A23.1.

.3 Supply and install 100x100x75mm (4"x4"x3") brick chairs for the support of reinforcing in slabs-on-grade of a type and in a manner, which will not puncture any vapour barrier. Space chairs 1200mm (4'-0") o/c, each way. Lap welded wire fabric at least one mesh plus 50mm (2") at all splices.

3.5 CONCRETE PLACING

.1 Do not start concrete placing until the Consultant has reviewed and approved all preparations including forms, joints, and reinforcing steel.

.2 All conveying, depositing, compaction and vibration is to be done in accordance with the current C.S.A Standard CAN3-A23.1.

.3 Maximum elapse of time between charging and placing is not to exceed one and a half (1.5) hours. Reject concrete which exceeds this limit. In hot weather, this time period may have to be reduced as directed by the Consultant.

.4 Place concrete carefully around all accessories, such as pipes, sleeves, and conduits.

.5 When concrete is to be placed in restricted locations, take special precautions to ensure close contact between the concrete and steel. Take care to exclude air pockets and honeycombed areas. Use of a superplasticizer may be required for proper placement.

.6 Where normal-size aggregate concrete cannot be successfully placed in a congested area, use concrete with a smaller top aggregate size.

.7 Use "elephant trunks" for high lift concrete to prevent segregation.

.8 When buggies are used for placing concrete in slabs on soil, they are to be supported on runways and not directly on the reinforcing steel.

.9 Just prior to placing concrete, place polyethylene vapour barrier as indicated in Section 07 26 1 and in other Consultant’s drawings. Wrap vapour barrier up sides of walls or slab edge. Do not install vapour unless building is closed in from accumulation of rain on top of membrane. Take special care not to damage vapour barrier. Repair all tears rips and punctures as per manufactures’ instructions.

.10 Place reinforcing steel for slab-on-grade on 100x100x75mm (4"x4"x3") concrete bricks spaced 1200mm (4'-0") o/c each way.

.11 Apply liquid surface evaporation reducers by sprayer to protect the concrete from premature surface drying when required. Mix in accordance with the manufacturer’s instructions and apply in a thin film following the bull-floating operation. Do not work liquid materials into the surface of the concrete.

.12 Maintain a sufficient number of internal mechanical vibrators on site to properly compact the concrete within fifteen (15) minutes of placing, but not less than two vibrators for any pour.

.13 Mechanical vibrators which are applied to the outside of the forms are not permitted without prior approval of the Consultant.

.14 Thoroughly compact all concrete during placing to ensure that the finished concrete is free of voids or other defects.

.15 Ensure that reinforcement, hardware, and inserts are not disturbed during concrete placement.

.16 Strike off-floor surfaces at the level shown on the drawings by means of previously set, continuous pipe screeding, set on adequate supports.

.17 Notify the Consultant at least twenty-four (24) hours in advance of any scheduled pour.

.18 Grout all steel column bases with non shrink grout by ramming in damp, mixed grout tightly below

bearing plate to completely fill space below plate without any voids.

.19 Place concrete stair non-slip nosing strips into concrete stairs. Take special care to ensure strips are aligned equally from tread to tread and are installed straight vertically and horizontally.

.20 Do not use fly ash in concrete that will be exposed to view nor in concrete that will be exposed to freeze-thaw cycles or de-icing chemicals.

.21 Take precautions to ensure bleeding from subsequent concrete lifts do not bleed out and stain already finished work that is exposed in the finished structure. Provide control joints only at reveal locations and seal, tape, or caulk panel joints.

.22 At any trench drains pour a 75mm (3") deep anchoring complete with cast-in anchoring rods before placement of suspended prefabricated trench drain. Adjust trench units to allow required slopes to catchbasins or waste lines within tolerances required by trench drain supplier. Place the greater of minimum concrete around drain as indicated on structural drawings or as required by trench drain manufacturer.

3.6 CURING AND PROTECTION

.1 Protection and curing of concrete for a minimum of seven (7) days in accordance with C.S.A. Standard CAN3-A23.1.

.2 Maintain all equipment and materials for the protection and curing of concrete on site, ready to use before concrete placing is started.

.3 Cover walls, piers, columns, beams and slab edges with wet burlap or tightly wrap with properly lapped 4 mil polyethylene sheeting, immediately after stripping to continue the curing periods. (Surfaces which will not be exposed to view or which will not have other surface treatment may be sprayed with curing compound after stripping).

.4 Completely cover floor and roof slabs with 4 mil polyethylene sheeting, properly lapped at side and edge laps and weighted down immediately after finishing.

.5 A sprayed-on membrane curing compound may be used in lieu of polyethylene sheeting for concrete, except as follows:

.1 Floor areas which are to have topping, stained concrete finishes, or other surface treatments are not to have spray-applied compounds employed, but must be polyethylene cured.

.6 Freshly finished floors are not to be used for seven (7) days after completion and only light use is permitted for an additional seven (7) days.

.7 Refer to Subsection Part 2 above for curing compound to be applied before liquid hardener. Make preparations and apply curing compound before application of compatible liquid hardener and in strict conformance to the manufacturer's instructions.

3.7 COLD WEATHER REQUIREMENTS

.1 All concreting operations during cold weather in accordance CAN3-A23.1. Carefully protect all corners and edges.

.2 Exercise particular care to ensure that previously placed concrete and reinforcing steel are adequately heated to prevent freezing of new concrete placed directly against it.

.3 Exercise care to avoid rapid temperature changes (thermal shock) when removing an area from temporary heating conditions.

.4 Remove and replace all concrete damaged by frost or freezing at the direction of the Consultant at no cost to the Owner.

.5 Accelerating chemical admixtures shall not be used without the written approval of the Consultant.

.6 When pouring new concrete directly against existing protect heat loss by extending the protection for fresh concrete at least 600mm (24”) over the existing.

.7 Locate heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and drying heat in enclosures.

3.8 HOT WEATHER CONCRETING

.1 All concreting operations during hot weather in accordance with C.S.A Standard CAN3-A23.1.

.2 Take special care to prevent surface crazing of floor slabs due to combined high temperatures and drying winds.

.3 The use of a water reducing-retarding chemical admixture in the concrete mix may be required at the Consultant's discretion.

3.9 FINISHING OF HORIZONTAL SURFACES

.1 Floors:

.1 Concrete slabs on grade are to conform with A.C.I Standard 301, Specification for Structural Concrete.

.2 Maintain a surface tolerance for all slabs in accordance with ASTM E1155-14 for that of a flat floor tolerance with a straightness of 5mm (3/16”) in 3m (10’-0”) on both suspended and slab on grade.

.2 Provide slopes to drains as directed by the Architect.

.3 Provide sufficient lighting as necessary for finishing requirements.

.4 Concrete floors shall be steel floated with a disc type power floating machine, having a 600mm (24”) disc, and weighing at least 140kg (300lb). Continue the floating operation until sufficient moisture is brought to the surface to fill all voids. After floating when the floor has hardened sufficiently so that excess fines will not be brought to the surface, trowel with a steel trowel to a surface free of all pinholes and trowel marks. Refer to A.C.I. Standard 301.

.5 The elevation of the top of the structural concrete is to be kept down below the finished floor elevation such that when the floor topping is applied, the finished floor elevation will match the architectural drawings.

.2 Exterior Flatwork:

.1 Provide slip resistant spun concrete or broom finish as indicated on Architect’s drawings or elsewhere in this specification booklet for all exterior concrete flat work.

3.10 CONCRETE TOPPINGS

.1 Thoroughly clean top of slabs to receive topping of all material likely to affect a good bond between previously placed concrete and the topping.

.2 Clean the existing surface using stiff brooms and a small jet from a high-pressure hose. Remove all dirt from crevices and depressions.

.3 If specified for application of bonding agent the surface shall be wet down at least four hours before placing the topping and shall be kept saturated until the topping is placed, but in no case shall there be any free water on the surface when the topping is placed.

.4 Prior to placing the topping, apply latex bonding agent to surface of concrete slab in strict accordance to manufactures instructions.

.5 The topping shall be placed finished and cured, in accordance with the appropriate requirements, including slopes to drains where applicable.

.6 Employ toppings with pea-stone aggregate at all locations where topping thickness is less than 50mm.

.7 Refer to CURING & PROTECTION portion of this specification for curing of topping slabs

3.11 FINISHING OF VERTICAL SURFACES

.1 In areas where concrete walls will be exposed, take extra care to avoid 'bugholes' and honeycombing. When placing concrete, re-vibrate critical areas to ensure complete consolidation of concrete near form surfaces.

.2 For reveal locations, see architectural drawings.

3.12 TREATMENT AND REPAIRS FOR FORMED SURFACES

.1 After removal of forms, the surfaces of concrete, exclusive of architectural concrete, are to be given one or more of the finishes specified hereafter. Methods used are to be in accordance with C.S.A. Standard CAN3-A23.1. Refer to C.S.A. Standard CAN3-A23.1 for requirements of architectural concrete.

.2 When, in the opinion of the Consultant, satisfactory repairs cannot be made, then the defective work is to be cut out and replaced as directed by the Consultant.

.3 Treatment of honeycombed areas is to be carried out as directed by the Consultant. Do not treat such areas prior to receiving instructions from the Consultant.

.4 Patch tie holes and other defects (unless otherwise directed by the Consultant as noted in paragraphs B and C above). Remove fins exceeding 5mm (1/4”) in height.

.5 All necessary patching shall have been done immediately after the forms have been removed. All surfaces are to be given a light surface grind with a power rotary grinder to remove all fins, ridges, and other imperfections. Follow the preparation, application, materials, and curing procedures of C.S.A. Standard CAN3.A23.1.

3.13 CONSTRUCTION JOINTS

.1 Construction joints in walls and floors shall be placed in locations approved by the Consultant or shown on the drawings.

.2 Construction joints shall be keyed and dowelled to the adjoining pour as detailed on the drawings.

.3 Before placing adjoining concrete at construction joints, clean the existing surface of dirt, laitance and loose aggregate.

.4 Where additional resistance to horizontal shear is required, mortises or keys shall be formed in the concrete. The pouring sequence and the location of construction joints shall be as shown on the plans, noted herein, or as approved by the Consultant.

3.14 CONTROL JOINTS

.1 Provide control joints as follows:

.1 Where shown and noted on the drawings in foundation and retaining walls and in floor slabs. Control joints in floor slabs shall be saw cut to the depth shown as soon after placing the concrete as the surface will allow without chipping but not later than twenty-four (24) hours after placing.

3.15 GROUTING OF COLUMN BASE AND BEAM BEARING PLATES

.1 Rough finish the top of walls, piers, or slabs which receive steel columns or steel beams.

.2 After the erection and alignment of columns and beams, fill the space beneath the plates with a non-shrink grout. Take particular care to ensure that air pockets or voids are eliminated.

.3 Mix and place grout in strict accordance with the manufacturer’s directions.

3.16 FIELD QUALITY CONTROL

.1 All materials and workmanship shall be subject to test and inspection by a testing and inspection company appointed by the General Contractor.

.2 Cost of testing in accordance with Division 1.

.3 Provide unhindered access to the project for purposes of inspection and testing. Provide storage space and the necessary protection for test specimens against damage or loss while on site.

.4 Provide representative samples of the materials as requested by the testing and inspection company at no cost to the Owner, or the cash allowance.

.5 All field tests for concrete quality and all criteria relating to failure to meet test requirements in accordance with C.S.A. Standard CAN3-A23.1 except as follows:

.1 Each test shall consist of three standard cylinders, accompanied by a slump test and measurement of air content (where applicable). Unless otherwise directed by the Consultant, one cylinder shall be tested at seven (7) days and the remaining two cylinders at twenty-eight (28) days.

.2 The inspection company shall take concrete tests for:

.1 not less than one test for each class of concrete placed each day, and

.2 not less than one test for each 100 cubic metres or portion thereof placed in any day.

.6 The cost of any additional testing and/or the cost of replacement of any part of the structure resulting from failure of the concrete to meet the test requirements shall be borne by the Sub-Contractor.

.7 Notify the testing company of the pouring schedule sufficiently in advance so that tests may be made.

.8 PVC waterstop to be inspected after the waterstop has been completely installed by the inspection company. Testing of the waterstop to be carried out by a certified company using approved testing methods.

3.17 CLEAN-UP

.1 At the completion of the work of this Section, remove from the site any excess materials, debris and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 05 10 – Masonry Procedures

.2 Section 04 05 12 - Mortar and Masonry Grout

.3 Section 04 05 19 - Masonry Anchorage and Reinforcing

.4 Section 04 05 23 - Masonry Accessories

.5 Section 04 22 00 – Concrete Masonry

1.2 MEASUREMENT PROCEDURES

.1 Work of this section, except as specified otherwise, will be measured by the Contractor. It will be paid for under payment items:

.1 Inspecting and testing to identify unsound joints. This item will not be measured; payment will be according to one fixed lump sum price for work necessary to locate unsound joints.

.2 Pointing - on lump sum basis.

.2 Repair work will be paid for on a unit price basis according to pre-established unit prices. Measurement will be based on lump sum.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA A23.1- 94, Construction Materials and Methods of Concrete Construction.

.2 CAN3-A371- 94, Masonry Construction for Buildings.

1.4 DEFINITIONS

.1 Raking: the removal of loose/deteriorated mortar until sound mortar is reached.

.2 Repointing: filling and finishing of masonry joints from which mortar has been raked out and or missing.

.3 Tooling: finishing of masonry joints using tool to provide final contour.

.4 Repair: using adhesives to rebond sections of fractured masonry.

.5 Consolidation: strengthening masonry units to prevent deterioration (spalling).

.6 Descaling: the removal of loose portions of the masonry (usually spalled area) through impact with a brush hammer or similar device.

1.5 SYSTEM DESCRIPTION

.1 Work of this Section includes but is not limited to:

.1 Visually inspecting for obvious signs of deteriorated masonry and testing/verification of masonry joints.

.2 Raking identified unsound joints.

.3 Preparation of masonry surface including joints surface cleaning, flushing of voids and open joints, and masonry wetting.

.4 Repointing of identified masonry joints.

.5 Removal of loose portions on stone surface.

.6 Resetting of dislodged masonry units.

.7 Ensuring cure of mortar.

.8 Grouting by hand, small voids.

.9 Consolidation of fractured masonry units or spalled units.

.10 Replacement of deteriorated or missing units.

1.6 SAMPLES

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

.2 Submit labelled samples of materials used on project for approval before work commences.

1.7 QUALIFICATIONS

.1 Contractor-Mason:

.1 Use single Contractor-mason for all masonry work. Ensure Contractor-mason has 10 years minimum in masonry work especially historic stone masonry.

.2 Ensure mason has certificate of qualification with experience in stone masonry. Ensure that all masonry work is strictly undertaken by certified masons.

.3 Ensure Contractor-mason has good level of understanding of structural behaviour of masonry walls if masonry work involves replacing or repairing stones which are part of structural masonry work.

.2 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.

1.8 MOCK-UPS

.1 Construct mock-up in accordance with Section 01 61 00 - Common Product Requirements.

.2 Construct mock-up 600mm x 600mm m to demonstrate repair procedure for each type of masonry material specified.

.3 Construct mock-up under supervision of Consultant to demonstrate a full understanding of specified procedures, techniques and formulations are achieved before work commences it required.

.4 Construct mock-up where directed.

.5 Allow 24 hours for inspection of mock-up by Consultant before proceeding with masonry repointing and repair work.

.6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.9 DELIVERY, STORAGE AND HANDLING

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

.2 Store cementitious materials and aggregates in accordance with CSA A23.1.

.3 Store lime putty in plastic lined sealed drums.

.4 Keep material dry. Protect from weather, freezing and contamination.

.5 Ensure that manufacturer's labels and seals are intact upon delivery.

.6 Remove rejected or contaminated material from site.

1.10 STORAGE AND PROTECTION

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

.2 At end of each working day, cover unprotected work with waterproof membranes. Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.

.3 Protect adjacent finished work against damage which may be caused by on-going work.

1.11 EXISTING CONDITIONS

.1 Report in writing, to Consultant areas of deteriorated masonry revealed during work. Obtain Consultant's approval and instructions of repair and replacement of masonry units before proceeding with repair work.

1.12 ENVIRONMENTAL REQUIREMENTS

.1 When temperature is 10°C or less:

.1 Store cements and sands for immediate use within heated enclosure. Allow these materials to reach minimum temperature of 10°C (that is equilibrium with air temperature in enclosure).

.2 Heat water to minimum of 20°C and maximum of 30°C:

.1 At time of use temperature of mortar to be minimum of 15°C and maximum of 30°C.

.2 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 30°C.

.2 Protection requirements are specified in Section 04 05 10 - Common Work Results for Masonry.

.3 Obtain approval from Consultant for methods of enclosure and protection.

Part 2 Products

2.1 MATERIALS

.1 Mortar materials: to Section 04 05 12 - Mortar and Masonry Grout

.2 Mortar: to match existing adjacent mortar colour, texture and patterning.

Part 3 Execution

3.1 GENERAL

.1 Perform work in accordance with CAN3-A371.

.2 Use manual raking or tool to remove deteriorated mortar and ensure that no masonry units are chipped/altered/damaged by work to remove mortar.

.3 Tool and compact using jointing tool to force mortar into joint.

.4 Finish joints to match existing joints, except where specified otherwise.

.5 Use suitable approved jointing tool to form compacted concave or V-shaped tooled joints.

3.2 REPOINTING

.1 Procedure of testing: inspect joints visually for obvious signs of deteriorated masonry. Test joints not visually deteriorated as follows:

.1 Test for voids and weakness by using hammers or other approved means.

.2 Perform testing in co-operation with Consultant so that unsound joints can be marked and recorded.

.2 Raking joints:

.1 Rake unsound joints free of deteriorated and loose mortar, dirt and other undesirable material.

.2 Clean joints to full depth of deteriorated mortar but in no case to less than 50 mm. Clean out voids and cavities encountered.

.3 Clean by compressed air, surfaces of joints without damaging texture of exposed joints.

.4 Flush open joints and voids; clean open joints and voids with low pressure water and if not free draining blow clean with compressed air.

.5 Leave no standing water.

.3 Repointing:

.1 Dampen joints and completely fill with mortar. If surface of masonry units/ stone has worn rounded edges keep pointing back from surface to keep same width of joint. Avoid feather edges. Pack mortar solidly into voids and joints.

.2 Keep masonry damp while pointing is being performed.

.3 Do no pointing in freezing weather. See Section 01 00 05 General Instructions for protection required for work in this Section.

.4 Build-up pointing in layers not exceeding 12 mm in depth. Allow bottom layers to set before applying subsequent layers. Maintain joint width.

.5 Tool joints behind masonry face with identical tools used for weathered joints. Match weathered joint.

.6 Remove excess mortar from masonry face before it sets. Finish jointing neatly as specified.

3.3 DESCALING

.1 Remove loose masonry portions by impact with bush hammer as directed by Consultant.

3.4 RESETTING

.1 Fix dislodged masonry units in correct location with water-soaked softwood wedges and firm mortar.

.2 Insert and compress firm mortar to within 50 mm of pointing surface. Allow mortar to set 24 hours.

.3 Pull out wood wedges when dried and shrunken.

.4 Point to surface in two layers.

3.5 GROUTING

.1 Clean out void with water until water runs clear.

.2 Fill joints and cracks with mortar set back 50 mm from final mortar surface.

.3 Pour epoxy grout through tube until void is full.

.4 Point as rest of work.

3.6 REPAIR

.1 Remove fractured unit without losing pieces or worsening damage or damaging adjacent units.

.2 Drill holes in each section and fracture.

.3 Insert non-ferrous dowels, seal in place temporarily with epoxy and apply cement grout to holes and joints between masonry units. Let set.

.4 Reinstate repaired units into work and repoint with specified mortar as rest of work.

3.7 CONSOLIDATION

.1 Remove decayed masonry as directed by Consultant.

.2 Apply consolidate as directed by Consultant.

.3 Repoint as rest of job.

3.8 CLEANING

.1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.

.2 Do further cleaning after mortar has set and cured.

.3 Clean masonry with stiff natural bristle brushes and plain water only. Vinegar or chemicals are not to be used unless instructed in writing by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal

.3 Section 01 45 00 - Quality Control

.4 Section 01 61 00 - Common Product Requirements

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

.6 Section 04 05 12 - Mortar and Masonry Grout

.7 Section 04 05 19 - Masonry Anchorage and Reinforcing

.8 Section 04 05 23 - Masonry Accessories

.9 Section 04 22 00 - Concrete Unit Masonry

.10 Section 05 50 00 - Metal Fabrications

.11 Section 07 21 19 - Foamed in Place Insulation

.12 Section 07 21 31 – Adhesive Grade Air Barrier membrane and Thru-Wall Flashing

.13 Section 07 92 10 - Joint Sealing

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 Unless otherwise stated, the applicable provisions of these reference standards are to be considered a part of this application. Standards to be current issue.

.2 CSA-A165 Series, Standards on Concrete Masonry Units

.3 CSA A179, Mortar and Grout for Unit Masonry.

.4 CSA-A371, Masonry Construction for Buildings.

1.3 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 Samples.

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

.2 Submit samples.

.1 Two (2) of each type of masonry unit specified.

.2 One (1) of each type of masonry accessory specified.

.3 One (1) of each type of masonry reinforcement and tie proposed for use.

.4 As required for testing purposes.

.3 Manufacturer's Instructions.

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports.

.1 Submit laboratory test reports in accordance Section 01 45 00 – Quality Control.

.2 Certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

.4 For clay units, in addition to requirements set out in reference to CSA and ASTM Standards, include date indicating initial rate of absorption for units proposed for use.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Mock-ups.

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

.2 Construct mock-up panel of exterior masonry wall construction 1200 x 1800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.

.3 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.2 For testing to determine compliance with performance requirements. Perform following tests.

.1 For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption.

.4 Construct mock-up where directed.

.5 Allow seven (7) days for inspection of mock-up by Consultant before proceeding with work.

.6 When accepted by Consultant, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of finished work.

.4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 00 01 05 – General Instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver materials to job site in dry condition.

.3 Storage and Protection.

.1 Keep materials dry until use except where wetting of bricks is specified.

.2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 for Construction/Demolition Waste Management and Disposal.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Cold weather requirements.

.1 When air temperature is below 5° C the requirements for masonry construction shall be in accordance with CSA CAN3-A371-M94 Section 6.7.2.

.2 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.

.3 Completed masonry or sections not being worked on shall be protected in accordance with CSA CAN3-A371-M04 Section 6.7.3.

.2 Heating Requirements.

.1 Observe the following heating requirements for mortar:

.1 Air Temperature 5º C (41º F) to 0º C (32º F): Mortar aggregate or mixing water shall be heated to produce mortar temperatures between 5º C and 45º C (113º F).

.2 Air Temperature 0º C (32º F) to -4º C (25º F): Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5º C and 45º C.
Mortar temperatures shall be maintained above freezing on the boards.

.3 Air Temperature -4º C (25º F) to -7º C (19º F): Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5º C and 45º C. Mortar temperatures shall be maintained above freezing on the boards. Salamanders or other sources of heat shall be used on both sides of walls under construction. Wind breaks shall be employed when wind is excess of 25 Km/hour.

.4 Air Temperature -7º C 19º F) and below: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5º C and 45º C. Enclosure and auxiliary heat shall be provided to maintain air temperatures above 0º C. Temperature of units when laid shall not be less than -7º C.

.2 Protections to complete masonry and masonry not being worked:

.1 Air Temperature 5º C (41º F) to 0º C (32º F): Masonry shall be protected from rain or snow for 24 hours by covering with a weather resistive non-staining membrane.

.2 Air Temperature 0º C (40º F) to -4º C (25º F): Masonry shall be completely covered with weather resistive non-staining membrane for 24 hours.

.3 Air Temperature -4º C (25º F) to -7ºC (19º F): Masonry shall be completely covered with insulating blanket or equally protected for 24 hours.

.4 Air Temperature -7º C (19º F) and below: Masonry temperature shall be maintained above 0º C for 24 hours by enclosure and supplementary heat, by electric heating blankets, infra-red heat lamps or other approved method.

.3 Hot weather requirements.

.1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

.2 Stiffened mortar due to the evaporation of water may be re-tempered within two (2) hours of original mixing provided the temperature is not over 25º C (77º F). If the temperature is over 25º C, it may only be re-tempered within one (1) hour of the original mixing.

1.8 PROTECTION

.1 Construct and maintain temporary protection as requested to permit continuous progress of the work. Areas so protected shall be of sufficient size to permit progress of all work necessary to maintain an orderly and effective sequence of construction operation.

.2 Cover wall under construction exposed to the elements with weather resistant non-staining covers at the end of each day's work and keep covered until work is continued or completed and protected by flashings or other permanent construction. Ensure coverings extend over walls and down sides sufficiently to protect walls from wind driven rain.

.3 Protect face work from marking and other damage. Protect completed work from mortar droppings using non-staining covers.

.4 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

.5 Maintain ambient temperature between 5° C (41º F) and 50° C (122º F) and protect site from wind chill.

Part 2 Products

2.1 MATERIALS

.1 Masonry materials are specified in Related Sections 1.1.

Part 3 Execution

3.1 WORKMANSHIP

.1 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 TOLERANCES

.1 Exposed block wall: plumb within 1:600.

.2 Walls to receive thin-set ceramic tile: plumb within 1:600.

.3 Deviation in joint thickness: +/- 2mm (0.08”).

3.3 EXPOSED MASONRY

.1 Remove chipped, cracked and otherwise damaged units in exposed masonry and replace with undamaged units.

.2 Exposed block masonry to be reviewed prior to application of first coat of paint (filler).

3.4 JOINTING

.1 Allow joints to set just enough to remove excess water before tooling joints.

.1 Mortar joints shall conform to CAN3-A371 standard, Clause 5.2.5.

.2 Tool horizontal and vertical joints with round jointer to provide smooth, compressed, uniformly concave joints for all exposed masonry.

.3 Strike flush all joints concealed in walls and joints in walls to receive gypsum board, plaster, tile, insulation, stucco or other applied material except paint or similar thin finish coating.

.4 If specifically noted, raked joints shall be uniform to 6mm (0.25”) depth and compressed with square tool to provide smooth, compressed raked joints of uniform depth.

3.5 JOINING WORK

.1 Where necessary to temporarily stop horizontal runs on masonry, and in building corners:

.1 Step-back masonry diagonally to lowest course previously laid.

.2 At existing masonry, “tooth” new masonry into existing masonry using masonry units to match size of existing units. Any discrepancy between onsite conditions and the drawings the contractor is to notify the architect prior to commencing work.

.3 Fill in adjacent courses before heights of stepped masonry reach 1200mm (48”).

3.6 CUTTING

.1 Cut out neatly for electrical switches, outlet boxes, and other recessed or built-in objects.

.2 Make cuts straight, clean, and free from uneven edges.

3.7 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.

3.8 WETTING OF MASONRY

.1 Except during winter, wet clay bricks having an initial rate of absorption exceeding 1g/minute/1000 mm^2 (0.025 oz./sq./inch/min.): wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface is dry.

.2 Wet tops of brick walls qualifying for wetting, when recommencing work on such walls.

3.9 SUPPORT OF LOADS

.1 Use concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.

.2 Install galvanized metal lath below voids to be filled with concrete; keep lath 25mm (1”) back from face of units.

3.10 PROVISIONS FOR MOVEMENT

.1 Leave 10mm (0.375”) space below shelf angles.

.2 Leave 20mm (0.75”) space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

.3 Fill deflection space with mineral wool compressed to 50% of original thickness to completely seal space.

.4 Coordinate laying of masonry with installation of lateral support specified in Division 4 and as provided in Division 5.

3.11 LOOSE STEEL LINTELS

.1 Install loose steel lintels centred over opening width, unless shown otherwise.

3.12 CONTROL JOINTS

.1 Provide continuous control joints to Typical Control Joint Details on Drawings where indicated.

.1 at intersections of interior block walls and exterior block walls.

.2 at locations between walls on foundations and walls on thickened slabs.

.3 over window and door jambs.

.4 not all control joints are shown on drawings. Provide control joints where new walls are bearing between existing to new structure and/or foundation. Provide control joints between existing and new walls.

.2 Back reinforcement to be non-continuous at control joints.

.3 Rake joints full height 10mm x 20mm and caulk to Section 07 92 10.

3.13 TESTING

.1 Inspection and testing will be carried out by a Testing Laboratory approved by the Consultant.

.2 Cost of testing will be paid for from Section 01 21 00 – Cash Allowances.

3.14 HEIGHT OF INTERIOR WALLS

.1 Extend tops of walls and partitions to deck, slab, or structural members as applicable, unless indicated otherwise on the drawings.

.2 Incorporate both lateral support and deflection space at termination of walls as required by Division 4.

.3 Seal all voids in walls including tops to provide fire/smoke barriers, as per governing codes.

3.15 PENETRATION OF MASONRY

.1 Fill voids of masonry within 19mm (0.75”) of structural members, pipes, ducts and conduit hat penetrates masonry walls and partitions unless otherwise indicated.

.2 Keep masonry units similarly clear of such penetrations.

.3 Finish mortar smooth to face of masonry.

.4 Pack remainder of annular void surrounding penetrating items with fire separation packing to within 12.7mm (0.5”) of face of masonry. Install appropriately rated sealant to maintain required fire separations

3.16 ADJUSTMENT AND CLEANING

.1 Patch damaged masonry walls that have been rejected.

.2 Point all holes in mortar joints except weep holes.

.3 Point all voids in concrete unit masonry faces.

.4 Cut out defective mortar joints to a minimum depth of 13mm (0.5”) and report.

.5 Wash down and brush masonry to remove mortar or stains. Use only detergents or proprietary masonry cleaners as recommended by brick manufacturers.

.6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 05 10 – Masonry Procedures

.2 Section 04 21 13 – Brick Unit Masonry

.3 Section 04 22 00 – Concrete Masonry Units

1.2 REFERENCES

.1 CSA A179-94 Mortar and Grout for Unit Masonry.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures

Part 2 Products

2.1 MATERIALS

.1 Mortar and grout: CSA A179.

.2 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

.3 Colour: ground-coloured natural aggregates or metallic oxide pigments.

.4 Dirt resistant additives: aluminum tristearate, calcium stearate or ammonium stearate.

2.2 MATERIAL SOURCE

.1 Use same brands of materials and source of aggregate for entire project.

.1 Mortar for exterior masonry above grade:

.1 Loadbearing: Type S and M based on proportion specifications.
.2 Non-loadbearing walls shown on structural drawings to be reinforced with vertically reinforced cores or horizontal bond beams: Type S based on proportion specifications.
.3 Non-loadbearing not shown on Structural Drawings: Type N based on Proportion specifications.
.4 Parapet walls, chimneys, unprotected walls: Type S based on proportion specifications.

.2 Mortar for foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: Type M based on Proportion specifications.

.3 Mortar for interior masonry:
- .1 Loadbearing: Type S and M based on Proportion specifications.
- .2 Non-loadbearing walls shown on structural drawings to be reinforced with vertically reinforced cores or horizontal bond beams: Type S based on proportion specifications.
- .3 Non-loadbearing: Type N based on Proportion specifications.

.4 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 M based on Proportion specifications.
- .4 Mortar for pointing: Type S based on Proportion specifications.
- .5 Mortar for glass block: 1-part Portland cement, 1-part hydrated lime, 4 parts aggregate by volume.
- .6 Mortar for gypsum units: 1 part gypsum, 3 parts aggregate by weight.

2.3 WHITE MORTAR

.1 White mortar: use white silica sand, white Portland cement, and lime white silica sand and white masonry cement to produce applicable mortar type.

2.4 COLOURED MORTAR

.1 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample. Allow for two colours.

.2 Use coloured mortar for brick masonry.

2.5 NON-STAINING MORTAR

.1 For non-staining mortar use non-staining masonry cement for cementitious portion of specified mortar type.

2.6 GROUT

.1 Grout: to CSA A179 Table 3.

.2 Concrete grout for reinforced masonry shall consist of one part Portland cement and three parts sand with water to provide a minimum compressive strength of 15 Mpa at 28 days. Maximum aggregate size to be 10 mm. Slump for the grout to be 200 to 250 mm.

.3 If special permission to complete high lift grouting is obtained. Grout for high lifts is consist of fine grout. Use of a superplasticizer will be required in congested areas to ensure cores are grouted full without voids.

.4 Grout: Solid all pockets in concrete. Block walls as noted on the drawings and where structural components installed.

2.7 PARGING

.1 Parging mortar: Type 5 to CSA A179

Part 3 Execution

3.1 MIXING

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

.2 Mix grout to semi-fluid consistency.

.3 Incorporate colour and admixtures into mixes in accordance with manufacturer's instructions.

.4 Use clean mixer for coloured mortar.

.5 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 nor more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

.6 Do not use salt or any additives that will adversely effect reinforcing by increasing susceptibility to corrosion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal

.3 Section 04 05 10 – Masonry Procedures

.4 Section 04 05 23 – Masonry Accessories

.5 Section 04 22 00 – Concrete Masonry

.6 Section 05 50 00 – Metal Fabrications

.7 Section 07 21 19 – Foamed in Place Insulation

.8 Section 07 21 31 – Adhesive Grade Air Barrier membrane and Thru-Wall Flashing

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 Unless otherwise stated, the applicable provisions of these reference standards are to be considered a part of this application. Standards to be current issue.

.2 Ontario Building Code

.3 CAN/CSA-A23.1-09/A23.2-09 Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete

.4 CSA-A370-04 (R2009), Connectors for Masonry

.5 CSA-A371-04 (R2009), Masonry Construction for Buildings

.6 CSA G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement

.7 CAN/CSA G30.18-09, Carbon-Steel Bars for Concrete Reinforcement.

.8 CSA G30.18-M92 (R2002) Billet-Steel Bars for Concrete Reinforcement

.9 CSA-S304.1-04 (R2009), Masonry Design for Buildings

.10 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.11 CSA A179-04 (R2009), Mortar and Grout for Unit Masonry

.12 ASTM A775/A775M-00a Standard Specification for Epoxy Coated Reinforcing Steel Bars

.13 Reinforcing Steel Institute of Canada (RSIC). “Reinforcing Steel Manual of Standard Practice”

.14 Construction Safety Act or any other regulations of the Ontario Ministry of Labour relating to the work of this section.

1.3 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 Submit two (2) copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products.

.2 Shop Drawings:

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

.2 Shop drawings consist of bar bending details, lists and placing drawings.

.3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 61 00 – Common Product Requirements.

1.5 WASTE MANAGEMENT and DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Refer to Structural Drawings for reinforcement details for interior and exterior block walls including all tie details for brick veneer and manufactured stone masonry. Follow those requirements in detail, which shall take precedence over reinforcing conditions and materials described in this Section. This section shall supply and install all block cell vertical and horizontal reinforcing steel and grout fill in accordance with Sections 04 05 12 for Mortar and Grout Masonry.

.2 Interior and exterior concrete block walls single wythe: Horizontal reinforcement shall be ladder or truss type as specified on Structural Details.

.3 Interior and exterior cavity walls: At walls with concrete block backup, provide block ties as specified for brick veneer, or manufactured stone as specified on the Structural Details.

2.2 FABRICATION

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

.2 Fabricate connectors in accordance with CSA-A370.

.3 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.

.4 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

.1 Provide Consultant with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Inform Consultant of proposed source of material to be supplied.

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 GENERAL

.1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

.2 Prior to placing concrete, mortar, grout, obtain Consultant's approval of placement of reinforcement and connectors.

.3 Supply and install additional reinforcement to masonry as indicated.

3.3 BONDING AND TYING

.1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.

.2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.

3.4 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry lintels and bond beams as indicated.

.2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.5 GROUTING

.1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.6 ANCHORS

.1 Supply and install metal anchors as indicated.

3.7 LATERAL SUPPORT AND ANCHORAGE

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

3.8 MOVEMENT JOINTS

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

.2 Terminate reinforcement 25 mm short of each side of control joints unless noted otherwise.

3.9 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.10 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.11 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal

.3 Section 04 05 10 –Masonry Procedures

.4 Section 04 22 01 – Concrete Masonry

.5 Section 07 21 19 –Foamed in Place Insulation

.6 Section 07 21 31 – Adhesive Grade Air Barrier membrane and Thru-Wall Flashing

1.2 REFERENCES

.1 ASTM D2240-86 Test method for Rubber Property - Durometer Hardness.

.2 CAN3-A371-94 Masonry construction for Buildings.

.3 CAN4-S102-79 and CSA A101M 1982 Cavity Wall Insulations for Buildings.

Part 2 Products

2.1 MATERIALS

.1 Control joint filler: purpose-made elastomer 35 Shore A durometer hardness to ASTM D2240 of size and shape to fit 12mm gap., Tremco; Dynamic Caulking. Colour to match brick and concrete unit masonry.

.2 Nailing inserts: 0.6 mm thick purpose-made galvanized steel inserts for setting in mortar joints.

.3 Masonry flashing: Modified Bitumen Flashing Membrane reinforced with non-woven Fiberglas matt as per Blueskin® by Bakor or approved alternate.

.4 Brick Vents/ Weepholes:Purpose made PVC: Williams-Goodco PVC brick vent for cavity walls for C.S.R. brick. Designed to drain cavities to exterior and to vent cavity. As supplied by Williams Products at Phone: 800-521-9594 or 248-643-6400 Or Email: Wilpro@williamsproducts.net Colour to be light gray.

.5 Mortar Net: By Dur-O-Wall – DA 1008 Mortar Net.

Part 3 Execution

3.1 CONTROL JOINTS

.1 Install continuous control joint fillers in control joints at locations indicated.

3.2 WEEP HOLE BRICK VENTS

.1 Provide weep hole brick vents in vertical joints immediately over thru-wall flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum 600 mm (24") O.C. Mortar or debris must not plug holes.

3.3 BRICK VENT HOLES

.1 Provide brick vent holes in vertical joints at top of walls and/or immediately below flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at a maximum of 600 mm (24") O.C. horizontally and every ten (10) courses vertically. Mortar or debris must not plug holes.

3.4 NAILING INSERTS

.1 Install nailing inserts in mortar joints at 400 mm oc each way, for attachment of wall strapping.

3.4 MASONRY FLASHING

.1 Install flashings in masonry in accordance with CAN3 A371.

.2 Masonry flashings are as specified in Section 07 27 31 for Adhesive Grade Air barrier and Thru-Wall Flashings.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-In Place Concrete

.2 Section 03 41 00 – Plant-Precast Structural Concrete

.3 Section 04 05 10 – Masonry Procedures

.4 Section 04 05 12 – Mortar and Grout Masonry

.5 Section 04 05 23 – Masonry Accessories

.6 Section 04 05 19 – Masonry Anchorage and Reinforcing

.7 Section 07 21 19 – Foamed in Place Insulation

.8 Section 07 27 31 – Adhesive Grade Air Barrier Membranes and Thru-Wall Flashing

1.2 REFERENCES

.1 CAN3-A165 Series - M85 CSA Standards on Concrete Masonry Units.

1.3 SUBMITTALS

.1 Samples: submit duplicate samples of concrete block, glass block, masonry accessories and mortar, prior to commencing work in accordance with Section 04 05 10.

1.4 DELIVERY

.1 Palletized with individual faces of block protected.

1.5 STORAGE AND HANDLING

.1 Store on level ground, do not double stack pallets. Avoid access movement before installation.

.2 Maintain glass block materials at ambient air temperature to minimum 4ºC prior to, during and 48 hours after completion of installation.

1.6 CO-ORDINATION

.1 Notify all other Trades when chases, openings, sleeves, etc. are required and are to be located in the work, and when other materials are to be set or anchored in the work of this trade.

.2 Make satisfactory arrangements with other Trades as to the time when various sections of the work are to be built.

1.7 QUALITY ASSURANCE

.1 Masonry surfaces, to which Air/ Vapour barrier is to be applied, shall be constructed flat and level; unevenness between masonry units shall not exceed 3 mm. All excess mortar must be removed, and all voids exceeding 3 mm in depth must be filled. All joints must be struck flush.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Standard concrete block autoclaved or bubble cured cellular concrete block units: to CAN3-A165 Series-M85.

.1 Classification:

.1 H/15/C/M for exposed-to-view and painted surfaces.

.2 H/15/A/M for unexposed-to-view locations.

.2 Size: metric modular. Sizes as shown on drawings

.3 Special shapes: provide square and bull-nosed units for exposed corners/ sills. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.

.4 Acceptable material: Day and Campbell, Niagara Block

Part 3 Execution

3.1 LAYING CONCRETE BLOCK UNITS

.1 Bond: running, unless noted otherwise or matching an adjacent wall.

.2 Coursing height: 200 mm for one block and one joint.

.3 Jointing: flush where exposed or where paint or other finish coating is specified.

.4 Blocks installed to tapered pilasters shall be set such that each succeeding course follows the angle of taper called up on drawings.

.5 Install bull-nosed blocks at <u>all</u> external corners/ or edges left exposed, including window sills.

.6 Cut blocks to fit around and to face of structural steel columns located inside walls.

END OF SECTION

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

.1 Read and be governed by conditions of the Contract and sections of Division 1.

1.2 SCOPE OF WORK

.1 Work Included
Supply all materials, provide all labour and equipment to erect the structural steel as shown or required by the drawings or specifications. The principal items include, but are not limited to:
- structural steel columns, beams, girts, angles
- bracing, plates, stiffeners, strap anchors
- galvanized shelf angles/bent plates
- anchor bolts
- loose structural shapes bolted to walls

.2 Related Work Specified Elsewhere

- Masonry - Division 4.
- Grouting of Column Bases Division 3
- Wind Bearing Studs Division 5

1.3 REFERENCED STANDARDS

.1 All standards in accordance with latest issue.

.2 C.S.A. Standard CAN/CSA-S16-01, "Limit States Design of Steel Structures".

.3 C.S.A. Standard W59-03, "Welded Steel Construction" (Metal Arc Welding).

.4 C.S.A. Standard W.55.3-1965 (R2003), "Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings".

.5 C.S.A. Standard W47.1-03, "Certification of Companies for Fusion Welding of Steel".

.6 C.S.A. Standard S136-01, "North American Specification for the Design of Cold Formed Steel Structural Members".

.7 CAN/CSA-G164-M92 (R2003), “Hot Dip Galvanizing of Irregularly Shaped Articles”.

.8 CISC/CPMA 2-75 Quick Drying Primer for use on Structural Steel.

.9 Ontario Building Code 2020 – as currently amended.

1.4 SHOP DRAWINGS

.1 Examine all drawings forming a part of this Contract and conform to the requirements of all such drawings.

.2 The Consultant reserves the right to relocate members prior to and during the approval of erection diagrams for the purpose of clearing ducts, piping, walls, etc., and to finalize the location of mechanical roof top units, etc., at no additional cost to the Owner. Any cost involved in revisions to erection diagrams or shop drawings as a result of these changes shall be borne by this Sub-Contractor.

.3 Any fabrication executed before review of shop drawings shall be at this Sub-Contractor's risk. Fabrication shall be assumed to begin when material is cut to length, whether this be by the fabricator or at the mill to the fabricator's orders.

.4 The Consultant's review of shop drawings will not relieve the Sub-Contractor from his responsibility for ensuring that his work is complete, accurate, and in accordance with the drawings and specifications.

.5 The use of reproducible copies of the Consultant's drawings for erection diagrams will not be permitted. If CAD files are requested, they will be provided for a fee. A Standard Agreement will be provided to be signed and returned with funds, before the release of any drawing files.

.6 Shop drawings are to be submitted as follows:
Erection drawings: 1 digital .pdf copy of each.
Shop fabrication items drawings: 1 digital .pdf copy of each.

.7 Provide one complete set of digital .pdf files and one hard copy of the erection diagrams to the Consultant showing "as-built" conditions, including final sizes and locations of openings and final locations of mechanical units.

.8 Within two weeks of awarding the contract the structural steel fabricator must submit for approval, a drawing showing the top of any bearing plate elevations and horizontal dimensions to all bearing plates, if applicable. The mason cannot start with blockwork above finished floor elevation until these drawings are reviewed and approved.

.9 All shop drawings are to be CAD produced otherwise they will not be accepted by the consultant. Stamping of the drawings shall be by a registered professional engineer, licensed in the Province of Ontario. Alternatively, Section 1.5.1 outlines additional options.

.10 No levelling plates will be allowed on this project unless the steel fabricator hires a 3rd party inspection firm to confirm that the requirements of clauses 25.3.1.2, 28.5, and 29.7.8 of CSA standard S16-01 have been met for all column bases where levelling plates have been used. Following inspection, the inspection firm must submit a letter signed and sealed by a professional engineer confirming that they have inspected all column bases employing levelling plates and that these bases meet the requirements of above noted clauses. The 3rd party inspection firm is to have a minimum 5 years experience inspecting steel structures and shall be certified as a CWB certified inspection company.

1.5 DESIGN CRITERIA

.1 Certificates

.1 Provide a certificate signed and sealed by the registered professional engineer responsible for the detailed structural steel connections, stating that the connections have been designed, detailed, and fabricated in accordance with the applicable standards.

.2 Certificates must bear the original seal and signature of the engineer and be dated. Photocopies or .pdf copies are not acceptable.

.2 All loads, forces and reactions shown on the drawings or noted in the specifications are service loads (unfactored), unless noted otherwise.

.3 Design and detailing of joists, connections, etc., in accordance with CSA CAN3-S16-M. Service

loads must be factored for Limit States Design.

.4 Typical connection details are shown on the drawings for guidance only. Design and submit for approval, suitable bolted or welded connections. In general, bolted connections are to be designed as "bearing" connections with threads included in the shear plane.

.5 The shear capacity of all beam and girder connections shall be not less than the shear capacity of the section acting as a simple beam loaded uniformly to its moment capacity over the same span nor less than that shown on the drawings, whichever is greater.

.6 Design joists and bridging members in accordance with applicable reference standards for the uniform loadings shown on the drawings with due allowance for local bending moments and for any additional concentrated and/or line loads for support of mechanical units and/or masonry walls. Design OWSJ such that total load deflection does not exceed 1/240th of the design span and the live load deflection does not exceed 1/360th of the design span.

1.6 COORDINATION

.1 Coordinate the work of this Section with the General Contractor’s scheduling in accordance with the General Conditions.

.2 Coordinate the work of this Section with the work of all affected Divisions to provide proper clearances and assembly of the work.

.3 Coordinate the work with Division 9 for any specially painted items including preparing steel with sandblasting to allow painting by Division 9.

1.7 Substitutions

.1 Substitution of available beam and column sections for those shown on the drawings may be permitted, provided that the substituted members have equivalent or greater capacity and stiffness than those shown.

.2 Proposed substitutions are subject to prior approval of the Consultant and must not interfere with Architectural clearances.

1.8 QUALITY ASSURANCE

.1 Fabrication and erection of all components to be by a Division 1 or Division 2.1 certified company only. Welders must have current CWB certification for the applicable position.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Rolled Steel Sections, Shapes, currently produced in Canada - in accordance with C.S.A. Standard G.40.21M-350W.

.2 Plates and Rod Currently produced in Canada - in accordance with C.S.A. Standard G.40.21M-300W.

.3 Hollow Structural Sections, currently produced in Canada - in accordance with C.S.A. Standard G40.21-350W Class – C.

.4 High Strength Bolts & Washers - in accordance with ASTM Standard A325.

.5 Shop Primer Paint - in accordance with CISC/CPMA Standard 2-75, for steel on interior of building. Refer to Division 9 for other specially painted items and required primer.

.6 Anchor bolts - in accordance with C.S.A. Standard G40.21M-300W.

.7 Hot Dip Galvanizing - zinc coating by hot dip process after fabrication to provide a uniform coating of not less than 2.0 ounces per square foot.

.8 Field Touch-up Paint

.1 As for shop paint for previously shop primed members.

.2 Galvafroid zinc rich coating by W.R. Meadows for previously galvanized members.

2.2 FABRICATION

.1 Fabrication of all structural steel in accordance with C.S.A. Standard CAN3-S16.1-M.

.2 Carefully make and fit all details and connections to ensure that the finished work presents a neat and workmanlike appearance.

.3 All shop and field connections are to be welded or high-strength bolted.

.4 Splicing will not be allowed without the approval of the Consultant at the shop drawing review stage. Splicing will then only be allowed if the length of the fabricated member required is longer than that normally produced at the mill.

.5 All members shall be true to length so that assembly may be done without fillers.

.6 Provide holes for bolted connections for connecting the work of other trades where such holes can be determined prior to fabrication and only at the request of the Engineer or the trade concerned. Such holes shall only be provided where they will not impair the satisfactory performance of the structure.

.7 Provide holes for blocking where blocking is required to receive 16 mm diameter bolts spaced at 600 mm o.c. and staggered where possible.

.8 Provide holes in webs or welded bar assemblies for masonry anchors as per typical details.

.9 Supply suitable anchor bolts for base plates and bearing plates.

.10 Base plate sizes shown on the drawings are finished sizes. Allow additional thickness as required for milling.

.11 Take care to minimize distortion due to welding and galvanizing procedures. Straighten members as required to maintain the fabrication tolerances of C.S.A. CAN3-S16.1-M.

.12 Thoroughly clean all steel of all loose mill scale, and rust.

.13 Apply one coat of shop primer on dry clean surfaces for all members except as follows:

.1 Do not paint steel in direct contact with concrete,

.2 Do not paint steel at locations where field welded moment connections are to be made. (Field prime all steel after welding and after removal of slag down to bear metal)

.3 Do not paint any galvanized steel items.

.4 Do not paint steel to be fireproofed if the manufacturer of the fireproofing material indicates that the bond of the fireproofing will be adversely affected by the primer.

.14 Galvanizing to C.S.A. Standard G164, including preparation. Blast clean to commercial quality after fabrication, prior to galvanizing. Provide seal welds in addition to structural welds as required by good practice.

.15 Provide welded "seal" plates (minimum 5mm) as required to close all HSS sections. If this is not possible in all locations, provide sufficient drain holes.

2.3 QUALITY CONTROL

.1 All materials and fabrication shall be subject to test by a testing and inspection company appointed by the Owner.

.2 Provide access to the work in the shop for the personnel of the inspection company.

.3 Provide such samples of materials and mill test reports as may be required by the inspection company at no cost to the Owner.

.4 The cost of testing will be paid for by the Owner.

.5 The testing done by the Independent testing company retained by the Owner is to inform the Consultant and the Owner of Contractor’s performance and must not be used in any way to bolster the quality control efforts of the Contractor nor relieve the Contractor of their contractual responsibility.

.6 Non-destructive testing (NDT) is to be carried out by radiography, magnetic particle, or ultra sonic methods, whichever is more appropriate.

.7 Any deficient welds identified by means of NDT, shall be repaired and retested at the Contractor’s expense.

.8 Shop testing by the Independent Testing Company retained by the Owner shall follow the following guidelines:

.1 Allow for 20% random visual and NDT on shop-welded connections.

PART 3- EXECUTION

3. 1 EXAMINATION

.1 Examine and obtain all necessary measurements of previously executed and existing work which may affect the work of this Section.
.2 Make a line and level survey of the foundations and anchor bolts. Report any discovered discrepancies to the Consultant so that instructions can be given for the necessary remedial

action.

3.2 ERECTION

.1 Accurately set all steel to the lines and elevations shown on the drawings. Temporarily connect all members with sufficient bolts to ensure the safety of the structure until permanent connections are made.

.2 Assemble all members without twists or open joints. Take particular care that all parts are well pinned up and drawn together before bolting or welding is started.

.3 Assume full responsibility for the correct plumbing and alignment and for setting of all members.

.4 If members do not fit properly in the field, repairs must be made by methods to the satisfaction of the Consultant. In no case shall cutting be done with a torch, except where specific approval as to size and location of same is granted by the Consultant. Unfair holes shall be enlarged with a twist drill and larger bolts used.

.5 Set column bases and beam bearing plates on steel shims or other suitable supports. Grouting under these plates will be by Division 3, "Cast-in-Place Concrete.

.6 Erect the steel frame true and plumb. Place temporary bracing where necessary to take care of all loads to which the incomplete building may be subjected, such as wind, equipment, or construction procedures. Leave temporary bracing in place as long as necessary for the safety of the structure.

.7 Erection tolerances in accordance with Section 28 of C.S.A. CAN3-S16.1.

.8 Install restraining clip angles to provide lateral support at the top of all new or existing masonry walls, if applicable. Carefully co-ordinate with the Contractor and the Masonry Sub-contractor.

3.3 FIELD PAINTING

.1 Field paint, using the appropriate finish paint, all scars, blemishes, and bolts not previously shop painted or those areas damaged by erection procedures.

.2 For members which are hot-dipped galvanized, touch up all scars, blemishes, scratches, etc. with a compatible zinc rich paint.

3.4 FIELD QUALITY CONTROL

.1 Provide access to the work at the site for the personnel of the inspection company.

.2 Testing shall be carried out at the option of the Consultant and will be paid for by a cash allowance, except that any re-testing required due to defective work shall be borne by this Sub-Contractor.

3.5 CLEAN-UP

.1 At the completion of the work of this section, remove any excess materials, debris, and equipment from the site.

END OF SECTION

PART 1 - General

1.1 GENERAL REQUIREMENTS

.1 Read and be governed by conditions of the Contract and sections of Division 01.

1.2 SCOPE OF WORK

.1 Work Included
Provide all plant, labour, equipment, and materials to supply and install the metal floor and roof deck, including flashings and accessories required for a complete installation.

.2 Related Work Specified Elsewhere

.1 Structural Steel - Division 05.
.2 Roofing, Flashing and Sheet Metal – Division 07.
.3 Cast-in-Place Concrete – Division 03.

1.3 APPLICABLE STANDARDS

.1 C.S.A. Standard S136-16, "North American Specification for the Design of Cold-Formed Steel Structural Members".

.2 C.S.A. Standard W47.1-19, "Certification of Companies Fusion Welding of Steel".

.3 Ontario Building Code 2020 - as currently amended.

.4 Manufacturing Standards, Canadian Sheet Steel Building Institute.

1.4 SHOP DRAWINGS

.1 Examine all drawings forming a part of this Contract and conform to the requirements of all such drawings.

.2 Prepare shop drawings to supplement the Consultant's drawings. Report any discovered discrepancies in the Contract Documents to the Consultant. Make allowances for clearance and provide details of framing around openings where these are not specifically detailed on the drawings.

.3 Shop drawings shall show the position, extent, type and arrangement of the units, their relationship to other materials, depths, thicknesses, connections and accessories.

.4 The Consultant's review of shop drawings will not relieve the Contractor from his responsibility for ensuring that his work is complete, accurate, and in accordance with the drawings and specifications.

.5 Furnish to the Consultant a schedule showing the number of erection diagrams, shop drawings, and their rate of submission.

.6 Examine the Mechanical and Electrical drawings to establish the number, size, and location of all openings through the deck.

.7 Submit one electronic .pdf copy of each shop drawing to the Consultants for their review.

.8 Shop drawings are to be signed and sealed by a licensed professional engineer responsible for the detailed design of deck.

.9 Refer to Architectural Drawings for extent of any Acoustic metal roof deck.

1.5 COORDINATION

.1 Coordinate the work of this Section with the Construction Manager's scheduling in accordance with the General Conditions.

.2 Coordinate the work of this Section with the work of Section 05 12 25, "Structural Steel", to ensure a continuous erection procedure.

.3 Supply and erect steel deck at such a rate and in proper sequence so that the schedule is maintained.

1.6 DESIGN CRITERIA

.1 The drawings show the minimum thicknesses and depths of the deck sections. Deck supplier’s engineer is to design deck units with increased thickness as warranted for heavier drift or deck loadings.

.2 Design all roof decks to support the live load and dead load shown on the drawings for each area in accordance with the requirements of C.S.A. Standard S136.

.1 For all areas, excluding area under sub-Section 1.6.4 of this Section, deflection of the roof deck shall not exceed 1/360th of the span under a live load of 1.08 kPa. Do not use drift loads to calculate deflections.

.3 Design and detail units to run over three or more supports, except where the structural steel layout does not permit.

.4 Roof deck systems act as a structural diaphragm. Deck must "close" with perimeter boundary members to ensure integrity of diaphragms. Detail finishing angles at edges and flashing plates at change of deck directions as required for diaphragm.

.5 Design suitable reinforcing or framing details around openings (where these are not specifically detailed on the drawings) to suit the opening size and loading condition.

1.7 STORAGE AND HANDLING

.1 Exercise care in storing, handling and placing the steel deck units to prevent damage likely to impair the adequacy or appearance of the material in the finished structure. Special care to be taken not to damage the pre-painted surface. Handle deck with appropriate slings and protection to avoid damage to finish.
.2 Replace or correct damaged material to the approval of the Consultant.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Steel Sheets: For the fabrication of deck sections, metal closures, straps and flashings, in accordance with C.S.A. Standard S136, Grade A, zinc coated, with minimum basic design stress in bending of 230 MPa or Grade B zinc coated with a minimum basic design stress in bending of 230 MPa for 38mm deep units.

.2 Zinc Coating:

.1 For interior of building provide Class Z075 (wipe coat) coating.

.3 Metal Roof Deck: 38mm deep with flutes centred at 152mm o/c in accordance with C.S.S.B.I. Standards - minimum core thickness 0.76mm (22 gauge). RD 938 by VicWest, P-3615 by Canam Steel Works, RD36 by Agway Metals Inc., S-15 by Canadian Metal Rolling Mills or equal.

.4 Composite Metal Floor Deck: 38mm deep with flutes centred at 152mm o/c in accordance with C.S.S.B.I. Standards - minimum core thickness 0.76mm (22 gauge). HB 938 by VicWest, P-3615 Composite by Canam Steel Works, CD36 by Agway Metals Inc., S-15-K by Canadian Metal Rolling Mills or equal.

.5 Finishing angles: L38x38x3.2 (minimum) in areas where 38mm deep deck is used or L76x76x4.8 (minimum) in areas where 76mm deep deck is used.

.6 Flashing Sheets: 1.22mm (18 gauge) minimum thickness.

.7 Concrete Screed Closure Channels: 1.22mm (18 gauge) closure channels complete with 1.22mm (18 gauge) straps spaced at 750mm o.c.

2.2 FABRICATION

.1 Form all deck units to have interlocking male and female side laps. Form all composite deck units with indentations for mechanical bond with concrete to form a true composite section.

.2 Provide sheet steel cover plates as noted on the drawings and to cover gaps where deck units abut or change direction.

.3 Provide sheet steel flashings to close between deck units and columns; between deck and beams.

.4 Provide sheet steel flashings and finishing angles to close between deck units and spandrel members, and deck edge supports (as required) to maintain the integrity of the diaphragm.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Examine and obtain all necessary measurements of previously executed work which may affect the work of this section.

.2 Report any discovered discrepancies to the Consultant so that instructions can be given for any remedial action.

3.2 ERECTION

.1 Erection of steel deck shall be performed by the erection forces of the manufacturer. Subletting of the erection of these materials will not be allowed without the prior written consent of the Consultant.

.2 Place and align units in their final position on the supporting steel structure prior to making permanent connections.

.3 Provide any temporary connection of the deck to the supporting structural steel to prevent displacement of the deck due to construction operations, wind forces, etc., which may result in a hazardous condition.

.4 Provide minimum permanent connection of the new steel roof deck to the supporting steel structure with 20mm (3/4”) diameter puddle welds at the following spacings:

i) Welds at ends of each sheet- 152mm o.c. (each flute) (6”)

ii) Welds in 'field' of sheet – 152mm o.c. (each flute) (6”)

iii) Weld each side of all lap joints.

iv) Perimeter welds along trimmer angles – 300mm o.c. (12”)

vi) Clinch side laps together at 300mm o.c. (12”)

.5 Provide minimum permanent connection of the new steel floor deck to the supporting steel structure with 20mm (3/4”) diameter puddle welds at the following spacings:

i) Welds at ends of each sheet- 152mm o.c. (each flute) (6”)

ii) Welds in 'field' of sheet – 300mm o.c. (every other flute) (6”)

iii) Weld each side of all lap joints.

iv) Perimeter welds along trimmer angles – 300mm o.c. (12”)

vi) Clinch side laps together at 400mm o.c. (16”)

.6 Handle deck with appropriate slings and protection to avoid damage to finish.

.7 Cut and reinforce, where necessary, all holes through the roof deck where secondary structural framing is not specifically shown around the openings as designed under sub-Section 1.6.5 of this Section. Exact location of openings will be established on site by the trades concerned.

.8 Install all flashing plates, closures, and finishing channels.

.9 Clean the new deck of all debris, welding rods, oil and grease or other materials likely to have a harmful effect on the bond or application of the roofing system or concrete in the case of composite deck units.

.10 Refer to typical details for detail at closure angle installation at locations where high deck flute does not ‘close’ with perimeter angle.

3.3 FIELD PAINTING

.1 Field paint with a compatible zinc rich paint, all scratches blemishes, welds or other defects.

.2 Remove all weld slag, grease, and oil from deck, deck welds, screeds, and all other deck accessories before applying zinc rich paint.

3.4 CLEAN-UP

.1 At the completion of the work of this Section, remove any excess materials, debris and equipment from the site.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The work to be done under this section shall consist of the supply of all materials, labour, supervision, plant and equipment to construct all miscellaneous metal shown on the drawings and specified herein.

.2 Carefully examine all drawings and the site to determine the extent of the work.

.3 Ensure that all drawings and specification sections, including those for structural, mechanical and electrical work, are consulted to establish the limits of work included in this section.

.4 Provide all labour, materials, and equipment required or called for in this specification, or which is necessary, to complete the work without any extra cost. This work may require any or all, but not be limited to, any of the following

.1 All bollards at exterior equipment.
.2 Roof access ladder and roof mounted ladders and associated pieces.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

.3 Section 05 12 23 - Structural Steel.

.4 Section 06 20 00 – Finish Carpentry

.5 Section 09 91 13 - Painting.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
.2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service.
.3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-G164-[M92(R1998)], Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.

.4 CSA W48-[01], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.5 CSA W59-[1989(R2001)], Welded Steel Construction (Metal Arc Welding) (Imperial Version).

.4 The Environmental Choice Program

.1 CCD-047a-98, Paints, Surface Coatings.

.2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.4 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 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:

.1 For finishes, coatings, primers and paints.

.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures and stamped by a professional engineer licenced to practice in the province of Ontario.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.5 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

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

.2 Storage and Protection:

.1 Cover exposed stainless-steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.

.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.7 WASTE MANAGEMENT and DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A53/A53M standard weight, black finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A307.

.6 Aluminum sheet: proprietary utility sheet 12 mm (0.5") minimum thickness, colour from full range.

.7 Stainless steel tubing: to ASTM A269, Type 302 Commercial grade with AISI No. 4 finish.

.8 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 Use self-tapping shake-proof round headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600g/m^2 to CAN/CSA-G164M.

.2 Shop coat primer: to CAN/CGSB-1.40.

.3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 ISOLATION COATING

.1 Isolate aluminum from following components, by means of bituminous paint:

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
.2 Concrete, mortar and masonry.

.3 Wood.

2.5 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 7º C (45º F).

.3 Clean surfaces to be field welded; do not paint.

.4 All exterior exposed metal to be galvanized.

2.6 ANGLE LINTELS

.1 Refer to structural steel division.

2.7 STAIR GUARDS AND HANDRAILS

.1 Fabricate as detailed.

2.8 ACCESS LADDERS

.1 Stringers: 75 mm x 12 mm (3.0” x 0.50”) – Exterior

.2 Steel Rungs: 19 mm (0.75”) dia, welded to stringers @ 300 mm (12”) on centre.

.3 Brackets: sizes and shapes as indicated, weld to stringers at 600 mm (24”) on centre, complete with fixing anchors to OBC SB-8.

.4 Galvanize finish for exterior

.5 Include ladder cage for exterior application.

2.9 Non-Penetrating - Roof Walkway Guardrail

.1 Refer to architectural and structural drawings for specs.

2.10 BOLLARDS

.1 Fabricate from 6mm (0.25”) thick galvanized steel pipe. Fill with concrete mounted 1200 mm (48”) for frost coverage and paint. Locations as shown on drawings. Smooth concrete cap.

Part 3 Execution

3.1 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 acceptable to 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 Provide components for building by other sections in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 STAIR GUARD AND HANDRAILS

.1 Install guard and handrails to stairs as detailed.

.2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.3 ACCESS LADDERS

.1 Install access ladders in locations as indicated as per manufactures instructions.

.2 Erect ladders clear of wall on bracket supports as detailed.

3.4 BOLLARDS

.1 Install bollards in locations indicated.

3.5 Non-Penetrating - Roof Walkway Guardrail

.1 Install as per manufacture specs.

3.6 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 74 19 – Construction/ Demolition Waste management and disposal

.2 06 20 00 – Finish Carpentry

.3 06 40 00 – Architectural Woodwork

.4 Division 10 - Specialties

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
.2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA O121-M1978(R1998), Douglas Fir Plywood.
.4 CAN/CSA-O141-91(R1999), Softwood Lumber.
.5 CSA O151-M1978(R1998), Canadian Softwood Plywood.
.6 CAN/CSA-O325.0-92(R1998), Construction Sheathing.

.2 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2000.

1.3 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 grade mark in accordance with applicable CSA standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 LUMBER MATERIAL

.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.

.2 Furring, blocking, nailing strips, grounds, bucks, cants, curbs, backing and sleepers:

.1 S2S is acceptable for all
.2 Board sizes: "Standard" or better grade.
.3 Dimension sizes: "Standard" light framing or better grade.
.4 Post and timbers sizes: "Standard" or better grade.

2.2 PANEL MATERIALS

.1 Douglas fir plywood (DFP): to CSA O121, standard construction.

.2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

.4 Fire Retardant Plywood Dricon® Product.

2.3 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Bolts: 12.5 mm (0.5”) diameter unless indicated otherwise, complete with nuts and washers.

.3 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.

2.4 FINISHES

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work interior highly humid areas, pressure- preservative, fire-retardant treated lumber.

.2 Stainless steel: use stainless steel alloy for all others.

2.5 WOOD PRESERVATIVE

.1 Surface-applied wood preservative: clear or copper naphthenate 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.

Part 3 Execution

3.1 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 one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat material as indicated:

.1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.

.2 Wood furring for blocking on outside surface of exterior masonry and concrete walls.

.3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

3.2 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, backing in steel stud framing for surface mounted accessories, facings, fascia, soffit, siding and other work as required.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

.4 Install bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

.6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

.7 Install sleepers as indicated.

.8 Use caution when working with particle board. Use dust collectors and high-quality respirator masks.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.4 SCHEDULES

.1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm (0.75”) thick plywood on 19 x 38 mm (0.75” x 1.5”) furring around spacing, perimeter and at maximum 300 mm (12”) intermediate using DriCon® Fire Retardant plywood.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES (but not limited to)

.1 Standing and running trim.

.2 Section 06 40 00 - Architectural woodwork

.3 Installation of finished hardware supplied in Section 08 71 00.

1.2 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry

.2 Section 06 40 00 - Architectural Woodwork

.3 Section 01 74 19 – Construction/Demolition Waste Management and Disposal

.4 Section 08 71 00 – Finish Hardware

.5 Section 09 91 13 – Painting

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-99, Particleboard.
.2 ANSI A208.2-94, Medium Density Fibreboard (MDF).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM E1333-96, Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

.1 AWMAC Quality Standards for Architectural Woodwork 2003.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.5 Canadian Standards Association (CSA)

.1 CAN/CSA-A247-M86(R1996), Insulating Fibreboard.
.2 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
.3 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
.4 CSA O115-M82(R2001), Hardwood and Decorative Plywood.
.5 CSA O121-M78(R1998), Douglas Fir Plywood.
.6 CAN/CSA O141-91(R1999, Softwood Lumber.
.7 CSA O151-M78 (R1998), Canadian Softwood Plywood.
.8 CSA O153-M80 (R1998), Poplar Plywood.
.9 CSA Z760-94, Life Cycle Assessment.

.6 International Organization for Standardization (ISO)

.1 ISO 14040-97, Environmental Management-Life Cycle Assessment - Principles and Framework.

.2 ISO 14041-98, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.

.7 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress January 1996.

.8 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2000.

.9 Underwriters Laboratories of Canada (ULC)

.1 CAN4-S104-80(R1985), Fire Tests of Door Assemblies.

.2 CAN4-S105-85(R1992), Fire Door Frames, meeting the Performance Required by CAN4-S104.

1.4 SHOP DRAWINGS

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

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.3 Indicate materials, thicknesses, finishes and hardware.

1.5 SAMPLES

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

.2 Submit duplicate samples: sample size 300 x 300 mm or 300 mm long unless specified otherwise of specified materials.

1.6 REGULATORY REQUIREMENTS

.1 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and CAN4-S105 for ratings specified or indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

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

.2 Protect materials against dampness during and after delivery.

.3 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 AWMAC custom grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable.

.3 Hardwood lumber: moisture content 19 % or less in accordance with following standards:

.1 National Hardwood Lumber Association (NHLA).

.2 AWMAC custom grade, moisture content as specified.

.4 Manufacturing process must adhere to Lifecycle Assessment (LCA) Standards as per CSA Z760 LCA Standards.

2.2 SHEET MATERIAL

.1 Douglas fir plywood (DFP): to CSA O121, standard construction.

.2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.3 Hardwood plywood: to CSA O115.

.4 Poplar plywood (PP): to CSA O153, standard construction.

.5 Particleboard: to ANSI A208.1.

.6 Hardboard: to CAN/CGSB-11.3.

.7 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m^3.

.1 Medium density fibreboard must:

.1 be manufactured such that formaldehyde emissions do not exceed 0.30 ppm (0.260 m^2/m^3) when tested in accordance with ASTM E1333.

.8 Low density fibreboard: to CSA-A247M.

.1 Ensure fibreboard is not manufactured with binders, coatings or adhesives which contain resins or other compounds that have potential to release formaldehyde during final product's use.

.9 Manufacturing process must adhere to Lifecycle Assessment Standards as CSA Z760 LCA Standards.

2.3 ACCESSORIES

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; stainless steel finish elsewhere.

.2 Wood screws: stainless steel, type and size to suit application.

.3 Splines: metal.

.4 Adhesive: recommended by manufacturer.

.5 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

2.4 INTERIOR TRIM

.1 Standing and running trim to be AWMAC custom grade construction.

.2 Trim to be size and species as detailed.

.3 Set nails and screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.

Part 3 Execution

3.1 INSTALLATION

.1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.2 CONSTRUCTION

.1 Fastening.

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim.

.1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.

.2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.

.3 Make joints in baseboard, where necessary using a 45^{o} scarf type joint.

.4 Install door and window trim in single lengths without splicing.

.3 Shelving.

.1 Install shelving as detailed.

.4 Hardware.

.1 Install as per schedule.

.5 Products supplied under Division 10.

.1 Install as per schedule.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 45 00 - Quality Control.

.5 Section 07 92 10 - Joint Sealing.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-[99], Particleboard.

.2 ANSI A208.2-[94], Medium Density Fiberboard (MDF).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM E1333-[96], Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.

.2 ASTM D5116-[97], Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

.1 AWMAC Quality Standards for Architectural Woodwork.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-71.20-[M88], Adhesive, Contact, Brushable.

.5 Canadian Standards Association (CSA)

.1 CSA B111-[74(R1998)], Wire Nails, Spikes and Staples.

.2 CSA O112.4-[M1977(R1999)], Standards for Wood Adhesives.

.3 CSA O115-[M1982(R2001)], Hardwood and Decorative Plywood.

.4 CSA O121-[M89(R1998)], Douglas Fir Plywood.

.5 CAN/CSA O141-[91R1999], Softwood Lumber.

.6 CSA O151-[M1978(R1998)], Softwood Plywood.

.7 CSA O153-[M1980(R1998)], Poplar Plywood.

.8 CSA Z760-[94], Life Cycle Assessment.

.6 International Organization for Standardization (ISO)

.1 ISO 14040-[97], Environmental Management-Life Cycle Assessment - Principles and Framework.

.2 ISO 14041-[98], Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.

.7 National Electrical Manufacturers Association (NEMA)

.1 NEMA LD-3-[95].

.8 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress [, January 1996.

.9 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber, 2000.

1.3 SHOP DRAWINGS

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

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.1 Scales: profiles full size, details 1/2 full size.

.3 Indicate materials, thicknesses, finishes and hardware.

.4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

1.4 SAMPLES

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

.2 Submit duplicate samples: sample size 300 x 300 mm

.3 Submit duplicate colour samples of laminated plastic for colour selection.

.4 Submit duplicate samples of laminated plastic joints, edging, cut-outs and postformed profiles.

1.5 MOCK-UPS

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

.2 Shop to prepare one base cabinet unit, wall cabinet, counter top, shelving unit, convector cabinet, complete with hardware and shop applied finishes, and install on project in designated location.

.3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with this work.

.4 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of finished work.

1.6 DELIVERY, STORAGE, AND HANDLING

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

.2 Protect millwork against dampness and damage during and after delivery.

.3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Separate wood waste in accordance with the Waste Management Plan and place in designated areas in the following categories for recycling: Solid wood/softwood/hardwood, composite wood, treated, painted, or contaminated wood.

.3 Set aside damaged wood for acceptable alternative uses (e.g., bracing, blocking, cripples, bridging, finger-joining, or ties). Store this separated reusable wood waste convenient to cutting station and area of work.

.4 Separate corrugated cardboard and place in designated areas for recycling.

.5 Do not burn scrap at the project site.

.6 Fold up metal banding, flatten, and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 AWMAC premium grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 The manufacturing process must adhere to Lifecycle Assessment (LCA) Standards as per CSA Z760 94 Life Cycle Assessment.

.4 Hardwood lumber: moisture content 19% or less in accordance with following standards:

.1 National Hardwood Lumber Association (NHLA).

.2 AWMAC premium grade, moisture content as specified.

.5 Douglas fir plywood (DFP): to CSA O121, standard construction.

.6 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.7 Hardwood plywood: to CSA O115.

.8 Poplar plywood (PP): to CSA O153, standard construction.

.9 Interior mat-formed wood particleboard: to ANSI A208.1.

.10 Birch plywood: to AWMAC Select White.

.11 Fibreboard must contain less than 10 % roundwood by weight, using a weighted average over a three-month period at each manufacturing location. (Roundwood refers to logs, with bark, delivered to a pulp mill, cut in lengths up to 3 m.)

.12 Hardboard

.1 to CAN/CGSB-11.3.

.2 manufactured such that formaldehyde emissions do not exceed 0.15 ppm [180 microg/m^3 when tested in accordance with ASTM E1333.

.3 if manufactured using a wet process:

.1 be made by a process that does not release matter in the undiluted product plant effluent generating a BOD5 in excess of [50] mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment;

.2 be made by a process that does not release TSS in excess of [60] mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment;

.4 contain at least 50 % recycled materials.

.13 Laminated plastic for flatwork: to NEMA LD3, Grade VGL.

.14 Laminated plastic for post forming work: to NEMA LD3, Grade VGL,

.15 Laminated plastic backing sheet: Grade BK, not less than 0.5 mm thick or same thickness and colour as face laminate.

.16 Laminated plastic liner sheet: Grade GP

.17 Thermofused Melamine: to NEMA LD3 Grade

.1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).

.18 Nails and staples: to CSA B111.

.19 Wood screws: type and size to suit application.

.20 Splines: metal.

.21 Sealant: Tremco Acrylic Latex- Translucent

.22 Cabinet and drawer pulls: Contemporary Metal Handle Pull 332, Richelieu Product #33285195, 128mm c/c, brushed nickel, “D” handle

.23 Door Hinges at Cabinets: All hinges at doors to be Blum 'Modul' series throughout min. 107° opening at all standard cabinets.

.24 Drawer Glides: All drawer glides to be side-mounted fill extension ball bearing glides, with a capacity of 75 lbs per pair. Acceptable products include Accuride 2632 series as supplied by Richelieu.

.25 Garment Hooks: Garment hooks to be double hooks similar to #0745-Z by Watrous.

.26 Door/ Drawer Locks: All millwork locks for drawers & cabinets to be chrome plated, as supplied by Hardware Schedule.

.27 Pilaster Strips: Pilaster strips at adjustable shelves to be clear aluminum finish throughout complete with aluminum support dips, 4 per shelf. Provide extra stock of clips to the quantity of 1 clip per every 2 shelves. All pilaster strips to be installed flush (recessed) with adjacent surfaces throughout.

2.4 EDGE BANDING/ RUNNING TRIM & RAILS

.1 PVC nosing's heavy duty (3 mm)

2.5 FABRICATION

.1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.

.2 Shop to install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinetwork to be adjustable unless otherwise noted.

.4 Provide cut-outs for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Shop to assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.8 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.9 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.10 Apply laminated plastic liner sheet where indicated.

2.6 FINISHING

.1 Per Section 099000 Painting.

Part 3 Execution

3.1 INSTALLATION

.1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.

.4 Use draw bolts in countertop joints.

.5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.

.7 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.2 CLEANING

.1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.

.2 Remove excess glue from surfaces.

3.3 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Below grade waterproofing and dampproofing

.2 Plaza deck and planter drainage sheets.

1.2 RELATED SECTIONS

.1 Section 31 223 16 - Excavation.

.2 Section 31 23 23 - Fill: Backfilling.

.3 Section 33 46 00 – Sub drainage: Foundation perimeter drainage

1.3 REFERENCES

.1 AATC 127 - Water Resistance: Hydrostatic Pressure Test; 1998.

.2 ASTM C 1311 - Standard Specification for Solvent Release Sealants; 2002.

.3 ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2004a.

.4 ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2004a.

.5 ASTM D 3776 - Standard Test Methods for Mass Per Unit Area (Weight) of Fabric; 1996 (Reapproved 2002).

.6 ASTM D 3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method; 2006.

.7 ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2005.

.8 ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).

.9 ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.

.10 ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 2003).

.11 ASTM D 4716 - Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head; 2004.

.12 ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

.13 ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products; 2000.

.14 ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

.15 CCMC Technical Guide for Foundation Wall Drainage Systems – Dimpled Membranes. Master Format Section 02622.1; (Oct. 11, 2006).

.16 CGSB 19-GP-14M - Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing; 1984

1.4 SUBMITTALS

.1 See Section 01300 - Administrative Requirements, for submittal procedures.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:

.1 Preparation instructions and recommendations.

.2 Storage and handling requirements and recommendations.

.3 Installation methods.

.4 Specimen warranty.

.3 Samples: 12” by 12” (300 by 300 mm) piece of sheet; minimum 12 inch (300 mm) long piece of strip; each type of fastener.

.4 Test Reports: Evaluation service reports or other independent testing agency reports showing compliance with specified requirements.

.5 Installer Qualifications: Include minimum of 5 project references.

.6 Executed warranty

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Company specializing in performing work of this type and approved by the membrane manufacturer.

.2 Manufacturer's Field Services: Provide the services of a representative accredited by the sheet manufacturer to examine substrates before starting installation, periodically review installation procedures, and review final installed systems.

1.6 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver products to project site in original packaging with labels intact.

.2 Store products in manner acceptable to membrane manufacturer.

.3 When products must be stored for extended periods, keep out of direct sunlight and at temperatures above minus 22 degrees F (minus 30 degrees C).

.4 Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 WARRANTY

.1 Manufacturer's Limited Product Warranty

Part 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

.1 Drainage Sheet Product:
.1 Delta X Drain as manufactured by Cosella-Dörken Products Inc
.2 Mira Drain 6000 as manufactured by Carlisle Coatings and Waterproofing
.3 Mel-Drain as manufactured by W.R. Meadows

.2 Waterproofing Products:
.1 Blueskin WP 200, Blueskin® WP 200 is a self-adhering composite membrane consisting of an SBS rubberized asphalt compound, integrally laminated to a blue, high-density polyethylene film. The membrane is specifically designed for self-adhering to a prepared substrate, and provides a high-performance waterproofing barrier.
.1 Acceptable Alternate: MEL-ROL, Self-Adhering Waterproofing Membrane as manufactured by W.R. Meadows

.2 Barricoat-S as manufactured by Carlisle Coatings and Waterproofing, spray applied rubberized asphalt membrane.

2.2 APPLICATIONS

.1 Foundation Wall Drainage Sheet: Install drainage sheet over waterproofing, from bottom of wall to grade level, and in locations indicated on the drawings.

.2 Basement Floor: Install horizontal application drainage sheet between mud slab, gravel substrate, or compacted soil and finish slab.

.3 Planters: Install drainage sheet inside planters, over waterproofing.

.4 Lagging Walls: Install drainage sheet on entire surface of walls prior to installation of rebar and pouring of foundation walls.

.5 Footings: Install water stops in accordance with Section 03 15 13.

.6 Accessories as recommended by product manufacturer's installation instructions.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that substrates are sound enough to retain fasteners and suitable for bonding of sealant.

.2 Verify that there are no active leaks within area to be covered.

.3 Verify that perimeter foundation, or underslab drainage system has been properly installed.

.4 Verify that finish grade elevations are clearly marked.

.5 Do not begin installation until substrates have been properly prepared.

.6 If substrate preparation is the responsibility of another trade, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

.1 Clean surfaces "broom clean" prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

.1 Remove projections larger than 1/4 inch (6 mm); remove sharp edges.
.2 In concrete and masonry, patch cracks and holes so that they provide suitable substrate as recommended by membrane manufacturer.

.3 Mark installation locations on walls prior to starting installation.

3.3 INSTALLATION

.1 Install in accordance with manufacturer's recommended procedure.

.2 Do not install when:

.1 Ambient temperature is below minus 22 degrees F (minus 30 degrees C).
.2 Concrete has been cured for less than 3 days.
.3 Standing water is present.

.3 General Sheet Installation: Start at lowest point and work to top, running length of sheets horizontally and overlapping upper sheets in shingle fashion at least 6 inches (150 mm); lap vertical joints at least 6 inches (150 mm).

.1 Install sheets without gaps, wrinkles, creases, or tears.
.2 Align and interlock overlapping layers.
.3 Secure to substrate at edges and in the field of the sheet using fasteners and methods recommended by sheet manufacturer; stagger fasteners in alternate rows.
.4 Flash and seal top edges, around openings and penetrations, and other locations recommended by manufacturer, in manner recommended by manufacturer.

.4 Drainage Sheets: In addition to general sheet installation specified above:

.1 Install with cup side on side facing surface waterproofed.
.2 Unless otherwise indicated, fasten dimpled sheets using specified fasteners with dimpled washers interlocked with sheet at not more than 12 inches (305 mm) on center.
.3 At top, install with flat edge secured with DELTA®-MOLD STRIP. Fasten at not more than 8 inches (200 mm) on center.
.4 At all joints, apply continuous bead of sealant between layers and fasten through both layers with specified fasteners with dimpled washers.
.5 At vertical joints, overlap sheets at least 6 inches (150 mm) and interlock dimples, making full contact with sealant.
.6 At horizontal joints overlap upper sheet over flat flange of lower sheet and fasten through both sheets at lower edge of upper sheet at 36 inches (910 mm) on center.
.7 At inside and outside corners, install sheet as close to substrate as possible without breaking and fasten along both sides of the entire length of corner, not closer than 5 inches (125 mm) to corner.
.8 At bottom of walls, extend a single sheet from wall over footing to drainage pipe.

.5 Drainage Sheet: in addition to general sheet installation:

.1 Install with protruding dimples and filter fabric on side facing away from the substrate, unless otherwise indicated.
.2 On lagging, pile, or earth forms, and other “blind” wall construction, install drainage sheet with filter fabric in contact with form; seal joints in dimpled sheet continuously with tape; anchorage to forms may be by adhesive if necessary.
.3 On low-slope split slab installations, install with filter fabric side up; seal dimpled sheets overlaps; anchor sheets sufficiently to prevent movement prior to and during installation of cover.
.4 At plaza deck, pavers are not to be installed directly on the drainage sheet. A buffer layer between the drainage membrane and the pavers must be installed. Install with filter fabric side up with butt joints rather than overlap joints.
.5 Use DELTA®-MOLD STRIP to enclose edges of drainage sheets; in fine silty clay soils, wrap exposed edges with filter fabric before installing DELTA®-MOLD STRIP.
.6 Cover sheet laps with filter fabric and do not leave dimpled sheet exposed.
.7 At bottom of walls, extend a single sheet from wall over footing to drainage pipe, if any.

.6 Repairs to Dimpled Sheet: Apply patch made of same material interlocked, with continuous sealant bead around tear or penetration.

.7 Repairs to Filter Fabric: Tape matching material over damaged area.

.8 In blindside application, after installation of reinforcing bars, inspect drainage sheet and repair damaged sheet and fabric.

3.4 FIELD QUALITY CONTROL

.1 Provide the services of a manufacturer's representative to inspect substrates for suitability for installation, to review procedures during construction, and to review the finished work.

.2 PROTECTION

.3 Do not leave installed membrane exposed to sunlight for more than 30 days after installation; to cover, complete backfill operation or cover with protection board.

.4 Prior to backfilling, inspect DELTA®-DRAIN for tears and other damage and repair.

.5 Take care when backfilling to avoid damage to membrane; replace membrane damaged during backfilling.

.6 Protect installed products until completion of project.

.7 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The work shall consist of the following but not limited to supply and installation of rigid perimeter insulation for under slab and foundation walls as shown on the drawings.

.2 The work shall consist of the following but not limited to supply and installation of rigid board insulation for cavity wall parapets and any other incidental conditions as shown on the drawings.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal

.3 Section 03 30 00 – Cast –In Place Concrete

.4 Section 04 22 00 – Concrete Masonry

.5 Section 07 26 00 - Vapor Retarders.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM E96-00e1, Test Methods for Water Vapour Transmission of Materials.
.2 ASTM C208-95(R2001), Specification for Cellulosic Fiber Insulating Board.
.3 ASTM C591-01, Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
.4 ASTM C612-00a, Specification for Mineral Fibre Block and Board Thermal Insulation.
.5 ASTM C726-00a, Specification for Mineral Fiber Roof Insulation Board.
.6 ASTM C728-97e1, Specification for Perlite Thermal Insulation Board.
.7 ASTM C1126-00, Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
.8 ASTM C1289-02, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.2 Canadian Gas Association (CGA).

.1 CAN/CGA-B149.1HB-00, Natural Gas and Propane Installation Code Handbook.
.2 CAN/CGA-B149.2-00, Propane Storage and Handling Code.

.3 Canadian General Standards Board (CGSB).

.1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.4 Underwriters Laboratories of Canada (ULC).

.1 CAN/ULC-S604-91, Type A Chimneys.

.2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

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

.4 CAN/ULC-S704-01, Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

.5 Environmental Choice Program (EPC).

.1 CCD-016-97, Thermal Insulation.

1.4 WASTE MANAGEMENT and DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 INSULATION

.1 Extruded polystyrene (XPS): to CAN/ULC-S701 for below grade.

.1 Type: Type 4 rigid, closed cell type, with integral high-density skin.
.2 Compressive Strength: to ASTM D1621, minimum 210kPa
.3 Water Absorption: to ASTM D2842, 0.7% by volume maximum.
.4 Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518
.5 Water vapour Permeance: to ASTM E96, 50 ng/Pas m²
.6 Size: 600 x 1220
.7 Thickness: 50mm
.8 Edges: square.
.9 Acceptable material: STYROFOAM™ Brand SM Extruded Polystyrene Foam Insulation by Dow Chemical Canada ULC or approved alternate.

.2 Extruded polystyrene foam insulation to CAN/ULC-S701 for other applications.

.1 Type: Type 3, rigid, closed cell type, with integral high-density skins.
.2 Compressive Strength: minimum 170 kPa.
.3 Water Absorption: to ASTM D2842, 0.7% by volume maximum
.4 Thermal Resistance: Long term aged RSI value of 0.87/25mm.
.5 Water Vapour Permeance: to ASTM E96, 90 ng/Pas m2
.5 Board Size: 600 X 2440 mm
.6 Thickness: 50mm.
.7 Edges: square
.7 Manufacturer and Product Name: STYROFOAM™ Brand CAVITYMATE™ Extruded Polystyrene Foam Insulation by Dow Chemical Canada ULC or approved alternate.

.3 Mineral Fibre non-structural sheathing board to CAN/ULC S702

.1 Flame Spread Rating = 0, Smoke Development Index = 0 as per CAN ULC S102
.2 Density: 8 lbs/ft^3
.3 Thermal Resistance: R4/inch

.4 Compressive Strength: 439psf @ 10% compression, 1065psf @ 25% compression

.5 Type: ComfortBoard 80 as manufactured by Roxul Canada Inc.

2.2 ADHESIVE

.1 Adhesive: to CGSB 71-GP-24M Type 1.

2.3 CLIPS AND FASTENERS

.1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

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 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 EXAMINATION

.1 Examine substrates and immediately inform Consultant in writing of defects.

.2 Prior to commencement of work ensure:

.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 RIGID INSULATION INSTALLATION

.1 Apply Type 1 adhesive to polystyrene insulation board in accordance with manufacturer's recommendations.

.2 Imbed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.

.3 In addition to adhesive, install mineral fibre insulation boards with insulation clips and disk, [2] per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.

.4 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm polyethylene strip over expansion and control joints using compatible adhesive before application of insulation.

3.4 PERIMETER FOUNDATION INSULATION

.1 Interior application: extend boards 600mm vertically below bottom of finish floor slab as indicated, installed on inside face of perimeter foundation walls.

.2 Under slab application: extend boards 600mm in from perimeter foundation wall as indicated. Lay boards on level compacted fill.

3.5 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.3 Section 07 26 00 - Vapour Retarders.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM C553-[02], Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.2 ASTM C665-[01e1], Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.3 ASTM C1320-[99], Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 Canadian Gas Association (CGA).

.1 CAN/CGA-B149.1HB-[00], Natural Gas and Propane Installation Code Handbook.

.3 Canadian Standards Association (CSA International).

.1 CSA B111-[1974(R1998)], Wire Nails, Spikes and Staples.

.4 Environmental Choice Program (EPC).

.1 CCD-016-[97], Thermal Insulation.

.5 Underwriters Laboratories of Canada (ULC).

.1 CAN/ULC-S604-1991, Type A Chimneys.

.2 CAN/ULC-S702-1997, Standard for Mineral Fibre Thermal Insulation for Buildings.
The standard describes five types of mineral-fibre insulation. These CCMC Evaluation Listings refer only to preformed insulation, Types 1, 2 and 3. They are defined as follows:

.1 Type 1, which has no membrane;
.2 Type 2, which has a permeable membrane; and
.3 Type 3, which has a vapour barrier.

The Standard does not apply to insulation less than 25 mm thick, or to preformed insulation used above a roof deck.

.6 National Building Code of Canada (NBC)

.1 The CAN/ULC-S702-97 standard is referenced in:
(a) NBC 1995 (April 2002 Revisions and Errata), Clause 5.3.1.2.(2)(j), Table 9.23.16.2.A. and Clause 9.25.2.2.(1)(g).

(b) NBC 2005, Division B, Table 5.10.1.1., Table 9.23.16.2.A. and Clause 9.25.2.2.(1)(d).

1.3 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 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 INSULATION

.1 Blanket Mineral Fibre Blankets: to thicknesses 90mm and 150mm.

.2 Noise Stop Blankets: to thickness 90mm and 150mm.

.3 Fire Stop Blankets

.4 Acceptable Manufacturers: Fiberglass Canada or Roxul.

2.2 ACCESSORIES

.1 Staples: 12 mm minimum leg.

.2 Tape: as recommended by manufacturer.

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 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 Install insulation with factory applied vapour barrier facing warm side of building spaces and vapour permeable membrane facing cold side. Lap ends and side flanges of membrane over framing members. Retain in position with staples installed as recommended by manufacturer. Tape seal butt ends and lapped side flanges. Do not tear or cut vapour barrier.

.5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.

.6 Do not enclose insulation until it has been inspected and approved by Consultant.

.7 Ensure all edges are closely abutted together.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 SUMMARY OF WORK

.1 This Section specifies spray-applied polyurethane-based foamed-in-place insulation and for use as an air barrier.

1.2 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants.

1.3 REFERENCES STANDARDS

.1 ASTM International (ASTM).

.1 ASTM C411-[2011], Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.2 ASTM C518-[2015], Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.3 ASTM D1621-[2016], Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

.4 ASTM D1622/D1622M-[2014], Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.5 ASTM D1623-[2009], Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

.6 ASTM D2126-[2015], Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

.7 ASTM D2842-[2012], Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.8 ASTM E96/E96M-[2016], Standard Test Methods for Water Vapor Transmission of Materials.

.9 ASTM E2178-[2013], Standard Test Method for Air Permeance of Building Materials.

.2 International Organization for Standardization (ISO).

.1 ISO/IEC 17024-[2012], Conformity Assessment. General Requirements for Bodies Operating Certification of Persons.

.3 National Research Council of Canada (NRC).

.1 Canadian Construction Materials Centre (CCMC) Reports.

.4 Underwriters' Laboratories of Canada (ULC).

.1 CAN/ULC S102 - [2010], Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S127 - [2014], Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Foam Plastic Building Materials.

.3 CAN/ULC-S705.1-[2015], Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification.

.4 CAN/ULC-S705.2-[2005], Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.

.5 CAN/ULC S770 - [2015], Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

.6 CAN/ULC S774 - [2014], Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Co-ordination: Co-ordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

.2 Pre-Application Meeting: Convene pre- application meeting after Award of Contract and one week prior to commencing work of this Section to verify project requirements, substrate conditions and co-ordination with other building sub-trades, and to review manufacturer's written application recommendations.

.1 Comply with Section 01 31 19 - Project Meetings and co-ordinate with other similar pre-application meetings.

.2 Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:

.1 Owner;

.2 Consultant;

.3 Spray foam insulation applicator;

.4 Manufacturer's technical representative.

.3 Ensure meeting agenda includes review of methods and procedures related to foamed-in-place polyurethane insulation application including co-ordination with related work.

.4 Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit product data including manufacturer's literature for foamed-in-place polyurethane insulation components and accessories, indicating compliance with specified requirements and material characteristics.

.1 Submit list on spray foam insulation manufacturer's letterhead of materials, components and accessories to be incorporated into Work.

.2 Include product VOCs.

.3 Include details of insulation joints with sealants.

.4 Include product names, types and series numbers.

.5 Include contact information for manufacturer and their representative for this Project.

.3 Test Reports: Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification, in accordance with Section 01 45 00 - Quality Control.

.1 Submit test reports to CAN/ULC S102 for surface burning characteristics.

.4 Field Reports: Submit third party inspection agency's field reports within 10 days of agency representative's site visit and inspection.

.5 Applicator Qualifications: Submit letter on spray foam insulation manufacturer's letterhead verifying applicator's certification for work similar to work of this Section.

1.6 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: Supply maintenance data for foamed-in-place polyurethane insulation for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Record Documentation: In accordance with Section 01 78 00 - Closeout Submittals.

.1 List materials used in foamed-in-place polyurethane insulation work.

.2 Warranty: Submit warranty documents specified.

1.7 QUALITY ASSURANCE

.1 Applicator Qualifications: Verify that applicator of foamed-in-place polyurethane insulation is licensed by ISO/IEC 17024 certification organization recognized by CCMC.

.2 Quality Assurance Program: Use only third-party quality assurance providers certified to ISO/IEC 17024 and recognized by CCMC.

.3 Mock-up: Construct full size 3 x 3 m mock-up of foamed-in-place polyurethane insulation using proposed procedures, materials and quality of work where directed by Consultant and in accordance with Section 01 43 00 - Quality Assurance

.1 Include door and frame, insulation, building wall conditions, junction with roof system and how materials interface with sealants.

.2 Purpose: To judge quality of work and material application.

.3 Allow Consultant 48 hours minimum prior to inspection of mock-up.

.4 Do not proceed with work prior to receipt of written acceptance of mock-up by Consultant.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for work of this Section.

.6 Approved mock-up may not remain part of finished work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Deliver material in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver foamed-in-place polyurethane insulation materials and components in manufacturer’s original packaging with identification labels intact and in sizes to suit project.

.2 Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions.

.1 Store materials at temperatures between 23 and 30 ºC.

.3 Packaging Waste Management:

.1 Separate and recycle waste packaging materials in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

.2 Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Apply foamed-in-place polyurethane insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

.1 Substrate temperature for Standard Grade: 10 to 50 ºC.

.2 Substrate temperature for Winter Grade: minus10 to 25 ºC.

1.10 WARRANTY

.1 All work shall be covered by the third-party warranty program as set forth by the manufacturers Quality Assurance Program.

Part 2 Products

2.1 MANUFACTURER

.1 Elastochem Specialty Chemicals Inc. or Other Approved Suppliers

.2 Contact Information:

.1 Address: 37 Easton Road, Brantford, Ontario, N3P 1J4.

.2 Phone: (519) 754-1678; (877) 787-2436.

.3 E-mail: info@elstochem-ca.com.

.4 Web site: www.elastochem-ca.com.

2.2 DESCRIPTION

.1 2-Component spray-applied medium density closed-cell polyurethane foam insulation and air barrier.

2.3 DESIGN CRITERIA

.1 Thermal Resistance:

.1 Long Term to CAN/ULC S770: ≥ 1.82 RSI at 50 mm thickness.

.2 Density to ASTM D1622: ≥ 29.6 kg/m^3.

.3 Vapour Permeability to ASTM E96: ≤ 56.3 ng/Pa.s.m^2 at 25 mm thickness.

.4 Water Absorption to D2842: ≤ 0.64 % volume.

.5 Air Permeability to ASTM E2178: ≤ 0.02 L/s m^2 at 75 Pa.

.6 Surface Burning Characteristics to CAN/ULC S102 & CAN/ULC S127.

.1 Flame spread: ≤ 500.

.2 Smoke developed: ≤ 500.

.7 Hot Surface Performance to ASTM C411: Pass

.8 Dimensional Stability to ASTM 2126:

.1 Volume change after 28 days: -9.6 % at 70 ºC and 97 % RH.

.9 Compressive Strength to ASTM D1621: ≥180 kPa minimum.

.10 Tensile Strength to ASTM D1623: ≥ 279 kPa minimum.

.11 VOC Emissions: Pass to CAN/ULC S774.

.12 Global Warming Potential of Blowing Agent: ≤ 1.

.13 Canadian Construction Materials Centre (CCMC): Report # [13697-L] [and 14030-R].

2.4 MATERIALS

.1 Insulation: Foamed-in-place, 2- component spray-applied polyurethane to CAN/ULC S705.1.

.1 Acceptable Materials:

.1 Elastochem Specialty Chemicals Inc., Insulthane® Extreme.

.2 Soprema Inc., Sopra-SPF 202

.3 BASF., Walltite CM01

2.5 ACCESSORIES

.1 Primers: In accordance with foamed-in-place polyurethane insulation manufacturer's written recommendations for surface conditions.

.2 Joint Sealants: In accordance with Section 07 92 00 - Joint Sealants.

.1 Ensure sealants are compatible with foamed-in-place polyurethane insulation.

.2 Acceptable material: Henry Company, BES 925 in accordance with foamed-in-place polyurethane manufacturer’s written recommendations.

2.6 PRODUCT SUBSTITUTIONS

.1 Substitutions: In accordance with Section 01 23 13 - Product Substitution Procedures, in accordance with General Conditions of Contract, No substitutions permitted.

Part 3 Execution

3.1 APPLICATORS

.1 Use applicators who have been trained and certified by ISO/IEC 17024 certification organization recognized by CCMC.

3.2 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for foamed-in-place polyurethane insulation application in accordance with manufacturer’s written recommendations.

.1 Visually inspect substrate in presence of Consultant.

.1 Ensure substrates are clean of oil or excess dust.

.2 Ensure that substrate temperatures are within manufacturer’s parameters for product being applied.

.3 Ensure that there is no surface spalling.

.4 Ensure sealants completely fill gaps in substrate and at joints and are applied in accordance with Section 07 92 00 - Joint Sealants.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with application only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

.4 Starting application of foamed-in-place insulation implies substrate conditions are acceptable for Work of this Section.

3.3 PREPARATION

.1 Remove loose or foreign matter, which might impair adhesion of materials.

.2 Fill open joints and voids in concrete greater 25 mm.

.3 Ensure substrate is free of frost and surface moisture prior to application of foamed-in-place insulation.

3.4 APPLICATION

.1 Apply foamed-in-place insulation to clean surfaces in accordance with manufacturer's printed instructions and with CAN/ULC S705.2.

.2 Apply primer to substrate in accordance with manufacturer's written recommendations.

.3 Site mix liquid components in accordance with manufacturer's written recommendations.

.4 Use only high-pressure sprayers to apply foamed-in-place insulation

.1 Apply evenly in 15 mm to 50 mm thick increments.

.5 Apply foamed-in-place polyurethane insulation 75 mm thick.

.6 For Stud cavities applications:

.1 Installers are to utilize the "picture framing" installation technique whereby a thin (5mm to 25mm) flash coating is first applied to the outer perimeter of the stud cavity before filling in the cavity with foam.

.7 For Exterior Applications over transition and/or full field membranes:

.1 Installers are to apply an initial 1st pass of closed cell sprayed polyurethane foam no more than 32mm. Subsequent passes to be installed no more than 50.8mm in accordance with the CAN/ULC 705.2 STANDARD FOR THERMAL INSULATION- SPRAY APPLIED RIGID POLYURETHANE FOAM. MEDIUM DENSITY – INSTALLER'S RESPONSIBILITY.

3.5 FIELD QUALITY CONTROL

.1 Field Inspection: Co-ordinate field inspection in accordance with Section [01 45 00 - Quality Control].

.2 Third Party Inspection by CCMC recognized Certification body:

.1 Urethane Foam Consultants for Insulthane Extreme. www.foamexperts.ca

.2 Building Professionals for Sopra SPF 202. www.buildingprofessionals.com

.3 Caliber for Walltite CM01. www.qap.caliberqa.com

.4 Schedule [and pay for] site visits to review work at stages listed:

.1 Twice during progress of work at 25% and 60% complete.

.2 Upon completion of Work, after cleaning is carried out.

.3 Report deficiencies immediately to Consultant.

.4 Obtain reports within 10 days of review and submit immediately to Consultant.

.5 Site Application Tolerances:

.1 Thickness: ± 6 mm of thickness indicated.

.3 Manufacturer's Services:

.1 Co-ordinate manufacturer's services with Section 01 45 00 - Quality Control.

.1 Have manufacturer's technical representative review work involved in handling, application and protection of foamed-in-place insulation, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.

.2 Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product application review in accordance with manufacturer's written recommendations.

.1 Report any inconsistencies from manufacturer's recommendations immediately to Consultant.

.3 Schedule and pay for site visits to review work at stages listed:

.1 After delivery and storage of foamed-in-place polyurethane insulation, and when preparatory work on which Work of this Section depends is complete, but before application begins.

.2 Upon completion of Work, after cleaning is carried out.

3.6 CLEANING

.1 Progress Cleaning: Perform cleanup as work progresses in accordance with Section 01 74 00 - Cleaning and Waste Management.

.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 00 - Cleaning and Waste Management].

.3 Waste Management:

.1 Co-ordinate recycling of waste materials with Section 01 74 19 - Construction Waste Management and Disposal.

.2 Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.

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

3.7 PROTECTION

.1 Protect applied materials from damage during construction.

.1 Repair damage to foamed-in-place polyurethane insulation caused by ongoing construction.

.2 Repair damage to adjacent materials caused by foamed-in-place polyurethane insulation application.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-ISO 9001, 9002, 9003, Requirements for Quality Assurance, Parts 1, 2 and 3.

.2 CAN/CSA-ISO 14001-96, Environmental Management Systems - Specifications with Guidance for Use.

1.2 SUBMITTALS

.1 Submit proof of manufacturer's CCMC Listing and listing number to Consultant.

.2 Submit proof of manufacturer's ISO 9001, 9002, 9003 registration and compliance to Consultant

.3 Submit proof of manufacturer's ISO 14001 registration and compliance Consultant.

.4 Submit proof of manufacturer's participation certificate for Environmental Choice Program to Consultant.

.5 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.3 PRODUCT DATA

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

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Submit product data sheets for sheet vapour retarders. Include:

.1 Product characteristics.

.2 Performance criteria.

.3 Limitations.

1.4 MOCK-UPS

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

.2 Allow 24 hours for inspection of mock-up by Consultant before proceeding with vapour barrier work.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 6 mm thick – walls when applicable.

.2 Polyethylene film: to CAN/CGSB-51.34, Refer to OESN Drawing– under slab on grade.

ACCESSORIES (as applicable)

.3 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.4 Sealant: To Section 07 92 10 - Joint Sealing

.5 Staples: minimum 6 mm leg.

.6 Moulded box vapour barrier: Use factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 Execution

3.1 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 where a vapour barrier is not present elsewhere in the wall assembly.

.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.

3.2 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.

3.3 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.

END OF SECTION

Part 1 General

1.1 REFERENCE

.1 Architectural Drawing A0-200 – Fire Safety and OBC Matrix for required fire resistance rating.

1.2 RELATED WORK

.1 Firestopping and smoke seals which relate to Mechanical Division 23 and Electrical Division 26 Systems, are covered in conjunction with this section.

1.3 SHOP DRAWINGS & SAMPLES

.1 Submit shop drawings, product data and samples in accordance with Sections 01016 and 01340.

.2 Provide details in shop drawings indicating all reinforcing, anchorage, fastenings and proposed method of installation for the various conditions within the project.

.3 Where applicable provide manufacturer's printed product data illustrating systems to be used on this project.

Part 2 Products

2.1 MATERIALS

.1 CAN4-S115-M85: Provide firestopping and smoke sealing systems in accordance with this standard.

.1 Materials (asbestos free) and systems fully capable of maintaining an effective barrier against gases, flame and smoke in compliance with this standard, not exceeding opening sizes stated and conforming to special requirements in Part 3.5.

.2 Service Penetration Assemblies: certified by this standard and used by ULC Guide No. 40 U19. Service components listed as certified in this guide are noted under Label Service of ULC/cUL.

.2 Fire resistance rating of firestopping material assembly must meet or exceed the fire resistance rating of the floor or wall section being penetrated.

.3 Firestopping and smoke seals at openings around penetrations for pipes, duct work and other mechanical items requiring sound and vibration control require an: elastomeric seal; do not use a cementitious or rigid seal at such locations.

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

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

.6 Sealants: for vertical joints, shall be non-sagging type.

2.2 ACCEPTABLE MATERIALS & SYSTEMS

.1 Tremco Ltd. – Refer to plans for required fire resistance ratings and separations.

.2 Metal Pipe, conduit

.1 Rigid - Fyre-Sil, Fyre-Sil S.L., TREMstop Acrylic, TREMstop IA, TREMstop WBM, Fyre-Shield

.2 Vibration or Moisture - Fyre-Sil, Fyre-Sil S.L., TREMstop Acrylic, TREMstop IA

.3 Insulated Pipe - Fyre-Sil, Fyre-Sil S.L., TREMstop Acrylic, TREMstop IA, TREMstop WBM, TREMstop WS, TREMstop MCR, Fyre-Shield

.4 Plastic Pipe - TREMstop IA, TREMstop D, Fyre-Can, TREMstop WS, Fyre-Can Sleeve, TREMstop MCR, TREMstop WBM

.5 Cable Trays, Cables - Fyre-Sil, Fyre-Sil S.L., TREMstop FP, TREMstop M, TREMstop PS, TREMstop WBM, Fyre-Shield

.6 Fire Rated Joints - Fyre-Sil, Fyre-Sil S.L., TREMstop Acrylic, TREMstop Acrylic Sprayable, DYmeric, DyMonic, DYmeric 511, THC 900

.7 Exterior Perimeter Edge of Floor and Wall / Curtainwall: Roxul Safe with 3M FireDam Spray 200, 3M Fire Barrier Watertight Spray, similar to ULC FW-D-0004

.8 Electrical device boxes in rated assemblies – HILTI Firestop Putty Pad CP 617, UL 263, CAN / ULC-S115, ASTM E84, ASTM G21

.9 Note: Reference Drawing A0-200 series for required Fire Resistance Rating.

Part 3 Execution

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of material. Ensure that substrates and surfaces are properly clean and dry and meet manufacturer’s instructions in all respects.

.2 Maintain insulation around pipes and ducts penetrating fire separation (without interruption to vapour barrier).

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

3.2 INSTALLATION

.1 Install firestopping and smoke seal material and components in accordance with ULC/cUL certification and manufacturer’s instructions.

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

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

.4 Tool or trowel exposed surfaces to a neat finish, removing excess compound promptly as work progresses and upon completion.

3.3 INSPECTION

.1 Advise Consultant when service penetration assemblies are in place and ready for inspection. Do not conceal or enclose firestopping materials prior to inspection by Consultant

3.4 SCHEDULE

.1 Firestop and Smoke Seal at:

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

.2 Top of fire resistance rated masonry and gypsum board partitions.

.3 Intersection of fire resistance rated masonry and gypsum board partitions.

.4 Control and sway joints in fire resistance rated masonry and gypsum board partitions and walls.

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

.6 Around mechanical and electrical assemblies penetrating fire separations.

.7 Rigid Ducts: greater than 129 cm^2: firestopping to consist of bead of firestopping material between retaining angle and fire separation and between retaining angle and duct on each side of fire separation.

3.5 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of firestopping and smoke materials.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 – Gypsum Board Assembly

.2 Section 05 12 25 – Structural Steel

1.2 SUMMARY

.1 Includes but not limited to:

.1 Furnish and install weather resistant air barriers on exterior side of exterior wall sheathing as described on contract documents.

1.3 REFERENCES

.1 ASTM E-96-90, “Standard Test Methods for Water Transmission of Materials.”

.

.2 ASTM E-1677-95 “Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.”

.3 AATCC-127 “Hydrostatic Head Test”

.4 Air-Ins Air Leakage Test

1.4 SUBMITTALS

.1 Quality Assurance:

.1 Submit copies of test results showing performance characteristics equaling or exceeding those specified.

Part 2 Products

2.1 WEATHER RESISTANT AIR BARRIER

.1 Spunbonded olefin, Nonwoven, Non-perforated.

.2 Performance Characteristics:

.1 Air-Ins air barrier
Air leakage rate at 75PA air pressure not greater than 0.02 L/s/m^2.
.2 Water vapour transmission of greater than 1100 Ng/Pa.s.m^2.
.3 Water penetration resistance of 200 cm minimum in accordance with AATCC-127

.3 Approved Manufacturers:

.1 Tyvek Commercial Wrap by DuPont Company, Wilmington, DE.

2.2 SEALING TAPE/ FASTENERS

.1 Approved Tape Manufactures:

.1 Contractor Sheathing Tape evaluated by CCMC.

.2 Recommended Fasteners for Wood, Insulated Sheathing Board, Exterior Gypsum:

.1 Nails with large heads or plastic washer heads.

.3 Recommended Fasteners for Steel Frame Construction:

.1 Screws with washers

.4 Recommended Fastening to Masonry:

.1 Polyurethane or elastomeric adhesives.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Manufacturer's instructions over exterior sheathing. Seal joints and penetrations through weather resistant barrier with specified tape and fasteners prior to installation of finish material. Air infiltration barrier shall be airtight and free from holes, tears, and punctures. All window and door penetrations are to be taped per manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 RELATED PROVISIONS

.1 The general provisions of the contract, including the General Conditions, Supplementary Conditions and Division 1, General Requirements apply to the work specified in this section.

1.2 RELATED WORK

.1 Section 04 05 10 – Masonry Procedures

.2 Section 04 05 23 – Masonry Accessories

.3 Section 04 22 00 – Concrete Masonry

.4 Section 06 10 11 – Rough Carpentry

.5 Section 07 21 19 – Foamed in Place Insulation

.6 Section 07 92 10 – Joint Sealing

.7 Section 08 11 14 – Metal Doors and Frames

.8 Section 08 90 00 – Louvres and Vents

1.3 WORK INCLUDED

.1 This specification covers the installation of:

.1 Bluskin® SA is a self-adhering membrane consisting of an SBS rubberized compound which is integrally laminated to a blue cross laminated polyurethane film. This product is specifically designed to be self-adhered to a prepared substrate to provide an air/ vapour/ water barrier. The sheet membrane is be used as a transition membrane between wall surfaces and columns, beams, lintels, floor slabs, openings at windows and door frames, and over parapets to extend the plane of air tightness and create a waterproof barrier

2. Blueskin® TWF is a self-adhered membrane consisting of an SBS rubberized asphalt compound which is integrally laminated to a yellow cross laminated polyethylene film. This product is specifically designed for use as a thru-wall flashing and dampproof course. The product is to be adhered to a prepared substrate of concrete, concrete block, wall surfaces and door and window heads as specified.

3. Dupont Flexwrap EZ DuPont™ FlexWrap™ EZ is a flexible, self-adhered tape with a 100% butyl-based adhesive layer that creates an air and water-tight seal around penetrations of all different shapes and sizes. Used for flashing around many smaller wall protrusions like plumbing and HVAC components, vents, wires, exterior electrical outlets, exterior lights, and gas lines. DuPont™ FlexWrap™ EZ is a part of a complete DuPont™ Tyvek® Building Envelope Solution that helps to improve the energy efficiency and durability of buildings.

1.4 SYSTEM DESCRIPTION

.1 Sub membrane primers shall be applied as specified.

.2 Air barrier membranes shall be applied to prepared substrate as specified.

.3 Foamed air barrier insulation shall be applied over membranes as specified.

1.5 QUALITY ASSURANCE

.1 Applicator Qualifications:

.1 The applicator shall be familiar with and fully equipped to apply air barrier membranes and shall be familiar with good construction practices.

.2 The applicator shall be approved by Bakor and acceptable to Consultant for installation of air barrier membranes.

.3 A pre-job conference is recommended between Masonry Contractor, approved Air Barrier Contractor, Consultant and Manufacturer's Representative prior to installation of system to be arranged at suitable time by Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Delivery of Materials:

.1 Materials shall be delivered to the jobsite in undamaged and original packaging indicating the name of the manufacturer and product.

.2 Storage of Materials:

.1 Store roll materials on end in original packaging on pallets.
.2 Protect rolls from weather or store in an enclosed area not subject to heat over 40°C or under -10°C. Double stacked pallets are not recommended. If double stacking is necessary, use a plywood sheet to distribute the load.
.3 Store adhesive, solvents and primers at temperatures of 5°C (40°F) and above to facilitate handling. Keep away from open flame or excessive heat.

.3 Handling of Materials:

.1 Protect rolls from direct sunlight until ready for use.
.2 Adhesive contains solvent and is flammable. Do not use near open flame or spark.

1.7 SITE CONDITIONS

.1 Environmental Requirements:

.1 No installation work shall be performed during rainy or inclement weather and on frost covered or wet surfaces.
.2 Apply under dry conditions above -4°C

1.8 SCHEDULING

.1 Work shall be so scheduled as to provide an air tight seal at the end of each working day on the area worked upon during the day.

.2 Co-ordinate work of this section with all other applicable sections to ensure continuity of the air seal.

Part 2 Products

2.1 MATERIALS

.1 Refer to technical data sheets for physical properties of product.

.2 Membrane Flashing: Bakor Blueskin® TWF for thru-wall flashing and dampproof course and over lintels at all door and window openings as detailed.

.3 Transition Membrane: Bakor Blueskin® SA, for all transition flashing between walls and beams, columns, floors, at jamb perimeters of all doors, at jambs and sills at all windows and over all parapets as detailed.

.4 Membrane Adhesive: Bakor Blueskin® LVC Adhesive is a quick drying, lower volatile compound (VOC) formulation, rubber-based adhesive designed to enhance the adhesion of self-adhesive membranes such as Blueskin® SA or TWF.

.5 Membrane Primer: Bakor Bluskin® Primer and Blueskin® Spray Prep is a rubber based adhesive primer for self-adhesive membranes such as Blueskin® SA.

.6 Membrane Primer: Aquatac™ is a polymer emulsion-based primer for self-adhesive membranes such as Blueskin® SA or TWF.

.7 Sealant: HE925 – BES or Polybitume® 570-05 Sealant fully compatible with components of Bakor's Building Envelope Systems.

.8 Air / Vapour Barrier: Air-Bloc 21 Air and Vapour Barrier and Insulation Adhesive is trowel consistency, solvent type, synthetic rubber based for full bed adhesion.

Part 3 Execution

3.1 SUBSTRATE PREPARATION

.1 Acceptable substrates are precast concrete, cast-in place concrete block, drywall and plywood.

.2 All surfaces to receive Blueskin® SA or TWF membranes, Blueskin Primers or Adhesives, must be clean of oil, dust and excess mortar. Strike masonry joints flush. Concrete surfaces must be smooth and without large voids, spalled areas or sharp protrusions. Concrete must be cured a minimum of 14 days and must be dry before application. Where curing compounds are used, they must be clear resin based within oil, wax or pigments.

.3 All surfaces to receive Blueskin® SA: Prime with Blueskin Primer, applied with lamb's wool roller, brush or spray equipment at a rate of 1 litre per 2-6 m² depending on porosity and texture of surface and allowed to dry for 30 minutes before Blueskin® SA is applied. Ensure

that all primed surfaces receive Blueskin® SA in the same day. Alternately, prime with Aquatac™. Allow to dry to a tacky film.

.4 All surfaces to receive Blueskin® TWF: Apply Blueskin® Primer, Aquatac™ Primer or Hi-Tac Primer by brush or roller at a rate of approximately 7.2 m²/L (300 ft.²/gal.), depending on porosity and texture of surface and allowed to dry for 30 minutes before Blueskin® TWF is applied. Allow additional time for primer to set if wet to the touch or can be easily rubbed off. Ensure that all primed surfaces receive Blueskin® TWF in the same day.

3.2 APPLICATION

.1 Blueskin® SA: Transition Membrane

.1 Refer to Blueskin® SA Guide Specification for detailed application information. Material should be conditioned at room temperature for ease of application.

.2 Transition membrane must be lapped a minimum of 50 mm on both sides and end laps. Position membrane for alignment, remove protective film and press firmly in place. When membrane is entirely in place, roll membrane including seams with a counter top roller to ensure full contact. When using membrane with brick ties, position membrane, press in place and cut for ties or projections. Seal around any openings and at leading edge at the end of the days work Air-Bloc 21, Polybitume® 570-05 or HE925 BES Sealant. Transition membranes applied to the underside of substrate requires mechanical fastening. Mechanical fastening must take place immediately after installation of membrane.

.3 Detail work must be carefully carried out to ensure continuous air tightness of the membrane. It is recommended that mechanical attachment be made to all window and door frames, or properly designed sealant joint be provided.

.2 Blueskin® TWF: Thru-Wall Flashing Membrane

.1 Refer to Blueskin® TWF Guide Specification for detailed application information. Material should be conditioned at room temperature for ease of application.

.2 Cut flashing membrane to the desired length and remove siliconized release paper. Position into place and apply positive pressure using a roller. Keep back 12 mm (0.5”) to 25 mm (1.0”) from outside face of wall or veneer. At all laps, seams penetrations, and along top edges of flashing membrane, apply a continuous bead of rubberized mastic such as Air-Bloc or Polybitume® 570-05. Form end dams as required and use rubberized mastic at laps.

.3 Top or leading edge of membrane flashing must be sealed with a rubberized mastic such as Air-Bloc, Polybitume® 570-05 or HE925 BES Sealant to prevent rain water from migrating behind the membrane.

.4 All laps, must be lapped a minimum of 50 mm (2”) on both sides and end laps.

.5 Masonry veneer walls without insulation: The flashing membrane should extend through the back-up block and be turned up on the inside surface.

.6 Masonry veneer walls with insulation: The flashing membrane should extend a minimum of 200 mm (8") up the back-up wall and return into mortar joint a minimum of 25 mm (1").

.7 The flashing membrane should be adhered to the back-up wall and to shelf angles with Air-Bloc 21 or as described in general application procedures.

.8 Parapet Plate Flashing: Extend flashing membrane under parapet plate and return down to membrane roof. Carry down face cavity wall approximately 600 mm (24”). Extend through the width of the wall, when used as a damp proof course flashing.

.6 On existing masonry walls extend a minimum of 400 mm (16") up the back-up wall and as indicated.

3.3 PROTECTION OF FINISHED WORK

.1 Blueskin® TWF or Bluskin® SA are not designed for permanent exposure. The membrane can be left exposed for six weeks, however, good construction practice calls for application of insulation as soon as possible to protect the air barrier from damage by other trades.

3.4 APPROVED ALTERNATES

.1 Alternates are subject to Section 00 21 13 for Instructions to Tenderers.

.2 Accepted Alternate: Air Shield” and “Thru Wall Flashing” as manufactured by W.R. Meadows of Canada”

3.5 WARRANTY

.1 Warranty for product and installation are as specified in Division B for Supplementary Articles and General Conditions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Requirements for the installation of preformed metal siding and soffit, including fascia and flashing.

1.2 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 06 10 11 – Rough Carpentry

.3 Section 05 41 00 – Light Gauge Structural Framing

.4 Section 05 50 00 – Metal Fabrications

.5 Section 07 27 31 - Adhesive Grade Air Barrier Membrane and Thru-Wall Flashing

.6 Section 07 21 19 – Foamed In-Place Insulation

.7 Section 07 26 00 – Vapour Retarders

.8 Section 07 62 00 – Sheet Metal Flashing

.9 Section 07 92 10 - Joint Sealing

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI B18.6.4-1981, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A792 Grade 33 (latest revision) with designation AZ150 for Galvalume material.

.2 ASTM A653 SS, Grade 33 (latest revision) with designation for Galvanized material.

.3 ASTM A653 SS, Grade 33 (latest revision) with designation for Prepainted Galvanized material.

.4 ASTM D 2369-98, Standard Test Method for Volatile Content of Coatings.

.5 ASTM D 2832-92(R1994), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.6 ASTM D 5116-90, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.2 CAN/CGSB-93.2-M91, Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use.

.3 CAN/CGSB-93.3-M91, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.

.4 CAN/CGSB-93.4-92, Galvanized Steel and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.

.5 CGSB 93.5-92, Installation of Metal Residential Siding, Soffits and Fascia.

.4 Canadian Standards Association (CSA)

.1 CAN/CSA-A247-96, Insulating Fibreboard.

.2 CSA B111-1974, Wire Nails, Spikes and Staples.

.5 Environmental Choice Program (ECP)

.1 ECP-45-92, Sealants and Caulking Compounds.

.2 ECP-69-94, Polyethylene Plastic Film Products.

1.4 SUBMITTALS

.1 General: Submit listed submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.

.3 Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

.1 Include details showing thickness and dimensions of the various system parts, fastening and anchoring methods, locations of joints and gaskets and location and configuration of joints necessary to accommodate thermal movement.

.2 Method of supporting and integrating mechanical, electrical or other trim devices and/ or accessories within the panel system.

.3 Develop all dimensions from the architectural drawings and where possible coordinate with field dimensions to obtain final panel layout.

.4 Samples: Submit selection and verification samples for finishes, colors and textures.

.1 Selected Samples: Manufacturer's color charts or chips illustrating full range of colors, finishes and patterns available for composite metal panels with factory-applied finishes.

.5 Quality Assurance Submittals: Submit the following:

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.

.3 Manufacturer's Instructions: Manufacturer's installation instructions.

.4 Manufacturer's Field Reports: Manufacturer's field reports.

.6 Design: Calculations shall be signed and sealed by a Professional Engineer, attesting to the ability of the metal panel assembly to withstand the specified loads, including inward and outward loads and loads under fastenings to the structure.

Identification: Panels shall be identified on shop drawings as to building location to facilitate panel removal and replacement due to construction and/or occupant damage.

.7 Closeout Submittals: Submit the following:

.1 Warranty: Warranty documents specified herein.

1.5 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacture's installation instructions and manufacturer's warranty requirements. Comply with Section 01 78 00 Closeout Submittals.

1.6 DELIVERY, STORAGE & HANDLING

.1 General: Comply with Section 01 61 00 – Common Product Requirements.

.2 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

.3 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.1 Protection: Protect finish of panels by applying heavy duty removable plastic film during production.

.2 Delivery: Package composite wall panels for protection against transportation damage. Provide markings to identify components consistently with drawings.

.3 Handling: Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

.4 Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

.1 Storage: Store panels in well-ventilated space out of direct sunlight.

.1 Protect panels from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.

.2 Slope panels to ensure positive drainage of any accumulated water.

.3 Do not store panels in any enclosed space where ambient temperature can exceed 49º C (120º F).

Damage: Avoid contact with any other materials that might cause staining, denting or other surface damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Siding: to CGSB 93-GP-4M, Type vertical, Class A plain.

.1 Finish coating: Pre-painted Galvanized

.2 Colour: From Standard and Extended Colour Range.

.3 Gloss: medium.

.4 Gauge: 24.

.5 Profile: 16 mm deep, preformed interlocking joints, fastener holes pre-punched.

.6 Acceptable Material: Diamond Rib by VicWest or approved alternate.

2.2 ACCESSORIES

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

2.3 SUB GIRT SYSTEM

.1 Panel load transfer grids shall be formed from minimum 1.2mm (18ga.) full-galvanized steel conforming to ASTM A653 Grade A Zinc coating to Z275 designation.

.2 Transfer grid to be hat bars, Z-bars, adjustable Z-bars or combination clip and Z-bar.

.3 Structural Members and panels shall be fastened together with interlocking clips as indicated.

2.4 FASTENERS

.1 Fasteners to be stainless steel and concealed at all locations. Sufficient quantities of fasteners of the proper size for fastening of the work shall be provided.

2.5 OPENINGS

.1 Openings shall be provided and coordinated with the work of other installers. Holes to accommodate the work of other sections to be provided in the panel prior to finishing whenever possible. The perimeter of holes greater than 300mm x 300mm shall be reinforced to details shown on drawing or the manufacturer's standard.

2.6 FLASHINGS

.1 Wherever practical at corners, jambs and abutments, no flashings will be permitted. Panel design to include for these connections. Where flashings are unavoidable, use post-painted material to match aluminum panel.

.2 Exposed surfaces of aluminum extrusions to be painted to match the finish of the panels.

2.7 FINISHES

.1 Cladding Coating: Prepainted fluorocarbon base with 70% Kynar Resins. Aluminum substrate to be alloy 3003 or 5052 conforming to ASTM B209.

2.8 SOURCE QUALITY

.1 Source Quality: Obtain composite panel products from a single manufacturer.

2.9 RELATED MATERIALS

General: Refer to other related sections for related materials, including cold-formed metal framing, flashing and trim, joint sealers, aluminum windows, glass and glazing and curtain walls

2.10 CAULKING

.1 Sealants: As per Section 07 92 10

.1 Test for acceptable VOC emissions in accordance with ASTM D 2369 and ASTM D 2832.

.2 Acceptable materials: Environmental Choice Certification Program ECP-45.

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 Install wall and soffit cladding in accordance with CGSB 93.5, and manufacturer's written instructions

.2 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.

.3 Install outside corners, fillers and closure strips with carefully formed and profiled work.

.4 Install fascia cladding, true to line, tight fitting, hairline joints.

.5 Attach components in manner not restricting thermal movement.

.6 Caulk joints with adjoining work with sealant in accordance with Section 07 92 10.

3.3 CLEANING

.1 Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Consultant's acceptance. Remove construction debris from project site according to Section 01 74 19.

3.4 PROTECTION

.1 Protection: Protect installed product's finish surfaces from damage during construction.

.1 Institute protective measures as required to ensure that installed panels will not be damaged by work of other trades.

END OF SECTION

Part 1 General

1.1 THIS SECTION INCLUDES

.1 Perimeter Metal

.2 Metal Flashings on parapet walls

.3 Metal counter flashings on vertical upstands and mechanical or electrical penetrations.

1.2 RELATED WORK

.1 Division 4 – Masonry

.2 Section 06 10 11 – Rough Carpentry

.3 Section 05 50 00 – Metal Fabrications

.4 Section 07 27 31 - Adhesive Grade Air Barrier Membrane and Thru-Wall Flashing

.5 Section 07 46 13 – Preformed Metal Siding and Soffit

1.3 SUBMITTALS

.1 General: Submit listed submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit sufficient material samples as may be required by the Consultant.

.3 Submit shop drawings including material finishes and dimensions.

1.4 WASTE MANAGEMENT AND DISPOSAL

Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.5 PROCEDURE

.1 No metal flashing is to be installed before the membrane flashings have been inspected and approved.

.2 Any concerns regarding the site conditions, specified materials or specified flashings should be brought to the attention of the consultant before proceeding with any installation.

1.6 WORKMANSHIP

.1 All work is to be executed by competent mechanics, skilled and specifically trained in the particular trade. Only first-class workmanship will be accepted, not only with regard to safety, efficiency and durability, but also with regard to neatness and accuracy of detail. All unsatisfactory work is to be removed and new work re-installed at the expense of the contractor.

.2 All applications shall be by mechanics skilled in this trade, certified by the roof membrane manufacturer and have a minimum of 5 years experience with the work to be done.

1.7 WARRANTIES AND GUARANTIES

.1 Provide a written warranty stating that the Contractor will warrant to repair, at its own expense, any actual roof leaks or deficiencies in the roofing membrane, flashing membrane and related sheet metal work resulting from faulty workman-ship for a period of 2 (two) years. After the effective date of the warranty.

Part 2 Products

2.1 METAL FLASHINGS

.1 Metal flashing to be galvanized steel sheet metal corresponding to ASTM 525.81 with a zinc coating designation ZF275 (G90) and in Series 5000/8000 baked enamel, 24 gauge (.6 mm thick), pre-coated finish by Stelco or Dofasco.

.2 Colour from full range of manufacturers options. Submit for Architect's approval.

2.2 CONTINUOUS CLEAT STARTER STRIP

.1 At parapets, install continuous 24-gauge (.6 mm thick) starter strip on exterior fascia to provide continuous support for lower edge of parapet flashing.

2.3 MECHANICAL FASTENERS

.1 Nails, screws, fasteners, and accessories to be compatible with the metal flashings.

.2 Long enough to penetrate into the blocking or base as minimum of 25 mm.

2.4 UNDERLAYMENT

.1 In accordance with Section 07 27 31 – Adhesive Grade Air Barrier Membrane and Thru-Wall Flashing

2.5 ISOLATION COATING

.1 Alkali resistant bituminous paint

2.6 MASTIC/ ROOF CEMENT

.1 Conform to CAN/CGSB 37.5

2.7 CAULKING

.1 Conform to CAN/CGSB 19.13 M87

.2 One part polyurethane - TREMCO Vulkem 116

Part 3 Execution

3.1 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA and as indicated.

.2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints. Flashing lengths less than 1000mm will not be accepted.

.3 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

3.2 INSTALLATION

.1 Install sheet metal work in accordance with CRCA FL series details,

.2 Use concealed fastenings except where approved before installation.

.3 Fasteners penetrations through roof membrane to be a minimum 200 mm (0.67”) above the finished roof surface.

.4 All counter-flashing parapet or perimeter edges shall have a continuous hook strip installed for the sheet metal flashings to be secured to.

.5 Profile shall be bent as to provide straight, even and square roof finishes without "oil-canning" “dishing” “cupping” or other finish blemishes.

.6 All sheet metal flashings shall be installed with provision of adequate expansion

.7 Provide adequate slope to cap flashings sufficient to ensure moisture run off.

.8 All sheet metal work will be installed with hemmed exposed edges. There will be no cut edges exposed.

.9 Where sheet metal is in contact with masonry brick, concrete or wood surfaces, provide underlay under sheet metal. Secure in place and lap joints 100 mm (0.33”).

.10 Counter-flash bituminous flashings at intersections of roof with vertical surfaces and curbs.

.11 Join flashing sections using S-lock forming tight fit over hook strips, minimum 25mm deep expansion locks.

.12 Lock end joints and caulk with sealant.

.13 All corner joints of the sheet metal flashings shall be mitered, and dovetailed to provide a proper and tight fit. After installation the joints shall be properly caulked to prevent water penetration.

.14 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.15 Insert metal flashing into reglets or under cap flashing to form weather tight junction.

.16 Caulk flashing at reglet with sealant

.17 All caulked joints to be in accordance with Section 07 92 10.

3.3 CLEANING

.1 Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Consultant's acceptance. Remove construction debris from project site according to Section 01 74 19.

3.4 PROTECTION

.1 Protection: Protect installed product's finish surfaces from damage during construction.

.1 Institute protective measures as required to ensure that installed panels will not be damaged by work of other trades.

END OF SECTION

1 General

1.1 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S101, 1989.
.2 CAN/ULC-S102, 1988.

1.2 TEST REPORTS

.1 Submit product data including certified copies of test reports verifying fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.

.2 Submit test results in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

.3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.

1.3 SAMPLES

.1 Submit duplicate 200 x 200 mm size sample of exposed fireproofing for approval of texture and colour.

1.4 MOCK-UP

.1 Apply fireproofing to approximately 1 m 2 area of surfaces of mock-up-matching surface to be treated.

.2 Allow 24 hours for inspection of mock-up by Consultant before proceeding with fireproofing work.

1.5 PROTECTION

.1 At outdoor temperatures less than 5°C, ensure that a 5°C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.

.2 Provide temporary enclosures to prevent spray from contaminating air beyond application area.

.3 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing materials.

2 Products

2.1 MATERIALS

.1 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC Designs specified.

.2 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified.

.3 Thin-Film Intumescent Coating: Intumescent Coating designated “A/D FireFilm III” applied in accordance with manufacturer’s instructions to the minimum dry film thickness. See attached background information.

3 Execution

3.1 PREPARATION

.1 Substrate shall be free of material, which would impair bond.

.2 Verify that painted substrates are compatible and have suitable bonding characteristics to receive fireproofing.

.3 Remove incompatible materials.

.4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.

.5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is completed.

3.2 APPLICATION

.1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.

.2 Apply fireproofing to correspond with tested assemblies, or acceptable calculation procedures to provide fire resistance ratings as per A0-100 series drawings.

.3 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density.

3.3 INSPECTION AND SITE TESTS

.1 Inspection and testing of fireproofing will be carried out by Testing Laboratory designated by Consultant.

.2 Owners will pay costs for testing under testing Allowance, Section 10 21 00.

3.4 INSPECTION SERVICE

.1 Peto MacCallum Ltd. 905-561-2231

.2 Trow Engineering 416-793-9800

.3 McClymont and Rak Engineers 416-675-0160

3.5 PATCHING

.1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, preparation and application for caulking and sealants for all divisions.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 61 00 - Common Product Requirements.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM C919-02, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).

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

.3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).

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

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

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.4 General Services Administration (GSA) - Federal Specifications (FS)

.1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.4 SUBMITTALS

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

.2 Manufacturer's product to describe.

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

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

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions to include installation instructions for each product used.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.7 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4º C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

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

1.9 WARRANTY

.1 Contractor hereby warrants that caulking will not leak, crack, crumble, melt, shrink, run, loose adhesion, or stain adjacent surfaces for a period of three (3) years after substantial completion.

Part 2 Products

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): Sealant type: Vulkem 921 by Tremco.

.2 Control and expansion joints in exterior surfaces of unit masonry walls: Sealant type: Vulkem 911 by Tremco.

.3 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: Vulkem 921 by Tremco.

.4 Expansion and control joints on the interior of exterior precast, architectural wall panels: Sealant type: Vulkem 911 by Tremco.

.5 Joints of underside of precast beams or planks: Sealant type: Vulkem 911 by Tremco.

.6 Control and expansion joints on the interior of exterior surfaces of unit masonry walls: Sealant type: Vulkem 911 by Tremco.

.7 Interior control and expansion joints in floor surfaces: Sealant type: Vulkem 911 by Tremco.

.8 Perimeters of interior frames, as detailed and itemized: Sealant type: Vulkem 921 by Tremco.

.9 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): Sealant type: Vulkem 911 by Tremco.

.10 Perimeter of bath fixtures (e.g., sinks, tubs, urinals, stools, water closets, basins, vanities): Sealant type: Tremsil 200 by Tremco.

.11 Acoustical, masonry concrete blocks, both sides of wythes to underside of steel roof deck complete room perimeter: Sealant Type – Acoustical Sealant - Tremco

2.3 JOINT CLEANER

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

.2 Primer: as recommended by manufacturer.

Part 3 Execution

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

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

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

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

.4 Ensure joint surfaces are dry and frost free.

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

3.3 PRIMING

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

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

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

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

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant.

.1 Apply sealant in accordance with manufacturer's written instructions.
.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.
.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing.

.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.

.1 Clean adjacent surfaces immediately and leave Work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealants.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 21 13 - Brick Masonry

.2 Section 04 22 00 – Concrete Masonry

.3 Section 05 41 00 – Light Gauge Structural Framing

.4 Section 07 92 10 - Joint Sealing

.5 Section 08 71 10 – Finish Hardware

.6 Section 09 91 13 - Painting.

.7 Section 26: Electronic Safety and Security.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)

.1 ASTM A653/A653M-01a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM B29-92(1997), Specification for Refined Lead.

.3 ASTM B749-97, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)

.1 G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA W59-M1989(R2001), Welded Steel Construction (Metal Arc Welding) (etric Version).

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).

.1 CSDMA, Specifications for Commercial Steel Doors and Frames, 1990.

.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA)

.1 NFPA 80-2007, Standard for Fire Doors and Fire Windows.

.2 NFPA 252-2008, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN4-S104-M80 (R1985), Fire Tests of Door Assemblies.

.2 CAN4-S105-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

.3 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies.

.7 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

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

.9 CAN/ULC-S704-01, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35ºC to 35ºC.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SUBMITTALS

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

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazing, louvres, arrangement of hardware and fire rating and finishes.

.3 Indicate each type of frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, firerating and finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.5 Submit test and engineering data, and installation instructions.

1.5 REQUIREMENTS

.1 Steel fire rated doors and frames: labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M for ratings specified or indicated.

.2 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict 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.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Exterior Steel Doors:

.1 Doors to be fabricated from tension levelled steel to ASTM A924-97(M- galvanized to ASTM A653-97(M-97), Commercial Steel (CS), Type B, coating designation A40 (ZF120), known commercially as paintable Galvanneal.

.2 Exterior Steel Doors:

.1 Doors to be fabricated from tension levelled steel to ASTM A924-97(M-97), galvanized to ASTM A653-97(M-97), coating designation A40 (ZF 120), known commercially as Galvaneel.

.3 Steel Frames:

.1 Frame product to be fabricated from tension levelled steel to ASTM A924-97(M-97), galvanized to ASTM A653-97(M-97), Commercial Steel (CS), Type B, coating designation A40 (ZF120), known commercially as paintable Galvanneal.

.4 Acceptable Materials: Fleming + Baron, Steelcraft or approved alternate.

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm (1”) maximum kraft paper 'honeycomb', weight: 36.3 kg (80 lb.) per ream minimum, density: 16.5 kg/m3 (1.03 pcf) minimum sanded to required thickness.

.2 Stiffened: face sheets welded core.

.1 Fibreglass: to CAN/ULC-S702, semi-rigid density 24 kg/m3.

.2 Expanded polystyrene: Rigid extruded, fire retardant, closed cell, Type 1, density 16 to 32 kg/m3 (1 to 2 pcf), thermal values, RSI 1.06, (R6.0), (minimum), conforming to CAN/ULC-S701.

.3 Polyisocyanurate: rigid foam, closed cell, faced board, thermal value RSI 2.17 (R12.3), (minimum), density 32 kg/m3 conforming to CAN/ULC-S704.

.3 Temperature rise rated (TRR):

.1 Solid slab core of non-combustible, inorganic composite to limit temperature rise on the “unexposed” side of door to 250ºC at 60 minutes.

.2 Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door

Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 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.

2.4 PRIMER

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

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Sections 09 91 13 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior and interior top and bottom caps: steel.

.3 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.

.4 Door bottom seal: as per hardware schedule.

.5 Metallic paste filler: to manufacturer's standard.

.6 Fire labels: metal riveted.

.7 Sealant: As per Section 07 92 10.

.8 Glazing: As per Section 08 80 50.

.9 Make provisions for glazing as indicated and provide necessary glazing stops.

.1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless-steel screws.

.2 Design exterior glazing stops to be tamperproof.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames:16 gauge reinforced with vertical stiffeners fully welded at 150mm (0.5”) on centre.

.4 Interior frames: 16 gauge with mechanically interlocked longitudinal edges.

.5 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.6 Protect mortised cutouts with steel guard boxes.

.7 Prepare frame for door silencers. Install three (3) on strike jamb for single door and two (2) on head for double doors.

.8 Manufacturer's nameplates on frames and screens are not permitted.

.9 Conceal fastenings except where exposed fastenings are indicated.

.10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.11 Insulate exterior frame components with polyurethane insulation.

.12 Exterior frames to be thermally broken.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforecement on hinge jamb and directly opposite on strike jamb.

.3 Provide two (2) anchors for rebate opening heights up to 1520 mm and one (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 o.c. maximum.

2.9 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 two (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.

2.10 DOOR FABRICATION GENERAL

.1 Exterior Steel Doors:

.1 Doors to be 16-gauge swing type, flush, 44mm (1.75") thick with provisions for glazed and/ or louvred openings as per schedule.

.2 Doors to be internally reinforced with 20-gauge continuous interlocking steel stiffeners at 150mm (0.5") on center, securely welded to each face sheet at 150mm (0.5") on center maximum, with voids between stiffeners filled and sound deadened with honeycomb core laminated under pressure to each face sheet.

.3 Longitudinal edges of exterior doors to be continuously welded the full height of the door, filled and ground smooth with no visible seams.

.4 Provide flush PVC steel top caps.

.5 Doors to be thermally broken.

.6 Doors to be equipped with continuous hinges. Refer to Section 0871 10 – Finish Hardware.

.2 Interior Steel Doors:

.1 Doors to be 18-gauge swing type, flush, 44mm (1.75") thick with provisions for glazed and/ or louvred openings as per schedule.

.2 Longitudinal edges of doors to be mechanically interlocked adhesive assisted with edge seams tack welded and sanded flush with no visible seam.

.3 Interior and Exterior Steel Doors:

.1 Doors to be blank, reinforced, drilled and tapped for fully templated mortised hardware and electronic hardware.

.2 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.3 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.4 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict 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.

.5 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.6 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.

.7 Manufacturer's nameplates on doors are permitted only on hinge side of door.

.8 Doors to be bevelled 3mm in 50mm (0.125” in 0.25”) on both lock and hinge edges.

.9 Top and bottom of doors to be provided with projection welded, inverted 16-gauge end channels.

.10 Hinge reinforcing to be 10-gauge steel, high frequency type for templated 114mm (0.39”) hinges, convertible from standard to heavy weight.

.11 Cylinder lock, ASA strike and flush bolt reinforcing to be 12-gauge minimum.

.12 Mortise locking and surface mounted hardware reinforcing to be 16-gauge minimum.

.13 Doors to be provided with integral 14-gauge steel closer reinforcing channel at top of door.

2.11 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 form interior parts with continuous interlocking thermal break.

.4 Apply insulation.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install labeled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 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 (48”) 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 and vapour retarder.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions, in steel frames as indicated on the drawings and in the Door Schedule. Refer to Section 08 71 10 for Finish Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install louvers as per Division 23.

.5 Install insulated hollow metal doors in aluminum curtain walls as indicated on the drawings and in the Door Schedule. Refer to Section 08 71 10 for Finish Hardware.

3.4 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.5 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 50 – Glazing and Mirrors.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Division One, General Requirements is part of this Section and shall apply as if repeated here.

.2 Throughout the specification, types of materials are specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the bidder may use the alternate products specified, except that the burden is upon the bidder to prove such quality. Supply samples if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty and cost.

1.2 WORK INCLUDED IN THIS SECTION

.1 Supply to the site, all finish hardware specified complete with templates and installation instructions, together with all required screws, expansion shields, anchors and other related accessories for satisfactorily attaching or installing all hardware. Supply and install power door operators and accessories where listed in the Finishing Hardware Schedule.

.2 Package hardware separately for each opening and state clearly on each package the number and description of the opening for which the hardware is intended.

1.3 HARDWARE CONSULTANT

.1 Furnish the services of a fully experienced Architectural Hardware Consultant (A.H.C.) to be in attendance at all times during installation at normal working hours to coordinate and check shop drawings and provide consultation services when required and on-site inspections.

.2 All hardware shall be inspected after installation by the Manufacturer's and/or Owner's representative who shall certify in writing to the Owner, that all hardware has been supplied and installed in accordance with the specifications and Hardware List, and are functioning properly.

.3 At project completion instruct the Owner's Representative on all aspects of maintenance and adjustments of all Finish Hardware.

.4 Following award of contract, arrange to meet with Owner & Hardware Consultant to finalize the keying schedule.

1.4 COORDINATION

Coordinate the hardware with other allied trades such as carpentry, millwork, aluminum door and screens, hollow metal doors and frames, electrical and others.

1.5 HANDLING AND STORAGE

.1 Handle and store materials on job site in such a manner that no damage will be done to the materials.

.2 Deliver and store materials undamaged in a dry area.

.3 Wrap all hardware in separate packages complete with all trimming and screws required for each item, distinctly labeled and numbered for each opening to correspond with the final reviewed Finish Hardware Schedule.

1.6 HARDWARE REINFORCEMENT

.1 Provision of hardware reinforcing required as to provide a firm support for hardware is under other sections of these specifications, however, it shall be the responsibility of this section to check that all doors, frames and panels are reinforced in a satisfactory manner to provide a firm support. Report any doors, frames or panels, which have not been adequately reinforced.

1.7 FIRE AND BUILDING CODES

.1 All hardware shall comply with applicable fire and building codes and requirements of local authority having jurisdiction over hardware. All electrical items must have CSA approval.

1.8 BARRIER FREE REQUIREMENTS

.1 The building is designed to meet the needs of barrier free access. All hardware shall be supplied and installed in accordance with the Ontario Building Code and CAN/CSA-B61-M90.

1.9 SUBMITTALS

.1 Shop Drawings

.1 It shall be the responsibility of the hardware suppler to examine the plans and schedules to satisfy itself that all hardware listed can be used as specified.

.2 Prepare and submit to the Architect for review, 3 copies of hardware schedule showing all hardware required for each opening.

.3 Fully detail schedule as to actual factory catalogue numbers quantities, hardware locations, etc. Include cut sheets of each item of hardware.

.4 Arrange schedule in the same format and numerical sequence as that in the accompanying schedule.

.5 All pages of the schedule shall be printed on 8-1/2" x 11" sized paper.

.6 Within 7 days after receiving reviewed hardware schedule, supply 2 copies of the schedule to the Architect. Bind in a hard cover with provision for insertion of additional pages.

.2 Samples

.1 Submit samples of the complete line of hardware and finishes to the Architect in accordance with Section 013300, if and when requested, to accompany any proposal for substitution. Fully label each sample as to manufacturer, type, size, and location for which its use is proposed.

.2 Remove samples from the Architect's office promptly upon request of Architect.

.3 Substitute new samples for any samples which are not considered by the Architect to be equal to the hardware scheduled. Final approved samples will be retained by the Architect/Consultant until the project is completed.

.4 Do not order hardware from the manufacturer until the samples have been approved by the Architect/Consultant, and the hardware and finishes supplied are identical with the approved samples.

.3 For Maintenance Use

.1 Submit the following to the Owner/Architect:

.1 One set wrenches for locksets, exit devices and door closers.

.2 Three sets of manufacturer's installation instructions for locksets.

.3 Three sets of manufacturer's instructions in regard to proper care of hardware including lubrication of locksets, exit devices and door closers.

.4 One complete set of template schedules.

.5 Catalogue cuts of all hardware installed.

1.10 CHANGES

.1 Check all changes to the work of this section, that may be issued and revise the reviewed hardware schedule accordingly. Submit all revisions to the hardware schedule to the Architect for review.

1.11 WARRANTY

.1 Submit a warranty in accordance with Section 017800, covering the repair or replacement of defective work within specified periods.

.2 Provide total warranty of 5 years for locksets and exit devices, 10 years for door closers, and 2 years for other hardware. Hinges require a written warranty from the manufacturer for the lifetime of the hinges. Provide a one-year parts and labour warranty for power door operators and accessories.

.3 State in the warranty that any defective (material and operation) item of hardware shall be replaced immediately upon notification that item is defective.

1.12 DEFINITION OF FINISHES AND SYMBOLS

AL, 689	Aluminum Paint
CP	Prime Paint
C15, 619	Dull-Nickel Plated
C32D, 630	Dull-Stainless Steel
C28, 628	Satin Finish Aluminum - Anodized
C26D, 626	Dull-Chromium Plated
CA, AL	Aluminum Anodized
STS	Self-Tapping Screws
WS/S	Wood Screws and Shields
SB	Sex Bolts
SB & MS	Sex Bolts & Machine Screws
TB Only	Thru Bolt Only
NRP	Non-Removable Pin
RH	Right Hand
RHR	Right Hand Reverse
LH	Left Hand
LHR	Left Hand Reverse
SLC	Strike Lip Length to Centre
FMS	Full Machine Screws
AMS	Arm Machine Screws
MS	Machine Screws
TMS	Template Machine Screws
KA	Keyed Alike
KD	Keyed Different
FBB	Template - Ball Bearing
TBGN	Grommet Nuts & Machine Screws
HO	Hold Open

1.13 HARDWARE LOCATION

.1 Building standard for all hardware shall be as follows:

Door Levers [1067 mm/42"] Centre line from finish floor

Deadlock Cylinder	[1200 mm/48"] from centre line of strike to finish floor
Deadlatch Cylinder	[1200 mm/48"] from centre line of strike to finish floor
Door Pulls	[1100 mm/43"] from centre line of pull to finish floor
Pushplates	[1100 mm/43"] from centre line of plate to finish floor
Panic Bolts	[1100 mm/39"] from centre line of crossbar to finish floor
Mortise Night	[1200 mm/48"] from centre line of strike to finish floor Latches
Top Hinges	[190 mm/7-1/2"] Down from top of door to top of hinge
Bottom Hinges	[206 mm/8"] Up from finish floor to bottom of hinge
Intermediate Hinges	Equally spaced between top and bottom hinges
Floor Stops	Maximum [152 mm/6"] from lock edge when door is in fully open position.
Exit Devices	To manufacturer's instructions
Kickplates	Maximum [3 mm / 1/8"] from bottom of door to bottom of kickplates.

Part 2 Products

Products and alternates listed are the standard of the owner. No deviations from the established manufacturers will be permitted.

2.1 HINGES

.1 Hinges are to be three knuckle slim line hinges which concealed bearings where listed.

Product Listed	Alternate	Alternate
McKinney	Stanley	Hager
TA714	CB1900	BB700
TA386	CB1961	BB850
TA786	CB1901	BB750

.2 Continuous Hinges are to be stainless steel pin and barrel construction, c/w 0.25” diameter stainless steel pin, 14-gauge stainless steel hinge leaves and adjustable fasteners.

.3

Product Listed	Acceptable Alternate
Markar FM-300	Gallery Specialty Hdwe. CH-941 C32D x ADJ Fasteners

2.2 LOCKS/ LATCHES

.1 Locks and latches are to be lever handle cylindrical lock as listed. Provide lock/latch functions as listed.

Product Listed	No Substitute
Sargent 11 Line	

2.3 EXIT DEVICES

.1 All exit devices to be slim line push bars style.

Product Listed	No Substitute
Sargent 80 Series	

2.4 DOOR CLOSERS

.1 Door closers are to be sized and handed for each door unless otherwise noted. Provide full covers for door closers.

Product Listed	Acceptable Alternate
LCN	Sargent
4041 Series	351 Series
1461 Series	1431 Series

2.5 OVERHEAD HOLDERS & STOPS

.1 Not used in this project.

2.6 MISCELLANEOUS

.1 Supply all miscellaneous products listed in the Hardware Schedule as listed or sources by approved equal.

Product	Manufacturer Listed	Acceptable Alternate
Door Pulls	CBH Mfg Inc.	Standard, Hager
Push/Kickplates	CBH Mfg Inc	Standard, Hager
Weatherstrip	KN Crowder	Pemko, Zero, Nat'l Guard
Power Door Operators	Horton Automatics	

2.7 KEYING

.1 Factory register all locks to suit existing keying system. Construction masterkey all locks. Provide 2 cut keys per cylinder and 12 Construction Master keys.

2.8 SUPPLEMENTARY MATERIAL REQUIREMENTS

.1 The following supplements Finish Hardware Schedule. Where conflict occurs, the Finish Hardware Schedule shall govern:

.1 Locks and Latches

.1 Supply cylindrical locks and latches as specified complete with cylinders levers as shown.

.2 Strike shall be ASA standard size with curved lip strikes for latch bolts and no lip strikes for dead bolts. Supplied complete with wrought boxes finished to match strike.

.3 Supply strikes in stainless steel C32D.

.4 Where lever handles are specified, locks and latches shall be specially designed for lever handles.

.2 Exit Devices:

.1 Exit devices shall be approved, labelled device for fire rated and exit doors.

.3 Closers

.1 All door closers shall be hydraulically controlled and full rack and pinion in operation.

.2 Each closer shall have adjustable general speed, latch speed and back check control.

.3 Supply special closer keys and wrenches as usually packed with closers.

.4 Supply all necessary attaching brackets, mounting channels, cover plates, etc. where necessary for correct application of door closers.

.4 Thresholds

.1 Supply thresholds in required widths and lengths to suit door openings.

.2 Cut ends of thresholds to follow exactly the door frame profile.

.5 Pulls, Pushplates, Kickplates

.1 Supply plates complete with double-sided tape.

Door pulls shall have Through Bolt mounting.

.2 Length of kickplates shall be [38 mm|1-1/2"] less than door width for single door and [25 mm| 1"] less than door width for door in pairs.

.3 All stainless-steel plates are to be .050 thick and of one manufacturer's product, free from burrs and sharp edges. Use Type 304 stainless steel only.

.4 Provide pushplates and kickplates with temporary strippable plastic coating.

.6 Stop, Stays and Holders:

.1 Supply floor stops Cast Bronze, dull or polished finish.

.7 Seals, Thresholds:

.1 All seals, (sound, light, weather) to be black sponge neoprene with aluminum extrusions of the same gauge, dimensions, quality and finish of those specified.

.2 Supply thresholds complete with countersunk holes, and with screws and anchors as required for proper anchorage.

.3 Modify sills to receive flush finish of adjacent floor finish.

2.9 TEMPLATES

.1 All hardware applied to metal doors and frames shall be made to template. Furnish templates, together with instructions necessary for door and frame preparation.

2.10 FASTENERS

.1 Provide screws, bolts, expansion shields, and other fastening devises as required for the satisfactory installation and operation of the hardware. Provide Robertson or Phillips heads.

.2 Fastening devices shall be of the same finish as the hardware which is to be fastened.

.3 Where a pull is scheduled on one side of the door and a pushplate on the other side, issue installation directions to the trade responsible for fixing, so that the pull is secured through the door from the reverse side, and the pushplate installed to cover the screws. Supply flush pulls with machine screws for attaching as specified above.

.4 For fastenings in concrete for floor stops and thresholds, use machine screws in expansion shields.

2.11 KEYING

.1 All locks shall be grandmasterkeyed, masterkeyed and/or keyed alike in groups to later instructions.

.2 Supply 2 keys per lock. Stamp each key DO NOT DUPLICATE, on one side and on the other with a keyset symbol consisting of not more than four letters or numbers.

.3 Supply keys, including a grandmaster and masterkeys, packed in separate envelopes for each group (key symbol) marked with the architectural door number(s) operated by the keys.

.4 Deliver all permanent keys to the Owner and obtain a signature for same.

.5 Prepare an itemized keying chart for the Owners approval.

.6 Supply the following:

.1 4 Grand Master Keys - Stamp DO NOT DUPLICATE
.2 4 Master Keys per group. Stamp DO NOT DUPLICATE
.3 2 Change Keys per cylinder.

Part 3 Execution

3.1 INSPECTION

.1 The consultant will inspect all the door openings to ensure the specified products are supplied and installed in accordance with the manufacturer's instructions. A written report will be furnished to the Architect detailing openings where products are missing, installed incorrectly or in need of proper adjustment. All items listed in the report shall be corrected immediately.

3.2 INSTALLATION

.1 This portion of work is to bid as a supply and install package. Installers must follow all manufacturers' instructions including door closer adjustment, handing of locksets as required, and degree of door swing. Advise the consultant if door frames are not square and plumb and prevent proper door hardware installation package. The hardware supplier shall obtain a copy of ANSI/DHI A115.1G-94, "Installation Guide for Doors and Hardware" for the use of their installers. It is the intent of this document to be used as a reference guide in the proper handling, storage and installation of finishing hardware, and doors and frames. This document can be obtained through the Door and Hardware Institute.

.2 Use only the original manufactures fasteners for the installation of all hardware products. Drill and tap doors and frames, where required, to properly install finishing hardware products.

.3 Mount hardware to suit door elevations.

.4 Manufacturers of specified products are responsible to instruct hardware installers in the proper installation methods of their products.

3.3 HARDWARE SCHEDULE

.1 See attached Schedule of Finishing Hardware.

END OF SECTION

FINISHING HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre
3200 Stanley Ave.
Niagara Falls
ON

ARCHITECT

Raimondo & Associates Arch. Inc.
4687 Queen Street,
Suite 2
Niagara Falls, ON
L2E 2L9

CONTRACTOR

CONSULTANT

Mike Martineau, A.H.C

PROJECT COORDINATOR

Issued:	February 10, 2021	
Revised:	February 16, 2021	Revised per Consultant comments
	February 24, 2021	New Door 118 Added

DOOR INDEX

City of Niagara Falls Municipal Services Centre

Door No.	Heading	Door No.	Heading	Door No.	Heading	Door No.	Heading
101	025	102a	026	103	027	106	003
115	028	118	027	19a	001	19b	002
200	029	24	003	25	003	25a	004
42	005	42a	003	49	006	61	007
61a	008	61b	009	61c	010	61d	011
61e	008	61f	012	61g	013	63a	014
63b	015	63c	004	63d	004	64a	002
64b	016	65a	017	65b	018	66a	019
66b	020	67	009	73	022	76	004
76a	023	76b	003	78	024		

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 001

1	SGL DOOR	19a	EXIST CARP/CONST CREW LUNCH 19 TO EXIST. METER TESTING 24	90-LH

TYPE F 3'0" X 7'0" X 1-3/4" HM DOOR X HM FRAME 3/4 HR

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	PASSAGE SET	ND10S RHO 10-025	626
1	SURFACE CLOSER	4040XP SCUSH	689
1	KICK PLATE	K10A 8" X 34-1/2" MS	630
1	GASKETING	W-22 X 17'0"	BLK
1	DOOR SWEEP	W-24S X 3'0"	CA

Item # 002

1	SGL DOOR	19b	EXTERIOR FROM EXIST CARP/CONST CREW LUNCH 19	90-LHR
1	SGL DOOR	64a	EXTERIOR FROM EXIST CARPENTRY 64	90-RHR

3'0" X 7'0" X 1-3/4" EXISTING DOOR X EXISTING FRAME

2	RIM EXIT DEVICES	22TP-F X 230TP 3'	689
2	MORTISE CYLINDERS	BY OWNER GMK	626
2	CARD READERS	BY SECURITY	
2	ELECTRIC STRIKES	9500 FSE 12VDC	630
2	SURFACE CLOSERS	4040XP SCUSH	689
2	SETS W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
2	DOOR SWEEPS	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 003

1	SGL DOOR	106	EXTERIOR FROM EXIST EXIT STAIR #2 106	90-LHR
1	SGL DOOR	24	EXTERIOR FROM EXIST METER ROOM 24	90-LHR
1	SGL DOOR	25	EXTERIOR FROM EXIST ENVIRO SHOP 25	90-LHR
1	SGL DOOR	42a	EXTERIOR FROM EXIST LUNCH ROOM 42	90-RHR
1	SGL DOOR	76b	EXTERIOR FROM EXIST STORES 76	90-RHR

3'0" X 7'0" X 1-3/4" EXISTING DOOR X EXISTING FRAME

5	RIM EXIT DEVICES	22TP-F X 230TP 3'	689
5	MORTISE CYLINDERS	BY OWNER GMK	626
5	SURFACE CLOSERS	4040XP SCUSH	689
5	SETS W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
5	DOOR SWEEPS	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 004

1	SGL DOOR	25a	EXTERIOR TO EXIST ENVIRO SHOP 25	O/H
1	SGL DOOR	63c	EXTERIOR TO EXIST WELDING 63	O/H
1	SGL DOOR	63d	EXTERIOR TO EXIST WELDING 63	O/H
1	SGL DOOR	76	EXTERIOR TO EXIST STORES 76	O/H

VARIES EXISTING DOOR X EXISTING FRAME

4	GARAGE DOOR SLIDE LOCKS	711	C2G

Item # 005

1	SGL DOOR	42	EXTERIOR FROM EXIST LUNCH ROOM 42	90-LHR

TYPE GP 3'0" X 7'0" X 1-3/4" INS HM DOOR X HM FRAME

3	HINGES	5BB1 4-1/2" X 4-1/2" NRP	630
1	RIM EXIT DEVICE	22TP-F X 230TP 3'	689
1	MORTISE CYLINDER	BY OWNER	626
1	SURFACE CLOSER	4040XP SCUSH	689
1	KICK PLATE	K10A 8" X 34-1/2" MS	630
1	THRESHOLD	CT-65 X 3'0"	AL
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
1	DOOR SWEEP	W-24S X 3'0"	CA

Item # 006

1	SGL DOOR	49	EXIST MAINTENANCE GARAGE 61 FROM LOCKER ROOM 49	90-RHR

EXISTING DOOR X EXISTING FRAME

1	DBLE CYLINDER LOCKSET	ND82PD RHO 10-025	626
2	KIL CYLINDERS	BY OWNER GMK	626
2	CARD READERS	BY SECURITY	
	INSTALL ON BOTH SIDES OF DOOR		
1	ELECTRIC STRIKE	8300 FSE 12VDC	630

BALANCE OF EXISTING HARDWARE TO REMAIN.

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 007

1 PR DOORS 61 EXIST MAINTENANCE GARAGE 61 TO NEW STORES 65 180-LH/180-RHA

TYPE DGP 2 - 3'0" X 7'0" X 1-3/4" HM DOOR X EXISTING FRAME 1-1/2 HR

1	ELECTRIC HINGE	5BB1 4-1/2" X 4-1/2" TW8	652
5	HINGES	5BB1 4-1/2" X 4-1/2"	652
2	MANUAL FLUSH BOLTS	FB458	626
1	DUST PROOF STRIKE	DP2	626
1	STOREROOM LOCKSET	ND80PD RHO 14-042 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	1006-CLB FSE 12VDC	630
2	SURFACE CLOSERS	4040XP REG	689
2	KICK PLATES	K10A 8" X 35" MS	630
2	FLOOR STOPS	S102	626
1	Z-ASTRAGAL FB/ASA	BY DOOR SUPPLIER	600

Item # 008

1 SGL DOOR 61a EXIST OFFICE CORRIDOR TO EXIST MAINTENANCE GARAGE 61 110-RH

1 SGL DOOR 61e EXIST EXIT STAIR CORRIDOR TO EXIST MAINTENANCE GARAGE 61 90-RH

TYPE GP 3'0" X 7'0" X 1-3/4" HM DOOR X EXISTING FRAME 1-1/2 HR

2	STOREROOM LOCKSETS	ND80PD RHO 10-025	626
2	KIL CYLINDERS	BY OWNER GMK	626
2	CARD READERS	BY SECURITY	
2	ELECTRIC STRIKES	8300 FSE 12VDC	630
2	SURFACE CLOSERS	4040XP REG	689
2	KICK PLATES	K10A 8" X 34-1/2" MS	630
2	FLOOR STOPS	S102	626
2	GASKETING	W-22 X 17'0"	BLK

BALANCE OF EXISTING HARDWARE TO REMAIN.

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 009

1	SGL DOOR	61b	EXIST MAINTENANCE GARAGE 61 TO OFFICE	90-LH
1	SGL DOOR	67	EXIST CARPENTRY 64 FROM NEW CARPENTRY OFFICE 67	100-RHR

TYPE GP 3'0" X 7'0" X 1-3/4" HM DOOR X EXISTING FRAME 1-1/2 HR

6	HINGES	5BB1 4-1/2" X 4-1/2"	652
2	STOREROOM LOCKSET	ND80PD RHO 10-025	626
2	KIL CYLINDERS	BY OWNER GMK	626
2	CARD READERS	BY SECURITY	
2	ELECTRIC STRIKES	8300 FSE 12VDC	630
2	SURFACE CLOSERS	1461 FC REG	689
2	KICK PLATES	K10A 8" X 34-1/2" MS	630
2	FLOOR STOPS	S102	626
2	GASKETING	W-22 X 17'0"	BLK

Item # 010

1	SGL DOOR	61c	EXTERIOR FROM EXIST MAINTENANCE GARAGE 61	90-RHR

TYPE GP 3'0" X 7'0" X 1-3/4" INS HM DOOR X HM FRAME 1-1/2 HR

3	HINGES	5BB1 4-1/2" X 4-1/2" NRP	630
1	RIM EXIT DEVICE	22TP-F X 230TP 3'	689
1	MORTISE CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	9500 FSE 12VDC	630
1	SURFACE CLOSER	4040XP SCUSH	689
1	KICK PLATE	K10A 8" X 34-1/2" MS	630
1	THRESHOLD	CT-65 X 3'0"	AL
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
1	DOOR SWEEP	W-24S X 3'0"	CA

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 011

1 SGL DOOR 61d EXIST MAINTENANCE GARAGE 61 TO EXIST WELDING 63 180-LH

EXISTING DOOR X EXISTING FRAME

1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	CARD READER	BY SECURITY	
1	SURFACE CLOSER	4040XP REG	689
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 012

1 SGL DOOR 61f EXTERIOR FROM EXIST MAINTENANCE GARAGE 61 90

EXISTING DOOR X EXISTING FRAME

1	RIM EXIT DEVICE	88NL-F X 880NL-R 3'	626
1	RIM CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	9500 FSE 12VDC	630
1	SURFACE CLOSER	4040XP SCUSH	689
1	THRESHOLD	CT-65 X 3'0"	AL
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 013

1	SGL DOOR	61g	EXIST MAINTENANCE GARAGE 61 FROM EXIST GARAGE STORAGE 61a	180-LHR

TYPE GP CUSTOM X 1-3/4" HM DOOR X HM FRAME
NEW FRAME TO FIT INTO EXISTING CHANNEL IRON FRAME

3	HINGES	5BB1 4-1/2" X 4-1/2" NRP	652
1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	SURFACE CLOSER	4040XP SCUSH	689
1	KICK PLATE	K10A 8" X 1-1/2" LDW MS	630
1	GASKETING	W-22 X 17'0"	BLK

Item # 014

1	SGL DOOR	63a	EXTERIOR FROM EXIST WELDING 63	90-LHR

TYPE GP 3'0"' X 7'0" X 1-3/4" INS HM DOOR X EXISTING FRAME
CONFIRM FRAME SIZE AND HINGE PITCH BEFORE ORDERING DOOR

1	RIM EXIT DEVICE	22TP-F X 230TP 3'	689
1	MORTISE CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	9500 FSE 12VDC	630
1	SURFACE CLOSER	4040XP SCUSH	689
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
	INSTALL HEAD SEAL BEFORE DOOR CLOSER		
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 015

1	SGL DOOR	63b	EXIST WELDING 63 TO EXIST CARPENTRY 64	90-LH

TYPE VP 3'0" X 7'0" X 1-3/4" HM DOOR X EXISTING FRAME

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	PASSAGE SET	ND10S RHO 10-025	626
1	SURFACE CLOSER	4040XP SCUSH	689
1	KICK PLATE	K10A 8" X 34-1/2" MS	630
1	GASKETING	W-22 X 17'0"	BLK
1	GASKETING	W-22 X 17'0"	BLK

Item # 016

1 SGL DOOR 64b EXISTING CARPENTRY 64 TO STAIR VESTIBULE 90-LH

EXISTING DOOR X EXISTING FRAME

1	SURFACE CLOSER	4040XP REG	689
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 017

1 SGL DOOR 65a STORES 61 TO NEW PARTS COUNTER 65 90-LH

TYPE GP 3'0" X 7'0" X 1-3/4" HM DOOR X HM FRAME 3/4 HR

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	SURFACE CLOSER	1461 FC REG	689
1	KICK PLATE	K10A 8" X 34-1/2" MS	630
1	WALL STOP	S123	626
1	GASKETING	W-22 X 17'0"	BLK

Item # 018

1 SGL DOOR 65b STORES 61 TO NEW PARTS COUNTER 65 O/H

4'3" X 3'9" COUNTER SHUTTER X MASONRY OPENING 3/4 HR

ALL HARDWARE C/W DOOR

Item # 019

1 SGL DOOR 66a EXIST EXIT STAIR CORRIDOR TO EXIST STORES VESTIBULE 120-RH

EXISTING DOOR X EXISTING FRAME

1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	SURFACE CLOSER	1461 FC REG	689
1	GASKETING	W-22 X 17'0"	BLK

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 020

1 SGL DOOR 66b EXTERIOR FROM EXIST EXIT STAIR CORRIDOR 90-RHR

EXISTING DOOR X EXISTING FRAME

1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	9500 FSE 12VDC	630
1	SET W/STRIP	W-52S X 17'0" (1-3'0", 2-7'0")	CA
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.
ADJUST DOOR CLOSER

Item # 022

1 SGL DOOR 73 EXIST EXIT STAIR #1 CORR 66 TO EXIST WASHROOM 73 90-RH

EXISTING DOOR X EXISTING FRAME

1	PASSAGE SET	ND10S RHO 10-025	626

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 023

1 SGL DOOR 76a EXIST STORES VESTIBULE FROM EXIST STORES 76 90-LHR

TYPE SG 3'0" X 3'1-1/4" X 1-3/4" HM DOOR X HM FRAME

2	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	PASSAGE SET	ND10S RHO 10-025	626
2	DOOR SILENCERS	SR64	GREY

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 024

1 SGL DOOR 78 EXIST STORES 76 TO EXIST STORES OFFICE 78 120-LH

TYPE GP 2'8" X 6'6" X 1-3/4" HM DOOR X HM FRAME

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	CLASSROOM LOCKSET	ND70PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	SURFACE CLOSER	1461 FC REG	689
1	KICK PLATE	K10A 8" X 30-1/2" MS	630
1	FLOOR STOP	S102	626
1	GASKETING	W-22 X 17'0"	CA
1	DOOR SWEEP	W-24S X 3'0"	CA

Item # 025

1 SGL DOOR 101 EXIST EXIT STAIR # 1 66 FROM EXIST CORRIDOR 101 90-LHR

EXISTING DOOR X EXISTING FRAME

1	GASKETING	W-22 X 17'0"	BLK
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Item # 026

1 SGL DOOR 102a EXIST CORRIDOR 101 TO EXIST OFFICE 102A 90-RH

TYPE F 2'8" X 7'0" X 1-3/4" SCWD DOOR X HM FRAME

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	SURFACE CLOSER	1461 FC REG	689
1	FLOOR STOP	S102	626
1	GASKETING	W-22 X 17'0"	BLK

HARDWARE SCHEDULE

City of Niagara Falls Municipal Services Centre

Item # 027

1	SGL DOOR	103	EXIST CORRIDOR 101 TO NEW MECH. ROOM 103	90-LH
1	SGL DOOR	118	EXIST ENVIRO. MEZZ. 113 TO NEW MECH. ROOM 118	90-RH

TYPE F 3'0" X 7'0" X 1-3/4" HM DOOR X HM FRAME 3/4 HR

6	HINGES	5BB1 4-1/2" X 4-1/2"	652
2	STOREROOM LOCKSETS	ND80PD RHO 10-025	626
2	KIL CYLINDERS	BY OWNER GMK	626
2	SURFACE CLOSERS	1461 FC REG	689
2	FLOOR STOPS	S102	626
2	GASKETING	W-22 X 17'0"	BLK

Item # 028

1	SGL DOOR	115	EXIST WASHROOM 73 TO STORAGE	90-LH

TYPE F 3'2" X 7'0" X 1-3/4" HM DOOR X HM FRAME 3/4 HR

3	HINGES	5BB1 4-1/2" X 4-1/2"	652
1	STOREROOM LOCKSET	ND80PD RHO 10-025	626
1	KIL CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	8300 FSE 12VDC	630
1	SURFACE CLOSER	1461 FC REG	689
1	FLOOR STOP	S102	626
1	GASKETING	W-22 X 17'0"	BLK

Item # 029

1	SGL DOOR	200	EXIST CORRIDOR FROM EXIST MECH. ROOM	90-LHR

EXISTING DOOR X EXISTING FRAME

1	MORTISE LOCKSET	MATCH EXISTING	626
1	MORTISE CYLINDER	BY OWNER GMK	626
1	CARD READER	BY SECURITY	
1	ELECTRIC STRIKE	1006-CDB FSE 12VDC	630
1	GASKETING	W-22 X 17'0"	BLK
1	DOOR SWEEP	W-24S X 3'0"	CA

BALANCE OF EXISTING HARDWARE TO REMAIN.

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The work shall consist of the following but not limited to:

.1 Glass or other glazing for all hollow metal doors and frames, aluminum curtain wall, aluminum windows, and any other similar or supplementary work shown on the drawings, both interior and exterior units, including single and double-glazed insulated units.

.2 Wall mounted mirrors other than washroom accessories as noted on the drawings.

.3 Mirrors as noted in Washroom Accessories Schedule.

1.2 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 06 10 11 – Rough Carpentry

.3 Section 08 11 14 – Metal Doors and Frames

.4 Section 09 91 13 - Painting

1.3 REFERENCES

.1 American National Standards Institute (ANSI).

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

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM C542-94(1999), Specification for Lock-Strip Gaskets.

.2 ASTM D790-02, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

.3 ASTM D1003-00, Test Method for Haze and Luminous Transmittance of Plastics.

.4 ASTM D1929-96(R2001)e1, Test Method for Determining Ignition Temperature of Plastics.

.5 ASTM D2240-02b, Test Method for Rubber Property - Durometer Hardness.

.6 ASTM E84-01, Test Method for Surface Burning Characteristics of Building Materials.

.7 ASTM F1233-98, Test Method for Security Glazing Materials and Systems.

.3 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-12.5-M86, Mirrors, Silvered.

.6 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.

.7 CAN/CGSB-12.8-97, 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.

.12 CAN/CGSB-12.13-M91, Patterned Glass.

.4 Canadian Standards Association (CSA International).

.1 CSA A440.2-98, Energy Performance Evaluation of Windows and Sliding Glass Doors.

.2 CSA Certification Program for Windows and Doors 2000.

.5 Environmental Choice Program (ECP).

.1 CCD-045-95, Sealants and Caulking.

.6 Flat Glass Manufacturers Association (FGMA).

.1 FGMA Glazing Manual - 1997.

.7 Laminators Safety Glass Association (LSGA).

.1 LSGA Laminated Glass Design Guide 2000.

1.4 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Provide 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 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.

.3 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

1.5 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.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 GLASS BREAKAGE

.1 The contractor shall be responsible for all glass broken or unsuitable due to faulty installation or manufacturer's error or product failure.

1.7 GLASS DESIGN

.1 Glazing Contractor shall be responsible for proper glass thickness and rating design as required by Codes. Report any discrepancies noted to Architect during tender period.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS: FLAT GLASS

.1 Float glass: to CAN/CGSB-12.3, Glazing quality, 6 mm thick.

.2 Sheet glass: to CAN/CGSB-12.2, AA-Special selected, 6 mm thick.

.3 Safety glass: to CAN/CGSB-12.1, transparent, 6 mm thick.

.1 Type 1-tempered

.4 Silvered mirror glass: to CAN/CGSB-12.5, 6 mm thick in all locations shown on drawings.

.5 Wired glass: to CAN/CGSB-12.11, 6 mm thick for rated doors and screens.

.1 Type 1-Polished both sides (transparent).

.2 Wire mesh styles 3-Square.

.6 Ceramic Glass: to CAN/ULC-S106, S104, Transparent 5mm thick

.1 Door and Sidelight Applications Acceptable Products: Keralite Select Filmed, Firelite NT

.2 Transoms Acceptable Products: Keralite Select Standard, Firelite

2.2 MATERIALS: SEALED INSULATING GLASS AND SPANDREL GLASS

.1 Insulating glass aluminum window and curtain wall systems: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.

.1 Glass: to CAN/CGSB-12.3.

.2 Glass thickness: outer and inner lites, 6 mm tempered glass, Low E, Argon 90% filled, tinted, exterior lite, clear interior lite.

.3 Inter-cavity space thickness: 13 mm between inner and outer lites with low conductivity spacers.

.4 Colour – Exterior 6 mm Grey, PPG Solar Ban 60 by Pilkington Glass, on Surface 3 or approved equal.

.5 Spandrel Panel: Match dark grey by Pilkington.

.6 Inert gas fill: argon

.2 Insulating glass for steel doors and screens: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.

.1 Glass: to CAN/CGSB-12.3.

.2 Glass thickness: outer and inner lights, 6 mm tempered glass, Low E, Argon filled, tinted, exterior lite, clear interior lite.

.3 Inter-cavity space thickness: 13 mm between inner and outer lites with low conductivity spacers.

.4 Colour – Exterior 6 mm Grey, Solar Control Low-E by Pilkington Glass.

.5 Inert gas fill: argon.

2.3 ACCESSORIES

.1 Setting blocks: Neoprene Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.

.2 Spacer shims: Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing tape:

.1 Preformed butyl Shore A durometer hardness to ASTM D2240; coiled on release paper.

.4 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C542.

.7 Mirror attachment accessories:

.1 Stainless steel clips.

.2 Plastic rosettes.

.3 Mirror adhesive, chemically compatible with mirror coating and wall substrate.

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 EXAMINATION

.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.

3.3 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.

3.4 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

.1 Perform work in accordance with FGMA Glazing Manual IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

.2 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.

.3 Place setting blocks at quarter points, with edge block maximum 150mm (0.5”) from corners.

.4 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

.5 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.

.6 Trim protruding tape edge.

3.5 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

.1 Perform work in accordance with FGMA Glazing Manual IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

.2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

.5 Place glazing tape on free perimeter of glazing in same manner described.

.6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

.7 Knife trim protruding tape.

3.6 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking.

.3 Remove glazing materials from finish surfaces.

.4 Remove labels after work is complete.

.5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.7 PROTECTION OF FINISHED WORK

.1 After installation, mark light with an "X" by using removable plastic tape or paste.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 21 13 – Brick Masonry

.2 Section 04 22 00 – Concrete Masonry

.3 Section 05 41 00 – Light Gauge Structural Framing

.4 Section 07 46 13 – Preformed Metal Siding and Soffit

.5 Section 07 92 10 - Joint Sealing

.6 Section 09 91 13 – Painting

.7 Division 23 – Heating, Ventilating & Air Conditioning

1.2 REFERENCES

.1 Aluminum Association

.1 Designation System for Aluminum Finishes - 1997.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A 167-94, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A 366M-91(R1993), Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

.3 ASTM A 653/A653 M-90, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM B 32-95, Specification for Solder Metal.

.5 ASTM B 370-92, Specification for Copper Sheet and Strip for Building Construction.

.6 ASTM D 523-89(1993), Test Method for Specular Gloss.

.7 ASTM D 822-89, Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 1-GP-121M-93, Vinyl, Pretreatment Coating for Metals (Vinyl Wash Primer).

.4 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

1.3 SHOP DRAWINGS

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

.2 Indicate fabrication and erection details, including anchorage, accessories, and finishes.

1.4 SAMPLES

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

.2 Submit duplicate samples of each type of louvre and vent showing colour and finish.

.3 Show frame detail, screening and finish.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for manual or motorized operated louvres for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 MATERIALS

.1 Galvanized steel sheet: commercial quality to ASTM A 526M with Z275 zinc coating.

.2 Steel sheet: commercial quality to ASTM A 366 with Class I matte finish.

.3 Aluminum sheet: mill finish plain utility sheet.

.4 Aluminum extrusions: Aluminum Association alloy AA6063-T5.

.5 Solder: to ASTM B 32, 50% tin and 50% lead.

.6 Flux: suitable for materials to be soldered.

.7 Nails and fasteners: same material as fabricated items.

.8 Gaskets: vinyl.

.9 Primer: to CGSB 1-GP-121M for aluminum surfaces.

.10 General

.1 Storm Resistant Louvre by C/S Group or approved equal.
.2 Fixed Drainable Louver Model RS-5300
.3 Depth: to suit wall condition
.4 Blade Style: Drainable
.5 % Free Area: 50.4%

.11 Frames and blades to be 6063 alloy 2.06 mm (0.082”) thick.

.12 Mullions to be sliding interlock type.

.13 Louvres to have 6 mm mesh removable mill finish aluminum bird and bug screens.

.14 Design free area to suit Section 23 requirements.

2.2 FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.

.2 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative.

.3 Colour to match surface penetration.

Part 3 Execution

3.1 INSTALLATION

.1 Install louvres and vents where indicated.

.2 Set adjustable louvre blades for uniform alignment in open and closed positions.

.3 Adjust louvres so moving parts operate smoothly.

.4 Attach bird, insect screen to inside face of louvre or vent.

.5 Repair damage to louvres and vents to match original finish.

3.2 TEST DATA

.1 Submit test data showing that the louvers meet the published data of the model specified.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 05 41 00 – Light Gauge Structural Steel Framing

.3 Section 06 10 11 – Rough Carpentry

.4 Section 07 92 10 – Joint Sealing

.5 Section 09 91 13 - Painting

1.2 REFERENCES

.1 Aluminum Association

.1 Designation for Aluminum Finishes-1997.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM C36/C36M-01, Specification for Gypsum Wallboard.

.2 ASTM C79/C79M-01, Standard Specification for Treated Core and Non-treated Core Gypsum Sheathing Board.

.3 ASTM C442/C442M-01, Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.

.4 ASTM C475-01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.5 ASTM C514-01, Specification for Nails for the Application of Gypsum Board.

.6 ASTM C557-99, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.7 ASTM C630/C630M-01, Specification for Water-Resistant Gypsum Backing Board.

.8 ASTM C840-01, Specification for Application and Finishing of Gypsum Board.

.9 ASTM C931/C931M-01, Specification for Exterior Gypsum Soffit Board.

.10 ASTM C954-00, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.11 ASTM C960/C960M-01, Specification for Pre-decorated Gypsum Board.

.12 ASTM C1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.13 ASTM C1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.14 ASTM C1280-99, Specification for Application of Gypsum Sheathing Board.

.15 ASTM C1177-01, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.16 ASTM C1178/C1178M-01, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.3 Association of the Wall and Ceilings Industries International (AWEI)

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

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

.5 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.

.2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

.3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours 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.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Standard and fire board: to ASTM C36/C36M regular, and 12.5mm/16 mm, Type X, 1200 mm wide x maximum practical length, ends square cut, edges rounded.

.2 Gypsum exterior sheathing board: to ASTM C79/C79M, Georgia Pacific DENS Glass Gold or CGC Securock™ glass mat sheathing, 12.5mm/16 mm thick, Type X, 1200 mm wide x maximum practical length.

.3 Water-resistant board: to ASTM C630/C630M regular, 16 mm thick and Type X, 16 mm thick, 1200 mm wide x maximum practical length. (use in new washroom areas)

.4 Abuse Resistant Board: To CAN/ULC-S102-M88 ASTM C36/ C36N. Acceptable Material: Fiberock® Abuse-Resistant Drywall by CGC or Tough-Rock by Georgia-Pacific or approved alternate. Use on all framing over structural steel lintels and columns.

.5 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30.

.6 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.7 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.8 Nails: to ASTM C514.

.9 Steel drill screws: to ASTM C1002.

.10 Stud adhesive: to CAN/CGSB-71.25.

.11 Laminating compound: as recommended by manufacturer, asbestos-free.

.12 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process 0.5 mm base thickness, perforated flanges, one piece length per location.

.13 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted. Include splice plates for joints.

.14 Shadow mould: 35 mm high, snap-on trim, of 0.6 mm base steel thickness galvanized sheet pre-finished in satin enamel.

.15 Sealants: in accordance with Section 07 92 10 - Joint Sealing.

.16 Polyethylene: to CAN/CGSB-51.34, Type 2.

.17 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.

.18 Joint compound: to ASTM C475, asbestos-free.

.19 J-Molds to suit Board width.

.20 D-200 to suite Board width.

.21 Studio Wall Feature Modular Panel 300.35.SF by 3Form in 4’x8’ sheets back fastened. Pattern Type: Carve, Colour: Crystal White.

2.2 FINISHES

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

Part 3 Execution

3.1 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.13 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

.2 Apply single layer gypsum board to metal furring or framing using screw fasteners, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls in accordance with 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 Apply single layer gypsum board to concrete block surfaces, where indicated, using laminating adhesive.

.1 Comply with gypsum board manufacturer's recommendations.

.2 Brace or fasten gypsum board until fastening adhesive has set.

.3 Mechanically fasten gypsum board at top and bottom of each sheet.

.4 Exterior Soffits and Ceilings: Install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.

.5 Apply water-resistant gypsum board where wall tiles to be applied and adjacent to slop sinks. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.6 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.7 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

.8 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.

.9 Install gypsum board with face side out.

.10 Do not install damaged or damp boards.

.11 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 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. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.

.6 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Locate control joints where indicated at approximate 10 m spacing on long corridor runs and at approximate 15 m spacing on ceilings.

.9 Install control joints straight and true.

.10 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Install cornice cap where gypsum board partitions do not extend to ceiling.

.13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.14 Splice corners and intersections together and secure to each member with 3 screws.

.15 Install access doors to electrical and mechanical fixtures specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

.16 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.

.17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:

.1 Levels of finish:

.1 Level 0: No taping, finishing or accessories required.

.2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.

.3 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.

.4 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 Level 4: (Required throughout unless noted otherwise) Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

.6 Level 5: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

.18 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.

.19 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.

.20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.21 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.22 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.23 Mix joint compound slightly thinner than for joint taping.

.24 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.

.25 Allow skim coat to dry completely.

.26 Remove ridges by light sanding or wiping with damp cloth.

.27 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 05 41 00 – Light Gauge Structural Steel Framing

.3 Section 06 10 11 – Rough Carpentry

.4 Section 07 92 10 – Joint Sealing

.5 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM C645-[00], Specification for Non-structural Steel Framing Members.

.2 ASTM C754-[00], Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.40-[97], Primer, Structural Steel, Oil Alkyd Type.

.3 Environmental Choice Program (ECP).

.1 CCD-047a -[98], Paints - Surface Coatings.

.2 CCD-048-[98], Surface Coatings - Recycled Water-borne.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C645, 64, 89 and 150 mm stud size, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.

.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.

.3 Metal channel stiffener: 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.

.4 Acoustical sealant: to CGSB 19-GP-21M.

.5 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self-sticking adhesive on one face, lengths as required.

Part 3 Execution

3.1 ERECTION

.1 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.

.2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically at 400 mm on centre and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom, ceiling track using screws.

.6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.9 Install heavy gauge single jamb studs at openings.

.10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

.13 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.14 Extend partitions to ceiling height except where noted otherwise on drawings.

.15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 mm leg ceiling tracks. Use double track slip joint as indicated.

.16 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.2 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-In Place Concrete

.2 Section 04 22 00 – Concrete Masonry

.3 Section 07 92 10 - Joint Sealing.

.4 Section 09 21 16 – Gypsum Board assemblies

.5 Section 09 91 13 – Painting

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)

.1 ASTM F1066-99, Specification for Vinyl Composition Floor Tile.
.2 ASTM F1344-00, Specification for Rubber Tile.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
.2 CAN/CGSB-25.21-95, Detergent-Resistant Floor Polish.

1.3 CLOSEOUT SUBMITTALS

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Maintain air temperature and structural base temperature at flooring installation area above 20°C for 48 hours before, during and for 48 hours after installation.

1.6 EXTRA MATERIALS

.1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide 2 m^2 of each colour, pattern and type flooring material required for this project for maintenance use.

.3 Extra materials to be from same production run as installed materials.

.4 Clearly identify each container of floor tile and each container of adhesive.

.5 Deliver to Owner, upon completion of the work of this section.

.6 Store where directed by Owner.

Part 2 Products

2.1 MATERIALS

.1 Rubber nosing strips:

.1 Johnsonite – DTN-40 Top Set Vinyl

.2 Colour to be selected by consultant from manufacturers full range.

.2 Primers and adhesives: recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.

.3 Sub-floor cementitious leveler: as recommended by flooring manufacturer for use with their product.

Part 3 Execution

3.1 INSPECTION

.1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer.

3.2 SUB-FLOOR TREATMENT

.1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.3 Old vinyl flooring to be removed by trained personnel (may contain asbestos).

.4 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.

.5 Seal concrete to flooring manufacturer's printed instructions.

3.3 APPLICATION

.1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air re-circulate through a 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 SPEC NOTE: If other patterns or alignments are required show on drawings. Change the following paragraph to suit.

.4 SPEC NOTE: Check manufacturer's recommendations for rolling resilient tiles and for weight of roller.

.5 Install feature strips and floor markings where indicated. Fit joints tightly.

.6 Install flooring in pan type floor access covers. Maintain floor pattern.

.7 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

3.4 NOSING APPLICATION

.1 Install as per manufacturers printed instructions.

3.5 PROTECTION OF FINISHED WORK

.1 Protect new floors from time of final set of adhesives until final inspection.

.2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 05 50 00 – Metal Fabrications

.3 Section 06 20 00 – Finish Carpentry

.4 Section 06 40 00 – Architectural Woodwork

.5 Section 08 11 14 – Metal Doors and Frames

.6 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Conform to latest MPI requirements for exterior painting work including preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.

.7 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90^0 to surface.

.2 Soffits: No defects visible from floor at 45^0 to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly" E1 ratings based on VOC (EPA Method 24) content levels.

1.5 SUBMITTALS

.1 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used in accordance with Section 01 33 00 - Submittal Procedures.

.2 Upon completion, submit records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Material Safety Data Sheets (MSDS).

1.6 SAMPLES

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

.2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.3 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

.4 Submit full range of available colours where colour availability is restricted.

1.7 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit one - four liter can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

1.8 DELIVERY, HANDLING AND STORAGE

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

.2 Deliver and store materials in original containers, sealed, with labels intact.

.3 Labels shall clearly indicate:

.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.

.4 Remove damaged, opened and rejected materials from site.

.5 Provide and maintain dry, temperature controlled, secure storage.

.6 Observe manufacturer's recommendations for storage and handling.

.7 Store materials and supplies away from heat generating devices.

.8 Store materials and equipment in a well-ventilated area with temperature range 7^0C to 30^0C.

.9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.

.11 Remove paint materials from storage only in quantities required for same day use.

.12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.13 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.

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

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

1.9 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10^0C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with General Contractor and ensure its operation during and after application of paint as required.

.5 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.

.6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:

.1 ambient air and substrate temperatures are below 10^0C.

.2 substrate temperature is over 32^0C unless paint is specifically formulated for application at high temperatures.

.3 substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 the relative humidity is above 85% or when dew point is less than 3^0C variance between air/surface temperature.

.5 rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when maximum moisture content of substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only 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 only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10^0C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 WASTE MANAGEMENT & DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) 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.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

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

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

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.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 an approved legal manner in accordance with hazardous waste regulations.

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

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials, deliver to Owner.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

Part 2 Products

2.1 MATERIALS

.1 Painting materials such as primers, paints, rust-inhibiting agents, stains, fillers, topcoats, lacquers, etc. to be supplied by either: Benjamin Moore, Sherwin Williams, Para, Pittsburg, Pratt & Lambert or Glidden ICI only.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, shall:

.1 be water-based.

.2 be non-flammable

.3 be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.4 be manufactured without compounds which contribute to smog in the lower atmosphere.

.5 do not contain toxic metal pigments.

.5 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.7 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.0^0C or greater.

.8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

.1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.9 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

.10 Recycled water-borne surface coatings must contain 50% post-consumer material by volume.

.11 Recycled water-borne surface coatings must not contain:

.1 Lead in excess of 600.0 ppm weight/weight total solids.

.2 Mercury in excess of 50.0 ppm weight/weight total product.

.3 Cadmium in excess of 1.0 ppm weight/weight total product.

.4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.

.5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

.1 Consultant will provide Colour Schedule after Contract award.

.2 Colour schedule will be based upon selection of five base colours and five accent colours. No more than ten colours will be selected for the entire project and no more than five colours will be selected in each area.

.3 Selection of colours will be from manufacturers full range of colours.

.4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.5 Second coat in a three-coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Consultant's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

.5 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.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level Category/	Units @ 60E/	Units @ 60E/
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces shall be as specified herein.

.3 All corridors and public areas shall have semi-gloss finish. All other areas to be satin finish.

2.5 EXTERIOR FINISHES

.1 Exposed Steel Lintels, Non-prefinished metal louvres, and miscellaneous unfinished steel items:

.1 1 coat Sherwin Williams “Kem Kromik” Universal Metal Primer (alkyd), B50 Series.

.2 2 coats Sherwin Williams “Industrial Enamel” topcoat (alkyd), B54 Series, gloss finish.

.2 Miscellaneous Ferrous Metals:

.1 1 coat Sherwin Williams “Kem Kromik” Universal Metal Primer (alkyd), B50 Series.

.2 2 coats Sherwin Williams “Industrial Enamel” topcoat (alkyd), B54 Series, gloss finish.

.3 Steel Doors and Frames:

.1 1 coat Sherwin Williams “Kem Kromik” Universal Metal Primer, B50 Series.

.2 2 coats Sherwin Williams “Industrial Enamel” top coat (alkyd), B54 Series, gloss finish, spray applied.

.4 Exterior Wood:

.1 Sand and prep all blistering and peeling area for Consultant’ review prior to finish.

.2 2 coats Sherwin Williams “Duration Exterior Latex Coating”, satin finish.

.5 Textured Architectural Coating:

.1 Fill all voids in poured concrete with hydraulic cement patching compound

.2 Minimum 3 coats Niagara Protective Coatings “Liquistone 50” exterior textured wall coating, applied at spread rate of 80 – 120 sq. ft. per gallon, minimum 10 mil dft. Per coat; coating to be pre-pigment to match Consultant supplied sample; total number of coats to be applied should adequately conceal spiral sono-tube impressions throughout.

2.6 INTERIOR FINISHES

.1 Gypsum Wall Board Walls

.1 1 coat Sherwin Williams “Prep Rite 200” Primer, B28W200 Series

.2 2 coats Sherwin Williams “Harmony” Low-VOC Interior Acrylic, B9 Series, satin finish. Allow for 2 colours.

.2 Gypsum Wall Board Ceilings & Bulkheads:

.1 1 coat Sherwin Williams “Prep Rite 200” Primer, B28W200 Series.

.2 2 coats Sherwin Williams “Harmony” Low-VOC Interior Acrylic, B9 Series, flat finish.

.3 Steel Door and Frames and Miscellaneous Non-prefinished Steel items:

.1 1 coat Sherwin Williams “Kem Kromik” Universal Metal Primer, B50 Series, spray applied

.2 2 coats Sherwin Williams “Industrial Enamel” topcoat (alkyd) B54 Series, gloss finish, spray applied.

.4 Galvanized and Zinc coated Metals:

.1 2 coat Sherwin Williams “Galvite HS” primer, B50 Series, spray applied.

.2 2 coats Sherwin Williams “Industrial Enamel” topcoat (alkyd), B54 Series, gloss finish, spray applied.

.5 Exposed Underside of Metal Deck, Open Web Steel Joists, Exposed Ducts, etc.:

.1 2 coats Sherwin Williams “Waterborne Acrylic Dryfall”, B42 Series, eggshell finish, spray applied.

.6 Concrete Horizontal Surfaces:

.1 Sealer: INT 3.2F Concrete floor sealer.

Part 3 Execution

3.1 GENERAL

.1 Perform preparation and operations for exterior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.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.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Wood: 15%.

3.3 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 such 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.

.4 Protect passing pedestrians, building occupants and general public in and about the building.

.5 Removal of light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Consultant.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare exterior surfaces in accordance with MPI Painting Specification Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent (and bleach where applicable) and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 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.

.3 Where possible, prime 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.

.4 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.

.5 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/vacuum cleaning.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up, including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 Do not apply paint until prepared surfaces have been accepted by the Inspecting Agency.

3.5 APPLICATION

.1 Method of application to be as approved by Consultant. Apply paint by brush, roller, air sprayer, or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types 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 shall be free of roller tracking and heavy stipple unless approved by Consultant.

.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 properly 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 a uniform layer, with overlapping at edges of spray pattern.

.4 Brush out immediately runs and sags.

.5 Use brushes 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 and only when specifically authorized by Consultant.

.5 Apply coats of paint as a 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 projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Paint fire protection piping.

.5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

.1 Field inspection of exterior painting operations to be carried out by independent inspection firm as designated by Consultant.

.2 Advise Consultant when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Co-operate with inspection firm and provide access to areas of work.

3.8 RESTORATION

.1 Clean and re-install all hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashing 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 to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry

.2 Section 09 91 13 - Painting

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.186-1996, High Performance Glazed Coating System, Interior.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver and store materials undamaged in original containers with labels and seals intact.

.2 Store materials in in a single designated area having ambient temperature of a minimum of 15º C (59º F).

1.5 WASTE MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Safety.

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.

.2 Ensure no open flame heating devices are used.

.3 Post “Wet Coating” signs and “No Smoking” signs while work is in progress and while coating is curing.

.4 Discourage occupancy of treated space until volatile materials are no longer being emitted and there is no odour.

.5 Protect adjacent surfaces not scheduled to receive coating from damage.

.6 Erect suitable barriers to prevent traffic and other trades from working in areas during application of coating.

.7 Provide adequate respiratory protection to exposed individuals.

.2 Ventilation.

.1 Provide ventilation continuously during and after coating application. Run system 24 hours per day during application; provide continuous ventilation for 7 days after completion of application.

.2 Maintain a reasonably dust free atmosphere during application.

.3 Temperature.

.1 Maintain temperatures in area to receive coating at a minimum of 15º C (59º F) air temperature for at least 24 hours prior, during and until the applied coatings have cured.

.2 Maintain minimum temperature 10º C (50º F) within area of installation until final acceptance of building.

1.7 QUALITY ASSURANCE

.1 Application of coatings shall be carried out by skilled applicators approved by the manufacturer in accordance with manufacturers current written instructions.

Part 2 Products

2.1 MATERIALS

.1 Interior high build glazed coating materials: to CAN/CGSB-1.186 in colour and texture selected by Consultant from full range of colours and textures.

.2 New concrete block walls: HBGC.

.1 Prime coat: cementitious type – Block Filler.

.1 Paint: Latex Paint – Flat finish. Colour selected by Architect. Refer to painting section.

.2 Finish coat: semi-gloss finish. Poly-Teks Glaze

.3 Acceptable material: Poly-Teks Glaze W.B. by Niagara Protective Coatings with compatible block filler and clear coat.

.3 Existing masonry and GWB walls: HBGC.

.1 Prepare surface as per section 09 21 16, Gypsum Board Assemblies and section 04 22 00 masonry.

.1 Paint: Latex Paint – Flat finish. Colour selected by Architect. Refer to painting section.

.2 Finish coat: semi-gloss finish. Poly-Teks Glaze.

Part 3 Execution

3.1 EXAMINATION

.1 Surfaces to be coated shall be sound, clean, non-dusting, cured, free from oil and efflorescence or any other contaminants.

.2 Report to Consultant all defects and unsatisfactory conditions. Commencement of work implies acceptance of existing conditions.

.3 Concrete must be cured 28 days with no more than 3% moisture content prior to coating application.

3.2 PREPARATION

.1 Prepare surfaces in accordance with CAN/CGSB-1.186.

.2 Mask surrounding surfaces to provide neat, clean juncture lines.

.3 Protect adjacent surfaces and equipment from damage by overspray.

.4 Remove any contamination, including grease and oil using an industrial cleaner

.5 Mechanical abrasions of the concrete surfaces is required to remove any loose, poorly bonded finishes and also create a surface profile for a mechanical bond. This will require the use of shot-blast machinery, sandblasting, scarifies or diamond grinding.

.6 Ensure the method of mechanical abrasions are dust free.

.7 Patch any uneven or damaged concrete prior to application of coating.

3.3 MIXING

.1 Prepare and mix materials and apply each component of coating system in accordance to manufacturer’s instructions.

3.4 APPLICATION

.1 Apply coating to produce smooth surface, uniform in sheen, colour and finish, free from marks, dirt, particles, runs, crawls, curling, holes, air pockets and other defects and to achieve smoothness index in accordance with CAN/CGSB-1.186.

.2 Apply coatings in accordance to manufacturer’s current written instructions.

3.5 CURING

.1 Coatings will be tack free within 10-12 hours at 22º C (72º F). Coating will support light traffic at 24 hours and will reach full cure and full chemical resistance in 7 days.

3.6 CLEANING

.1 Clean surfaces to coating manufacturer's printed instructions.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 These Specifications are an integral part of the Contract Documents. Tendering and Contract Requirements, General Requirements apply to all Division 20 Specification Sections.

.2 Work in the Specifications is divided into descriptive Sections which are not intended to delegate functions or work to any specific Subcontractor or identify absolute contractual limits between Subcontractor, nor between the Contractor and his Subcontractor. The requirements of any one Section apply to all other Sections, for example: the motor service factor requirement. Refer to other Divisions and Sections to ensure a completed operational product and fully coordinated standard of work.

.3 The direction to 'provide' equipment, materials, products, labour and services shall be interpreted to 'supply, install and test' the Division 20 work indicated on the Drawings and specified in the Specifications.

.4 Provide and include in the Contract Price Division 20 work including mechanical components and normal system accessories not shown on the Drawings or stipulated in the Specifications, and required to ensure completed operational systems and a fully coordinated standard of Work acceptable to the Consultant and all authorities having jurisdiction.

.5 All mechanical work noted within the specification and drawings shall be performed by **RES** and drawn against the cash allowance noted in Section 01 21 00

.1 Ryan McAndrews

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1.2. INTENT /PHASING

.1 Mention in the Specifications or the indication on the Drawings of equipment, materials, operation and methods, requires provision of the quality noted, the quantity required, and the systems complete in every respect.

.2 Consider the Specifications as an integral part of the accompanying Drawings. Any item or subject omitted from one or the other, but which is either mentioned or reasonably implied, shall be considered as properly and sufficiently specified.

.3 Where there is apparent contradiction or ambiguity in the documents, or where there are apparent discrepancies in or omissions from the documents, or if there is any doubt as to the intent of the documents, the bidder shall request and obtain written clarification(s) from the Consultant prior to submitting a tender. Consideration will not be granted for misunderstanding of the intent of the documents or the extent of the work to be performed.

.4 Be completely responsible for the acceptable condition and operation of all systems, equipment and components forming part of the installation or directly associated with it. Promptly replace defective materials, equipment and parts of equipment and repair related damages.

.5 Phasing shall be scheduled with the Owner and general contractor.

1.3. METRIC PRACTICE

.1 Conform to Canadian Metric Practice Guide CSA CAN3-Z234.1-89.

.2 Provide adapters between metric and imperial installations.

.3 Metric descriptions in this Division are nominal equivalents of Imperial values.

1.4. COORDINATION

.1 Coordinate and schedule Division 20 work with all other work in the same area or with work which is dependent upon Division 20 work so as to facilitate mutual progress.

.2 Identify and resolve interference problems prior to prefabrication and installation of equipment. Submit interference drawings for review upon Consultant Request.

.3 Examine the site and all Contract Documents prior to bid submission. No allowance will be made for any difficulties encountered due to any features of the building, methods of construction, site or surrounding public and private property which existed up to the bid close.

1.5. REFERENCE STANDARDS

.1 Provide new materials and equipment of proven design and quality. Provide current models of equipment manufactured in Canada or the United States, unless specified otherwise, with published ratings certified by recognized North American testing and standards agencies.

.2 Select Canadian made materials and equipment and other equipment to maximize the Canadian content of the Work.

.3 Workmanship and installation methods shall conform to the best modern practice. Employ skilled tradesmen to perform work under the direct supervision of fully qualified personnel.

.4 Install equipment in strict accordance with manufacturers written recommendations.

.5 Meet ASHRAE and other industry standards in the selection and provision of equipment, materials, pipe and duct components and systems.

.6 Meet ASHRAE/IES 90.1, 1989 Standards for the supply and installation of all equipment.

.7 Meet the additional selection, sizing and performance criteria specified in this Specification.

1.6. DRAWINGS AND MEASUREMENTS

.1 Drawings show general design and arrangement of mechanical system installation, and are diagrammatic. Obtain further clarification of Drawings or Specifications from Consultant prior to installation.

.2 Drawings do not indicate exact Architectural, Structural or Electrical features. Examine Drawings prior to laying out.

.3 Do not scale Drawings to order materials. Take field measurements before ordering and fabricating materials.

.4 Clarify 'roughing-in' requirements of equipment which is not part of Division 20 work before proceeding.

.5 Leave areas clear where space is indicated as reserved for future equipment and where space is required to maintain equipment. Maintenance clearances in addition to providing for servicing of equipment, shall allow for removal and reinstallation of replaceable items such as motors, coils and filters.

1.7. REGULATORY REQUIREMENTS

.1 Meet the requirements of Division 1.

.2 Meet the requirements and recommendations of all Municipal, Provincial and Federal Bylaws and Ordinances.

.3 Do not reduce the quality of work specified and/or shown on the Drawings because of regulatory requirements.

.4 In general, and as applicable, the physical and chemical properties, the characteristics and the performance of Division 20 work shall meet the requirements of recognized agencies including those listed herein:

AMCA	-	Air Moving & Conditioning Association
ADC	-	Air Diffusion Council
ANSI	-	American National Standards Institute
ARI	-	Air Conditioning & Refrigeration Institute
ASHRAE	-	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AWWA	-	American Water Works Association
CGA	-	Canadian Gas Association
CGC	-	Consumers Gas Company
CGSB	-	Canadian General Standards Board
CIRI	-	Canadian Industrial Risk Insurers
CSA	-	Canadian Standards Association
CTI	-	Cooling Tower Institute
FCC	-	Federal Communication Commission
FM	-	Factory Mutual
IAO	-	Insurers Advisory Organization
MMC	-	Marsh McLennan Insurance Protection Consultants
MTC	-	Ministry of Transportation and Communication
NBCC	-	National Building Code of Canada
NFPA	-	National Fire Protection Association
OBC	-	Provincial Ontario Building Code
OFM	-	Local Fire Codes or Standards Ontario Fire Marshall

OH	-	Ontario Hydro Special Inspection Department
OME	-	Ontario Ministry of Environment
OML	-	Ministry of Labour and Workmen's Compensation Requirements
OWRA	-	Ontario Plumbing Code
TBD	-	Local Building Codes City of Toronto, Buildings Department
UL	-	Underwriter's Laboratories Inc.
ULC	-	Underwriter's Laboratories of Canada

.5 Give all necessary notices, obtain all permits and pay for all governmental fees, taxes and other costs in connection with the work. File all necessary Contract Documents, prepare submissions and obtain approvals of regulatory bodies having jurisdiction.

.6 Comply with the requirements of the Model National Energy Code for Buildings in the selection, application and installation of all mechanical equipment and systems.

1.8. CHANGES TO CONTRACT WORK

.1 Do not proceed with any changes to the Work without written authority from the Owner.

.2 Follow procedures outlined in Tendering and Contract Requirements for administration and execution of Contract revisions.

.3 Quotations for changes to Division 20 work shall be based on the actual cost of the work:

.1 For Equipment - The latest edition of the Allpriser, including all applicable discounts or actual invoices where costs are not published.

.2 For Labour Rates –

.1 The Mechanical Contractors of America (MCA) published rates, Latest Edition, and as modified by negotiations.

.2 SMACNA.

.3 National Electrical Contractors Estimating Manual.

.3 Markup for overhead and profit as defined in the Contract General Conditions.

.4 Where changes are extensive, or where requested by the Consultant, material and labour take-off shall be organized on a drawing by drawing basis, or area by area basis to more readily facilitate verification of quantities and labour hours.

1.9. WARRANTY

.1 Meet the requirements of Tendering and Contract Requirements.

.2 Unconditionally warrant all equipment, material and workmanship for not less than one year from date of Substantial Performance of the Work, or for longer periods when stated elsewhere in the Specifications.

.3 If any equipment or material does not match the manufacturer's published data or specially supplied rating schedules during performance tests, replace without delay the defective

equipment or material. Bear all associated costs of replacement without charge to the Owner. Adjust all components to achieve the proper ratings.

.4 The Owner will give notice of observed defects promptly in writing.

.5 Promptly correct defects and deficiencies which originate during the warranty period. Pay for resulting damage.

.6 Payment against cash allowances will be made only upon receipted verification of approved statements. Copies of supplier's invoices will be required to substantiate charges against an allowance.

.7 Do not charge labour, administration, overhead and profit from cash allowance. It is deemed to be included in Contract Price.

.8 Remaining portion of cash allowances not authorized for use shall revert to Owner.

PART 2 - SUBMITTALS

2.1. SHOP DRAWINGS

.1 Meet the requirements of Section 01 00 05. Submit one (1) copy of shop drawings electronically for Consultant review. One (1) copy will be returned to the General Contractor bearing comments. Include all cost for reproduction of sufficient copies of reviewed shop drawings for manuals, site forces and coordination among other trades. Where submissions are not readily reproducible in photocopy form, provide mylor/vellum copy in addition to two (2) prints.

.2 Identify Shop Drawing by Specification index reference and project name.

.3 Review all Shop Drawings prior to submittal and clearly certify as 'Correct for Review by Consultant'. Show company name, date and sign all Shop Drawings.

.4 Consultant review of Shop Drawings does not relieve the Contractor of full responsibility for errors, necessity to check Shop Drawings, furnish materials and equipment and perform work required by the Contract Documents.

.5 Clearly identify all components, accessories, including options to be supplied with each item.

2.2. ALTERNATIVE MANUFACTURER AND SUPPLIER

.1 Equipment and materials are specifically described for the purpose of indicating standards of quality and workmanship. Base Bid on the items specified and shown on Drawings.

.2 Maximize the Canadian content of all equipment and materials used on this project.

.3 Alternatives for equipment or materials considered equal in quality and performance may be submitted with the Bid Form. Supply with each alternative, following bid submission, upon request by Consultant, the following information:

.1 details of manufacture

.2 dimensions including required clearance

.3 performance data

.4 the cost saving for piping, ductwork and electrical changes imposed by the alternative

.5 the effect upon and estimated cost to other trades

.6 Canadian content percentage

.4 Where alternatives are accepted, there will be no further cost allowances for subsequent changes in Division 20 work or other Contracts to make the alternative complete and equal to the specified equipment and materials.

.5 If alternative equipment, differing from that which is shown on Drawings is accepted, prepare when requested, equipment layouts at no extra cost. Show clearly in plan, elevations and sections, all equipment details including dimensional changes. Show location changes to ducts, pipes and wiring and the effect of these changes on the building. Drawings shall be {1:50} [1/4"=1'0”] scale.

.6 The right is reserved to accept or reject any alternative.

2.3. COORDINATION DRAWINGS

.1 Prior to commencement of work, submit for Consultant review, pipe, duct and equipment interference and sleeving drawings for each floor level and for all Division 20 work. Drawings must be coordinated and certified correct for review.

.2 Coordination drawings shall be to a scale sufficient to show the necessary details. Submit for review, using the same procedures as specified for Shop Drawings.

.3 Prepare drawings in conjunction with other Divisions, wherever possible conflict due to the positioning of Division 20 equipment, piping or ductwork exists.

.4 Dimension proposed location of Division 20 work with respect to building elevations and established grid lines.

.5 Prepare fully dimensioned detail drawings of all shafts, duct spaces and pipe spaces. Show sleeving, recessed and formed holes required in concrete for Division 20 work. Include information pertaining to access, clearances, tappings, housekeeping pads, drains and electrical connections.

.6 Base information used to prepare drawings on reviewed Shop Drawings.

.7 Provide field drawings with position of various services when required by Consultant.

.8 Submit a list of access doors and panels showing proposed type, size and location. Coordinate drawings with Architectural detail drawings and reflected ceiling plans prior to submission.

2.4. RECORD DRAWINGS

.1 Meet the requirements of Section 01 00 10.

.2 Suitably store and protect drawings on site and make available at all times for inspection.

.3 Record inverts of underground piping at building entry/exit and below floor slab at each branch, riser base, change in direction as well as at least three points on straight runs.

.4 Show locations of access doors and panels and identify the equipment and components that they serve.

2.5. OPERATING AND MAINTENANCE MANUALS

.1 Meet the requirements of Section 01 00 10.

.2 Submit one copy for review at least two weeks before instructions to Owner are commenced.

.3 Submit two copies of final manuals to the consultant.

.4 Submit one hard copy and one electronic copy of final manuals to the owner.

.5 Ensure that the terminology used in various sections of the manual is consistent.

.6 Each manual shall contain the following information:

.1 description of each system with description of each major component of system

.2 complete sets of page size equipment Shop Drawings

.3 equipment manufacturer’s installation, startup and operation manuals

.4 equipment manufacturer’s recommended spare parts lists

.5 equipment wiring diagrams

.6 lubrication schedule for all equipment

.7 equipment identification list with serial numbers

.8 page size valve tag schedule and flow diagrams

.9 final balancing reports

.10 water treatment procedure and tests

.11 control drawings, sequences of operation

.12 extended warranty documentation if applicable

PART 3 - EXECUTION

3.1. INSPECTION, TESTING AND CERTIFICATES

.1 Periodic inspections of the work in progress will be made to check general conformity of the work to the Contract Documents. Observed deficiencies will be reported. Correct deficiencies immediately.

.2 Meet the requirements of all laws, bylaws, codes, regulations and authorities having jurisdiction.

.3 Where the Contract Documents, instructions or the governing authorities require Division 20 work to be tested, inspected or approved, give sufficient notice of its readiness for inspection and schedule the date and time for such inspection.

.4 Uncover Division 20 work that is covered up without consent, upon Consultant request, for examination and restore at no extra cost to the Owner.

.5 Furnish certificates and evidence that Division 20 work meets the requirements of authorities having jurisdiction.

.6 Correct deficiencies immediately upon notification.

3.2. COMPLETION

.1 Meet the requirements of Sections 01 00 10 and 01 78 00.

.2 Remove all debris from inside Division 20 systems and equipment.

.3 Rectify deficiencies and complete work before submitting request for Substantial Performance inspection.

.4 Follow manufacturer's written instructions regarding bearing lubrication. Remove grease from pillowblock type bearings and install new grease before equipment is put into operation.

.5 Check and align all drives to manufacturer's acceptable tolerances.

.6 Adjust belts for proper tension.

.7 Check and align all pumps to manufacturer's acceptable tolerances.

.8 Remove all temporary protection and covers.

.9 Remove oil and grease from equipment and bases.

.10 Clean all fixtures and equipment. Polish all plated surfaces.

.11 Vacuum clean the inside of all air handling systems, including fans, ducts, coils and terminal units to ensure that they are free from debris and dust.

.12 Change air and water filters.

.13 Remove, clean and reinstall pipeline strainer screens.

.14 Leave Division 20 work in as new working order.

3.3. REMOVAL AND REUSE OF EXISTING MATERIALS

.1 Carry out demolition work in accordance with the Occupational Health and Safety Code.

.2 Remove existing equipment, services and obstacles where required for refinishing or restoring existing surfaces. Replace same as work progresses.

.3 Present to the Owner existing material and equipment removed but not identified for reuse on site. Acceptance of removed material and equipment is at discretion of Owner. Remove such items from site when deemed unsuitable.

.4 The Owner will relocate equipment from existing facilities to the new building over a time period to be scheduled.

.5 Where computer room air conditioning equipment is indicated to be existing, include for the disconnection and removal of this equipment from the location of existing equipment. Include for protection of the equipment per equipment manufacturer's recommendations, transport to the new building and position to locations shown on the Drawing.

Prepare new site for immediate conversion and connection of reused equipment. Carry out all preparatory work, measurements, prefabrication, etc., without interruption of existing services. All work to disconnect, remove, relocate, convert, connect, test and commission reused equipment shall be performed during a two-day weekend shutdown period. Include premium time in the Contract Price.

.6 Execute work with least possible interference or disturbance to Owner and to other work taking place over the same time period.

.7 Use only elevators assigned for Contractor use for moving men and material within buildings. Protect walls of elevators to satisfaction of Owner prior to use and accept liability for damage, safety of equipment and overloading of existing equipment.

3.4. PROTECTION OF OWNER'S PREMISES

.1 Adhere strictly to the Owner's requirements.

.2 Confer with the Owner concerning schedule, dust and noise control prior to commencing work in or adjacent to existing facilities where such work might affect either those facilities or their occupants.

.3 Execute work with least possible interference or disturbance to occupants, public and normal use of premises.

.4 Provide temporary means to maintain security when security has been reduced by Division 20.

.5 Only elevators, dumbwaiters, conveyors or escalators assigned for Contractor's use may be used for moving men and material within building. Protect walls of passenger elevators, to approval of Owner prior to use. Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Provide temporary dust screens, barriers, warning signs in locations where renovations and alteration work is adjacent to areas which will be operative during work.

.7 Drawings indicate approximate locations of known existing underground and above ground facilities. Avoid damage to existing services. Bear cost of repairs and replacements.

.8 Immediately advise Consultant when unknown services are encountered and await instructions.

.9 Accept liability for costs incurred by the Owner in repairing and cleaning equipment, etc., resulting from failure to comply with the above requirements.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Provide all labour, materials, products, equipment and services to supply and install the basic mechanical materials indicated on the Drawings and specified in Division 20 of these Specifications.

1.2. IDENTIFICATION OF MECHANICAL SERVICES

.1 Identify all mechanical services after finish painting is complete.

.2 Use terminology consistent:

.1 with the Drawings and Specifications

.2 with the Owner's requirements and standards.

.3 Identify lay-in type acoustic ceilings used for access to equipment and components by a method acceptable to Consultant.

.4 Mark valve and equipment identification on Record Drawings.

.5 Provide typewritten master lists for each Equipment Room. Frame under glass. Insert copies in Operating and Maintenance Instruction Manuals.

1.3. PIPE AND DUCTWORK IDENTIFICATION

.1 Provide SMS Wrap-Mark on all pipe coverings, using Wrap-Mark pipe markers with flow arrow and alternating wording. For outside diameters up to {150 mm} [6"], allow marker to completely wrap pipe. For larger outside diameters, secure markers with stainless steel springs. Secure markers on vertical piping and elsewhere where markers could be inadvertently moved.

.2 Use stencils and stencil paint on ductwork or ductwork insulation. Apply solid black capitalized lettering {50 mm} [2"] high and solid black flow arrows {150 mm} [6"] long x {50 mm} [2"] wide.

.3 Locate identification and flow arrows so they can be seen clearly from floor and service platforms

.1 at least once in each room

.2 at each piece of equipment

.3 at each branch close to connection point to main piping and ductwork

.4 at not greater than intervals of {15 metres} [50 ft] on straight runs of exposed piping and ductwork

.5 at entry and leaving point to pipe and duct chases, or other concealed spaces

.6 both sides where piping and ductwork passes through walls, partitions and floors

.7 on vertical pipes and ducts approximately {1800 mm} [6 ft] above floor

.8 behind each access door and panel

.9 at valves, identify piping upstream of valves and identify branch, equipment, building part or building serviced downstream of valve

.4 Colour code pipes to meet code and Owner's requirements. At minimum, colour code pipes with {50 mm} [2"] wide bands in accordance with the detail shown on the drawings.

.5 Identify electrical tracing of pipes on pipe insulation.

1.4. VALVE TAGS

.1 Provide {40 mm} [1-1/2"] dia., {1 mm} [0.040"] thick brass tags with {10mm} [3/8"] high die-stamped black letters.

.2 Attach to valves with {100 mm} [4"] long brass chains.

.3 Tag all valves except for small valves isolating a single piece of equipment such as a unit heater, fan coil unit, terminal reheat coil and radiation section.

1.5. EQUIPMENT NAMEPLATES

.1 Identify equipment, starters, and, remote control devices in a manner consistent with the Drawings.

.2 Use solid black capitalized lettering {100 mm} [4"] high.

.3 Where equipment size does not permit stencil identification, use lamacoid labels, engraved white on black, mechanically fastened to the equipment. Minimum lettering size {10 mm} [3/8"].

1.6. CONTROLS IDENTIFICATION

.1 Meet Section 25 50 00 requirements.

PART 2 - PRODUCTS

2.1. PIPE HANGERS

.1 Provide pipe hangers and supports for all piping. Provide hangers in accordance with the following requirements. Provide steel supports in accordance with the subsequent article in this specification section. Provide galvanized steel hangers and supports with galvanized fittings and accessories where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.

.2 Provide manufactured hangers, accessories and supports in accordance with ANSI B31.1 and MSS SP58, SP69, SP89 and SP90 similar to the Grinnell or Myatt figures numbers below.

.3 Select products to ensure adequate safety factors under anticipated loads.

.4 Provide upper attachments as follows:

.1 Standard beam clamp for normal service - Grinnell Fig 133 with Fig 290 or Fig 278 or Myatt Fig 500 with Fig 480 or Fig 440.

.2 Standard side beam clamp for normal service - Grinnell Fig 225 or Myatt Fig 505.

.3 Top beam clamp - Grinnell Fig 92 or Myatt Fig 406.

.4 C clamp - Grinnell Fig 86 or Myatt Fig 586.

.5 Angle clip for light duty side mounting - Grinnell Fig 202 or Myatt Fig 542.

.5 For vertical adjustment of hanger rods, provide forged steel turnbuckle - Grinnell Fig 230 or Myatt Fig 475.

.6 Provide pipe attachments as follows:

.1 Adjustable swivel rings for uninsulated fire service piping - ULC and FM approved - Grinnell Fig 69 or Myatt Fig 41.

.2 Clevis hanger for copper piping up to and including {100 mm} [4"] diameter - Grinnell Fig CT-65 plastic coated or Myatt Fig 56 epoxy coated.

.3 Swivel ring hanger for copper tubing up to and including {25 mm} [1"] diameter - Myatt Fig 43 epoxy coated.

.4 Standard duty clevis hanger for steel piping - Grinnell Fig 260 or Myatt Fig 124.

.5 Standard duty long clevis hanger for steel piping - Grinnell Fig 300 or Myatt Fig 124L.

.7 Provide vertical pipe supports as follows:

.1 Riser clamp for copper pipe - Grinnell Fig CT121C plastic coated or Myatt Fig 186 epoxy coated.

.2 Riser clamp for steel or cast iron pipe - Grinnell Fig 261 or Myatt Fig 182 or Fig 183.

.8 Provide supports for other piping types such as plastic, mechanically fused or packed joint pipe according to the pipe manufacturer's published recommendations. Support piping continuously where required to prevent sagging.

.9 Provide protection saddles where insulated piping is supported from below.

.1 For high temperature insulated pipe - Grinnell Fig 160 or Fig 165 or Myatt Fig 210 or Fig 240.

.2 For insulated pipe with vapour barrier for low temperature service, insulate pipe with calcium silicate at hangers and provide Grinnell Fig 167 or Myatt Fig 251.

.10 Provide roll type supports where shown on the drawings and where longitudinal movement may occur. Provide single pipe rolls - Grinnell Fig 177 or Myatt Fig 262 where supported from below and Grinnell Fig 171 or Myatt Fig 261 where suspended. Provide spring cushions where slight vertical movement is likely and cushioning required - Grinnell Fig 178 or Myatt Fig 880.

.11 Provide Grinnell or Myatt engineered constant support hangers on piping subject to vertical movement exceeding {40 mm} [1 1/2"] due to vertical pipe expansion.

2.2. EQUIPMENT RIGGING SUPPORTS

.1 Provide eyebolts suitable for block and tackle connection, adequately supported by the structure above for:

.1 chiller and condenser shell heads

.2 heat exchanger and shell heads

.3 sewage and bilge pumps

.4 pumps in Mechanical Equipment Rooms

.5 motors

.6 other equipment which will require block and tackle handling

2.3. SLEEVES, WALL AND FLOOR PLATES

.1 For pipe sleeves, use machine cut and reamed standard weight steel piping.

.2 Concealed perimeter risers and runouts may have sleeves of {1.31 mm} [18 gauge] galvanized steel set around section of insulation to provide freedom of movement of piping. Extend {50 mm} [2"] above finished floor level.

.3 For piping through exterior walls, cooperate with the waterproofing trade at all times, and do not break any waterproofing seal without consent of the waterproofing trade. Provide waterproof link seals as detailed on Drawings.

.4 Provide leak plates where pipe sleeves pass through exterior building walls. Each leak plate shall be a {3.42 mm} [10 gauge] steel plate, welded to the sleeve, {100 mm} [4"] diameter greater than sleeve outside diameter.

.5 Provide {1.31 mm} [18 gauge] galvanized steel duct sleeves. Provide adequate bracing for support of sleeves during concrete and masonry work. For fire rated floors and walls, build fire damper assemblies into structure to attain fire rated construction, in a manner acceptable to the governing authorities.

.6 Cover pipe sleeves in walls and ceilings of finished areas, other than Equipment Rooms, with satin finish stainless steel, or satin finish chrome or nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks, however, may be used.

.7 Cover exposed duct sleeves in finished areas with {1.31 mm} [18 gauge] galvanized steel plates in the form of duct collars. Fix in position with non-ferrous metal screws.

2.4. PROVISION FOR PIPE EXPANSION, CONTRACTION AND BUILDING SHRINKAGE

.1 Where space limitations do not permit the use of expansion loops or offsets, provide Flexonics Expansion Joints properly selected for system operating pressures according to the following:

.1 For piping up to and including {65 mm} [2-1/2"], select ends to suit specified pipe fittings. Pressure shall be external to the bellows. Pressure ratings for Model H and HB expansion compensated as {1400 kPa} [200 psi] and {1050 kPa} [150 psi].

.2 Steel Piping - Flexonics Model H expansion compensator with two ply stainless steel bellows.

.3 Copper Piping - Flexonics Model HB expansion compensator with two ply bellow, all bronze construction.

.4 For piping {75 mm} [3"] and above, use flanged ends.

.5 Steel Piping - Flexonics controlled, flexing expansion joint with stainless steel pressure carrier, flanged ends.

.6 Copper Piping - Flexonics controlled, flexing expansion joint with monel pressure carrier, and brass flanged ends.

.7 Provide Victaulic 150/155 expansion joints for Victaulic piping systems.

.8 Submit for Consultant review prior to installation, drawings showing the location of expansion joints, anchors and guides. Show details of proposed connection to structure and loads to be imposed. All Drawings must be signed by a Professional Engineer registered in the Province of Ontario.

2.5. ACCESS DOORS AND PANELS

.1 Provide access to concealed mechanical equipment and components which require inspection, adjustment, repair and preventive maintenance. Install systems and components to result in a minimum number of access doors and panels. Install equipment and components in locations readily accessible through doors and panels.

.2 Supply for installation by Other Contractors, doors, panels and frames. Ensure that access doors and panels are properly located.

.3 Select access doors and panels to suit Architectural finishes and large enough to provide adequate access to equipment and components. Where personnel must pass through, provide {600 mm x 450 mm} [24" x 18"] minimum size doors and panels. Otherwise, provide {300 mm x 300 mm} [12" x 12"] minimum size doors and panels.

.4 Provide access doors and panels with a fire rating required by the code governing the fire rating of the structure.

.5 In tile walls, and washroom walls, supply minimum {2.78 mm} [12 gauge] Type 304 stainless steel with #4 finish, with recessed frame secured with stainless steel countersunk flush head screws.

.6 For all other surfaces, supply minimum {2.66 mm} [12 gauge] welded steel, flush type with concealed hinges, lock and anchor strap, and factory prime coat finish.

2.6. FLASHING

.1 Flashing will be carried out under Division 07 roof curbs and exterior wall penetrations shown on the Architectural or Structural Drawings.

.2 Provide flashing for pipe openings or premanufactured roof curbs.

.3 Carry out all counterflashing for roof mounted mechanical equipment and for pipes and ducts passing through roof. Fit counterflashing over flashing or curb. Pitch pockets are not acceptable.

2.7. CURBS

.1 Curbs required for Division 20 work and shown on the Structural or Architectural Drawings will be carried out under other Divisions of the Specifications.

.2 Premanufactured curbs for mechanical equipment mounted on roof will be supplied by equipment manufacturer and they are specified under other Sections of this Division.

.3 Curbs are required for roof mounted equipment, around ducts passing through roof and surrounding holes where groups of pipes and/or ducts pass through Equipment Room floors, Kitchens and similar areas where water dams are required.

.4 Provide roof curbs at least {300 mm} [12"] above finished roof, unless exceeded by Architectural considerations.

.5 Provide concrete curbs around holes in Equipment Room floors, extending at least {150 mm} [6"] above finished floor. Make watertight connection between curb and floor.

2.8. FIRESTOPPING

.1 Provide ULC classified firestopping products by 3M or Hilti which have been tested in accordance with CAN4-S115.

2.9. PIPE, DUCT AND EQUIPMENT INSTALLATION

.1 Locate distribution systems, equipment and materials for maximum usable space, optimum service clearances and to accommodate current requirements and identified future expansion.

.2 Coordinate Division 20 services installation above typical floor modular ceilings to allow installation and future relocation of lights and air troffers without interfering with or requiring relocation of mechanical, electrical or other services, or removal of ceiling grid.

.3 Include all pipe and duct offsets required to eliminate interference with the work of other Divisions.

.4 Install equipment and materials to present a neat appearance. Run piping, ducts and conduit parallel to or perpendicular to building planes. Conceal piping, ducts and conduit in finished areas. Install so as to require a minimum amount of furring.

.5 Install pipe, duct and conduit straight, parallel and close to walls and slab or deck underside, with specified pitch.

.6 Use standard fittings for all direction changes. Do not use drilled tees and other field fabricated fittings.

.7 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.

.8 Where pipe sizes differ from connection sizes of equipment, provide reducing fittings between inline components such as valves, strainers and fittings, and equipment. Reducing bushings are not permitted.

.9 Cap open ends of piping during installation.

.10 Lay copper tubing so that it is not in contact with dissimilar metal and will not kink or collapse.

.11 Use non-corrosive lubricant or teflon tape equal to Dow Corning and apply on male thread.

.12 Provide brass adaptors or dielectric couplings wherever dissimilar metals are joined.

.13 No pipe to be laid in water or when, in opinion of Consultant conditions are unsuitable.

.14 Protect buried copper and steel piping with Tapecoat materials using procedures recommended by Tapecoat Company of Canada Limited, or other approved manufacturer.

.15 Ensure that pipe installation does not transmit vibration to the walls and floors through which they pass.

.16 Make provisions for neat insulation finish around equipment and materials. Do not mount equipment within insulation depth.

.17 In electrical rooms and elevator machine rooms, provide drip trays under the entire length of all pipe within the confines of the room. Pipe drip tray to nearest floor drain.

.18 Perform pipe welding to meet ANSI B31.9.

2.10. CONNECTIONS TO EQUIPMENT

.1 Provide unions or flanges at all connections to equipment. Ensure that piping adjacent to equipment is readily removable for servicing and/or removal of equipment without shutting down entire system.

.2 Install unions in piping up to and including {50 mm} [2"] pipe size. Install flanges in piping {65 mm} [2-1/2"] pipe size and larger.

.3 Prevent galvanic corrosion by isolating copper and steel. Use red brass adapters, or completely isolate flanges using full face gaskets with bolts installed through phenolic sleeves with insulating fibre washers. Where the Plumbing Code prohibits the use of red brass adapters, use insulating couplings. Where system valves are required, solid brass isolating valves may be used in lieu of adapters or couplings.

.4 Provide metallic code rated continuity link between flanges or unions, where pipe mains carry flammable fluids or gases.

.5 Make all plumbing and sheet metal connections to equipment provided by the Owner.

2.11. HANGERS

.1 Suspend piping, ductwork and equipment with all necessary hangers and supports required for a safe and neat installation. Ensure that pipes are free to expand and contract and are graded properly. Adjust each hanger to take its full share of the weight.

.2 Suspend hanger rods directly from the structure. Do not suspend pipes, ducts or equipment from other pipes, ducts, equipment, metal work or ceilings.

.3 Provide auxiliary structural steel angles, channels and beams where ductwork, piping and equipment must be suspended between joists or beams.

.4 Use galvanized rods, steel support angles, channels and beams where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.

.5 Space hangers to ensure that structural steel members are not over stressed. In no case shall pipe hangers be further apart than indicated in the tables. When requested, submit detailed drawings showing locations and magnitude of ductwork, piping and equipment loads on the structure. Provide calculations when requested by Consultant.

.6 Do not use trapeze type hangers for support of piping, without prior review by Consultant. Where permitted, fabricate from angle or channel frames, and space hangers to suit the smallest pipe size.

.7 Do not use hooks, chains or straps to support equipment and materials.

.8 For precast concrete work, if inserts cannot be cast into members, pass hanger rods between the members and weld to steel plates resting on the upper surface of the precast material. To prevent raising of the hanger rod, apply a lock nut and {50 mm} [2"] minimum dia. flat washer tight against the under surface of the precast material.

.9 Ensure that copper materials are completely isolated from ferrous materials. Use plastic or epoxy coated hangers and clamps. Use lead inserts between copper piping and other ferrous materials.

.10 Provide round steel threaded rods meeting ASTM A-36. Provide cadmium plated rod and accessories where exposed to direct contact with water or to possible high humidity conditions where condensation can occur.

.11 The following table establishes minimum standards of rod sizes and hanger spacing for steel and copper piping.

Maximum Horizontal Spacing of Supports			
Pipe Size {mm} [in]	**Rod Size {mm} [in]**	**Steel {m} [ft]**	**Copper {m} [ft]**
{12} [1/2]	{10} [3/8]	{1.5} [05]	{1.5} [05]
{20} [3/4]	{10} [3/8]	{1.8} [06]	{1.8} [06]
{25} [1]	{10} [3/8]	{1.8} [06]	{1.8} [06]
{32} [1-1/4]	{10} [3/8]	{2.4} [08]	{2.1} [07]
{40} [1-1/2]	{10} [3/8]	{2.7} [09]	{2.4} [08]
{50} [2]	{10} [3/8]	{2.7} [09]	{2.7} [09]
{65} [2-1/2]	{12} [1/2]	{3.0} [10]	{3.0} [10]
{75} [3]	{12} [1/2]	{3.0} [10]	{3.0} [10]
{90} [3-1/2]	{12} [1/2]	{3.0} [10]	{3.3} [11]
{100} [4]	{16} [5/8]	{3.0} [10]	{3.7} [12]
{125} [5]	{16} [5/8]	{3.7} [12]	{3.7} [12]
{150} [6]	{20} [3/4]	{3.7} [12]	{3.7} [12]
{200} [8]	{22} [7/8]	{3.7} [12]	
{250} [10]	{22} [7/8]	{3.7} [12]	
{300} [12]	{22} [7/8]	{3.7} [12]	
{350} [14]	{25} [1]	{3.7} [12]	
{400} [16]	{25} [1]	{3.7} [12]	
{450} [18]	{29} [1-1/8]	{3.7} [12]	
{500} [20]	{32} [1-1/4]	{3.7} [12]	
{600} [24]	{32} [1-1/4]	{3.7} [12]	

.12 For steel pipe sizes larger than {600 mm} [24"], refer to Drawings.

.13 In addition to these basic requirements, provide hangers in the following location:

.1 to eliminate vibration

.2 at points of vertical and horizontal change of direction of pipe

.3 at inline centrifugal pumps

.4 at valves and strainers

.5 on mains at branch takeoffs

.6 to avoid stress on equipment connections

.14 Install spring hangers or other special supports specified in Section 15240.

.15 Support horizontal cast iron soil pipe at each hub. Where groups of fittings occur, not more than three joints shall be between hangers.

.16 Refer to applicable articles of the Specification regarding thermal insulation requirements. Unless shown specifically on Drawings, provide the following support methods.

.1 For insulated warm and hot water piping, for condensate piping and for steam piping up to {65 mm} [2-1/2"] diameter, support with hangers directly on piping.

.2 For steam piping {75 mm} [3"] diameter and above, support with hangers under specified protection saddles.

.3 For chilled water and domestic cold water piping, hangers shall be large enough to fit over specified pipe covering. At each point of support, install specified protection saddles with sufficient length to prevent crushing of insulation.

.17 Generally, support ducts with {2.7 mm} [12 gauge] by {25 mm} [1"] wide galvanized hangers or with {12 mm} [½"] dia. rods and {40 mm} [1-1/2"] rolled angle saddles to meet SMACNA or ASHRAE Standards.

.18 Support vertical duct risers at each floor with rolled angle collars bearing on building structure.

2.12. SLEEVES, WALL PLATES, FLOOR PLATES

.1 Set sleeves for piping and ductwork in conjunction with erection of floors and walls. Locate sleeves accurately in accordance with submittal drawings, and as follows:

.1 Through interior walls, set sleeves flush with finished surfaces on both sides.

.2 Through exterior walls above grade, set sleeves flush with finished surfaces on inside and to suit flashing on outside.

.3 For floors in Mechanical Equipment Rooms, Janitors Closets, Kitchens and similar areas where a water dam is required, set sleeves flush to underside of structure and extending {50 mm} [2"] above finished floor.

.4 For other floors, set sleeves flush to both finished surfaces. Refer to Room Finish Schedule.

.2 Size sleeves to provide {25 mm} [1"] clearance around insulated piping and ductwork.

.3 Provide continuous insulation runs through fire separations. Ensure that piping and ductwork do not touch sleeves or for warm and hot water piping and ductwork terminate insulation cover on each side of sleeve. For chilled water and domestic cold water piping, provide same thickness Manville Thermo-12 pipe insulation with all purpose vapour barrier jacket through fire separation to a point {100 mm} [4"] on each side of fire separation.

.4 Install leak tight seals to meet the manufacturer's requirements. Select the inside diameter of each wall sleeve opening to fit the pipe and leak tight seal, all to ensure watertight joint.

.5 Additional sleeving requirements:

.1 Provide sleeves for systems not part of Contract, but identified to be required on Drawings.

.2 Provide sleeves to accommodate compressed air piping and wiring conduits required for Division 20 work.

.3 Provide additional sleeves as required by Drawings to accommodate service requirements. Include for the cost of drilling and setting sleeves.

.4 Fill unused sleeves through fire separations with firestop material (see Firestopping article). Fill other unused sleeves with suitable noncombustible materials.

2.13. FIRESTOPPING

.1 Ensure that fire ratings of floors and walls are maintained.

.2 Pack clearance spaces, fill all spaces between openings, pipes and ducts passing through fire separations and install firestopping systems in accordance with the appropriate ULC system number for the products and type of penetration.

.3 Install firestopping systems using personnel trained or instructed by the product manufacturer.

2.14. PROVISION FOR PIPE EXPANSION, CONTRACTION AND BUILDING SHRINKAGE

.1 Make provision for pipe expansion, contraction and building shrinkage with suitable anchors and offsets or expansion loops.

.2 Install piping to allow freedom of movement in all planes without imposing undue stress on any section of main piping, branch piping, equipment and structure.

.3 Use offsets at takeoffs to radiation, unit heaters, fan coil units, risers and other branch lines.

.4 Select expansion joints for the calculated movement according to the following temperature ranges.

.1 For cold pipes, from minimum operating temperature to {38°C} [100°F], plus 25% safety factor.

.2 For warm and hot pipes, from minimum ambient, but not lower than {-5°C} [23°F], to maximum operating temperature plus 25% safety factor.

.5 When ambient temperature during installation is higher than operating temperature, use precompressed expansion joints.

.6 Select expansion joints to withstand system test pressure, as well as operating pressures and temperatures.

.7 Install expansion joints in accordance with manufacturer's published installation instructions.

.8 During the construction and warranty periods, regularly review provisions for building shrinkage and make necessary adjustments to piping to ensure freedom from binding and stress.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 01, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install thermal insulation, vapour barriers and finishes for mechanical work as indicated on the Drawings and specified in this Section of these Specifications.

.3 Insulation requirements shall comply with Part 5 of the Model National Energy Code of Canada, latest version and insulation thickness shown are the minimum acceptable.

1.2. SUBMITTALS

.1 Submit samples and specification sheets of all types of insulation materials specified in this Section of the Specifications. Include manufacturers installation instructions.

1.3. ENVIRONMENTAL REQUIREMENTS

.1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulating cements.

1.4. QUALITY ASSURANCE

.1 Insulation materials must be manufactured at facilities certified and registered with an approved Registrar to conform to ISO 9000 quality standard.

PART 2 - PRODUCTS

2.1. MATERIALS – GENERAL

.1 Acceptable insulation manufacturers are Owens Corning Canada, Johns Manville, Manson Insulation Inc., Knauf Fiber Glass and Certainteed.

.2 Provide insulation and covers in strict accordance with authorities governing combustibility and fireproofing of materials and in accordance with manufacturer's recommendations.

.3 Provide non-combustible insulation, jackets and finishes having a Flame Spread/Smoke Developed rating of 25/50 or less, meeting CAN/ULC S-102 requirements.

.4 Attain a complete and continuous vapour barrier over insulation applied to cold and dual temperature piping, sheet metal and equipment. Use either factory applied vapour barrier jacket or field applied Reinforced Foil Flame Resistant Kraft vapour barrier jacket. Apply to piping, fittings, valves and inline components, sheet metal and fittings and equipment. Seal longitudinal and circumferential laps with Childers CP82 or Bakor 230-39 adhesive. If vapour barrier jacket is not lapped, seal joints with self-adhering {100mm} [4"] wide plain aluminum foil tape, or adhere {100mm} [4"] wide aluminum foil tape with Childers CP82 or Bakor 230-39 adhesive. Jacketing with self-adhesive laps and self-adhesive vapour barrier tape will be an acceptable alternative closure system.

.5 Recover all exposed insulation and insulation finishes with minimum {0.20kg/squaremetre} [6oz.] canvas, and two applications of Childers CP50 or Bakor 120-09 white fire resistant coating. An acceptable alternative recovering will be PVC fitting covers and jacketing,

installed as per manufacturer's instructions, and conforming to the specified Flame Spread/Smoke Developed Rating.

.6 Recover insulation and insulation finishes outside the building or exposed to the weather with one {1.5mm} [1/16"] thick layer of Childers Encacel X or Bakor 110-26 fire retardant black mastic vapour barrier coating. Embed a layer of woven glass reinforcing fabric into the wet coating, lapping ends and edges at least {75mm} [3"]. Apply a top coating of {1.5mm} [1/16"] thick Encacel X or Bakor 110-26 over the entire surface of the fabric. Seal the entire covering to achieve a watertight assembly.

.7 In lieu of above recovering of insulation and insulation finishes outside the building, aluminum jacket with aluminum fittings may be substituted. Band all transverse seams with waterproof mastic tape and caulk all longitudinal seams with silicone caulking. Seal the entire covering to achieve a watertight assembly.

2.2. PIPE INSULATION

.1 Provide insulation materials with a minimum thermal conductivity of {0.036 W/m.ºC} [0.24 BTU.in/(hr.ft^{2o}F] at {38ºC} [100ºF] mean temperature.

.2 On hot piping applications, hold insulation in place with flare type staples (outward clinch).

.3 On cold and dual temperature piping applications, apply vapour barrier jacket over insulation and seal longitudinal and circumferential laps with Childers CP82 or Bakelite 230-39 adhesive. Seal all pipe terminations, including fittings, wall penetrations and pipe supports with vapour barrier mastic. For chilled water and brine systems provide vapour seal pipe terminations every four (4) pipe sections.

.4 Apply pipe insulation over {40mm} [1-1/2"] in thickness in two layers with joints staggered.

.5 Insulate fittings with fabricated mitered or preformed sections of specified insulation.

.6 Insulate over flanges and mechanical couplings with specified insulation and thickness, sized to suit flange diameters. Fill spaces between insulation and adjoining pipe insulation with similar material.

.7 Insulate valves and inline components with flexible insulation density {12kg/cubicmetre} [3/4lbs./cu.ft.] compressed not more than 50% of original thickness. Build up to specified thickness with approved asbestos free finishing cement.

.8 Do not insulate terminal unit automatic control valves installed in hot piping. Do not insulate terminal unit automatic control valves which are installed in cold and dual temperature piping and which are located over condensate drain pans.

.9 Provide removable {1.31mm} [18gauge] galvanized sheet metal enclosures lined with Armaflex II sheet insulation {25mm} [1"] thickness on pipeline strainers to facilitate screen access.

.10 Under all hangers used on primary chilled water, domestic chilled water, domestic chilled water recirculation, dual temperature water and domestic cold water, provide an insert between support shield and piping for piping {38 mm} [1½"] or larger. Fabricate using T-12 calcium silicate or other high density insulating material suitable for temperature application. Insulation inserts shall not be less than the following lengths:

Pipe Size	Length

{40 mm - 60 mm} [1½" – 2½"]	{250 mm} [10"]
{75 mm - 150 mm} [3" - 6"]	{300 mm} [12"]
{200 mm - 250 mm} [8" - 10"]	{400 mm} [16"]
{300 mm and over} [12" and over]	{550 mm} [22"]

.11 Provide one of the following pipe insulation types, and as scheduled in the Pipe Insulation Table.

.1 Type P1: Owens Corning 850 Pipe Insulation, Johns Manville Micro-Lok AP-T PLUS Fiberglas Pipe Insulation, Manson Fiberglas Pipe Insulation or Knauf Pipe Insulation with factory applied all purpose vapour barrier jacket where scheduled.

.2 Type P2: Johns Manville Thermo 12 Gold throughout molded hydrous calcium silicate type, indicating asbestos free pipe insulation. Density shall be not less than {224kg/cubicmetre} [14lbs./cu.ft.]. Insulation shall be banded securely in place with {20mmx0.5mm} [3/4"x.020"] stainless steel bands on maximum {300mm} [12"] centres.

.3 Type P3: Owens Corning Flex-Wrap Pipe Insulation, Johns Manville Pipe & Tank, Manson Multi-Flex or Knauf Flex-Wrap with protective reinforced foil scrim, {48 kg /cubic metre} [3.0 lbs /cu.ft.] density.

.12 Pipe Insulation Table:

No	Duty	Insulation Type	Thickness	Vapour Barrier
1	Domestic cold water, and domestic chilled water, and domestic chilled water recirculation			
	{100mm} [4"] and less	P-1	{12mm} [1/2"]	Yes
	{125mm} [5"] and larger	P-1	{25mm} [1"]	Yes
2	Domestic hot and domestic tempered water, and domestic hot water and tempered water recirculation			
	{50mm} [2"] and less	P-1	{25mm} [1"]	No
	{65mm} [2-1/2"] and larger	P-1	{40mm} [1-1/2"]	No
3	Primary heated water supply and return, and secondary heated water supply and return (Below {94ºC} [201ºF])			
	{50mm} [2"] and less	P-1	{25mm} [1"]	No
	{65mm} [2-1/2"] and larger	P-1	{40mm} [1-1/2"]	No

No	Duty	Insulation Type	Thickness	Vapour Barrier
4	Refrigeration machine oil cooler and purge all pipe sizes	P-1	{25mm} [1"]	Yes
5	Horizontal condensate drains except with fan coil unit enclosure all pipe sizes	P-1	{12mm} [1/2"]	Yes
6	Refrigerant piping suction lines {4.4ºC}[40ºF] and above Refrigerant piping suction lines below {4.4ºC} [40ºF] {25 mm} [1"] and smaller {32 mm} [1-1/4"] and larger	P-1 P-1 P-1	{25mm} [1"] {25mm} [1"] {40mm} [1-1/2"]	Yes Yes Yes

.13 In lieu of specified pipe insulation, where permitted by governing authorities, and in concealed locations, Imcoa Polyolefin or Armstrong AP Armaflex pipe insulation in nominal {12mm} [1/2"] thickness may be substituted for the following applications, on piping not exceeding {100mm} [4"] diameter, and shall be applied in strict accordance with manufacturer's recommendations.

.1 domestic cold water

.2 domestic chilled water

.3 domestic chilled water recirculation

.4 domestic hot and tempered water

.5 domestic hot and tempered water recirculation

.6 heated water, chilled water and dual temperature water runouts concealed behind perimeter enclosure

.7 condensate drains

2.3. SHEET METAL INSULATION

.1 Provide insulation with a minimum thermal resistance of {0.036 W/m.ºC} [0.25 BTU.in/(hr.ft^{2}ºF)] at {24ºC} [75ºF] mean temperature.

.2 Prior to finishing of insulation of hot and cold exposed rectangular ductwork, provide corner beads similar to Roll-on Type.

.3 Apply vapour barrier over insulation on cold and dual temperature ducts.

.4 Circular silencers and acoustic plenums need not be externally insulated.

.5 Ductwork and casings lined with acoustic insulation {25mm} [1"] or more in thickness need not be externally insulated. Refer to Section 15890 for Acoustic Insulation.

.6 Provide one of the following external sheet metal insulation types, and as scheduled in the Sheet Metal Insulation Table.

.1 Type D1: Owens Corning Rigid Duct Insulation, Johns Manville 814 Spin-Glas, Manson 800 Series Spin-Glas Rigid Insulation Board or Knauf Rigid Insulation Board, not less than {48kg/cubicmetre} [3lbs./cu.ft.] density. Impale insulation on mechanically fastened pins located at not greater than {300mm} [12"] centres. Secure insulation with speed washers.

.2 Type D2: Owens Corning Flexible Duct Insulation, Johns Manville Microlite type 75 Duct Wrap, Manson Microlite Duct Wrap or Knauf Duct Wrap, {12kg/cubicmetre} [3/4lbs./cu.ft.] density. Adhere insulation to duct surface with Childers CP82 or Bakelite 230-39 adhesive, which shall be applied in strips {150mm} [6"] wide at not greater than {300mm} [12"] centres. Lap all edges at least {50mm} [2"] and secure insulation with fire resistant tying cord, similar to Fiberglas EC9-4-T. Take care that insulation is not compressed to less than specified thickness. It is recognized that some compression of insulation will take place immediately under tying cord, but in no case shall the thickness of the compressed material be less than 75% of original specified thickness.

.3 Type D3: Owens Corning Rigid Vapour Seal Duct Insulation, Johns Manville 814 Spin-Glas with FSK Facing, Manson Spin-Glas Rigid Insulating Board with reinforced foil facing, or Knauf Rigid Insulation Board with FSK facing. Density shall be not less than {48kg/cubic metre} [3lbs./cu.ft.]. Impale on mechanically fastened pins located at not greater than {300mm} [12"] centres. Secure with speed washers. Butt joints tightly together and seal washers, breaks and joints with self-adhering {100mm} [4"] wide plain aluminum tape, or adhere foil with Childers CP82 or Bakelite 230-39 adhesive.

.4 Type D4: Owens Corning Flexible Duct Insulation, Johns Manville Microlite Type 75 Duct Wrap, Manson Microlite Insulation or Knauf Duct Wrap, {12kg/cubic metre} [3/4lb./cu.ft.] density with factory applied reinforced foil facing. Adhere insulation to duct surface with Childers CP82 or Bakelite 230-39 adhesive, which shall be applied in strips {150mm} [6"] wide at not greater than {300mm} [12"] centres. Butt edges of insulation tightly together, and seal breaks and joints of facing with self-adhering {100mm} [4"] wide aluminum tape or adhere foil with Childers CP82 or Bakelite 230-39 adhesive.

.7 Sheet Metal Insulation Table

No	Duty	Insulation Type	Thickness	Vapour Barrier
1	Panels behind unused portion of louvres	D3	{50mm} [2"]	Yes
2	Outside air plenums and ducts Outside air supply fans	D3	{50mm} [2"]	Yes
3	Mixed air plenums and ducts	D3	{40mm} [1-1/2"]	Yes
4	Relief and exhaust air plenums	D3	{40mm} [1-1/2"]	Yes
5	Exhaust ducts between motorized dampers and building exterior or final {3m} [10 ft] of exhaust air ducts whichever is greater	D3	{25mm} [1"]	Yes
6	Rectangular hot supply ducts	D1	{25mm} [1"]	No
7	Round hot supply ducts	D2	{40mm} [1½"]	No
8	Exposed rectangular cold and dual temperature supply ducts	D3	{25mm} [1"]	Yes
9	Exposed round cold and dual temperature supply ducts	D3	{25mm} [1"]	Yes
10	Supply and return ductwork outside the building or exposed to the weather	D3	{50 mm} [2"]	Yes
11	Concealed supply air, (including ducts in shafts) to air terminal control units, excluding flexible ducts	D4	{25mm} [1"]	Yes
12	Concealed supply air ducts from air terminal control unit discharge to air terminals excluding flexible ducts.	D4	{25mm} [1"]	Yes
13	Free standing supply fan casings	D3	{40mm} [1-1/2"]	Yes

PART 3 - EXECUTION

3.1. PROTECTION

.1 Protect the work of other trades with tarpaulins.

.2 Protect the work of this trade from being defaced by other trades. Make good any damage and leave in perfect condition, ready for final painting.

3.2. INSTALLATION

.1 Apply insulation over clean dry surfaces, firmly butting all sections together.

.2 Apply insulation, vapour barriers and insulation finishes in strict accordance with manufacturer's recommendations.

.3 Do not cover equipment nameplates with insulation.

.4 Coordinate related work with other Divisions.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with the Agreement between the Construction Manager and Trade Contractor and all other documents referred to therein.

.2 Provide all services, materials and labour required to fully commission the mechanical systems in accordance with this Section of the Specification.

1.2. COORDINATION

.1 Meet the requirements of the General Instructions.

.2 Coordinate the work of this Section with all other Divisions to ensure complete and operational mechanical systems at completion of this work.

.3 Appoint a single person as Commissioning Coordinator who shall be responsible for progressing the commissioning activities of each Division 20 trade. The Commissioning Coordinator shall report to the Commissioning Manager.

.4 Review the design intent of the project and the intended operation of systems with the Consultant before proceeding with commissioning.

1.3. QUALITY ASSURANCE

.1 The commissioning process shall meet the requirements of CAN/CSA Z31 series, the Code of Practice for Commissioning Mechanical Systems in Buildings. Meet ASHRAE Standard 1-1989 Guideline for Commissioning of HVAC Systems and the Commissioning Guideline published by APEGGA.

.2 Division may elect to source startup and handover by a specialist commissioning company. Supply to the Commissioning Manager, the following details regarding the proposed firm:

.1 Principle representative and qualifications

.2 Proposed personnel and relevant project experience

.3 Previous similar assignments and references

.4 Scope of work to be undertaken

.5 Company resources and equipment

.3 Use of a commissioning specialist shall not relieve Division 20 of the obligation to name one of his own employees as the person responsible for progressing commissioning, i.e. the Commissioning Coordinator.

.4 Supply the name, qualifications and experience of the proposed Commissioning Coordinator upon Construction Manager request. Selection shall be subject to review and the approval of the Consultant. Supply alternative person(s) when requested by Consultant.

.5 The Consultant may, at his discretion, attend and advise in the commissioning process. Meet Consultant requirements.

.6 Hold and attend regular meetings during the commissioning process. Prepare detailed progress reports to coincide with regular commissioning meetings. Coordinate with the Commissioning Manager, the preparation and issue of minutes for each meeting to be circulated to each involved trade, the Consultant and the Construction Manager representative(s). Minutes shall highlight action items.

PART 2 - PRODUCTS

2.1. SCHEDULES AND COMPLETION OF INSTALLATION OF SYSTEMS

.1 Submit to the Consultant, 60 days prior to the scheduled Substantial Performance, a detailed and comprehensive installation completion/startup/testing schedule, identifying all trades and suppliers to be involved. Update the schedule and resubmit for review, on a bi-weekly basis, during the course of commissioning. If found to be unacceptable, revise the schedule and the construction forces to suit the reviewed schedule. This schedule shall include, but is not limited to the following items:

.1 Installation and testing of pipe systems

.2 Installation, leak testing and cleaning of duct systems

.3 Chemical clean out and treatment of pipe systems, including disinfection of domestic water piping

.4 Control system wiring (by Control Contractor)

.5 Air and water balancing (by Balancing Contractor)

.6 Electrical service connections (by Electrical Contractor)

.7 Equipment suppliers prestart checkout of the equipment installations, including controls and ice rink refrigeration system

.8 Start up of various pieces of equipment and systems

.9 Operational testing of system components

.10 Performance testing of equipment and systems

.11 Troubleshooting

.12 Calibration of controls and point checkout (by Control Contractor)

.13 Control software setup and checkout including seasonal and response checkout of operating sequences, PID optimization (By Control Subcontractor).

.14 Emergency system checkout

.15 Fire alarm and control system interfacing (by Control Contractor & Division 16)

.16 Submittal of completed equipment and system checkout sheets

.17 Demonstration of systems and equipment

.18 Maintenance manual preparation and submittal

.19 Operator training program

.20 Record documentation submittal

2.2. RECORD DOCUMENTATION

.1 Prepare record documentation for each equipment installation covering:

.1 Equipment identification and supplier

.2 Shop Drawing submittal, review, production release, and delivery dates

.3 Dates for completion of all work required to prepare for equipment installation

.4 Dates for equipment installation, supplier prestart checkout and system availability for startup

.5 Dates for equipment startup, performance testing, proposal for temporary use, acceptance testing, demonstration, turnover and warranty start/finish

.2 Submit proposed record sheets and procedures to Consultant for review, when requested by the Owner.

.3 List all specialist personnel and equipment required for the test and ensure that these are available by the test date.

.4 Provide documentation of the commissioning process for inclusion into the maintenance manuals. These are to include checkout sheets, equipment data sheets, startup certificates from suppliers involved in startup, documentation concerning demonstration to the Owner. Include all records and result sheets from commissioning tests.

.5 Maintain a log of key operating parameters, problems encountered, solutions employed and verification of effectiveness of solutions. Include log in maintenance manuals.

.6 Refer to example documentation available from Construction Manager's representative. Meet or exceed this level of reporting.

2.3. STARTUP

.1 Coordinate and supervise the startup of the various pieces of equipment and systems. Utilize the startup services of the manufacturer's representative. Ensure that the equipment is operating in a satisfactory manner. Check the following items:

.1 Direction of rotation

.2 Grease and lubricants

.3 Noise, if deemed to be a problem

.4 Seals

.5 Alignment of pump and fan drives by a millwright

.6 Piping connections and safeties

.7 Electrical amp draw, starting inrush current and trip/heater settings

.2 Meet Section 15010 requirements for Temporary Services and Temporary and Trial Use.

2.4. TROUBLESHOOTING

.1 Resolve inter-Division coordination problems.

.2 Where problems become apparent during the commissioning process, identify and resolve these problems. The basic functions in troubleshooting are:

.1 What - identification and definition of the problem

.2 Why - determination and evaluation of the causes

.3 When - determine the time available to resolve the problem

.4 Involve the designing authority in the review of the problem and proposed resolution

.5 Coordinate remedial action with the appropriate parties

.6 Evaluate the effectiveness of the remedial action

.7 Record the problem, cause, remedial action and result

2.5. OPERATION AND TESTING

.1 Meet Section 20 04 00 requirements for Inspection, Testing and Certificates.

.2 Test the operation of the individual components and systems. Go through each step of the sequence of operation and verify that each component operates correctly. Direct and ensure that all trades involved make the required changes and adjustments to effect the proper operation of all components and systems. Meet commissioning test requirements.

.3 Document operation and testing.

.4 Carry out operational tests for the current season and simulate operation of summer, winter and intermediate seasons.

2.6. DEMONSTRATION

.1 Demonstrate to the Owner the proper operation of all equipment and systems supplied under this Division. Demonstrations shall occur only after the operation and testing has been successfully completed. Ensure that Trade Contractor and equipment suppliers participate in the demonstration as required.

.2 Meet Section 20 04 00 requirements for Instruction to Owners.

2.7. OPERATING AND MAINTENANCE MANUALS

.1 Meet Section 20 04 00 requirements.

.2 Coordinate the manual provision with Consultant prepared Operation and Maintenance Manual, if available.

2.8. RECORD DRAWINGS

.1 Meet Section 20 04 00 requirements.

2.9. COMPLETION

.1 Meet Section 20 04 00 requirements.

2.10. SPARE PARTS

.1 Provide a list of spare parts, special tools, lubricants, etc. for each item of equipment which has been purchased as part of the Contract.

.2 Provide a listing of recommended spare parts for all equipment installed under Division 20, to cover a period from Substantial Completion to Warranty end.

.3 Provide at minimum, the following information for recommended spare parts:

.1 Manufacturer's name, address, phone and fax numbers

.2 Manufacturer's part name, part number, unit price, lead time, shelf life

.3 Quantity recommended for 1 year

.4 Alternative suppliers of compatible parts, including local supplier name, address, phone and fax numbers

.4 Submit preliminary list of spare parts and tools to Owner at least 30 days prior to intended system handover to Owner. The Owner reserves the right to add to, reduce or omit entirely, the recommendations contained on these lists.

PART 3 - EXECUTION

3.1. COMMISSIONING TESTS

.1 Verify readings, calibration and setup of sensors and equipment, including:

.1 Temperature sensors

.2 Freeze protection devices

.3 Flow switches

.4 Status switches

.5 Temperature and pressure gauges and gauge connection utilization

.6 Control damper positioning, including tightness when closed and full open/balance position

.7 Alarm contacts

.2 Verify correct sensors are reporting accurately to the distributed field panels and operator workstation.

.3 Operate each air handling unit. Verify and correct the following if required:

.1 Start/stop from the terminal

.2 Correct open/close and modulation procedures with valves and dampers

.3 Stable operation of controls under normal conditions and with changes in air/water/on/off conditions

.4 Trend logs operation indication

.5 Piping, sensor and unit installation

.6 Filters for bypass

.7 Drain pan operation and trap priming

.4 Verify systems pipe cleaning and chemical treatment condition for all systems.

.5 Verify duct cleaning, air and water balancing and air pattern adjustments.

.6 Verify access to each fire damper.

.7 Verify that all cooling coil drain pans and condensate piping operate.

.8 Verify backflow preventer operation.

.9 Verify operation of fire protection system including flow switches and supervisory switches.

.10 Demonstrate access to all valves, equipment and components for servicing.

.11 Coordinate with Division 26, a power failure test with emergency generator startup.

.1 Miscellaneous equipment on emergency power, with Division 26.

.2 Stability of control equipment with startup power surge

.3 Controls system recovery

.12 Verify the operation of all other equipment provided by Division 20.

.13 Verify that interfacing to the work of other Divisions results in complete and operational systems.

3.2. POST SUBSTANTIAL PERFORMANCE VISITS

.1 Visit the site and the Owner's representative each month after Substantial Performance for a minimum period of two days until the end of the project warranty period.

.2 Review the operation of the system.

.3 Correct any operating problems, if problem is related to warranty issues.

.4 Prepare a report for the Consultant and Construction Manager for inclusion in the Operating Manuals of the problems and issues that have arisen and the corrective action(s) recommended and implemented.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 These Specifications are an integral part of the Contract Documents. Tendering and Contract Requirements and Division 1, General Requirements apply to all Division 20 Specification Sections.

.2 Provide labour, materials, products, equipment and services required to complete the demolition work specified herein.

.3 Refer to Drawings for extent of demolition work. The drawings indicate the approximate locations of services as far as these are known.

.4 Dispose, off site, of all debris in accordance with the jurisdictional authorities.

.5 Removal and storage of salvageable items as directed by this specification section and the Owner of their representative.

.6 Mechanical demolition work associated with this building is indicated on the demolition drawings and generally and consists of the following:

.1 Plumbing and Drainage

.2 HVAC systems and equipment

.3 Building Control Systems

1.2. REFERENCE STANDARDS

.1 Meet the requirements and recommendations of all Municipal, Provincial and Federal Bylaws and Ordinances.

.2 Execute this work in accordance with the latest edition of the following codes and standards.

.1 CAN/CSA-S350-M1980 - Code of Practice for Safety in Demolition of Structures.

.2 Ontario Building Code.

.3 Occupational Health and Safety Act.

.4 Regulations for Construction Projects.

.5 Ontario Fire Code.

.6 Regulations under Fire Marshals Act.

1.3. QUALITY ASSURANCE

.1 All work shall be performed by a firm having adequate equipment and skilled labour and being able to provide written evidence of satisfactorily completed work, similar to that specified during the past immediate five (5) years.

.2 Removal from site and disposal of debris shall be carried out in accordance with the requirements of the local jurisdictional authorities.

.3 Arrange and pay for all permits, notices and inspections necessary for the proper execution and completion of the demolition work.

1.4. SUBMITTALS

.1 Submit shop drawings as requested by the consultant, indicating demolition sequence, cutting and patching, bracing and protection of existing services designated to remain.

PART 2 - PRODUCTS

2.1. DISPOSAL OF MATERIALS

.1 All materials which have not been designated for salvage from the demolition shall become the property of the Contractor. Remove all material and debris from the site as quickly as possible and dispose of legally. Burning of debris or selling of materials on the site will not be permitted.

.2 Present to the Owner existing equipment removed but not identified for salvage on site. Acceptance of removed equipment is at the discretion of the Owner. Remove such items from site when deemed unsuitable.

.3 Conform to requirements of municipality's Works Department regarding disposal of waste materials.

.4 Materials prohibited from municipality waste management facilities shall be removed from site and disposed to recycling companies specializing in recyclable materials.

PART 3 - EXECUTION

3.1. GENERAL INSTRUCTIONS

.1 At the end of each work shift, leave work in a safe condition.

.2 Patch fire rated partitions and floors to maintain rating upon removal of mechanical services originally spanning fire rated assembly.

.3 Demolish work into sections of practical size for removal without alteration or damage to existing building.

3.2. STORAGE OF MATERIALS

.1 Store materials only in areas designated by the Owner and as permitted by the local jurisdictional authorities.

.2 Materials and debris shall not be stacked in building to the extent that overloading of any part of the structure will occur.

3.3. PROTECTION OF OWNERS PREMISES

.1 Adhere strictly to the Owner's requirements.

.2 Confer with the Owner concerning schedule, dust and noise control prior to commencing work in or adjacent to existing facilities where such work might affect either those facilities or their occupants.

.3 Execute work with least possible interference or disturbance to occupants, public and normal use of premises.

.4 Provide temporary means to maintain security when security has been reduced by Division 20.

.5 Only elevators, dumbwaiters, conveyors or escalators assigned for Contractor's use may be used for moving men and material within building. Protect walls of passenger elevators, to approval of Owner prior to use. Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Provide temporary dust screens, barriers, warning signs in locations where renovations and alternation work is adjacent to areas which will be operative during work.

.7 Protect all mechanical systems, indicated to remain, from damage.

.8 Provide and maintain ready access to fire fighting equipment at all times.

.9 Provide and maintain proper and suitable fire extinguishers throughout the duration of the work.

.10 The drawings indicate the approximate locations of services as far as these are known. Should any mechanical or electrical service line be broken, or disrupted by operations specified under this contract, repair service lines, and make good all damage due to the disruption or break, at no expense to the Owner. Notify the Owner immediately whenever any service line is broken or damaged.

.11 The drawings indicate the approximate locations of services as far as these are known. Immediately advise Consultant in writing when unknown services are encountered.

.12 Accept liability for costs incurred by the Owner in repairing and cleaning equipment, etc., resulting from failure to comply with the above requirements.

3.4. RESTRICTIONS ON USE OF PREMISES

.1 Use only those existing entrances and stairs designated by the Owner for access to and egress from the existing buildings and various floors where work of this contract is to be carried out. No traffic through other areas of the building will be permitted without the prior consent of the Owner.

.2 Keep stairs and corridors clear and open as required by Fire Marshall for exit purposes in case of fire, and as required for use by the Owner's personnel.

.3 Owner will designate which toilet facilities may be used.

3.5. INTERRUPTION OF EXISTING SERVICES

.1 Arrange, schedule and perform work with minimum disturbance to existing facilities and services.

.2 Submit a complete schedule of service interruptions and changeovers with approximate dates required, durations and times of day, for approval before proceeding.

.3 Notify Owner in writing at least 72 hours in advance of planned interruption to existing services.

.4 Interruption of service must occur at the times and for the duration stipulated by the Owner.

.5 Keep service interruption duration to an absolute minimum. Carry out all preparatory work, measurements, etc., without interruption of existing services.

.6 If service interruptions are required by the Owner during the night or on weekends, etc., premium time shall be included at the Contract Price. No extra charges will be allowed at a later date for failure to include same.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install the plumbing and drainage inside the building to point of connection outside the exterior building wall as indicated on the Drawings and specified in this Section of the Specifications.

PART 2 - PRODUCTS

2.1. PIPE AND FITTINGS

.1 Provide chrome plating on all exposed piping within washrooms.

.2 Drainage and Vent Piping:

	Pipe Size {65mm} [2-1/2"] &Smaller	**Pipe Size {75mm} [3"] & Larger**
Sanitary - Above Ground	DWV copper pipe with drainage fittings and 95/5 tin/antimony solder joints.	CSA Class 4000 cast iron soil pipe and fittings, with mechanical joints.
Sanitary - Below Ground	Type L copper with 95/5 tin/antimony joints.	CSA Class 4000 cast iron soil pipe and fittings, with mechanical joints or IPEX Ring-Tite SDR35, CSA certified to B182.2 PVC gasketted sewer pipe.
Vent Piping - Above Ground	DWV copper pipe with drainage fittings, 95/5 tin /antimony solder joints.	CSA Class 4000 cast iron soil pipe and fittings with mechanical joints.
Vent Piping - Below Ground	Type L copper pipe with wrought copper fittings and 95/5 tin /antimony solder joints.	CSA Class 4000 cast iron soil pipe and fittings, with mechanical joints or IPEX Ring-Tite SDR35, CSA certified to B182.2 PVC gasketted sewer pipe.

.3 Domestic Water:

.1 Domestic hot water and recirculation - all sizes:

.1 Type L hard copper pipe, wrought copper fittings with 95/5 tin/antimony solder joints.

.2 Domestic cold water all sizes.

.1 Type L hard copper pipe, wrought copper fittings with 95/5 tin/antimony solder joints.

.3 Provide Type K soft copper pipe without joints below ground.

.4 Alternatively, for piping 2-1/2” and larger: Victaulic style 606 couplings with Grade E flush seal Vic Plus gasket, and grooved copper piping systems may be used in accessible areas for domestic water. Provide Victaulic installation instructions on site.

2.2. VALVES

.1 Provide ASTM domestic water valves to the following Kitz figure numbers:

.1 Ball Valves:

.1 {50 mm} [2"] and smaller - soldered {1400 kPa} [200 psi] w.o.g.

.2 {65 mm} [2-1/2"] and larger – grooved {1400 kPa} [200 psi] w.o.g.

.2 Standard Check Valves:

.1 {50 mm} [2"] and smaller - soldered {2070 kPa} [300 psi] w.o.g.

.2 {65 mm} [2-1/2"] and larger - Grooved {1400 kPa} [200 psi] w.o.g.

.2 For {50 mm} [2"] and smaller, ball valves may be provided as substitute for gate and globe valves. Provide ball valves with brass or bronze body, chrome plated solid ball, PTFE seats and seals and full port.

.1 up to {50 mm} [2"] - {4140 kPa} [600 psig] w.o.g. - soldered Fig 59.

.3 Provide Check-Rite or Centre Line non-slam check valves on discharge side of pumps and where shown or specified.

.4 For Victaulic grooved piping systems, provide Victaulic Series 608 lever handle, butterfly valves complete with EPDM-coated disk and drive hub extension insulation block.

PART 3 - EXECUTION

3.1. VERIFICATION OF INVERTS

.1 Verify all field service conditions immediately after award of Contract to ensure that drainage runs can meet the inverts of the site services.

.2 Give notification immediately of any apparent difficulties or discrepancies.

.3 No extra will be paid at a later date for rerouting of drains because site inverts cannot be met.

3.2. TESTING

.1 Carry out not less than the following tests:

.1 Ball test drains.

.2 Perform water tests on all soil, waste, vent and rainwater systems when rough-in of the system, or section thereof including fittings, branches, cleanouts and traps except fixture traps. When the system or section is filled, shut off the water, and allow to stand for one hour. There shall be no loss by leakage during this time.

.3 Pressure test domestic cold water, domestic hot water, and recirculation lines with water at 150% of maximum operating pressure, for 6 hours without loss of pressure.

.2 Conduct additional tests required by the authorities having jurisdiction.

.3 If tests are required by an authority having jurisdiction, perform tests in the presence of each governing authority's authorized inspector, and obtain certification.

.4 Certify tests not required by the authorities having jurisdiction.

.5 Perform tests before piping, drains or vents are covered or concealed.

.6 Remove all components which will not withstand test pressure, and replace after tests.

.7 Eliminate leaks, or remove and refit defective parts. Caulking of threaded or welded joints will not be permitted.

.8 Repeat tests as often as necessary to obtain certification.

.9 Set all fixtures and fill all traps with water after tests have been completed.

3.3. CLEANING AND FLUSHING SEWERS

.1 On completion of construction of drains, flush all drains until the deposits of earth and other foreign material have been removed.

3.4. CLEANING, FLUSHING AND DISINFECTING WATER PIPING

.1 Be responsible for care and cleaning of the piping system during and after construction. Plug all open ends during construction to prevent the entrance of foreign materials.

.2 Flush all systems with clean, potable water to remove scale and sediment immediately upon filling.

.3 Sterilize all potable water lines to meet local municipal requirements.

.4 After completing satisfactory hydrostatic tests of the complete system, and flushing mains as outlined above, disinfect the mains in accordance with AWWA Standard C651-86. Repeat the flushing and disinfecting operation until the test results are satisfactory.

.5 Ensure by operation of isolating valves or the installation of check valves, that the disinfecting solution does not flow back into street mains or other sections of piping in use.

.6 Arrange and pay for water quality tests to be performed by a recognized independent testing laboratory. Obtain certificates confirming safety of potable water supply.

3.5. CONNECTIONS TO OWNER'S EQUIPMENT

.1 Rough in and connect to Owner's equipment. Do not rough in prior to receipt of final approved layout of Owner's equipment.

3.6. CONNECTIONS TO KITCHEN EQUIPMENT

.1 Provide rough-in and make all final connections to the kitchen area equipment as shown on Drawings.

.2 Do not begin rough-in work until supplied with a final set of dimensioned rough-in drawings from the kitchen equipment supplier.

.3 All final connections shall include shut off valves on hot and cold water supplies and the installation of all vacuum breakers, check valves, backflow preventors, and other plumbing specialities to meet authorities having jurisdiction.

.4 Final connections to dishwasher shall include a pressure reducing valve, pressure gauge downstream and shock absorber upstream of pressure reducing valve.

3.7. CONNECTIONS TO LABORATORY EQUIPMENT

.1 Provide rough-in and make final connections to laboratory equipment as shown on Drawings. Otherwise, valve and cap services in ceiling or walls as shown.

.2 Do not begin rough-in work until supplied with a final set of dimensioned rough-in drawings from the laboratory equipment supplier.

.3 All final connections shall include shut off valves on hot and cold water supplies and the installation of all vacuum breakers, check valves, backflow preventors, and other plumbing specialities as shown on Drawings and as required to meet authorities having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply, install and test compressed air system for outlets required in the Laboratories, Preparation Rooms and Shops.

PART 2 - PRODUCTS

2.1. PIPING

.1 Provide Type L hard copper piping for compressed air piping conforming to ASTM Standard B88.

.2 Provide wrought copper braze joint fittings. Do not use cast fittings.

.3 Make connection to piping of a different material with dielectric fittings.

2.2. BRAZING ALLOYS

.1 Provide silver type brazing alloys with a melting point of approximately {593EC} [1100EF] and a tensile strength of {621 MPa} [90,000 psi] minimum, cadmium free, requiring no flux for installation. Silver brazing alloy shall be Aircosil 45.

2.3. VALVES

.1 Provide for valves up to {50 mm} [2"] Jenkins Fig. 902A ball valves ASME rated for non-shock cold water pressure of {4200 kPa} [600 psig].

.2 Provide for valves over {50 mm} [2"] Jenkins Fig. No. 106-BP bronze solder and globe valves.

2.4. PRESSURE GAUGES

.1 Provide Ashcroft Model 1000, {40 mm} [1-1/2"] pressure gauges complete with shutoff cocks and Ashcroft Model 1106A snubbers. Select gauges with {0-1380 kPa} [1-200 psig] range.

2.5. OUTLET STATIONS

.1 Provide Leslie Class AW, pressure reducing valve stations complete with isolation valves where indicated on the Drawings. Valves shall be suitable for an inlet pressure of {700 kPa} [100 psi] and an outlet pressure of {140 kPa} [20 psi].

.2 Provide Leslie Class AW pressure reducing valve stations at each piece of Owner's equipment indicated on the drawings. Station shall be complete with isolation valves, Foster {6 mm} [1/4"] female quick detachable coupling and pressure gauge. Valve shall be suitable for an inlet pressure of {700 kPa} [100 psi] and an outlet pressure of {525 kPa} [75 psi].

.3 Provide, at each compressed air outlet station, {2440 mm} [8 ft.] long by {10 mm} [3/8"] internal dia. heavy duty neoprene standard service station hose, complete with Foster Model 48-4-3/8" plug hose stem to snap onto the female detachable coupling. Provide Foster Model 48-4-3/8" female hose barb for the other end of the hose.

.4 Provide one Foster Model 40-4-1/4" and one Foster Model 42-4-3/8" male hose plug for each outlet station.

2.6. Pump Stations

.1 Refer to drawing M-210 for piping configuration and equipment specifications.

PART 3 - EXECUTION

3.1. INSTALLATION

.1 Pitch piping not less than 1:480 [1" in 40 ft].

.2 Install full size dirt pockets not less than {150 mm} [6"] long at the bottom of each riser and elsewhere where dirt or condensate may accumulate. Do not exceed {30 m} [100 ft] between drain points.

.3 Make all branch takeoffs from top of main.

.4 Provide unions at connection to all equipment.

.5 Provide valves at each equipment connection and to isolate each main, branch and riser.

.6 Provide check valves on compressor discharge piping.

.7 Provide interconnecting piping including fittings, valves and auxiliaries.

3.2. TESTING

.1 Test at {1380 kPa} [200 psig] with dry nitrogen for not less than 6 hours without change in pressure allowing for temperature change.

.2 Visibly inspect all joints for leakage. Repair leaking joints and repeat test from beginning.

3.3. STARTUP

.1 Thoroughly clean the compressed air system before and after testing to ensure that all dirt, water and moisture is removed.

.2 Demonstrate the condition and operation of the complete compressed air installation to the satisfaction of the Consultant.

.3 Warrant the system to be completely oil free.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply, install and test complete plumbing specialties indicated on the drawings and specified in this section of the Specifications.

PART 2 - PRODUCTS

2.1. FLOOR AND AREA DRAINS

.1 Provide floor and area drains manufactured as noted within the drawings.

2.2. CLEANOUTS

.1 Stack cleanouts shall be cast iron tee type with gas-tight plug Zurn Z1445-75, Smith models 4510/4530, Mifab C1460.

.2 Line cleanouts shall be cast iron ferrule with threaded or bolted plug, Zurn Z1440, Smith 4420, Mifab C1450.

.3 Provide custom access doors to line cleanouts which require access through washroom tiled walls. Access door shall be stainless steel with friction fit door and have a recessed top to accept tile size used in washroom. Acudor Series UF5000SS, CAN-AQUA CA-HD Series, Mifab Series UASS or CAD.

.4 Floor cleanouts shall be cast iron construction with gas tight seal. Tops shall be round, heavy duty, scoriated nickel bronze, adjustable to finished floor. Cleanouts shall be complete with nickel bronze recessed tops where required to suit floor finishes. In unfinished and heavy traffic areas, use heavy duty scoriated ductile iron tops. Zurn Series Z1400 or Smith Series 4020, Mifab Series C1100.

2.3. TRAP PRIMING

.1 Prime all floor drain traps with cold water.

.2 For individual traps provide Mifab M-500 or P.P.P-P0500 bronze trap seal primers with integral vacuum breakers.

.3 For installations (such as equipment rooms) with large numbers of traps in close proximity to one another, provide electronic trap priming systems equivalent to Precision Plumbing Products Inc. Electronic Trap Priming Manifold PT-4 through PT-30. Select model to suit the number of traps to be primed (4 through 30). Each electronic trap priming assembly shall comprise:

.1 24 hour timer - 120/1/60
.2 circuit breaker
.3 manual override switch
.4 manual isolation valve {20 mm} [3/4"] for incoming water supply
.5 solenoid valve - 120/1/60
.6 vacuum breaker
.7 calibrated manifold for equal water distribution to all floor drains

.8 complete internal power and control wiring
.9 complete internal piping
.10 NEMA 1 cabinet constructed of 16 ga. steel - provide flush mounted cabinet in finished areas and surface-mounted cabinet in mechanical rooms and other service rooms.

PART 3 - EXECUTION

3.1. PROTECTION

.1 Provide each floor drain with {0.15mm} [6 mil] polyethylene under strainer to prevent dirt from entering the system during construction. Remove polyethylene from all drains immediately prior to Substantial Performance of the Work.

3.2. COORDINATION

.1 Coordinate all drain and clean out provisions with final construction.

.2 If water meters are not immediately available, make arrangements with City of Toronto and provide the necessary companion pieces and filler connection. Remove filler pieces and install meter when available. Provide stanchion supports within {150 mm} [6"] of water meter inlet and outlet.

.3 Coordinate installation of parking garage floor drains with General Contractor to ensure proper integration of membrane topping.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install the sound and vibration control devices indicated on the Drawings and specified in this Section of the Specification.

1.2. QUALITY ASSURANCE

.1 Provide vibration isolation and duct attenuators from a single sound and vibration control manufacturer, whose responsibilities shall include, but not be limited to:

.1 supply of all vibration and sound isolation equipment necessary to meet the performance requirements

.2 coordination throughout the project with all provided equipment to ensure adherence to performance criteria

.3 determination of equipment, pipe and duct mounting arrangements

.4 field supervision and inspection to assure proper installation and performance

.5 allowance for expansion and contraction when selecting and applying isolation materials

.6 coordination of any silencer provisions with sound power levels of fans specified elsewhere in this Specification

.2 Ensure the provision of adequate vibration and sound control equipment for all fans, pumps, ducts, pipes, chillers, boilers, cooling towers, air handling units and other mechanical equipment.

.3 Ensure that no ducts and pipe installation transmit vibration to the walls and floors through which they pass.

.4 Provide equipment, pipe and duct mountings non-resonant with equipment operating and building structure natural frequencies.

.5 Sound and vibration control manufacturer shall be Vibro-Acoustics Limited.

1.3. SUBMITTAL REQUIREMENTS

.1 Supply to the sound and vibration control manufacturer, a copy of certified Shop Drawings of equipment to be isolated and sound power levels of equipment requiring sound attenuators.

.2 Submit Shop Drawings of sound and vibration control components including all calculations. For each piece of equipment to be isolated, identify on the shop drawings the equipment’s lowest operating speed, it’s weight, band, and the type and location of isolators.

.3 Submit Shop Drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, all bases including necessary concrete and steel

work and vibration isolation devices, and all required hanger bolts and other appurtenances necessary for proper installation of the equipment.

1.4. VIBRATION ISOLATION PERFORMANCE

.1 For each piece of equipment to be isolated, select the vibration isolation mounts on the basis of 98% vibration isolation efficiency at the lowest operating speed. That is, the natural frequency of each vibration isolation system shall be no higher than 1/10 of the lowest excitation frequency of the rotating machinery, when ever practicable, but in no case greater than 1/7.

.2 Where structural floor deflection will exceed 1/10 of the determined static deflection of the isolator, increase the isolator static deflection to maintain this minimum ratio of the floor to isolator deflection.

.3 Static deflections shown on the drawings, specified or scheduled are a guide only. Actual isolators are to achieve the required static deflection under load, with at least 50% reserve deflection.

PART 2 - PRODUCTS

2.1. ISOLATORS

.1 All spring isolators shall be complete with levelling devices, {6 mm} [1/4"] thick ribbed neoprene sound pads and completely stable, colour coded springs.

.2 Select springs to operate at no greater than 2/3 solid deflection.

.3 Paint all hardware with zinc chromate. For applications subject to outdoor or high humidity conditions, neoprene coat springs, and paint mounts with two coats of rust resisting paint. Use neoprene instead of rubber when pads may be affected by outside weather conditions or oil contamination.

.4 Piping connections to air compressors shall be isolated with FPM Metal Hoses.

.5 Support equipment with one of the following types of isolator, as scheduled:

.1 Type CM: closed spring mounts with top and bottom housing separated with neoprene rubber stabilizers.

.2 Type FS: Open spring mounts having extra stable iso-stiff springs. (Horizontal stiffness shall be equal to vertical stiffness).

.3 Type CSR: Free standing restrained mounts with heavy rigid steel base frame, built-in limit stops and removable spacer plates. Springs shall be iso-stiff with a minimum horizontal to vertical stiffness (Kx/Ky of 1.0). The clearance around the bolt holes must be a minimum {12 mm} [½"] such that a +/-3 degree rotational misalignment may be tolerated. As an alternative provide rubber sleeve of minimum {3 mm} [1/8"] thick, not more than 60 Durometer hardness for limit stop bolts so that shortening would not be possible.

.4 Type HCS: Similar to Type SH, suitable for horizontal installation to limit horizontal movement of isolated equipment.

.5 Type MD: Elastomer rubber mount with threaded insert and hold down bolt holes.

.6 Type R: Waffle pads shall be 50 durometer natural rubber {14,000 kPa} [2000 psi] tensile, a minimum of {12 mm} [½"] thick and selected for an optimum loading of {420 kPa} [60 psi]. When pads are built into spring isolators or hangers 50 durometer {21,000 kPa} [3000 psi] tensile pads are acceptable with an optimum loading of {630 kPa} [90 psi].

.7 Type N: Waffle pads shall be 30 durometer neoprene, {12,600 kPa} [1800 psi] tensile, minimum of {12 mm} [½"] thick and selected for an operating load of {630 kPa} [90 psi].

.8 Type RSR: Rubber-steel-rubber pads shall consist of two layers of {12 mm} [½"] thick Type R pad, as specified above, bonded to each side of {6 mm} [1/4"] steel plate. All holes to be sleeved and complete with an isolation washer.

.9 Type NSN (special): Neoprene-steel-neoprene pads shall consist of two layers of {12 mm} [½"] thick Type N pad, as specified above, bonded to each side of {1.6 mm} [1/4"] steel plate. All holes to be sleeved and complete with isolation washers.

.10 Type KIP: Kinetic precompressed moulded fibreglass pads shall be coated with a flexible moisture impervious elastomeric membrane. Glass fibres, produced by the multiple flame attenuation process shall have a diameter not exceeding {.0045 mm} [.00018"].

2.2. SPRING HANGERS

.1 Select springs to operate at not greater than 2/3 solid deflection. Paint all hardware with zinc chromate primer.

.2 Spring hangers shall be Type SH or Type SHR with completely stable, colour coded springs.

.3 The spring and cup washer assembly shall have a single stable position under load.

.4 All hangers must be capable of tolerating a vertical misalignment of +/-15 degrees without loss of stability.

.5 Ensure that there is no physical contact between pipes and sleeves or pipes and structure.

.6 Type SH: Shall have fabricated steel housing with one coat anti-rust paint, and be complete with a colour coded stable spring, retaining cups and acoustic washer.

.7 Type SHR: shall be as for Type SH above, but shall have a {25 mm} [1"] elastomeric element in lieu of acoustic washer.

.8 Attach top of hanger frame rigidly to the structure. However, do not install spring hangers in concealed locations.

.9 Suspend piping connected to isolated equipment with Type SHR spring hangers as follows:

.1 Up to {100 mm} [4"] pipe - at first 3 points of support.

.2 {125 mm to 200 mm} [5" to 8"] - at first 4 points of support.

.3 {250 mm} [10"] and larger - at first 6 points of support.

.10 The first point of support shall have a static deflection of twice the deflection of the isolated equipment.

.11 If, due to space restrictions, it is impossible to use at least two spring hangers, provide rubber hose to provide flexibility. Flexible metal hose may only be used when pressure rated rubber hose is not available. Provide control cables in lieu of control rods where alignment is required.

.12 Ensure that there is no physical contact between pipes and sleeves, or pipes and structure.

PART 3 - EXECUTION

3.1. FLOOR MOUNTED EQUIPMENT

.1 Erect floor mounted equipment on {100 mm} [4”] high concrete pads over complete floor area of equipment. Mount vibration eliminating devices and concrete inertia blocks on {100 mm} [4"] high housekeeping pads.

3.2. VIBRATION ISOLATION SYSTEMS

.1 Have vibration isolator manufacturer determine mounting sizes. Install in accordance with manufacturer's instructions.

.2 Installed vibration isolation system for each floor or ceiling supported equipment shall have a maximum lateral motion under equipment startup or shut down conditions of {6 mm} [1/4"]. Restrain excess motions by approved mountings.

3.3. MOUNTING SYSTEMS EXPOSED

.1 Protect mounting systems exposed to weather and other corrosive environments with factory corrosion resistant coatings. Hot dip galvanized metal parts of mountings (except springs and hardware). Cadmium plate and neoprene coat springs. Cadmium plate nuts and bolts.

3.4. PACKAGED AIR HANDLING UNITS MOUNTING

.1 Mount packaged air handling units which are not internally isolated directly on stable bare steel spring isolators. Where units to be mounted are furnished with internal structural frames and external lugs (both of suitable strength and rigidity), or without any severe overhangs, no additional structural frame provided beneath unit. Integrally mount motor on slide rails.

3.5. PIPE SUPPORT

.1 Support piping as follows:

.1 Resiliently support all suspended piping connected to isolated equipment.

.2 Provide resilient diagonal mountings or other approved devices to limit piping motion due to equipment startup or shutdown, to a maximum deflection of {3 mm} [1/8"].

3.6. EXPANSION AND CONTRACTION

.1 Allow for expansion and contraction when selecting and applying isolation materials.

3.7. NOISE LEVELS

.1 Isolate equipment to attain acceptable noise criteria (NC) levels in occupied areas, using terms of reference set out by ASHRAE.

.2 After systems have been balanced, take sound measurements throughout the complete range of audible frequencies from 63 Hz through 8000 Hz, in each occupied area above, below and beside each Mechanical Equipment Room and where directed. Plot readings on noise criteria NC curves.

.3 Modify, as required and at no additional cost to the Owner, the fan distribution and other mechanical systems to achieve the specified noise criteria.

.4 Submit a report, including sound curves, to substantiate that equipment has been isolated adequately, and that acceptable noise levels have been attained. Provide a list to indicate equipment in operation at time of readings taken. Certify report by Professional Engineer of Ontario.

.5 Make sound measurements in accordance with the American Standard Method for the Physical Measurement of Sound, ANSI S1.2.

.6 Sound measuring equipment shall be Type 2 Class I in accordance with ANSI Standards S1.4 or S1.11.

END OF SECTION

PART 1 - GENERAL

1.1. DEFINITIONS

.1 This building is considered a Priority one (P1) Building: A building in which life safety is paramount concern. It is necessary that P1 buildings remain operative during or after an earthquake.

.2 SRS: For Seismic Restraint System.

1.2. LIMITATIONS

.1 One only seismic restraint system to be used for all systems and equipment. Provide additional instrumentation for special packages provided as a separate price.

1.3. GENERAL DESCRIPTION

.1 This section governs design, supply and installation of complete SRS for all systems, equipment specified for installation on this project. This includes fire protection, plumbing & utility piping, mechanical equipment and systems, both vibration isolated and statically supported. Complete work shall meet Factory Mutual's requirements.

.2 SRS to be fully integrated into, compatible with:

.1 Noise and vibration controls specified elsewhere in this project specification.

.2 Structural, mechanical, electrical design of project.

.3 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.4 Design to be by Professional Engineer specializing in design of SRS and registered in Province of Ontario.

.5 Each contractor (fire protection, plumbing, and ventilation contractor) shall be responsible for coordinating their respective discipline as it relates to Seismic restraints system to ensure a single system is used throughout the project. Each contractor shall adhere to Section 15071 and/or more stringent code (i.e. NFPA 13 and Factory Mutual).

1.4. REFERENCE

.1 CSA G40.21-98, Structural Quality Steels.

.2 ANSI/NFPA 13-1999, Installation of Sprinkler Systems.

.3 Factory Mutual's requirements.

.4 SMACNA Seismic Restraint Manual - current edition

.5 ASHRAE Standards for seismic restraint

1.5. SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 15010 - Mechanical General Requirements.

.2 Submittals to include:

.1 Full details of design criteria.

.2 Full written description of scope of work.

.3 Calculations

.4 Detail Drawings

.3 Submit additional copy of shop drawings and product data to Structural Engineer for review of connection points to building structure.

1.6. MAINTENANCE DATA

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 15010 - Mechanical General Requirements.

PART 2 - PRODUCTS

2.1. SRS MANUFACTURER

.1 SRS to be from one manufacturer regularly engaged in production of same.

.2 Acceptable materials: Mason Industries, Vibra-Sonic Control, and Kinetics Noise Control.

2.2. GENERAL

.1 SRS to provide gentle and steady cushioning action and avoid high impact loads.

.2 SRS to restrain seismic forces in all directions.

.3 Fasteners and attachment points to resist same load as seismic restraints.

.4 SRS of Piping systems to be compatible with:

.1 Expansion, anchoring and guiding requirements.

.2 Equipment vibration isolation and equipment SRS.

.5 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.

.6 Attachments to RC structure:

.1 Use high strength mechanical expansion anchors.

.2 Drilled or power driven anchors not permitted.

.7 Seismic control measures not to interfere with integrity of firestopping.

2.3. SRS FOR STATIC EQUIPMENT SYSTEMS

.1 Floor-mounted equipment, systems:

.1 Anchor equipment to equipment supports.

.2 Anchor equipment supports to structure.

.3 Use size of bolts scheduled in approved shop drawings.

.2 Suspended equipment, systems:

.1 Use one or combination of following methods:

.1 Install tight to structure.

.2 Cross-brace in all directions.

.3 Brace back to structure

.4 Slack cable restraint systems.

.2 SCS to prevent sway in horizontal plane, “rocking” in vertical plane, sliding and buckling in axial direction.

.3 Hanger rods to withstand compressive loading and buckling.

2.4. SRS FOR VIBRATION ISOLATED EQUIPMENT

.1 Floor mounted equipment systems:

.1 Use one or combination of following methods:

.1 Vibration isolators with built-in snubbers.

.2 Vibration isolators and separate snubbers.

.3 Built-up snubber system approved by Engineer, consisting of structural elements and elastomeric layer.

.2 SRS to resist complete isolator unloading.

.3 SRS not to jeopardize noise and vibration isolation systems. Provide 4-8 mm clearance between seismic restraint snubbers and equipment during normal operation of equipment and systems.

.4 Cushioning action to be gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.

.2 Suspended equipment systems:

.1 Use one or combination of following methods:

.1 Slack cable restraint system.

.2 Brace back to structure via vibration isolators and snubbers

PART 3 - EXECUTION

3.1. INSTALLATION

.1 Attachment points and fasteners:

.1 To withstand same maximum load that seismic restraint is to resist and in all directions.

.2 Install SRS at least 25 mm from all other equipment, systems, services.

.3 Miscellaneous equipment not vibration-isolated:

.1 Bolt through house-keeping pad to structure.

.4 Co-ordinate connections with all disciplines.

.5 Vertical tanks:

.1 Anchor through house-keeping pad to structure.

.2 Provide steel bands above centre of gravity.

.6 Horizontal tanks:

.1 Provide at least two (2) straps with anchor bolts fastened to structure.

3.2. INSPECTION AND CERTIFICATION

.1 SRS to be inspected and certified by Manufacturer upon completion of installation.

.2 Provide written report to Engineer with certificate of compliance.

3.3. COMMISSIONING DOCUMENTATION

.1 Upon completion and acceptance of certification, hand over to Engineer complete set of construction documents, revised to show “as-built” conditions.

END OF SECTION

PART 1 - GENERAL

1.1. QUALIFICATIONS

.1 The TAB Agency shall be a current member in good standing with either the Associated Air Balance Council or National Environmental Balancing Bureau.

1.2. SUBMITTAL REQUIREMENTS

.1 Submit the following information with the Bid Form:

.1 List of proposed equipment to be used for this project.

.2 Proof of membership in the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB).

.3 The names and qualifications of all personnel who will be assigned to this project. Use of other personnel will be grounds for contract termination.

.4 A listing of references including project names, Consultant, Contractor and Owner references with telephone numbers.

1.3. WORK INCLUDED

.1 Comply with Division 1 - General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to test, adjust and balance all air and hydronic systems to verify conformance to specified quantities and to the design intent of the mechanical system.

.3 Refer to Specification 20 08 00 for commissioning activities to be performed by others. Cooperate with the Commissioning Agent.

.4 The following systems and/or equipment are included in the Scope of Work:

.1 Air Systems:

.1 Supply Fan AHU

.2 Return Fans

.3 Relief Fans

.4 Exhaust Fans

.5 Zone Branch and Main Ducts

.6 Diffusers, Registers and Grilles

.7 Coils (Air Temperatures and Flow)

.2 Hydronic Systems:

.1 Branches to newly installed coils

.5 Refer to Specification Section 23 31 00 for test openings in duct system. Provide additional openings to fulfill the work of this section.

1.4. REFERENCE STANDARDS:

.1 All work shall be in accordance with the latest edition of the AABC or NEBB National Standards. If these contract documents set forth more stringent requirements than the Reference Standards, these contract documents shall prevail.

1.5. REFERENCE DOCUMENTS:

.1 Obtain and pay for, a complete set of reviewed Shop Drawings of pumps, fans and control systems.

.2 Obtain and pay for, a complete set of Mechanical Drawings and Specifications.

PART 2 - PRODUCTS

2.1. TEST EQUIPMENT

.1 When requested by the Consultant, provide current calibration certificates for test equipment.

PART 3 - EXECUTION

3.1. GENERAL

.1 The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC or NEBB Standards or "5%, which ever is more stringent.

.2 Any deficiencies in the installation or performance of a system or component shall be reported in writing to the Contractor and Consultant.

.3 Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be physically marked to show final settings.

3.2. JOB SITE INSPECTION

.1 Inspect the installation of the systems to be tested at least twice during the construction period. Ensure specified devices and components required for testing and balancing functions have been installed according to the manufacturer’s recommendations.

.2 Ensure all required balancing dampers are installed, functional, and accessible for use in testing and balancing procedures.

.3 Provide a written report of inspection to the Contractor and Consultant identifying specific concerns and deficiencies affecting the testing and balancing procedures.

3.3. FANS AND AIR HANDLING SYSTEMS

.1 Verify that all ductwork, dampers, grilles, registers and diffusers have been installed per design.

.2 Balance air handling systems at minimum outdoor air quantities. On completion of TAB procedures, retest at maximum outdoor air quantities.

.3 Test and adjust fan RPM to achieve design flow.

.4 Test and record motor voltage and amperage. Compare data with nameplate limits.

.5 Perform pitot tube traverse at all main and branch ducts. Compare traverse total with measured outlet total to determine actual duct leakage.

.6 Test and adjust minimum outdoor and relief air volumes.

.7 Test and record system static pressure profile of each air handling system at minimum outdoor air volume. Note coil (ie. wet/dry) and filter condition of time of testing.

.8 Test and record entering and leaving air conditions for each heat transfer coil and device. Simulate conditions to achieve winter or summer design parameters.

.9 Test and record settings of motor thermal overload devices. Adjust settings where required.

3.4. AIR DISTRIBUTION AND TERMINALS

.1 Adjust duct distribution to obtain specified air quantities. At least one zone balancing damper shall be completely open. Multi diffuser/grille branch ducts shall have at least one volume damper completely open.

.2 Test and adjust each air terminal to obtain specified flow. Adjust deflectors and pattern controllers to eliminate drafts.

3.5. HYDRONIC EQUIPMENT

.1 Test and adjust water flow to devices such as coils to obtain the specified flow. Compare actual equipment water side pressure drops with manufacturer’s published data.

3.6. PRELIMINARY TESTING

.1 In the event preliminary testing reveals a deficiency in the system which cannot be corrected through the balancing process, advise the Contractor and Consultant in writing describing the conditions and suggested corrective action.

3.7. REPORTS

.1 Provide one (1) copy of the TAB report electronically for Consultant review.

.2 Summarize all testing into logical sections, tabulated and summarized.

.3 Identify system terminals and distribution on legible plan or schematic drawings depicting actual system arrangement. Label pitot tube traverse locations, terminal identification and equipment identification in a manner consistent with the contract documents.

3.8. REPORT VERIFICATION

.1 Cooperate with the Consultant in field verification of the final reported valves.

.2 Specific and random verifications will be performed using the same procedures used in preparation of the reports.

.3 Sufficient verifications will be performed to satisfy the Consultant that the reports accurately represent the actual system conditions.

3.9. GUARANTEE

.1 Provide AABC National Project Performance Guaranty or NEBB Performance Bond for the work.

.2 Include a copy of the guarantee in each copy of the Testing and Balancing Report.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install the waste oil storage and piping system, as indicated on the Drawings and specified in this Section of the Specifications.

.3 Include for the complete provision of:

.1 waste oil return piping system

.2 Waste oil pumps and relocate4d storage tank.

PART 2 - PRODUCTS

2.1. WASTE OIL PIPING

.1 Pipe larger than and equal to {12 mm} [1/2"], Schedule 40 steel to CSA B63 and ASTM A120.

2.2. JOINTS AND FITTINGS

.1 Joints, threaded with approved oil resistant jointing compound.

2.3. VALVES

.1 Provide Crane, Jenkins or Kitz valves from one manufacturer, new, all brass/bronze construction and packed for oil use, to the following Kitz Figure numbers:

.1 Check valves {75 mm} [3"] and smaller, {862 kPa} [125 psi] bronze, screwed ends, horizontal swing check, regrinding type, Fig. 22.

.2 Ball valves {75 mm} [3"] and smaller, {1034 kPa} [150 psi] brass or bronze body, two piece, chrome plated solid ball, full port, screwed ends Fig. 58.

2.4. WASTE OIL PUMPS

.1 Provide a pumps and controls as noted in thee drawing package

2.5. OIL STORAGE TANK

.1 Install existing oil tank in existing side building as noted in the drawings. Connect waste oil piping to the relocated tank and provide all controls as noted in the drawing package.

PART 3 - EXECUTION

3.1. OIL STORAGE TANK INSTALLATION

.1 Repair damage to exterior paint finish prior to installation.

.2 Install tank according to Detail Drawing M-210.

3.2. PIPING INSTALLATION

.1 Slope piping to storage tank. Provide swing joint pipe connections.

.2 Terminate the oil tank vent with noted specified vent cap.

3.3. TESTING

.1 Test oil tank and complete oil system.

.2 Ensure Vacuum charge existing in tank.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install the natural gas piping system indicated on the Drawings and specified in this Section of the Specifications.

1.2. PERSONNEL QUALIFICATIONS

.1 Install natural gas system only with fitters certified to Ontario Gas Utilization Regulations and CGA requirements.

PART 2 - PRODUCTS

2.1. NATURAL GAS SYSTEM

.1 Provide complete natural gas system, to CGA requirements.

.2 Provide pressure reducing, regulating and relief valving required for compatibility between equipment and building natural gas distribution system.

PART 3 - EXECUTION

3.1. INSTALLATION

.1 Install natural gas service to meet CGA, and The Ontario Gas Utilization Regulations and all authorities having jurisdiction.

3.2. DISTRIBUTION

.1 Distribute gas within the building at 7” W.C.

.2 Select pressure reducing valves to maintain downstream pressures within $\pm$5% range of setting. Submit sizing data for each valve with Shop Drawings.

.3 Select pressure relief valves for the maximum capacity of the pressure reducing station served plus not less than 25%. Submit sizing data for each valve with Shop Drawings.

.4 Pipe all relief vents individually to outdoors. Size piping for a maximum pressure drop of 10% of the pressure reducing valve setpoint gauge pressure with a 25% capacity safety factor.

.5 Provide upstream and downstream isolating valves and pressure gauges complete with gauge cocks at all pressure reducing stations. Connect relief valves so that they cannot be isolated from the appliances which they serve.

3.3. CONNECTIONS TO EQUIPMENT

.1 Connect gas piping to all gas fired equipment.

3.4. PAINTING

.1 Paint gas service piping to meet code requirements.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply, install and test the heated water piping systems indicated on the Drawings and specified in this Section of the Specifications.

PART 2 - PRODUCTS

2.1. PIPING, JOINTS AND FITTINGS

.1 Meet the following pipe provision requirements:

.1 Pipe: {12 mm} [½"] to {50 mm} [2"]

.1 ASTM A53, Standard wall steel electric resistance weld, threaded for {1035 kPa} [150 psi] beaded malleable iron line joint couplings and {860 kPa} [125 psi] threaded cast iron fittings.

.2 Pipe: {65 mm} [2-1/2"] and larger

.1 ASTM A53, Standard wall steel electric resistance weld, ends bevelled for welding for welded line joints and standard wall seamless steel Grinnell Tubeturn, or Ladish fittings and {1035 kPa} [150 psi] slip on flanges.

.2 Meet Section 20 05 00 requirements for pipe installation and equipment connection including union and flange provision.

.3 Provide {1-1/2 mm} [1/16"] thick Cranite ring gaskets. Provide line joints, valves, fittings, flanges and in-line components below ____ floor level for {2100 kPa} [300 psi] system operating pressure. Select line joints, fittings and flanges used at and above ____ floor level for actual system operating pressures.

.4 Provide Type L copper takeoffs from risers, runouts and horizontal distribution systems.

.1 Meet hanger requirements in accordance with the manufacturer's recommendations as a minimum. Meet Section 20 05 00 requirements where hanger requirements are greater than the manufacturer's.

2.2. VALVES

.1 Ball Valves: Provide ball valves with brass or bronze body, chrome plated solid ball, PTFE seats and seals and full port:

.1 soldered - Kitz Figure 59

.2 screwed - Kitz Figure 58

2.3. CIRCUIT BALANCING VALVES

.1 Provide Armstrong Model CBV circuit balancing valves:

.1 on the common return pipe from each coil bank.

.2 on each return riser

.3 where shown on the Drawings

2.4. SAFETY AND RELIEF VALVES

.1 Provide safety and relief valves for all closed water systems. Pipe relief to nearest floor drain.

.2 Provide Watts 174A valves rated at {1035 kPa} [150 psig] at {99°C} [210°F] ASTM rated, cast iron body bronze disc and seat, steel spindle assembly, carbon steel spring.

2.5. HYDRONIC TERMINAL UNIT VALVES

.1 Provide Dahl bronze ball valves at inlet and outlet of each hydronic terminal unit.

2.6. AIR VENTS

.1 Select air vents to suit system operating pressures.

.2 Provide manual air vents, screwdriver or key type at each unit heater, cabinet unit heater, convector, wallfin section and fan coil unit.

2.7. STRAINERS

.1 Provide wye type strainers upstream of new hydronic coils.

PART 3 - EXECUTION

3.1. INSTALLATION

.1 Meet Section 20 05 00 requirements.

.2 Use valves and strainers of the same size as pipe in which it is installed, unless otherwise indicated.

.3 Provide globe, ball or plug valves for throttling or controlling flow in accordance with article 2.2.

.4 Provide gate, ball or butterfly valves for shutoff in accordance with article 2.2.

.5 Install reducing fittings so as not to trap air.

.6 Provide long radius elbows.

.7 Provide flanges or unions at connections to all equipment.

.8 Provide screwed or flanged joints only in accessible locations. Provide access doors as required.

.9 Do not use field fabricated fittings.

.10 Equip low points with {20 mm} [3/4"] drain valve piped to floor drain. Provide, at high points on lines and on equipment connections, collection chambers and high capacity float operated automatic air vents.

.11 Connect branch pipe runouts to top of main distribution pipe.

3.2. TESTING

.1 Meet testing requirements of all authorities having jurisdiction. Obtain certification and certify tests not required by authorities. Perform not less than the following tests.

.2 Prove hydronic piping tight under a hydrostatic test of 150% of design working pressure but not less than {700 kPa} [100 psi]. Test without pressure drop for a period of not less than 4 hours.

.3 Perform tests before piping is covered or concealed.

.4 Remove all components which will not withstand test pressure and replace after tests.

.5 Eliminate leaks or remove and refit defective parts. Do not caulk threaded or welded joints.

.6 After work is completed, adjust and put all parts of the system into proper working order. Adjust all valves to achieve specified heating capacities. Leave the complete job ready for regular operation, all to the satisfaction of the Consultant.

.7 After the testing period, drain the system, and before water treatment is introduced into the system, clean out all dirt pockets and strainers.

.8 Provide lubricating oils, packing, and other accessories, for proper operation of the system.

.9 The final test and acceptance shall not be made until the work is finally completed.

3.3. INSTALLATION OF CONTROL DEVICES AND INSTRUMENTATION

.1 Install all control devices and instrumentation for the hydronic systems as shown on the drawings, specified in Section 25 30 00 and supplied by the controls supplier.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install refrigerant piping systems as indicated on the Drawings and specified in this Section of the Specifications.

.3 Installation shall be designed and installed by refrigerant piping system specialists.

1.2. SUBMITTAL DATA

.1 Submit Shop Drawings of refrigerant piping systems and control systems for review prior to commencement of installation.

.2 Drawings shall include the following:

.1 An isometric layout of refrigerant piping showing all piping and components required for the satisfactory operation and maintenance of systems, including but not limited to charging valves, isolating valves, sight glasses, strainers, driers, thermostatic expansion valves, solenoid valves, receivers, relief valves, mufflers, traps, oil separators, and water regulating valves.

.2 Control wiring interconnecting air conditioning equipment and refrigerant piping system components.

.3 A description of the sequence of operation of the refrigerant piping system.

1.3. REFERENCE STANDARDS

.1 Meet Division 26 requirements for wiring methods and materials.

.2 Refrigerant piping design and installation shall conform to the recommendations and requirements of the following:

.1 CSA Standard B52 - Mechanical Refrigeration Code

.2 Ontario Building Code

.3 Air Conditioning and Refrigeration Institute

.4 Air Conditioning Equipment Manufacturer

PART 2 - PRODUCTS

2.1. PIPING, JOINTS AND FITTINGS

.1 Select pipe, fittings and components to suit systems test and operating pressures.

.2 Refrigerant piping shall be factory cleaned and sealed, type ACR seamless copper piping. use only silver brazed joints.

.3 Use only long radius elbows.

.4 Size refrigerant piping to attain air conditioning equipment manufacturer's listed cooling capacities.

PART 3 - EXECUTION

3.1. PIPING AND WIRING INSTALLATION

.1 Keep piping runs and number of elbows and fittings to a minimum.

.2 Reduce the effect of piping vibration with the use of flexible metal hose.

3.2. DEHYDRATION AND CHARGING

.1 After installation of piping, a minimum test pressure of {2100 kPa} [300 psi] on the high pressure side and {1050 kPa} [150 psi] on the low pressure side shall be placed on the piping system with nitrogen. Pressures shall be maintained without loss for not less than four (4) hours. Repair or replace defective joints.

.2 After joints have been proven tight under test pressures, achieve a vacuum of not less than {95 kPa} [28" Hg] using a separate vacuum pump. Maintain vacuum without change in pressure for at least twelve (12) hours.

.3 System shall then be charged with dry refrigerant.

.4 After charging, recheck all joints with a halide leak detector. Replace any joints found to leak, and repeat the above dehydration testing and charging procedures.

3.3. START UP AND ADJUSTMENT

.1 Provide necessary instruments, gauges and testing equipment required.

.2 Adjust thermostats, valves and controls and demonstrate that design requirements and equipment manufacturer's ratings have been met.

.3 Test and record equipment voltage and amperes and compare with motor nameplate data.

.4 Set and adjust controls to achieve required sequence of operation.

3.4. GUARANTEE

.1 Replace any refrigerant and oil lost during the warranty period.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply and install the sheet metal and ductwork systems as indicated on the Drawings and specified in this Section of the Specifications.

1.2. REFERENCE STANDARDS

.1 Meet Standards described in the latest Edition of HVAC Duct Construction Standards handbook from Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

.2 Duct dimensions shown on Drawings are net, inside insulation and acoustic duct lining.

.3 Combination fire and smoke dampers and fire dampers shall be ULC listed and labelled, and meet requirements of Ontario Fire Marshall and NFPA-90A.

PART 2 - PRODUCTS

2.1. DUCTWORK

.1 Fabricate ductwork from galvanized sheet metal with a minimum coating of {1.83 grams/m5} [0.60 oz/sq.ft.] (G60 coating) unless other materials are specifically named. Duct installation shall conform to the following:

.1 Ductwork shall be smooth on the inside and free of obstructions, vibration and rattle.

.2 Fabricate ductwork, except as described in the next item, according to the following classifications:

.1 Class 1: All ducting subject to positive or negative static pressure of {250 Pa} [1 in wg] or less with maximum velocities of {13 m/s} [2500 fpm] shall be constructed in accordance with SMACNA construction standards for {250 Pa} [1 in wg] duct.

.3 Provide duct transformation with expansion fittings having slopes not exceeding 1 to 7 and contraction fittings having slopes not exceeding 1 to 4.

.4 Provide full radius tees, bends, and elbows for changes in direction except where square elbows are required due to space restrictions. Provide DuroDyne double thickness {0.8 mm} [24 gauge] turning vanes assembled in top and bottom rails in square elbows.

.5 Provide balancing dampers free to move in either direction without binding and rattling. Construct dampers in ductwork from {1.2 mm} [18 gauge] galvanized sheet metal. Use manual quadrants on small ducts. On dampers longer than {375 mm} [15"] use push rods with DuroDyne Model SRP ball joints. Use two push rods on ducts wider than {600 mm} [24"]. Provide OBD balancing dampers where shown on the drawings.

.6 Isolate equipment with DuroDyne neoprene {0.8 mm} [0.032"] thick flexible connectors with finished fabric width not less than {150 mm} [6"].

.7 Provide {50 mm} [2"] insulated sheet metal blank off panels behind unused portions of exterior louvers.

.8 Seal all joints in low, medium and high pressure ductwork with Transcontinental MP for low and medium pressure or DuroDyne S2 duct sealer for high pressure. Joints shall be sealed to conform to SMACNA standards as follows:

Seal Class	Sealing Required	Static Pressure Construction Class
A	All transverse joints, longitudinal seams and duct wall penetrations.	{1000 Pa} [4" w.g. and up]
B	All transverse joints and longitudinal seams.	{500-750 Pa} [2" - 3" w.g.]
C	Transverse joints	Up to {500 Pa} [2" w.g.]

.9 Seal joints in exhaust ducting where fan intake is further than {25 m} [82 ft] from furthest intake in accordance with seal Class A.

.10 Construct round ductwork to meet high pressure duct standards and as follows:

.11 Provide welded slip joint construction round duct fittings. Wipe pipe and fittings with Durodyne S-2 duct sealer before assembly. Secure joints with self-tapping screws, then brush again with thick coat of duct sealer.

.12 Provide dieformed round elbows through {200 mm} [8"] dia. constructed from {1.1 mm} [20 gauge] galvanized steel. Provide 5 section construction for larger elbows.

.13 Provide conical round tees.

.2 Flexible Ductwork:

.1 Provide Flexmaster Triple Lock Aluminum, flexible ductwork upstream and downstream of air terminal control units and/or other locations indicated on the Drawings.

.2 Construct ductwork from a tape of soft annealed aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and flexibility. Provide a triple mechanical lock to form a continuous secure air joint without the use of adhesives for pressures up to {3000 Pa} [12"].

.3 Conform to the requirements of NFPA 90 and Underwriters Laboratories classification for round duct to specification UL 181.

.3 Provide flexible ductwork in minimum lengths of {1500 mm} [5'-0"] and maximum lengths of {3600 mm} [12'-0"] Class 1 pressure systems. For Class 2 and higher pressure systems restrict minimum and maximum lengths to {1200 mm} [4'-0"].

.4 Provide fume exhaust systems as follows:

.1 Ductwork shall be stainless steel fabricated using Type 304L sheet stainless steel of {1.52 mm} [22 gauge] thickness.

.2 Provide stainless steel access panels set in frames that do not weaken the ducts into which they are placed.

.3 Provide access panel assembly complete with neoprene gaskets and quick opening/closing stainless steel latches.

2.2. ACCESS DOORS

.1 Provide access doors for galvanized ductwork using {0.7 mm} [24 gauge] galvanized material with galvanized mounting frame and {25 mm} [1"] rigid insulation between panels. Provide fastening devices to give tight closure.

.2 Provide access doors for stainless steel ductwork using {0.61 mm} [24 gauge] stainless steel with stainless steel mounting frame and {25 mm} [1"] rigid insulation between panels. Provide fastening devices to give tight closure.

.3 Provide access doors for aluminum ductwork of {0.61 mm} [24 gauge] aluminum with aluminum mounting frame, and {25 mm} [1"] rigid insulation between panels. Provide fastening devices to give tight closure.

.4 Provide access doors and removable panels in plenums and casings of {1.31 mm} [18 gauge] galvanized material with {50 mm} [2"] thickness fiberglass insulation. Equip doors with handles and hinges to open from either side (without risk of injury) as follows:

.1 for mandoors:

.1 handles - Durodyne SP-20

.2 hinges - Durodyne HB-3

.3 gaskets - Durodyne GN-22

.2 for removable panels:

.1 sash locks - Durodyne SL-1

.2 gaskets - Durodyne GN-22

.5 Construct all access doors with double panels.

.6 Provide neoprene gaskets securely formed into door frames around the periphery of all duct access doors.

.7 Equip door frames for plenums and casings with hollow tubular gaskets.

.8 Provide access doors at all fire dampers.

2.3. ACOUSTIC DUCT LINING

.1 Provide {25 mm} [1"] thick acoustic duct liner where shown on drawings and as follows:

.1 Rectangular Duct Liner: Permacote Linacoustic meeting ASTM C 1071 with air surface coated with acrylic coating treated with EPA registered anti-microbial agent proven to resist microbial growth as determined by ASTM G 21 and G 22.

.1 Noise Reduction Coefficient: .70 or higher based on “Type A mounting” and tested in accordance to ASTM C 423.

.2 Adhesive: meeting ASTM C 916.

.3 Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.

2.4. FIELD ASSEMBLED PLENUM AND CASING CONSTRUCTION

.1 Provide metal partitions, plenums and casings of not less than {1.61 mm} [16 gauge] galvanized sheet metal suitably reinforced with rolled angle sections.

.2 Provide metal partitions, plenums and casings with adequate strength for all operating conditions. Fabricate each sheet of material as a panel. Join panels by {40 mm} [1.5"] standing seams on outside of casings and secure with bolts at {300 mm} [12"] centres.

.3 Provide closure baffles around banks of coils, filters and other inline components.

.4 Provide {25 mm} [1"] minimum size rolled structural steel angles where casing meets floor. Caulk joints to prevent air and water leakage.

.5 Flange and bolt casings on {150 mm} [6"] centres to coils, blankoff panels and filler panels.

.6 Incorporate adjustable directional flow baffles into mixing plenums, to ensure complete mixing of outdoor and return airstreams with stratification not to exceed {$\pm$2^{o}C} [$\pm$4^{o}F] across the coil face at winter outdoor design temperature.

.7 Provide Blender Products, Inc. blender section for air mixing plenums where shown on the drawings and as scheduled. Construct housing and blenders of {1.52 mm} [16 gauge] steel with corrosion resistant paint. Provide blank-off panels as required. Equip air blender with {50 mm} [2 "] flanges and line with {25 mm} [1"] {9 kg} [2 lb.] {1.4 kg} [3 lb.] available density fiberglass liner. Construct mixing section with mixing distances such that the maximum temperature standard deviation thru a plane parallel with blender at the discharge of the mixing section shall be {-14.4^{o}C} [6^{o}F] when the difference between entering air streams is {33^{o}C} [60^{o}F]. The variation coefficient governing the profile shall be no greater than .3 based on the equation (VARIATION COEFFICIENT = STANDARD DEVIATION/AVERAGE VELOCITY.) Provide full size access doors in each blender. Provide double wall construction.

2.5. INSULATED PLENUMS AND CASINGS

.1 Provide insulated metal sandwich panels for all exterior intake and exhaust air plenums consisting of prefabricated 18 gauge galvanized sheet metal panels and {50 mm} [2"] rigid fiberglass insulation with interlocking joints securely fastened.

.2 Provide steel supports, joiner sections, floor channels, opening frames and sealing materials. Provide {1.31 mm} [18 gauge] minimum channel stiffeners at not greater than {800 mm} [32"] centres.

.3 Connect corners and butt joints with {1.61 mm} [16 gauge] galvanized sections. Seal all joints with rubber mastic. Use angle joints to attach panel edges to walls.

.4 Construct entire plenum to resist deflection and seal sufficiently to avoid air leakage when subjected to a pressure differential between inside and outside of up to {2500 Pa} [10 in. w.g.].

.5 Provide access doors suitable for personnel pass through.

2.6. FIRE DAMPERS

.1 Provide Ruskin curtain or parallel blade type dampers to maintain fire rating integrity of membrane being pierced. Minimum rating to be 1-1/2 hours with {100°C} [212°F] fusible link. Provide multiple dampers where sizes exceed code limitation.

.2 Provide models as follows, to suit application:

Model No.	Application
IBD-2, Style B or C	Normal duct application (2 hrs.)
IBD-20 Style G	Behind grilles (2 hrs.)
IBDT	In doors or thin separations (2 hrs.)
IBD-23	In fire walls (4 hrs.)
FSF	Behind outlets in fire rated floor (roof) and ceiling assemblies
FD-35	Combination fire and balancing damper (2 hrs.)

.3 Select dampers with air flow resistance not exceeding {13 Pa} [0.05 in. w.g.] at design flow rates.

2.7. BACKDRAFT DAMPERS

.1 Provide Ruskin Model CBD2 counter-balanced backdraft dampers suitable for use in temperatures from {-40°C to 93°C} [-40°F to 200°F].

.2 Frames shall be 6063T5 extruded aluminum {2.3 mm} [.090"] wall thickness. Blades shall be formed aluminum, {.63 mm} [.025"] wall thickness. Bearings shall be molded synthetic and linkage {12 mm} [1/2"] tie bars. Blade edge seals shall be extruded vinyl. Dampers shall be equipped with adjustable counter-balance weights attached to rear of blades.

.3 Refer to Drawings for locations, mounting direction and air flow direction.

PART 3 - EXECUTION

3.1. SHEET METAL INSTALLATION

.1 Provide acoustic insulation on supply air ductwork from discharge side of mechanical air volume control boxes and attenuators as follows:

.1 {3000 mm} [10 ft.] for straight duct run box or

.2 {1500 mm} [5 ft.] downstream of 1st elbow or

.3 {1500 mm} [5 ft.] for each branch downstream of 1st tee.

.2 Provide final duct connections to all fume hoods and other individual canopies or hoods provided by Division 11, as designated on the drawings.

.3 Frame and install motorized dampers. Unless shown otherwise, attach each motorized damper module to the channel framing.

.4 Provide frames in ductwork for airflow stations.

.5 Provide DuroDyne IP-1 or IP-2 test openings in all ducts entering and leaving air handling equipment. Install test openings at {150 mm} [6"] intervals across the long dimension of rectangular ducts, and at 90 degree intervals around circular ducts. In insulated surfaces, provide extension to suit insulation thickness. Provide additional Model IP-4 test ports in ductwork where required for air balancing. Submit drawings to indicate proposed locations.

.6 Make provisions in ductwork and plenums for installation of duct type smoke detectors and other control devices.

.7 Provide a stainless steel skirting around kitchen exhaust ductwork between hood connection and ceiling line where top of hood is below ceiling.

.8 Slope ductwork down to exhaust hoods and other equipment connections. Provide drains at low points and pipe to nearest floor or funnel drain.

.9 Provide neoprene isolation gaskets and nylon bolts at connections required for dissimilar metals.

.10 Seal water tight all longitudinal and transverse joints in ductwork for swimming pool and change room systems.

.11 Seal water tight bottom and sides of intake and exhaust ducts connected to exterior louvers as follows:

.1 Intake - from Louvre to air handling unit.

.2 Exhaust - from Louvre to {2 metres} [6'-6"] upstream of Louvre.

3.2. ACOUSTIC DUCT LINING INSTALLATION

.1 Seal all leading and trailing edges and repair all rips or tears of acoustic duct liner with a suitable sealing compound similar to Johns-Manville Superseal.

.2 Provide a tapered sheet metal nose piece to hold the leading edge of acoustic duct liner and direct the air over the edge.

3.3. INSTALLATION OF FIRE DAMPERS, SMOKE DAMPERS AND COMBINATION FIRE AND SMOKE DAMPERS

.1 Install dampers in approved manner suitably anchored to building structure in locations indicated on the Drawings.

.2 Install fire dampers complete with sleeve and full perimeter steel angle on both sides of barrier being pierced. Provide manufacturers recommended minimum clearance between masonry or non-combustible frame and sleeve. Sleeve shall accept actual size of damper with blades pocketed outside of air stream.

.3 Divide openings into smaller openings using fire resistant structures where openings to be protected require dampers larger than maximum UL listed sizes.

3.4. CLEAN UP

.1 Vacuum clean the inside of all air handling systems, including fans, plenums, ducts, coils and terminal units to ensure that they are free from debris and dust.

END OF SECTION

PART 1 - GENERAL

1.1. WORK INCLUDED

.1 Comply with Division 1, General Requirements and all documents referred to therein.

.2 Provide all labour, materials, products, equipment and services to supply, install, wire, calibrate and test the electronic control and monitoring system instrumentation indicated on the Drawings, the Control Drawings, the point schedules and specified in this Section of the Specifications.

.3 Coordinate instrumentation provisions with the BAS equipment specified in the control diagrams. Make compatible without conversion at the DDC System Controller.

.4 Provide BAS master station in west mechanical room complete with monitor, keyboard, CPU and mouse.

.5 Provide remote access to BAS through secure network. Coordinate with City of Niagara Falls IT department.

.6 Provide sensor transmitter output of 4 to 20 mA unless otherwise specified.

1.2. ADDITIONAL INSTRUMENTATION

.1 Where the application of any special software package requires additional instrumentation to meet the requirements herein specified, provide the necessary instrumentation at no additional cost whether or not such instrumentation is identified in the point definition sheets.

.2 Provide additional instrumentation for special packages provided as a separate price.

.3 The required additional instrumentation shall meet the requirements of this Section. Submit for Consultant review prior to installation.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1. INSTALLATION OF INSTRUMENTATION

.1 Meet applicable codes, each manufacturer's recommended installation procedures and Division 26 requirements.

.2 All installations to be performed by skilled and certified technicians.

.3 Install instrumentation to be mechanically stable. Fix as necessary to wall or floor. Provide anti-vibration mounted where required to properly isolate the equipment.

.4 Install instrumentation so as to allow for easy maintenance access and so that it does not interfere in any way with access to adjacent equipment and personnel traffic in the surrounding space.

.5 Install instrumentation in locations providing adequate ambient conditions for its specified functioning, allowing for adequate ventilation and with no condensate traps.

.6 Permanently identify each wire, cable, conduit and tube at each point of connection.

.7 Protect all components placed in areas of high humidity or potentially high humidity.

.8 Provide complete drawings for Consultant review before any field installation is started giving complete description of all control elements and showing complete schematic piping and wiring diagrams, including functional description.

.9 Review proposed location of any instrumentation with Consultant prior to its installation.

.10 Provide thermowell mount RTDs, as specified in this Section, for the temperature monitoring of liquids. Where thermowell installation necessitates the shutting down of pumps or draining of pipes, coordinate with the Consultant.

.11 Provide averaging type RTDs as specified in this Section wherever the points schedule of these specifications indicates a mixed air temperature is to be monitored. Install averaging type RTDs in serpentine configuration with adequate provision for the mechanical protection of the sensor. Support along its entire length.

.12 Modifications to existing plenum and ductwork to achieve the intent of the Contract Documents shall adhere to the following:

.1 Mount sensors with extension necks such that access to sensors is not restricted by insulation.

.2 Keep cutting to a minimum and perform in a neat and workmanlike manner.

.3 Provide patches and access covers of the same material and thickness as adjoining ductwork. Provide necessary reinforcing and fastening materials.

.4 Provide gaskets, seals and insulation to restore to, or exceed as found conditions in areas where this Contractor has made modifications.

.13 Where the point schedules indicate that auxiliary contact provision, provide all instrumentation, wiring, conduit, power supplies and services as required to integrate these points into the BMS.

.14 Provide interposing and motor control relays at the local item of equipment or at the associated MCC as applicable. Provide all relays, wiring, conduit, power supplies and services as required to integrate these points into the BMS.

.15 Wire instrumentation which is part of the same control loop to the same field panel.

3.2. EXISTING INSTRUMENTATION

.1 Remove and dispose of existing instrumentation which becomes redundant in accordance with the Owner's direction.

.2 Reuse existing thermowells where possible.

3.3. NAMEPLATES

.1 Provide for each piece of instrumentation and end device, a {50 mm x 75 mm} [2" x 3"] plastic nameplate embossed to indicate the following:

.1 mnemonic for point

.2 remote field panel and PIU termination

.3 English language description

.4 field panel

.2 Affix the nameplate to the instrumentation, valve, etc., via a plastic cable tie or other similar device.

.3 Submit specimen nameplate and cable tie to Owner for approval prior to installation.

3.4. WARNING NOTICES

.1 Place warning notices at the MCC Panel, local starter and on or close to all motors under BMS control.

.2 Make the notices conspicuous with bold lettering to advise that the motor is under BMS control and may start at any time without warning. Submit sample notice for review prior to fabrication and installation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 The General Conditions of the Contract, the Supplementary Conditions, and all Sections of Division 01 apply to and are a part of this Section of the Specification.

1.02 APPLICATION

.1 This Section specifies requirements that are common to electrical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.03 NOTE RE: BOLD LETTERING

.1 "Bold" type lettering is used throughout this Specification in an attempt to enhance the readability of the text. The use of "bold" lettering does not indicate a greater level of importance.

1.04 SUBMITTALS

.1 As specified in this Section, submit the following to the Consultant:

.1 project close-out documentation: O & M Manuals, record as-built drawings, and all associated data

.2 progress payment breakdown: a detailed breakdown of the electrical work cost

.3 Contractor’s P. Eng. Documentation: the name, qualifications, and evidence of current liability insurance for all professional engineers to be retained by the Contractor to perform work associated with the Contract

.4 Extended Warranties: copies of all extended warranties specified, and in the name of the Owner

.5 O & M Training Schedules & Manual: a proposed schedule of demonstration and training dates and times, and a preliminary copy of the training manual developed for operational and maintenance training

1.05 DEFINITIONS

.1 The following are definitions of words found in electrical work Sections of the Specification and on associated drawings:

.1 "concealed" – means work hidden from normal sight in furred spaces, shafts, tunnels, ceiling spaces, walls and partitions

.2 "exposed" – means work normally visible, including work in electrical and equipment rooms and similar spaces

.3 "provide" (and tenses of provide) – means supply and install complete

.4 "install" (and tenses of install) – means install and connect complete

.5 "supply" – means supply only

.6 "finished area" - means any area or part of an area which receives a finish such as paint, or is factory finished

.7 "governing authority" and/or "regulatory authority" and/or "Municipal authority" – means all government departments, agencies, standards, rules and regulations that apply to and govern the electrical work and to which the work must adhere

.8 "Consultant" – means the Architect or Consulting Engineer who has prepared the Contract Documents on behalf of the Owner

.2 Wherever the words "indicated", "shown", "noted", "listed", or similar words or phrases are used in the specification they are understood, unless otherwise defined, to mean that the product referred to is "indicated", "shown", "listed", or "noted" on the drawings.

.3 Wherever the words "approved", "satisfactory", "as directed", "submit", "permitted", "inspected" or similar words or phrases are used in the specification or on the drawings they are understood, unless otherwise defined, to mean that work or product referred to is "approved by", "inspected by", etc., the Consultant.

.4 In the electrical specification, singular may be read as plural, and vice-versa.

1.06 QUALITY ASSURANCE

.1 All electrical work is to be done by journeyman tradesmen who perform only the work that their certificates permit, or by apprentice tradesmen under direct on-site supervision of an experienced journeyman tradesman. The use of apprentice tradesmen is to be limited and the journeyman/apprentice ratio is subject to the Consultant’s approval.

.2 An experienced and qualified superintendent is to be on-site at all times when electrical work is being performed.

1.07 CODES, REGULATIONS, AND STANDARDS

.1 All Codes, Regulations, and Standards referred to in this Section and in Sections to which this Section applies are the latest edition of the Codes, Regulations, and Standards in effect at the time of bidding on this Project.

.2 All electrical items are to be certified and bear the stamp or seal of a recognized testing agency such as CSA, UL, ULC, ETL, etc., or bear a stamp to indicate special electrical utility approval.

.3 Requirements of the Contract Documents are to take precedence when they are more stringent than codes, ordinances, standards, and statutes.

1.08 IMPERIAL AND METRIC MEASUREMENTS

.1 Conform to requirements of CAN/CSA-Z234.1, Canadian Metric Practice Guide.

.2 Both Metric and Imperial units of measurement are indicated in the electrical Specification. Metric measurements are "soft" and have been rounded off.

1.09 EXAMINATION OF SITE AND DOCUMENTS

.1 When estimating the cost of the work and prior to submitting a bid for the work carefully examine all of the bid documents and visit the site to determine and review all existing site conditions that will or may affect the work, and include for all such conditions in the bid price.

.2 Report to the Consultant, prior to bid submittal, any existing site condition that will or may affect performance of the work as per the drawings and specifications. Failure to do so will not be grounds for additional costs.

1.10 DRAWINGS AND SPECIFICATION

.1 Read the electrical work drawings in conjunction with all other structural, architectural, sprinkler, mechanical, etc., drawings.

.2 The electrical drawings are performance drawings, diagrammatic, and show approximate locations of equipment and connecting services. Any information regarding accurate measurement of the building are to be taken at the site. Do not scale the drawings, and do not use the drawings for prefabrication work.

.3 The drawings are intended to convey the scope of work and do not show architectural and structural details. Provide, at your cost, all offsets, fittings, transformations, and similar products required as a result of obstructions and other architectural and structural details but not shown on the drawings.

.4 The locations of equipment and materials shown may be altered, when reviewed by the Consultant, to meet requirements of the equipment and/or materials, other equipment or systems being installed, and of the building, all at your cost.

.5 Sections of the electrical specification are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and the Sections are to be read as a whole.

.6 The electrical specification does not generally indicate the specific number of items or extent of material required. The specification is intended to provide product data and installation requirements. It is necessary to refer to drawing schedules, layouts, schematic diagrams, riser diagrams, and details to determine correct quantities.

.7 The electrical drawings and specification are intended to be cooperative. Perform all work that is shown, specified, or reasonably implied on the drawings but not mentioned in the specification, or vice-versa, as though fully covered by both.

.8 When the scale and date of the drawings are the same, or when the discrepancy exists within the specification, the most costly arrangement will take precedence.

.9 In the case of discrepancies or conflicts between the drawings and specification, the documents will govern in the following order:

.1 the specification

.2 drawings of larger scale

.3 drawings of smaller scale

.4 drawings of later date when the scale of the drawings is the same

.10 In the case of discrepancies between the drawings and specifications, the documents will govern in the order specified in the General Conditions, however, when the scale and date of the drawings are the same, or where the discrepancy exists within the specification, the costliest arrangement will take precedence.

1.11 PLANNING AND LAYOUT OF THE WORK, AND ASSOCIATED DRAWINGS

.1 Properly plan, coordinate, and establish the locations and routing of services with all subcontractors affected prior to installation such that the services will clear each other as well as any obstructions, including structural components of the building. Unless otherwise specified, the order of right-of-way for services is to be as follows:

.1 piping requiring uniform pitch

.2 piping 100 mm (4") dia. and larger

.3 large ducts (main runs)

.4 electrical cable tray and bus duct

.5 conduit 100 mm (4") dia. and larger

.6 piping less than 100 mm (4") diameter

.7 smaller branch ductwork

.8 conduit less than 100 mm (4") diameter

.2 Unless otherwise shown or specified, conceal all work in finished areas, and conceal work in partially finished or unfinished areas to the extent made possible by the area construction. Install conduit, raceway, and similar services as high as possible to conserve headroom and/or ceiling space. Notify the Consultant where headroom or ceiling space appears to be inadequate prior to installation of the work.

.3 Revise or alter the arrangement of work that has been installed without proper coordination, study and review, even if it was completed in accordance with the Contract Documents, in order to conceal the work behind finishes, or to allow the installation of other work, at no additional cost. In addition, pay for the cost of alterations in other work required by the alterations to your work.

.4 All junction boxes, equipment and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.

1.12 COORDINATION OF THE WORK

.1 Review all the Contract Documents and coordinate the work with the work of all subcontractors. Coordination requirements are to include, but not be limited to, the following:

.1 written notifications of all concrete work such as housekeeping pads, bases, etc., required for electrical work, and including required dimensions, operating weight of equipment, location, etc.

.2 depth and routing of excavation required for electrical work, and requirements for bedding and backfill

1.13 GENERAL RE: INSTALLATION OF EQUIPMENT

.1 Unless otherwise specified all equipment is to be installed in accordance with the equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions.

.2 Ensure that proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Remove and replace any equipment which does not meet this requirement.

1.14 PERMITS, FEES, AND CERTIFICATES

.1 Apply for, obtain and pay for all permits required to complete the electrical work.

.2 Submit to the Consultant, all approval/inspection certificates issued by governing authorities to confirm that the work as installed is in accordance with the rules and regulations of the governing authorities. Pay any costs associated with issue of the certificates.

.3 Include a copy of all approval/inspection certificates in each operating and maintenance manual.

1.15 WORKPLACE SAFETY

.1 Comply with requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding the use, handling, storage and disposal of hazardous materials. Submit WHMIS MSDS (Material Safety Data Sheets) for all products where required, and maintain one copy at the site in a visible and accessible location available to all personnel.

.2 Comply with all requirements of Occupational Health and Safety Regulations and all other regulations pertaining to health and safety, including worker's compensation/ insurance board and fall protection regulations.

.3 Asbestos, Mould, Lead Paint, Etc.: If at any time during the course of the work asbestos containing materials, black mould, lead paint, or any other such materials are encountered or suspected, immediately report the discovery to the Consultant and cease all work in the area in question. Do not resume work in affected areas until the situation has been properly corrected and without written approval from the Owner.

1.16 SHOP DRAWINGS AND PRODUCT DATA SHEETS

.1 Prior to supplying any products to the site, submit for review, shop drawings and/or product data sheets indicating in detail the design, construction, and performance of products as requested in Sections of this Specification. The number of copies of shop drawings and/or product data sheets will be as later directed.

.2 Shop drawings are those prepared specifically for the Project. Product data sheets are copies of manufacturer’s standard catalogue, etc., literature.

.3 Unless otherwise specified or required, submit shop drawings/product data sheets via email in AutoCAD or PDF format only.

.4 Wherever possible, shop drawings and/or product data sheets are to be 215 mm x 280 mm (8½" x 11"), 215 mm x 356 mm (8½" x 14"), or 356 mm x 432 mm (11" x 17") single side white bond paper with sufficient clear space for review stamps, comments, and identification as specified below.

.5 Shop drawings and product data sheets must confirm that the product proposed meets all requirements of the Contract Documents.

.6 Each shop drawing or product data sheet is to be properly identified with the project name and the product drawing or specification reference, i.e., "Lighting Fixture F1", and all shop drawing or product data sheet dimensions are to be either SI or Imperial to match dimensions on the drawings.

.7 Carefully review each shop drawing and product data sheet prior to submittal to ensure that the proposed product is correct and meets with all requirements of the Project. Endorse each copy of each shop drawing or product data sheet “Correct for Review By Consultant”, or "Certified to Be In Accordance With All Requirements" and include your company name, the submittal date, and the signature of an officer of your company to indicate your review and approval as above.

.8 The Consultant will review shop drawings and product data sheets and will indicate the review status by stamping the shop drawings and product data sheets as follows:

.1 "Reviewed" or "Reviewed As Noted" to indicate that his review is final and no re-submittal is required

.2 "Returned For Correction" to indicate that the submission is rejected and is to be revised in accordance with comments marked on the shop drawings and product data sheets by the Consultant and re-submitted

.9 The Consultant will retain one or two copies of each shop drawing or product data sheet submission.

.10 The following is to be read in conjunction with the wording on the Consultant's review stamp applied to each and every electrical work shop drawing or product data sheet submitted:

"This review is for the sole purpose of ascertaining conformance with the general design concept. This review does not approve the detail design inherent in the product data/shop drawings, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of the responsibility for errors or omissions in the product data/shop drawings or of his responsibility for meeting all requirements of the Contract Documents. Be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all sub-trades."

1.17 CHANGES OR REVISIONS TO THE WORK

.1 Whenever the Consultant proposes in writing to make a change or revision to the design, arrangement, quantity or type of any work from that required by the Contract Documents, prepare and submit to the Consultant for approval, a quotation being your proposed cost for executing the change or revision.

.2 Your quotation is to be a detailed and itemized estimate of all products, material, labour, and equipment costs associated with the change or revision, plus overhead and profit percentages and all applicable taxes and duties.

.3 Unless otherwise stated in the Contract Documents, the following requirements apply to all quotations submitted:

.1 when the change or revision involves deleted work as well as additional work, the cost of the deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from the cost of the additional work before overhead and profit percentages are applied to the additional work

.2 material costs are not to exceed those published in local estimating price guides such as Allpriser, less applicable trade discounts

.3 costs for journeyman and apprentice labour must not exceed prevailing rates at the time of execution of the Contract and must reflect the actual personnel performing the work

.4 cost for the site superintendent must not exceed 10% of the total hours of labour estimated for the change or revision, and the change or revision must be such that the site superintendent's involvement is necessary

.5 costs for rental tools and/or equipment are not to exceed local rental costs

.6 the overhead percentage will be deemed to cover all quotation costs other than actual site labour, product and materials, and rentals

.7 all quotations, including those for deleted work, must include a figure for any required change to the Contract time

.4 Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable the Consultant to expeditiously process the quotation and issue a Change Order will not be grounds for any additional change to Contract time.

.5 If, in your opinion, changes or revisions to the work should be made, inform the Consultant in writing and, if the Consultant agrees a Notice of Change will be issued.

.6 Do not execute any change or revision until written authorization for the change or revision has been obtained

1.18 SCAFFOLDING, RIGGING, AND HOISTING

.1 Unless otherwise specified or directed, supply, erect and operate all scaffolding, rigging, hoisting equipment and associated hardware required for your work. Immediately remove from the site all scaffolding, rigging, and hoisting equipment when no longer required.

1.19 PROJECT CLOSEOUT SUBMITTALS

.1 Prior to application for Substantial Performance, submit all required items and documentation specified, including the following:

.1 Operating and Maintenance Manuals

.2 as-built record drawings and associated data

.3 extended warranties for equipment as specified

.4 all operating test certificates, i.e., Fire Alarm System Test Certificate

.5 identified keys for electrical equipment and/or panels for which keys are required, and all other items required to be submitted

.6 other data or products specified

.2 Operating and Maintenance Manuals: Submit three hard copies of operating and maintenance manuals consolidated in hardcover three "D" ring binders, each binder sized to include approximately 25% spare space for future data, and identified permanently with the Project name, "ELECTRICAL OPERATING AND MAINTENANCE MANUAL" wording, and the date. Manuals are to include the following:

.1 an Introduction sheet listing the Consultant’s, Contractor’s, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses

.2 a Table of Contents sheet, and corresponding index tab sheets

.3 a copy of each "Reviewed" or "Reviewed As Noted" shop drawing or product data sheet, with manufacturer’s/supplier’s name, telephone and fax numbers, email address, and the email address for local source of parts and service

.4 test reports, and certificates issued by governing authorities

.5 Operating Data: Operating data is to include:

.1 a description of each system and its controls

.2 operation instruction for each system and each component

.3 description of actions to be taken in event of emergencies and/or equipment failure

.6 Maintenance Data: Maintenance data is to include:

.1 servicing maintenance, operation and trouble-shooting instructions for each item of equipment and each system

.2 schedules of tasks, frequency, tools required, and estimated task time

.3 complete parts list with numbers

.7 Performance Data: Performance data is to include:

.1 equipment and system start-up data sheets

.2 equipment performance verification test results, and final commissioning report

.8 Review Submittal: Assemble one copy of the O & M Manual and submit to the Consultant for review prior to Owner training and instructions, and assembling the remaining copies. Incorporate all comments into the final submission.

.9 Digital O & M Manuals: Submit four digital versions of the hard copy manual using the latest version of Adobe Acrobat Portable Document Format and enhanced with bookmarks, internet links, and internal document links. The digital copies are to be copied to CDR with custom labels which indicate the project name, date, the Consultant’s name, and "Operating & Maintenance Manual for Electrical Systems".

.3 Record "As-Built" Drawings and Data: As work progresses at the site, clearly mark in red in a neat and legible manner on a set of white prints of the Contract Drawings, all significant changes and deviations from the routing of services and locations of equipment shown on the Contract Drawings and resulting from the issue of Addenda, Site Instructions, Change Orders, and job conditions. Use notes marked in red as required. Maintain the white print red line as-built set at the site for the exclusive use of recording as-built conditions, keep the set up-to-date at all times, and ensure that the set is always available for periodic review. The as-built set is also to include the following:

.1 the dimensioned location of all inaccessible concealed work

.2 the locations of control devices with identification for each

.3 the location of all junction boxes, terminal cabinets, etc.

.4 for underground conduit, ducts, etc., record dimensions, invert elevations, all offsets, fittings, and accessories if applicable, and locate dimensions from benchmarks that will be preserved after construction is complete

.5 the location of all concealed services terminated for future extension

.6 Digital Record "As-Built" Drawings: When work on site is complete, transfer all the as-built red line information from the site as-built drawings to a recordable and identified CAD disc with CAD work of equal quality to the Contract Drawings. Obtain a CAD disc as described below.

.7 Obtaining CAD Discs: The electrical drawings have been prepared on a CAD system using the latest Release of AutoCAD software. For the purpose of producing final as-built drawings, discs of the Contract Drawings will be supplied free of charge by the Consultant.

.8 Review and Submittal: Prior to inspection for Substantial Performance of the work, submit for review, the red line site as-built white prints, a CAD disc of the as-built drawings, and a bound set of white prints (of equal quality to the Contract Drawings) made from the disc. The Consultant will review the drawings and, if necessary, return the disc and the marked-up white prints for corrections or further revisions, in which case complete the corrective and/or revision work and resubmit the disc and white prints until they are determined to be acceptable, all prior to issue of a Certificate of Substantial Performance.

1.20 PROGRESS PAYMENT BREAKDOWN

.1 Submit, prior to submittal of the first progress payment draw, a breakdown of the cost of the electrical work to assist the Consultant in reviewing and approving monthly progress payment claims.

.1 Submit a breakdown of the tender price into separate classifications and totalling the total contract amount. Each item is to be broken into material and labour costs.

.2 Breakdown shall follow, but not be limited to;

.1 Permits and fees
.2 Mobilization
.3 Demolition
.4 Distribution equipment (i.e., Switchboards, panelboards, etc.)
.5 Incoming feeders and conduits
.6 Branch wiring and conduits
.7 Branch wiring
.8 Mechanical equipment wiring
.9 Fire alarm devices
.10 Fire alarm wiring
.11 Fire alarm verification and certification
.12 Exit and Emergency lighting
.13 Lighting

.14 Lighting controls
.15 Voice and Communication conduits
.16 Voice and Communication wiring and terminations
.17 Access Control and Security
.18 Miscellaneous and Speciality Equipment (i.e., Public Address, Sound, etc.)

.2 The payment breakdown is subject to the Consultant's approval and progress payments will not be processed until an approved breakdown is in place. The breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning, and project closeout submittals.

.3 Progress draws, when submitted, are to be itemized against each of the draw breakdowns and shall be in table form identifying contract amount, amount of this draw, total to date, percentage complete and balance.

1.21 REQUIREMENTS FOR CONTRACTOR RETAINED ENGINEERS

.1 All professional engineers retained by you to perform consulting services with regard to your work, i.e., structural engineer, are to be members in good standing with the local Association of Professional Engineers, and are to carry and pay for errors and omissions professional liability insurance in compliance with requirements of the governing authorities in the locale of the work.

.2 Your engineer's professional liability insurance is to protect your Consultants and Sub-Consultants, and their respective servants, agents, and employees against any loss or damage resulting from the professional services rendered by your Consultants, Sub-Consultants, and their respective servants, agents, and employees in regards to the work of this Contract.

.3 Liability insurance requirements are as follows:

.1 coverage is to be a minimum of $1,000,000.00 inclusive of any one occurrence

.2 the insurance policy is not to be cancelled or changed in any way without the insurer giving the Owner a minimum of thirty days written notice

.3 liability insurance is to be obtained from an insurer registered and licensed to underwrite such insurance in the location of the work

.4 evidence of the required liability insurance in such form as may be required is to be issued to the Owner, the Owner's Consultant, and Municipal Authorities as required prior to commencement of your Consultant's services

1.22 EXTENDED WARRANTIES

.1 Unless otherwise specified, all extended warranties specified in electrical work Sections of the Specification are to be full parts and labour warranties, at the site, and in accordance with requirements of the Contract warranty, but direct from the equipment manufacturer/supplier to the Owner. Submit signed and dated copies of extended warranties which clearly state requirements specified above.

1.23 EQUIPMENT AND MATERIAL MANUFACTURER REQUIREMENTS

.1 Equipment and materials scheduled or specified on the drawings or in the Specification have been selected to establish a performance and quality standard.

.2 In most cases acceptable equipment and material manufacturers are listed for any product specified by manufacturer's name and model number. Unless otherwise stated the bid price may be based on products supplied by any of the manufacturers named as acceptable for the particular product. If acceptable manufacturers are not listed for a particular product, base the bid price on the products supplied by the specified manufacturers.

.3 If products supplied by a manufacturer named as acceptable are used in lieu of the products specified by manufacturer's name and model number, ensure that the product is equivalent in performance and operating characteristics (including energy efficiency if applicable) to the specified product. Pay for any additional costs and changes to associated or adjacent work resulting from the use of products supplied by a manufacturer other than the specified manufacturer. In addition, in equipment spaces where products named as acceptable are used in lieu of the specified products and the dimensions of such products differ from the specified products prepare and submit for review, if requested, accurately dimensioned layouts of the rooms affected to prove that all the equipment in the room will fit properly.

1.24 SUBSTITUTED OR ALTERNATIVE PRODUCTS

.1 Products supplied by a manufacturer/supplier other than a manufacturer specified as acceptable may be considered for acceptance by the Consultant if requested in writing a minimum of five full working days prior to the bid closing date. Requests may be made by letter, or by email. Telephone requests will not be considered.

.2 Each request for acceptance of a proposed substitution or alternative product must be accompanied by detailed catalogue and engineering data, fabrication information, and performance characteristics to permit the Consultant to make an informed decision.

.3 Pay for any additional costs and changes to associated or adjacent work resulting from the use of products supplied by a substituted or alternative manufacturer. In addition, in equipment spaces where substituted or alternative products are used in lieu of the specified or acceptable products and the dimensions of such products differ from the specified or acceptable products, prepare and submit for review, if requested, accurately dimensioned layouts of the rooms affected to prove that all the equipment in the room will fit properly.

.4 The Consultant's decision regarding any proposed substitution or alternative product is final.

1.25 ALLOWANCES

.1 The amount of the allowance is to be net and is to include all product and material costs (less applicable trade discounts), including delivery to the site and all applicable taxes.

.2 All other costs, including unloading and handling at the site, installation, overhead and profit and all other burdens are to be included in the bid amount, not in the allowance.

.3 Whenever costs are more or less than the amount of the allowance, the Contract amount will be adjusted accordingly by Change Order.

.4 Materials and products under the allowance will be selected by the Owner in sufficient time to avoid delays to the work, and the Owner reserves the right to take all or any part of the allowance out of the Contract amount at any time.

1.26 IDENTIFIED PRICES

.1 Identified prices for work consist of alternative prices, separate prices, and itemized prices. Definitions of these prices are as follows:

.1 Alternative Price(s): An alternative price the difference in the bid amount (plus or minus) for substituting specified work or products for alternative work or products.

.2 Separate Price(s): A separate price is the amount of money to be added to the bid amount for new work not included as part of the Bid Documents.

.3 Itemized Price(s): An itemized price is the amount of money included in the bid amount for work as described.

1.27 PHASING OF THE WORK

.1 Phasing of the work is required to maintain the existing building in operation, all as specified in Division 01. Include all costs for phasing the work including all required "off hours" premium time labour costs.

1.28 EQUIPMENT AND SYSTEM MANUFACTURER’S CERTIFICATION

.1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for the equipment/system manufacturer’s authorized representative to visit the site to examine the installation, and when any required corrective measures have been made, to certify in writing to the Consultant that the equipment/system installation is complete and in accordance with the equipment/system manufacturer’s instructions.

1.29 EQUIPMENT AND SYSTEM START-UP

.1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in electrical work Sections in accordance with the following requirements:

.1 submit a copy of each equipment/system manufacturer’s start-up report sheet to the Consultant for review, and incorporate any comments

.2 under direct on-site supervision and involvement of the equipment/system manufacturer's representative, start-up the equipment/systems, make any required adjustments, document the procedures, leave the equipment/systems in proper operating condition, and submit a complete set of start-up documentation sheets signed by the manufacturer/supplier and the Contractor

1.30 EQUIPMENT AND SYSTEM COMMISSIONING

.1 After successful start-up and prior to Substantial Performance, commission the electrical work using approved commissioning sheets. Submit final commissioning data sheets. Include for equipment manufacturer's representation at the site to assist in the commissioning process

1.31 EQUIPMENT AND SYSTEM O & M DEMONSTRATION & TRAINING

.1 Refer to equipment and system operational and maintenance training requirements specified in Division 01.

.2 Train the Owner's designated personnel in all aspects of operation and maintenance of equipment and systems as specified in electrical work Sections of the Specification. All demonstrations and training is to be performed by qualified technicians employed by the equipment/system manufacturer/supplier.

.3 For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Operating and Maintenance Manuals are to be used during the training sessions, and training modules are to include:

.1 Operational Requirements and Criteria: requirements and criteria are to include but not be limited to equipment function, stopping and starting, safeties, operating standards, operating characteristics, and limitations

.2 Troubleshooting: troubleshooting is to include but not be limited to diagnostic instructions, test and inspection procedures

.3 Documentation: documentation is to include but not be limited to equipment/system warranties, and manufacturer's/supplier's parts and service facilities, telephone numbers, email addresses, and the like

.4 Maintenance: maintenance requirements are to include but not be limited to inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools

.5 Repairs: repair requirements are to include but not be limited to diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory

.4 Assemble the training modules into a training manual and submit a copy to the Consultant for review prior to scheduling training. Ensure that each participant in each training session has all required training material.

.5 Schedule demonstrations and training at mutually agreed to times with a minimum of 7 working days' notice.

.6 Demonstration and Training Confirmation: Obtain a list of personnel to receive demonstration and training from the Consultant, and have each participant sign the list to confirm that he/she understood the demonstration and training session.

2 PRODUCTS

NOT APPLICABLE

3 EXECUTION

NOT APPLICABLE

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies products, common criteria and characteristics, and methods and execution that are common to one or more electrical work Sections of the Specification, and it is intended as a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit the following for review:

.1 product data sheets: submit for:

.1 firestopping and smoke seal products

.2 waterproofing seal assemblies

.3 electrical work identification products

.2 access door locations: submit white prints of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations in walls and ceilings in finished areas

.3 samples: submit a sample of each proposed type of access door, and samples of materials and any other items as specified in electrical work Sections of the Specification

.4 list of equipment nameplates: submit a list of equipment identification nameplates indicating proposed wording and sizes

.5 conduit & conductor identification: submit a list of conduit and conductor identification colour coding and wording

.6 sleeve and formed opening location drawings: submit, prior to concrete pours, accurately dimensioned drawings to locate all required sleeves, formed openings, and recesses required in poured concrete

.7 waste management and reduction plan: submit a waste management and reduction plan prior to commencing work and as per requirements specified in this Section

.8 additional submittals: submit any other submittals specified in this Section or other electrical work Sections of the Specification

2 PRODUCTS

2.01 SLEEVES

.1 Galvanized Sheet Steel: Minimum #16-gauge galvanized steel with an integral flange at one end to secure the sleeve to formwork construction.

.2 Polyethylene: Factory fabricated, flanged, high density polyethylene sleeves with reinforced nail bosses.

.3 Waterproof Sleeves: Schedule 40 mild galvanized steel pipe with a welded-on square steel anchor and water stop plate at the sleeve midpoint, or PSI-Thunderline “Century-Line” Model CS HDPE sleeves.

.4 Galvanized Steel: Schedule 40 mild galvanized steel.

2.02 MULTI-CABLE TRANSITS

.1 UL/ULC listed and labelled multi-cable transits sized to suit the fire barrier opening and the number of cables/conduits involved and to facilitate a minimum 2-hour water-tight fire and smoke seal. Each assembly is to be complete with a stainless-steel frame, cadmium plated compression bolts, proper end packing, compression plates, steel stay plates, and fire rated neoprene insert blocks.

2.03 FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Firestopping and smoke seal system materials for electrical penetrations through fire rated construction are specified in Division 07 and the work will be done as part of the work of Division 07.

2.04 WATERPROOFING SEAL MATERIALS

.1 Modular, mechanical seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so that when the bolts are tightened the links expand to seal the opening watertight. The seal assemblies are to be selected to suit the pipe size and the sleeve size or wall opening size. Acceptable products are:

.1 Thunderline Corp. (Power Plant Supply Co.) "LINK SEAL" Model S-316;

.2 The Metraflex Co. "MetraSeal" type ES.

2.05 ESCUTCHEON PLATES

.1 One-piece chrome plated brass or #4 finish type 302 stainless steel plates with matching screws for attachment to the building surface, each plate sized to completely cover the conduit/cable sleeve or building surface opening, and to fit tightly around the conduit or cable.

2.06 ACCESS DOORS

.1 Prime coat painted steel (unless otherwise specified) flush access doors, each complete with a minimum #16-gauge frame, minimum #18-gauge door panel, heavy-duty rust-resistant concealed hinges, a positive locking screwdriver lock, and mounting and finishing features to suit the particular construction in which it is to be installed.

.2 Access door sizes are to suit the concealed work for which they are supplied, and wherever possible they are to be of a standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.3 Access doors in fire rated construction are to be ULC listed and labelled and of a rating to maintain the fire separation integrity.

.4 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting the finish in which they are to be installed so as to maintain the final building surface appearance throughout, and constructed of stainless steel with a #4 finish.

2.07 IDENTIFICATION MATERIALS

.1 Equipment Nameplates: Minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as single-phase starters and switches, minimum 25 mm x 65 mm (1" x 2½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:

.1 unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved capital letter wording to completely identify the equipment and its use with no abbreviations;

.2 wording is generally to be as per the drawings, i.e., Lighting Panel A, and is to include equipment service and building area/zone served, but must be reviewed prior to engraving;

.3 supply stainless steel screws for securing nameplates in place

.4 nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size so as to be easily readable from floor level

.2 Self-Adhesive Labels: Equal to Brother “P-Touch” or Thomas & Betts Canada Ltd. “EZCODE” Model EZL500 electronic labelling system self-adhesive labels with size and colour as directed, and permanently printed circuit identification nomenclature which is to be approved by the Consultant prior to producing the labels.

.3 Warning Signs: Equal to Thomas & Betts Canada Ltd. “BP” Series 250 mm x 355 mm (10” x 14”) semi-rigid vinyl signs with corner screw holes, the required printed wording (generally red on a white background with black trim), pressure sensitive adhesive on the back, and stainless-steel screws.

.4 Conduit and Armoured Cable Identification: Equal to Brady Canada minimum 50 mm (2”) wide self-adhesive coloured vinyl tape.

.5 Conductor Terminations: Equal to Electrovert Ltd. Slip-on “Z” type

.6 Conductor Colour Coding: As specified with the conductors.

2.08 ELECTRICAL ENCLOSURES

.1 Unless otherwise specified electrical enclosure are to be wall mounting NEMA/EEMAC/CSA enclosures as follows:

.1 indoor in sprinkler protected areas, Type 2

.2 indoor in high humidity/washdown areas, Type 4

.3 indoor in corrosive environments, Type 4X, 316 stainless steel

.4 indoor explosion-proof, Class 1, Groups C & D, Type 7

.5 outdoor, Type 3R

.6 indoor in non-hazardous areas except as noted above, Type 1

2.09 ENCLOSURE BACKBOARDS

.1 Construction grade Fir plywood, G1S, 20 mm (¾”) thick with width and length to suit enclosure dimensions, coated on all surfaces with a ULC listed water based latex intumescent flame retardant paint, ASTM E-84 Class A rated.

3 EXECUTION

3.01 GENERAL ELECTRICAL WORK INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, locate and arrange horizontal conduits, raceways, and conductors above or at the ceiling on floors on which they are shown, arranged so that under consideration of all other work in the area, the maximum ceiling height and/or usable space is maintained.

.2 Unless otherwise specified, install all conduits and conductors concealed in finished spaces, and concealed to the degree possible in partially finished and unfinished spaces. Refer to and examine the Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Note that walls which are painted are considered finished.

.3 Unless otherwise specified conduits and main distribution conductors may be exposed in equipment rooms.

.4 Install all exposed conduits, raceways, and conductors parallel to building lines and to each other.

.5 Do not install conduit, raceway, or conductors within 150 mm (6”) of “hot” piping or equipment.

.6 All conduit, raceway, conductors, etc., must be supported from the structure, not from ceiling hangers, piping, ductwork, cable tray, and similar mechanical or electrical products.

.7 Neatly group and arrange all exposed work. Do not install conduit to prevent access into equipment.

.8 Access: Locate all work to permit easy access for service or maintenance as required and/or applicable. Locate all products which will or may need maintenance or repairs and which are installed in accessible construction so as to be easily accessible from access doors. Where such products occur in vertical services in shafts, pipe spaces or partitions, locate the accessories at the floor level.

.9 Manufacturer’s Instructions: Ensure that equipment and material manufacturer's installation instructions are followed unless otherwise specified herein or on the drawings, and unless such instructions contradict governing codes and regulations.

.10 Cleaning: Carefully clean all conduits, raceway, fittings prior to installation. Temporarily cap or plug ends of conduit which are open and exposed during construction.

.11 Surfaces To Receive Your Work: Inspect surfaces and structure prepared by other trades before performing your work. Verify that surfaces or the structure to receive your work have no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing. Installation of your work will constitute acceptance of such surfaces as being satisfactory.

.12 Repair of Finished Surfaces: For factory applied finishes, repaint or refinish all surfaces damaged during shipment and installation. The quality of the repair work is to match the original finish. This requirement also applies to galvanized finishes.

.13 Work In High Humidity Areas: Where electrical work is located in high humidity areas where ferrous metal products will be subject to corrosion and protection for such products is not specified, provide finishes on the products to protect against corrosion or provide products which will not corrode in the environment.

.14 Work In Health Care Facility Patient Care Areas: Provide conduit, conductors, and similar work in health care facility patient care areas in accordance with the Ontario Electrical Safety Code, including amendments, and test branch circuits in accordance with CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

3.02 INSTALLATION OF SLEEVES

.1 Where conduits, round ducts, and armoured cable pass through concrete and/or masonry surfaces provide sleeves as follows:

.1 in poured concrete slabs: unless otherwise specified - minimum 16 gauge flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves

.2 in concrete or masonry walls: Schedule 40 galvanized steel pipe

.2 Waterproof Sleeves: Provide waterproof sleeves in the following locations:

.1 in mechanical room floor slabs, except where on grade

.2 in slabs over mechanical, fan, electrical and telephone equipment rooms or closets

.3 in all floors equipped with waterproof membranes

.4 in the roof slab

.5 in waterproof walls

.3 Size sleeves, unless otherwise specified, to leave 12 mm (½") clearance around the conduit, duct, cable, etc.

.4 Pack and seal the void between the sleeves and the conduit, duct, cable, etc., in non-fire rated construction for the length of the sleeves as follows:

.1 interior construction: pack sleeves in interior construction with mineral wool and seal both ends of the sleeves with non-hardening silicone base caulking compound

.2 exterior walls above grade: pack sleeves in exterior walls above grade with mineral wool and seal both ends of the sleeve’s water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified

.3 exterior walls below grade: seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified below.

.5 Where sleeves are required in masonry work, accurately locate and mark the sleeve location, and hand the sleeves to the mason for installation.

.6 Terminate sleeves that will be exposed so that the sleeve is flush at both ends with the building surface concerned so that the sleeve may be completely covered by an escutcheon plate, except for sleeves in waterproof floors which are to terminate 100 mm (4") above the finished floor.

.7 "Gang" type sleeving will not be permitted.

.8 Where sleeves are provided in non-fire rated construction for future services, or where conduit, ducts, cable, etc., has been removed from existing sleeves, cap and seal both ends of the sleeved opening.

3.03 RECTANGULAR OPENINGS

.1 Rectangular openings for cable tray, raceways, multiple conduits and/or cables and similar rectangular openings will be provided in new poured concrete work, masonry, drywall and other building surfaces by the trade responsible for the particular construction in which the opening is required.

.2 Waterproof Openings: Provide watertight link type mechanical seals in exterior wall openings where shown or specified. Assemble and install each mechanical seal in accordance with the manufacturer's instructions. After installation, periodically check each mechanical seal installation for leakage and, if necessary, tighten link seal bolts until the seal is completely watertight.

.3 Openings In Non-Fire Rated Construction: For all rectangular openings in non-fire rated construction pack and seal the space between the conduits, ducts, cables, etc., with mineral wool for the full thickness of the building surface penetrated, and seal both ends.

.4 Openings In Fire Rated Construction: Provide multi-cable transits in all fire rated openings and install in accordance with the manufacturer’s instructions.

3.04 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

.1 Prepare and submit for review, white print drawings indicating the size and location of all required sleeves, recesses and formed openings in poured or precast concrete work.

.2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs

.3 Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

3.05 INSTALLATION OF ESCUTCHEON PLATES

.1 Provide escutcheon plates suitable secured over all exposed conduits, ducts, armoured cable, etc., passing through finished building surfaces. A finished building surface is any surface with a factory finish or that receives a site applied finish.

.2 Install the plates so that they are tight against the building surface concerned, and ensure that the plates completely cover sleeves and/or openings, except where waterproof sleeves extend above floors, in which case the plate is to fit tightly around the sleeve.

3.06 INSTALLATION OF FASTENING AND SECURING HARDWARE

.1 Provide fastening and securing hardware required for electrical work to maintain installations attached to the structure or to finished floors, pads, walls, and ceilings in a secure and rigid manner capable of withstanding the dead loads, live loads, superimposed dead loads, and any vibration of the installed products.

.2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.

.3 Where floor, wall, or ceiling construction is not suitable to support the loads, provide additional framing or special fasteners to ensure proper securement to the structure. Provide reinforcing or connecting supports where required to distribute loading to structural components.

.4 Obtain written consent before using explosive actuated fastening devices. If consent is given comply with requirements of CAN3-Z166.1 and .2.

.5 Do not attach fasteners to steel deck without written consent from the Consultant.

3.07 SUPPLY OF ACCESS DOORS

.1 Supply access doors to give access to all electrical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on the drawings.

.2 Locate access doors as inconspicuously as possible in walls and partitions and arrange electrical work such that it is clearly within view and accessible for inspection and servicing, and to suit access door locations shown on the reviewed and approved white prints of reflected ceiling plan and elevation drawings submitted as per Part 1 of this Section.

.3 Group services to ensure the minimum number of access doors is required. Access doors will be installed by the trades responsible for the particular type of construction in which the doors are required.

.4 Submit a sample of each proposed access door for review prior to ordering.

3.08 ELECTRICAL WORK IDENTIFICATION

.1 Identify all new/relocated electrical work in accordance with existing identification standards at the site.

.2 Identify all electrical work, including conduit systems and wiring, as follows:

.1 the size and wording of identification nameplates must be approved by the Consultant

.2 identification wording for equipment is to follow drawing nomenclature unless otherwise specified

.3 secure nameplates to equipment with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces

.4 locate nameplates in the most conspicuous and readable location

.5 for multi-cell or multiple component equipment provide a main nameplate and a smaller nameplate for each cell or component

.6 where electrical work is to be identified in conjunction with mechanical work, coordinate with the mechanical trades to ensure identical tagging

.7 all identification wording is to be in English

.8 all identification and colour coding is to be indicated on “as-built” record drawings

.2 Terminal Cabinets, Pull Boxes, Junction Boxes, Etc.: Clearly identify terminal cabinets, main pull and junction boxes by neatly spray painting the outside surface of the cover with a paint colour as specified below for conduit and conductor identification. Provide a nameplate on terminal boxes, main pull and junction boxes in communication systems specified in Division 27.

.3 Transformers: Transformer nameplated must identify the transformer capacity as well as primary and secondary voltages.

.4 Branch Circuit Panelboards: Panelboard nameplates must identify the electrical source connected to the panelboard, each circuit breaker, and, neatly typed on the door directory card, the load connected to each breaker.

.5 Motor Starters and Disconnect Switches: Provide nameplates for each motor starter and disconnect located in a motor control centre or on a motor starter panel, and on each individually mounted starter and disconnect provided as part of the electrical work. Nameplates must also indicate the voltage and phase.

.6 Luminaires On Emergency Circuits: Identify all luminaires on emergency circuit be means of a 15 mm (½”) diameter self-adhesive red label secured to the T-bar ceiling component adjacent to the luminaire, or if not in a T-bar ceiling, to the frame of the luminaire.

.7 Lighting Switches & Receptacles: Identify each lighting switch and each receptacle by means of a permanent self-adhesive label indicating the source panelboard and circuit number and secured to the device faceplate.

.8 Communication Equipment/Systems: Identify all “head end” equipment with nameplates and all “downstream” devices with self-adhesive labels indicating circuit numbers.

.9 Warning Signs: Provide appropriately worded warning signs secured in place with stainless steel hardware in locations as follows:

.1 on all doors into transformer vaults

.2 on all doors into high voltage switchgear rooms

.3 on all collector bus enclosures

.4 on pad mounted transformer enclosures

.5 wherever else required by Code

.10 Conduit & Armoured Cable: Colour code conduit and armoured cable by means of 25 mm (1") wide primary colour plastic adhesive backed tape or neatly applied suitable paint with, where scheduled, a 20 mm (¾") wide auxiliary colour at all points where the conduit or cable penetrates a wall, ceiling, floor, at 6 m (20') intervals or at least once in each room or accessible ceiling space, at each access door location, and elsewhere at 15 m (45') intervals. Unless otherwise indicated/specified, colours are to be as follows:

Service	Primary Colour	Secondary Colour
up to 250 volts	yellow	
250 to & including 600 volts	yellow	green
above 600 volts to 5 kV	yellow	blue
above 5 kV to 28 kV	yellow	red
telephone	green	
fire alarm	red	
emergency voice	red	blue
security systems	red	yellow
other communication systems	green	
isolated power	orange	

.11 Wire & Cable Terminations: Identify both end of wire and cable terminations with the same unique number. Where numbers are not indicated or specified, assign a number and record them.

.12 Buried Cable/Duct Runs: Identify buried cable/duct runs under paved and landscaped areas with appropriate concrete markers, flush with grade at each change in direction, at least twice on runs less than 60 m (200') and on 60 m (200') centres on longer runs.

.13 Overhead Wiring Service Poles: Unless otherwise indicated on the drawings identify poles with wording such as "HV#1". For wooden poles use 50 mm (2") high non-corrosive embossed aluminium pole markers. For concrete poles use non-corrosive metal plated secured to the pole with metal strapping.

.14 Distribution System Schematic Diagrams: Prepare AutoCAD, coloured, 1200 mm x 900 mm (48" x 36") schematic diagrams of electrical distribution systems to identify all equipment and circuits. Install framed and glazed diagrams in electrical rooms housing the system equipment. Confirm location prior to installation. Include reduced size copies of the diagrams in each copy of the O & M Manuals.

3.09 INSTALLATION OF TERMINAL BACKBOARDS

.1 Provide properly sized plywood backboards for wiring terminals in terminal cabinets and enclosures where shown/specified/required.

3.10 GENERAL ELECTRICAL WORK TESTING

.1 Perform testing in accordance with the Electrical Work Testing Section, and, in addition, any tests required by governing Codes, Standards.

3.11 BRANCH CIRCUIT BALANCING

.1 Connect all branch circuits to panelboards so as to balance the actual loads (wattage) to within 5%. If required, transpose branch circuits to achieve this requirement.

.2 After the building is occupied and if requested by the Consultant, demonstrate that branch circuit balancing has been achieved.

3.12 FINISH PAINTING OF ELECTRICAL WORK

.1 Finish paint exposed electrical work as specified and/or scheduled in accordance with requirements of the painting Section in Division 09.

.2 Touch-up paint all damaged factory applied finishes on electrical work products.

.3 Finish painting of exposed electrical work is specified in Division 09 and is part of the work of Division 09.

3.13 SUPPLY OF MOTOR STARTERS AND ACCESSORIES

.1 Motor starters for mechanical equipment will be supplied as part of the mechanical work.

3.14 ELECTRICAL WIRING WORK FOR MECHANICAL WORK

.1 Unless otherwise specified or indicated, the following electrical wiring work for mechanical equipment is to be done as part of the electrical work:

.1 "line" side power wiring to motor starters or disconnect switches in motor control centres and starters or disconnects on motor starter panels, and "load" side wiring from the starters or disconnects to the equipment

.2 mounting of individual starters, "line" side power wiring to individual wall mounted starters, and "load" side wiring from the starters to the equipment

.3 "line" side power wiring to pre-wired power and control panels and variable frequency drives, and "load" side power wiring from the panels and VFD's to the equipment

.4 provision of receptacles for plug-in equipment

.5 provision of disconnect switches for all motors that are in excess of 10 m (30') from the starter location, or that cannot be seen from the starter location, and all associated power wiring

.6 all motor starter interlocking in excess of 24 volts

.7 wiring from motor winding thermistors in motors 30 HP and larger to motor starter contacts

.8 provision of dedicated 120 volt, 15A-1P circuits terminated in junction boxes in mechanical equipment rooms for automatic control and building automation system wiring connections to be made as part of the automatic controls work

.9 120-volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;

.10 120-volt wiring connections to lighting fixture/switch combinations integral with air handling units

.11 120-volt wiring connections to duplex receptacles integral with air handling unit control panels

.2 Mechanical wiring work not listed above or specified herein or on the drawings will be done as part of the mechanical work in accordance with wiring requirements specified for the electrical work.

3.15 INTERRUPTION TO AND SHUT-DOWN OF ELECTRICAL SERVICES AND SYSTEMS

.1 Co-ordinate all shut-down and interruption to existing electrical systems with the Owner. Generally, shut-downs may be performed only between the hours of 12:00 midnight Friday until 6:00 a.m. Monday morning.

.2 Upon award of a Contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform the Owner and Consultant in writing seventy-two hours in advance of the proposed shut-down or interruption and obtain written approval to proceed. Do not shut-down or interrupt any system or service without such written approval.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize the shut-down time and to reinstate the systems as soon as possible, and, prior to any shut-down, ensure that all materials and labour required to complete the work for which the shut-down is required are available at the site.

3.16 EQUIPMENT BASES AND SUPPORTS

.1 Concrete Housekeeping Pads: Unless otherwise specified or required, set all floor mounted equipment on minimum 100 mm (4") high reinforced concrete housekeeping pads 200 mm (8") clear of the equipment on each side and end, or a minimum of 200 mm (8") from the centreline of equipment anchor bolts to the edge of the base, whichever is larger. Conform to the following requirements:

.1 supply dimensioned drawings and equipment base templates, and provide anchor bolts for proper setting and securing of equipment on pads

.2 place anchor bolts during the concrete pour and be responsible for all required levelling, alignment, and grouting of the equipment

.3 as a minimum, use wire mesh reinforcement, however, for pads for large heavy equipment, use reinforcement as per structural drawing details

.2 Structural Steel Stands/Supports: For equipment not designed for base mounting, where required, provide welded, cleaned and prime coat painted structural steel stands or supports conforming to the following requirements:

.1 all stands and supports, except those for small equipment, are to be designed by a structural engineer registered in the jurisdiction of the work, and stamped and signed design drawings with calculations are to be submitted as shop drawings for review

.2 all steel stands are to be flange bolted to concrete housekeeping pads

.3 all stands and supports are to be seismically restrained in accordance with applicable requirements

3.17 CONCRETE WORK FOR EQUIPMENT BASES/PADS

.1 All concrete work required for electrical equipment bases/pads will be provided as part of the concrete work of Division 03.

.2 Exactly locate bases/pads at the site and be present during the concrete pour to ensure that anchor bolts, inserts, plates and similar hardware are not damaged or dislodged.

.3 Coordinate base/pad installations with the concrete trade and ensure that bases and pads are keyed into the structure to meet seismic restraint requirements.

3.18 EXCAVATION AND BACKFILL WORK

.1 Do all excavation, backfill and related work required for your work. Perform such work in accordance with requirements of the Excavation and Backfill Section, except as modified by this Article. Obtain a copy of the soil test report and review during the bidding period.

.2 Grade the bottom of trench excavations as required.

.3 In firm, undisturbed soil, lay ducts, conduits, etc., directly on the soil, unless otherwise directed.

.4 Unless otherwise specified, backfill trenches within the building with clean sharp sand in individual layers of maximum 150 mm (6”) thickness compacted to a density of 100% Standard Proctor. Hand compact the first layers up to a compacted level of minimum 300 mm (12") above the top of the service. Hand or machine compact the balance up to grade.

.5 Unless otherwise specified, backfill trenches outside the building (not under roads, parking lots or traffic areas), up to a compacted level of 450 mm (18") thick above the service, hand compacted to a density of 95% Standard Proctor, using granular "A" gravel. Backfill the balance in 150 mm (6") layers with approved excavated material, compacted to 95% Standard Proctor density.

.6 Unless otherwise specified, backfill trenches outside the building under roads, parking lots or traffic areas with crushed stone or granular "A" gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level.

.7 The location and inverts of existing underground site services shown on the drawings are based on available information and are assumed to be correct, however, prior to excavation, carefully check inverts and locations and report any serious discrepancy, and contact Utilities to accurately locate their services.

.8 You will be held responsible for any damage done to existing underground services caused by neglect to determine and mark out the location of such services prior to excavation work commencing.

.9 After the first lift of backfill has been compacted, mark the entire path of pipe using continuous 75 mm (3") wide detectable identified marking tape equal to SMS Ltd. D-UGMT.

.10 Engage the services of an independent soils testing agency to test the final backfill compaction density of each backfilled location. Compact the backfill to the satisfaction of the testing agency and in accordance with the Specification. Submit a copy of the testing agency's report to the Consultant for review.

3.19 CUTTING, DRILLING, AND PATCHING

.1 Do all cutting, drilling and patching of the existing building for the installation of your work. Perform all cutting and drilling with proper tools and equipment. Confirm the exact location of cutting and drilling with the Consultant prior to commencing the cutting and/or drilling work.

.2 Patch surfaces, where required, to exactly match existing finishes using tradesmen skilled in the particular trade or application worked on.

.3 Where new conduits, conductors, etc., pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around the product involved.

.4 Prior to drilling or cutting an opening in poured concrete construction, determine the location, if any, of existing services concealed in the construction to be drilled or cut. X-ray or Ferro Scan Test the walls or slabs if required.

.5 You will be responsible for the repair of any damage to existing services, exposed or concealed, caused as a result of your cutting or drilling work.

.6 Where drilling is required in waterproof slabs, size the opening to permit snug and tight installation of a sleeve which is sized to leave 12 mm (½") clearance around the product involved. Provide a sleeve in the opening. Sleeves are to be Schedule 40 galvanized steel pipe with a flange at one end and a length to extend 100 mm (4") above the slab. Secure the flange to the underside of the slab and caulk the void between the sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.

3.20 PACKING AND SEALING CORE DRILLED OPENINGS

.1 Pack and seal the void between the core drilled opening and the service insulation for the length of the opening as follows:

.1 non-fire rated interior construction: pack openings in non-fire rated interior construction with mineral wool and seal both ends of the opening with non-hardening silicone base caulking compound to produce a water-tight seal;

.2 exterior walls above grade: pack sleeves in exterior walls above grade with mineral wool and seal both ends of the sleeve’s water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified;

.3 exterior walls below grade: seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified below.

3.21 FLASHING FOR ELECTRICAL WORK PENETRATING THE ROOF

.1 Do all required flashing work, including counter-flashing, for electrical work penetrating and/or set in the roof.

.2 Perform flashing work in accordance with requirements of drawing details, and requirements specified in Division 07.

3.22 CLEANING ELECTRICAL WORK

.1 Refer to cleaning requirements specified in Division 01.

.2 Clean all electrical work prior to application for Substantial Performance of the work.

3.23 MAINTAINING EQUIPMENT PRIOR TO ACCEPTANCE

.1 Maintain all equipment in accordance with the manufacturer's printed instructions prior to start-up, testing and commissioning.

3.24 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with requirements specified in Division 01.

.2 Separate and recycle waste materials in accordance with requirements of Canadian Construction Association Standard Document CCA 81, A Best Practices Guide to Solid Waste Reduction.

.3 Prepare a waste management and reduction plan and submit a copy for review prior to work commencing at the site.

.4 Place materials defined as hazardous or toxic waste in designated containers.

.5 Ensure emptied containers are sealed and stored safely for disposal.

3.25 SEISMIC RESTRAINT ANCHOR POINTS FOR EQUIPMENT

.1 All electrical equipment requiring seismic restraint (see the electrical work Section entitled Seismic Control and Restraint) is to be complete with manufacturer designed and rated seismic restraint anchor points and attachments, certified by the equipment manufacturers, so that the equipment may be bolted down or restrained in the field.

.2 The equipment to be restrained must be designed such that the strength and anchorage of the internal components of the equipment exceeds the force level used to restrain and anchor the equipment itself to the supporting structure.

3.26 REQUIREMENTS FOR BARRIER-FREE ACCESS

.1 Include for all applicable requirements for barrier-free access to electrical devices in accordance with governing Codes and Regulations, whether shown on the drawings, specified, or not

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies seismic control and restraint requirements that are common to electrical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 SEISMIC CONSULTANT

.1 Retain and pay for the services of an experienced Seismic Consultant who is a registered professional engineer licensed in the area of the work and a member in good standing of a Professional Engineers Association in the area of the work.

.2 The Seismic Consultant is to:

.1 determine the proper seismic hazard level, design, recommend, and review all proposed electrical work seismic restraint shop, placement and securing drawings, and sign and stamp all drawings prior to submittal for review as specified below

.2 supervise installation of all electrical work seismic restraint and, when work is complete, certify in writing that the seismic restraint work has been installed in accordance with signed, stamped and reviewed drawings

.3 prepare and submit to the Municipality and authorities having jurisdiction, on a form approved by the Municipality and authorities having jurisdiction, at the beginning of seismic restraint work and when the work is complete, original signed and sealed Letters of Assurance for the design, installation and field review of all seismic restraint work

1.03 SUBMITTALS

.1 Shop Drawings/Product Data Sheets: Obtain all required equipment information and submit manufacturer's shop drawings/product data sheets for all restraining devices and steel bases. Include placement data, and details of attachment to both the equipment and the structure meeting requirements of the forces involved. All product data sheets and drawings are to be signed and stamped by the Seismic Consultant referred to above.

.2 Seismic Consultant's/Seismic Control Product Manufacturer's Certification Letters: Submit copies of the Seismic Consultant's Letters of Assurance as specified above. Submit copies of the Seismic Consultant and seismic control manufacturer's certification letters as specified in Part 3 of this Section.

.3 Samples: If requested, submit samples of seismic restraint materials for review.

1.04 QUALITY ASSURANCE

.1 Seismic restraints are to be designed by a Seismic Consultant as specified above, and are to be installed by qualified tradesmen under the supervision of and to the approval of the Seismic Consultant.

.2 Unless otherwise specified seismic control and restraints are to be designed in accordance with

.1 National Building Code of Canada

.2 CAN/CSA-S832, Seismic Risk Reduction of Operational and Functional Components (OFC's) of Buildings

.3 local Code requirements

.3 All restraint products must be tested in an independent testing laboratory, or certified by the Vibration Isolation and Seismic Control Manufacturer's Association and Seismic Consultant, to confirm that the restraint products meet all requirements of this Section, i.e. dynamic ultimate limit load state as required by the Code, "Fail Safe" design, etc. If particular tests are carried out to represent a restraint type, the test is to be valid for the full load range of the restraint. Submit such tests or certification when requested.

.4 Seismic control and restraint product manufacturers are to provide all required assistance during the installation, and, when the installation is complete, submit written reports from the manufactures listing any deficiencies to the installation.

2 PRODUCTS

2.01 GENERAL

.1 Isolation, anchors, bolts, bases, restraints, etc., are to be designed to withstand without failure or yielding, the dynamic G load as specified in the Code for the seismic zone in which the building is located. Design loads are ultimate limit state loads (1.5 times working load) acting through the centre of gravity of the anchored or restrained equipment. "Fail Safe" designs are acceptable.

.2 For both isolated and non-isolated floor mounted equipment, design and provide anchors and bolts to withstand, without failure or yielding, a dynamic ultimate limit state load as defined in the Code, of the greater of 0.3 g or as required by the Code, applied horizontally through the centre of gravity.

.3 Where impact forces may be significant, use ductile materials.

.4 Seismic restraining devices which are factory supplied with equipment are to meet all requirements of this Section.

2.02 ACCEPTABLE MANUFACTURERS

.1 Acceptable seismic restraint product manufacturers are:

.1 Mason Industries Inc.

.2 Kinetics Noise Control

.3 Vibro-Acoustics Ltd.

.4 The VCM Group

2.03 SLACK CABLE RESTRAINTS

.1 Galvanized steel aircraft cable slack cable restraints meeting all current requirements of the Building Code, sized to suit the application and complete with all required cable ties, anchor hardware (selected for a load equal to twice the weight of the equipment), and similar connection accessories.

2.04 ANCHOR BOLTS

.1 Equal to Mason Industries type SAB seismic anchor bolts.

3 EXECUTION

3.01 INSTALLATION OF SEISMIC RESTRAINT MATERIALS

.1 Provide seismic restraint for all electrical equipment, conduit, raceways, lighting fixtures, etc., as per the requirements of the current edition of the Building Code and this Section of the Specification.

.2 Provide structural steel bases for all equipment unless the equipment manufacturer certifies direct attachment capabilities.

.3 Space restraints under equipment so that the minimum distance between adjacent corner restraints is at least equal to the height of the centre of gravity of the equipment. Include the height of the centre of gravity on shop drawings, otherwise, design for increased forces on the supports and submit design calculations with shop drawings.

.4 Floor mounted isolated equipment is to be installed on concrete housekeeping pads (design and thickness as selected by the Seismic Consultant) with at least 200 mm (8") clearance between drilled inserts and the edges of the pads. Ensure that all housekeeping pads are keyed to the structure to resist seismic displacement.

.5 Requirements pertaining to seismic control work are as follows:

.1 execute seismic control and restraint work in accordance with drawing details and reviewed product data and shop drawings

.2 seismic control systems are to work in all directions

.3 fasteners and attachment points are to resist the same maximum load as the seismic restraint

.4 drilled or power-driven anchors and fasteners are not permitted

.5 no equipment, equipment supports or mounts are to fail before failure of the structure

.6 seismic control measures are not to interfere with the integrity of firestopping

.7 all equipment is to be bolted to the structure, and all bolts are to fitted with isolation washers

.8 the number, size, type, and installation of anchor bolts are to be as recommended by the anchor bolt manufacturer and the Seismic Design Consultant

.9 where more than a 3 mm (1/8") differential exists between an anchor or attachment bolt diameter, an anchor and attachment point hole, or an isolator gap attachment bolt and equipment anchor attachment hole, pack the air gap with Mason type 0.5 FastSteel reinforced epoxy putty

.10 all hung equipment and hangers are to be fitted with a means of preventing upward movement, and non-isolated equipment and hanger rods are to be fitted with oversized steel washers and nuts above and below the hanger or equipment attachment point, locked tight to prevent uplift of the equipment or hanger

.11 where suspended equipment hanger rod length exceeds 50 rod diameters between the structure and the equipment attachment point, reinforce the rods with angle iron to prevent bending due to uplift forces

.12 seismic control measures are not to jeopardize noise and vibration isolation systems, and 6 mm (¼") to 9 mm (3/8") clearance during normal operation of equipment and systems is to be provided between seismic restraint and equipment

.13 where hold-down bolts for seismic restraint equipment penetrate roofing membranes coordinate with roofing trade for installation of pitch pockets/"gum cups" and sealing compound to maintain the water-tight integrity of the roof

.14 where friction type clamps are used for support of equipment and connecting services, secure clamps to steel work by means of welding or other positive means to prevent slippage or loosening of the clamps due to seismic force

3.02 SITE INSPECTION AND LETTERS OF CERTIFICATION

.1 When all seismic control products have been installed, arrange for the seismic control product manufacturer and Seismic Consultant to examine the installation of all seismic control products and to certify in writing (separate letters) that the products have been properly installed in accordance with governing Codes and Regulations, and recommendations and instructions. The Seismic Consultant is to apply his signed and dated professional stamp to the letter.

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies requirements, criteria, methods and execution for electrical demolition work that are common to one or more electrical work Sections, and it is intended as a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit documentation to confirm that all PCB material and/or equipment containing PCB material has been properly removed and disposed of as applicable.

1.03 REFERENCE STANDARD

.1 Perform demolition work in accordance with requirements of CAN/CSA-S350, Code of Practice for Safety in Demolition of Structures.

2 PRODUCTS

Not Applicable

3 EXECUTION

3.01 DISCONNECTION AND REMOVAL OF EXISTING ELECTRICAL WORK

.1 Where indicated on the drawings, disconnect and remove existing electrical work, including hangers, supports, etc. Disconnect at the point of supply, remove obsolete connecting services and make the system safe. Cut back obsolete conduit behind finishes and cap unless otherwise specified.

.2 The scope and extent of the demolition or revision work is only generally indicated on the drawings. Estimate the scope, extent and cost of the work at the site during the bidding period scheduled site visit(s).

.3 Where deemed necessary by the Owner and Consultant, existing shafts, walls, and inaccessible ceilings will be opened by the Owner to permit site visit inspection of services to be removed/revised as part of the work but usually concealed behind such construction.

.4 Claims for extra costs for demolition work not shown or specified but clearly visible or ascertainable at the site during bidding period site visits will not be allowed.

.5 If any re-design is required due to discrepancies between the electrical drawings and site conditions, notify the Consultant who will issue a Site Instruction. If, in the opinion of the Consultant, discrepancies between the electrical drawings and actual site conditions are of a minor nature, the required modifications are to be done at no additional cost.

.6 Where existing electrical services extend through, or are in an area to serve items which are to remain, maintain the services in operation. Include for rerouting existing services concealed behind existing finishes and which become exposed during the renovation work, so as to be concealed behind new or existing finishes.

.7 Unless otherwise specified, remove from the site and dispose of all existing materials which have been removed and are not to be relocated or reused.

.8 Unless otherwise specified, remove from the site and dispose of all existing materials which have been removed and are not to be relocated or reused.

3.02 HAZARDOUS MATERIALS AND WASTE

.1 If hazardous materials and/or waste not listed in the Specification is found, stop the associated work and notify the Owner and Consultant immediately and await directions.

3.03 INTERRUPTION TO AND SHUT-DOWN OF ELECTRICAL SERVICES AND SYSTEMS

.1 Co-ordinate all shut-down and interruption to existing electrical systems with the Owner. Generally, shut-downs may be performed only between the hours of 12:00 midnight Friday until 6:00 a.m. Monday morning.

.2 Upon award of contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform the Owner in writing seventy-two hours in advance of the proposed shut-down or interruption and obtain written approval to proceed. Do not shut-down or interrupt any system or service without such written approval.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize the shut-down time and to reinstate the systems as soon as possible, and, prior to any shut-down, ensure that all materials and labour required to complete the work for which the shut-down is required are available at the site.

3.04 ROOFING WORK

.1 Where roof revisions and/or replacements are part of the project, include for disconnecting, lifting, or temporarily removing electrical equipment and electrical connections to other roof mounted equipment as required to permit completion of the roofing work, and for re-installing/re-connecting the equipment when the roofing work is complete.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Test Reports: Submit signed test reports for all testing work specified.

.2 Approval Certificates: Submit Certificates of Approval as issued by governing authorities.

.3 Electrical Distribution System Coordination Study: Submit copies of the electrical distribution system protective device coordination study specified in Part 3 of this Section, prior to energizing the electrical distribution equipment.

2 PRODUCTS

NOT APPLICABLE

3 EXECUTION

3.01 GENERAL ELECTRICAL WORK TESTING REQUIREMENTS

.1 Satisfactorily perform all testing required by governing authorities, Codes, Regulation and the Specification, including general testing specified below. Prepare and sign test reports to confirm satisfactory completion of testing and submit as specified in Part 1 of this Section.

.2 Perform testing to suit phasing of the work, as applicable.

.3 Leaks, Grounds, and Crosses: After luminaries, switches, receptacles, motors, signals, and similar equipment has been installed, whether or not the work has been installed as part of the work of this Division of the Specification or by other Divisions (telephone system excepted), test the work to ensure that there are no leaks, grounds, or crosses.

.4 Motor Operation: Test and establish proper motor rotation, measure full load running currents, and check overload elements. Report to the Consultant any discrepancies that are found. Existing motors that have been disconnected and reconnected as part of the electrical work must be checked with rotation meter, and be responsible for any damage caused by reverse rotation.

.5 Branch Circuit Voltage Drop: Demonstrate to the Consultant that branch circuit voltage drop is within specified limits.

3.02 GROUNDING AND BONDING SYSTEM

.1 Provide visual and mechanical inspection of the grounding and bonding system and verify that the system is in compliance with all requirements.

3.03 DISTRIBUTION SYSTEM TESTING AND COORDINATION STUDY

.1 The electrical distribution system protective devices have been selected such that protection is adequate and proper coordination is possible, however, since differences do exist between manufacturers of equipment, some changes in trip ratings or relay settings may be necessary and are to be performed as part of the work, prior to energizing the electrical distribution system. To determine the above, a testing and coordination study of the electrical distribution system equipment is to be performed by one of the following companies:

.1 G.T. Wood Co. Ltd.

.2 Brosz and Associates Ltd.

.3 Enkompass

.4 Spark Power/Rondar Inc.

.5 Haronitis & Associates Ltd.

.2 Submit Short Circuit and Coordination Study with new distribution equipment shop drawings.

.3 Short Circuit and Coordination Study: Immediately upon notification of award of Contract, arrange for the testing company to perform the following:

.1 cooperate with and obtain from manufacturers of the distribution system equipment a list of equipment requiring protective devices to be used, and along with the manufacturers, ensure that proper control and protective devices are selected such that they can be properly coordinated

.2 prepare, as soon as possible, a set of coordination curves on proper time current characteristic graph paper and submit to the Consultant, accompanied by supporting symmetrical as well as asymmetrical fault current calculation data with tabulations to very protection of the various distribution system elements under maximum and minimum fault conditions at the various points in the system

.3 plot the time current characteristic curves for the following:

.1 main and feeder protective devices at voltage levels used in the distribution system

.2 protective devices associated with the largest motor in each motor control centre, the refrigeration machine compressors (as applicable), and the largest lead fed from each distribution panelboard

.3 emergency power engine generator set protective devices, damage curves, and current decrement curves

.4 where relays, breakers, etc., do not perform to approved coordination curves they are to be revised at no cost as part of the work

.4 Review the existing distribution equipment and, where possible, obtain the existing distribution system coordination study to determine the best coordination between the existing and new equipment. If an existing coordination study is not available, survey the existing equipment and prepare calculations of proper coordination between the new and existing equipment. Where defective or incorrectly applied relays or breakers are found, clearly identify the problem on curves submitted with the report and suggest a recommended course of action.

.5 The on-site test and coordination study of distribution system protective devices is to include, as applicable:

.1 testing, cleaning when necessary, and calibrating relays and circuit breaker trip devices (calibration) of protective devices is to conform to requirements of approved coordination (curves).

.2 a function test of associated control device

.3 replacement of any fuses destroyed during tests

.4 an acceptance test in the presence of and to the satisfaction of the Consultant

.5 the presence at the site, for the length of time required, of qualified equipment manufacturer's representatives

.6 an insulation resistance test of "load" side feeders with respect to ground

.7 testing of motor control centres, motor starters, and where supplied as part of the electrical work, viable speed drives

.6 Arc Flash Hazard Analysis: Perform an arc hazard analysis and prepare and submit a report with calculations to determine the flash protection boundary and the incident energy at locations in the electrical distribution system (switchboards, switchgear, motor control centres, distribution panelboards, bus duct, splitters), and other equipment where work could be performed on energized equipment. Include significant locations in systems fed from transformers 125 kVa and greater, and specify safe working distances for calculated fault locations based on the calculated arc flash boundary considering an incident energy of 1.2 cal/cm². Provide minimum 90 mm x 125 mm (3½" x 5") thermal transfer type high adhesion polyester warning labels at each work location and piece of equipment analysed. Labels are to have an orange header with machine printed wording warning, ARC FLASH HAZARD, and the following information:

.1 nominal voltage

.2 flash protection boundary

.3 hazard risk category

.4 incident energy

.5 working distance

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies mounting height requirements that are common to electrical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

.2 Reference 26 05 00 – ELECTRICAL WORK GENERAL INSTRUCTIONS

2 PRODUCTS

2.01 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting heights of equipment are not specified or indicated, verify with the Consultant prior to rough-in and installation.

.3 Unless indicated otherwise on the drawings or within the specifications, install electrical equipment at following heights;

.1 Local switches – no lower than 900mm and no higher than 1100mm

.2 Wall receptacles:

.1 General – 400mm (to bottom of receptacle)

.2 Above top of continuous baseboard heater – 200mm

.3 Above top of counters or counter splash backs – 175mm

.4 In mechanical rooms – 1000mm

.5 In equipment storage rooms – 1000mm

.3 Panelboards – 2000mm to top of panel and as required by Electrical Safety Code

.4 Telephone and interphone outlets – 400mm (to bottom of receptacle)

.5 Wall mounted telephone and interphone outlets – no lower than 900mm and no higher than 1100mm

.6 Thermostats – 1200mm to the point of controls

.7 Fire Alarm stations – 1200mm to the top of point of operating action

.8 Wall Mounted Fire Alarm Audible Devices – 2300mm

.9 Television outlets not mounted behind a wall mounted television – 400mm (to bottom of receptacle)

.10 Wall mounted speakers – 2100mm

.11 Handicap pushbuttons – no lower than 900mm and no higher than 1100 mm

.12 Wall mounted Exit Signs

.1 For ceilings up to 2500mm height – 2100mm

.2 For all ceilings greater than 2500mm – 2400mm

.13 Wall mounted Battery Packs and Emergency Heads

.1 For ceiling up to 2500mm height – 2100mm

.2 For all ceilings greater than 2500mm – 2400mm

.14 Wall mounted occupancy sensors – no lower than 900mm and no higher than 1100mm

.15 Wall mounted visible signal devices – entire lens shall be no less than 2000mm and no more than 2400mm

Note: In all applications the visible signal device shall be located to provide optimal viewing by the occupants. There may be applications where mounting heights outside of the range described would be more suitable and should be reviewed based on space layout and brought up to Engineer as construction progresses.

.16 Top of remote annunciator and passive graphic panels shall be no more than 1800mm above finished floor

3 EXECUTION

3.01 NOT USED

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for all products specified in this Section. Indicate compatibilities and limitations, and application instructions.

.2 Samples: If requested, submit identified conductor samples.

.3 MSDS Sheets: Submit Material Safety Data Sheets for conductor pulling lubricants.

2 PRODUCTS

2.01 DISTRIBUTION AND BRANCH CIRCUIT CONDUCTORS

.1 Conductors to and including No. 10 AWG are to be solid. Conductors larger than No. 10 AWG are to be stranded. All conductors are to be constructed from 98% conductive copper and are to be approved for 600 volts. Conductors are to be colour coded, factory identified on the insulation with the manufacturer's name, conductor size and metal, voltage rating, and CSA type and designation. Conductors are to be as follows:

.1 "T-90 Nylon" single conductor in accordance with CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables, 90° C (195° F) rated, PVC insulated and nylon covered

.2 "RW-90" single conductor in accordance with CAN/CSA C22.2 No. 38, Thermoset-Insulated Wires and Cable, 90° C (195° F) rated, X-link polyethylene insulated

.3 "TWU" single conductor in accordance with CSA C22.2 No. 75, -40° C (-40° F) rated, PVC insulated

.4 "AC90" flexible cable to CSA C22.2 No. 51, Armoured Cable, with 90° C (195° F) rated, X-linked polyethylene insulated conductors, a concentric ground conductor, and an interlocking aluminium armour jacket

.5 Tyco/Raychem "CI" cable in accordance with requirements of CSA C22.2 No. 208, Fire /Alarm and /Signal Cable, FAS90 shielded or un-shielded as required, 90° C (195° F) rated, consisting of a copper conductor, silicone rubber insulation, and a polyolefin outer jacket

.6 equal to Nexans Canada "Firex II" TECK 90 cable in accordance with requirements of CSA C22.2 No. l3l, Type TECK 90 Cable, consisting of single or multiple copper conductors with X-link polyethylene insulation enclosed in a liquid and vapour-tight solid corrugated aluminium sheath and, where required, an overall PV C jacket

2.02 LOW VOLTAGE (24 VOLT) CONDUCTORS

.1 "T-90" or "RW90" stranded copper conductors as specified above.

.2 Equal to Nexans Canada “Securex II” FAS/LVT/FT1300 volt wire to CSA C22.2 No. 208, Fire /Alarm and Signal Wire, 105° C (220° F) rated, consisting of solid copper conductors (stranded for control wiring), flame retardant PVC insulation, an aluminium/Mylar optional shield with a #22 AWG tinned copper insulation and a drain wire, and, if required for the application, interlocking aluminium armour with or without an overall jacket.

2.03 CONNECTORS

.1 Conductors In Conduit: Except as noted, equal to Ideal Industries Inc. “Wing Nut” CSA certified, 60 volt rated pressure type twist connectors.

.2 Conductors 3/0 AWG and Larger: Long barrel, double crimp, compression type lug connectors, unless otherwise specified.

.3 Armoured Cable: Except as noted, proper squeeze type connectors and plastic anti-short bushings at terminations in accordance with requirements of CSA C22.2 No. 18.3, Conduit, Tubing and Cable Fittings.

.4 Teck Cable: Connector and termination hardware supplied by the cable manufacturer to suit the application.

2.04 CONDUCTOR PULLING LUBRICANT

.1 Equal to Ideal Industries Inc. “Yellow 77” or “ClearGlide”, as required.

.2 French Chalk or Talcum Powder conductor pulling lubricant.

3 EXECUTION

3.01 Conform to the following conductor installation requirements:

.1 Conductor Routing: Conductor routing indicated on the drawings is schematic and approximate. Determine exact routing and conductor lengths at the site. Route conductors to avoid interference with other work. Unless otherwise specified or shown install conductors parallel to building lines.

.2 Conductor Pulling: When pulling conductors into conduit use lubricant and ensure that the conductors are kept straight and are not twisted.

.3 Securing/Supporting Conductors**:** Conform to the following requirements:

.1 neatly secure exposed conductors in equipment enclosures with proper supports and/or ties

.2 support flexible armoured cable in ceiling spaces and stud walls with steel two-hole cable straps to Code requirements

.4 Conductor Splicing: Generally, conductor splicing is not permitted unless otherwise approved by the Consultant, and if approved splicing is subject to the following conditions:

.1 splicing is permitted to extend existing conductors

.2 for thermoplastic insulated conductors, splices are to be made within an approved electrical box with mechanical compression connectors to suit the type and size of conductors, and the box(es) are to be properly identified and locations are to be indicated on “as-built” drawings

3.02 INSTALLATION OF DISTRIBUTION AND BRANCH CIRCUIT CONDUCTORS

.1 Provide all required conductors.

.2 Non-Fire Rated Conductors: Unless otherwise specified herein or on the drawings, non-fired rated conductors are to be used as follows:

.1 conductors underground inside or outside the building, and in non-climate-controlled areas – TWU

.2 unless otherwise specified, conductors in accessible ceiling spaces, within stud wall construction, and in furniture systems to luminaries and wiring devices – AC90 (BX) flexible armoured cable, maximum 3 m (10’) run permitted

.3 for conductors except as specified above or elsewhere in the Specification or on the drawings – T90 Nylon or RW90

.3 “Teck” Cable Installation Requirements: Install “Teck” cable in accordance with the manufacturer’s instructions, including the following requirements:

.1 support and secure overhead suspended “Teck” cable tray where indicated

.2 secure individual cables to cable tray or, where shown, directly to building surfaces by means of single screw non-ferrous clamps

.3 terminate cable with lugs and termination kits supplied with the cable

.4 Conductor Sizing: Generally, conductor sizes are indicated on the drawings. Unless otherwise specified, do not use conductors smaller than No. 12 AWG in systems over 30 volts. Unless otherwise specified, do not use conductors smaller than No.6 AWG for exterior luminaire wiring. Conductor sizes indicated on the drawings are minimum sizes and must be increased, where required, to suit length of run and voltage drop in accordance with the voltage drop schedule found at the end of this Section.

.5 Conductor Colour Coding: Unless otherwise specified, colour code conductors to identify phases, neutral, and ground by means of self-laminating coloured vinyl tape, coloured conductor insulation, or properly coloured plastic discs. Colours are to be as follows:

.1 phase A – red

.2 phase B – black

.3 phase C – blue

.4 neutral – white

.5 control – orange

Communication System Colour Coding: Unless otherwise specified, colour code conductors for communication systems in accordance with the system manufacturer's recommendations.

MAX. BRANCH WIRING DISTANCE FOR 120 VOLT SYSTEM AT 2% VOLTAGE DROP

Wire Size	Breaker Size (AMPERES)	15	20	30	40	50	60	70	80	100
	MAX LOAD AT 80% (AMPERES)	12	16	24	32	40	48	56	68	80
No 12.	----------	16.8	12.2	----------	----------	----------	----------	----------	----------	----------
No 10	----------	25.9	19.0	----------	----------	----------	----------	----------	----------	----------
No. 8	----------	39.6	30.4	12.9	----------	----------	----------	----------	----------	----------
No. 6	----------	62.4	47.2	32.0	23.6	19.0	16.0	----------	----------	----------
No.4	----------	99.0	73.1	50.2	38.1	30.4	24.3	21.3	19.0	----------
No. 2	----------	----------	114.3	77.2	57.9	47.2	38.8	33.5	28.9	22.8
No. 1	----------	----------	----------	96.0	73.1	57.9	47.2	42.6	36.5	27.4
No.1/0	----------	----------	----------	----------	85.3	68.5	56.3	48.7	41.9	33.5
No. 2//0	----------	----------	----------	----------	102.8	80.7	67.0	57.9	50.2	40.3
No. 3/0	----------	----------	----------	----------	----------	95.2	79.2	68.5	59.4	47.2
No. 4/0	----------	----------	----------	----------	----------	----------	92.9	79.2	70.1	56.3
250 MCM	----------	----------	----------	----------	----------	----------	102.8	86.8	76,.2	60.9
300 MCM	----------	----------	----------	----------	----------	----------	----------	100.5	88.3	70.1

NOTE: DISTANCES INDICATED IN METRES FROM PANEL TO LOAD FOR SINGLE PHASE MAX. BRANCH WIRING DISTANCE FOR 120 VOLT SYSTEM AT 3% VOLTAGE DROP

Wire Size	Breaker Size (AMPERES)	15	20	30	40	50	60	70	80	100
	MAX LOAD AT 80% (AMPERES)	12	16	24	32	40	48	56	68	80
No 12.	----------	24.4	18.3	----------	----------	----------	----------	-------	----------	----------
No 10	----------	38.1	29.0	19.1	----------	----------	----------	-------	----------	----------
No. 8	----------	59.4	44.2	30.5	22.9	----------	----------	-------	----------	----------
No. 6	----------	91.4	70.1	47.2	35.1	28.2	23.6	-------	----------	----------
No.4	----------	-------	109.7	73.2	54.9	42.7	38.1	32.0	27.4	----------
No. 2	----------	-------	---------	114.3	85.3	68.6	57.9	50.3	41.1	35.0
No. 1	----------	-------	-------	--------	103.6	85.3	73.2	61.0	54.9	43.4
No.1/0	----------	-------	-------	-------	128.0	102.9	85.3	73.2	64.0	48.8
No. 2//0	----------	-------	-------	--------	--------	122.9	100.6	86.9	74.7	60.9
No. 3/0	----------	-------	-------	----------	----------	----------	118.1	102.1	88.4	70.1
No. 4/0	----------	-------	-------	----------	----------	----------	----------	120.4	102.9	83.8
250 MCM	----------	-------	-------	----------	--------	----------	----------	-------	114.3	91.4
300 MCM	----------	-------	-------	----------	----------	----------	----------	-------	----------	103.6

NOTE: DISTANCES INDICATED IN METRES FROM PANEL TO LOAD FOR SINGLE PHASE

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for all products specified in Part 2 of this Section except for copper wire/cable conductors.

1.02 QUALITY ASSURANCE

.1 Grounding and bonding work is to be in accordance with requirements of the following:

.1 CSA C22.2 No. 41, Grounding and Bonding Equipment (Tri-National Standard with UL 467)

.2 CSA C22.2 No. 0.4, Grounding and Bonding of Electrical Equipment

.3 requirements of the Electrical Safety Authority and any other governing authority

1.03 COORDINATION

.1 Coordinate the installation of grounding hardware and conductors associated with concrete with the trades providing the concrete work.

1.04 FIELD QUALITY CONTROL REPORT

.1 Submit written and signed report(s) indicating successful results of the ground continuity tests specified in Part 3.

2 PRODUCTS

2.01 GROUND RODS

.1 Copper clad solid steel round rods, 20 mm (¾”) diameter, 3 m (10’) long, each complete with driving cap, pointed bronze tip, and a #14-gauge hot dipped galvanized steel or PVC, 250 mm (10”) diameter, 300 mm (12”) long ground rod box with a vandal-proof removable identified cover.

2.02 GROUND PLATES

.1 Copper plates, 1 m² (11 ft.² surface area, 6 mm (¼”) thick.

2.03 GROUND MAT

.1 Copper mesh gradient control mat, 1.5 m (5’) square, 2 mm (3/32”) thick, 50 x 50 mesh.

2.04 GROUND BUS

.1 Solid electrical grade copper, minimum 50 mm x 6 mm (2" x ¼), minimum 600 mm (24") long but with lengths as required (continuous lengths for health care and data centre projects), predrilled for two-hole lug connections, suitable for wall or backboard mounting and complete with corner angles, tamper-proof stainless steel hex head bolts, nuts, and spring lock washers, standoff insulators, and all connection hardware.

2.05 FLEXIBLE GROUND BRAID

.1 Flat 98% conductivity tinned copper grounding braid with dimensions to suit the application.

2.06 GROUND CONDUCTORS

.1 Unless otherwise specified and/or shown. Stranded un-tinned soft annealed copper wire, bare or green PVC insulated conforming to requirement of the Section entitled Wire and Box Connectors (0-1000volts).

2.07 GROUNDING AND BONDING CONNECTIONS

.1 Below Grade: Equal to Erico International Corp. "CADWELD" exothermic welded connections.

.2 Above Grade: Compression type connectors with zinc-plated fasteners and external tooth lock washers, or, if approved by the Consultant, exothermic Erico International Corp. "CADWELD" welded connections.

2.08 COMMUNICATIONS, ACCESS CONTROL, & ELECTRONIC SAFETY SYSTEM GROUND BUS

.1 Solid electrical grade copper bus bars, minimum 6 mm x 20 mm (¼" x ¾") designed for mounting on the framework of open or cabinet enclosed equipment racks.

2.09 LAN ROOM GROUND BUS

.1 Solid electrical Grade copper bus bars, 300 mm x 50 mm x 9 mm (12" x 2" x ⅜") with 8 drilled holes, suitable for wall mounting and equipped with standoff insulators.

3 EXECUTION

3.01 GENERAL RE: GROUNDING AND BONDING

.1 Perform all required grounding and bonding work in accordance with the Contract Documents and requirements of governing Codes and Standards, including the Electrical Safety Authority.

.2 Bond metallic conduits, boxes, cable tray, ducts, and non-current carrying metal parts of equipment together to form a continuous ground system. In electrical equipment rooms, solidly bond circuits, panelboards, conduits, equipment enclosures, and other equipment to perimeter ground bus using bronze connectors and hardware.

.3 Protect exposed conductors from injury. Install underground conductors a minimum of 450 mm (18”) below grade.

.4 Use tinned copper conductors for aluminium structures.

.5 Do not use bare copper conductors adjacent to un-jacketed lead sheath cables.

3.02 GENERAL PRIMARY GROUNDING AND BONDING REQUIREMENTS

.1 Grounding and bonding work associated with primary electric service work is to be performed only by qualified journeyman electricians employed by the subcontractor doing the primary electric service work.

.2 Provide a separate ground conductor in all PVC conduits.

3.03 INSTALLATION OF GROUND ROD GRIDS

.1 Construct ground rod grids consisting of copper clad steel ground rods as indicated/specified where indicated, each consisting of the number of rods shown, driven into the earth a minim of 300 mm (12”) below grade and terminated with a galvanized steel box enclosing the ground conductor clamp, and interconnected with minimum #3/0 AWG bare copper conductor. Flush with grade at each ground rod, provide an identification monument.

3.04 INSTALLATION OF GROUND BUS

.1 Provide ground bus where shown/specified. Wall mount 300 mm (12”) above finished floor level on standoff insulators and follow the outline of door frames and room corners using 90º bus angles to form continuous bus. Connect the ground bus to the ground rod grid by means of two minimum #3/0 copper conductors terminated with approved fittings.

.2 Provide flexible braided copper ground straps from the ground bus to each steel door frame and door in the room, each securely bolted in place.

.3 Tighten all bus bar joint connection bolts and lug using a torque wrench to the bus manufacturer’s prescribed tension, then coat the bus with two 100% covering coats of shellac to prevent copper oxidization.

3.05 CABLE SHEATH GROUNDING

.1 Bond single conductor metallic sheathed cables together at one end only. Break the sheath continuity in an approved manner, and provide #6 AWG flexible copper ground conductor soldered (not clamped) to the cable sheath.

3.06 LOCAL AREA NETWORK (LAN) ROOM GROUNDING

.1 Provide minimum 3/0 AWG insulated copper ground conductors and wall mounted copper ground bus in each LAN Room. Connect the ground bus to computer equipment racks and to the building ground system.

3.07 TELECOMMUNICATIONS SYSTEMS GROUNDING

.1 Provide all required conductors and hardware to properly ground and bond communication system raceways, cable tray, metallic cable shields, and equipment to a ground source in accordance with requirements of TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications.

END OF SECTION

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1 GENERAL

1.01 SUBMITTALS

.1 Product Data: If requested, submit product data sheets for products specified in this Section.

.2 Samples: If requested, submit samples of products specified in this Section.

2 PRODUCTS

2.01 SPLITTER TROUGH

.1 Formed #16-gauge steel Type 1 splitter trough in accordance with CSA C22.2 No. 76, Splitters, finished inside and outside with ANSI 61 gray heat cured powder epoxy paint, and complete with welded seams ground smooth, various size knockouts on each side, back mounting holes, removable doors with stainless steel hinges and hinge pins, terminal blocks for conductor connections, a single point ground lug

.2 Enclosures: Unless otherwise specified, enclosures are to be in accordance with the following NEMA/EEMAC ratings:

.1 all enclosures located in sprinklered areas – Type 2

.2 all enclosures except as noted above – Type 1

2.02 PULL BOXES AND JUNCTION BOXES

.1 Each box is to be CSA certified, sized to suit the number and size of conduit and conductors, and complete with connecting and securing facilities. Unless otherwise specified, pull boxes and junction boxes are to be as follows:

.1 galvanized or prime coat plated steel, suitable in all respects for the application and complete with screw-on or hinged covers as required and connectors suitable for the connected conduit

.2 “Condulet”, threaded galvanized cast iron or cast aluminium pull boxes ad junction boxes of an exact type to suit the application, each complete with screw-on gasketed cover

.3 rigid plastic (PVC), junction boxes and access fittings with solvent weld type joints and screw-on PVC covers

3 EXECUTION

3.01 INSTALLATION OF SPLITTER TROUGH

.1 Provide all required splitter trough in accordance with drawing plans, schedules, details, and requirements of the Specification.

.2 Rigidly secure that the splitter trough in place, level and plumb.

.3 Ensure that the splitter trough itself, and all branch circuits are properly identified.

3.02 INSTALLATION OF PULL BOXES AND JUNCTION BOXES

.1 Provide pull boxes in conduit systems wherever shown on the drawings, and/or wherever necessary to facilitate conductor installations. Generally, conduit runs exceeding 30 m (100') in length, or with more than three 90° bends, are to be equipped with a pull box installed at a convenient and suitable intermediate accessible location.

.2 Provide junction boxes wherever required and/or indicated on the drawings.

.3 Unless otherwise specified, boxes are to be as follows:

.1 in rigid conduit and EMT inside the building – stamped galvanized or prime coated steel

.2 in exterior rigid conduit – "Condulet" cast aluminium gasketted boxes unless otherwise noted

.3 in plastic conduit – rigid PVC boxes

.4 All pull boxes and junction boxes must be accessible after the work is complete.

.5 Accurately locate and identify all concealed pull boxes and junction boxes on "as-built" record drawings.

.6 Cover boxes in fire walls with aluminium tape and seal with caulking.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: If requested, submit product data sheets for products specified in this Section.

.2 Samples: If requested, submit samples of products specified in this Section.

2 PRODUCTS

2.01 OUTLET BOXES

.1 Each box is to be CSA certified, suitable in all respects for the application, and be complete with suitable securing lugs, connectors suitable for the connected conduit, knockouts, and, where necessary, suitable plaster rings, concrete rings, covers and any other required accessory. Unless otherwise specified, outlet boxes are to be as follows:

.1 stamped, electro-galvanized steel outlet boxes

.2 zinc coated cast malleable iron or cast aluminum “FS and “FD” boxes with threaded inlet/outlet hubs

.3 rigid PVC outlet boxes

3 EXECUTION

3.01 INSTALLATION OF OUTLET AND CONDUIT BOXES

.1 Provide an outlet box or back box for each luminaire, wiring device, telephone outlet, fire alarm system component, communications systems components, and all other such outlets.

.2 Stamped Galvanized Steel: Outlet boxes flush mounted in interior construction, surface mounted in concealed interior locations, and surface mounted in exposed interior locations where the connecting conduit is EMT are to be stamped galvanized steel outlet boxes unless otherwise noted.

.3 “FS” and “FD” Series Boxes: Outlet boxes for surface mounted for exterior lighting, receptacles, and other device outlets, boxes flush mounted in exterior building surfaces, and boxes mounted in interior device locations where the connecting conduit is rigid, and for boxes in perimeter walls where insulation and vapour barrier is present, are to be “FS” or “FD” Series cast boxes unless otherwise noted, cast iron inside the building, cast aluminium outside the building.

.4 Outlet boxes for special wiring devices, for special equipment and special applications if required, are specified hereinafter in other Sections or on the drawings.

.5 The size and arrangement of outlet boxes are to suit the device which they serve.

.6 Generally, mounting heights and locations for outlets are indicated on the drawings, however, confirm the exact location and arrangement of all outlets prior to roughing-in. Architectural drawings and the Consultant's instructions have precedence over electrical drawing diagrammatic layouts and specified mounting height and locations. In addition, abide by the following requirements:

.1 locate flush mounting boxes in masonry walls to require cutting of the masonry unit corner only, and coordinate masonry cutting to achieve a neat opening

.2 position outlet boxes to locate luminaires as shown on reflected ceiling plans

.3 coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes

.7 Do not install outlet or back boxes "back-to-back" in walls and partitions. Stagger such outlets and seal against noise transmission with acoustic insulation. "Thru-wall" type boxes will not be permitted for any application.

.8 Where boxes ae multi-ganged or grouped together, mount boxes level and spaced consistently.

.9 Temporarily pack all open boxes located in concrete and masonry to prevent debris from entering the box.

.10 Include all costs for installed boxes that have not been covered by wall/ceiling finishes, to be relocated up to 1 m (3') to suit final device location coordination.

.11 Provide blank coverplates over all boxes left empty for future installation of devices. Clearly identify each box as to its intended use to the Consultant's approval. Generally, blank overplates are to be stainless steel.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for all products where submittal is specified in Part 2 or Part 3 of this Section.

.2 Colour Coated EMT Colour Chart: Submit the colour coated EMT manufacturer's standard colour chart for colour selection(s) by the Consultant.

.3 Drawing(s) of Conduit Locations/sizes In Structural Poured Concrete: As specified in Part 3 of this Section, submit drawings to indicate the proposed location, size, and length of run for conduit proposed to be installed in structural poured concrete work.

2 PRODUCTS

2.01 EMT

.1 Galvanized steel to CSA C22.2 No. 83, Electrical Metallic Tubing, complete with factory made bends where site bending is not possible, and joints and terminations made with steel couplings and set screw type connectors, concrete tight where required.

2.02 RIGID GALVANIZED STEEL CONDUIT

.1 Rigid galvanized steel to CSA C22.2 No. 45, Rigid Metal Conduit, with an enamel interior coating, galvanized threads where factory threaded, red lead coated threads where site threaded, factory made bends where site bending is not possible, factory made threaded fittings and connectors, and terminations made with rigid couplings, concrete tight where required.

2.03 FLEXIBLE GALVANIZED STEEL LIQUID-TIGHT CONDUIT

.1 Flexible galvanized steel liquid-tight conduit to CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit, complete with Ideal Industries Inc. "Steel Tough" liquid-tight connectors at terminations

2.04 FLEXIBLE GALVANIZED STEEL CONDUIT

.1 Galvanized steel flexible conduit to CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit, complete with proper and suitable squeeze type connectors at terminations.

2.05 RIGID PVC CONDUIT

.1 Rigid PVC conduit to CSA C22.2 No. 211.1, Rigid Types EB1 and DB2/ES2 PVC Conduit, FT-4 rated, complete with site made heat gun bends for conduit to and including 50 mm (2") diameter, factory made fittings for conduit larger than 50 mm (2") diameter, solvent weld joints, factory made expansion joints where required, and terminations made with proper and suitable connectors and adaptors.

2.06 FLEXIBLE PVC CONDUIT

.1 Equal to Ipex Electrical Inc. “Cor-line” flexible, water-tight, corrugated PVC conduit with Ipex “Kwikon” fittings and ESU conduit supports spaced at every 600 mm to 900 mm (2’ to 3”), and proper and suitable terminations and adapters.

2.07 FISH CORD

.1 Polyethylene or nylon fish cord/tape with cable pull accessories to suit the application.

3 EXECUTION

3.01 GENERAL RE: INSTALLATION OF CONDUIT

.1 Refer to the article entitled General Conduit and Conductor Installation Requirements in the electrical work Section entitled Basic Electrical Materials and Requirements.

.2 Ensure that all open empty conduit ends are properly protected against dirt and debris during the construction process.

3.02 CONDUIT INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, provide conduit for all conductors except armoured cable, mineral insulated fire rated cable, and except where cable tray, cable duct, or a similar raceway is used.

.2 Conduit Types: Conduit is to be as follows:

.1 for main distribution wiring in electrical rooms and similar areas – rigid galvanized steel

.2 for exposed conduit from floor level to 1.2 m (4”) above the floor in mechanical and other service rooms – rigid galvanized steel

.3 for concealed conduit in exterior walls – rigid galvanized steel

.4 for conduit exposed outside the building, except where rigid PVC conduit is permitted – rigid galvanized steel

.8 for short (minimum 450 mm (18”), maximum 600 mm (24”), with a 180º loop wherever possible) runs of conduit to electric motors, distribution transformers, and vibration isolated equipment – flexible galvanized steel liquid-tight conduit

.9 at points where exposed conduit crosses building expansion joints – flexible galvanized steel conduit

.10 for branch circuit conductors underground inside the building, and underground outside the building beneath structures and concrete or asphalt paving – rigid PVC

.11 for branch circuit conductors outside the building at roof level – rigid PVC

.12 for branch circuit conductors in concrete slabs on grade, and in concrete and masonry walls except exterior walls - rigid PVC

.13 for concealed branch circuit conductors associated with isolated power systems – rigid PVC

.14 for branch circuit conductors in concrete slabs above grade – flexible PVC

.15 for all conduit except as specified above – EMT

.16 for fire alarm system, and communications/security systems conductors – colour coated EMT with colours as selected

.3 Conduit Fittings: Unless otherwise specified, conduit fittings are to be of the same material as the conduit and suitable in all respects for the application. Provide proper adaptors for joining conduit of different materials.

.4 Conduit Bends: Site made bends for conduit must be made using proper bending equipment, bends must maintain the full conduit diameter with no kinking, and conduit finishes and lining must not flake or crack when the conduit is bent.

.5 Site Cutting Conduit: Cut square and ream all site cut conduit ends.

.6 Conduit Threads: Site cut rigid steel conduit using proper thread cutting equipment, in an approved area. Protect the area and building surfaces from being soiled/damaged by the threading process. Clean and lubricate threads and coat threads with red lead or other zinc rich coating.

.7 Conduit Sizes: Generally, conduit is sized on the drawings. Conduit not sized on the drawings is to be sized in accordance with the governing Codes/Regulations. The sizes of branch circuit conductors shown/specified are minimum sizes and must be increased to suit length of run and voltage drop, and where this occurs, increase the conduit size to suit. Do not use conduit less than 20 mm (3/4”) diameter.

.8 Empty Conduit: Ensure that all conduit left empty for future wiring is clean, capped, and properly identified. Provide end bushings and fish cord in all such conduit.

.9 Empty Conduit At Panelboards: Where a suspended ceiling occurs, provide 4, empty, 20 mm (¾”) diameter conduits from each flush wall mounted panelboard terminated in the suspended ceiling above, capped and identified.

3.03 CONDUIT INSTALLED IN POURED CONCRETE

.1 Where conduit is to be embedded in structural poured concrete, obtain the Consultant’s approval. Submit a drawing indicating the location and size of the conduit, the length of run, and any other required details. Obtain the Consultant’s written approval prior to conduit installation. The Consultant’s decision regarding conduit in structural poured concrete is final and is not the basis of a claim for additional costs.

.2 When and where conduit is permitted in structural poured concrete, abide by the following requirements:

.1 install the conduit in accordance with requirements of CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction

.2 the conduit must be secured in a manner such that the c9ncrete will not be displaced when the concrete is poured, and during the concrete pour, monitor the conduit installation to prevent displacement or damage, and immediately report any misplacement or damage observed

.3 where conduit extends adjacent to a column, stay away from the column a minimum of 2 times the thickness of the slab and drop away from the column

.4 where conduits terminate adjacent to a column or wall, bring the conduit in toward the column/wall as close to 90º to the face of the column/wall as possible

.5 where more than 2 conduits are adjacent to each other they are to be spaced the greater of 3 conduit diameters or 100 mm (4”) apart

.6 the total depth of conduits crossing over each other is to be less than 1 third the thickness of the slab

.7 place conduit in the middle third of the slab thickness, and do not in any case lay conduit directly on reinforcing steel

.8 do not locate conduit adjacent to parallel reinforcing bars

.9 the maximum size of any conduit is $1/5^{th}$ of slab thickness

.10 do not install conduit longitudinally in a beam without specific approval of the Consultant, and extend conduit through a beam at right angles to the beam span

.11 where conduits extend through beams stay a minimum of twice the depth of the beam away from the supports

.12 do not install conduit in the slab beside a drop or beam within twice the depth of the slab from the edge of the drop or beam

.13 do not install conduits through shear walls or columns without written approval from the consultant

.14 do not install conduit in parking garage structures, garage ramps, water retaining structures, or any other concrete subject to the application of de-icing products

.15 in areas where installation of conduit embedded in concrete is not permitted, extend conduit through beams in sleeves, if the installation of the sleeves is permitted

.16 slope all underground conduit to drainage points and ensure that the counduit can be drained

3.04 CONDUIT UNDER SLAB ON GRADE

.1 Where conduit is to be installed under a slab on grade, the system is to be a pull-in system, must consider and address any effects of magnetic fields, and the following is to apply:

.1 concrete encased duct bank with non-ferrous conduits is to be used

.2 conduit is to be sloped to a proper drainage pit

.3 20% spare conduit (minimum 1) is to be provided

3.05 CONDUIT SUPPORT

.1 Underground Conduit: Unless otherwise shown or specified, support underground conduit on a well tamped bed of earth or sand, free from rocks or protrusions of any kind.

.2 Surface Mounted & Suspended Single/Double Conduit Runs: Support and secure single and double runs of conduit at support spacing in accordance with Code requirements by means of galvanized steel pipe straps, conduit clips, ring bolt type hangers with galvanized steel hanger rods, or by other approved manufactured devices.

.3 Support of Multiple Conduit Runs: Support multiple conduit runs by means of Electrovert Ltd. “CANTRUSS” or Burndy Ltd. “FLEXIBLE” conduit racks and galvanized steel rods with support spacing to suit requirements of the smallest diameter conduit in the group.

.4 Conduit Expansion Facilities: Abide by the following:

.1 wherever concealed or surface mounted conduit extends across a building expansion joint, provide expansion facilities to permit free movement without imposing additional stress or loading on the support system, and to prevent excessive movement at joints and connections

.2 provide manufactured expansion joint fittings in rigid PVC conduit at spacing recommended by the expansion joint fitting manufacturer

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for all products specified in this Section.

.2 Colour Chart: Submit a colour chart with product data and do not order raceway until the colour selection has been confirmed by the Consultant.

1.02 QUALITY ASSURANCE

.1 Wireways and auxiliary gutters are to be in accordance with requirements of CAN/CSA C22.2 No. 26, Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

2 PRODUCTS

2.01 WIREWAYS AND GUTTERS

.1 Wireways and gutters are to be of sheet steel construction with no sharp edges, sized for the wiring as required and/or indicated, complete with all required fittings and accessories, and a baked grey enamel finish. Covers are to be hinged and bolted to give uninterrupted access to wiring.

3 EXECUTION

3.01 INSTALLATION OF WIREWAYS AND GUTTERS

.1 Provide wireway/gutters where shown. Confirm exact locations and routing prior to installation. Provide supports, fittings, adaptors, and accessories as required but keep the number of elbows, offsets, and connections to the minimum.

.2 Provide barriers in wireways/gutters where different voltage wiring is required.

.3 Install gutter to full length of equipment.

.4 Identify wireways/gutters with engraved nameplates as specified in the Section entitled Basic Electrical Materials and Methods.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for wiring devices. Ensure that the sheets indicate colours and faceplate finishes.

.2 Wiring Device Samples: Submit identified samples in original packaging of the following wiring devices:

1.02 QUALITY ASSURANCE

.1 All wiring devices are to be CSA certified as a minimum, in accordance with the following standards, as applicable:

.1 CAN/CSA C22.2 No. 42, General Use Receptacle, Attachment Plugs and Similar Wiring Devices

.2 CAN/CSA C22.2 No. 42.1, Cover plates for Flush Mounted Devices

.3 CSA C22.2 No. 111, General Use Snap Switches

.2 Wherever possible, all wiring devices are to be supplied by the same manufacturer.

.3 Acceptable Manufacturers: Unless otherwise specified in this Section or on the drawings, acceptable manufacturers are:

.1 Hubbell Canada LP

.2 Cooper Industries (Arrow Hart)

.3 Legrand/Pass & Seymour

.4 Leviton Canada

1.03 WIRING DEVICE AND PLATE COLOURS

.1 Unless otherwise specified, wiring device colours will be as specified in Part 3 of this Section

2 PRODUCTS

2.01 SWITCHES

.1 Unless otherwise specified, Specification Grade, Premium Quality, back and side wired, 20 ampere, 120–277-volt A.C. quiet action toggle switches, single pole, 2-pole, 3-way, or key type as indicated on the drawings, each complete with a nickel-plated steel ground terminal, brass power wiring terminals and screws, silver cadmium oxide contacts with a moveable brass contact arm, and nylon toggle with colour as specified below. Switch types are as follows:

.1 Standard Wall Toggle Switches: As above.

.2 Illuminated Handle Standard Wall Toggle Switch: As above for standard switches but with a clear red or green polycarbonate toggle which is illuminated when the switch is on or off. Confirm toggle colour and position when illuminated prior to ordering.

.3 Decorative Wall Rocker Switch: Generally, as specified above for standard toggle switches but rectangular decorative rocker type with rocker handles.

.4 Illuminated Decorative Wall Rocker Switch: Generally, as specified above for decorative toggle switches but with a rocker type illuminated handle.

.5 Door Switch: Box, switch and plate assemblies with a 125-volt 3 ampere illuminated switch which is on or off when the door is open (confirm prior to ordering), a 34 mm x 94 mm x 40 mm (1 11/32" x 3 11/16" x 1½") box, cover plate, and mounting screws.

.6 Hazardous Location Switch: Explosion-proof, surface mounting, front operated switches suitable for use in Class 1 Division 2 locations with exact classification and configuration to suit the mounting location and the equipment the switch is provided for.

.7 Motor Control Snap Action Switch: Illuminated handle snap action horsepower rated switch, CSA certified for motor control and sized to suit the application.

.8 Occupancy Sensor Switch: Digital ultrasonic sensor type, 120–277-volt A.C. with integral photo sensor and selected to suit the area and occupancy of the room served.

2.02 SPECIFICATION GRADE STANDARD RECEPTACLES

.1 Back or side wired, U-ground, 2 pole receptacles as follows:

.1 15 Amp. 125 Volt Duplex Receptacle: 3-wire receptacles, NEMA configuration 5-15R

.2 15 Amp. 250 Volt Duplex Receptacle: 3-wire receptacles, NEMA configuration 6-15R

.3 20 Amp. 125 Volt Duplex Receptacle: 3-wire receptacles, NEMA configuration 5-02R

.4 20 Amp. 250 Volt Duplex Receptacle: 3-wire receptacles, NEMA configuration 6-20R

.5 30 Amp. 250 Volt Simplex Receptacle: 3-wire receptacles, NEMA configuration 6-30R

.6 30 Amp. 125/250 Volt Simplex Receptacle: 3-wire receptacles, NEMA configuration 14-30R

.7 50 Amp. 250 Volt Simplex Receptacle: 3-wire receptacles, NEMA configuration 6-50R

.8 50 Amp. 125/250 Volt Simplex Receptacle: 4-wire receptacles, NEMA configuration 14-50R

2.03 SPECIFICATION GRADE LOCKING RECEPTACLES

.1 Specification Grade, back or side wired, U-ground 2-pole, 3-wire locking type receptacles as follows:

.1 15 Amp. 125 Volt Duplex Receptacle: NEMA configuration L6-15R

.2 15 Amp. 250 Volt Duplex Receptacle: NEMA configuration L6-15R

.3 20 Amp. 125 Volt Duplex Receptacle: NEMA configuration L5-20R

.4 20 Amp. 250 Volt Duplex Receptacle: NEMA configuration L6-20R

2.04 SPECIFICATION GREADE ISOLATED GROUND RECEPTACLES

.1 120 Amp. 125 Volt Duplex Receptacle: Back and side wired, duplex, U-ground, 2-pole, 20 ampere, 125 volt, 3-wire, orange colour, surge suppression isolated ground nylon construction receptacles, NEMA configuration 5-20R.

2.05 SPECIFICATION GRADE GROUND FAULT RECEPTACLES

.1 Heavy-duty, 15/20 ampere, 125 volt, ULC Class A, Group 1. automatic ground fault circuit interrupting duplex receptacles with a 10-kA short circuit current rating automatic self-test diagnostics, green power on LED, and red ground fault LED. Ground fault receptacles for indoor climate controlled and outdoor or non-climate-controlled areas are to be as follows:

.1 indoor climate-controlled areas: equal to Hubbell Canada No. GFST15/GFSTt20 “AUTOGUARD”

.2 outdoor areas and indoor non-climate areas: equal to Hubbell Canada No. GFR5262TR/GFR 4362TR “AUTOGUARD”

2.06 DEVICE FACEPLATES

.1 Device faceplates are to be ULC listed and CSA certified and, unless otherwise specified, supplied by the device manufacturer. Where two or more devices are installed in a common box, a common one-piece faceplate is to be used. Faceplate colours are specified in Part 3. Faceplates, unless otherwise specified, are to be as follows:

.1 Phenolic switch and receptacle faceplates, brown or ivory, complete with matching screws

.2 “Decorator” type Phenolic switch and receptacle faceplates

.3 type 302 stainless steel switch and receptacle faceplates, brush finish or satin finish as directed, with stainless steel screws

.4 high impact smooth finish switch and receptacle faceplates

.5 hot dipped galvanized steel switch and receptacle faceplates

.6 NEMA 3 rated, single gang, horizontal/vertical mounting, weather-proof in use, gasketed cast aluminium, receptacle faceplates to suit the type of receptacle used

.7 weather-proof, gasketed, water-tight single gang type 302 stainless steel switch plate with clear silicone rubber bubble over the switch toggle

3 EXECUTION

3.01 GENERAL RE: INSTALLATION OF WIRING DEVICES

.1 Provide all required wiring devices and faceplates

.2 Confirm exact locations, including mounting heights prior to roughing-in.

.3 For barrier-free mounting heights for devices, conform to requirements of the governing code or regulation.

.4 Ensure that switches located adjacent to doors are located at the strike side of the door. Confirm door swings prior to roughing-in.

.5 Install single throw switches with the handle in the up position when the switch is closed.

.6 Confirm all switch, receptacle and faceplate types, colours and finishes prior to ordering

.7 Provide a separate insulated ground conductor for each isolated ground receptacle.

.8 Faceplates for computer equipment receptacles are to be permanently identified with “Computer Equipment Only” wording.

.9 Faceplates for housekeeping receptacles are to be permanently identified with “Housekeeping Only” wording.

.10 Do not install faceplates for flush devices until wall, etc., finishing work is complete

.11 Where devices are to be installed in casework, millwork, or similar construction, carefully coordinate device installations and device openings with the trade providing the casework, millwork, etc.

.12 Device locations indicated on the drawings are approximate, and, if requested, relocate the device up to 3 mm (10') away from the location shown at no additional cost.

.13 All receptacles within 1.5m of a sink or shower/tub to be GFCI type.

3.02 WIRING DEVICE AND DACEPLATLE TYPES AND COLOURS

.1 Unless otherwise specified, wiring devices colours and faceplate types and colours are to be as follows:

.1 standard switches & receptacles I finished areas-non-essential circuits: ivory, with ivory Phenolic faceplates

.2 "Decorator" switches & receptacles in finished areas-non-essential circuits: white or ivory, with white or ivory "Decorator" Phenolic faceplates

.3 switches & receptacles in finished areas-non-essential circuits: ivory, stainless steel faceplates

.4 switches & receptacles in unfinished areas-non-essential circuits: ivory, stainless steel faceplates

.5 switches & receptacles in finished areas-essential power circuits & isolated power switches: red, with stainless steel faceplates

.6 isolated power receptacles: cast aluminium gasketed weather-proof faceplates to suit the type of receptacle installed

.7 weather-proof switches: weather-proof stainless-steel faceplates with clear silicone bubble over the switch toggle

3.03 TESTING

.1 When installation is complete, test operation of all devices.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Samples: Submit product data sheets for products specified in this Section.

.2 Factory Test Reports: Submit certified copies of the transformer manufacturer's standard factory testing.

.3 Installation Test Report: As specified in Part 3 of this Section, submit signed copies of the site installation test report.

.4 Transformer Extended Warranty: Submit a signed copy of the manufacturer's extended warranty as specified below.

1.02 QUALITY ASSURANCE

.1 Dry type distribution transformers are to be in accordance with requirements of the following:

.1 CAN/CSA-C22.2 No. 47, Air-Cooled Transformers (Dry Type)

.2 CSA-C9 Dry-Type transformers

.3 CAN/CSA-C802.2, Minimum Efficiency Values for Dry-Type Transformers

.4 NEMA TP1, Guide for Determining Energy Efficiency for Distribution Transformers

1.03 EXTENDED WARRANTY

.1 Distribution transformers are to be covered by a five-year non-prorated extended warranty (as per the Contract warranty) direct from the manufacturer to the Owner against defects in material, workmanship and performance.

2 PRODUCTS

2.01 DISTRIBUTION TRANSFORMERS

.1 Dry type distribution transformers, factory assembled and tested, supplied with a 5-year extended warranty as per Part 1 of the Section, as per the drawing schedule and with the following features:

.1 a minimum NEMA/EEMAC 3R enclosure with rigid end frame, removable gasketed front and rear plates, a bottom terminal compartment, ventilation louvers designed to protect internal live parts from fire protection sprinkler system spray, a drip shield, a factory ASA No. 61 light grey enamel finish, an aluminium nameplate secured to rivets to the front of the enclosure and listing impedance rating, weight connection diagram, style and serial number, and, where required by governing Codes and Regulations, seismic restraint facilities for site connection

.2 copper windings, a core constructed of stacked laminations of high permeability silicone streel, epoxy resin impregnation, and Class H silicone type coil insulation such that the winding temperature rise will not exceed 150° C (300° F) and the enclosure temperature rise will not exceed 65° C (150° F) under full load in a 40° C (104° F) ambient temperature

.3 an electrostatic shield for the attenuation of voltage spikes, line noise, and transients

.4 lugs or pressure type terminals to suit primary and secondary conductors

.5 four 2½ % full capacity taps, 2 above normal and 2 below normal

.6 basic impulse level (BIL), standard

.7 mounting hardware for the location(s) shown

.8 average sound levels as follows:

.1 40 dB for transformers up to 9 kVA

.2 45 dB for transformers from 10 to 50 kVA

.3 50 dB for transformers 51 to 150 kVA

.4 55 dB for transformers 151 to 300 kVA

.5 60 dB for transformers 301 kVA and larger

.6 integral vibration dampening with anti-vibration pads between the core and enclosure

.2 Acceptable Manufacturers: Acceptable manufacturers are:

.1 Eaton Canada

.2 Schneider Electric Canada

.3 Siemens Canada Inc.

.4 Hammond Power Solutions Inc.

.5 Rex Power Magnetics

.

3 EXECUTION

3.01 INSTALLATION OF DISTRIBUTION TRANSFORMERS

.1 Provide distribution transformers where shown. Ensure that adequate operation and maintenance clearance is maintained on all sides of each transformer as per Code requirements.

.2 Wall mount transformers 75 kVA and less on a structural steel primed and enamelled wall mounting bracket assembly located approximately 300 mm (12') below the ceiling and adequately secured to wall construction. Submit wall bracket construction and securing details with transformer product data sheets.

.3 Secure each transformer large than 75 KVA, level and plumb, on suitable rubber-steel-rubber vibration isolation pads on a concrete housekeeping pad.

.4 Ground and bond transformers as indicated on the drawings.

.5 Isolate primary and secondary connections from transformer enclosures by means of from 300 mm to 450 mm (12' to 18') of liquid-tight flexible conduit.

.6 Identify each transformer with an engraved Lamacoid nameplate in accordance with requirements of the Section entitled Basic Electrical Materials and Methods. Confirm nameplate wording with the Consultant prior to manufacture.

.7 Provide seismic restraints in accordance with requirements of the electrical work Section entitled Seismic Control and Restraint.

3.02 VERIFICATION AND TESTING

.1 Test and verify transformer secondary voltage and make any required adjustments to produce secondary voltages specified. Re-test and verify voltages when the building is in normal operation. Submit signed testing and verification reports as per Part 1 of this Section.

3.03 TRAINING AND INSTRUCTIONS

.1 Include for a minimum of 2 separate 4-hour system operation and maintenance training sessions for up to six persons per session, to be held at the site.

.2 Prepare and submit for review, an outline of the proposed training session, including a list of all documents, visual aids, etc., to be used.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Shop Drawings/Product Data: Submit shop drawings/product data sheets for all equipment specified in this Section. Both shop drawings and product data sheets must confirm that the equipment proposed meets all requirements of the Contract Documents. Shop drawings/product data is to include:

.1 equipment dimensions and details

.2 a single line diagram and a schematic diagram, if applicable

.3 component nameplate and warning sign data

.4 short circuit ratings, voltage ratings, continuous current ratings, and interrupt ratings

.5 any additional information requested by the Consultant

.2 Test Reports: Submit signed copies of all test reports, and include a copy of each report with O & M Manual project close-out data.

.3 Spare Fuses: Submit as specified in Part 3 of this Section.

.4 Manufacturer’s Installation Certification Letter: Submit a service entrance board manufacturer’s installation certification letter as specified in Part 3 of this Section.

2 PRODUCTS

2.01 SERVICE ENTRANCE BOARD

.1 In accordance with Section 26 24 13 Switchboard

.2 Acceptable Manufacturers: Acceptable manufacturers are:

.1 Schneider Electric Canada

.2 Eaton Electric Canada

3 EXECUTION

3.01 INSTALLATION OF SERVICE ENTRANCE EQUIPMENT

.1 Provide electric service entrance equipment where shown.

.2 Wall mount the equipment where indicated but confirm exact location prior to installation.

.3 Secure the service entrance board in place, level, and plumb, on a concrete housekeeping pad.

.4 Make “line” and “load” side connections as indicated.

.5 Check protective devices against the coordination study results to ensure proper operation of the devices.

.6 Ground and bond as indicated and as per the electrical work Section entitled Grounding-Secondary.

.7 If service entrance equipment identification is not factory installed, install at the site using stainless steel screws.

.8 Supply a complete set of identified fuses for the disconnect switch and store in an identified wall mounted steel cabinet adjacent to the service entrance equipment.

.9 Equipment and System Manufacturer’s Certification: Refer to the article entitled Equipment and System Manufacturer’s Certification in the Electrical Work General Instructions Section.

.10 Start-Up: Refer to the article entitled Equipment and System Start-up in the Electrical Work General Instructions Section.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for all products specified in this Section.

.2 Panelboard Door Keys: Submit an identified key (minimum 3) for panelboards equipped with doors.

1.02 QUALITY ASSURANCE

.1 Distribution panelboards are to be rated to interrupt and withstand short circuit faults greater than the available fault current. Indicate conformance with this requirement on product data sheets submitted for review.

2 PRODUCTS

2.01 DISTRIBUTION PANELBOARDS

.1 General Re: Panelboards: Distribution panelboards are to be dead front, factory assembled panelboards designed for sequence phase connection of branch circuit devices, as per the drawing schedule and plans, and in accordance with requirements of CAN/CSA- C22.2 No. 29, Panelboards and Enclosed Panelboards Industrial Products. Comply with OESC Rule 14-014 with regards to series rated combinations of over-current protective devices and ensure that equipment in which the lower rated devices are installed are marked with a series combination interrupting rating at least equal to the available fault current. Each panelboard is to be complete with:

.1 silver plated, electrical grade, 95% conductivity copper bus mains for the full length of each enclosure

.2 main and branch circuit conductor solderless lugs approved for copper conductors

.3 neutral bus and main lugs at the same end, and a removable cover for main lugs

.4 for panelboards in Elevator and/or Escalator Machine Rooms, hardware to permit padlocking the switch or breaker in the open position

.2 Panelboard Enclosures: Panelboard enclosures, unless otherwise specified, are to be EEMAC 2 sprinkler-proof, constructed of Code gauge galvanized sheet steel, equipped with drip shields, and factory cleaned, primed, and finished with ASA-61 light gray equipment enamel. Each enclosure is also to be equipped with:

.1 wiring gutter space on all sides in accordance with CAN/CSA-C22.2 No.29 requirements

.2 space for future breakers/switches as applicable and as per the drawing schedule, and where spare beaker space is scheduled, breaker connector kits

.3 for panelboards in areas other than secure Electrical, etc., Rooms, a concealed hinged door and flush latch with keyed alike lock

.4 for free-standing floor mounted panelboards, reinforcement as required for a rigid enclosure

.3 Circuit Breaker Panelboards: Breakers are to be moulded case, bolt-on breakers in accordance with CSA-C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, calibrated for operation in a 40° C (150° F) ambient temperature, sized in accordance with the drawing schedules, and complete with:

.1 a top main breaker

.2 for breakers 225 amperes and larger, a solid-state adjustable trip unit with long time, short time, and instantaneous time functions and time delays, set at ratings in accordance with the distribution coordination study

.4 Switch and Fuse Panelboards: Fusible switches are to be quick-make, quick-break, visible contact bolt-on switches in accordance with CSA-C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, sized in accordance with the drawing schedules, and complete with:

.1 a top main switch

.2 operating handles which protrude through the dead front enclosure, interlocked with the switch mechanism, and equipped with facilities for padlocking in either the “ON” or “OFF” position

.3 fuse clips, and HRC fuses as per the drawing schedule

.5 Modifications & Accessories: Panelboards are to be factory equipped with modifications and accessories as follows:

.1 200% rated neutral

.2 insulated ground bus assembly

.3 isolated ground bus assembly

.4 a barriered main breaker or switch

.5 a main breaker/switch through the cover key interlock

.6 an electrically held contactor in the mains, installed in a separate compartment with removable cover

.7 a shunt trip for the main breaker

.8 undervoltage release for the main breaker

.9 an alarm switch for the main breaker

.10 a surge protection package with audible alarm and silence button, From “C” relay contact, and EMI/RFI filtering providing 50 dB noise attenuation at 100 kHz

.6 Acceptable Manufacturers: Acceptable manufacturers are:

.1 Eaton Canada

.2 Schneider Electric Canada

.3 Siemens Electric Canada

3 EXECUTION

3.01 INSTALLATION OF DISTRIBUTION PANELBOARDS

.1 Provide distribution panelboards where shown. Ensure adequate operation and maintenance clearance on all sides of each panelboard as per Code requirements.

.2 Wall mount panelboards independent of connected conduit.

.3 Secure each free-standing panelboard, level and plumb, to a concrete housekeeping pad.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

.5 Identify each panelboard and each panelboard component with an engraved Lamacoid nameplate in accordance with requirements of the Section entitled Basic Electrical Materials and Methods. Confirm nameplate wording with the Consultant prior to manufacture. Include a printed circuit directory card in a frame with acetate cover.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for products specified in this Section.

.2 Panelboard Door Keys: Submit identified keys (minimum 6) for panelboard doors.

2 PRODUCTS

2.01 BRANCH CIRCUIT PANELBOARDS

.1 General Re: Panelboards: Breaker type branch circuit panelboards are to be dead front, factory assembled panelboards designed for sequence phase connection of branch circuit breakers, as per the drawing schedule and plans, and in accordance with requirements CAN/CSA-C22.2 No. 29, Panelboards and Enclosed Panelboards Industrial Products. Comply with OESC Rule 14-014 with regards to series rated combinations of over-current protective devices and ensure that equipment in which the lower rated devices are installed are marked with a series combination interrupting rating at least equal to the available fault current., Each panelboard is to be complete with:

.1 electrical grade, 95% conductivity copper sequence phase bus mains for the full length of each enclosure

.2 a fully capacity neutral unless otherwise specified

.3 main and branch circuit conductor solderless set-screw type lugs approved for copper conductors

.4 neutral bus and main lugs at the same end, and a removable cover for main lugs

.5 a manufacturer’s nameplate which indicates panelboard characteristics including the fault current that the panelboard, including breakers, has been constructed to withstand

.2 Panelboard Enclosures: Panelboard enclosures, unless otherwise specified, are to be EEMAC 2 sprinkler-proof, flush or surface mounted as indicated, constructed of Code gauge galvanized sheet steel, equipped with drip shields, and factory cleaned, primed, and finished with ASA-61 light gray equipment enamel. Each enclosure is also to be equipped with:

.1 wiring gutter space on all sides in accordance with CAN/CSA-C22.2 No. 29 requirements

.2 space for future breakers an applicable and as per the drawing schedule

.3 a concealed hinged door and flush latch with keyed alike lock, and a frame with acetate cover and a circuit directory card on the inside face of the panel door

.4 mylar circuit breaker identification strips secured in place

.3 Circuit Breakers: Breakers are to be moulded case, bolt-on breakers in accordance with CSA/C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, calibrated for operation in a 40° C (105° F) ambient temperature, sized in accordance with the drawing schedules, and as follows:

.1 branch circuit breaker interrupting capacity is to suit the panelboard voltage and be as scheduled, or in accordance with Code requirements to suit the application

.2 odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number

.3 for ground fault breakers, CSA Class A, Group 1 combination thermal magnetic trip breakers with solid-state ground default interrupters

.4 for breakers 225 amperes and larger, a solid-state adjustable trip unit with long time, short-time, and instantaneous time functions and time delays, set a ratings in accordance with the distribution coordination study

.5 for dedicated breakers, handle lock devices

.6 as scheduled or shown, spare breakers or space for future breakers

.4 Modification & Accessories: Where indicated on the drawings or scheduled, panelboards are to be factory equipped with modifications and accessories as follows:

.1 a factory installed, maintenance free surge protective device (SPD) in accordance with ANSI/UL 1449, connected to the bussing through a disconnect device and equipped with a diagnostic package with status indicators on each phase, LCD six-digit surge counter display, EMI/RFI filtering, audible alarm with silence button, and Form C alarm contacts

.2 200% neutrals for panelboards equipped with SPD units and other panels as scheduled

.3 isolated ground bus for panelboards feeding electrically sensitive equipment and as scheduled

.4 insulated ground bus assembly

.5 sub-feed lugs

.6 through-feed lugs

.7 a non-automatic or automatic (as schedule) main breaker

.8 a shunt trip for the main breaker

.9 Isolated ground bus

.5 Acceptable Manufacturers: Acceptable Manufacturers are:

.1 Eaton Canada

.2 Schneider Electric Canada

.3 Siemens Electric Canada

3 EXECUTION

3.01 INSTALLATION OF BRANCH CIRCUIT PANELBOARDS

.1 Provide breaker type branch circuit panelboards where shown. Ensure adequate operation and maintenance clearance on all sides of each panelboard as per Code requirements.

.2 Unless otherwise specified, supply panelboards from a single manufacturer only.

.3 Wall mount panelboards independent of connected conduit. Accurately install with reference to wall finish and confirm exact locations prior to roughing-in.

.4 Where two or more panelboards are installed in one enclosure equip the panelboards with double lugs and increase gutter capacity to accommodate additional cabling.

.5 In addition to load circuit breakers scheduled and indicated for each normal power panelboard, provide five 15A-1P additional breakers for small power and miscellaneous mechanical loads, each connected with 30 m (100') of 12 mm (½") diameter EMT and two # 12 AWG plus ground, with terminations as directed during construction.

.6 In each panelboard adjacent to mechanical equipment spaces, provide a dedicated 15A-1P breaker with lock-on device, and 12 mm (½") diameter EMT and two #12 AWG plus ground terminated in an identified junction box (BAS) in the equipment space.

.7 Provide additional devices and accessories for panelboards as indicated and/or scheduled.

.8 Test each surge protection device in accordance with the manufacturer's instructions.

.9 For each GFI breaker demonstrate in the presence of the Consultant that the protected circuit will trip when a simulated ground fault is applied to the "load" side of the breaker, and meggar the "load" side neutral to ensure that the neutral is not grounded on the "load" side of the GFI.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Shop Drawings/Product Data: Submit shop drawings and product data sheets for all equipment specified in this Section.

.2 Test Reports: Submit signed test reports for all testing work specified in Part 3 of this Section.

.3 Manufacturer's Installation Certification Letter: Submit an installation certification letter from the equipment manufacturer as specified in Part 3 of this Section.

1.02 QUALITY ASSURANCE

.1 Codes and Standards: Each ground fault unit is to be in accordance with requirements of the following Codes and Standards:

.1 CAN/CSA C22.2 No.144, Ground Fault Circuit Interrupters

.2 NEMA PG 2.2, Application Guide to Ground Fault Protection Devices for Equipment

.2 Training and Instructions: As specified in Part 3 of this Section.

2 PRODUCTS

2.01 GROUND FAULT PROTECTION EQUIPMENT

.1 Panel mounting (unless otherwise indicated) ground fault protection units(s) supplied by one manufacturer, designed to operate instantaneously at the ground current setting, and with characteristics as indicated on the drawings. Each unit it to be complete with:

.1 a ground fault sensing relay for operation at the setting indicated on the drawings, and with 120-volt control voltage

.2 an ammeter with a 0 to 5 ampere scale to indicate the ground fault current

.3 a 3-position sensitivity control switch to select the value of leakage current at which the relay will operate

an identified indicating LED which is illuminated when no ground fault exists and is extinguished when a ground fault occurs or the unit is tested

.5 a manual reset switch with manual target indication and SPDT contacts for alarm and trip, and a rest button for the contacts and target

.6 a zero-sequence transformer of a type to suit the conductors involved, with 300 to 3000 mA range

.7 an artificial neutral and grounding resistor or a neutral ground resistor unit to suit the system

2.02 ACCEPTABLE MANUFACTURERS: Acceptable manufacturers are:

.1 Schneider Electric Canada

.2 Eaton Canada

.3 Siemens Canada

3 EXECUTION

3.01 INSTALLATION OF GROUND FAULT PROTECTION EQUIPMENT

.1 Provide ground fault protection equipment for electric service entrance and distribution equipment where shown.

.2 Where ground fault equipment is to be part of an assembly such as switchgear, arrange for the ground fault equipment to be shipped to the distribution equipment manufacturer’s plant for factory installation.

.3 Ensure that the neutral on the load side of the sensor is not grounded, and that phase conductors including the neutral are installed through the zero-sequence transformer.

.4 Make all required conductor connections with proper terminations in accordance with the ground fault unit manufacturer’s instructions and requirements.

.5 When installation is complete but before the system is energized, arrange for the manufacturer’s authorized service representative to visit the site to inspect the installation, check trip settings, test operation of the units including simulated ground faults, and, when the inspections and reports have been satisfactorily completed, checked, and the equipment operates as intended, submit a copy of an inspection certification letter to the Consultant.

3.02 TRAINING AND INSTRUCTION

.1 Ground fault protection equipment operation and maintenance training is to be done by qualified manufacturer’s personnel in accordance with requirements specified in the electrical work section entitled Electrical Work General Requirements, and is to consist of a minimum of 2 on-site 4-hour sessions for 6 people per session.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for occupancy sensors.

1.02 MOCK-UP

.1 Include for providing a sensor mock-up installation in a typical washroom to verify proper operation prior to installation of other sensors.

1.03 QUALITY ASSURANCE

.1 All occupancy sensors are to be solid-state design, UL/ULC listed and labelled and CSA certified in accordance with CAN/CSA C22.2 No. 184, Solid-State Lighting Controls, and designed specifically for energy conservation.

1.04 ACCEPTABLE MANUFACTURERS:

.1 Acceptable sensor manufacturers are:

.1 WattStopper/Legrand

.2 Pass & Seymour/Legrand

.3 Novitas Inc.

.4 Leviton Manufacturing Co. Inc.

.5 Lutron Electronics Co. Inc.

.6 Cooper Controls “Greengate”

2 PRODUCTS

.1 As indicated on drawings and schedules.

3 EXECUTION

3.01 INSTALLATION OF OCCUPANCY SENSORS

.1 Provide occupancy sensors, generally where shown but with exact locations in accordance with reflected ceiling plans and the sensor manufacturer’s instructions. Include for all required site assembly, and provide all required installation and support hardware.

.2 Confirm exact locations prior to roughing-in.

.3 Connect sensors to circuits indicated with wiring in conduit.

.4 Provide power packs for 24-volt DC sensors and locate where accessible for maintenance. Ensure that panelboard breakers serving power packs are equipped with lock-on devices. Unless otherwise indicated install power packs in 150 mm x 150 mm x 100 mm (6” x 6” x 4”) utility boxes painted white and identified with a Lamacoid nameplate, and connect to sensors with armoured cable with 1.5 m (5”) of slack cable for location adjustment if required.

.5 Assist the Owner’s operating personnel in the location and adjustment of sensors to suit the location and application.

.6 Include for a 4-hour on-site training session for the Owner’s personnel to demonstrate operation and adjustments of sensors, and trouble-shooting procedures.

END OF SECTION

1 GENERAL

1.01 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittals and Section 26.

2 PRODUCT

2.01 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure, size as indicated.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated.

.5 Fuse holders: relocatable and 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.

.8 Outdoor switches to be weather proof.

2.02 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 Common Works Results – Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

2.03 ACCEPTABLE MANUFACTURERS

.1 Siemens Canada

.2 Federal Pioneer Ltd.

.3 Square ‘D’ Company

.4 Cutler Hammer / Eaton

3 EXECUTION

3.01 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Drawings and general provisions or the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

.2 Section 26 36 23 Automatic Transfer Switches – for transfer switches including sensors and relays to initiate automatic-starting and –stopping signals for engine-generator sets.

1.02 SUMMARY

.1 Section includes packaged engine-generator sets for emergency power supply with the following features
- .1 Gas-engine
- .2 Unit-mounted cooling system
- .3 Unit-mounted control and monitoring
- .4. Performance requirements for sensitive loads
- .5 Fuel system
- .6 Outdoor enclosure

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed, and include:
  - .1 Engine: make and model, with performance curves.
  - .2 Alternator: make and model.
  - .3 Voltage regulator: make, model and type.
  - .4 Automatic transfer switch: make, model and type.
  - .5 Manual bypass switch: make and model.
  - .6 Battery: make, type and capacity.
  - .7 Battery charger: make, type and model.
  - .8 Alternator control panel: make and type of meters and controls.
  - .9 Governor type and model.
  - .10 British standard or DIN rating of engine.
  - .11 Flow diagrams for:
    - .1 Cooling air.
  - .12 Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.
  - .13 Continuous full load output of set at 0.8 PF lagging.

.14 Description of set operation including:
- .1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.
- .2 Manual starting.
- .3 Automatic shut down and alarm on:
  - .1 Overcranking.
  - .2 Overspeed.
  - .3 High engine temp.
  - .4 Low lube oil pressure.
  - .5 Short circuit.
  - .6 Alternator over voltage.
  - .7 Lube oil high temperature.
  - .8 Over temperature on alternator.
- .4 Manual remote emergency stop.

1.04 CLOSEOUT SUBMITTALS

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

.2 Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:
- .1 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, engine room ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.
- .2 Technical data:
  - .1 Illustrated parts lists with parts catalogue numbers.
  - .2 Schematic diagram of electrical controls.
  - .3 Flow diagrams for:
    - .1 Fuel system.
    - .2 Lubricating oil.
    - .3 Cooling system.
  - .4 Certified copy of factory test results.
  - .5 Maintenance and overhaul instructions and schedules.
  - .6 Precise details for adjustment and setting of time delay relays or sensing controls which require on site adjustment.

1.05 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 - Closeout Submittals.

.2 Include:
- .1 Fuses: One for every 10 of each type and rating but no fewer than one of each.
- .2 Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
- .3 Filters: Two sets each of lubricating oil, fuel and combustion air filters.
- .4 Special tools for unit servicing.

1.06 WARRANTY

.1 Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period

1. Warranty Period: 5 years from date of Substantial Completion

2 PRODUCTS

2.01 SYSTEM DESCRIPTION

.1 Basis of Design Product: Subject to compliance with requirements, provide Generac Systems Inc Diesel model SD500 generator set, rated 500 kW, 347/600V, 3-phase, 60Hz, or a comparable product by one of the following

.1 Kohler Power Systems

.2 Cummins

.3 Caterpillar

.2 Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer. Generator set shall be standard offering from manufacturer. No special ratings will be permitted.

.3 Engineering changes resulting from the substitution of another product will be the responsibility of the electrical contractor.

.2 Generating system consists of:
.1 Diesel engine.
.2 Alternator.
.3 Alternator control panel.
.4 Automatic transfer equipment.
.5 Battery charger and battery.
.6 Fuel supply system.
.7 Exhaust system.
.8 Steel mounting base.
.9 Synchronizing panel.
.10 Manual by-pass switch.

.3 System designed to operate as emergency standby in remote location.

2.02 ENGINE

.1 Fuel: Diesel

.2 Turbo charged and after cooled, synchronous speed 1800 rpm.

.3 Capacity:
.1 Rated continuous power in kW at rated speed, after adjustment for system

losses in auxiliary equipment necessary for engine operation at the specified site altitude and temperature. Products that de-rate below specified kW for temperature or altitude shall not be accepted.

.2 Engine overload capability 110% of continuous output for 1 hour within 12 hours period of continuous operation.

.4 Cooling System:

.1 Liquid cooled: heavy duty industrial radiator mounted on generating set base with engine driven pusher type fan to direct air through radiator from engine side, with ethylene glycol anti-freeze non-sludging above -46 degrees C.

.2 To maintain manufacturer's recommended engine temperature range at 10% continuous overload in ambient temperature of 40 degrees C.

.3 Block heater: thermostatically controlled lube oil or liquid coolant heater connected to line side of automatic transfer switch to allow engine to start in room ambient 0 degrees C.

.1 Switch and fuse in heater circuit, mounted in engine-alternator control cubicle and fed from line side of automatic transfer switch.

.5 Governor: mechanical hydraulic with:

.1 Steady state speed band of plus or minus 0.5%.

.2 Speed regulation no load to full load 5% maximum.

.3 Electronic load sharing type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.

.6 Lubrication system:

.1 Pressure lubricated by engine driven pump.

.2 Lube oil filter: replaceable, full flow type, removable without disconnecting piping.

.3 Lube oil cooler.

.4 Engine sump drain valve.

.5 Oil level dip-stick.

.7 Starting system:

.1 Positive shift, gear engaging starter 12 or 24V dc.

.2 Cranking limiter to provide three (3) cranking periods of 10s duration, each separated by 5 s rest.

.3 Lead acid, 12 or 24V storage battery with sufficient capacity to crank engine for 1 min at 0 degrees C without using more than 25% of ampere hour capacity.

.4 Battery charger: constant voltage, solid state, two stage from trickle charge at standby to boost charge after use.

.1 Regulation: plus or minus 1% output for plus or minus 10% input variation.

.2 Automatic boost for 6 hours every 30 days.

.3 Equipped with dc voltmeter, dc ammeter and on-off switch.

.4 Minimum charger capacity: 10 A.

.8 Vibration isolated engine instrument panel with:

.1 Lube oil pressure gauge.

.2 Lube oil temperature gauge.

.3 Lube oil level gauge.
.4 Coolant temperature gauge.
.5 Coolant level gauge.
.6 Running time meter: non-tamper type.

.9 Guards to protect personnel from hot and moving parts.
.1 Locate guards so that normal daily maintenance inspections can be undertaken without their removal.

.10 Drip tray.

2.03 ALTERNATOR

.1 Alternator: to NEMA MG1.

.2 Rating: 3 phase, 347/600V, 4 wire, 500 kW, 60 Hz, at 0.8 PF.

.3 Output at 40 degrees C ambient:
.1 100% full load continuously.
.2 110% full load for 1 hour.
.3 150% full load for 1 minute.

.4 Revolving field, brushless, single bearing.

.5 Drip proof.

.6 Amortisseur windings.

.7 Synchronous type.

.8 Dynamically balanced rotor permanently aligned to engine by flexible disc coupling.

.9 Exciter: rotating brushless permanent magnet.

.10 Voltage regulator: thyristor controlled rectifiers with phase controlled sensing circuit:
.1 Stability: 1 % maximum voltage variation at any constant load from no load to full load.
.2 Regulation: 4 % maximum voltage deviation between no-load steady state and full-load steady state.
.3 Transient: 25 % maximum voltage dip on one-step application of 0.8 PF full load.
.4 Transient: 30 % maximum voltage rise on one-step removal of 0.8 PF full load.
.5 Transient: 2.5 s maximum voltage recovery time with application or removal of 0.8 PF full load.

.11 Alternator: capable of sustaining 300% rated current for period not less than 10 s permitting selective tripping of down line protective devices when short circuit occurs.

2.04 CONTROL PANEL

.1 Totally enclosed, mounting base isolated from generator.

.2 Instruments:
.1 Digital indicating type 2 % accuracy, rectangular face, flush panel mounting:
.1 Voltmeter: ac, scale 0 to 750 V.
.2 Ammeter: ac, scale 0 to 800 A.
.3 Wattmeter scale 0 to 600 kW.
.4 Frequency meter: scale 55 to 65Hz.
.2 Voltmeter selector switch, rotary, panel mounting, four position, labelled "Off-Phase A-Phase B-Phase C".
.3 Ammeter selector switch, rotary, maintained contacts, panel mounting, designed to prevent opening of current circuits, four position labelled "OFF-Phase A-Phase B-Phase C".

2.05 CONTROLS

.1 Engine start button.

.2 Selector switch: Off-Auto-Manual - Test full load test no load.

.3 Engine emergency stop button and provision for remote emergency stop button.
.1 Alternator output breaker:
.1 Circuit breaker: bolt-on, moulded case, temperature compensated for 40 degrees C ambient, dual thermal-magnetic trip.
.2 Voltage control rheostat: mounted on inside of control panel.
.3 Operating lights, panel mounted:
.1 "Normal power" pilot light.
.2 "Emergency power" pilot light.
.3 Green pilot lights for breaker on and red pilot lights for breaker off.
.4 Solid state indicator lights for alarm with 1 set manually reset NO/NC contacts wired to terminal block for remote annunciation on:
.1 Low fuel level.
.2 Low battery voltage.
.3 Ventilation failure.
.4 Low coolant temperature.
.5 Solid state controller for automatic shutdown and alarms with 1 set manually reset NO/NC contacts wired to terminal block for remote annunciation on:
.1 Engine over crank.
.2 Engine overspeed.
.3 Engine high temperature.
.4 Engine low lube oil pressure.
.5 Short circuit.
.6 AC over voltage.
.6 Lamp test button.

2.06 AUTOMATIC TRANSFER SWITCH

.1 Refer to Section 26 36 23.

2.07 STEEL MOUNTING BASE

.1 Complete generating set mounted on structural steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and

under operating conditions on suitable level surface.

.2 Assembly fitted with vibration isolators and control console resiliently mounted.
.1 Spring type isolators with adjustable side snubbers and adjustable for levelling.

.3 Sound insulation pads for installation between isolators and concrete base.

.4 Elastometric Isolator Pads: Oil and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

2.08 EXHAUST SYSTEM

.1 Heavy duty industrial horizontally mounted exhaust silencer with condensate drain, plug and welded couplings.

.2 Heavy duty flexible exhaust pipe with flanged couplings as required.

.3 Fittings and accessories as required.

.4 Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.

2.9 FUEL SYSTEM

.1 The engine fuel system shall be designed for operation on #1 or #2 diesel fuel.

.2 The engine shall include a primary fuel filter, water separator, manual fuel priming pump, and engine flexible fuel lines must be installed at the point of manufacture. Element shall be replaceable paper type.

.3 The engine’s suction line shall be fitted with a check valve to secure prime for the engine’s injection pump.

2.10 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Control panel:
.1 Size 5 nameplates for controls including alternator breakers and program selector switch.
.2 Size 3 nameplates for meters, alarms, indicating lights and minor controls.

2.11 OUTDOOR GENERATOR SET ENCLOSURE

.1 Description: OEM Factory manufactured, vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels

shall be lockable and provide adequate access to components requiring maintenance. Panel shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

.2 Control panel:

.1 Structural Design and Anchorage: Comply with ASCE 7 for wind loads up to 100 mph (160 km/h).
.2 Hinged Doors:
1) Door Panels: With integral stiffeners, and capable of being removed by one person without tools.
2) Slip-pin hinges and latches stainless steel with nylon spacers.
3) Gasketed for weather and rodent protection.
4) Handles to have padlocking provisions.

.3 Space Heater: Thermostatically controlled and sized to prevent condensation. Provide as needed to meet NFPA110, Level 1 temperature levels.
.4 Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
.5 Muffler Location: All exhaust piping shall be wrapped for personnel protection and to eliminate excessive heat build-up during generator operation.
.6 Assembly Hardware (Nuts and Bolts): Use JS500 and nylon washers to prevent paint deterioration.

B. Sound Attenuation: Factory enclosure, designed to meet the following design criteria:

1. Weather protective enclosure limiting sound emissions to 85 dB(A) at 23 ft (7 m) in a free field environment.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

D. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

E. Sub-base fuel tank
1. The packaging shall include a double wall, sub-base mounted, ULC-S601 listed fuel tank. The tank shall be sized to provide 24 hours of run time at 100% load.
2. The tank shall include fuel suction and return connections, normal and emergency vents, secondary containment emergency vent and rupture basin sensor, mechanical fuel level indication, overfill protection device, and fill-spill basin.
3. Provide a stub-up area suitable for electrical conduit entry at the generator end of the tank, to match stub-up areas on generator install drawing. All fittings are to be ULC listed and to conform to current CSA B139 and TSSA requirements.
4. The fuel tank shall use an electric fuel sensor to provide an analog indication of fuel level. The controller shall have a warning indication on low fuel level and provide optional shutdown functionality for low, low fuel level.

5. The fuel tank must be supplied by the engine-generator set manufacturer and be installed before shipment to site. Submittal drawings must show the entire packaged unit on one drawing as a minimum, with overall dimensions shown in all three planes.
6. Site inspection by TSSA is required before first fill of fuel. This contractor shall provide for the inspection and the first fuel fill. Submit a copy of the successful inspection to the owner for record-keeping purposes.

2.12 FABRICATION

.1 Shop assemble generating unit including:
- .1 Base.
- .2 Engine and radiator.
- .3 Alternator.
- .4 Control panel.
- .5 Battery and charger.
- .6 Automatic transfer equipment.

2.13 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Alternator control cubicle: paint inside, exterior to match engine and alternator.

.3 Exhaust and inlet air hoods international orange.

.4 Other ducts and racks grey.

.5 Supply 0.25 L of grey touch-up enamel.

2.14 SOURCE QUALITY CONTROL

.1 Factory test generator set including engine, alternator, control panels, transfer switch and accessories in presence of Owners Representative and/or Consultant.

.2 Notify Owners Representative and Consultant 14 days in advance of date of factory test.

.3 Test procedure:
- .1 Prepare blank forms and check sheet with spaces to record data and at top of first sheet record:
  - .1 Date.
  - .2 Generator set serial no.
  - .3 Engine, make, model, serial no.
  - .4 Alternator, make, model, serial no.
  - .5 Voltage regulator, make and model.
  - .6 Rating of generator set, kW, kV.A, V, A, r/min, Hz.
- .2 Mark check sheet and record data on forms in duplicate as test proceeds.
- .3 Departmental Representative's and Consultant's signature on completed forms to indicate concurrence in results of test.

.4 Tests:

.1 With 100% rated load, operate set for 23 hours, taking readings at 30 minutes intervals, and record following:

.1 Time of reading.
.2 Running time.
.3 Ambient temp in degrees C.
.4 Lube oil pressure in kPa.
.5 Lube oil temp in degrees C.
.6 Engine coolant temp in degrees C.
.7 Exhaust stack temp in degrees C.
.8 Alternator voltage: phase 1, 2, 3.
.9 Alternator current: phase 1, 2, 3.
.10 Power in kW.
.11 Frequency in Hz.
.12 Power Factor.
.13 Battery charger current in A.
.14 Battery voltage.
.15 Alternator cooling air outlet temp.

.2 At end of 23 hours run increase load to 110% rated value, and take readings every 15 minutes for 1 hour.

.3 After completion of 24 hours run, demonstrate following shut down devices and alarms:

.1 Over cranking.
.2 Overspeed.
.3 High engine temp.
.4 Low lube oil pressure.
.5 Short circuit.
.6 Alternator over voltage.
.7 Low battery voltage, or no battery charge.
.8 Manual remote emergency stop.
.9 High alternator temperature.

.4 Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load.
.2 No load to 70% load to no load.
.3 No load to 20% load to no load.
.4 20% load to 40% load to no load.
.5 40% load to 60% load to no load.
.6 60% load to 80% load to no load.

.5 Demonstrate:

.1 Automatic starting of set and automatic transfer of load on failure of normal power.
.2 Operation of manual bypass switch.
.3 Automatic shut-down of engine on resumption of normal power.
.4 That battery charger reverts to high rate charge after cranking.

.6 Demonstrate low oil pressure and high engine temperature shutdown devices operation without subjecting engine to these excesses.

3 EXECUTION

3.01 INSTALLATION

.1 Locate generating unit and install as indicated.

.2 Install fuel supply system as indicated.

.3 Install ventilating air duct system as indicated.

.4 Pipe muffler drains to nearest floor drain.

.5 Complete wiring and interconnections as indicated.

.6 Start generating set and test to ensure correct performance of components.

3.02 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Notify Owners Representative 10 working days in advance of test date.

.3 Demonstrate:
- .1 Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
- .2 Unit start and shut down on "Manual" control
- .3 Unit start and transfer on "Test" control.
- .4 Unit start on "Engine start" control.
- .5 Operation of manual bypass switch.
- .6 Operation of automatic alarms and shut down devices.

.4 Run unit on load for minimum period of 4 hours to show load carrying ability, stability of voltage and frequency, and satisfactory performance of dampers in ventilating system to provide adequate engine cooling.

.5 At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.

3.03 TRAINING

.1 The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.04 MAINTENANCE - CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and CSA-B139.

END OF SECTION

1 GENERAL

1.02 REFERENCES

.2 CSA International
.1 CSA C22.2 No.5-, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).
.2 CSA C22.2 No.178.1-, Automatic Transfer Switches.
.3 CAN/CSA C60044-1-, Instrument Transformers.

.3 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 2-, Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

1.03 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 transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Acceptable Manufacturers:
.1 ASCO
.2 Eaton
.3 Schneider

2 PRODUCTS

2.01 SYSTEM DESCRIPTION

.1 Automatic load transfer equipment to:
.1 Monitor voltage on phases of normal power supply.
.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.
.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.
.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.
.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

2.02 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

2.03 CONTACTOR TYPE TRANSFER EQUIPMENT

.1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.

.2 Two- 4 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, motor solenoid operated, open type with CSA enclosure.

.3 Rated: 600 V, 60Hz, 600 A. 4 wire, solid neutral.

.4 Main contacts: silver surfaced, protected by arc disruption means.

.5 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.

.6 Auxiliary contact: gold plated, to initiate emergency generator start-up on failure of normal power.

.7 Fault withstand rating: 35 kA symmetrical for 3 cycles with maximum peak value of 35 kA.

.8 Lever to operate switch manually when switch is isolated.

.9 Neutral bar, solid rated: 600 A.

.10 Overlapping neutral contacts on contactor type transfer equipment.

2.04 CONTROLS

.1 Selector switch - 4 position "Test", "Auto", "Manual", "Engine start".
- .1 Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.
- .2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
- .3 Manual position - transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.
- .4 Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.2 Control transformers: dry type with 120 V secondary to isolate control circuits from:
- .1 Normal power supply.
- .2 Emergency power supply.

.3 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A

minimum:

.1 Voltage sensing: 3-phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.2 Time delay: normal power to standby, adjustable solid state, 0 to 60 s5 to 180 s 20 s to 10 minutes.

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 60 s 3 to 20 s delay.

.4 Time delay on retransfer from standby to normal power, adjustable 0 to 60 s 5 to 180 s 20 s to 10 minutes.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 0 to 60 s 5 s intervals to 180 s20 s intervals to 10 minutes.

.6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5 s intervals to 180 s.

.7 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.8 Neutral disconnected position delay: allow time for motors to delay between live sources, adjustable, 0 to 5 s.

.4 Solid state electronic in-phase monitor.

2.05 ACCESSORIES

.1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

.3 Manual bypass and isolator: to normal supply.

2.06 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Control panel:

.1 For selector switch and manual switch: size 5 nameplates.

.2 For meters, indicating lights, minor controls: use size 3 nameplates.

2.07 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Consultant.

.2 Notify Consultant 10 days minimum in advance of date of factory test.

.3 Tests:

.1 Operate equipment both mechanically and electrically to ensure proper performance.

.2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start

and record results.

.3 Check voltage sensing and time delay relay settings.

.4 Check:

.1 Automatic starting and transfer of load on failure of normal power.

.2 Retransfer of load when normal power supply resumed.

.3 Automatic shutdown.

3 EXECUTION

3.02 INSTALLATION

.1 Locate, install and connect transfer equipment as indicated.

.2 Check relays solid state monitors and adjust as required to ensure correct operation.

.3 Install and connect battery and remote alarms.

3.03 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.4 Set selector switch in "Manual" position and check to ensure proper performance.

.5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

.7 Repeat, at 1 hour intervals, 3 times, complete test with selector switch in each position, for each test.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for lighting fixtures. Include certified fixture photometric data which includes total input watts, candlepower summary, candela distribution zonal lumen summary, CIE type coefficient of utilization, and lumen rating in accordance with CSA IESNA testing procedures.

1.02 QUALITY ASSURANCE

.1 All lighting fixtures are to be ULC listed and/or CSA certified and labelled.

1.03 JOB SITE MOCK-UP

.1 Construct a mock-up installation, including temporary wiring connection.

2 PRODUCTS

2.01 GENERAL RE: LIGHTING FIXTURES

.1 Lighting fixtures and are scheduled on the drawings.

.2 Lighting Fixture Construction: Unless otherwise specified the following requirements apply to lighting fixture construction:

.1 bodies are to be constructed of minimum #20 gauge cold rolled prime coat steel, of rigid construction and complete with knockouts as required

.2 fixtures are to be suitable in all respects for the mounting locations indicated on the drawings, and are to be complete with all required mounting hardware

.3 any fixture located in a high humidity area, i.e., swimming pool areas, must be gasketed and corrosion-resistant, regardless of what is selected on the fixture schedule

.3 Lighting Fixture Finish: Unless otherwise specified, lighting fixtures are to be finished in two coats of spray applied baked white enamel applied to chemically degreased and neutralized surfaces. Reflecting surfaces are to be white with a reflectance of minimum 85%. Confirm exact colour and finish of fixtures at the submittals stage and prior to ordering.

.4 Lenses/Louvres: Unless otherwise specified, lenses/louvres are scheduled with the fixtures they are associated with. Lenses/louvres are specified in the Section entitled Ballasts, Lenses and Louvres.

3 EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES

.1 General Installation Requirements: Provide lighting fixtures where shown. Include for all required site assembly, and provide all required installation and support hardware. Additional requirements are as follows:

.1 confirm exact lighting fixture locations prior to roughing-in

.2 in finished areas, refer to architectural reflected ceiling plans and/or wall elevations

.3 in equipment rooms, shafts, and similar unfinished areas, install fixtures after the equipment is roughed-in, and shelving and similar items are installed, and do not suspend fixtures from piping, ductwork, conduit equipment, or similar items

.4 prior to roughing-in for lighting fixture installations, examine drawings and site conditions to determine that suitable space is available for the fixture installation as shown. If sufficient space is not available, notify the Consultant immediately and, if required, relocate the fixtures within reasonable distances without additional cost

.5 locate recessed downlights, troffers, and surface mounted fixtures in or on suspended tile ceilings in or on full tiles, and where ceiling tile openings are cut for fixtures, cut to exact sizes so that there are no gaps, and fixture trim completely covers the perimeter of the opening

.6 provide plaster frames for fixtures in suspended plaster or drywall ceilings

.7 use clean gloves when handling reflector cones, louvres, glass sconces, and all exposed surfaces of fixtures

3.02 SUSPENDED LIGHTING FIXTURES

.1 Support all lighting fixtures in suspended ceilings from the slab or building construction above, independent of the suspended ceiling construction. All supports are to be in accordance with requirements of governing Codes and Regulations.

.2 Support continuous rows of fixtures at minimum 1.2 m (48”) centres.

3.03 LIGHTING FIXTURES ALIGNMENT

.1 Align lighting fixtures mounted in continuous rows to form straight uninterrupted lines. Alignment variation is not to exceed 6 mm (¼”) in any 5 m (15’) run.

.2 Align lighting fixtures mounted individually parallel and/or perpendicular to building lines.

.3 Aim accent and spot lighting as indicated and/or as directed by the Consultant, and secure the fixture positions after the Consultant’s approval.

3.04 LIGHTING FIXTURES CIRCUIT WIRING

.1 Connect lighting fixtures to circuits indicated with wiring as shown/specified.

.2 Minimize the number of splices required.

3.05 EXISTING LIGHTING FIXTURES

.1 Where existing lighting fixtures are to be reused, examine the fixtures during the bidding period and include for replacing faulty ballasts, broken lenses, and any other obvious damage, Substantial Performance, and conform to the following requirements:

.1 disconnect existing fixtures to be reused, safely store where directed, relocate and reinstall

.2 unless otherwise directed, disconnect and remove obsolete fixtures, identify and make wiring safe, and dispose of the fixtures off-site in an approved manner

.3 if existing fixtures to be removed are equipped with ballasts that contain PCB's, engage the services of a disposal company licensed by the MOE to remove and destroy PCB ballasts, to remove the ballasts and destroy them off-site at an approved facility, and the disposal company is to be fully insured, registered, and in good standing with the WSIB, and is to issue a Certificate of Destruction upon completion of the work

3.06 CLEANING

.1 When all lighting fixture installation work is complete, clean all fixtures, and any ceiling, wall, etc., surfaces soiled as a result of the fixture installation work.

.2 If wall and ceiling surfaces are damaged as a result of the fixture installation, replace the wall or ceiling surface to the Consultant's approval.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for emergency lighting. Include complete battery charger data, battery charger and discharge voltage/time characteristics, and, where required, certified wiring diagrams.

.2 Battery Warranty: Submit a copy of the battery warranty specified below, and include a copy in the O & M Manual.

.3 Letter of Certification: As per Part 3 of this Section, submit a letter from the representative of the emergency lighting manufacturer to certify that the installation has been tested and adjusted and operates as intended.

1.02 QUALITY ASSURANCE

.1 All emergency lighting is to be CSA certified in accordance with:

.1 CSA C22.2 No. 141, Unit Equipment for Emergency Lighting

.2 UL 924, Standard for Emergency Lighting and Power Equipment

.3 CSA C22.2 No. 107.2, Battery Chargers

1.03 WARRANTY

.1 For batteries, the Contract warranty is to be extended to ten years with no-charge replacement during the first five years, and a pro-rate charge during the last five years. Submit a signed copy of the warranty in the name of the Owner.

2 PRODUCTS

.1 As per drawings and schedules.

.2 Acceptable manufacturers are:

.1 Lumacell Inc.

.2 Emergi-Lite Ltd.

.3 Hubbell Inc. “Dual-Lite”

.4 Philips “LightGuard”

3 EXECUTION

3.01 INSTALLATION OF SELF-CONTAINED EMERGENCY LIGHTING UNITS

.1 Provide self-contained emergency lighting units where shown. Include for all required site assembly, provide all required installation and support hardware, and plug the assemblies into adjacent receptacles. Confirm exact locations prior to installation.

.2 Where remote heads are indicated, install and connect to the battery unit with conductors (sized as indicated) in conduit. Ensure that panelboard breakers serving battery units are equipped with lock-on devices.

.3 Connect exit light 12-volt DC holders to battery units with wiring in conduit as indicated.

.4 Aim all adjustable heads to the Consultant's approval.

.5 When all installation work is complete, clean all battery units, heads, and any ceiling, wall, etc., surfaces soiled as a result of the installation work.

.6 If wall and ceiling surfaces are damaged as a result of the installation, replace the wall or ceiling surface to the Consultant's approval.

.7 Test operation of each battery unit, including charge rate after discharge, in the presence of the manufacturer's representative, and submit a letter from the manufacturer's representative to certify that all battery units and heads have been tested and operate as intended.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Shop Drawings/Product Data: Submit product data sheets for exit lighting fixtures.

1.02 QUALITY ASSURANCE

.1 All exit lighting fixtures are to be CSA certified in accordance with:

.1 CAN/CSA- C22.2 No. 141, Unit Equipment for Emergency Lighting

.2 CAN/CSA- C860, Performance of Internally-Lighted Exit Signs

2 PRODUCTS

2.01 EXIT LIGHTS

.1 As per drawings and schedules.

.2 Acceptable Manufacturers: Acceptable manufacturers are:

.1 Lumacell Inc.

.2 Emergi-Lite Ltd.

.3 Philips “LightGuard”

.4 Canlyte Inc. “Uniglo”

.5 Hubbell Inc. “Dual-Lite”

.6 Luxnet Corp.

3 EXECUTION

3.01 INSTALLATION OF EXIT LIGHTS

.1 Provide exit lights where shown. Include for all required site assembly, and provide all required installation and support hardware.

.2 Confirm exact exit light locations prior to roughing-in, and in any case, ensure that exit lights are not less than 2 m (6½’) from the underside of the fixture to the finished floor.

.3 For ceiling mounted exit lights in areas with unfinished ceilings, mount the fixture alongside a junction box, with or without canopy, and connect the fixture laterally with conduit (or with embedded conduit where permitted or specified) or by using the exit light canopy as a junction box where permitted.

.4 Connect exit lights to circuits indicated with wiring as specified. Install wiring in conduit. Ensure that panelboard breakers serving exit lights are equipped with lock-on devices.

.5 When all exit light installation work is complete, clean all fixtures, and any ceiling, wall, etc., surfaces soiled as a result of the installation work.

.6 If wall and ceiling surfaces are damaged as a result of the installation, replace the wall or ceiling surface to the Consultant's approval.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems.

2 PRODUCTS

2.01 DESCRIPTION

.1 Empty telecommunications pathway systems consist of outlet boxes, cover plates, terminal and distribution cabinets, conduit cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts, all as indicated.

2.02 MATERIALS

.1 Conduit: EMT and/or rigid PVC in accordance with the electrical work Section entitled Conduit Systems.

.2 Raceways: In accordance with the electrical work Section entitled Surface and Lighting Fixture Raceway, and the Section entitled Wireways and Auxiliary Gutters.

.3 Junction Boxes, Pull Boxes & Outlet Boxes: In accordance with the electrical work Section entitled Splitter, Junction and Pull Boxes, and the Section entitled Outlet Boxes, Conduit Boxes and Fittings.

.4 Fish Wire: Polypropylene type.

.5 Backboards: Unless otherwise specified, G1S 20 mm (¾") thick Fir plywood painted on both sides with fire ULC Class A retardant flat white, intumescent alkyd paint.

3 EXECUTION

3.01 INSTALLATION

.1 Provide empty pathways, fish wires, boxes, cover plates, conduit, backboards, miscellaneous and positioning material for a complete system for communications systems wiring, all as indicated on the drawings.

.2 Identify pathways and boxes in accordance with the electrical work Section entitled Basic Electrical Materials and Methods.

.3 Ground and bond pathway systems in accordance with requirements of the electrical work Section entitled Communications Systems Grounding and Bonding.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit product data sheets for products specified in this Section

.2 Test Reports: Submit sighed test reports for all testing work specified.

1.02 QUALITY ASSURANCE

.1 Communication system grounding and bonding is to be in accordance with the following Standards:

.1 ANSI J-STD-607- A, Joint Standard-Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

.2 CSA C22.2 No. 41, Grounding and Bonding Equipment

2 PRODUCTS

2.01 GROUND BUS

.1 Pre-drilled copper bus bars to ANSI J-STD-607-A, suitable for wall or backboard mounting, 6 mm (¼”) thick, 100 mm (4”) wide with lengths as required, electro-tin plated with 8 mm (5/16”) diameter holes for use with standard sized lugs and complete with all required fittings and mounting accessories.

2.02 GROUNDING AND BONDING CONDUCTORS

.1 3/0 AWG insulated (green colour), soft annealed copper conductors marked to ANSI J-STD-607-A.

2.03 GROUNDING AND BONDING CONNECTIONS

.1 Compression type connectors with zinc-plated fasteners and external tooth lock washers.

2.04 WARNING LABELS

.1 Non-metallic warning labels to ANSI J-STD-607-A with English and French wording to read: “If this connector ifs loose or must be removed, please call the Building Telecommunications Manager”.

3 EXECUTION

3.01 GENERAL COMMUNICATIIONS GROUNDING AND BONDING REQUIREMENTS

.1 Perform all required communication systems grounding and bonding complete with bus, bonding backbones, and bonding conductors. Unless otherwise specified, grounding and bonding work is to be in accordance with requirements of ANSI J-STD-607-A, and the requirements of all other governing authorities.

.2 Bond metallic conduits, boxes, cable trays, ducts, and non-current carrying metal parts of equipment together to the communications grounding and bonding system

.3 Include for ground connections to all communication system racks.

.4 When ground conductors are installed in metal conduit longer than 3 m (10’), bond to each end of the conduit.

3.02 GROUND BUS

.1 Provide main ground bus in communications entrance rooms and install on insulated supports 50 mm (2”) high close to the electrical power panel if there is one installed in the room.

.2 Provide telecommunications ground bus as for main bus in all telecommunications rooms.

3.03 WARNING LABELS

.1 Apply warning labels to telecommunications bonding and grounding conductors at connections.

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 This Section includes:

.1 The supply, delivery, supervision, coordination, and installation of equipment items specified herein and shown on the Drawings

.2 The documentation and instruction for completing the Identification for Communication Systems

.2 Examine the contract documents in their entirety (including drawings and specification sections in the other divisions) for requirements or work which may affect work under this section, regardless of whether such requirements or work are specifically indicated in this section.

.3 Contractor Shall Provide and Install

.1 Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.

.4 Errors or Omissions in Drawings or Documentation

.1 If any errors or omissions appear in Drawings, Specifications, or other documents, the bidding Contractor shall notify the Engineer no later than ten (10) days prior to submitting the bid.

.2 Should conflict occur in or between Drawings and Specifications, the bidding Contractor is deemed to have estimated the more expensive way of doing the work, unless the bidding Contractor has asked for and obtained written decision (addendum) before submission of the bid as to which method or materials will be required.

.5 Related Sections:

.1 Section 00 00 00 – Procurement and Contracting Requirements –

.2 Section 01 00 00 – General Requirements

.3 Section 07 84 00 – Penetration Firestopping

.4 Section 26 05 26 – Grounding and Bonding for Electrical System

.5 Section 27 05 26 – Grounding and Bonding for Communication Systems

.6 Section 27 05 28 – Pathways for Communication Systems

.7 Section 27 11 16 – Communications Cabinets, Racks, Frames and Enclosures

.8 Section 27 11 19 – Communications Termination Blocks and Patch Panels

.9 Section 27 11 26 – Communications Rack Mounted Power Protection and Power Strips

.10 Section 27 13 23 – Communications Fiber Backbone Cabling

.11 Section 27 15 13 – Communications Copper Horizontal Cabling

.12 Section 27 15 43 – Communications Faceplates and Connectors

.13 Section 27 16 13 – Communications Copper Custom Cable Assemblies

.14 Section 27 16 13.01 – Communications Fiber Custom Cable Assemblies

.15 Section 27 16 19 – Communications Patch Cords

.16 Section 27 17 00 – Testing of Structured Cabling Systems

1.02 DEFINITIONS

.1 ANSI – American Northern Standards Institute

.2 AWG – American Wire Gauge

.3 BICSI – Building Industry Consulting Service International

.4 BCT – Bonding Conductor for Telecommunications

.5 EIA – Electronics Industry Alliance

.6 ETL – Intertek Certification Services

.7 IEC – International Electrotechnical Commission

.8 IEEE – Institute of Electrical and Electronic Engineers

.9 IDC – Insulation displacement contact

.10 ISO – International Standards Organization

.11 NECA – National Electrical Contractors Association

.12 NFPA – National Fire Protection Agency

.13 NRTL – Nationally Recognized Testing Laboratory

.14 TIA – Telecommunications Industry Association

.15 UL – Underwriters Laboratory

.16 Provide: Furnish, install, terminate, label, test and certify a complete operating cabling system.

.17 Contract Documents (CD): Design drawings, specifications, sketches and schedules

provided by the Engineer as they directly relate to this scope of work and this project.

.18 Structured Cabling Systems (SCS) wiring is defined as all required equipment and cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber cable installed and configured to provide computer data and voice connectivity.

.19 Point–of–Entry (POE): Unmarked Manholes/Vaults at property line

.20 NET–POP Rooms/MPOE (Main Point of Entry): The area where the outside plant media/carrier services appear in the facility. The NET–POP contains equipment used by owner or carrier to hand–off/transition cable from outside plant into inside plant type.

.21 Network Center/Main Distribution Frame (MDF) Areas: This technology space houses Layer 2/3 network switching gear and other main network distribution equipment and acts as the mid–connection point between the Core/Network and the TR/IDF/access zones for all connections.

.22 Telecommunications Room (TR)/Intermediate Distribution Frame (IDF): is the location for the termination of backbone cables and for termination of horizontal cables, and for the interconnection of each. The space also hosts access–layer switches and user network connections within each floor.

.23 Active Equipment: electronic equipment used to develop various WAN, LAN, and voice services, e.g., digital multiplexers, RS–232 controllers, Ethernet hubs, switches, routers, PBX, etc.

.24 Horizontal: cabling system consisting of media and termination hardware interconnecting the Telecommunication Outlets (TOs) and the TRs.

.25 Bonding: permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.

.26 Basket Cable Tray: A cable support and management system fabricated of continuous, rigid, welded steel wire mesh and available in many sizes with attachment hardware suiting multiple installation methods

.27 Cable Tray: vertical or horizontal open supports, usually made of aluminum or steel, which are fastened to the building structure. Cables are laid in and fastened to the trays.

.28 Cabinet: free standing, floor–mounted or wall–mounted modular enclosure designed to house and protect rack–mounted electronic equipment and passive terminations.

.29 Channel: The end–to–end transmission path between two points at which application specific equipment is connected; encompasses all the elements of the horizontal cabling link, plus the equipment cords in the telecommunications spaces and work area.

.30 Cross–Connect: equipment used to terminate and tie together communications

circuits.

.31 Cross–Connect Jumper: a cluster of twisted–pair conductors without connectors used to establish a circuit by linking two cross–connect termination points.

.32 Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.

.33 Jack: receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight–position/eight–contact modular jacks.

.34 Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

.35 LAN: Local area network.

.36 Link: Horizontal cabling link encompassing all components of the horizontal cabling (TO, patch panels, blocks, jumpers and patch cords that join them in the horizontal cross–connect). It is distinguished from a channel because it does not include the equipment cables/cords at the telecom spaces or work area.

.37 Media: twisted–pair, and fiber optic cable or cables used to provide signal transmission paths.

.38 Mounting Frame: rectangular steel framework, which can be equipment rack or wall mounted to support wiring blocks, patch panels, and other communications equipment.

.39 Outside Plant (OSP): generally, any and all portions of the cable system that runs outside of an environmentally enclosed structure and/or building with each end terminated at different buildings. This specifically includes inter–building cables, conduits, manholes, hand–holes, and innerduct.

.40 UTP: Unshielded Twisted Pair.

.41 FO: Fiber Optic

.42 Passive Equipment: non–electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, patch panels, wiring blocks, fiber optic shelves, etc.

.43 Patch Cords: a length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross–connect.

.44 Patch Panel: system of terminal blocks or connectors used with patch cords that facilitate administration of cross–connect fields.

.45 Pathway: facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, under floor systems, overhead systems, raised floor, ceiling support wires, etc.

.46 Protectors: electrical protection devices used to limit foreign voltages on metallic

communications circuits.

.47 Raceway: an enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wire ways, under floor raceways, overhead raceways and surface raceways; does not include cable tray.

.48 Racks: An open, freestanding, floor–mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.

.49 Riser Backbone: The Riser Backbone subsystem links the main cross connect (MDF) in the equipment room to the distribution rooms (TRs).

.50 Structured Cabling System (SCS): A SCS is defined as all required cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber optic cable installed and configured to provide computer data and voice connectivity from each data or voice device to the network file server or voice network/switch designated as the service point of the local area network.

.51 Telecommunication Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.

.52 Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

.53 Work Area Subsystem: The connection between the telecommunications outlet and the station equipment in the work area is provided by the Work Area Subsystem. It consists of cords, adapters, and other transmission electronics.

.54 Wireless Access Point (WAP): Telecom outlet designated for use with wireless network devices. Such outlet shall be mounted above ceiling.

.55 Contractor – The successful bidder engaged to provide the work of this specification

1.03 REFERENCES

.1 Most recent editions and addenda of the following documents:

.1 ANSI/TIA 568 series, most recent revisions, addenda and systems bulletins. All applicable

.2 ANSI/TIA–569 Telecommunications Pathways and Spaces, most recent revision including all relevant addenda and systems bulletins

.3 ANSI/TIA–606 Administration Standard for Telecommunications Infrastructure, most recent revision including all addenda and systems bulletins

.4 ANSI/TIA–607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, most recent revision including all addenda and systems bulletins

.5 ANSI/TIA–862 Structured Cabling Infrastructure Standard for Intelligent Building Systems, most recent revision including all addenda and systems bulletins

.6 ANSI/TIA–942 Telecommunications Infrastructure Standard for Data Centres, most recent revision including all addenda and systems bulletins

.7 ANSI/TIA–1179 Healthcare Facility Telecommunications Infrastructure Standard, most recent revision including all addenda and systems bulletins

.8 ANSI/TIA–4966 Telecommunications Infrastructure Standard for Educational Facilities, most recent revision including all addenda and systems bulletins

.9 TIA–TSB–162 Telecommunications Cabling Guidelines for Wireless Access Points, most recent revision including all addenda and systems bulletins

.10 Telecommunications Distribution Methods Manual, most recent edition

.11 Information Transport Systems Installation Methods Manual (ITSIMM), most recent edition

.12 National Electric Codes (NEC) – all applicable

.13 OSHA Standards and Regulations – all applicable

.14 Local Codes and Standards – all applicable

.15 UL444 – Standard for Safety of Communications Cable

.16 UL 1666 – Standard for Safety of Flame Propagation Height

.17 Local Authority Having Jurisdiction (AHJ)

.18 Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either

.19 Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense

1.04 SYSTEM DESCRIPTION

.1 Located throughout the Network are physical infrastructure components that support IT equipment providing essential services to critical business applications

.2 Any disruption of the physical infrastructure could cause interruption to business applications resulting in thousands to millions of dollars of cost and lost revenue. Disruption of the physical infrastructure can be caused by moves, additions, changes, or system failures.

.3 The advantage of a properly identified infrastructure is that system components can be quickly and accurately identified so that the infrastructure and business service are restored.

.4 The Contractor will provide and install identification labeling for the project's communications systems, including all components from the TR to the work outlet and between telecommunications spaces.

1.05 SUBMITTALS

.1 Engineer's Review

.1 The Engineer's review of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the contract documents.

.2 With the shop drawings, the Contractor shall include an index sheet detailing all deviations from the contract documents, and will be held responsible for all deviations, unless the Contractor has received written approval from the Engineer for the specific deviation, separate from general shop drawing approval.

.3 The Engineer's review shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

.2 General Component Data

.1 For all products covered under this Section, the Contractor shall submit the following data for each component:

.1 A Specification Section

.2 The Manufacturer's name.

.3 The Manufacturer's model and part number

.3 Identification

.1 In addition to the general requirements above, the Contractor shall submit the following additional data:

.1 Cable identification numbers scheme for all installed items

1.06 QUALITY ASSURANCE

.1 Standards for Materials and Equipment

.1 The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from ANSI, FCC, ASTM, EIA/TIA, IEEE, NEC, NFPA, NEMA, OSHA, REA, and UL.

.2 Installer Qualifications

.1 Refer to Section 27 05 00

1.07 DELIVERY, STORAGE, AND HANDLING

.1 To prevent damage, theft, soiling, and misalignment, protect equipment during transit, storage, and handling

.2 The contractor shall coordinate the secure storage of equipment and materials on site, or, if no on-site storage is available, shall provide their own secure storage at the Contractor's expense.

.1 Do not store equipment where conditions fall outside the manufacturer's recommendations for environmental conditions.

.2 Do not install damaged equipment. Remove environmental conditions from the site and replace damaged equipment with new equipment.

.3 If off-site storage of materials is necessary, this shall be at the Contractor's expense.

1.08 COORDINATION

.1 The Contractor shall coordinate with all other trades. The Contractor will submit a schedule for the installation within 10 days of contract award

.1 The schedule shall include delivery, installation, and testing for conformance to specific job completion dates.

.2 At minimum, the schedule shall provide dates for the start of demolition, the completion of demolition, the installation start date, the completion of copper cabling, the completion of backbone cabling, the completion of testing and labelling, cutover, the completion of the final punch list, final inspection, and acceptance.

.2 Meeting Attendance and Schedule Adherence

.1 The Contractor must attend all project-related meetings and adhere to schedule set by the Project Manager.

.3 Final Inspection

.1 The Contractor is required to notify the Engineer of a proposed appointment for Final Inspection at least 72 hours before the appointment.

.2 Within five working days after the final inspection, the Contractor shall send final project documentation and warranty information to the Owner and Engineer. The final project documentation shall include, but may not be limited to:

.1 As-Built Drawings, in an AutoCAD format, with legible outlet address and cable paths

.2 Factory Test Results for each installed item with appropriate Identification

.3 Outlet location spreadsheets with appropriate Identification

.4 Warranty paperwork

.5 A copy of the Final Inspection and Acceptance Signoff Sheet

.6 Photos of each ER and TR

1.09 PROJECT CONDITIONS

.1 Project Environmental Requirements

.1 Hazardous Materials Prohibition

.1 The Contractor shall ensure that all materials used in the project are asbestos-free, unless specifically authorized in writing by the Owner

.2 Existing Conditions

.1 Verify that all conditions on the project site are acceptable for the Work specified in this Section. Prior to bid opening, notify the Consulting Engineer, in writing, of any discrepancies, conflicts, or omissions. Otherwise, correct these issues at no additional cost to the Owner.

.2 Continue to monitor the project site. If conditions develop that require a variance from the Specifications or Drawings, then immediately notify the Owner in writing. Otherwise, make recommendations, submit drawings showing how the Work may be installed, and, upon approval, proceed with the necessary changes without additional cost to the Owner.

.3 Record Drawings

.1 Keep a complete set of all telecommunications drawings in the job site office for demonstration of the actual installation work specified in this Section.

.2 Use this set of drawings for no other purpose.

.3 Where any material, equipment, or system components are installed differently than what is shown on the drawings, indicate the differences clearly and neatly using ink or indelible pencil.

.4 Upon completion of the project, submit the record set of drawings.

1.10 USE OF THE SITE

.1 Where the Owner deems it necessary to place restrictions, use the site as directed by the Owner.

.2 When proceeding with the work, do not interfere with the ordinary use of streets, aisles, passages, exits, or operations of the Owner. During the day, set up cones and barriers in hallways and walkways. Do not string cable down the hallways during normal hours.

.3 Request a hazardous materials worksheet that identifies potentially-hazardous locations. Do not proceed with any work in locations where hazardous materials are known to be. Obtain instructions from the Contractor’s Project Manager on and when to work in these areas.

.4 Multiple times each day, each contractor shall remove all trash and debris from the site. Before leaving the room each day:

.1 The Contractor shall replace all ceiling tiles that they have removed.

.2 The Contractor shall place all furniture and equipment that they have moved back into its original location.

.3 The Contractor shall return any equipment that they have disconnected to working order.

.4 The Contractor's Job Foreman shall inspect all work locations to ensure that the rooms are clean and that all of the tasks described above have been done.

.5 It is recommended that the Contractor inspect the site and take pictures to document the condition of the ceilings and walls.

1.11 CONTINUITY OF SERVICES

.1 Take no action that will interfere with or interrupt existing building services, unless previous arrangements have been made with the Owner's representative. Arrange all work to minimize shutdown time.

.2 The Owner's personnel shall perform shutdown of operating systems. When shutdown of systems is required, the Contractor shall give three (3) days advance notice.

.3 Should building services be inadvertently interrupted:

.1 The Job Foreman shall immediately notify the Project Manager of the accidental disruption of services, the remedy, and how long it will take to restore services.

.2 The Contractor shall immediately furnish the labor, including overtime, the material, and the equipment necessary to promptly restore the interrupted service at no cost to the Owner.

1.12 WARRANTY

.1 Refer to Section 27 05 00

2 PRODUCTS

2.01 GENERAL

.1 Refer to Section 27 05 00 for General Requirements

.2 All materials and products shall be:

.1 Appropriate for the intended use

.2 Recognized as such by a Nationally Recognized Testing Laboratory (NRTL) such as Underwriters Laboratories (UL), ETL SEMCO (ETL), the Canadian Standards Association (CSA) or the American National Standards Institute (ANSI)

.3 Permitted by the Authority Having Jurisdiction (AHJ)

.3 All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.

.4 Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.

.5 Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.

.6 All components will be approved by the Engineer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:

.1 Be in compliance with the Construction Documents

.2 Have fit and finish compatible with the existing surrounding structure

.3 Be unobtrusive

.4 Provide the required functionality

.7 Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.

.8 The TIA-606 standard establishes guidelines for owners, end users, manufacturers, consultants, contractors, designers, installers, and facilities administrators involved in the administration of the telecommunications infrastructure.

.9 Four classes of administration are specified in the standard, to accommodate diverse degrees of complexity present in the telecommunications infrastructure. The specifications for each class include requirements for identifiers, records, and labelling.

.1 Class 1 - addresses the administration needs of a premise that is served by a single telecommunications space (TS) containing its telecommunications equipment. Required in Class 1 administration are identifiers for the TS, cabinets or racks, patch panels and termination blocks, ports or termination block positions, patch cables, cabling subsystem 1 links or horizontal links, equipment and workspace outlets, consolidation points, zone enclosures, splices, and all telecommunications grounding and bonding systems.

.2 Class 2 - administration provides for telecommunications infrastructure administration needs of a single building or tenant that is served by a single or multiple TSs within a single building. Class 2 administration includes all elements of Class 1 administration, plus identifiers for cabling subsystem 2 and 3 or backbone cabling, cabling subsystem 2 and 3 ports, and firestopping locations.

.3 Class 3 - administration addresses the needs of a campus, including its buildings and outside plant elements. Class 3 administration includes all elements of Class 2 administration, plus identifiers for buildings and inter-building cabling. Administration of pathways and spaces, and of outside plant elements is recommended.

.4 Class 4 - administration addresses the needs of a multi-campus system. Class 4 administration includes all elements of Class 3 administration, plus an identifier for each site, and optional identifiers for wide area network connections.

2.02 SUBSTITUTION POLICY

.1 This is a performance-based specification developed from the experience of The City of Niagara Falls IT in providing exceptional solutions for all our facilities and departments. As such, substitution of specified products or systems is not allowed.

.2 Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

.3 Refer to Section 27 05 00

2.03 TELECOMMUNICATION SPACE LABELING

.1 Each TS should be identified with a scheme that defines the location of the space. The location should be defined with the floor and room number or other room designation.

.2 A typical telecommunication space would have the following scheme:

1DC2

.1 THIS IDENTIFIER WOULD DEFINE THAT THIS IS DATA CENTER 2 LOCATED ON THE FIRST FLOOR OF THE BUILDING

2.04 COMPONENT LOCATIONS IN THE TELECOMMUNICATIONS SPACE

.1 Locations for components in the TS can be determined either by using the grid coordinates for the space or assigning unique numbers to the various cabinet and wall segments in the space.

.2 Component locations in a TS are determined using a X-Y coordinate system that is usually based on the floor tile system in the data centre space. Using alphabetic designations on one axis of the room and numerical designations on the other axis of the room create a series of alphanumeric designations that can be established for each floor tile in a data centre space.

.3 These floor tile designations are the basis for determining the location of data centre devices.

	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT
01																				
02																				
03																				
04																				
05																				
06																				
07																				

.4 City of Niagara Falls approved Manufacturer:

.1 Panduit

.5 City of Niagara Falls approved Grid Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Part Number	Description
C850X1100YJJ	Laser/ink jet component label, 8.50" W x 11.0" H, adhesive polyester, white, 1 label/row, 1 labels/sheet, 25 labels/package

2.05 CABINET/RACK LABELING

.1 The floor tile designations are used to identify each cabinet or rack in the data center. The cabinet/rack location is based on which floor tile the right front corner of the cabinet/rack rests upon. Cabinets and racks should have location labels applied to the top and bottom of both the front and rear of the device. These labels should be visible whether doors are closed or opened on the cabinets.

.2 A typical cabinet/rack label would have the following scheme:

AY15

.1 THIS IDENTIFIER WOULD DEFINE THAT THE CABINET/RACK IS LOCATED WITH ITS RIGHT FRONT CORNER AT THE INTERSECTION OF ROW AY AND COLUMN 15

.3 City of Niagara Falls approved Manufacturer:

.1 Panduit

.4 City of Niagara Falls approved Cabinet/Rack Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Printer Type	Laser/InkJet	LS8EQ	Desktop Thermal
Label Area	2.00 x 1.00	2.00 x 1.00	2.00 x 1.00
Label P/N	C200X100YJJ	C200X100YPC	C200X100YPT
			C200X100APT
			C200X100AMT

2.06 PANEL LABELING

.1 Once the cabinet/rack identifiers are established, then the various panels in the cabinet/rack should be identified. The designation for the panel positions in a cabinet/rack can be either an alphabetic designation or a two-digit number that represent the rack unit number (RU) where the top-left mounting screw lands in the cabinet/rack. Using the RU method provides the data center manager with greater flexibility since it allows for panels and equipment to be added or removed later and not disrupt the designation of panel identifiers.

.2 A typical panel label would have the following scheme:

AB04-24

.1 This identifier would define that the top left mounting screw of the panel is located at the 24th rack unit position in the cabinet/rack located grid AB04 in the data center.

.3 City of Niagara Falls approved Manufacturer:

.1 Panduit

.4 City of Niagara Falls approved Panel Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Printer Type	**Laser/InkJet**	**LS8EQ**	**Desktop Thermal**
Label P/N	C100X050YJJ	C100X050YPC	C100X050APT
			C100X050A0T

2.07 PORT LABELING

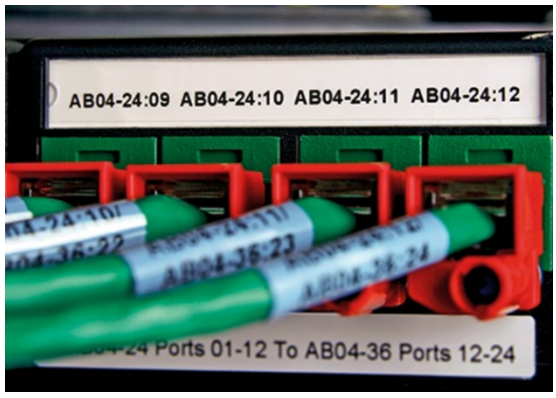
.1 Establish identifiers for each port on a panel. Port identifiers are very important in that they will define the connectivity of cabling within the data center infrastructure.

.2 Many patch panels come from the factory with numbers already screen-printed above the ports. If this is the case, then there is no need to re-label those patch panels. If the patch panels are not pre-printed with port numbers, then labels will need to be created to identify the port numbers.

.3 The numbering sequence should proceed from left to right and top to bottom for all ports on a patch panel. The number of digits used for all numbers on a patch panel should be consistent with the total number of ports on that patch panel.

.1 Example a 48-port patch panel should be labelled 01 through 48 and a 144-port patch panel should be labelled 001 through 144.

.4 A typical port label would have the following scheme:



AB04-24:12

.1 This identifier can be decoded to define that this is port 12 located on panel 24 in cabinet/rack AB04.

.2 This is somewhat redundant information given that the cabinet/rack and panel

are clearly identified and are not usually required information on the port label since the cabinet/rack and panel are apparent to the viewer who is standing at the location of the port.

.3 Therefore, a typical port label would have the following scheme:

12

.4 This identifier defines that this is port 12.

.5 City of Niagara Falls approved Manufacturer:

.1 Panduit

.6 City of Niagara Falls approved Port Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Cable Type	Copper	Copper	Copper	Copper	Fiber
Label Style	Adhesive	Adhesive	Non-Adhesive	Non-Adhesive	Adhesive
Number of Ports	4	6	4	6	n/a
Label P/N	C261X030FJJ	C379X030FJJ	C261X035Y1J	C390X030Y1J	C350X100YJJ
Cable Type	Copper	Copper	Copper	Copper	Fiber
Label Style	Adhesive	Adhesive	Non-Adhesive	Non-Adhesive	Adhesive
Number of Ports	4	6	4	6	n/a
Label P/N	C252X030FJC	C379X030FJC	C261X035Y1C	C390X030Y1C	T100X000YPC-BK
Cable Type	Copper	Copper	Fiber		
Label Style	Adhesive	Adhesive	Adhesive		
Number of Ports	4	6	n/a		
Label P/N	C252X030YPT C252X030APT	C379X030YPT C379X030APT	C350X100YJT		

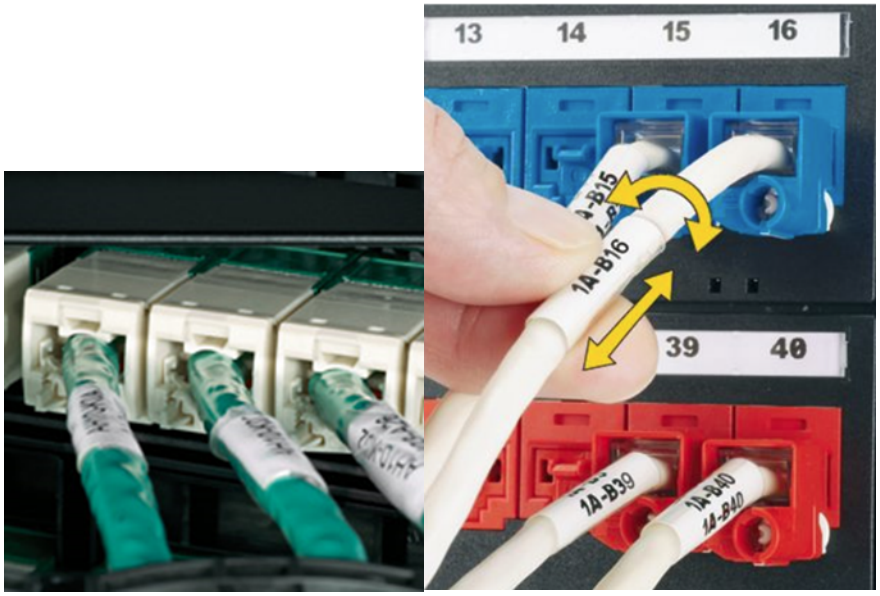
2.08 CABLE LABELS

.1 Cables labels are identified with information that defines the connection between the near end panel connection and the far end panel connection.

.2 The near end connection is the connection that is closest to the Main Distribution Area (MDA) in the network topology. A near end connection identifier would consist of the cabinet/rack location, panel location, and port location.

.3 The far end connection identifier would consist of the cabinet/rack location, panel location, and port location.

.4 A typical cable label would have information in the following scheme:



AB04-24:01/AB07-36:13

.1 This identifier would be decoded to define the cable connects between cabinet AB04 panel 24 port 01 going to cabinet AB07 panel 36 port 13. The far end of the cable would have a label that would have the same information.

.5 City of Niagara Falls approved Manufacturer:

.1 Panduit

.6 City of Niagara Falls approved Cable Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Printer Type	Laser/InkJet				
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia. (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Flag	Flag	Self-Laminating

Printer Type	Laser/InkJet				
Label P/N	S100X150YAJ R100X150X1J	S100X225YAJ R100X225X1J	F102X220FJJ	F102X220FJJ	S100X225YAJ R100X225X1J
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia. (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating for Label-Core	Self-Laminating for Label-Core	Self-Laminating
Label P/N	S100X150VAC R100X150V1C	S100X225VAC R100X225V1C	S100X160VAC	S100X220VAC	S100X225VAC R100X225V1C
Cable Type	Copper	Copper	Fiber		
Cable Diameter	Cat5/5e/6	10G UTP/STP	Dia. (0.24" to 0.48")		
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating		
Label P/N	S100X150VAT R100X150V1T	S100X225VAT R100X225V1T	S100X225VAT R100X225V1T		
Note	"S" TYPE LABEL/" R" – TURN-TELL TYPE LABEL				

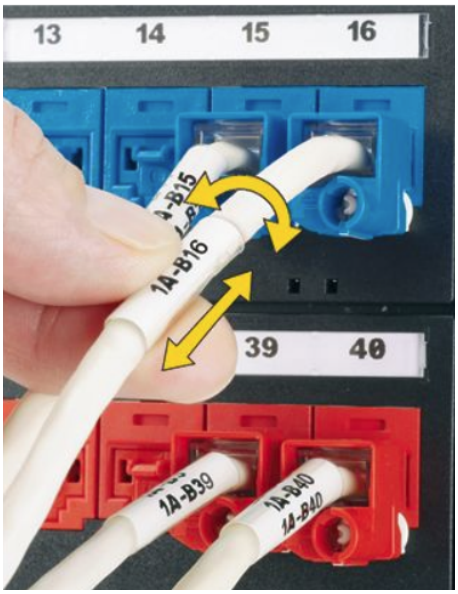
2.09 PATCH CORD/EQUIPMENT CORD LABELS

.1 Patch cord/equipment cord labels are identified with information that defines the connection between the near end patch panel front connections and the far end patch panel front connections or equipment connections.

.2 A near end connection identifier would consist of the cabinet/rack location, panel location, and port location.

.3 The far end connection identifier would consist of the cabinet/rack location, panel location, and port location.

.4 A typical patch cord label would have information in the following scheme:



"S" TYPE LABEL "R" – TURN-TELL TYPE LABEL

AB04-24:12\AB04-36:24

.1 This identifier would be decoded to define the patch cord connection between cabinet AB04 panel 24 port 12 going to the same cabinet panel 36 port 24. The far end of the cable would have a label that would have the same information.

.5 A typical equipment cord label would information in the following scheme:

AB04-24:01\AB04-TINLEY2:A

.1 This identifier would be decoded to define the equipment cord connection between cabinet AB04 panel 24 port 01 going to the same cabinet port A on equipment named Tinley2. Rack unit location could be substituted for equipment name if necessary.

.6 City of Niagara Falls approved Manufacturer:

.1 Panduit

.7 City of Niagara Falls approved Patch and Equipment Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

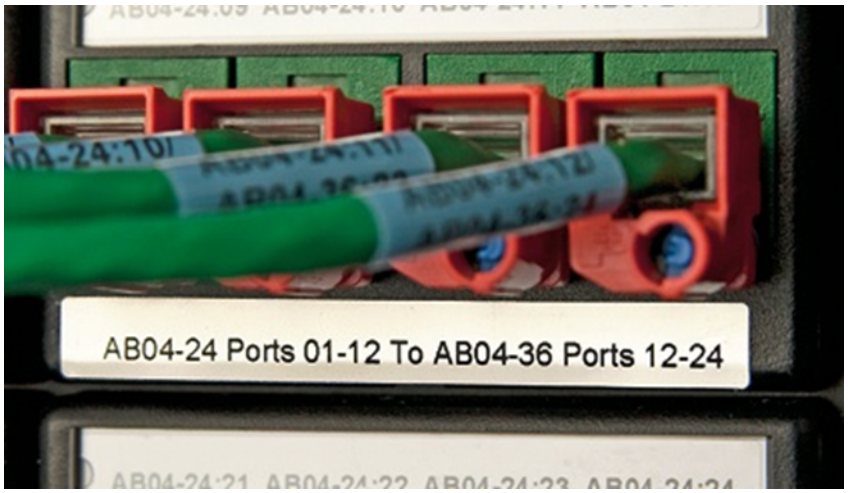
Printer Type	Laser/InkJet				
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia. (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Flag	Flag	Self-Laminating

Printer Type	Laser/InkJet				
Label P/N	S100X150YAJ R100X150X1J	S100X225YAJ R100X225X1J	F102X220FJJ	F102X220FJJ	S100X225YAJ R100X225X1J
Printer Type	LS8EQ				
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia. (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating for Label-Core	Self-Laminating for Label-Core	Self-Laminating
Label P/N	S100X150VAC R100X150V1C	S100X225VAC R100X225V1C	S100X160VAC	S100X220VAC	S100X225VAC R100X225V1C
Printer Type	Desktop Thermal				
Cable Type	Copper	Copper	Fiber		
Cable Diameter	Cat5/5e/6	10G UTP/STP	Dia. (0.24" to 0.48")		
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating		
Label P/N	S100X150VAT R100X150V1T	S100X225VAT R100X225V1T	S100X225VAT R100X225V1T		
Note	"S" TYPE LABEL/" R" – TURN-TELL TYPE LABEL				

2.10 PATCH PANEL CONNECTIVITY

.1 Patch Panel connectivity defines the connections between the near-end ports and the far-end ports. This labelling can define the connection of a range of ports on a panel or just define the connection for two individual ports.

.2 A typical patch panel connectivity label would have the following scheme:



AB04-24:PORTS 01-12/AB04-36:PORTS 13-24

.1 This identifier would describe that ports 01 through 12 on panel 24 of cabinet AB04 connect to ports 13 through 24 on panel 36 of cabinet AB04.

.3 City of Niagara Falls approved Manufacturer:

.1 Panduit

.4 City of Niagara Falls approved Patch Panel Connectivity Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Printer Type	Laser/InkJet				
Media	Copper	Copper	Fiber		
Ports	4 or less	more than 4	n/a		
Label P/N	C252X030FJJ	C379X030FJJ	C350X100YJJ		
Printer Type	LS8EQ				
Media	Copper	Copper	Fiber		
Ports	4 or less	more than 4	n/a		
Label P/N	C252X030FJC	C379X030FJC	T100X000VJC-BK		
Printer Type	Desktop Thermal				
Media	Copper	Copper	Fiber		
Ports	4 or less	more than 4	n/a		
Label P/N	C252X030YPT	C379X030YPT	C350X100YJT		

2.11 GROUNDING AND BONDING

.1 Labelling of the Ground and Bonding system involves the identifications of the Main Grounding Busbar, Grounding Busbar, Conductors Connecting Busbars, Conductors Connecting Devices to Busbars and Equalizing Conductors.

.2 The typical scheme for the main grounding busbar would be:

1-B301-TMGB

.1 This identifier can be decoded to define that this is the main telecommunications grounding busbar located on floor 1 in space B301.

.3 The typical scheme for a grounding busbar would be:

2-R201-TGB

.1 This identifier can be decoded to define that this is the telecommunications grounding busbar on floor 2 in space R201.

.4 The typical scheme for the busbar connections would be:

1-B301-TMGB/2-R201-TGB

.1 This identifier can be decoded to define that this is the conductor that connects the main telecommunications grounding busbar located on floor 1 in space B301 to the telecommunications grounding busbar on floor 2 in space R201.

.5 City of Niagara Falls approved Manufacturer:

.1 Panduit

.6 City of Niagara Falls approved Busbar/Busbar Connections Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Busbar Connections Labels					
Printer Type	Laser/InkJet				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075YAJ	S100X125YAJ	S100X225YAJ	S100X400YAJ	S100X650YAJ
Printer Type	LS8EQ				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAC	S100X125VAC	S100X225VAC	S100X400VAC	S100X650VAC
Printer Type	Desktop Thermal				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAT	S100X125VAT	S100X225VAT	S100X400VAT	S100X650VAT
Grounding Busbar Labels					
Printer Type	Laser/InkJet				
Label P/N	C400X200YJJ				
Printer Type	LS8EQ				
Label P/N	C200X100YPC				
Printer Type	Desktop Thermal				
Label P/N	C400X200YPT				

2.12 POWER CABLES

.1 Labeling of the power system involves the labeling of the cables feeding power outlet units (POU) with information defining the source of power to the POU. This information would include the distribution panel and the circuit that feeds the POU.

.2 A typical scheme for the power labeling would be:

AB03A-PP21-15

.1 This identifier can be decoded to define that this is the power cable that connects POU A located in rack/cabinet AB03 to circuit breaker 15 in power panel 21.

.3 City of Niagara Falls approved Manufacturer:

.1 Panduit

.4 City of Niagara Falls approved Power Cable Label part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

Busbar Connections Labels					
Printer Type	Laser/InkJet				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075YAJ	S100X125YAJ	S100X225YAJ	S100X400YAJ	S100X650YAJ
Printer Type	LS8EQ				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAC	S100X125VAC	S100X225VAC	S100X400VAC	S100X650VAC
Printer Type	Desktop Thermal				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAT	S100X125VAT	S100X225VAT	S100X400VAT	S100X650VAT

2.13 SAFETY, FIRE AND SECURITY

.1 Maintaining a safe workplace is essential to the proper operation of the data center. There are many potentially dangerous systems present in a data center such as fire suppressant systems, cooling systems, and power systems.

.2 The following pre-printed labels can be installed in the data center.

Area	Part Number	Example
ELECTRICAL HAZARDS	Safety Signs PPS0305W2200 PPS0305W2100 PVS0305W2102Y PVS0507W2103Y PPS0710D77 PPS0710D73 Voltage Markers PCV-120CY PCV-220CY PCV-480BY	 
Fire Safety Signs	PPS1209G010 PPS1209G011 PPS0710G001 PPS0710B430	

		
Piping	GPMSH-PY GPMSH-NY	
Security	PSL-DCJB PSL-DCPL FLCCLIW-X PSL-LCAB	

3 EXECUTION

3.01 GENERAL

.1 Upon completion of work, a Registered Communications Distribution Designer (RCDD) shall submit as-built drawings to the Owner and Engineer, and the Contractor shall input the cabling data into the cable management software.

.2 Provide any necessary screws, anchors, clamps, tie wraps, support hardware, etc. necessary to facilitate the installation of the identification communication system.

.3 Furnish any special installation equipment or tools necessary to properly complete the installation.

.4 Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to bring the installation back into alignment with the guidelines and to correct, any and all, damage to the cables by the installer during the implementation.

.5 All techniques and fixtures used in the installation must allow for easy maintenance of, and ready access to, all components for test measurements.

.6 No self-tapping screws shall be used.

.7 All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass.

.8 All materials used in installation shall be resistant to fungus growth and moisture deterioration.

3.02 SYSTEM ADMINISTRATION

.1 All components of the installed system shall be uniquely identified by location, function, unit, and sub-unit.

.2 Each location shall be identified by a unique alphanumeric identifier.

.3 Each equipment enclosure in the building shall be assigned a unique alphanumeric identifier.

.4 Each adapter module installed in each distribution or interconnect enclosure shall be identified by an alphanumeric identifier.

.5 All conduits, trays, and pathways shall be identified by a unique alphanumeric identifier.

.6 Optical fiber cables shall be identified by a textual label, which indicates its type, strand count, point of origin, and termination.

.7 Supply a Cable Identification Matrix.

.8 Supply all records in compliance with ANSI/TIA-606.

.9 Provide a database, compliant with Open Database Connectivity (ODBC), for administration of the Structured Cabling System described herein.

3.03 IDENTIFICATION

.1 Prior to the installation or termination of cabling, confirm all specific labeling requirements with the Owner or the Owner’s Engineer.

.2 Cables

.1 Mark backbone cables at each endpoint and at all intermediate pull points,

access points, and junction boxes. Labels shall indicate the origination and destination identifier, the sheath identifier, and the strand or pair range.

.2 Horizontal cables shall be marked at each end, on the sheath indicating the TR, patch panel and panel port to which the cable is wired.

.3 Faceplates, Patch Panels, and Wiring Blocks

.1 Mark Fiber Distribution Enclosures (FDEs) with adhesive labels that indicate the range of circuits installed within. Label each port with the origination and destination grid identifier and the individual strand ID.

.2 Label patch panels alphabetically, beginning at the top. Individual ports shall come from the factory labelled with a number designation.

.3 Label each faceplate to indicate, for each cable that it houses, the TR, patch panel, and panel port to which the cable is wired.

.4 Label each wiring block numerically, beginning at the top left of the termination field. Within each block, identify the individual rows alphabetically, beginning at the top left and proceeding sequentially down and to the right. Label each row with the corresponding cable identifier and label each pair or circuit on each cable.

.5 Fit each cable with a self-laminating label, bearing the appropriate cable identifier, that surrounds the outermost jacket. Place the label at each end of the cable, within 3 inches (75 mm) of the end of the sheath.

.6 Fit each equipment enclosure with a self-adhesive label bearing its respective identifier, affixed to the top center of the front and rear doors.

.7 Fit each FDE with a self-adhesive label, bear its respective identifier in block characters, affixed at the top center of the front and rear faces.

.8 Fit each adapter inside enclosures with a label bearing its identifier, affixed directly adjacent to its shortest side. Rotate characters so that their orientation is kept left to right, top to bottom.

.9 Label conduits and pathways within 0.5 m (18 inches) of each end, where exposed and accessible. It is recommended that additional labeling be provided every 3 m (10 feet) of exposed length.

.10 Fit network equipment with a label, placed in an accessible area on the front and rear, bearing the appropriate identifier, MAC address, and date of installation. The label shall not interfere with the operation of or interface to the unit, nor shall it obscure manufacturer’s labels.

END OF SECTION

1 GENERAL

1.01 GENERAL

.1 The Consultant shall withhold 15% of the telecommunications project value from the Telecommunications Cabling Contractor until all accurate close-out documentation is forwarded to the General Contractor/Construction Manager or The Consultant. In addition, this value will be withheld until all deficiencies are resolved.

.2 Upon completion of the testing, the Consultant may ask the Telecommunications Cabling Contractor to perform a random test of up to 10% of the cables.

.3 All deficiencies must be corrected before the Consultant will forward authorization to release the Holdback.

2 EXECUTION

2.01 INSTALLATION

.1 Bi-directional testing of all horizontal Category 3 backbone copper cables are to be completed in accordance with the follow test criteria:

- continuity
- shorts
- opens
- grounds
- correct polarity
- length

.2 Testing of all horizontal Category 6 copper cables are to be completed in accordance with the follow test criteria:

- Basic Link
- continuity
- shorts
- opens
- grounds
- correct polarity
- length
- attenuation
- NEXT
- PSNEXT
- ACR
- PSACR
- ELFEXT
- PSELFEXT
- Return Loss
- resistance

.3 Fibre strands in excess of 122m 400'(ft) shall be tested with an Optical Time Domain Reflectometer for length and attenuation.

.4 Test each stand of fibre, bi-directionally, with a Power Meter / Light Source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres.

.5 Maximum multi-mode passive link loss (including patch cords) is not to exceed - 2.35dB.

.6 Maximum single-mode passive link loss (including patch cords) is not to exceed - 1.0dB.

2.02 DOCUMENTATION

.1 The Telecommunications Cabling Contractor is required to submit test results in native tester format or a format which can be read with a text reader (i.e., ".txt" extension). Paper results shall not be submitted for projects with 100 or more horizontal cable drops and/or fibre cables.

.2 The Telecommunications Cabling Contractor is required to provide the software required to view the results.

.3 The report should be divided into sections by Telecommunications Room.

.4 The report should indicate for each cable when it was tested successfully, the result, and the length.

.5 The Telecommunications Cabling Contractor shall sign off on the entire test report prior to submitting to the General Contractor/Construction Manager or The Consultant.

.6 The test result documentation is to be submitted to the General Contractor/Construction Manager or The Consultant for review no later than ten (10) working days following the completion of the installation.

.7 All deficiencies must be corrected before the General Contractor/Construction Manager or The Consultant will provide a certificate to release the Holdback on the project.

.8 Record Drawings

.9 The Telecommunications Cabling Contractor is required to maintain one (1) set of correct and accurate record drawings on-site at all times. These drawings are to be made available to the General Contractor/Construction Manager or the Consultant for review during the project.

.10 The Telecommunications Cabling Contractor is required to provide record drawings of the telecommunication cabling installation in relation to the drawings provided in this specification.

.11 The record drawings shall be updated electronically and include, but are not limited to;

- Horizontal cable numbers on the floor plans
- Horizontal Cable Routing on the floor plans
- Changes on the floor plans
- Backbone cable Routing between Telecommunications Rooms
- Paging Speaker Locations including daisy chain cable run
- Wireless Access Points and Cell coverage
- Cabinet/Rack Elevation drawings
- Backboard Elevation Drawing

.12 The Telecommunications Cabling Contractor shall provide one (1) soft copy in AutoCAD 2010 and one (1) plotted copy for the General Contractor/Construction Manager or The Consultant to review prior to complete close-out documentation submission.

.13 After approval, the Telecommunications Cabling Contractor shall submit one (1) plotted copy of the drawings for;

- The Main Computer Room
- Each Telecommunications Room
- The Consultant

.14 All close-out documentation must be submitted to the Consultant within ten (10) working days of the completion of the project before the documentation holdback will be released.

END OF SECTION

1 GENERAL

1.01 CABLE MANAGEMENT

.1 The Cable Management System shall be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall be a complete cable management system comprised of vertical cable managers, horizontal cable manager, and cable management accessories used throughout the cabling system. The system shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.

2 PRODUCT

2.01 RACKS

.1 The Rack system shall meet all EIA requirements as defined EIA-310-D.

.2 Racks as indicated on plans.

2.02 VERTICAL CABLE MANAGEMENT

.1 Vertical cable managers shall include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment. Managers shall protect network equipment by controlling cable bend radius and providing cable strain relief. Managers shall be a universal design mounting to EIA 19" or 23" racks and constructed of a base with cable management fingers. The fingers shall include retaining tabs to keep cables in place during cover removal. The covers shall be hinged to open in either direction allowing for quick moves, adds, and changes.

Part Number	Type	Rack Spaces	Type	Max. Side Extension (in.)
PRV12	Front and Rear	45	High Capacity	12.0
PRVF12	Front only	45	High Capacity	12.0
PRD12	Hinged Door	-	-	12.0
PRV8	Front and Rear	45	Standard	8.0
PRVF8	Front only	45	Standard	8.0
PRD8	Hinged Door	-	-	8.0
PRV6	Front and Rear	45	Standard	6.0
PRVF6	Front only	45	Standard	6.0
PRD6	Hinged Door	-	-	6.0
PRSP5	Rear Slack Spool, 5”	-	-	-
PRSP7	Front Slack Spool, 7”	-	-	-

3 EXECUTION

1. Install racks and cable management in communication room(s) as indicated on drawings.

END OF SECTION

1 GENERAL

1.01 TERMINATION EQUIPMENT

.1 All termination mounts shall be fully loaded with the appropriate connectors.

.2 Blank labeling strips are required for connectors that are not in use.

.3 IDC block quantities shall accommodate the number of terminated cable pairs.

.4 IDC 250-pair and 300-pair blocks shall be complete with labeling strips.

.5 Material and equipment shall be new, and conform to grade, quality and standards specified.

.6 Backboard layout will be as per manufacturer's recommendations unless expressly written otherwise by the General Contractor/Construction Manager or the Consultant

2 PRODUCT

2.01 CATEGORY 6 ANGLED PATCH PANEL

.1 *MINI-COM* ® Angled Modular Faceplate Patch Panels shall allow cable to flow to each side of the rack and shall eliminate the need for horizontal cable managers by enabling patch cords to be routed directly into vertical cable managers. The angled design shall allow the labeling scheme and port identification to be visible at all times. Vertical cable managers in the *PANDUIT* ® PatchRunner Cable Management System utilize moulded cable management fingers and integral bend radius control. These features coupled with the Angled Patch Panels shall provide the ultimate high-density cable management system.

Part Number	Number of Ports	Rack Spaces
CPPLA24WBL	24	1
CPPLA48WBL	48	2

MINI-COM ® High Density Modular Faceplate Patch Panels

Part Number	Description	Number of Ports	Rack Spaces
DPA24688TGY	Cat 6	24	1
DPA48688TGY	Cat 6	48	2

MINI-COM ® High Density 110 termination Back Panel Patch Panels

Panduit Minicom TX6 Plus Category 6 Module

Part Number	Style	Configuration	Category	Colors
CJ688TG**	RJ45	Universal	6	11

** Designates color

.2 Colours:

.1 Phone: White

.2 Data: Blue

Panduit Opticom Rack Mount Fibre Optic Enclosures

.3 Can be mounted to any standard 19" or 23" EIA rack or cabinet.

.4 Includes fiber optic cable routing kits (grommets, cable ties, saddle clips, spools, strain relief and ID/caution labels) for various cable management solutions.

.5 Multiple cable entry locations provided in rear of enclosure on top, bottom, and side
Holds Opticom® Fiber Adapter Panels.

.6 Durable molded hinged front and rear lockable doors

Part Number	Rack Spaces
FRME1	1
FRME2	2
FRME3	3

Frames for Modular Jacks

.7 Frames shall be 4-port Frames which will accommodate RJ45 Style, RJ12, ST Compatible or SC jacks.

.8 Where applicable, use recessed blanks for all unused ports. Blanks to match Frame colour.

.9 Part #: 4-port ……CFG4** *(** denotes colour)*

.10 Colour: IW (International White).

SC OptiCam Fibre Optic Connector

.3 *PANDUIT* ® *OPTI-CAM* ® LC Fiber Optic Connectors shall be field terminable (mechanical crimp termination) simplex fiber optic connectors for multimode glass fiber that fully complies with the fiber optic connector performance requirements specified in TIA/EIA-568-B.3 and the intermatability requirements specified by the TIA 604-2 FOCIS-2 document.

Part Number	Style	Fiber Type	Termination	Simplex/ Duplex	Colour
FLCSMCXAQY	LC	10 Gig 50/125µm Multimode 3mm jacketed	Pre-polished, mechanical crimp	Simplex	Aqua

FLCDMCXAQY	LC	10 Gig 50/125μm Multimode 3mm jacketed	Pre-polished, mechanical crimp	Duplex	Aqua

3 EXECUTION

3.01 INSTALLATION

.1 Refer to Section 27 - Horizontal Cabling.

END OF SECTION

1 GENERAL

1.01 WORK INCLUDED

.1 Provide all labor, materials, and equipment for the complete installation of work called for in the Contract Documents.

1.02 SCOPE OF WORK

.1 This section includes the minimum requirements for ceiling-mounted, floor-mounted and wall-mounted zone cabling and wireless enclosures for use as consolidation point enclosures, telecommunications enclosures, or wireless access point enclosures outside of communications equipment rooms.

.2 Included in this section are the minimum composition requirements and installation methods for the following:

.1 Enclosures, ceiling-mounted.

.2 Enclosures, floor-mounted.

.3 Enclosures, wall-mounted.

1.03 QUALITY ASSURANCE

.1 All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

.2 Strictly adhere to all Building Industry Consulting Service International (BICSI), Electronic Industries Alliance (EIA) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.

.3 Material and work specified herein shall comply with the applicable requirements of:

.1 ANSI/TIA/EIA – 568-C Commercial Building Telecommunications Cabling Standard, 2000-2004

.2 TIA – 569-B Commercial Building Standard for Telecommunications Pathways and Spaces, 2004

.3 ANSI/TIA/EIA – 606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2002

.4 ANSI-J-STD – 607-A Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, 2002

.5 NFPA 70 – National Electric Code, 2005

.6 BICSI – Telecommunications Distribution Methods Manual, 10th Edition, 2003

1.04 SUBMITTALS

.1 Provide product data for the following:

.1 Manufacturers data sheets/cut sheets, specifications and installation instructions for all products (submit with bid).

2 PRODUCTS

2.01 CONSOLIDATION POINT ENCLOSURES

.1 Wireless Enclosures, Ceiling-Mounted (PZWIFIXX, where X indicates Wireless access point (WAP) type.

.1 Ceiling or wall mounted wireless enclosures shall be manufactured fully from sheet aluminum except for units designed for integral antenna WAP units, which may have a flat plastic window for radio frequency transmission.

.2 Each enclosure will be rectangular in shape, where a standard ceiling tile can be cut to allow the enclosure to fit into, or with accessory brackets, sized to replace, a single 2’ x 2’ drop ceiling tile, as specified below.

.3 When installed into the ceiling, hanger brackets will be provided to allow mounting above the ceiling. The body of the enclosure will be located above the drop ceiling supported from the structural ceiling by hanger wires. One side of the enclosure will be flush with the drop ceiling. An access door on the flush surface will open into the work area below the drop ceiling providing access to equipment within the enclosure.

.4 When wall mounted, keyhole features in the back of the enclosure will allow mounting to a wall. Stud mounting is recommended. Knockouts will also be provided for conduit from behind the wall to access the enclosure for power and data cables if necessary.

.5 The access door will be fully hinged and will key lock in the closed position. Units that accept WAP units with directional antenna will have knockouts in the door allowing the antennas protrude though the door. WAP units with separate patch antennas will be provided with knockouts for mounting patch antennas either on the door or on the enclosure if wall mounted. On fully metal doors, knockouts will be provided for L.E.D viewing from outside a locked enclosure.

.6 The wireless access point will be attached to a back plate that will attach to the inside back of the enclosure and support the WAP off the enclosure back. A back plate will be supplied for WAP units that ship without back plates, otherwise a suitable back plate will be provided.

.7 The enclosure will have one or more cable access ports located on the side of the enclosure. The port will include an approved fire-rated foam sealing kit. Cable tie points for securing cables will be located within the enclosure. The manufacturer will sell compatible cable management straps as a separate accessory.

.8 The enclosure shall have optional drop ceiling mounting kits to allow flush mounting of the enclosure in a standard drop ceiling.

.9 Finish shall be white powder coat (paint).

.10 The enclosure shall be delivered fully assembled.

.11 The enclosure will be UL Listed for use within a plenum space. UL Listing will be stated in the manufacturer’s product literature.

.12 Design Make:

.13 Panduit Corporation

.14 PanZone wireless access point enclosures

2.02 PANZONE WIRELESS ACCESS POINT ENCLOSURES

Part Number	Description
PZWA125 12.0”W x 2.31” (PZWWB)	Panzone Wireless Enclosure for the Aruba 92, 93, 104, 105, 124 and 125 Series, UL 2043 rated. Dimensions: 12”0 H x Deep (305mm x 305mm x 59mm) Optional Wall Mount Bracket
PZWA135	Panzone Wireless for the Aruba 135 Series, UL 2043 rated. Dimensions: 12.0”H x 12.0”W X 2.31” Deep (305mm x 305mm x 59mm). Optional Wall Mount Bracket (PZWWB)
PZWC35	PanZone® Wireless Access Point Enclosure for surface mount or for use in suspended ceilings with optional in-ceiling mounting bracket. Accommodates Cisco Aironet^ 1140 and 3500 Series Wireless Access Points. UL 2043 rated. Dimensions: 13.75"H x 12.00"W x 3.1"D (349.8mm x 304.8mm x 78mm)
PZWC35I	PanZone® Wireless Access Point Enclosure; accommodates Cisco Aironet^ 1140 and 3500 Series Wireless Access Points. UL 2043 rated. Dimensions: 23.8"H x 23.8"W x 3.1"D (603mm x 603mm x 78mm).
PZWC35E	PanZone® Wireless Access Point Enclosure for surface mount or for use in suspended ceilings with optional in-ceiling mounting bracket. Accommodates Cisco Aironet^ 1260 and 3500E Series Wireless Access Points. UL 2043 rated. Dimensions: 13.75"H x 12.00"W x 3.1"D (349.8mm x 304.8mm x 78mm
PZWIFIEN	PanZone® Wireless Access Point Enclosure; accommodates Cisco Aironet^ 1250 Series Wireless Access Points. UL2043 rated. Dimensions: 13.75"H x 12.00"W x 4.75"D(349.8mm x 304.8mm x 120.6mm)
PZWIFIEN A	PanZone® Wireless Access Point Enclosure; compatible with all Cisco Aironet^ 1250 Series WAPs when used with Cisco Patch Antennas (AIRANT5140V- R and/or AIR-ANT2430V-R). UL2043 rated. Dimensions: 13.75"H x 12.00"W x 4.75"D (349.8mm x 304.8mm x 120.6mm).
PZWIFIED	PanZone® Wireless Access Point Enclosure; accommodates Cisco Aironet^ 1230 and 1240 Series Wireless Access Points. UL2043 rated. Dimensions: 13.75"H x 12.00"W x 3.06"D (349.8mm x 304.8mm x 77.7mm).

PZWIFIEA	PanZone® Wireless Access Point Enclosure; compatible with all Cisco Aironet^ 1200, 1230, and 1240 Series WAPs when used with Cisco Patch Antennas (AIR-ANT5145V-R and/or AIR-ANT5959). UL2043 rated. Dimensions: 13.75"H x 12.00"W x 3.06"D (349.8mm x 304.8mm x 77.7mm).
PZWIFIEH	PanZone® Wireless Access Point Enclosure; accommodates HP ProCurve* 420, Foundry‡ IP200, and Enterasys^^ RBT-4102 Wireless Access Points. UL 2043 rated. Dimensions: 13.75"H X 12.00"W X 3.06"D (349.8mm X 304.8mm X 77.7mm).
PZWIFIE	PanZone® Wireless Access Point Enclosure; accommodates Cisco Aironet^ 1200 Series Wireless Access Points. UL2043 rated. Dimensions: 12.00"H x 12.00"W x 2.31"D (304.8mm x 304.8mm x 58.7mm).
PZWIFIEW	PanZone® Wireless Access Point Enclosure with windowed front door; accommodates Cisco Aironet^ 1130 Series Wireless Access Points. Dimensions: 12.00"H x 12.00"W x 2.31"D (304.8mm x 304.8mm x 58.7mm).
In Ceiling Mounting Brackets	
PZWIFICB	PanZone® Wireless Enclosure In-Ceiling Mounting Bracket Kit for PZWIFIE and PZWIFIEW. Dimensions: 3.31"H x 13.62"W x .75"D (84.1mm x 345.9mm x 19.0mm).
PZWIFIDCB	PanZone® Wireless Enclosure In-Ceiling Mounting Bracket Kit for PZWIFIEN, PZWIFIENA, PZWIFIED, PZWIFIEA and PZWIFIEH. Dimensions: 4.06"H x 13.73"W x .81"D (103.1mm x 348.7mm x 20.6mm).
PZW2X2CB	PanZone® Wireless Enclosure 2x2 ft. In-Ceiling Mounting Bracket Kit for PZWIFIE and PZWIFIEW. Dimensions: 3.19"H x 23.75"W x 23.75"D (81.1mm x 603.3mm x 603.3mm).
PZW2X2DCB	PanZone® Wireless Enclosure 2x2 ft. In-Ceiling Mounting Bracket Kit for PZWIFIEN, PZWIFIENA, PZWIFIED, PZWIFIEA, and PZWIFIEH. Dimensions: 3.94"H x 23.75"W x 23.75"D (100.1mm x 603.3mm x 603.3mm).

3 EXECUTION

3.01 INSTALLATION

.1 Ceiling Enclosures

.1 Attach the enclosure to the ceiling so that the access door can be opened fully without obstruction by other building, storage or architectural components. Locate the enclosure near the center of the cabling zone. The enclosure should be positioned so that access to the enclosure does not require movement of furnishings and so that disturbance in the workspace is minimized. The ceiling space must provide sufficient height for the enclosure. Access to the enclosure through surrounding ceiling tiles should also be considered when selecting location of the enclosure.

.2 Follow the manufacturer's installation instructions when securing the enclosure to the ceiling and installing equipment. The enclosure must be attached to building structure with threaded rods and cannot be supported by the drop ceiling grid (t-bars) or tiles unless the enclosure is provided with brackets specifically for this purpose. Use 3/8" hardware or appropriate hardware as defined by local code or the authority having jurisdiction to secure the enclosure to building structure. Auxiliary framing may be required to position the enclosure as desired. The body of the enclosure should be above the drop ceiling tiles. The access door of the enclosure should be flush with the drop ceiling grid. Seal the cable port(s) with the included foam sealing kit(s) per instructions in plenum ceilings used as air handling spaces.

Note: Seismic installations require additional bracing of enclosures and overhead cable runways to building structure as advised by and certified by a licensed structural engineer.

.2 Raised-Floor Enclosures

.1 Select a position for the raised floor enclosure where the enclosure (tile over the enclosure) can be opened fully without obstruction by other building, storage or architectural components. Location should be central within the cabling zone. The enclosure should be positioned so that access to the enclosure does not require movement of furnishings and so that disturbance in the workspace is minimized. The floor space must provide sufficient depth for the enclosure. Access to the enclosure through surrounding raised floor tiles should also be considered when selecting location of the enclosure.

.2 Follow the manufacturer's installation instructions when securing the enclosure to the floor or raised floor pedestals and installing equipment. The body of the enclosure should be below the raised floor tiles. The raised floor tile above the enclosure serves as the cover for the enclosure and should be flush with the floor. Seal the cable port(s) with the included foam sealing kit(s) per instructions in raised floor plenums used as air handling spaces.

Note: Seismic installations require additional bracing of enclosures to building structure as advised by and certified by a licensed structural engineer.

.3 Wall-Mount Enclosures

.1 Select a location for the wall-mount enclosure where the enclosure can be opened fully without obstruction by other building, storage or architectural components. Location should be central within the cabling zone. The enclosure should be positioned so that access to the enclosure does not require movement of furnishings and so that disturbance in the workspace is minimized.

.2 Follow the manufacturer's installation instructions when securing the enclosure to the wall and installing equipment.

END OF SECTION

1 GENERAL

1.01 RELATED DOCUMENTS

.1 a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 & 1 Specification Sections, apply to this Section.

1.02 SUMMARY

.1 Section Includes:

.1 Telecommunications termination elements.

.2 Related Sections:

.1 Section 270500 “Common Work Results for Communications”

.2 Section 271323 "Communications Optical Fiber Backbone Cabling"

.3 Section 271315 “Communications Copper Horizontal Cabling”

.4 Section 271116 “Communications Cabinets, Racks, Frames and Enclosures”

1.03 SUBMITTALS

.1 Coordinate with Division 0 & 1.

.2 Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

.3 Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

.1 Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

.2 Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

.3 Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.04 QUALITY ASSURANCE

.1 Electrical Components, Devices, and Accessories: Listed and labeled, meeting the National Electrical code or National Building Code and tested by a qualified testing agency, and marked for intended location and application

.2 Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-B, the National Electrical Code and the National Building Code.

.3 Grounding: Comply with ANSI-J-STD-607-A and the National Electrical Code.

.4 Warranty

.1 See Section 270500 “Common Work Results for Communications”.

.5 PROJECT CONDITIONS

.1 Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings in IT spaces is complete.

.6 COORDINATION

.1 Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

.2 Meet jointly with other equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.

.3 Record agreements reached in meetings and distribute them to other participants.

.4 Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

.5 Adjust arrangements and locations of equipment with distribution frames,

.6 cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

.7 Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

2 PRODUCTS

2.01 MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE THE FOLLOWING:

.1 PANDUIT

2.02 CATEGORY 6A MODULAR PATCH PANELS

.1 24 and 48 port patch panels that accept Category 6A modular jacks with IDC connector terminations on rear

.1 The patch shall have electrical performance guaranteed to meet or exceed TIA/EIA 568-
C.2 Category 6A and ISO/IEC 11801 Class EA component and channel specifications.

.2 The panel shall be available in flat and angled 24-port 1RU and 48-port 1RU and 2RU configurations.

.3 Each modular jack in the panel shall come with universal A/B labeling and IDC termination that ensures 22 to 26 AWG cable conductors are fully terminated by utilizing a termination cap design and terminates to the modular jack through a smooth forward motion without impact on critical internal components for maximum reliability.

.4 Each modular jack shall be 100% performance tested, capable of being re-terminated up to 20 times and identified with the performance level and with an individual serial number for traceability.

.5 The panel shall have a black powder finish over high-strength steel.

.6 The panel shall have a labeling option to comply with TIA/EIA-606-A.

.7 The panel shall be equipped with a removable rear mounted cable management bar

.8 The panel shall be UL listed and UL-C certified.

.9 The panel shall support network line speeds in excess of 1 and 10 gigabit per second and
be backward compatible with Category 6, 5e, 5 and 3 cords and cables.

.10 The Category 6A modular jack panels shall meet or exceed the Category 6/Class E
standards requirements in ISO/IEC 11801, TIA/EIA-568C and shall be UL Listed.

.11 The panels shall be 19-inch rack mountable.

.2 B. 24 and 48 port patch panels:

.1 1. The Category 6A modular jack panels shall meet or exceed Category 6A standards
requirements in ANSI/ TIA 568-C.2 and Class EA in Amendment 1 to ISO/IEC11801:2002 shall be UL Listed.

.2 The modular jack panel shall utilize universal A/B wiring.

.3 The jack panels shall be 19-inch rack mountable.

Insertion Loss	5 %	2 %
Electrical Parameter	*Guaranteed Channel Margins to ISO/IEC 11801:2002 "Class E" (1 – 250MHz)*	*Guaranteed Channel Margins to Draft ISO/IEC 11801 Edition 2.1 "Class EA" (1 – 500 MHz)*
NEXT	6 dB	1 dB
PSNEXT	7.5 dB	2.5 dB
ACR-F	6 dB	4 dB
PSACR-F	8 dB	6 dB
Return Loss	3 dB	2 dB
PSANEXT	N/A	2 dB
PSAACR-F	N/A	5 dB

2.03 HIGH-CAPACITY, HIGH-DENSITY COMBINATION FIBER-OPTIC PANEL AND MODULAR SHELVES

.1 Modular Shelves

.1 Low Profile Combination Modular Shelf

.1 The shelf shall be used for a combination of splicing and termination of fiber-optic building cable or outside plant (OSP) cables.

.2 The modular shelf shall be available in both 1U- and 2U-height fully enclosed shelves, with integrated front cable management trough included.

.3 They shall be a slide-out, tilt-down tray for easy access. Slide-out, tilt-down functionality shall be maintained regardless of the number of enclosures stacked one on top of another within a given rack or cabinet.

.4 They shall provide complete interoperability with MTP based plug and play pre-terminated fiber systems.

.5 The modular shelf shall have interchangeable modules, which are ordered separately.

.6 The modules shall be available in LC for 50 and 62.5 micron multimode and single mode solutions

.7 The 1U shelf shall accept up to 4 modules and the 2U shelf shall accepts 8 fiber modules, which shall be pre-populated with fiber-optic adapters.

.8 The fiber modules shall be either fibreless or equipped with pre-terminated pigtails ready for splicing.

.9 Multimedia outlet bezel shall be able to be used interchangeably with the module to facilitate multimedia applications.

.10 Enclosures must be modular to support mixed multimedia applications

.11 i. Each modular shelf shall be equipped with the following:

.1 Hinged front doors for easy access

.2 Front cable management trough

.3 Top cover panel

.4 Standard water-tight cable entry conduit connectors for OSP cable

.5 Blank labels for identifying fiber splices and terminations

.12 Additional shelf accessories shall include Water-tight connector kit for smaller diameter cables.

.13 Specifications:

Modular Fiber Enclosures

Application	Connection Type	Capacity 1U	Capacity 2U
Termination Only	LC	96	192
Termination + Fusion Splicing	LC	96	192
Termination + Mechanical Splicing	LC	48	

.2 Modules for Modular Shelves

.1 The modular shelf systems, described above, shall have interchangeable modules available in LC for multimode and single mode solutions.

.2 Adapters deployed within modules shall be color coded per TIA/EIA 568C.3 .

.3 All modules shall be prepopulated with fiber-optic adapters, and shall be offered with or without pre-assembled and factory-terminated pigtails.

.4 LC adapters must contain zirconia-ceramic alignment sleeves for both LOMF and single mode applications.

.5 Unterminated Modules shall include the following features and options:

.1 Laser Optimized Multimode modules with twelve duplex LC adapters

.2 Multimode modules with twelve duplex LC adapters

.3 Single mode modules with twelve duplex LC adapters

.4 All modules can be used on all shelves

.6 Pre-Terminated Modules shall include the following features and options:

.1 Laser Optimized Multimode modules with twelve duplex LC adapters; include 2-meters long pre-terminated pigtails.

.2 Multimode modules with twelve duplex LC adapters include 2-meters long pre-terminated pigtails.

.3 Single mode modules with twelve duplex LC adapters include 2-meters long pre-terminated pigtails.

.4 All modules can be used on all shelves.

.7 Modular panel shall include:

.1 Blank panel with the same footprint as the fiber module, and can be used in all
modular shelves.

.2 Multimedia Outlet Bezel panel with the same footprint as the fiber module, which accepts up to four M-Series jacks for multimedia applications. Blanking panels for individual ports shall be available.

2.04 FIBER OPTIC CONNECTORS

.1 LC Fiber Optic Connectors

.1 The connector shall have an insertion release mechanism similar to the RJ-45 intuitive push/pull-style housing.

.2 The connector shall be pull-proof to prevent momentary disconnect from axial loads

.3 The connector possess a unitary, anti-snag, rear-pivot latch which facilitates routing of patch cords

.4 The connector shall be field-mountable with minimal polish

.5 The connector shall have the capability to change polarity in the field.

.6 The connector shall be Bellcore, TIA/EIA and IEC compliant

.7 The connector shall meet the following specifications:

Fiber Type	Multimode	Single mode
Nominal Fiber OD	125 im	125 ìm
Cable OD	0.9 mm	0.9 mm
Insertion Loss ì, ó	0.10, 0.10 dB	0.10, 0.15 dB
Return Loss Maximum	-20.0 dB	-40 dB
Cable Retention	2 lbs.	2 lbs.
Mating Durability for 500 Reconnects Insertion Loss Change	<0.2 dB	<0.2 dB
Temperature Stability (-40°C to +75°C) Insertion Loss Change	<0.3 dB	<0.3 dB
Tip Material	Ceramic	Ceramic

Table Footnotes: * Assumes these values represent average and standard deviation.

2.05 REQUIRED ADDITIONAL EQUIPMENT AND MATERIAL NECESSARY FOR INSTALLATION.

.1 A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional SCS installation shall be provided in a level of quality consistent with other specified items.

2.06 110 WIRING BLOCK – WALL MOUNTED (COPPER BACKBONE)

.1 The wiring block shall support Category 3, Category 5, Category 5e and Category 6 (110 type terminations) applications and facilitate cross connection and interconnection using cross connect wire (voice only).

.2 The wiring blocks shall be fire retardant, molded plastic consisting of horizontal index strips for terminating 25 pairs (24 pairs for Category 6) of conductors each. The index strips shall be marked with five colors on the high teeth, separating the tip and ring of each pair, to establish pair location.

.3 C. A series of fanning strips shall be located on each side of the block for dressing the cable pairs
terminated on the adjacent index strips.

.4 The wiring block shall accommodate 22- through 26-AWG conductors and shall be able to mount directly on backboards..

.5 Clear label holders with the appropriate inserts shall be provided with the wiring blocks. The insert labels shall contain vertical lines spaced on the basis of circuit size (3-, 4-, or 5-pair) and shall not interfere with running, tracing or removing jumper wire/patch cords.

.6 The wiring blocks shall be available in 100 and 300 pair sizes.

.7 The wiring block shall be reliable for over 500 repeated insertions without incurring permanent deformation when tested per IEC 11801.

.8 The 110 wiring blocks shall meet the TIA/EIA– T-568-C specifications:

3 EXECUTION

3.01 UNSHIELDED TWISTED-PAIR INSTALLATION

.1 Place unshielded twisted-pair (UTP) cable so as to maintain the minimum cable bend radius limits specified by the manufacturer or the following, whichever is larger:

.1 1. Horizontal 4-Pair Unshielded Twisted-Pair Cables:

.1 Termination Points: eight times the cable diameter.

.2 Other Locations: four times the cable diameter.

.2 Multi-pair Unshielded Twisted-Pair Cables: Maintain a minimum bend radius of ten
times the cable diameter.

.2 To avoid stretching four-pair horizontal cable conductors during installation, do not exceed a25-pound force pulling tension (tensile loading).

.3 Place copper cables transitioning between the cable trays and cabinets or racks in a neat and orderly manner per NEC 318.11(b) requirements. Velcro tie-wrap transitioning bundles.

.4 Directly terminate twisted-pair cable on wiring blocks, patch panels, and TOs in standard T568B color termination scheme.

.5 Use wiring block and/or connector manufacturer's recommended tools with the proper-sized anvils for all copper punch down, wire wrap, and crimp terminations. Stuffer caps are not permitted.

.6 Unshielded twisted-pair connecting hardware and material including wiring blocks, patch

.7 panels, connectors, TOs, cross-connect jumper wire or cables, patch cords, and other components used to connect unshielded 1 00-ohm twisted-pair cable shall meet or exceed the requirements of EIA/TIA 568-C.2, Specifications for Unshielded Twisted-Pair Connecting Hardware, for the category of use specified in the Contract Documents.

.8 Cable Jackets: To reduce untwisting of pairs, maintain the twisted pair cable jacket as close as
possible to the point of termination.

.1 Multi-pair Cable: Strip back only as much cable jacket as is minimally required to terminate on connecting hardware.

.2 Horizontal Cable: Strip back no more than 1 inch of cable sheathing.

.9 H. Pair Twist: Observe the TIA/EIA -568-C recommended practice of preserving wire pair twists as closely as possible to the point of mechanical termination. The amount of untwisting in a pair as a result of termination to connecting hardware shall be no greater than 1/2 inch for all copper cables. This practice maintains the maximum number of twists in the wire, to minimize signal impairment and reduce potential problems with high-speed transmission.

3.02 FIBER-OPTIC INSTALLATION

.1 Place fiber-optic cable so as to maintain the minimum cable bend radius limits specified by the manufacturer or the following, whichever is larger:

.2 Horizontal Fiber-Optic Cables:

.1 Termination Points: Ten times the cable diameter.

.2 Other Locations: Ten times the cable diameter.

.3 Backbone Fiber-Optic Cables: Maintain a minimum bend radius of ten times the cable diameter.

.4 Place fiber-optic cables transitioning between the cable trays and cabinets or racks in a neat and orderly manner per NEC 318.11(b) requirements and pathway requirements of EIA/TIA 569-A. Velcro tie-wrap transitioning bundles.

.5 Follow guidance of current draft of proposed TIA/ EIA 568-C.3 regarding polarity management of fiber elements in the permanent link. Directly terminate fiber-optic on patch panels, in standard color code order.

.6 Use connector manufacturer's recommended tools.

.7 Fiber-optic connecting hardware and material including patch panels, connectors, TOs, cross-connect cables, patch cords, and other components used to connect fiber-optic cable shall exceed the requirements of TIA/EIA 568-C.3. Specifications for Fiber-optic Connecting Hardware for the type of use specified in the Contract Documents.

.8 Cable Jackets: Maintain the cable jacket as close as possible to the point of termination.

.9 Strip back only as much cable jacket as is minimally required to terminate on connecting
hardware.

3.03 IDENTIFICATION

.1 See Section 270553 "Identification for Communications Systems".

END OF SECTION

1 GENERAL

1.01 GENERAL

.1 The Telecommunications Cabling Contractor shall ensure ANSI/EIA/TIA-568-B installation practices are followed.

.2 The Telecommunications Cabling Contractor shall terminate all pairs of cable. Terminate all spare cables at the Telecommunication Room end.

.3 The Telecommunications Cabling Contractor shall run all horizontal cables parallel to building grid lines with no splices.

.4 Provide 3m (10'-0") of slack at the workstation end of the cable to permit future outlet relocation. Neatly coil slack in ceiling space or on the side of the cable tray.

.5 Provide 1m (3'-0") of slack at the Telecommunications Room end of the cable to permit future relocation. Neatly coil the cable in the cable tray or in the ceiling space.

.6 Inform The Consultant immediately of any horizontal cable runs exceeding 90 m 295' (ft.).

.7 When terminating copper cables remove cable jacket only enough to perform termination and untwist pairs a maximum of 13 mm (1/2") for Category 6 cables.

.8 The Consultant shall determine the quality of workmanship during installation. Cables that have not been properly installed will be reinstalled by the Telecommunications Cabling Contractor at no additional expense to the client.

.9 Maintain a minimum of four (4) times cable diameter as a bend radius if no bend radius is specified.

2 PRODUCT

2.01 CATEGORY 6 CABLES

.1 Data - 4-pair UTP cable shall exceed Category 6A requirements per ANSI/TIA/EIA-568-B.

.2 The PANDUIT ® TX Copper Plenum Rated Cable shall be used for the horizontal cabling subsystem. These requirements are for cables of unshielded 24 AWG bare copper conductors, insulated with thermoplastic, twisted into pairs and enclosed in a thermoplastic jacket. The finished cable shall meet or exceed the following requirements of ANSI/EIA/TIA-568-B.

.3 All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations and carry labeling of CMP. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor and carry the labeling of CMR.

Part Number	Category	Colours
PUP6004**-U	6 Plenum	4

** Denotes colour

.4 Colour:

.1 Phone: White

.2 Data: Blue

3 EXECUTION

3.01 INSTALLATION

.1 All horizontal cables shall be bundled on the Telecommunications Racks using Panduit Velcro straps. Bundles shall be wrapped at a maximum of 203 mm 8” (in) separation.

.2 All exposed cabling at the workstation between wall/floor-input point locations and systems furniture are to be wrapped with Panduit Pan-Wrap Split Harness Wrap or Panduit Polyethylene Spiral Wrap, size and length as required to suit.

.3 Provide blank filler plates for all unused modular jack positions on faceplates.

.4 Supply and install Category 6 CMP cables to the outlets outlet indicated on the drawings. The Telecommunications Cabling Contractor shall refer to the legends on the drawing to determine the number of cables to each outlet location.

.5 Terminate test and label each Cat6 cable in accordance to the parameters stated in this specification document.

END OF SECTION

1 GENERAL

1.01 GENERAL

1. None.

2 PRODUCT

2.01 Panduit TX6 Plus Category 6 Patch Cord (Data)

1. Category 6 Patch Cords shall be factory terminated with enhanced performance Pan-Plug ™ modular plugs featuring a one-piece, tangle-free latch design eliminating the need for strain-relief boots to provide easy moves, adds and changes. Each patch cord shall be 100% verified for wiring sequence and continuity at the factory. The patch cords shall come in standard lengths of three, five, seven, 10 14, and 20 feet and six standard colors of Off White, Black, Blue, Green, Red and Yellow.

Part Number	Length (ft)	Length (M)
UTPSP3**	3	0.91
UTPSP5**	5	1.52
UTPSP7**	7	2.13
UTPSP10**	10	2.74
UTPSP14**	14	4.27
UTPSP20**	20	6.10

** Designates colour

2. Provide a 7’ patch cord for each data outlet indicated on the drawings.
3. Colour:
   .1 Phone: White
   .2 Data: Blue

Fiber Optic Patch Cords

1. Dual fiber optic patch cables to meet same performance criteria as fiber optic cabling.
2. Cables to be FL Plug to an SC.
3. Connectors to be;

Part Number	Category	Plug Config	Length
FXE10-10M3Y	10G 50/125 µm	LC to LC	10’-3m

4. Patch cords positions (i.e., A & B) to be in accordance with ANSI/TIA/EIA-568-B.3.
5. Colours: Multimode: Aqua

3 EXECUTION

3.01 INSTALLATION

1. Refer to Section 27 Horizontal Cabling for quantities and installation details.

END OF SECTION

1 GENERAL

1.01 1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 & 1 Specification Sections, apply to this Section.

.2 Section 270500 “Common Work Results for Communications”

1.02 SUMMARY

.1 Section Includes:

.1 Twisted-pair jumper wires;

.2 Twisted-pair patch cords.

.3 Fiber Optic patch cords.

.4 Related cross-connect components;

.5 Cross-connection and patching

.2 Related Sections:

.1 Section 270500 “Common Work Results for Communications”

.2 Section 271323 “Communications Optical Fiber Backbone Cabling”

.3 Section 271315 “Communications Copper Horizontal Cabling”

.4 Section 271313 “Communications Copper Backbone Cabling”

.5 Section 271119 “Termination Blocks and Patch Panels”

1.03 SUBMITTALS

.1 Product Data: For each type of product indicated.

.1 For Category-6a patch cords, include the following installation data for each type used:

.1 Nominal OD.

.2 Minimum bending radius.

.3 Maximum pulling tension.

.2 For Fiber Optic patch cords, include the following installation data for each type used:

.1 Nominal OD.

.2 Minimum bending radius.

.3 Maximum pulling tension.

.2 Source quality-control reports.

.3 Field quality-control report

1.04 QUALITY ASSURANCE

.1 Electrical Components, Devices, and Accessories: Listed and labeled by a qualified testing agency, and marked for intended location and application.

.2 Warranty

.1 See Section 270500 “Common Work Results for Communications”.

1.05 DELIVERY, STORAGE, AND HANDLING

.1 Test cables upon receipt at Project site.

.1 Test optical fiber cables to determine the continuity of the strand end to end. Use optical loss test set.

.2 Test each pair of UTP cable for open and short circuits.

1.06 PROJECT CONDITIONS

.1 A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2 PRODUCTS

2.01 PATCH CABLES

.1 Manufacturers: Subject to compliance with requirements, available manufacturers
offering products that may be incorporated into the Work include the following:

.1 PANDUIT

.2 General Requirements: Comply with TIA/EIA-569-C.

.3 Patch Cords: Factory-made, four-pair cables terminated with eight-position modular plug at each end in lengths as indicated in pricing sheet.

.1 Patch cords shall have bend-relief-compliant boots to ensure Category 6a performance.

.2 UTP Patch Cords to be provided for one at rack and one at workstation (2 per outlet). Shall be available in the following lengths:

Description
4- pair UTP Category-6A Non-plenum Modular Patch Cords - 7ft
4- pair UTP Category-6A Non-plenum Modular Patch Cords - 10ft

.4 Patch Cords: Factory-made, dual-fiber cables with NC connectors.

.5 Estimated Quantities

.1 The estimate of cable counts and lengths is given for bid purposed only; the final count and lengths will be provided in the integration phase of the project.

.2 Pricing should include single cable pricing and quantity discount pricing.

.6 Cable Connecting Hardware:

.1 Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA568-C.3.

.2 Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.

2.02 IDENTIFICATION PRODUCTS

.1 Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, and
inks used by label printers.

.2 Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.03 SOURCE QUALITY CONTROL

.1 Factory test UTP cables according to TIA/EIA-568-C.2.

.2 Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568- C.3.

.3 Provide test and inspection reports.

3 EXECUTION

3.01 FIELD QUALITY CONTROL

.1 Perform tests and inspections.

.1 Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling connections for compliance with TIA/EIA-568-C.1.

.2 Visually confirm Category 6a, marking of patch cables.

.3 Visually confirm Fiber patch coble marking.

.4 Visually inspect cable placement, and patch cords, and labeling of all components.

.2 Use copper patch cord lock-in devices to prevent the disconnection of critical equipment connections.

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 Section Includes:

.1 Materials and installation for fire alarm systems.

.2 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general two-stage alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.

.3 Trouble signal devices.

.4 Power supply facilities.

.5 Manual alarm stations.

.6 Automatic alarm initiating devices.

.7 Audible signal devices.

.8 End-of-line devices.

.9 Annunciators.

.10 Visual alarm signal devices.

.11 .Ancillary devices.

1.02 REFERENCES

.1 Government of Canada

.1 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.

.2 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 .Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524-2001, Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525-1999, Audible Signal Device for Fire Alarm Systems.

.3 CAN/ULC-S526-2002, Visual Signal Devices for Fire Alarm Systems.

.4 CAN/ULC-S527-1999, Control Units.

.5 CAN/ULC-S528-1991, Manual Pull Stations for Fire Alarm Systems.

.6 CAN/ULC-S529-2002, Smoke Detectors for Fire Alarm Systems.

.7 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.

.8 CAN/ULC-S531-2002, Standard for Smoke Alarms.

.9 CAN/ULC-S536-S537-2004, Burglar and Fire Alarm Systems and Components.

.4 National Fire Protection Agency

.1 NFPA 72-2002, National Fire Alarm Code.

.2 NFPA 90A-2002, Installation of Air Conditioning and Ventilating Systems.

1.03 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.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

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

.2 Include:

.1 Layout of equipment.

.2 Zoning.

.3 Complete wiring diagram, including schematics of modules.

.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.

.3 Manufacturer's Field Reports: manufacturer's field reports specified.

.4 Closeout Submittals:

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.

.2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.

.3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15working days to prior to final inspection.

.4 Submit following:

.1 Manufacturer's Data for:

.1 Control panel and modules.

.2 Storage batteries.

.3 Battery charger.

.4 Manual pull stations.

.5 Heat detectors.

.6 Open-area smoke detectors.

.7 Duct smoke detectors.

.8 Alarm bells.

.9 Alarm horns.

.10 Visible appliances.

.11 Main annunciator.

.12 Remote annunciator panel.

.13 Graphic annunciator panel.

.14 Master fire alarm boxes.

.15 Auxiliary transmitter.

.16 Master box pedestal.

.17 Radio master box pedestal.

.18 Master box.

.19 Radio master box location light.

.20 Radio fire alarm master box.

.21 Radio fire alarm auxiliary transmitter.

.22 Radio fire alarm interface panel.

.23 Combination auxiliary transmitter and interface panel.

.24 Freeze protection thermostatic switch.

.25 Electro-magnetic door holder-releases.

.26 Valve tamper switches.

.27 Wiring.

.28 Ground rods.

.29 Conduit.

.30 Outlet boxes.

.31 Fittings for conduit and outlet boxes.

.32 Trouble bell buzzer.

.33 Projected beam smoke detector.

.34 Surge suppression devices.

.35 Mark data which describe more than one type of item to indicate which type will be provided.

.36 Submit 1original for each item and clear, legible, first-generation photocopies for remainder of specified copies.

.2 System wiring diagrams:

.1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.

.2 Show modules, relays, switches and lamps in control panel.

.3 Design data: Power Calculations:

.1 Submit design calculations for existing system and new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.

.2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.

.3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.

.4 Instructions for operation:

.1 Projected beam smoke detector.

.5 Schedules:

.1 Conductor wire marker schedule.

.6 Test Reports:

.1 Open-area 2-wire smoke detectors.

.2 Preliminary testing:

.1 Final acceptance testing.

.2 Submit for inspections and tests specified under Field Quality Control.

1.04 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in fire alarm system installations with 5 -years documented experience approved by manufacturer.

.2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

.3 System:

.1 To TB OSH Chapter 3-04.

.2 Subject to Fire Commissioner of Canada (FC) approval.

.3 Subject to FC inspection for final acceptance.

.4 To Canadian Forces Fire Marshal approval.

.4 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.5 Maintenance Service:

.1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative DCC Representative Consultant.

1.05 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.1 Power supply: to CAN/ULC-S524.

.2 Audible signal devices: to CAN/ULC-S525.

.3 Visual signal devices: to CAN/ULC-S526.

.4 Control unit: to CAN/ULC-S527.

.5 Manual pull stations: to CAN/ULC-S528.

.6 Thermal detectors: to CAN/ULC-S530.

.7 Smoke detectors: to CAN/ULC-S529.

.8 Smoke alarms: to CAN/ULC-S531.

2.02 SYSTEM OPERATION

.1 Provide complete, electrically supervised, code 3 temporal common coded, manual and automatic, zoned, enunciated, fire alarm system.

.2 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.

.3 Single stage operation. Operation to actuation following:

.1 Manual station.

.2 Heat detector.

.3 Smoke detector.

.4 Automatic fire sprinkler system.

.5 Fire extinguishing system.

.6 Fire standpipe system.

.4 Actuation of single operation device to initiate following:

.1 Building evacuation alarm devices to operate continuously.

.2 Transmit signal to fire department via fire alarm transmitter monitoring station.

.3 Zone of alarm device to be indicated on control panel and remote annunciators.

.4 Air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.

.5 Fire doors and smoke control doors if normally held open, to close automatically.

.6 Electro-magnetic door holders to de-energize.

.7 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.

.8 Fire doors and smoke control doors if normally held open, to close automatically.

.9 Electro-magnetic door holders to de-energize.

.10 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.

.5 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

2.03 CONTROL PANEL

.1 Addressable Simplex 4010ES.

.2 Single stage operation.

.3 Zoned.

.4 Coded.

.5 Enclosure:

.1 CSA Enclosure 1, c/w lockable concealed hinged door, full viewing window, flush lock and 2 keys.

.2 Provide modular type panel installed in flush surface mounted steel cabinet with hinged door and cylinder lock.

.3 Mount with panel centreline 1.5 m above finished floor elevation.

.4 Switches and other controls: not accessible without use of key.

.5 Design of control panel: neat, compact assembly containing parts and equipment required to provide specified operating and supervisory functions of system.

.6 Control panel components: CSA approved and approved by control panel manufacturer for use in control panel.

.7 Panel cabinet: finished on inside and outside with factory-applied enamel finish.

.8 Provide main annunciator located on exterior of cabinet door or visible through cabinet door.

.9 Provide audible trouble signal.

.10 Provide permanent engraved rigid plastic metal identification plates, silk-screened labels attached to rear face of panel viewing window, for lamps and switches.

.11 Provide 1 set of Form C dry alarm contacts per zone, common system Form C dry alarm contact, and common system Form C dry trouble contact. Indicate set/unset condition of master box auxiliary transmitter by control panel.

.12 Permanently label switches.

.13 Provide panel with following switches:

.1 Trouble silencing switch which silences audible trouble signals including remote trouble devices without extinguishing trouble indicating lamp(s).

.1 For non-self-resetting type switch: Upon correction of trouble condition, audible signals will again sound until switch is returned to its normal position.

.2 For silencing switch of momentary action self-resetting type: trouble signal circuit automatically restored to normal upon correction of trouble condition.

.2 Evacuation alarm silencing switch which when activated will silence alarm notification appliances without resetting panel, and cause operation of system trouble signals. Subsequent alarm(s) from additional zone(s) not originally in alarm to cause activation of notification appliances even with alarm silencing switch in "silenced" position.

.3 Individual zone disconnect switches which when operated will disable only their respective initiating circuit and cause operation of system and zone trouble signals.

.4 Reset switch which when activated will restore the system to normal standby status after cause of alarm has been corrected, and activated initiating devices reset.

.5 Operation of reset switch to restore activated smoke detectors to normal standby status.

.6 Lamp test switch.

.7 Drill switch which will enable test of notification appliances and restoration to normal without tripping master box.

.8 Master box disconnect switch which when activated will disconnect coded device and cause operation of system trouble signal.

.9 HVAC shutdown bypass switch. Operation of the switch to allow HVAC system to operate with detectors in alarm and cause operation of system trouble signals.

.6 Supervised, modular design with plug-in modules:

.1 Alarm receiver with trouble and alarm indications provision for remote supervised annunciation, for class B initiating circuit.

.2 Spare zones: compatible with smoke detectors and open circuit devices.

.3 Space for future modules.

.4 Latching type supervisory receiver circuits. Discrete indication for both off-normal and trouble.

.7 Components:

.1 Coded alarm receiver panel with trouble and alarm indications for class B initiating circuit.

.2 Single stage alarm pulse rate panels:

.1 Single stroke control type for output to signal control panel continuously.

.3 Two stage alarm pulse rate panel for single stroke output to signal control panel. First stage-20 strokes per minute, second stage continuous.

.4 Common control and power units:

.1 Control panel containing following indications and controls:

.1 "Power on" LED (green) to monitor primary source of power to system.

.2 "Power trouble" indication.

.3 "Ground trouble" indication.

.4 "Remote annunciator trouble" indication.

.5 "System trouble" indication.

.6 "System trouble" buzzer and silence switch c/w trouble resound feature.

.7 System reset switch.

.8 "LED test" switch if applicable.

.9 "Alarm silence" switch to silence signals manually. If new alarm occurs after signals have been silenced, signals to resound.

.10 ."Signals silenced" indication.

.2 Master power supply panel to provide 24 V dc to system from 120 V ac, 60 Hz input.

.3 Fire department connections:

.1 Plug-in module for tripper shunt type municipal box.

.2 Fire department bypass switch c/w indicator for trouble at panel.

.4 Auxiliary relays: plug-in type, dust cover, supervised against unauthorized removal by common trouble circuit and c/w individual bypass switch.

.1 Contacts: 2.0 A, 120 V ac, for functions such as release of door holders or initiation of fan shut down.

.2 Contact terminal size: capable of accepting 22-12 AWG wire.

2.04 POWER SUPPLY

.1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gel cell batteries minimum expected life of 4 years, sized in accordance with NBC.

2.05 MANUAL ALARM STATIONS

.1 Provide non-coded single double action type with mechanical reset features.

.1 Non-coded single pole normally open contact for single stage.

.2 General alarm key switch for two stage system.

.2 Stations: surface semi-flush mounted and interior weatherproof type as indicated.

.1 For surface mounting provide station manufacturer's approved back box.

.2 Back box finish to match station finish.

.3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.

.4 Stations: type not subject to operation by jarring or vibration.

.1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.

.5 Station colour: red.

.6 Provide station with visible indication of operation.

.7 Restoration to require use of key.

.1 Keys: identical throughout system for stations and control panel(s).

.8 Mount stations with operating lever not more than 1.2 m above finished floor.

.9 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.

.1 Finish housings with red enamel paint and provide permanently affixed engraved raised-letter plastic metal bilingual English French signage indicating "FIRE ALARM" with white letters of 19 mm high.

2.06 AUTOMATIC ALARM INITIATING DEVICES

.1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise rate compensating line-type fixed temperature principle.

.2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for surface semi-flush outlet box mounting and supported independently of conduit, tubing or wiring connections.

.1 Contacts: self-resetting after response to rate-of-rise actuation

.2 Operation under fixed temperature actuation to result in external indication.

.3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.

.3 Rate Compensating Detector (Spot Type): designed for surface flush vertical unit outlet box mounting and supported independently of conduit, tubing or wiring connections.

.1 Detectors: hermetically sealed and automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise.

.2 Detector operation: not be subject to thermal time lag.

.4 Line-Type Fixed Temperature Detectors: provide thermostatic or thermistor line-type heat detection cable with weather-resistant outer covering where indicated.

.1 Cable: nominally rated for temperature of 6888 138 degrees C and operate on fixed temperature principle.

.5 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by ionization photoelectric principle.

.1 Detectors: 4-wire 2-wire type.

.2 Provide necessary control and power modules required for operation integral with control panel.

.3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.

.4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.

.5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.

.6 Provide remote indicator lamps for each detector that is located above suspended ceilings, beneath raised floors, concealed from view.

.7 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.

.8 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.

.9 Screen each detector to prevent entrance of insects into detection chamber(s).

.6 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.

.1 Provide separate, power circuit for each smoke detection initiating circuit (zone).

.2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.

.7 2-Wire Smoke Detectors: detector circuits of 2-wire type capable of transmitting detector operating power over initiating circuit are permitted, provided detectors used are approved by control panel manufacturer for use with control panel provided and are ULC listed as being compatible with control panel.

.1 Total number of detectors on any detection circuit: not exceed 80% of maximum number of detectors allowed by control panel manufacturer for that circuit. Provide additional zones if required to meet this requirement.

.8 Ionization Detectors: multiple chamber type responsive to both invisible and visible particles of combustion.

.1 Detectors: not susceptible to operation by changes in relative humidity.

.9 Photoelectric Detectors: operate on light scattering principle using LED light source.

.1 Detector: respond to both flaming and smouldering fires.

.10 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.

.11 Mount detectors at underside of ceiling or deck above unless otherwise indicated.

.1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.

.2 For heights greater than 9 m space detectors no farther apart than 34% of their listed spacing.

.12 Temperature rating of detectors: in accordance with NFPA 72.

.13 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.

.14 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.

.15 Provide detectors with terminal screw type connections.

.16 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.07 ALARM INITIATING DEVICE SPACING AND LOCATION

.1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.

.2 Provide at least 2 detectors in rooms of 54 square meters or larger.

.3 Spacing: not to exceed 9 m by 9 m per detector, and 9linear m per detector along corridors.

.4 Locate detectors minimum 0.9 1.5 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.

.5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

.6 Mount detectors installed beneath raised floors with base within 50 mm of underside of raised floor, with detector facing downward.

.1 Where space under raised floor is less than 300 mm in height, mount detectors with their bases either horizontal or vertical, with detection chamber(s) located in upper half of underfloor space.

.2 Do not mount detectors facing upward.

.3 Space detectors beneath raised floors maximum 4.5 m by 4.5 m, 6 m by 6 m per detector.

2.08 AUDIBLE SIGNAL DEVICES

.1 Provide remote system trouble 100mm bell buzzer arranged to operate in conjunction with panel's integral trouble signal.

.2 Locate remote trouble bell buzzer as indicated.

.1 Provide 100 mm trouble bell external trouble buzzer at control panel arranged to operate in conjunction with panel's integral trouble signal.

.2 Provide trouble bell buzzer with rigid plastic white on red engraved identification sign which reads "FIRE ALARM SYSTEM TROUBLE".

.3 Lettering on identification sign: minimum 25 mm high.

.3 Audible device(s):

.1 Horns: weatherproof mounting, 24 V dc.

.2 Mini-horns: surface flush mounting, red beige colour, 24 V dc.

.4 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.

.5 Provide appliances specifically listed for outdoor use in locations exposed to weather.

.6 Finish appliances in red enamel.

.7 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

2.09 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open , short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.10 PASSIVE GRAPHIC

.1 Provide passive graphic at Fire Alarm Control Panel.

2.11 VISUAL ALARM SIGNAL DEVICES

.1 Surface Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.

.2 Appliances: minimum of 15 30 75 110 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location shown.

.3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.

.4 Provide visible appliances within 300 mm of each audible appliance as indicated.

.5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.12 FREEZE PROTECTION THERMOSTATIC SWITCH

.1 Provide switch with concealed set point, cover, and allen head screws.

.2 Omit temperature indicator or conceal indicator within cover. Switch: not to be adjustable below 4 degrees C. Switch contacts to transfer close when fire protection equipment room air temperature drops below 4 degrees C, causing supervisory signal on fire alarm system. Removal of switch from circuit to cause trouble signal on its respective zone.

.3 Mount switch with centreline 1.5 m above finished floor.

.4 Provide with insulating subbase when mounting on exterior wall.

2.13 GROUNDING

.1 Ground each master box transmitter by connection from grounding terminal connection of box to either driven ground rod or buried, metallic water pipe.

.1 Resistance to ground: not exceed 10 ohms.

.2 Ground rods: sectional type, copper-encased steel, with minimum diameter of 19 mm and total length of 3 m.

.3 Rods: hard, clean, smooth, continuous copper surface throughout rods length.

.4 Copper: minimum wall thickness of 0.325mm at any point on rod.

.5 Ground rods: not to protrude more than 75 mm above grade.

2.14 WIRING

.1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.

.2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor

.3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.

.4 Wire for connection to base telegraphic alarm loop: No. 10 12 AWG minimum solid copper conductor.

.5 Insulation 75 degrees C minimum with nylon jacket.

.6 For underground or wet allocations cable from control panel to master box auxiliary transmitter and to telegraphic loop: type UF.

.7 Colour code wiring.

2.15 SURGE SUPPRESSION

.1 Provide line voltage and low voltage surge suppression devices to suppress voltage transients which might damage control panel and transmitter components.

.2 Mount suppressors in separate enclosure(s) adjacent to control panel and transmitter unless suppressors are specifically UL approved for mounting inside control panel and transmitter provided and approved for such use by control panel and transmitter manufacturers.

2.16 LINE VOLTAGE SURGE SUPPRESSOR

.1 Suppressor : ULC approved with maximum 330 volt clamping level and maximum response time of 5 nanoseconds.

.2 Suppressor: multi-stage construction which includes inductors and silicon avalanche zener diodes.

.3 Equip suppressor with long-life indicating lamp light emitting diode neon lamp which extinguishes upon failure of protection components.

.4 Fuses: externally accessible.

.5 Wire in series with incoming power source to protected equipment using screw terminations

2.17 LOW VOLTAGE SURGE SUPPRESSOR

.1 Provide surge suppression for circuits which leave building shell.

.2 When circuits interconnect 2 or more buildings, provide arrestor at circuit entrance to each building.

.3 Suppressor: UL 497B listed with maximum 30 volt clamping level and maximum response time of 5 nanoseconds.

.4 Suppressor: multi-stage construction and both differential and common mode protection.

2.18 AS-BUILT RISER DIAGRAM

.1 Fire alarm system riser diagram: in glazed frame on black lamicoid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

2.19 ANCILLARY DEVICES

.1 Remote relay unit to initiate fan shutdown.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.

.2 Install main control panel and connect to ac power supply, ac dc standby power.

.3 Locate and install manual alarm stations and connect to alarm circuit wiring.

.4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Locate and install signal bells chimes horns and visual signal devices and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices at end of alarm and signalling circuits.

.9 Install remote annunciator panels and connect to annunciator circuit wiring.

.10 Locate and install door releasing devices.

.11 Locate and install remote relay units to control fan shut down.

.12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.13 Room detection system including Halon 1301.

.1 Locate and install detectors. Make necessary connections between room detection panel and main fire alarm panel.

.2 Locate and install audible signals visual alarms.

.3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.

.4 Locate and install gas discharge stations. Connect valves on Halon system to room detection panel.

.14 Connect fire suppression systems to control panel.

3.03 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electricaland CAN/ULC-S537.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system Halon system transmit alarm to control panel and actuate first stage alarm general alarm ancillary devices.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.4 Class A circuits.

.1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.5 Class B circuits.

.1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.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 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, 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.

3.04 TRAINING

.1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.05 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 GENERAL REQUIREMENTS

.1 Conform to requirements specified under Division 01.

1.2 SCOPE OF WORK

.1 Work Included

Provide all plant, labour, equipment and materials to carry out the work of this section. The work includes, but is not limited to, the following:

- Grubbing, stripping and stockpiling of any topsoil
- Excavation and disposal of asphalt, concrete or other materials
- Backfill and compaction
- Rough grading to make ready for application of topsoil for seed or sod
- Removal and disposal of existing foundations
- Dewatering

.2 Related Work Specified Elsewhere

.1 Cast-in-Place Concrete – Division 03
.2 Excavations and Backfill for Mechanical & Electrical Services – Division 33
.3 Asphalt and Curbs – Division 32
.4 Site Services – Division 33
.5 Finish Grading and Landscaping – Division 32

1.3 APPLICABLE STANDARDS

.1 Ontario Building Code 2020 – as currently amended.

.2 The Construction Safety Act, local by-laws and all other regulations of the Ontario Ministry of Labour relating to the work of this Section.

.3 OPSS Forms 1010, and 1010, Material Specification for Aggregates-General and Granular A, B, M, and Select respectively.

1.4 SUB-SURFACE CONDITIONS

.1 Sub-surface investigations were carried out by Bendigo Consulting Inc. dated April 27, 2020 (Reference No. 2020-96-G/K) for the Fuel Tanks Replacement project used as a reference for the foundation work being planned immediately south of the Stores area and the new generator pad location.

.2 A copy of their report is appended within this specification.

.3 The information given in these reports was obtained for the use of the Owner in the execution of the design. It is presented in good faith to assist the Contractor. No guarantee is made or implied as to its detailed accuracy for every site location. It is incumbent upon the Contractor to make any additional tests to obtain any additional information deemed necessary for the proper execution of the work, at no additional cost to the Owner.

1.5 DRAWINGS

.1 Examine the drawings forming a part of this Contract and conform to the requirements of all such drawings.

1.6 COORDINATION AND COOPERATION

.1 Coordinate the work of this Section with the work of all other Sections in accordance with the General Conditions.

.2 Coordination and cooperation are particularly important with Landscaping, Asphalt Paving, Cast-in-Place Concrete, and excavation for Mechanical Electrical trades.

1.7 EXAMINATION

.1 Examine the site for the purpose of determining the conditions prevailing there, which may affect the work of this Section, including available access to the site, existing contours, existing services, etc.

.2 Determine the nature and locations of all existing services below and above ground, which may affect the work of this Section.

1.8 SPECIAL CONDITIONS

.1 The Contractor’s attention is drawn to the possibility of contamination in the soil below the Stores area and to the south exterior in the same area. Refer to drawings for guidance as to removal of such material, environmental and personnel safety concerns. After removal of topsoil or granular, soft spots, and otherwise unsuitable material the Contractor must manage the existing site excavated materials and imported materials, to bring grades up to finished elevations shown on the drawings.

1. 9 PRICES

.1 Unit Prices

1. Provide unit prices for any items listed in the tender form.

2. Include all costs as outlined in Division 01.

3. Additional payment will not be made for accidental over-excavation by the Contractor.

PART 2- PRODUCTS

2.1 MATERIALS

.1 Granular Fills - Class ‘A’ and Class ‘B':

Imported in accordance with current O.P.S.S. Form 1010, with the added requirement that material to be deposited within the building must be clean with no asphalt or other contaminates on or mixed with the soil.

.2 Granular Fill - Class PR:

Imported, well-graded, compactable stony pit-run granular material with a maximum 8% silt fraction as approved by the geotechnical consultant.

.3 Crushed Stone:

Clean, screened crushed stone, well graded in size between 10mm and 25mm, with sufficient angular particles rather than round, to ensure proper compaction.

.4 Granular materials shall be free draining and not susceptible to frost action as determined by current M.T.C. Standards. All granular materials to be used within the building shall also be free of asphalt or other contaminates on or mixed with the soil.

.6 Submit representative samples of each class of proposed material to the Geotechnical Inspection Company for testing and approval for use on this project. Mark samples as to source of supply, including pit locations.

.7 Supply only those materials approved for use on this project by the Inspection Company.

.8 Lean Concrete Fill:

Min. 7 MPa with 125mm (5") slump.

.9 Weeping Tile: – 100mm (4") diameter perforated Big-O, or approved equal.

.10 Geotextile Fabric: - Terrafix 270R or equal.

2.2 FABRICATION

.1 Mixing, transportation, placing, curing, and protection of concrete in accordance with Division 03

2.3 SOURCE QUALITY CONTROL

.1 All materials shall be subject to test and inspection by a Testing and Inspection Company appointed by the Owner.

.2 Cost of testing will be paid by the Owner.

.3 Provide access to pits or quarries for the personnel of the Inspection Company.

.4 Provide representative samples of materials as may be required by the Inspection Company at no additional cost to the Owner.

PART 3- EXECUTION

3.1 GRUBBING AND CLEARING

.1 Grub and clear the site of trees, shrubs, existing foundations to be removed, debris and obstructions, unless clearly noted elsewhere to be retained.

.2 Remove and dispose of all material listed in items .1 away from the site.

3.2 STRIPPING OF TOPSOIL

.1 Carefully strip the topsoil from areas affected by new construction.

.2 Stockpile the topsoil on the site at a location or locations approved by the Architect and General Contractor for possible later use on this project.

.3 Maintain topsoil stockpiles separate from any other stockpiles and protect from contamination.

.4 Prevent silt runoff from stockpiles and site with the use of silt fences and/or straw bale barricades.

3.3 EXCAVATION

.1 Footings are designed to bear at least 1200mm within the undisturbed Clayey Sand and Gravel Fill Layer for a maximum safe allowable bearing pressure of 150kPa for the Serviceability Limit State (SLS) and 225kPa for the Ultimate Limit State (ULS).

.2 Notify the Engineer of any unusual soil conditions encountered during excavation so that corrective action may be taken, if necessary.

.3 Where excavations for footings are accidentally over-excavated, fill the over-excavated portion with lean concrete fill to the founding elevation shown on the plans, at no additional cost to the Owner.

.4 Provide excavations for footings of sufficient width for the construction and inspection of formwork and the satisfactory and safe execution of the work. In general, provide not less than 450mm clear of all construction.

.5 Trim the bottom of all excavations true to line and grade, and remove all loose, wet, soft or unsatisfactory material.

.6 Install footings at lower elevations prior to installing adjacent footings at higher elevations to ensure that bearing capacity of upper levels is not adversely disturbed.

.7 Notify the Testing Company when each phase of the excavation is completed so that bearing surfaces may be inspected.

.8 All excavations into native subsoil are to be carried out using a smooth-blade bucket to preclude disturbance of the subgrade by normal bucket teeth.

.9 Protect all soils supporting footings and slab on grade against penetration of frost and rain before, during and after placement of concrete.

.10 Unless noted otherwise on plan the drawings indicate footings bearing down onto the approved, undisturbed soil layer.

.11 Below slab on grade areas excavate down a minimum of 200mm below slab-on-grade or as required to remove topsoil or otherwise unsuitable material and proof roll subgrade with a heavy roller. Sub-excavate any soft or wet spots as identified by the Geotechnical Engineer and replace with granular ‘B’ material or approved ‘PR’ material compacted to 98% Standard Proctor Maximum Dry Density.

.12 After construction of forms minimize disturbance of subgrade within footing forms. If soils within footings become disturbed remove all loose material with hand shovels down to sound soil.

3.4 PUMPING AND DEWATERING

.1 Keep all excavations, pits and trenches free from accumulations of water from all sources, including ground water, perched groundwater, rain and surface water, at all times by pumping or other methods satisfactory to the Geotechnical Engineer.

.2 Conduct dewatering operations, when required, in such a manner as to avoid damage to work under construction or existing adjacent structures and so as not to weaken the strength of bearing soils or to endanger the stability of banks or slopes.

3.5 BACKFILL AND COMPACTION

.1 After the construction of footings, walls or piers, and the approval of the work by the Consultant, backfill and compact interior side of foundation walls with granular 'B' material to the elevations shown on the drawings.

.2 Backfill and compact in equal lifts on each side of walls below grade. Maximum grade difference on opposite sides of non-retaining or basement walls is not to exceed 450mm.

.3 Deposit and spread granular materials in uniform layers not exceeding 300mm (loose measurement) in depth.

.4 Compact all granular materials to not less than 98% of Standard Proctor Maximum Dry Density, except as noted on drawings or specifications. Maintain optimum water content for proper compaction by the addition of water, as required.

.5 Compact using approved vibratory plate tampers or vibratory rollers, except when working close to silt or other materials which may be adversely affected by vibration; in which case, use approved non-vibratory rollers to avoid disturbance of the sub-grade.

.6 Immediately below sidewalks, place a 150mm (6") layer of Granular `A' compacted to 98% of Standard Proctor Density.

.7 Backfill at the exterior side of all foundation walls below sidewalks and paved areas, exclusive of areas adjacent to basement walls, can consist of approved site excavated materials, or imported granular 'B', compacted in 300mm (12") deep lifts to 96% Standard Proctor Maximum Dry Density with the upper 600mm (24") compacted to 98% Standard Proctor Maximum Dry Density. Backfill to extend up to the underside of a 150mm (6") granular 'A' layer below the sidewalk.

.9 Backfill on the interior side of all foundation walls up to the underside of the 200mm (8") stone layer to consist of approved pit-run, or granular 'B' material placed and compacted in 300mm (12") deep loose lifts to 98% Standard Proctor Maximum Dry Density.

.10 Use hand operated compaction equipment within the lesser of 3.0m (10') or the height of the wall, for pit walls, foundation walls and retaining walls.

.11 Protect all fill materials supporting slab on grade against penetration of frost and rain before, during and after placement of concrete.

3.6 SUB-FLOOR GRANULAR FILL

.1 Proof roll all existing fill materials with a heavy roller and sub-excavate any soft or wet spots.

.2 Provide a minimum of 200mm (8") of 19mm (3/4") crushed stone material under the slab-on-grade compacted to 98% standard proctor dry maximum density.

.3 Fill below 200mm (8") crushed stone layer to consist of approved pit run or granular 'B' material down to approved subgrade for footings bearing on undisturbed soil. Compact granular materials in 300mm (12") maximum loose lifts to 98% standard proctor dry density.

.4 Take care not to damage any under-floor mechanical and electrical systems.

.5 Remove clay, silt, dirt, and construction debris from the granular layers.

.6 Ensure all electrical and mechanical piping runs in granular layers below the underside of the floor slab.

3.7 GRADING

.1 Rough grade outside the foundation walls (where applicable) to the lines and grades shown on the final site plan.

2. Rough grade to within 150mm (6”) below the underside of exterior sidewalks and place layer of Granular ‘A'.

3.8 FIELD QUALITY CONTROL

1. All materials and workmanship shall be subject to test and inspection by a Testing and Inspection Company appointed by the Consultant.

.2 The cost of testing, except as noted in paragraph 3.8.3 will be paid through a cash allowance.

.3 Material or workmanship which fails to achieve the specified standards shall be re-compacted or replaced as directed by the Consultant and additional tests made. The cost of such additional testing and the cost of remedial action shall be at no additional cost to the Owner.

.4 The foundation subgrade will be inspected by the Inspection Company immediately following final preparation of the excavation by the Contractor. The Inspection Company may direct that the depth of excavation be increased to reach a competent bearing stratum if existing soil conditions at the specified elevation are not satisfactory.

3.9 CLEAN-UP

.1 At the completion of the work in this Section, remove from the site any excess materials, debris and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDE

.1 Materials and installation for chain link fences and gates.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A90/A90M-01, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 A653/A653M-03, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM C618-03, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.5 ASTM F1664-01, Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.

.2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.

.3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.

.4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.

.5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International).

.1 CAN/CSA-A23.1/A23.2-00(August 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-A3000-98(R2002), Cementitious Materials Compendium. Includes:

.1 CAN/CSA-A23.5-98, Supplementary Cementing Materials

.4 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.6 The Master Painters Institute (MPI) - Architectural Painting Specification Manual - March 1998.

.1 MPI # 18, Organic Zinc Rich Primer.

.7 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.4 SUBMITTALS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Unused paint or coating material must be disposed of at official hazardous material collections site.

.4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.1 Nominal coarse aggregate size: 20-5.
.2 Compressive strength: 20 MPa minimum at 28 days.
.3 Additives: fly ash to CAN/CSA-A23.5.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

.1 Type 1, Class A, heavy style, 9 gauge
.2 Height of fabric: 1800 mm – Refer to site plan for locations.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as Drawings.

.4 Top and bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized.

.5 Tie wire fasteners: steel wire.

.6 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.

.7 Gates: to CAN/CGSB-138.4.

.8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

.1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized.

.2 Fasten fence fabric to gate with twisted selvage at top.

.3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.

.4 Furnish double gates with chain hook to hold gates open.

.9 Fittings and hardware: to CAN/CGSB-138.2, cast aluminum alloy.

.1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.

.2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.

.3 Overhang tops to provide waterproof fit, to hold top rails and an [outward] [inward] projection to hold barbed wire overhang.

.4 Provide projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart.

.5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.

.6 Turnbuckles to be drop forged.

.10 Organic zinc rich coating: to CAN/CGSB-1.181

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1, heavy duty, 9 gauge

.2 For pipe: 550 g/m^2minimum to ASTM A90.

.3 For other fittings: to CAN/CSA-G164.

Part 3 Execution

3.1 GRADING

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

.1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.2 ERECTION OF FENCE

.1 Erect fence along lines as indicated and to CAN/CGSB-138.3.

.2 Excavate post holes to dimensions indicated.

.3 Space line posts 1.5 m apart, measured parallel to ground surface.

.4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.

.5 Install additional straining posts at sharp changes in grade and where directed by Consultant.

.6 Install corner post where change in alignment exceeds 10 degrees.

.7 Install end posts at end of fence and at buildings.

.1 Install gate posts on both sides of gate openings.

.8 Place concrete in post holes then embed posts into concrete to depths indicated

.1 Extend concrete 50 mm above ground level and slope to drain away from posts.

.2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.9 Do not install fence fabric until concrete has cured minimum of 5 days.

.10 Install brace between end and gate posts and nearest line post, placed in centre of panel

.1 Install braces on both sides of corner and straining posts in similar manner.

.11 Install overhang tops and caps.

.12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.

.1 Give tie wires minimum two twists.

.16 Install grounding rods as indicated.

3.3 INSTALLATION OF GATES

.1 Install gates in locations as indicated.

.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Determine position of centre gate rest for double gate.

.1 Cast gate rest in concrete as directed.

.2 Dome concrete above ground level to shed water.

.4 Install gate stops where indicated.

3.4 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.

.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

.1 Clean and trim areas disturbed by operations.

.1 Dispose of surplus material and replace damaged turf with sod.

END OF SECTION