SPECIFICATION FOR

ADDITION AND ALTERATIONS
EGAN FUNERAL HOME
203 QUEEN STREET SOUTH
BOLTON, ONTARIO

GEORGE ROBB ARCHITECT
4800 Dundas Street West
Suite Two Hundred & One
Toronto, Ontario M9A 1B1
416 596 8301 (tel)
416 596 1508 (fax)

BLACKWELL – BOWICK PARTNERSHIP LIMITED
Structural Engineering Consultants

CALLIDUS ENGINEERING
Mechanical & Electrical Engineering

ADDITION & ALTERATIONS
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203 QUEEN STREET SOUTH
BOLTON, ONTARIO

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Dated September 4, 2008
Terraprobe Limited

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Dated July 3, 2008
Decommissioning Consulting Services Limited

Appendix C Roof and Exterior Upgrades
Dated November 20, 2008
Decommissioning Consulting Services Limited

1. CONTRACT DOCUMENTS

The Contract Documents consist of the following:

.1 Instructions to Bidders
.2 Tender Form
.3 CCDC No.2, Stipulated Price Subcontract, 2008
.4 Supplementary General Conditions to CCDC No.2
.5 Specifications as listed in the Index to the Specifications
.6 Drawings as listed on Drawing #A100
.7 Addenda issued prior to tender delivery

2. PROJECT

ADDITION & ALTERATIONS
EGAN FUNERAL HOME
203 QUEEN STREET SOUTH
BOLTON, ONTARIO

3. TENDER CLOSING

3.1 Enclose the executed tender in a sealed, opaque envelope identified as "Tender" with name of Project.

3.2 Deliver tenders and other specified submissions to:

GEORGE ROBB ARCHITECT
4800 DUNDAS STREET WEST
SUITE TWO HUNDRED & ONE
TORONTO, ONTARIO M9A 1B1

Not later than 2:00:00 PM local time Tuesday, June 7th, 2011.

4. EXAMINATION

4.1 Bidders shall examine all Contract Documents, and shall also visit the building site and carefully examine the existing structure and all other conditions affecting the Work.

4.2 Report to the Architect all discrepancies, omissions, errors, departures from Building By-Laws or good practice and points considered to be of dubious intent, so that the Architect may review these issues with the appropriate consultants. If the Consultants consider it desirable, they will issue instructions by addenda at least three working days before tender closing date by courier service. The Consultants will not be responsible for oral instructions.

4.3 No payments for extra work will be allowed to the Contractor for site conditions, which can be determined by examination of the Contract Documents, the existing structure, or the site. The same conditions apply to examination of drawings and specifications.

4.4 It is the responsibility of all subcontractors to review all drawings and specifications, during

tendering, so that they are fully aware of requirements and conditions affecting the work of, and coordination and cooperation required by and for, other trades.

4.5.1 Questions regarding the Contract Documents or access to the site may be arranged through the Architect.

4.5.2 A pretender site visit has been scheduled for **Thursday May 19th, 2011 at 10:00 am.** All Contractors are required to attend.

5. PREPARATION OF TENDER

5.1 Submit Tender on Tender Forms furnished with the Specifications.

5.2 All blanks in the Tender Form and Appendices must be completed as instructed. **TENDER DOCUMENTS NOT COMPLETED IN FULL OR QUALIFIED BY ANY CONDITION MAY BE REJECTED.**

5.3 Submit tender signed under seal. Incorporated companies shall affix their corporate seal under the hand of their duly authorized officers.

5.4 The Tender shall be irrevocable from the time it is submitted until 60 days after the closing date for Tenders.

6. ACCEPTANCE

6.1 Tenders will be opened in private, after the closing date. The Owner will not necessarily award a contract to any Bidder, or to the Bidder submitting the lowest tender.

6.2 The Owner may require each Bidder to submit further evidence of his experience and capability to take on the project at this time.

6.3 Tenders received after the specified latest delivery time will be disqualified and returned unopened.

7. TENDER DOCUMENTS

7.1 Tender Documents for bidding purposes will be issued as tender sets in their entirety to invited contractors. One set of full size drawings, one half size set of drawings, one set of specifications and PDF copies of the drawings and specifications will be provided for each contractor.

7.2 The Tender Documents shall be kept intact and shall not be altered or mutilated for any reason whatsoever. They shall be returned intact and bound in order, as originally issued, within one week of the contract award.

8. TENDERED PRICE

8.1 The Tendered Price shall be expressed excluding Harmonized Sales Tax (HST).

9. CONTRACT ARRANGEMENTS

9.1 The selected Contractor will enter into a CCDC #2, Stipulated Price Contract, 2008, with the Owner.

10. CONSTRUCTION SCHEDULE

10.1 Refer to Section 01311, Construction Schedule for the requirements related to the anticipated schedule of the work. See Section 01010 Scope of Work for a complete description of the four phases of this project. The anticipated construction completion for this work is late spring 2012.

11. MEETINGS

11.1 Site meetings will be held every two weeks, or more frequently should the schedule require. All major sub-trades are required to attend. The Architect and Sub-Consultants will be available, as required, to discuss job related issues.

12. INSURANCE

12.1 The Contractor shall provide Builders All Risk and Cross Liability Insurance in accord with GC 11 of CCDC 2, 2008. Subcontractors shall include for liability insurance.

13. OWNER OCCUPANCY

13.1 The existing site will remain in operation throughout the construction period. The Owner understands that partial use of the site will occur during the phases of the work. The Owner however will require the partial occupancy of completed phases prior to the loss of the areas of the building that are associated with the next phase of the work. Consult the phasing schedule as provided in Section 01010 Scope of Work.

13.2 The Owner and the General Contractor are required to keep in contact, as required, during the construction period to apprise one another of the their specific scheduled activities.

1. The Owner shall advise the General Contractor and the site superintendent of their specific schedules for visitations and funerals that will require a suspension of the work or the scheduling of approved quiet work with updates as commitments are scheduled.
2. The General Contractor is required to advise the Owner of major events in the construction as soon as these dates are set with the anticipation that this work will be scheduled up to one week before the occurrence. This will allow the Owner to organize his schedule of activities in the building outside of these specific days.
3. Contact between the parties shall include electronic notification as well as a scheduled regular weekly planning meeting.

13.2 The Owner shall have the right to take possession of any particular area or areas of the project whether partially or entirely completed as described in Section 01010 Scope of the Work.

14. TEMPORARY FACILITIES

14.1 Existing Washroom facilities may not be used by the sub-trades. The general contractor shall

provide portable toilet units in conformance with local authorities having jurisdiction.

15. SAFETY

15.1 All contractors must agree to follow the regulations of the latest issue of the Occupational Health and Safety Act.

15.2 Provide all necessary methods, materials and construction to ensure that no damage or harm to work, materials or existing property results from the work of this trade.

16. SHOP DRAWINGS

16.1 All shop drawings shall be submitted in accord with Section 01300 Submittals of these specifications.

17. CUTTING & PATCHING

17.1 All sub-trades are required to make good the work of their own trade.

18. WARRANTIES

18.1.1 Provide a one year warranty, except where extended warranties are noted elsewhere in the specification.

19. SUBTRADE CONTRACTORS OR SUPPLIERS

19.1.1 The Owner has requested that the General Contractors seek subtrade tender prices from the following list of local Subtrade Contractors or Suppliers. Aside from being local trades, several of these subtrade contractors have provided maintenance and ongoing services to this property over the years. The subtrade contractors and suppliers include the following:

Subtrade Contractors & Suppliers	Name of Subtrade or Supplier
Mechanical – HVAC	Rosetown Central Refrigeration & Air Conditioning
Mechanical – Plumbing	Glen the Plumber
Electrical – Complete Electrical	Bolton Electric Limited
Roofing – Asphalt Shingles (Only)	Cairns Roofing Limited
Asphalt Paving	York Paving & Asphalt
Granular & Concrete	James Dick Concrete – Aggregates (905) 951-2244

Part Two of the Tender Form is required to be submitted within 24 hours of the closing. This second submission provides the confirmation of the subtrade contractors and suppliers carried and the difference in the cost (Plus or Minus) to carry the local trades as indicated by the Owner.

END OF SECTION

ADDITION & ALTERATIONS
EGAN FUNERAL HOME
265 QUEEN STREET SOUTH
BOLTON, ONTARIO

GEORGE ROBB ARCHITECT

0660 **June 2, 2010** ***(Revised May 2011)*** **TENDER FORM**

PART ONE OF TWO

Submitted by:

_____

_____

_____ Date: _____

1. Having examined the Specifications, including addenda up to and including #_____, and the drawings, all as prepared by George Robb Architect, for:

Addition and Alterations
Egan Funeral Home
203 Queen Street South
Bolton, Ontario

We hereby offer to provide all labour, material and plant required for the execution of the work in accordance with the true intent of the contract documents for a Stipulated Price as follows:

Total Scope of Work	$
Contingency Allowance (Section 00801)	$150,000.00
Inspection & Testing Allowance (Section 01450)	$8,000.00
Steel Railing Brackets (Section 05500)	$3,000.00
Cabinet Hardware Allowance (Section 06200)	$8,000.00
Finishing Hardware & Washroom Accessories Allowance (Section 08710)	$42,000.00
Total Stipulated Price	$

The Stipulated Price excludes HST in the Amount of: $ _____

2. Alternate Prices

Further, we offer to provide all labour, material and plant required for the execution of the work related to the following Alternate Prices:

1. Alternate Price No. 1 – Difference in the Cost to provide a cut stone fireplace surround, in lieu of the Base Bid precast concrete fireplace surround as supplied by Solus under Section 11010 – Gas Fireplace Unit as follows:

$ _____

HST TO BE ADDED $ _____

2. Alternate Price No. 2 – Difference in the Cost to provide the alternate Modified Bitumen Flashing in lieu of the Base Bid Elastomeric Flashing as outlined in Article 2.6 & 2.7 of Section 07510 – Built Up Bituminous Roofing & Waterproofing as follows:

$ _____

HST TO BE ADDED $ _____

3. Alternate Price No. 3 – Difference in the Cost to provide the alternate Tri Fab 451T Series Aluminum Entrance Screen as manufactured by Kawneer, in lieu of the Base Bid Aluminum Entrance Screen Assembly to be Kawneer Aluminum Curtain Wall System, 1600 Wall System with 2 1/2" x 6" sections as outlined in Section 08413 – Aluminum Entrance Screen as follows:

$ _____

GST TO BE ADDED $ _____

3. Separate Prices

Further, we offer to provide all labour, material and plant required for the execution of the work related to the following Separate Prices:

1. Separate Price No. 1 – The additional Cost to provide Asphalt Paving for the Funeral Home Site as described as the Phase I separate price and the associated irrigation work as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

2. Separate Price No. 2 – The additional Cost to provide Asphalt Paving for the additional residential properties to the north as described as the Phase II separate price and the associated irrigation work as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

3. Separate Price No. 3 – The additional Cost to provide the irrigation system for the Funeral Home Site as the designated Zone 1 on the irrigation drawings as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

4. Separate Price No. 4 – The additional Cost to provide the irrigation system for the residential properties to the north as the designated Zone 2 and Zone 3 on the irrigation drawings as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

3. Separate Prices (Continued)

5. Separate Price No. 5 – The additional Cost to provide a new 15 ton RTU Unit over the Casket Display Room which includes the removal of the existing and placement of the new unit, the disconnect and reconnection of the gasline and the disconnect and the reconnection of the electrical connections as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

6. Separate Price No. 6 – The additional Cost to provide a new 7.5 ton RTU Unit over the Chapel in lieu of the existing 6.5 ton unit, which includes the removal of the existing 6.5 ton unit and the placement of the new 7.5 ton unit, the disconnect and the reconnection of the gasline and the disconnect and the reconnection of the electrical connections as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

7. Separate Price No. 7 – The additional Cost to provide the conduits and pull wires for the new buried electrical supply lines to the south boulevard and the north side of the property to for the provision of new capped electrical feeds for the future new parking lot lighting as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

8. Separate Price No. 8 – The additional Cost to provide new lighting bases, poles, conduit and wiring for the new parking lot lights as outlined in Section 01010 – Scope of Work as follows:

$ _____

HST TO BE ADDED $ _____

4. The following is a list of architectural unit prices applicable to additions and deletions to the Work. Prices are to include for both the supply and installation of work.

ITEM	ADD PRICE $	DELETE PRICE $	UNIT OF MEASURE
(1) Cost to excavate and dispose for footings and subgrade material at all exterior excavations.			Per Cu. Yd.
(2) Cost to excavate and dispose for footings and subgrade materials at all interior excavation locations.			Per Cu. Yd.
(3) Cost to supply and install additional concrete for foundation walls.			Per Cu. Yd.
(4) Cost to supply and install additional reinforcing bars for concrete work.			Per Ton
(5) Cost for supply and placement of additional fill at foundation walls and slabs.			Per Cu. Yd.

5. If changes to the work are to be valued by the cost and percentage fee method, we will require a fee, expressed as a percentage of the cost of the work, of:

_____ (%)

6. If we are notified of the acceptance of this tender within sixty (60) days of the date of this submission, we will:

   .1 Execute a contract with the Owners on the Standard Form of Agreement Between Owner and Contractor, CCDC #2, and,

   .2 Furnish a general analysis of the cost of the work, and, Complete, substantially, all work in accord with the Contract Documents, in a period of_____ weeks following commencement.

7. Within 48 hours of submitting the tender submission, provide a complete list of subtrade contractors being carried to undertake the work.

8. Within 24 hours of submitting the tender submission, provide the Part Two – Subtrades Portion of the Tender Form that follows on the next page. This submission can be provided by email or fax to the offices of George Robb Architect on or before Wednesday, June 8th, 2011 before 2:00 pm local time. (email to dscott@gra.ca) or (fax to (416) 596-1508).

In submitting this Tender, we recognize the right of the Owner to accept any tender or to reject all tenders.

Signed: _____

Witness: _____

ADDITION & ALTERATIONS
EGAN FUNERAL HOME
265 QUEEN STREET SOUTH
BOLTON, ONTARIO

GEORGE ROBB ARCHITECT

0660 **June 2, 2010** ***(Revised May 2011)*** **TENDER FORM**

PART TWO OF TWO – SUBTRADES

The following Part Two Portion of the Tender Form is provided as a requirement to complete the Part One Section of this Tender Submission. This submission can be provided by email or fax to the offices of George Robb Architect on or before Wednesday, June 8th, 2011 before 2:00 pm local time. (email to dscott@gra.ca) or (fax to (416) 596-1508).

Subtrade Division	Included in Base Bid	Subtrade Contractor	Difference in Cost Extra or (Credit)
Mechanical – HVAC		Rosetown Central Refrigeration & Air Conditioning	
Mechanical – Plumbing		Glen the Plumber	
Electrical Subcontractor		Bolton Electric	
Roofing – Asphalt Shingles		Cairns Roofing	
Asphalt Paving		York Paving & Asphalt	
Granular & Concrete		James Dick & Co. Ltd.	

In submitting this Part Two Section of the Tender Form we recognize the right of the Owner to accept any tender or to reject all tenders.

Signed: _____

Witness: _____

Amend by adding the following:

"27 The abbreviation N.I.C. shall mean NOT IN CONTRACT and any work so described will be performed by 'Other Contractor's" — **Definitions**

Delete entirely sentence 3.2.2.2 — **G.C. 3.2 Construction by Owner or Other Contractors**

Add the following: — **G.C. 3.5 Construction Schedule**

3.5.2.1 The Owner, it's agents, and other Contractors shall have the right to enter upon, and the Owner shall have the right to take possession of the Work, in whole or in part, for the purpose of placing fittings and equipment or the use before completion of the Contract, if, in the opinion of the Consultant, such entry and taking of possession shall not be considered as acceptance of the Work nor in any way relieve the Contractor of his responsibility to complete the Contract.

Amend by adding the following: — **G.C. 3.10 Shop Drawings**

"3.10.5 All shop drawings submitted to the Architect for review shall include details illustrating the construction of all parts of the work, thickness, methods of joining, details of field connections and anchorage and interfacing with other work."

Revise 4.1 to read as follows: — **G.C. 4.1 Cash Allowances**

"4.1.4 Where the total cost of the *Work* under Cash Allowances exceed the total amount of the Allowances..."

"4.1.5 ...between the actual costs and the total amount of the Allowances."

Amend by adding the following: — **G.C. 4.2 Contingency Allowance**

"4.2.5 Carry a contingency allowance in the value of $150,000.00

Add the following sentence: — **G.C. 5.2 Applications for Progress Payment**

5.2.8 The Contractor must provide with each application after the first, a Statutory Declaration on CCDC #9B, certifying that all accounts have been paid for which he has received payment. CCDC #9A shall be used for the final payment.

G.C. 6.5 Delays

Add the following new sentence:

6.5.6.1 If the work is delayed, through no fault of the Owner, Consultant, or anyone employed or engaged by them directly or indirectly, and for reasons other than identified in 6.5.2 and 6.5.3, the Owner reserves the right to take possession and occupancy of the Work on or after the original date scheduled for occupancy as set out in GC 3.5 CONSTRUCTION SCHEDULE.

6.5.6.2 After the Owner has taken possession and occupancy of the Work, in whole or in part, the Contractor shall complete the Work at times convenient to the Owner, which may include evening work, weekend or shift work, without adjustment to the Contract Price.

G.C. 7.2 Contractor's Right To Stop the Work Or Terminate the Contract

Delete the words "and such other damages as the Contractor may have sustained as a result of termination of the Contract"

Add the following:

7.2.6 If the Contractor stops the Work or terminates the Contract in accordance with GC 7.2, he shall leave the site and the Work in a secure condition in keeping with the intent of the Ontario Health and Safety Act and appropriate regulations.

G.C. 8.2 Negotiation, Mediation, and Arbitration

"8.2.9 Within five (5) days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing:

a) a copy of the notice of arbitration

b) a copy of supplementary conditions 8.2.9 to 8.2.15 of this Contract, and;

c) any claims or issues which the Contractor or the Owner, as The case may be, wishes to raise in relation to the Consultant Arising out of the issues in dispute in the arbitration.

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten (10) days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

a) has a vested or contingent financial interest in the outcome Of the arbitration;

b) gives the notice of election to the Owner and the Contractor Before the arbitrator is appointed.

c) agrees to be a party to the arbitration within the meaning of The rules referred to in paragraph 8.2.6, and;

d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If the Consultant is not given the written notice required under paragraph 8.2.9, both the Owner and the Contractor are stopped from pursuing an action, counter claim or other proceeding or making an application against the Consultant arising out of the issues in dispute in the arbitration between the Owner and the Contractor under paragraph 8.2.6.

8.2.12 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding, the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.2.13 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

a) on application of the Owner or the Contractor, determine whether The Consultant has satisfied the requirements of paragraph 8.2.10 and;

b) make any procedural order considered necessary to facilitate the Addition of the Consultant as a party to the arbitration.

8.2.14 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant;

8.2.15 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding."

Delete "Subject to... CONTRACTORS," from 9.4.1

Revise "the Contractor" to read "The Contractor"

G.C. 9.4 Construction Safety

Amend by adding the following:

G.C. 11.2 Bonds

11.2.3 Provide a Labour & Material Payment Bond and a Performance Bond in the amount of 50% of the cost of the Work. The Contractor shall submit an Agreement to Bond from a duly licensed surety with the tender submission.

11.2.4 The Contractor shall submit a Bid Bond from a duly licensed surety with the tender submission.

END OF SECTION

1. REGULATORY DOCUMENTS

1.1 Nothing contained in the Drawings or Specifications shall be so construed as to be in conflict with any law, by-law or regulation of the municipal, provincial or other authorities having jurisdiction. Work shall be performed in conformity with all such laws, by-laws and regulations.

1.2 Contract forms, codes, specifications, standards, manuals, and installation, application and maintenance instructions, referred to in these Specifications are of the latest published editions at the date of signing the Contract.

1.3 All work shall be in accord with the Building Code (Ont. Reg. 403/97), Canadian Electric Code (CEC), Can3.B44-M and supplements thereto, W59 as applicable. Conform to Occupational Health and Safety Act, Ontario and Regulations for Construction Projects and the Ontario Fire Code, and all other applicable codes and building By-laws.

2. PERMITS

2.1 The Owner's have applied and paid for the Municipal Building Permit.

2.2 The Contractor shall apply for, secure and pay for all approvals relative to his work, from all authorities having jurisdiction, including where required, inspection fees and permits. The Contractor shall furnish all necessary bonds or cash deposits that may be required as pledge and/or security for the protection or maintenance of any property in connection with or arising out of the work.

2.3 The Contractor shall be responsible for ensuring that no work is undertaken which is conditional on permits, approvals or guarantees until it is certain that all conditions necessary to obtain them are met. No time extension will be allowed for delay in obtaining necessary permits.

3. EXAMINATIONS

3.1 Site and Documents

.1 The Contractor shall examine the site, drawings, specifications, and other contract Documents and become fully conversant with:

- Access to and from site.
- Any obstacles on site affecting access or work of contract.
- Rights and interests which might be interfered with.
- Total extent of the work and the conditions under which it will be performed.
- Existing structures on the site.

.2 No claims for extra payment will be paid for extra work made necessary, or for difficulties encountered, due to conditions of the site which were visible or reasonably inferable from an examination of the site at the time prior to tender closing date. Failure of the Contractor to visit and examine the site shall be deemed a waiver of all claims for extra payment due to any condition of the site existing prior to tender closing date.

3.2 Previously Completed Work and Existing Conditions:

.1 Where dimensions are required for proper execution, verify dimensions of completed Work in place before installation of subsequent Work to be incorporated with it.

.2 Verify that previously execute Work and surfaces are satisfactory for installation or application, or both, and that performance of subsequent Work will not be adversely affected.

.3 Ensure that Work installed in an unsatisfactory manner is rectified by those responsible for its installation before further work proceeds.

.4 Defective Work resulting from application to, or installation on, or incorporated with, unsatisfactory previous Work will be considered the responsibility of those performing the later Work.

3.3 Field Measurements:

.1 Verify relevant field dimensions prior to commencement of installation of any Work affected by these dimensions. Report discrepancies to the Owner.

.2 Examine surfaces and structures underlying, or adjacent to, Work to be installed or affecting Work to be executed.

.3 Make good any conditions that adversely affect the Work to be executed or installed.

.4 The commencement of Work concerned implies acceptance of relevant conditions and no subsequent claims based on these conditions will be entertained.

4. CUTTING AND PATCHING

4.1 Except where shown on drawings, do not cut or drill structural or load-bearing elements.

4.2 Do not endanger Work or property by cutting, drilling or similar activities. No Contractor shall cut or alter the Work of another Contractor unless such cutting or alteration is approved by the later.

4.3 Cut and drill with true smooth edges and to minimum suitable tolerances.

4.4 Fit installations tightly to stop air movement completely. The Contractor performing Work that penetrates an air, vapour, moisture, thermal or acoustical separation of the building shall pack voids tightly with approved materials; seal air, vapour, and moisture barriers; caulk joints as required to ensure that no air movement through the penetration is possible.

5. PROTECTION OF WORK, PROPERTY AND PERSONS

5.1 Include all necessary methods, materials, and construction to ensure that no damage or harm to Work materials, property and persons results from the Work of this Contract. The Contractor shall bear the cost of repairing and making good any damage, loss or injury to the property of the Owner or others which is attributable to the performance of this Contractor or to the negligence or failure of this Contractor to conform to the provisions of the Contract or to take reasonable precautions.

5.2 The building occupants will occupy the premises continuously while the work progresses. Scheduling of work must respect the privacy of the Owners. Every attempt will be made to co-operate in scheduling effective stages of the work with Owners.

5.3 Protect adjacent private and public property from damage and, if damaged, make good to match in all details. Save the Owner and the Architect harmless from claims for loss or damage to adjacent property.

5.4 Protect surfaces of completed Work from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable to the material and surface location.

5.5 Enforce fire prevention methods at site. Use flammable materials only if proper safety precautions are taken, both in use and storage.

5.6 Do not store flammable materials in the building. Take necessary measures to prevent spontaneous combustion. Place cloths and other disposable materials that are a fire hazard in closed metal containers and remove them from the building every night.

5.7 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.

5.8 Ensure that volatile fluid wastes are not disposed of in building drains.

6. FASTENINGS

6.1 Include in the Work necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in Work of others, deliver devices in ample time for installation, locate devices and cooperate with other Contractors as they require.

6.2 Do not use fastenings which cause spalling or cracking of materials in which installed.

6.3 Use only approved fastenings.

6.4 Install Work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, constructions, components, and equipment. Space anchors within limits of load-bearing or shear capacity.

7. CLEANING

7.1 Ensure that spatters, droppings, soil, labels and other debris are removed from surfaces to receive finishes, before they set up. Leave Work and adjacent finished Work in new condition.

7.2 Use only specified cleaning materials which are recommended for the purpose by the manufacturer of the surface to be cleaned and of the cleaning material.

7.3 Maintain area "broom clean" at all times during the Work.

7.4 Remove construction debris and dirt as often as required to avoid accumulation.

7.5 Ensure that cleaning operations are scheduled to avoid deposit of dust or other foreign matter on surfaces during finishing Work and until wet or tacky surfaces are cured.

8. ADJUSTING

8.1 Ensure that all parts of Work fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.

8.2 Verify that Work functions properly, and adjust it accordingly to ensure satisfactory operation.

9. OWNER OCCUPANCY

9.1 The Owner reserves the right to occupy portions of the premises, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with continuation of the Work of this Contract.

9.2 Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of the Work in whole, or in part, nor shall it imply acknowledgment that terms of the Agreement are fulfilled.

10. CONSTRUCTION SCHEDULE

10.1 Submit a construction schedule. Show on this schedule order and delivery times as well as commencement and completion of the Work and all Trades within ten working days of notification of tender acceptance, for approval.

10.2 Should the Contractor be notified or made aware of any delays, which could affect the progress of the Work, the Contractor shall immediately notify the Architect.

END OF SECTION

1 – CONTRACT DOCUMENTS

1.1 The Contract will be in the form of the Agreement between Owner and Contractor, Canadian Standard Construction Document, CCDC 2, 2008 Stipulated Price Contract as amended by the Supplementary Conditions.

1.2 The General Conditions of the Stipulated Price Contract, Standard Construction Document, CCDC 2, 2008; as amended and supplemented by the Supplementary General Conditions, Section 00801, will govern the Work specified in each Section of the Specifications.

1.3 Section 01005, General Requirements, of the Specifications generally specifies Work and coordination of the Work that is the responsibility of the Contractor, and shall not be interpreted to defined absolutely the limits of responsibility that must be established between the Contractor and his subcontractors by their separate agreements.

1.4 Ensure that Sub-Contractors understand that the General Conditions of the Contract, Supplementary Conditions, and Division 1, General Requirements, apply to Sections of the Specifications governing their Work.

1.5 Work in the Specifications is divided into descriptive Sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and his Subcontractors.

1.6 Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the Architect unless specifically stated otherwise.

1.7 Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

1.8 Wherever in the Specifications it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.

1.9 Wherever in the Specifications it is specified that Work shall be repaired, made good or replaced, it shall be performed without any additional cost to the Owner.

2 – PROJECT DESCRIPTION

2.1 The work consists of the alterations and additions shown on the drawings and specified herein.

2.2 The Egan Funeral Home will remain in operation throughout the duration of the construction of the alterations and additions to the existing building. The work will be required to be carried out in phases. This is required in order to allow the Owners to continue the operation of the funeral home during the entire course of the construction. The public components of the existing building include the ground floor Visitation Rooms, Chapel, Sitting Room, Library and Foyer and the Reception Room, Casket Display Room and Public Washrooms on the Second Floor over the Garage. The support spaces include the ground floor Front Office, Preparation Room, Garage Suite and the second floor Reception Room, Storage Room, Office and Hoistway. Work will need to be arranged in phases to allow for the access to various components of the building for public and employee access. Staged sign offs on occupancy will be required.

2.3 The following four phases of construction are being proposed for the implementation of the scope of work as outlined by the drawings and specified herein (See the attached Sketches No. SK 01, SK 02 and SK 03).

2.4 **Asbestos Removal and Abatement**
The scope of this work will form part of the work of the General Contractor and shall be undertaken in the phases of the work as outlined below.

2.5 **Phase One: Exterior Foundation Work facing Queen Street South and Downey**
Undertake the foundations required on the site for the Second Floor Addition to the front of the building. The work to gut the existing second floor apartment can proceed at the same time in preparation for the commencement of the Phase Two work. Site work outlined by the drawings and as specified herein shall be undertaken at this same time.

The entire funeral home programme will remain in operation during this phase of the work.

2.6 **Phase Two: Front End Alterations to the Ground and Second Floor**
The phase two work will modify the original front end of the funeral home. This work will require modifications and additions to the existing structural framing system to accommodate the new assembly uses on the second floor of the former apartment area. The work includes the construction of a new elevator shaft, staircase and an expanded second floor configuration. The scope of work also includes the provision of a new partition wall between the house and the funeral home at the second floor, a new dormer extension to the house and modifications to the connecting corridor between the front visitation rooms and the existing rear reception room. This scope of work will eliminate an existing hoistway in the back corridor that will be replaced by the provision of the new elevator. It will be a mandatory requirement that the hoistway stay in operation up to the time of the approval of the elevator. The partial occupancy of this portion of the site will also require the approval of temporary exit facilities from the second floor area of the building which will require the use of Stair No. 1 or retain access to Stair No. 5 during the construction work under Phase Three of this work.

During this phase of the construction, the chapel, south foyer, library (some interruption), offices, casket room (some interruption), reception room and public washrooms would remain in use. Some limited usage of the ground floor visitation room would be anticipated prior to the completion of the second floor level and the final commissioning of the elevator.

Provide a dust screen of polyethylene at the location indicated on drawing SK-02. Provide a construction partition complete with gypsum board finish and a latching door at the location indicated on drawing SK-02.

2.7 **Phase Three: Ground Floor Chapel and Foyer Renovations**
The phase three work will undertake the scope of work to accommodate upgrades to the remaining portions of the ground floor which includes the chapel, the family room suite, the library, the foyer and the associated hallways and service areas.

During this phase of the construction, the remainder of the building will be accessible for use. All required exit facilities for the second floor will be complete. The access to the south entrance will be closed and temporary access in the case of an emergency could be routed through Hallway 108, Corridor 123 to Corridor 124.

2.8 **Phase Four: Second Floor Reception Room and related Ground Floor Alterations**
The phase four work will expand the second floor area to align with the north edge of the garage wing of the funeral home. This second floor expansion will require revisions to the ground floor area for mechanical and structural modifications and revisions to the ground floor layout of the existing garage floor and drainage system. The second floor will be reconfigured to provide an

increase to the size of the existing washrooms, reception room, vestibule and storage area.

During this phase of the construction, the entire ground floor area will be available for use with the exception of the garage. The new visitation rooms on the second floor will be open for use up to the access to the ramp. Stair No. 5 will be available for use as a temporary exit from the second floor area and that either the existing ground floor visitation room or the new second floor visitation rooms will be used as a reception room as needed.

3 – ALTERNATE PRICES

3.1 It is the intent that the Base Tender Price include the total scope of work, and that the Alternate Prices be provided for the consideration of the Owner to reduce the Scope of the Work following the Tender submission. These alternate prices shall be shown separately on the Tender Form.

3.2 The Alternate Prices shall include the General Contractors overhead and profit as a part of the cost of the work.

3.3 The Alternate Prices shall include the following areas of work:

3.4 Alternate Price No. 1
The Alternate Price No. 1 shall carry all the labour and material required to supply and install an alternate cut stone fireplace surround in lieu of the precast concrete surround as supplied by Solus under Section 11010 Gas Fireplace Unit. Show the difference in the cost on the tender form.

3.5 Alternate Price No. 2
The Alternate Price No. 2 shall carry all the labour and material required to supply and install an alternate Modified Bitumen Flashing in lieu of the Base Bid Elastomeric Flashing as outlined in Articles 2.6 and 2.7 of Section 07510 – Built Up Bituminous Roofing and Waterproofing. Show the difference in the cost on the tender form.

3.6 Alternate Price No. 3
The Alternate Price No. 4 shall carry all the labour and material required to supply and install an alternate Aluminum Entrance Screen assembly to be Kawneer Tri Fab 451T Series in lieu of the Base Bid Aluminum Entrance Screen Assembly to be Kawneer Aluminum Curtain Wall System, 1600 Wall System with 2 ½" x 6" thermally broken frames with outside mounted insulated glazing units with pressure plate closure. Show the difference in the cost on the tender form.

4 – SEPARATE PRICES

4.1 It is the intent that the Base Tender Price includes the total scope of work excluding the Separate Prices. These separate prices shall be shown separately as additional items of work on the Tender Form. The Owner will review these Separate Prices and add none, some or all of the items to the final scope of the work under the contract.

4.2 The Separate Prices shall include all labour, materials, products, equipment, services, co-ordination and respective overhead and profit to provide and install the individual Separate Prices.

4.3 The Separate Prices shall include the following areas of work:

4.4 **Separate Price No. 1: Asphalt Paving – Funeral Home Site**
Provide a separate price to undertake the work required to supply new asphalt paving for the funeral home site as outlined as the Phase I separate price as shown on Drawing A101. This separate price shall include the provision of the sprinkler sleeving only required for the Zone 1 and Zone 3 sprinkler work as outlined on Drawing No. A101 and as detailed on the Irrigation Drawing No.IR 100.

4.5 **Separate Price No. 2: Asphalt Paving – Adjacent Residential Properties**
Provide a separate price to undertake the work required to supply new asphalt paving for the Residential Properties to the north at 173, 179 & 185 Queen Street South as outlined as the Phase II separate price as shown on Drawing A101. Provide all required excavation, disposal, new fill materials, compaction and paving as required by the drawings and as specified herein.

4.6 **Separate Price No. 3: Irrigation System for the Funeral Home Site**
Provide a separate price to undertake the work required to supply and install a new irrigation system to the Funeral Home Site as designated as Zone 1 on the Site Irrigation Plan on Drawing A101 and as detailed on the Irrigation Drawing No.IR 100. This installation should include all required feeds into the lawn area behind the existing house at 191 Queen Street to service the future installation of Zone 2 and Zone 3.

4.7 **Separate Price No. 4: Irrigation System for Adjacent Residential Properties**
Provide a separate price to undertake the work required to supply and install a new irrigation system to the adjacent residential properties as designated as Zone 2 and Zone 3 on the Site Irrigation Plan on Drawing A101 and as detailed on the Irrigation Drawing No.IR 100.

4.8 **Separate Price No. 5: Replacement of 15 ton RTU Unit over Casket Display Room**
Provide a separate price to undertake the work required to supply and install in its entirety a new 15 ton roof top unit in place of the existing roof top unit. This separate price includes three separate prices as outlined on the Mechanical and Electrical Drawings.

- ***Mechanical Separate Price No. 1*** for the replacement of the existing 15 ton RTU and VVT controls and provide new isolation curb as shown on Drawing No. M105.
- ***Mechanical Separate Price No. 3*** for the disconnect and reconnect for the gas service for the new 15 ton RTU unit as shown on Drawing No. P104.
- ***Electrical Separate Price No. 3*** for the disconnection and reconnection of power to accommodate the replacement of the new 15 ton RTU unit as shown on Drawing No. E301.

4.9 **Separate Price No. 6: Replacement of 7.5 ton RTU Unit over North Chapel Roof**
Provide a separate price to undertake the work required to supply and install in its entirety a new 7.5 ton roof top unit in place of the existing 6.5 ton roof top unit. This separate price includes three separate prices as outlined on the Mechanical and Electrical Drawings.

- ***Mechanical Separate Price No. 2*** for the replacement of the existing 6.5 ton RTU with a 7.5 ton RTU and provide new isolation curb as shown on Drawing No. M105.
- ***Mechanical Separate Price No. 4*** for the disconnect of the gas service to the existing 6.5 ton RTU and reconnect for the gas service for the new 7.5 ton RTU unit as shown on Drawing No. P104.
- ***Electrical Separate Price No. 4*** for the disconnect of the existing 6.5 ton RTU and the supply of a new power feed to the new 7.5 ton RTU unit as shown on Drawing No. E301.

4.10 **Separate Price No. 7: Provision of Exterior Lighting Conduits and Pull Strings**
Provide a separate price to undertake the work required to supply and install two separate new conduits and pull strings for conduits across as outlined by ***Electrical Separate Price No. 1*** and as shown on Electrical Drawing No. E100. Note that the work for the installation of the south conduit should be undertaken in conjunction with the replacement paving as indicated under Separate Price No. 1.

4.11 **Separate Price No. 8: Provision of Replacement Lighting for Parking Lot**
Provide a separate price to undertake the work required to supply and install new exterior lighting bases, poles, conduit and wiring as outlined by ***Electrical Separate Price No. 2*** and as shown on Electrical Drawing No. E100.

5 – WORK PERFORMED UNDER SEPARATE CONTRACTS

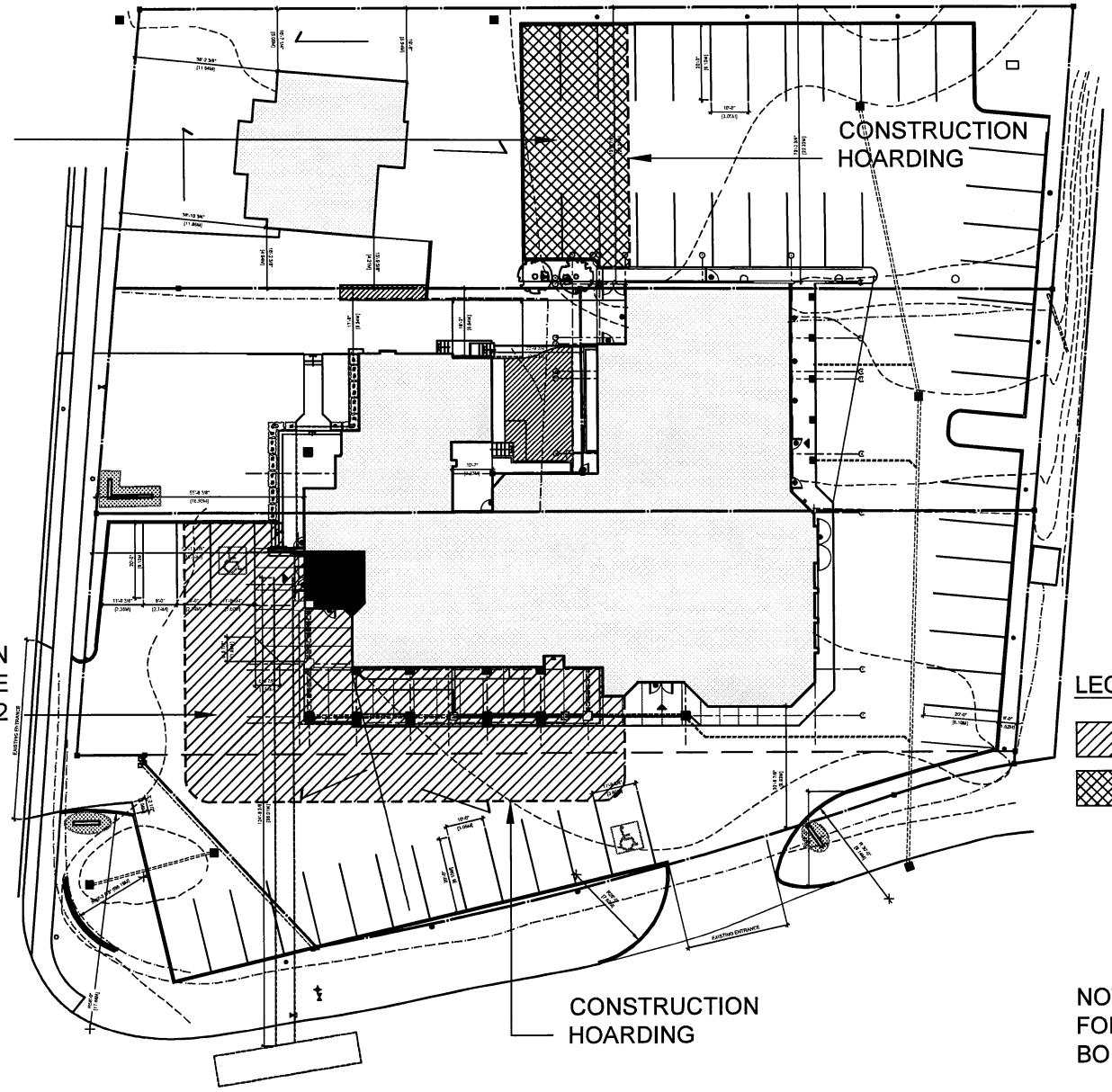
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The general Contractor shall co-ordinate and advise this subtrade contractor of the schedule and the timing for the placement of their work within the building. This subtrade contractor to the Owner should be invited to an early site meeting to arrange and confirm schedules for the staged installation of their work within the building.

END OF SECTION

GEORGE ROBB ARCHITECT



TITLE: CONSTRUCTION ENCLOSURES

PROJECT: Addition & Alterations - Egan Funeral Home
203 Queen St.S.,Bolton, Ontario

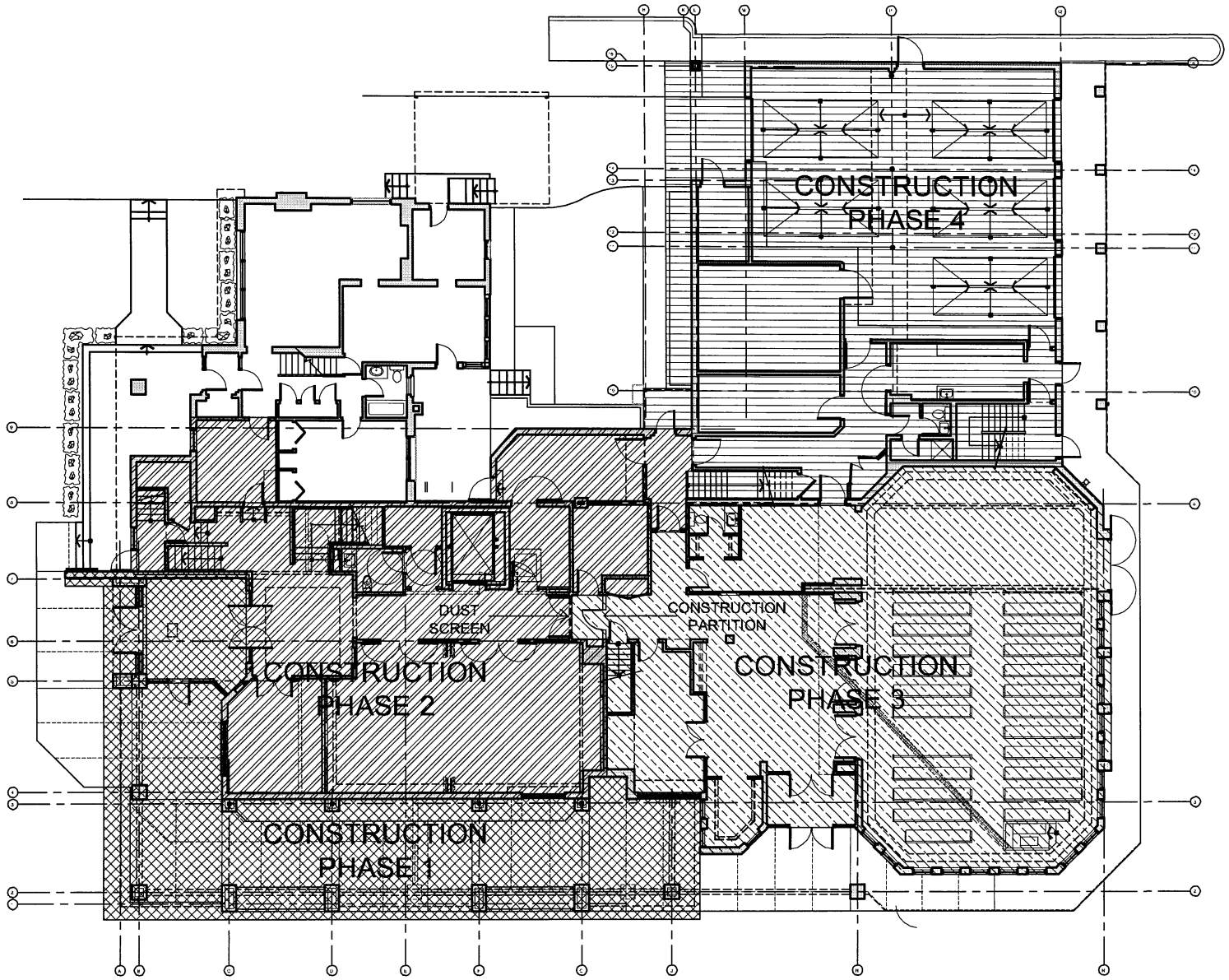
SCALE: N.T.S

PROJECT #: 0660

DATE: 3 MAY 2011

DRAWING:

SK-01



TITLE: CONSTRUCTION PHASES

PROJECT: Addition & Alterations - Egan Funeral Home
203 Queen St.S.,Bolton, Ontario

SCALE: N.T.S

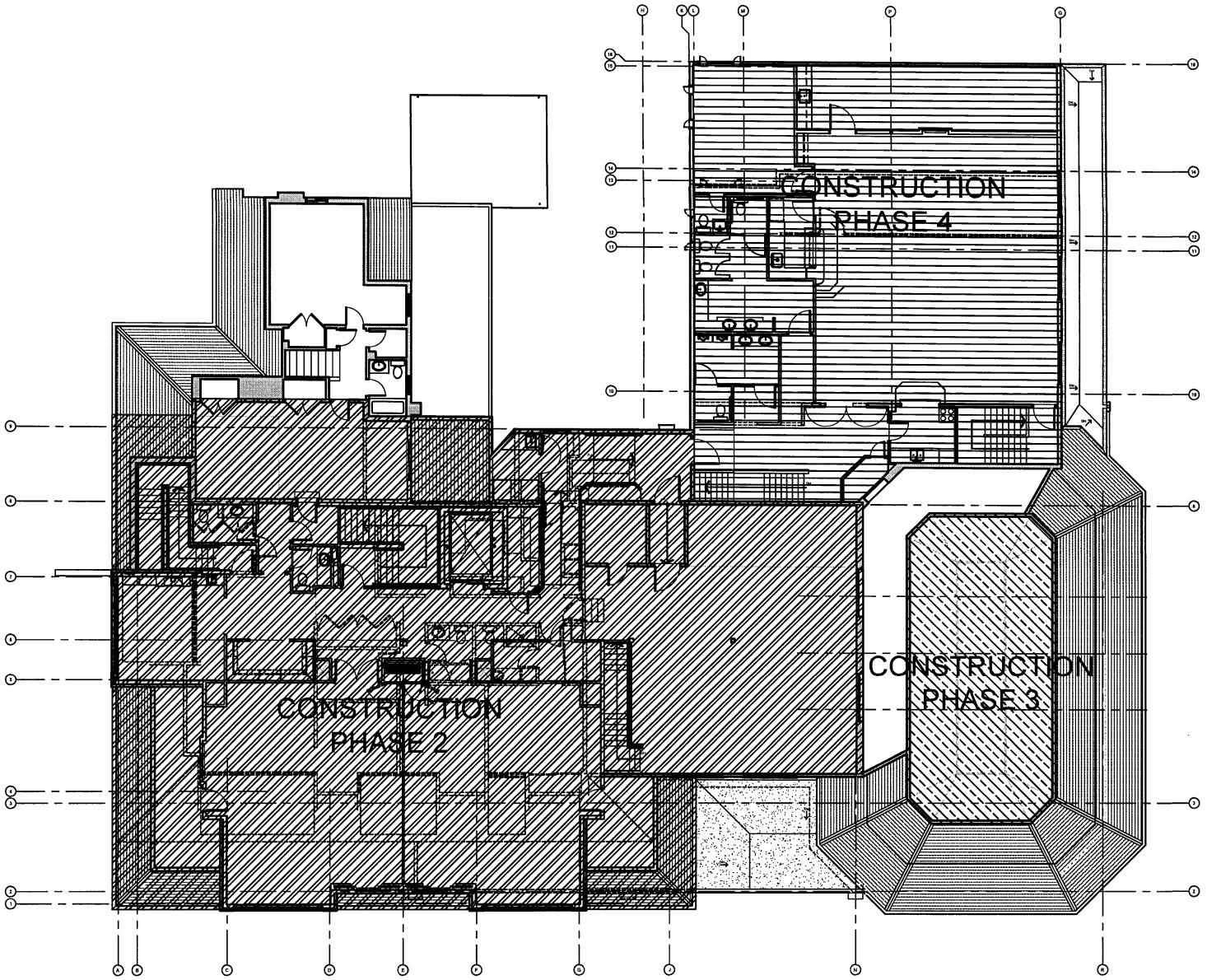
PROJECT #: 0660

DATE: 3 MAY 2011

DRAWING:

SK-02

GEORGE ROBB ARCHITECT



TITLE: CONSTRUCTION PHASES

PROJECT: Addition & Alterations - Egan Funeral Home
203 Queen St.S.,Bolton, Ontario

SCALE: N.T.S

PROJECT #: 0660

DATE: 3 MAY 2011

DRAWING:

SK-03

3 – ALTERNATE PRICES

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3.6 Alternate Price No. 3
The Alternate Price No. 3 shall carry all the labour and material required to supply and install an alternate Fibreglass Shingle, Cambridge 30 as manufactured by IKO Industries Ltd. in lieu of the Base Bid Fibreglass Shingle, Hatteras as manufactured by Certainteed under Section 07311 - Asphalt Shingle Roofing System. Show the difference in the cost on the tender form.

3.7 Alternate Price No. 4
The Alternate Price No. 4 shall carry all the labour and material required to supply and install an alternate Aluminum Entrance Screen assembly to be Kawneer Tri Fab 451T Series in lieu of the Base Bid Aluminum Entrance Screen Assembly to be Kawneer Aluminum Curtain Wall System, 1600 Wall System with 2 ½" x 6" thermally broken frames with outside mounted insulated glazing units with pressure plate closure. Show the difference in the cost on the tender form.

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Provide a separate price to undertake the work required to supply and install new exterior lighting bases, poles, conduit and wiring as outlined by ***Electrical Separate Price No. 2*** and as shown on Electrical Drawing No. E100.

5 – WORK PERFORMED UNDER SEPARATE CONTRACTS

5.1 Where the Owner has work performed under separate Contract by others, this Contractor shall co-operate as fully as possible to allow the work to be carried out at the proper time and location.

5.2 The Owner's Audio Visual trade has submitted a separate proposal to the Owner for the scope of work required to accommodate the new Audio Visual equipment throughout the facility. The Electrical Division drawings and specifications have co-ordinated their drawings and specifications to accommodate this scope of work.

The general Contractor shall co-ordinate and advise this subtrade contractor of the schedule and the timing for the placement of their work within the building. This subtrade contractor to the Owner should be invited to an early site meeting to arrange and confirm schedules for the staged installation of their work within the building.

END OF SECTION

0660 June 2, 2010 SECTION 01035 - WORK RELATED TO EXISTING FACILITES

1. GENERAL

1.1 Execute each part of the Work related to existing buildings by tradesmen specializing in such work.

2. OCCUPANCY OF EXISTING BUILDINGS

2.1 Access shall be maintained to all areas in the building.

2.2 Maintain fire protection in existing building.

2.3 Maintain exits and ensure that proper and safe means of egress from all parts of existing building to open spaces are provided at all times to the approval of all authorities having jurisdiction.

3. REMOVAL OF EXISTING WORK AND SALVAGE

3.1 Demolish only those portions of the existing building indicated on the drawings and as necessary for incorporating new work.

3.2 Remove building elements, components, materials and equipment as required of the Work.

3.3 Limit removal of items to the smallest areas and volumes possible and make good disturbed existing work.

3.4 Unless otherwise indicated, or directed by the Owner all such items removed shall become the property of the Contractor and shall be disposed of away from the site.

3.5 Remove waste materials and debris from the site at regularly scheduled times.

4. NEW AND REPLACEMENT WORK

4.1 Repair new surfaces to original line of existing surfaces. Make junctions between existing and new work or at replaced or remedial work visually undetectable. If this is impossible make a proposal of the intended method of making good for approval before starting work.

5. SERVICES IN EXISTING BUILDING

5.1 Where existing services are to be intentionally disturbed, make all provisions, and provide protection to avoid unnecessary disruptions until alternative or permanent means for continuation of the services are made.

END OF SECTION

1. GENERAL

1.1 Coordination of the Work of those Sections of the Specifications, which form this Contract, is the responsibility of the Contractor.

1.2 The Contractor will be deemed to possess the necessary technical skills to carefully evaluate all requirements of the Contract, and to have included for all project coordination and supervision to properly implement these requirements.

2. QUALITY ASSURANCE

2.1 Coordinate requirements of authorities having jurisdiction.

2.2 Maintain job records and ensure that such records are maintained by subcontractors.

3. SUBMITTALS

3.1 Schedule and expedite submission of specified submittals.

3.2 Review submittals and make comments as specified in Section 01300.

4. PRODUCT DELIVERY, STORAGE AND HANDLING

4.1 Schedule delivery of products with the Owner, to determine access and unloading areas.

4.2 The Owner will make available areas for storage of products and construction equipment to meet specified requirements, and to ensure a minimum of interference with progress of the Work and relocations.

4.3 Make arrangements for transference of stored products and construction equipment to work areas.

5. JOB CONDITIONS

5.1 Ensure that protection of adjacent property and the Work is adequately provided and maintained to meet specified requirements.

6. WARRANTIES

6.1 Ensure that warranties are provided as specified.

7. COORDINATION

7.1 Review Contract Documents and advise the Owner in writing of possible conflicts between parts of the Work before ordering of products or commencement of affected Work.

7.2 Coordinate all Work of this Contract on which subsequent Work depends to facilitate progress, and to prevent conflict between parts of the Work.

7.3 When installation information is given in error, or too late to incorporate in the Work the Contractor will be responsible for having all additional Work done which is thereby made necessary.

7.4 Remove and replace Work installed in error which is unsatisfactory for subsequent Work.

8. USE OF PREMISES

8.1 During the progress of the Work the Contractor will not have exclusive access to the Work areas nor the construction facilities. The site will continue to function as currently intended and the Contractor must not hinder access thereto.

8.2 The Contractor shall confine his plant, equipment, the storage of materials and the operations of his workmen to limits indicated by the Owner and shall not unreasonably encumber the premises with his materials.

8.3 The Contractor shall not load or permit to be loaded any part of the Work with a weight that will endanger its safety.

9. CONSTRUCTION METHODS

9.1 The Contractor shall be responsible for the safety, adequacy and efficiency of his plant and equipment at the site of the Work and for the construction methods, employed for its execution. The Contractor shall cause its employees, and the employees of any of its Subcontractors, to comply in all respects with rules and regulations issued from time to time in writing by the Owner governing safety and the execution of the Works.

END OF SECTION

PART 1- GENERAL

1.1 SCOPE

.1 Refer to all other sections of the documents to determine their effect on the work of each Section of these specifications.

1.2 DESCRIPTION

.1 It is intended that the Work proposed be executed in a manner which, to the fullest possible extent, minimizes any adverse effects on the cultural and natural environment of the project area. The environmental conditions of contract stated herein must be complied with in all respects. It is the responsibility of the Contractor that all his personnel be sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental damage.

.2 This Section outlined the general requirements of the environmental considerations and will be specified in more detail as required in the special clauses of these documents.

PART 2 – PRODUCTS

.1 There are no products under this section.

PART 3 – EXECUTION

.1 Refueling, Cleaning and Maintenance Areas

.1 The Contractor shall undertake a detailed review of his proposed route of construction to plan access routes and fueling areas. Construction equipment shall be cleaned prior to entering public roadways. All equipment cleaning and construction debris shall be contained and disposed of in an approved location. Refueling, cleaning and maintenance of equipment shall not be undertaken in or adjacent to watercourses. Suitable areas shall be established and all of these activities shall be conducted in these areas. The locations of such areas are subject to approval by the Engineer. Exhaust emissions from equipment should be minimized through efficient maintenance.

.2 Procedures for the interception and rapid clean up and disposal of spillages that do occur shall be submitted to the Engineer for review prior to starting work. All materials required for clean up of fuel spillages shall be maintained readily accessible on site. Any spills causing environmental impairment shall be reported immediately to the local District office of the Ministry of Environment.

.3 The exception to the fueling location requirement shall be generators, cranes, backhoes or shovels which may be fuelled at other than the designated fuelling areas. However, no fuelling of backhoes shall be carried out within 30 metres of any watercourse. This requirement may be relaxed at the discretion of the Engineer if no-spill fuelling facilities are used.

.2 Noise Control

.1 All vehicles and equipment shall be equipped with efficient muffling devices to minimize noise levels in the project area. In particular, construction equipment such as compressors, gas and diesel driven engines, and pavement breakers shall be equipped with efficient mufflers.

.2 The Contractor shall establish and maintain site procedures consistent with the objective that noise levels from the construction area shall be minimized, and in accordance with local by-laws.

.3 In areas where semi-permanent installations, such as tunnel shafts, are required, other devices such as artificial barriers, berms, etc. shall be used to minimize noise levels.

.3 Dust Control

.1 The Contractor shall undertake all dust control measures to prevent dust nuisances resulting from any phase of his operation. Dust control practices shall be carried out at all locations on site or on adjacent roads. Permitted dust control measures include the applications of calcium chloride, oiling or water.

.2 Frequent water applications shall be required throughout the duration of the work. The contractor shall ensure that sufficient water and applicators are available at all times. The use of calcium chloride shall be restricted to weekend applications except where the Engineer has given prior approval in writing due to circumstances beyond the control of the Contractor. The use of calcium chloride and oil shall be minimized in close proximity to watercourses.

.3 The transporting of excessively dusty materials such as cement must be carried out in covered haulage vehicles.

.4 Working Area Delineation

.1 The boundaries of the working area shall be delineated through the use of snow fencing, prefabricated fencing materials or solid plywood barriers to obstruct the view of stored materials and or equipment provided to the site.

.2 Snow fencing shall be placed between the construction easement and watercourse, marshes, trees and shrubs that are to be protected.

.5 Clearing of Vegetation

.1 Prior to clearing of vegetation the route of the proposed works shall be examined to identify significant environmental features which must be maintained. Particular attention shall be given to any natural wildlife habitats located within the working areas. Trees which can be preserved shall be protected by snow fencing or equivalent placed around the drip line. The Engineer shall designate on the Drawings and shall identify in the field those natural environmental features within the working limits which must be preserved. If deemed necessary by the Engineer, the Contractor shall erect, maintain and remove snow fence in order to protect these areas.

.2 In general, clearing and grubbing shall be kept to a minimum. Vegetative

cover shall be removed only slightly in advance of actual construction. Clearing and grubbing shall be performed in a manner stated herein or as shown on the Contract Drawings.

.6 Stockpiles

.1 Stockpiles of a semi-permanent nature, e.g. topsoil, excess excavated material, shall be located and protected to ensure minimum environmental interference.

.2 Stockpiles of this type shall be covered with plastic sheeting and perimeter drainage ditches shall be constructed to intercept and divert runoff to adjacent settling ponds.

.3 Specific attention must be given to the locating of stockpiles or other fills away from tree stands, flood plains and areas containing valuable natural wildlife habitats. The destruction of tree roots or other vegetation by unnecessary cutting during construction or by the placing of excessive fill in trees stand areas, or by compaction due to heavy equipment will not be permitted.

.4 Excess excavated material shall be disposed of in an approved manner.

.7 Protection of Trees

.1 The Contractor shall be responsible for the protection of tops, trunks and roots of existing trees on the project site that are to remain. Existing trees subject to construction damage shall be fenced around the drip line before any work is started. Wherever possible, do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars immediately with an approved tree wound dressing.

.2 Where excavating, filling or grading is required within the branch spread of trees that are to remain the work shall be performed as follows

1. Trenching When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots. Any roots over 25 mm which are damaged, shall be treated immediately with tree paint.

2. Raising Grades-When the existing grade at the tree is below the new finished grade, and fill not exceeding 400mm is required, clean washed gravel graded from 25mm to 50mm size shall be placed directly around the tree trunk. The gravel shall extend out from the trunk on all sides a minimum of 450mm and finish approximately 50mm above the finished grade at the tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill.

3. Lowering Grades Trees marked for preservation that are located above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level . Exposed or broken roots shall be cut clean and covered with topsoil.

.3 Trees potentially undermined by trench construction shall be braced to unaffected trees by means of cables and turnbuckles, for the period of open trench construction.

.4 All trees outside the working easement, or those within the working easement, or those within the working easement and designed to be protected shall be protected from construction activity.

.5 Any shrubs or trees killed by the construction operation shall be removed from the construction site and disposed of in a location approved by the Engineer.

.6 Any such trees which, in the opinion of the Engineer have been damaged beyond repair by the Contractor's activity shall be replaced by the Contractor at his expense with trees of a similar size and species, or such size and species as may be approved by the Engineer. These trees shall be subject to guaranteed maintenance.

.8 Fires

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

.9 Disposal of Wastes

.1 Do not bury rubbish and waste materials on site, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

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

.10 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump or permit water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materails or other harmful substances in accordance with local authority requirements.

.11 ISO 14001 Environmental Management System Requirements

The Town, as part of its ISO 14001 Environmental Management System Requirements, requires that contractors and suppliers working on behalf of the Engineering & Public Works Department be qualified, trained and competent to carry out their functions and duties. All contractors and suppliers shall be aware of environmental issues and the Engineering & Public Works Department's environmental policy and procedures in all matters associated with their work. The Town may request a contractor or supplier to provide documented education, training records, licensing, certification, skills and years of experience for persons working on behalf of the

Engineering & Public Works Department. Contractors and suppliers may from time to time be required, as determined by the Town in its sole discretion, to attend environmental awareness, procedural or work instruction training sessions at the Town prior to the commencement of Work.

Erosion & Sedimentation Control
Contractor shall prepare and implement an Erosion and Sediment Control plan detailing sediment control measures to be implemented before construction activities on the subject lands to protect downstream watercourses and environmental features.

Where silt fencing is required, the Contractor shall install Enviro Fence, or approved equal, for sediment control as per OPSD 219.110. The silt fencing shall be 1.2 m high, complete with T-bars and a filter fabric attached to the fence. The sediment control fence must be anchored and toed-in at least 15-20 cm (6 to 8 inches) in a trench and then backfilled and compacted.

Recycled Material and Energy Conservation Specification
In order to contribute to waste reduction and energy conservation and to increase the development and awareness of environmentally sound purchasing, acquisitions of goods and services will ensure that wherever possible, specifications are amended to provide for expanded use of durable products, reusable products and products (including those used in services) that contain the maximum level of post-consumer waste and/or recyclable content, and which consume less energy, without significantly affecting the intended use of the products or service. It is recognized that cost analysis is required in order to ensure that the products are made available at competitive prices.

Spill Response
Any and all fuel, oil or chemical spills must be reported by the Contractor to the Town immediately. As soon as a spill starts, the Contractor will cease operations immediately until the Contractor's supervisor arrives on site.

Dryall or other absorbent, depending on the nature of the spill, will be laid down by the Contractor immediately, and other steps will be taken as necessary to prevent the spill from entering the sewer or watercourse. As soon as the absorbent has had the desired effect, it is to be scraped from the road or affected property. If residue still remains the Contractor will repeat the above process until all of the spill has been absorbed and will leave the site in a clean and tidy condition. Failure to respond immediately to spills may result in asphalt or other damage for which the Contractor will be responsible.

The Contractor will notify the Town as soon as they have completed the steps outlined above in order that the Town can inspect the site to ascertain whether any further action is required. If necessary, at the Commissioner's discretion, power washing and/or other spill clean-up measures will be utilized at the Contractor's expense.

Working Near Water Courses
The Contractor shall follow the guidelines contained in the Metropolitan and Region Conservation Authority publication entitled "Erosion and Sediment Control Guidelines for Construction", April 1994.

i. Watercourses shall not be diverted, or blocked and temporary watercourse crossings shall not be constructed or utilized, unless otherwise specified in the contract.

ii. Where the contract does not require work in watercourses or on watercourse banks, equipment shall not be operated within such areas.
iii. Construction material, excess material, construction debris and empty containers shall be stored away from the watercourse and environmentally sensitive areas.
iv. All equipment maintenance and refueling shall be controlled so as to prevent any discharge of petroleum products. Vehicular maintenance and refueling shall be conducted away from watercourse and environmentally sensitive areas.
v. Run-off from construction materials and any stockpiles shall be contained and discharged so as to prevent entry of sediment to watercourses.
vi. If dewatering is required, any sediment laden water is to not discharge directly into the watercourse and is to be filtered.
vii. To reduce erosion, erosion mats will be placed to aid in slope stabilization until the cover vegetation has taken as specified in the contract.
viii. Construction is to not occur within watercourse due to MNR timing restrictions. Once the construction for the culvert extensions commence, it shall continue until complete. Temporary erosion mats may be required for temporary stoppage, i.e. overnight, Sundays, etc. Work shall not commence on the extension if rain is forecast within the time allotted for the construction of the extension. Work for the extension shall not be scheduled to commence near the end of the week.
ix. Erosion control measures are to be in place before extension construction commences. Materials that result from the work or that are disturbed by the work shall be prevented from entering the open portion of the watercourses.
x. The contractor is to inform the Contract Administration and the Conservation Authority 2 working days in advance of commencing construction.

The contractor shall install other erosion and sediment controls as required as per OPSS 577 (Feb. 1996).

END OF SECTION

1.1 Pre-Construction Meeting

.1 Immediately prior to construction, upon notification, attend at location of Owner's choice, a pre-construction meeting, along with authoritative representatives of key subcontractors, project superintendent, inspection and testing company representatives, and the consultants.

.2 Purpose of meeting is as follows:

.1 Review project communications procedures.

.2 Review Contract administration requirements including submittals, payment and change order procedures.

.3 Identify all critical points on Construction Schedule for positive action.

.4 Review Consultant's inspection, requirements.

.5 Review any points which require clarification.

1.2 Site Meetings

.1 Hold regular site meetings every two weeks. Ensure that persons, whose presence is required, are present and that relative information is available to allow meetings to be conducted efficiently. The Consultant will attend these meetings. The Owner may also choose to attend these meetings, at his discretion.

.2 Schedule additional meetings, if required.

.3 Prepare an agenda for each meeting and distribute a copy to all required participants prior to the meeting.

.4 Record minutes of each meeting and promptly distribute copies to be received by all participants not later than seven calendar days after meeting has been held.

1.3 Supervision

.1 Employ an experienced and qualified superintendent for the project who shall devote his time exclusively to the work of this Contract and who shall be in complete charge of the work from commencement to completion. A working foreman will not be acceptable. The superintendent shall not be changed after commencement of work without the Consultant's approval. The Superintendent shall possess a C.C.S. and/or Gold Seal Certificate designation and be acceptable to the Owner.

.2 Supervise, direct, manage and control the work of all forces carrying out the work, including subcontractors and suppliers. Carry out daily inspections to ensure compliance with the working drawings and detailed specifications and the maintenance of quality standards. Ensure that the inspection staff includes personnel competent in supervising the mechanical and electrical trades.

1.4 Progress Record

.1 The Contractor shall maintain on site, permanent written record of progress of work. Record shall be open to inspection by Owner at all times and copy shall be furnished to Consultants upon the Consultant's request.

.2 This record shall show weather conditions, dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to erection and removal of forms, pouring of concrete, installation of roofing and other critical or major components as well as number of employees of various trades and type and quantity of equipment employed daily, shall be noted.

.3 Display a copy of the construction schedule in the site office from start of construction to completion. Superimpose actual progress of work on schedule at least once each week.

1.5 As-Built Drawings

.1 Maintain an accurate set of As-Built Drawings showing progress of the work and all changes, revisions and additions to the work and deviations from the Contract Documents in red ink.

.2 Include accurate location, depth, position, size and type of concealed and underground services, both inside and outside shall be as part of these As-Built Drawings.

.3 As-Buift Drawings shall be available for review at each site meeting by the Consultant.

1.6 Documents on Site

.1 The Contractors field office shall at all times contain a complete set of Contract Documents (Drawings and Specifications) with all addenda, site instructions, change orders, reviewed shop drawings and samples, colour schedule, paint materials schedules, hardware list, progress reports and meeting minutes.

.2 The Contractor's field office shall at all times contain a complete set of all construction documents, as issued for building permit and bearing the stamp of the appropriate municipal authority.

END OF SECTION

1. GENERAL

1.1 Make submittals specified in this Section to the Owner unless otherwise specified.

1.2 Ensure that submissions requiring review and comment, or approval, are made to allow sufficient time for review without delaying progress of scheduled construction.

1.3 Work affected by a submittal requiring review by the Owner shall not proceed until review is complete.

2. CONSTRUCTION SCHEDULES

2.1 Submit proposed construction schedule prior to commencement of Work, as specified in Section 01311 Construction Schedule.

2.2 As construction progresses, submit up-dated construction schedules to the Owner.

3. EXTRA STOCK

3.1 Supply extra stock at completion of Project where specified in other Sections of the Specifications.

4. SAMPLES

4.1 Submit samples for which a submission requirement is specified in other Sections of the Specifications.

4.2 Submit samples in duplicate of adequate size to represent the material in its intended use on the Project.

4.3 Label samples with the Project name, Contractor name and date.

4.4 If sample is not approved, both samples will be returned. If sample is approved, one sample will be returned, marked "approved".

4.5 Approved samples shall serve as a model against which the products incorporated in the Work shall be judge.

5. SHOP DRAWINGS

5.1 Submit shop drawings where required in other Sections of the Specifications. Include in shop drawing submissions detailed information, templates and installation instructions required for incorporation and connection of the Work concerned.

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

5.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams,

connections, explanatory notes and other information necessary for completion of the Work. Indicate cross references to design drawings and specifications.

5.4 The Contractor will check, sign, and make notations he considers necessary on shop drawings before submission to the Owner.

5.5 Indicate on each submission, changes from the Contract Drawings and Specifications that have been incorporated in the shop drawings. The Contractor shall be responsible for changes made from the Contract Drawings and Specifications which are not indicated or otherwise communicated in writing with the submission.

5.6 Shop drawing review by the Architect is for the sole purpose of ascertaining general conformance with the design concept. This review shall not mean that the Architect warrants or represents that the information contained on the shop drawings is either accurate or complete, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for meeting design, details and all other requirements of the Contract Documents. The Contractor is 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.

5.7 Adjustments made on shop drawings by the Owner are not intended to change the Contract Price. If adjustments affect the Value of Work, state such in writing to the Owner prior to proceeding with the Work.

5.8 Submit shop drawings folded into 8 - ½" x 11" size with title block appearing on outside. Copies of engineering data sheets, catalogue cuts and standard diagrams may be substituted for shop drawings where applicable. Submit three prints and one sepia of each drawing or four copies of catalogue cuts.

5.9 Shop drawings which require extensive correction will be sent back for revisions and resubmission. Two prints will be retained and all other copies returned.

5.10 Other than 5.9, shop drawings will be sent back with review comments only. One print will be retained and all other copies returned.

5.11 Only drawings noted for revision and resubmission need be resubmitted.

5.12 Do not add new details or information to shop drawings after they have been finally reviewed, except when approval is given.

5.13 Review of shop drawings shall not relieve the Contractor of his responsibility for execution of Work in accordance with Contract Documents.

5.14 Fabricate Work exactly as shown on shop drawings. If shop practice dictates revisions, revise drawings and resubmit.

5.15 File one copy of each finally revised and corrected shop drawing at site.

6. EXTENDED WARRANTIES

6.1 Submit the extended warranties as specified in each application Section of the Specifications.

6.2 Extended warranties shall commence on termination of the standard one year warranty granted in this Contract as specified in Article GC 12.3, Warranty, of the General Conditions, and shall be an extension of these same provisions.

6.3 Submit each extended warranty in an approved uniform format.

7. AS-BUILT DRAWINGS

7.1 Submit as built drawings to the Architect.

END OF SECTION

1. SCHEDULE

.1 Before commencement of Work, provide construction Schedule to Consultant and Owner for approval.

.2 Schedule shall show:
- .1 Commencement and completion dates of Contract,
- .2 Commencement and completion dates of stipulated stages,
- .3 Commencement and completion dates of Trades,
- .4 Commencement and completion dates of any anticipated interruptions to the on-going use of the building,
- .5 Order and delivery times for materials and equipment, where possible,
- .6 Dates for submission of shop drawings, material lists and samples,
- .7 Any other information relating to the orderly progress of the Contract.

2. UPDATING AND MONITORING

.1 Set up format of Construction Schedule to allow plotting of actual progress against scheduled progress.
- .1 Allow sufficient space for modifications and revisions to the Schedule as Work progresses.
- .2 Format shall be approved by the Consultant.

.2 Copy of the Schedule shall be displayed in Site Office during construction period and actual progress shall be plotted weekly.

.3 Arrange participation, on site and off site, with sub-contractors and suppliers, as and when necessary for the purpose of updating the schedule and monitoring progress.

END OF SECTION

1 References

1.1 Export and Import of Hazardous Waste Regulations.

1.2 National Fire Code of Canada.

1.3 Transportation of Dangerous Goods Act.

1.4 Transportation of Dangerous Goods Regulations.

2 Definitions

2.1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.

2.2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

2.3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.

2.4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

3 Submittals

3.1 Submit product data in accordance with Section 01330 - Submittal Procedures.

3.2 Submit to the Owner current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.

3.3 Submit hazardous materials management plan to the Town, that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

4 Storage and Handling

4.1 Coordinate storage of hazardous materials with the Town and abide by internal requirements for labeling and storage of materials and wastes.

4.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

4.3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.

4.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use. Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Owner.

4.5 Transfer of flammable and combustible liquids is prohibited within buildings.

4.6 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

4.7 Flammable liquids having a flash point below 38C, such as naphtha or gasoline, will not be used as solvents or cleaning agents.

4.8 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.

4.9 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.

4.10 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

4.10.1 Store hazardous materials and wastes in closed and sealed containers which are in good condition.

4.10.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

4.10.3 Store hazardous materials and wastes in containers compatible with that material or waste.

4.10.4 Segregate incompatible materials and wastes.

4.10.5 Ensure that different hazardous materials or hazardous wastes are not mixed.

4.10.6 Store hazardous materials and wastes in a secure storage area with controlled access.

4.10.7 Maintain a clear egress from storage area.

4.10.8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.

4.10.9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.

4.10.10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

4.11 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

4.12 Report spills or accidents immediately to the Town. Submit a written spill report to the Town within 24 hours of incident.

5 Transportation

5.1 Transport hazardous materials and wastes in accordance with the federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

6 Materials

6.1 Only bring on site the quantity of hazardous materials required to perform the Work.

6.2 Maintain MSDSs in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

7 Disposal

7.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

7.2 Recycle hazardous wastes for which there is an approved, cost effective recycling process available.

7.3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.

7.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

7.5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

7.6 Dispose of hazardous wastes in a timely fashion in accordance with applicable provincial regulations.

8 Site Remediation

8.1 Undertake scope of work required to remediate the site prior to the commencement of work on the property in response to the information that is provided in the Designated Substances Survey as undertaken by Decommissioning Consulting Services Limited as submitted on July 3, 2008 and the secondary review that was undertaken for the Roof and Exterior Upgrades Project as submitted on November 20th, 2008. See Appendix B and C for copies of these reports.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Uniform Traffic Control Devices for Canada, (UTCD), latest edition distributed by Transportation Association of Canada.

1.2 Protection of Public Traffic

.1 Comply with requirements of Acts, Regulations and By-laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to present minimum of interference and hazard to travelling public.

.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Do not close any lanes of road without approval of the Town. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in Part D of UTCD.

.4 Keep travelled way graded, free of pot holes and of sufficient width for required number of lanes of traffic.

.1 Provide minimum 7 m wide temporary roadway for traffic in two-way sections through Work and on detours.

.2 Provide minimum 5 m wide temporary roadway for traffic in one-way sections through Work and on detours.

.5 As directed by the Town, provide gravelled detours or temporary roads to facilitate passage of traffic around restricted construction area, if required.

.6 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exists that meet approval of the Town.

1.3 Informational and Warning Devices

.1 Provide and maintain signs, and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Part D, Temporary Conditions Signs and Devices, of UTCD manual.

.3 Place signs and other devices in locations recommended in UTCD manual.

.4 Meet with the Town prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of the Town.

.5 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Removing or covering signs which do not apply to conditions existing from day to day.

1.4 Control of Public Traffic

.1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in, UTCD manual in following situations:

.1 When public traffic is required to pass working vehicles or equipment which block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 For all truck access entering and leaving one hour before opening and one hour after closing of adjacent schools (8-9:00 a.m. and 3-4:00 p.m.).

1.5 Operational Requirements

.1 Maintain existing conditions for traffic throughout period of construction contract.

END OF SECTION

0660 June 2, 2010 SECTION 01380 – CONSTRUCTION PHOTOGRAPHS

1.0 GENERAL

.1 Provide construction photographs in accordance with procedures and submission requirements specified in this Section.

.2 Photographs to be taken with a digital camera with minimum 10.0 megapixel quality.

2.0 PROGRESS PHOTOGRAPHS

.1 Image size: Provide 203 x 279 pictures, with one per page.

.2 Printed on 20 lb. minimum paper with date stamp included.

.3 Paper to be 92 brightness or better.

.4 Number of printed copies required: Allow for two sets

.5 Identification: Include an identification tag as an explanation indicating the name of the project, project number, location of the picture, time & other relevant data related to the print copy.(Weather, condition illustrated, etc.)

.6 Number of viewpoints: 2 for each area of work. Locations of viewpoints determined by Consultant.

.7 Frequency: monthly with progress statement, showing areas for which claim is being made, showing areas of work commences, at 50% complete work, at completion of work on any area of the building.

.8 In addition to photographs required by this Section, refer to other Sections for additional photographs of specific components of the Work.

3.0 DETAIL PHOTOGRAPHS

.1 Image sizes: 127 x 178 mm with two per page.

.2 Printed on 20 lb. minimum paper with date stamp included.

.3 Paper to be 92 brightness or better.

.4 Number of printed copies required: Allow for two sets

.5 Identification: Include an identification tag as an explanation indicating the name of the project, project number, location of the picture, time & other relevant data related to the print copy.(Weather, condition illustrated, etc.)

.6 Number of viewpoints:
.1 As indicated in respective specification Sections.

.7 Frequency: As requested on site and as required to record the progress, condition, context or impact of the specific condition being followed, documented, analyzed and /or examined.

4.0 FINAL PHOTOGRAPHS

.1 Print sizes: 203 x 279 mm.

.2 Printed on 20 lb. minimum paper with date stamp included.

.3 Paper to be 92 brightness or better.

.4 Number of printed copies required: Allow for two sets

.5 Identification: Include an identification tag as an explanation indicating the name of the project, project number, location of the picture, time & other relevant data related to the print copy.(Weather, condition illustrated, etc.)

.6 Number of viewpoints:

.1 Each side of building, and selected details, for maximum total of 32 viewpoints, maximum 1,280 exposures (40 sets of digital images of progress)

.2 Locations of viewpoints determined by Consultant.

5.0 ELECTRONIC RECORDS

.1 Submit a complete set of digital records that are logged by date sequentially and follow the progress of the work in the four phases of the construction and illustrates required special conditions and all onsite items arising throughout the course of the construction contract.

.2 Submit a binder that contains the biweekly progress digital photo record and monitors the special conditions arising, requested or required by other sections of this specification.

.3 All record photographs prints shall be fully annotated showing the date, special temperature or conditions, name of the project and project number.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01330 - Submittal Procedures.

.2 Section 01780 - Closeout Submittals.

1.2 Inspection

.1 Allow the Inspection and Testing Agency access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Provide timely request for inspection if Work that is designated for testing, inspecting or verification as specified or required by current regulations.

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

.4 The Town may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.3 Independent Inspection Agencies

.1 Independent inspection/testing Agency will be engaged by the Contractor as one of the cash allowance items for the purpose of inspecting and/or testing portions of Work.

.2 Contractor to contact Terraprobe Limited directly for all testing requirements. Terraprobe Limited , 10 Bram Court, Brampton, Ontario, L6W 3R6, Tel: 905-796-2650, Fax: 905 796-2250, attention: Mr. Billy Singh.

.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 at no cost to the Owner.

.6 Contractor to pay costs for testing and inspection from the Cash Allowance and the Contractor to pay costs for all retesting and reinspection associated with failed tests.

1.4 Access to Work

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

.2 Co-operate with inspection/testing agency to provide reasonable facilities for such access.

1.5 Procedures

.1 Notify appropriate agency and the Owner 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 first meeting agenda. 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.

1.6 Rejected Work

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

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

1.7 Reports

.1 Reports by the Testing agency will be distributed by the Testing agency to the Architect, the Contractor and the Structural Engineer.

.2 Reports of all other inspection and test results will be distributed by the Contractor. 2 copies for each party.

1.8 Tests and Mix Designs

.1 Furnish test results and mix designs as may be requested.

1.9 Mock-ups

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

.2 Remove mock-up at conclusion of Work. Mock-ups may remain as part of the Work, when acceptable to the Consultant.

1.10 Equipment and Systems

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

1.11 Cash Allowance for Inspection and Testing

.1 Carry a cash allowance in the amount of $8,000.00 for the inspection and testing required throughout the course of the work.

END OF SECTION

PART ONE – GENERAL

1.1 Related Sections

.1 Section 01535 – Temporary Facilities.

.2 Section 01560 – Temporary Controls.

1.2 Installation, Maintenance and Removal

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

.2 Remove from site all such work after use.

.3 Maintain temporary utilities and plant in good operating order.

1.3 Dewatering

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

1.4 Sanitary Facilities

.1 Provide sanitary facilities in accordance with applicable legislation. Use of sanitary facilities in the building is prohibited.

.2 Maintain in clean condition.

1.5 Water Supply

.1 Provide a continuous supply of potable water for construction use.

.2 Provide temporary connections to supply points, and pay all costs for installation, maintenance and removal.

.3 Existing sources of water can be made available to the Contractor by the Owner.

.4 Avoid wasteful use of water.

1.6 Temporary Heating

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel (unless otherwise specified), for exterior work, or work exposed to exterior conditions, during construction period 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.

.2 Construction heaters used inside building or enclosure shall be vented to outside or be non-flameless type. Solid fuel salamanders not permitted.

.3 Maintain temperatures of minimum 10°C in areas where construction is in progress, unless indicated otherwise in specifications.

.4 Permanent heating system of building, or portions thereof, may be used when available. Be responsible for damage thereto. Do not modify or alter existing system without written direction from Consultant.

.5 On completion of work for which permanent heating system is used, replace filters, and leave equipment clean.

.6 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 accepted by Consultant.

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

.8 Prevent excessive use or waste of utilities, and minimize utility costs to Owner.

.9 Maintain strict supervision of operation of temporary heating equipment to:

.1 Conform to 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.

1.7 Temporary Ventilation

.1 Ventilate heated areas keep building free of exhaust or combustion gases.

.2 Provide local exhaust ventilation to prevent accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.

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

.4 Ventilate storage spaces containing hazardous or volatile materials.

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

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

.1 Conform to 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 New and existing equipment and systems shall not be used for temporary ventilating.

.8 Use of electric heaters for temporary heating of work areas (other than site office) and materials is prohibited.

1.8 Temporary Power and Light

.1 Existing power and lighting may be used during construction. Provide and pay for any additional temporary power required during construction, except as indicated otherwise.

.2 Avoid wasteful use of power.

.3 Supply all necessary temporary connections for use of power. Make connections in accordance with Canadian Electrical Code.

.4 Take all measures to prevent waste of power.

.5 Site verify available power supply, including amperage, voltage, and phases. Unless otherwise advised or ascertained, assume maximum power supply at 110V, single phase, 60 Hz is available.

1.9 Temporary Telephone

.1 Provide and pay for temporary telephones necessary for own use and use of Consultant and Owner.

.2 Telephone service shall be separate from Owner's existing service.

.3 Telephone service shall be complete with answering machine or voice mail messaging system, and facsimile machine.

1.10 Fire Protection

.1 Provide and maintain temporary fire protection equipment during performance of work required by governing codes, regulations and bylaws and by Owner's requirements.

.2 Open debris and burning rubbish are not permitted on site.

PART 2 – PRODUCTS **Not Used.**

PART 3 – EXECUTION **Not Used.**

END OF SECTION

PART ONE – GENERAL

1.1 Related Sections

.1 Section 01510 – Temporary Utilities.

.2 Section 01560 – Temporary Controls.

1.2 Installation and Removal

.1 Provide construction facilities in order to execute work expeditiously.

.2 Maintain temporary facilities and plant in good operating order.

.3 Remove from site such work after use.

1.3 Scaffolding

.1 Provide and maintain scaffolding, ramps, ladders, platforms, temporary stairs and other temporary access devices as required to complete the Work.

.2 Design and construct scaffolding in accordance with CSA S269.2-M87, and provisions of applicable occupational health and safety legislation. Construct and maintain scaffolding in rigid, secure and safe manner, complete with stairs to all levels.

.3 Erect scaffolding independent of walls. Remove promptly when no longer required. **Note:** scaffolding may be temporarily secured to walls where fasteners are into joints only, and where masonry units are not affected or damaged by drilling, anchor shields, or other objects. Anchoring shall not require size of joint to be widened, or that masonry be removed to accommodate anchors.

.4 Where scaffold is secured to walls, anchors shall be non-corroding type, and anchors may only be set into masonry joints, and only where existing brick and stone masonry units are not damaged by scaffold anchors. Remove anchors and repoint prior to completing work in accordance with other Sections.

.5 Any part of the scaffolding, hoists or any construction plant shall not directly bear against the masonry. Provide insulating material of lumber or plywood with additional padding as necessary to prevent damage to the existing masonry and other surfaces.

.6 Install bearing pads below scaffold legs to protect surfaces such as asphalt pavement from damage.

.7 Not less than 50% of the building, as measured by wall area, shall be scaffolded at any time during the course of the work, unless otherwise agreed in advance by the Consultant. Terminate scaffolding at natural breaks in the work involved, such as changes in wall plane.

1.4 Hoisting

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

.2 Hoists and cranes shall be operated by qualified operator.

1.5 Elevators

.1 Not applicable as a temporary facility within the building.

1.6 Site Storage/Loading

.1 Confine work and operations of employees to limits indicated by Contract documents or where no limits shown on drawings, to immediate area of work. Do not unreasonably encumber premises with products.

.2 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work or cause permanent deformation.

.3 Assume full responsibility for protection and safekeeping of products under this Contract.

.4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.5 Establish fenced and secure outdoor storage areas for materials not requiring weather protection.

1.7 Security

.1 Comply with Owner's security requirements.

1.8 Offices

. 1 Provide and maintain in clean condition during progress of work, adequately lighted, heated and ventilated temporary Contractor's office with drawing lay down table, space for filing and layout of Contract Documents and Contractor's normal site office staff.

.2 Provide adequate required first aid facilities.

1.9 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 least interference with work activities.

1.10 Construction Sign

.1 Provide and erect, within two weeks of signing Contract, and prior to submitting first claim for payment, minimum 4' x 8' x 5/8" G1S plywood sign, complete with wood framing and supports, listing project title, Owner, all consultants and contractor, with name and address for all; sign background and rear face of sign shall be white; letters for names 50 mm high, addresses and telephone numbers 25 mm high, black paint, except Project Name 100 mm high, Owner's name 75 mm high; typeface as respective corporate colour. Provide 100 mm between parties. Provide layout sketch for Consultant's approval prior to fabricating sign. At Contractor's discretion, subcontractors may be listed on the construction sign, space permitting. Sign shall be executed with exhibit lettering produced by a professional sign manufacturer/painter.

.2 Erect sign prior to first application for payment.

.3 No other signs or advertisements, other than warning signs, or signs required by law, are permitted on site, without Owner's consent.

.4 Maintain sign in good condition for duration of work. Clean periodically.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

PART ONE – GENERAL

1.1 Related Sections

.1 Section 01002 Special Project Requirements.

.2 Section 01510 Temporary Utilities.

.3 Section 01535 Temporary Facilities.

1.2 Installation and Removal

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

.2 Maintain temporary controls and plant in good operating order.

.3 Remove from site all such work after use.

1.3 Hoarding

.1 Erect hoarding to protect the public, workers, public and private property from injury or damage.

.2 Provide lockable gates within hoarding for access.

.3 Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to building.

.4 Provide barriers around trees and plants designated to remain. Protect from damage.

.5 Erect signs to prohibit entry of unauthorized personnel into work areas. Use all necessary security means to prevent unauthorized access into work areas.

.6 Erect walkways, hoarding, guards, or other protective measures and directional devices required to provide persons with safe access to the building. Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law to permit access to and from building.

.7 Maintain public side of enclosure in clean condition.

.8 Maintain the area within the temporary enclosure in a neat, clean, and orderly manner.

.9 Keep all operations, other than access to and from the work of this contract, within the temporary enclosure and existing site fencing.

1.4 Guard Rails and Barricades

.1 Provide secure, rigid guardrails and barricades around deep excavations, open shafts, open stairwells, open edges of floors and roofs.

.2 Provide secure, rigid guard rails and barricades as required by governing authorities.

.3 During dismantling and re-building of southerly entrance stairs, provide temporary facilities to maintain exit route. Advise Owner and occupants during periods when exit through this doorway is not possible.

1.5 Security and Weather Enclosures

.1 In addition to the requirements of other Sections, provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors, walls, and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work area for temporary heat.

1.6 Dust Tight Screens

.1 In addition to the requirements of other Sections, provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work, Owner and occupation, and public.

.2 Provide and place dust screens, covers, or other appropriate dust protection to keep surfaces, furnishings, equipment, and fittings completely free from dust and debris arising from the Work.

.3 Install temporary filters to existing mechanical grilles, louvers, exhausts, etc., unless the Owner has consented to disconnect the equipment involved.

.4 Maintain and replace protection until such Work is complete. Remove upon completion of dust- generating work, and clean areas affected.

1.7 Access to Site

.1 Use new and existing driveways, roads, parking areas, and sidewalk crossings as may be required for access to the work.

.2 Protect driveways, roads, parking areas and sidewalk crossings from damage, and make good damage arising.

.3 Keep public roads clean of soiling.

1.8 Public Traffic Flow

.1 Provide and maintain flag persons, traffic signals, barricades and flares, lights, or lanterns as required to perform the work and protect the public.

.2 Provide protected covers to all building entrances and exits at all times.

1.9 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.

1.10 Garbage Chutes and Bins

.1 Provide garbage chutes to control fall of debris from above grade works to waste container. Do not allow debris to free-fall.

.2 Provide all necessary garbage bins and dispose of debris off-site.

1.11 Enclosure of Structure

.1 Where the existing building envelope is opened, breached, or otherwise compromised by work of this Contract, possibly permitting entry of wind or precipitation into the building, or possibly adversely affecting usual interior temperatures and humidity, provide temporary weather tight and dust tight enclosures and protection for exterior openings made until permanently enclosed.

.2 Refer to other specification Sections for additional requirements pertaining to particular temporary closures.

.3 Erect enclosures to allow access for installation of materials and working inside enclosure where necessary.

.4 Design enclosures to withstand wind pressure and snow loading.

.5 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration work is adjacent to areas used by public or government staff.

.6 Provide temporary dust barriers at all exterior openings, which could permit entry of dust from Work of this Contract to interior areas, contaminating occupied or habitable spaces. Be advised that windows in this building are generally operable, and must be at least partially maintained as ventilating units for occupant health and comfort. Where temporary screens prevent adequate space ventilation, and ventilation is required by occupant use, provide alternate ventilation means to maintain level of occupant comfort normally occurring in this building.

.7 Existing mechanical grilles, louvers, exhausts, etc., shall not be covered or blocked without the Consultant's consent. Where required, provide temporary extension of these elements past the exterior face of the scaffold, and/or filtering of incoming air for these elements past the exterior face of the scaffold, and/or filtering of incoming air for these elements in a manner that will not impede normal operation of the equipment, unless the Consultant has consented to disconnect the equipment involved.

.8 Protect adjacent and abutting properties and buildings from damage, dust, and disturbance by providing temporary screens and barriers, and providing warnings of work in progress.

1.13 Protection of Building Finishes and Equipment

.1 Provide protection for finished and partially finished building finishes and equipment during performance of work.

.2 Provide necessary screens, covers, and hoardings as required.

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

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01320 - Construction Progress Documentation.

1.2 References

.1 Town's identification of existing survey control points and property limits.

1.3 Qualifications of Surveyor

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to the Consultant and the Owner.

1.4 Survey Reference Points

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to the Consultant.

.4 Report to the Consultant and the Owner when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.5 Survey Requirements

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.6 Existing Services

.1 Before commencing work, establish location and extent of service lines in area of Work and notify the Engineering Consultant of findings.

.2 Remove abandoned service lines within 2 m of new structures. Cap or otherwise seal lines at cut-off points as directed by the Mechanical or Electrical Consultant.

1.7 Location of Equipment and Fixtures

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform the Architect of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by the Engineering Consultant.

1.8 Record

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

.4 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.9 Subsurface Conditions

.1 Promptly notify the Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should the Consultant and/or Inspection and Testing Company determines that conditions do differ materially, instructions will be issued for changes in Work.

END OF SECTION

MAINTENANCE MANUAL

.1 On completion of the project, submit to the Architect and/or Engineering Consultant three copies of an Operations & Maintenance Manual made up as follows:

1. Bind data in vinyl hard covered three ring loose leaf binder, 8 1/2" x 11".
2. Enclose title sheet, labelled "Operation Data and Maintenance Manual", project name, date and list of contents.
3. Organize contents into applicable sections of work to parallel project specification breakdown. Mark each section by labelled tabs.

.2 Include the following information, as applicable:

1. Maintenance instructions for finished surfaces and materials,
2. Copy of related schedules,
3. Descriptiuon, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts. Indicate name plate information where applicable.
4. Names, addresses and phone numbers for subcontractors and suppliers,
5. Guarantees, warranties and bonds,
6. One complete set of reviewed shop drawings indicating corrections or changes made.

MAINTENANCE MATERIALS

.1 Where maintenance materials are specified, deliver to the Owner as follows:

1. Materials in unbroken cartons,
2. Clearly mark as to contents,
3. Schedule indicating where used (by Room Number) and colour.

AS-BUILT DRAWINGS

.1 Provide "as-built" drawings as required by Section 01300.

END OF SECTION

PART 1GENERAL

1.1 Related Section

.1 Section 01357 - Hazardous Materials

.2 Section 01780 - Closeout Submittals

1.2 Project Cleanliness

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

.2 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.

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

.4 Provide and use clearly marked separate bins for recycling if applicable.

.5 Remove waste material and debris from site regularly.

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

.7 Provide adequate ventilation during use of volatile or noxious substances.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 Final Cleaning

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove stains, spots, marks and dirt from all surfaces.

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

.6 Remove dirt and other disfiguration from exterior surfaces.

.7 Sweep and wash clean paved areas.

.8 Clean and check drainage systems

END OF SECTION

PART 1GENERAL

1.1 Related Sections

.1 Section 01330 - Submittal Procedures.

.2 Section 01450 - Quality Control and Testing

.3 Section 01720 - Lines and Levels.

1.2 Submission of Spare Parts and Special Tools

.1 Provide spare parts and special tools, in quantities as supplied by the manufacturer.

.2 Provide spare parts to the Owner as supplied by manufacturer. Ensure spare parts, maintenance materials and special tools provided to the Owner are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.3 Provide items with tags identifying their associated function and equipment.

.4 Deliver to location to the site and confirm transfer to Owner by transmittal.

1.3 Submission of Operating and Maintenance Manual

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

.2 Prior to Substantial Performance of the Work, submit to the Engineering Consultant two final copies of operating and maintenance manuals in English.

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

1.4 Format of Operating and Maintenance Manual

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

.2 Arrange content by systems, under Section numbers and sequence of Table of Contents.

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

.4 Text : Manufacturer's printed data, or typewritten data.

1.5 Contents of Operating and Maintenance Manual

.1 Table of Contents

.2 Project Information :

- .1 Title of project.
- .2 Date of submission.
- .3 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
- .4 Schedule of products and systems, indexed to content of volume.

.3 For each product or system list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.4 Product Data : mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.5 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.6 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.7 Spare Parts Listing: include complete listing of spare parts submitted to the Owner.

.8 Special tools Listing: include complete listing of special tools submitted to the Owner.

.9 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 reordering 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.

.10 Equipment and Systems : (where applicable)

- .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 Mechanical equipment and systems shall be inspected by TSSA inspectors prior to turn over. TSSA inspection reports shall be included in Maintenance Manuals.
- .3 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .4 Include installed colour coded wiring diagrams.
- .5 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
- .6 Maintenance Requirements: include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .7 Provide servicing and lubrication schedule, and list of lubricants required.
- .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.

.11 Final "As-Built" Survey.

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

.2 Submit a final "as built" topographic survey by a certified Ontario Land Surveyor in ACAD 2000 format, tied to the Town's horizontal control - NAD 87. Scope of information to be covered by the survey as documented in the "Pre-Construction Meeting Minutes".

.12 Contractor's Field Notes :

.1 Information recorded on blackline opaque drawings provided by the Consultants 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.

.2 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.

.13 Warranties:

.1 Separate each warranty with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 This section includes the demolition, removal and disposal of existing parts of the existing building to allow the proposed new construction.

.2 Include all labour, equipment and material required for a complete and finished project.

1.2 QUALIFICATIONS

.1 Work under this section shall be performed by a Contractor specializing in this type of work. Furnish evidence of qualifications upon request of the consultant.

.2 Use only skilled tradesmen for work under this section.

1.3 MATERIALS FROM DEMOLITION

.1 All materials resulting from demolition work will become the property of the Contractor.

1.4 SUBMITTALS

.1 Prior to the commencement of Work, submit a schedule and a summary of the methods of demolition and type of equipment intended to be used.

1.5 PROTECTION

.1 Provide, maintain and remove on completion, suitable hoarding, supports, tarpaulins or other means to ensure that no debris or dust enters existing areas. Provide full protection for Owner's and Consultant's personnel and others on site.

.2 Protect existing areas against damage which might occur from falling debris or other cause. Do not interfere with use of existing areas, and maintain free, safe passage to and from same.

.3 Precautions shall be taken to prevent movement of existing areas. This Contractor shall be responsible for safety and support of existing areas and be liable for any movement, any damage or injury caused thereby, or resulting therefrom.

.4 If at any time, during the course of Demolition work, the safety of the existing areas appear to be endangered, cease operations and notify the Consultant; and do not proceed with Demolition Work until permission has been granted to do so.

.5 If movement is caused by negligence or default of the Contractor, he shall be completely responsible to rectify the situation, at no extra cost to the Owner.

PART 2 - EXECUTION

2.1 PREPARATION

.1 Prior to bidding, all contractor's shall visit the site and thoroughly examine existing conditions in order to familiarize themselves with the extent of demolition and removal work required to properly execute this portion of the contract.

2.2 DEMOLITION

.1 Do not start demolition without the approval of the Consultant.

.2 The burning of materials on site is not permitted.

.3 In addition to following the requirements of the Ontario Building Code, carry out demolition in accordance with the requirements of local and Municipal authorities.

.4 Furnish all labour, materials, tools, plant, and services required or incidental to the completion to the full extent of the Work, and to the full intent of the Drawings and Specifications, for the execution of all demolition and protection work specified herein.

2.3 CLEANUP AND DISPOSAL

.1 Clean up the work areas daily to the satisfaction of the consultant.

.2 Clear up the entire site of all debris at completion of this contract.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01560 - Temporary Facilities

.2 Section 02315 - Excavation, Trenching and Backfilling.

1.2 Measurement for Payment

.1 Site grading will be measured as specified in the contract unit price schedule which includes disposal of any extra materials from the site. (See 1.5 below)

.2 Supply, delivery and compaction of additional fill materials will be measured as specified in the contract unit price schedule.

.3 Supply and installation of silt fencing will be measured as specified in the contract unit price schedule.

1.3 References

.1 American Society for Testing and Materials (ASTM)
  .1 Current ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m 3).

1.4 Existing Conditions

.1 Examine soil investigation report included in the Tender Documents.

.2 Verify underground and surface utility lines and buried objects that are indicated on drawings.

1.5 Earth Moving Quantities

.1 The Contractor shall be responsible for estimating earth quantities to his own satisfaction. No adjustments to the lump sum prices will be considered because of variance in earth quantities.

.2 The Contractor shall make the appropriate allowances in the quantities for bulking or shrinkage of fill.

.3 Prices tendered shall be deemed to include all costs for cut-to-fill and disposal of excess fills if required. If excess fill results from the grading operations, Contractor will be directed by Town to dispose of excess fill in adjacent future phases of park.

1.6 Protection

.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as indicated on drawings. If damaged, restore to original or better condition.

.2 Protect newly graded and filled areas from washouts and settlement caused by rain and water drainage. Correct any damage as necessary.

PART 2 - PRODUCTS

2.1 Materials

.1 Excavated or graded material existing on site may be suitable to use as fill for grading work with the approval of the Soils Engineer.

.2 Fill material: Type in accordance with Section 02315 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 Stripping of Topsoil

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by the Town.

.2 Commence topsoil stripping of areas as required to accommodate site related work for irrigation, drainage and retaining walls as shown on the drawings.

.3 Strip weeds and grasses and remove off-site.

.4 Strip topsoil and store on site to accommodate work..

.5 Do not mix topsoil with subsoil.

.6 Stockpile in open lawn area north of the funeral home.

3.2 Rough Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated on drawings.

.2 Rough grade to specific depths below finish grades as per applicable details.

.3 Place fill material in maximum 250mm lifts.

.4 Maintain tree protection fencing and do not disrupt elevations within drip lines of trees to be preserved.

.5 Grade slopes for landscape areas to a maximum of 4:1 unless otherwise specified on drawings.

.6 Grade ditches and swales to depths indicated on drawings. Ensure gradient transitions are smooth and drain in the direction indicated on drawings.

.7 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.8 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:

.1 85% under landscaped areas.

.2 98% under paved and walk areas.

.3 As otherwise specified in the soils report or indicated on drawings.

.9 Finished subgrade surface to be free of debris or stones larger than 50mm diameter.

.10 Remove surplus material and material unsuitable for fill, grading or landscaping off site at Contractor's expense. "Cut to fill" should roughly balance. Remove excess fill materials from site associated with paving, new retaining walls, foundations and interior excavations within the building.

3.3 Verification of Constructed Rough Grade

.1 Verify that grades are correct. If discrepancies occur, notify the Consultant and do not commence work until instructed by the Consultant.

.2 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.3 Obtain approval from the Consultant and the Soils Engineer of the rough grades before commencing finish grading.

3.4 Testing

.1 Inspection and testing of soil compaction will be carried out by the Soils Engineer.

.2 Costs of successful tests will be paid from the Cash Allowance for Inspections and Testing.

.3 Costs for retesting due to failed tests will be paid by the Contractor.

END OF SECTION

PART 1 - GENERAL

.1 Work of this Section includes:

a) Excavation for all footings, grade beams and foundations.

b) Shoring and bracing as required.

c) Backfilling and compacting of excavated areas to levels indicated.

d) Excavating and backfilling for electrical & mechanical trades.

e) Rough grading.

f) Strip existing asphalt in area of new building and a sufficient distance beyond to allow for the construction of the new building and re-surfacing of parking lot.

g) Regrading of site adjacent to parking areas to accommodate changes in the grade of the parking surfaces as they relate to existing grades.

.2 Lines and levels will be determined and established by the General Contractor, but excavator shall be responsible for maintenance of all stakes and witness posts, benchmarks and datum points established.

.3 Protection

a) Keep excavation free of water at all times.

b) Protect excavations from frost. No concrete may be poured on frozen ground.

c) Shore & brace excavation and provide sheet piling where necessary to prevent cave-in. Remove shoring and piling prior to backfilling, but not until permanent supports are in place and strong enough to withstand the weight of backfill material.

.4 Soil Test

Report of Terraprobe Limited, dated Sepetember 4th, 2008, is appended as a separate Appendix to the end of the specifications for the information of all.

.5 Inspection

a) A qualified inspector, acting as the agent of the Owner, shall carry out such inspections and tests as are required to ensure compliance with the drawings and specifications.

b) The Inspection and Testing company shall have a representative present on site periodically during excavation and continuously during backfilling and compaction of fill under floors on earth, and he shall perform the following duties:

- Determine the depth of satisfactory bearing as noted on the Structural Drawings. Soil at the founding depth must be capable of a bearing capacity as outlined in the Structural Drawings as as indicated by the soils report.
- Determine the depth of existing soil that must be removed in order to provide a soil capable of supporting necessary fill and floor on grade without deleterious settlement. Elevations of existing grades and finished floor slabs are shown on the drawings.
- Sample materials to be used for fill under floor slabs and paving to determine:
  - Natural moisture content,
  - Optimum moisture content and maximum density,

- The quantity of water to be added or removed to bring it to the correct moisture content for compaction and maximum density,
- Check placing and compaction at final location,
- Determine the moisture and density of the compacted soil in place and verify that compaction has been carried out to at least 98% Standard Proctor dry density.

PART 2 - PRODUCTS

.1 Excavated material shall not be re-used for fill without permission of the Architect and th Soils Engineer.

.2 Fill to all service trenches shall be clean, sharp sand, free from stones, rocks or boulders.

.3 Imported material for backfilling shall be Granular 'A' or 'B', as shown on the drawings and specified herein.

PART 3 - EXECUTION

3.1 GENERAL

.1 Excavate as indicated on the drawings and specified herein.

.2 Excavate to the extent, elevation and depth required for construction of the building, slabs on grade and paving. Excavate to a sufficient distance beyond to permit proper construction, shoring, pumping and inspection.

.3 Remove all top soil from the entire building area. Set footings on undisturbed material capable of supporting the design loading as indicated by the Structural Drawings and as outlined by the soils report.

.4 Backfilling to all trenches, etc. shall not be placed until the work has been inspected and approved.

.5 Remove all debris before backfilling proceeds.

.6 All excavations shall be approved.

.7 Stockpile excavated material approved for re-use, if any.

.8 Take care to avoid damage to, or displacement of walls, columns, piers, underground services during backfilling. Report immediately existing services encountered during excavation to the Architect for instructions. Cut back and cap unused services. Protect all live services encountered and repair such services damaged due to the work of this Section.

.9 Backfill shall be wetted down and firmly compacted, using mechanical tampers, to obtain a minimum 98% Standard Proctor Maximum Dry Density or as shown on the drawing and approved by the Soils Consultant.

.10 Report any existing services encountered to the Architect immediately. Cut back and cap unused services. Protect all live services encountered and repair any such services damaged due to the work of this section.

3.2 DEPTH OF EXCAVATION

.1 Should the excavations for footings, by negligence or error, be carried to greater depth than shown on the drawings or authorized by the Architect, such excavations shall not be filled in but the structural work shall be built thereon and the cost of the additional work shall be the responsibility of the Contractor.

.2 Where soil at the depth indicated by the drawings is unsatisfactory, on the Architects written order, excavate to a greater depth until bearing is achieved. Such work shall increase the contract price by the amount of additional work multiplied by the unit price established in the Contract.

.3 The bottom of all excavations shall be leveled by cutting only in undisturbed soil.

3.3 BACKFILL

.1 Backfilling to all foundations, trenches, etc. shall not be placed until the work has been inspected and approved.

.2 Remove all debris before backfilling proceeds.

.3 Take care to avoid damage to, or displacement of walls, columns, piers, underground services during backfilling.

.4 Place fill materials in layers not to exceed 6" in depth. Each layer shall be wetted down and firmly compacted, using mechanical tampers, to obtain a minimum 98% of Standard Proctor Maximum Dry Density (SPMDD).

3.4 GRANULAR BASE COURSE

.1 All slabs on grade shall be placed on thoroughly consolidated & compacted bases. All soft spots shall be excavated and faulty material removed before placing slabs on grade.

.2 After approval of sub-grade, entire area shall be filled with the following minimum depths:
- Slabs on Grade on 8" Clear Crushed Stone (19mm size)(See Soils Report)

.3 All slabs on grade shall be placed on thoroughly compacted and consolidated bases. All soft spots shall be identified by proof rolling, faulty material removed and replaced by fully compacted imported material. (See Soils report for recommendations)

3.4 DAMPROOFING

.1 Install 6 mil polyethylene damproofing under all slabs on grade. Joints in damproofing shall be lapped 4" and taped.

3.5 ROUGH GRADING

.1 Exterior rough grade shall be 5" below required finished grade except in paved areas.

.2 Interior rough grade shall be 8" below u/s of concrete slab on grade (See Soils Report).

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Provide all material and labour required for the completion of the Contract. Breakdown of Work by Section is for guidance only and is not necessarily complete.

.2 Work Furnished and Installed:

i. Helical Piers

.3 Related Work Specified Elsewhere

i. Concrete Formwork, Section 03100.

ii. Concrete Reinforcement, Section 03200.

iii. Cast-in-Place Concrete, Section 03300.

iv. Structural Steel, Section 05120.

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the Ontario Building Code 2006 (O. Reg. 403/97) and any applicable acts of any authority having jurisdiction and the following:

i. CSA-A23.1-94 - Concrete Materials and Methods of Concrete Construction, Canadian Standards Association.

ii. CAN/CSA-G30.18-M92 - Billet-Steel Bars for Concrete Reinforcement, Canadian Standards Association.

iii. CSA-G40.20-M98 - General Requirements for Rolled or Welded Structural Quality Steel, Canadian Standards Association.

iv. CSA-G40.21-M98 - Standard Quality Steel, Canadian Standards Association.

.2 Where there are differences between the specifications, drawings, codes, standards or acts, the most stringent shall govern.

1.3 TOLERANCES

.1 Install piles within the following tolerances:

i. Out of plumb - 2% of pile length.

ii. Location at cut-off - maximum 75 mm from position on plan.

iii. Cut-off elevation - maximum 75 mm from elevation shown.

iv. Material sizes shall not be less than the sizes specified.

.2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.4 QUALIFICATIONS AND CERTIFICATION

.1 The organization and personnel undertaking the design and installation of the helical pier foundation system shall be:

i. Experienced in performing work on similar projects to that required for this project.

ii. Certified by the manufacturer of the helical pier foundation system.

.2 Provide written evidence of experience and certification to the Consultant.

1.5 GEOTECHNICAL INVESTIGATION

.1 Soils investigation(s) of the site has been made by **Terraprobe**. Their report **(1-08-3182)** dated **4 September 2008** and memorandum dated **28 January 2009** is available from the Consultant. Read these, visit the site and thoroughly familiarize yourself with surface and subsurface conditions.

.2 This information is given solely as a guide. No responsibility is accepted by the Owner or Consultant for its correctness nor shall its accuracy affect the provisions of the Contract.

1.6 DESIGN OF PILES

.1 The drawings indicate:

i. Assumed pile layout.

ii. Design loads for piles.

iii. Assumed details of interface between piles and the supported structure.

.2 Design pile system with a configuration and safe capacity in accordance with the assumptions and loads indicated in accordance with the manufacturer's recommendations and the findings and recommendations in the geotechnical report.

.3 Design shall be done by a Professional Engineer Licensed to practice in the Province of Ontario

1.7 ALTERNATIVE PROPOSALS

.1 If the Contractor wishes to provide an alternative pile type or vary number and/or location of the piles, he shall provide the Consultant with a complete proposal, including calculations for review.

.2 Any variation to pile caps or grade beams required thereby shall be designed and provided by the Contractor at Contractor's expense and the design shall be submitted to the Consultant for approval along with the information noted above.

.3 Alternative pile types will not necessarily be approved by the Consultant.

.4 The Contractor shall state in tender the type of pile upon which his tender is based.

1.8 SUBMITTALS

.1 Erection and Fabrication Drawings

i. Submit erection and fabrication drawings for review by the Consultant.

ii. The structural drawings shall not be reproduced, in whole or in part, for use as erection and fabrication drawings without the Consultant's approval.

iii. Amongst other items, show the following:

Fully dimensioned layout of piles;

Cut-off elevations;

Assumed founding elevations;

Design load of each pile and installation criteria;

Pile type, materials and sizes of all components.;

Splice and tip details.

iv. In advance of construction, provide complete installation procedures for the Consultant's review.

v. All submittals shall be stamped and signed by the Licensed Professional Engineer responsible for its design.

.2 Certificates

i. Provide certification from an approved Independent Inspection and Testing Company that materials used for the piling work meet, as a minimum, the values stated in the pile design calculations reviewed by the Consultant. The cost of certification of materials shall be borne by the Contractor.

2 PRODUCTS

2.1 MATERIALS

.1 Pile System shall be one of the following:

i. Chance Helical Piers as manufactured by AB Chance Company, a subsidiary of Hubbell Power Systems.

ii. Round Shaft Helical Piers as manufactured by Pier Tech Systems

iii. Techno Metal Posts as manufactured by Techno Pieux Thetford Mines Inc.

iv. Composite Helical Pipe Piles as manufactured by Maclean-Dixie

.2 Conform to the manufacturer's recommendations.

.3 Steel Piles, including Splices, Shoes and Caps: Conform to CSA G40.20/G40.21; Grade 300W.

3 EXECUTION

3.1 QUALITY CONTROL

.1 Provide a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and state recommendations in writing.

3.2 NOTIFICATION

.1 Prior to commencing significant segments of the work, give the Consultant and independent inspection and testing agencies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirements may be cause for the Consultant to classify the work as defective.

3.3 CONSTRUCTION REVIEW

.1 The Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the *Owner *Client of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve him of contractual responsibility.

3.4 INSPECTION AND TESTING

.1 Appointment of Independent Inspection Agencies

i. The Owner will appoint the Independent Inspection and Testing Company to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Company shall be responsible only to the Consultant, and shall make only such inspection or tests as the Consultant may direct.

ii. When defects are revealed, the Owner may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.

.2 Inspection firm shall amongst other items, inspect the following:

i. Type, fabrication, size, location, plumbness and cut - off elevation of piles.

ii. Installation of piles.

iii. Load tests when required.

.3 Assist the inspection firm in making inspections or tests as required.

3.5 DEFECTIVE MATERIALS AND WORK

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed such as concrete core strength tests, analytical calculations of

structural strength and the like in order to help determine whether the work must be replaced. Tests, inspections, calculations or surveys carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of the *Ontario Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or work which fails to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work incorporating defective materials or work shall be removed and replaced or repaired to the satisfaction of the Consultant promptly, at no expense to the Owner.

3.6 LAYOUT

.1 Lines and levels shall be supplied by the Contractor. Check the lines and levels supplied and after checking, this Sub-Contractor shall be responsible for their correctness and for their correct observance. Responsibility for the correctness of reference lines and benchmarks shall rest with the Contractor.

.2 From the reference lines and benchmarks established for this contract, locate each pile and establish its elevation in order to complete the piling to the lines and levels shown on the drawings and to the specified tolerances.

.3 Commencement of installation of each pile shall be construed as acceptance of the line and level supplied.

3.7 LOAD TESTS

.1 General

i. Perform load tests on at least 2 piles or as otherwise required to confirm the capacity of the piles.

ii. The first load test shall be performed in order to prove the theoretical pile design capacity by testing one of the first six piles installed. The piles to be tested will be chosen by the Consultant.

iii. If the test pile does not meet the stipulated design capacity, install piles with a suitably higher torque (or deeper penetration) or use a lower pile design capacity and thereby increase the number of piles or employ such other alternatives such that the design loads will be safely supported by the pile system. Any additional costs to grade beams and/or pile caps and redesign of same, shall be the responsibility of the Contractor. After the design capacity of piles has been proven and as pile driving proceeds, the Consultant will select the second pile to be tested.

iv. If a pile load test is not successful, carry out one or more additional load tests until the test is successful. Additional load tests required due to test failure shall be at the Contractor's expense.

.2 Acceptance Criteria

i. Acceptance criteria shall be as agreed with the geotechnical engineer. As a minimum, should results of any test pile show net settlement in excess of 0.25 mm per tonne of test load, a further test shall be carried out by reloading the pile gradually to a test load which will produce a maximum net settlement not in excess *0.25 mm per tonne of test load.

ii. The allowable working load of the type of pile involved shall then be established at ½ the last test load and additional piles shall be installed at the Contractor's cost as directed by the Consultant wherever required to make up for the reduced allowable working load.

3.8 INSTALLATION

.1 General

i. Install piles to safely develop the design loads shown.

ii. Conform to the manufacturer's recommendations.

iii. Install all piles to at least the same criteria as that determined as being sufficient to develop the design load on the test pile.

iv. Install individual piles or pile clusters in such a way as to minimize the generation of increased driving resistance by compaction and displacement of the soil.

v. At the termination of installation of each pile, take readings of the elevation of the top of the pile. On the completion of all piling in a cluster or nearby clusters, take elevation readings again to determine whether any heaving has occurred. If heaving has occurred, re-install the pile to the proper resistance or proceed as the Consultant directs.

vi. The Contractor shall be responsible for additional cost of pile caps or grade beams arising out of misplaced piles which the Consultant may accept as load carrying.

vii. Note the location of piles close to adjacent existing construction. Use equipment, which can install the piles in these locations without damaging the existing construction.

.2 Obstructions

i. In a case where an obstruction is encountered above the bearing stratum, an attempt shall be made to drive through such obstruction.

ii. If the Consultant is satisfied that a pile cannot be installed to the required criteria because of obstructions and if the Consultant is not satisfied that the specified capacity has been obtained, the pile may be abandoned at the Consultant's discretion and shall be paid for as a contract pile.

iii. Quote a price for each complete additional pile. This price shall form the basis for extras should it be found necessary to add piles because of obstructions encountered.

3.9 FIELD RECORDS

.1 Keep a record covering each pile installed. The record shall be jointly certified by the Contractor and the inspection company.

.2 Records shall indicate the following:

i. Pile number and identification as to location;

ii. Tip elevation, cut - off elevation and length of pile, as installed;

iii. Final torque or other installation criteria.;

iv. Elevation readings of butt end at completion of installation and subsequent to installing adjacent piles. A record of re-installation, if necessary;

v. Record of pile plumbness, position relative to designated position and verification that these are within tolerable limits;

vi. Remarks concerning unusual driving conditions, obstructions, damage to piles caused by driving or other similar data

END OF SECTION 02350

PART 1 GENERAL

1.1 Related Work

.1 Section 02311 - Site Grading.

.2 Section 02315 - Excavating, Trenching and Backfilling.

.3 Section 03300 - Cast-in-Place Concrete.

1.2 Measurement Procedures

.1 Asphalt paving will be measured as noted in the contract unit price schedule, including all excavation, base preparation, compaction and all incidental items required to complete the installation as shown on the drawings and details, including line painting of the parking area.

.2 Two types of paving profiles are used: light duty asphalt installed at car parking zones and heavy duty paving along main driveway access and fire route.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Submit to the Soils Engineers, samples of material for sieve analysis at least three (3) weeks before commencing asphalt work.

1.4 OPSS Forms

.1 The Contractor shall have the current copies of all OPSS forms and details mentioned in this specification on the site for the duration of this work.

1.5 Delivery and Storage of Materials

.1 Coarse and fine aggregates shall be stored separately, in free draining stockpiles and in such a manner as to prevent contamination and segregation.

1.6 Quality Assurance and Testing

.1 The asphalt contractor shall have a minimum of five (5) years of experience in asphalt paving work.

.2 Asphalt plants, spreading equipment and rollers and asphalt paving to meet the requirements of the current applicable OPSS sections.

.3 Haul trucks to be of adequate size, spread and condition to ensure orderly and continuous operation. Employ suitable hand tools.

.4 It is the responsibility of the Contractor to contact the testing laboratory for tests and to give them timely notice.

.5 If any test does not meet the specifications, it will be the Contractor's responsibility to remedy the work and pay for all subsequent testing necessary to achieve the specified results.

.6 Testing to be conducted for this section of work is as follows:

.1 subgrade to be minimum 98% Standard Proctor Maximum Dry Density

.2 granular A compacted to 100% Standard Proctor Maximum Dry Density

.3 asphalt to be tested for content and grain size and mix

PART 2 - PRODUCTS

2.1 Materials

.1 Materials and thicknesses to conform to applicable details as shown on Drawing No. A101, Detail No. 6/A101 (Heavy Duty) and Detail No. 7/A101 (Light Duty)

.2 Aggregates to: OPS1010.
.1 Granular A – or 19mm Crusher Run Limestone

.3 Prime coat: MTO Primer or SS-1 to OPSS1103.

.4 Tack coat: SS-1 to OPSS1103.

.5 Asphalt concrete: to OPSS1150.

.1 Hot mix, hot laid HL3

.2 Hot mix, hot laid HL8

.6 Paint thinner: to CGSB1-GP-5M.

.7 Pavers: mechanical grade controlled, self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated conforming to OPSS 310.06.01. Blade graders are not permitted for spreading asphalt.

.8 Rollers: sufficient number of rollers of type and mass to obtain specified density of compact mix in accordance with OPSS 310.06.02.

PART 3 - EXECUTION

3.1 Site Preparation

.1 Set out work to lines and levels shown on Drawings. Gain approval from the Town of all works prior to installation. Maintain such lines and levels for duration of work.

.2 Excavate and prepare all bases as noted on details. Remove and dispose of existing unsuitable subgrade materials off site.

.3 Verify grades of subgrade for conformity with elevations and sections before placing base material.

.4 Disturbed subgrade or clean fill shall be compacted to 98% of Standard Proctor Density in accordance with ASTM D698-70.

.5 If required, place sub-base material in 75 mm lifts, compacting each lift to 98% SPMDD.

.6 Gain final sub-grade approval from the Soils Consultant prior to placing base material.

3.2 Base Material

.1 Exercise due care at all times to prevent base material from becoming contaminated by clay or other types of deleterious materials.

.2 Place base material to compacted thickness as indicated.

.3 Place in layers not exceeding 150 mm compacted thickness. Compact to density not less than 98% maximum dry density in accordance with ASTM D698.

.4 The granular surface shall be rolled continuously, compacted and bladed as necessary, and shall be within 10 mm of specified grade, but not uniformly high or low.

.5 Finished surface of granular material shall not deviate more than 10 mm from designed grade.

.6 Gain approval from the Soils Consultant of the installed base course. Approval to place asphalt shall be contingent upon the condition of base test results indicating that the required compaction has been achieved.

3.3 Transportation of Mix

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with light oil, limewater, soap or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted.

.3 Schedule delivery of material for placing during daylight hours.

.4 Deliver material to pave at a uniform rate and in an amount within the capacity of the paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at a temperatures recommended by OPSS documents.

.6 Air temperature during placing of mixture shall be minimum 7°C (45°F) and rising. Temperature of mixture when spread shall be not less than 120°C (245°F) nor more than 150°C (300°F). Do not increase temperature of mixture to offset long distance hauling.

3.4 Asphalt Placing

.1 Place asphalt to thickness, grades and lines indicated on drawings and details.

.2 Asphalt shall not be placed during rainfall, or on a surface which is wet or covered by ice or snow, or if the temperature is below recommendations in OPSS documents.

.3 Compact asphaltic mixture as soon as it can bear roller without undue displacement or hair cracking and continue until all roller marks are eliminated. Keep speed of roller slow enough to avoid displacement of mixture. Keep roller wheels slightly moistened by water to prevent adhesion of mixture. Excess water is not permitted. Compact mixture with hot tampers in locations that are not easily accessible to machine roller.

.4 Use self propelled Class 'B' roller for initial and final rolling.

.5 For vehicular areas carry out compaction in three operations in close sequence:

.1 "Breakdown" rolling with two wheeled rollers as soon as possible after spreading.

.2 Rolling with pneumatic tired or tandem rollers immediately after the first rolling to achieve the minimum specified density.

.3 Final rolling with two or three axle tandem rollers to remove roller marks.

.4 Compact mix with hot tampers or other equipment approved by the Town in areas inaccessible to rollers.

3.5 Pavement Construction

.1 Application of prime coat: OPSS302.

.2 Construction of asphalt concrete: OPSS310 and in conformance with OPSS Forms 310, 501,1010 and 1150.

3.6 Finish Tolerances

.1 Upon completion of compaction each pavement course shall be:

.1 Smooth and true to crown and grade with variation not more than 3 mm from thickness shown on Drawing. Do not place any asphaltic course less than 25 mm thick or more than 75 mm thick.

.2 Finished asphalt surface to be within 10 mm of design elevation, but not uniformly high or low, and with no irregularities greater than 10 mm in 4.5m.

.3 Compacted to a density not less than 98% of density of laboratory compacted mixture.

3.7 Defective Work

.1 Correct irregularities which develop before rolling is completed, by loosening surface mix and removing or adding material, as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.

.2 Repair areas showing checking or hairline cracking.

3.8 Joints

.1 Cut back bituminous course to its full depth in straight or curved lines as required to expose a fresh, straight, vertical surface. Remove broken and loose material.

.2 Asphalt shall be placed in such a manner that the joint shall not be allowed to cool before adjacent asphalt course is applied.

.3 Overlap previously laid strip with spreader by 150 mm, plus or minus 50 mm.

.4 Carefully place and compact hot asphaltic material against joints. Correct any unsatisfactory joint before proceeding with work.

.5 Feathering of joints is not permitted.

3.9 Cleaning

.1 After completion of asphalt work and prior to final inspection, clean all areas contaminated by asphaltic or other materials resulting from the work.

3.10 Warranty

.1 Warranty all workmanship and materials for a period of two (2) years from the date of Substantial Completion.

.2 Repair all cracks or settlement which occurs during the Warranty period at no additional cost to the Town.

.3 Upon notification by the Town, repair or make good failure, deterioration or damage in accordance with Part B - Section 15.

3.11 Line Painting at Parking Area

.1 The parking stall lines shall be accurately laid out with the use of a mason's line, 50mm width and be painted with two coats of 100% acrylic latex paint such as "California Products" or approved equal.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

1.1.1. Includes But Not Limited To
- .1 Furnish and install underground sprinkler system as described on Drawings No. A101 and Irrigation Drawing No. IR100.

1.2 SYSTEMS DESCRIPTION

1.2.1 Design Requirements
- .1 Layouts of Irrigation Heads -
  - .1 Locations of heads shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
  - .2 During layout consult with Consultant to verify proper placement and make recommendations, where revisions are advisable.
  - .3 Arrange valve stations to operate in an easy-to-view progressive sequence around building. Record sequence on controller lid.

1.2.2 Performance requirements - Minor adjustments in system will be permitted to avoid existing fixed obstructions.

1.3 SUBMITTALS

1.3.1 Product Data
- .1 Manufacturer's cut sheets for each element of system.
- .2 Parts lists for operating elements of system.
- .3 Manufacturer's printed literature on operation and maintenance of operating elements of system.

1.3.2 Quality Assurance / Control - Results of service pressure test before beginning work on system.

1.3.3 Closeout

- .1 As installation occurs, prepare accurate record drawing to be submitted before final inspection, including -
  - (1) Detail and dimension changes made during construction.
  - (2) Significant details and dimensions not shown in original Contract Documents.
  - (3) Field dimensioned locations of valve boxes, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
  - (4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.

1.3.4 Operations and Maintenance Manual Data -

(1) Instruction manual which lists complete instructions for system operation and maintenance, including winterizing.
(2) Complete instructions on how to drain entire backflow preventer to prevent freezing.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications
.1 Sprinkler Installation Company -
.1 Produce certification of following requirements prior to beginning work of this Section -
(1) In sprinkler installation business for five years minimum providing quality of labor and materials described in Contract Documents.
(2) Evidence of completing ten projects minimum of scope and quality equal to this project and in timely manner.
(3) Certifiable list of suppliers from whom it will be obtaining materials used on this project.(AUTHORIZED IRRIGATION DISTRIBTOR)

(4) Is a Certified Irrigation Contractor by Irrigation Association.

.2 Workers -
.1 Use only trained personnel familiar with required sprinkling system installation procedures.
.2 Perform installation under direction of foreman or supervisor with five years minimum experience in sprinkling system installations.

1.4.2 Regulatory Requirements - Work and materials shall be in accordance with latest rules and regulations, and other applicable Provincial or local laws. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

1.4.3 Pre-Installation Conference - After Flagging is done a site visit with the irrigation Consultant to go over layout and specifications. It is the Irrigation Contractors responsibility to contact the irrigation consultant and set up the meeting prior to the start of the installation.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 During delivery, installation and storage protect materials from damage and prolonged exposure to sunlight.

1.6 SEQUENCING

1.6.1 Install sleeves before installation of concrete and paving.

1.7 WARRANTY

1.7.1 Standard one-year guarantee on workmanship as well as Product Warranty -
- .1 Filling and repairing depressions and replacing plantings due to settlement of irrigation trenches for one year following acceptance of Project.
- .2 System can be adequately blown out to protect from freeze damage.
- .3 System has been adjusted to supply proper coverage of areas to receive water.

1.8 OWNER'S INSTRUCTIONS

1.8.1 After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.

1.9 AS-BUILT DRAWINGS and MAINTENANCE

1.9.1 As-Build

Upon completion of the work, the Irrigation Contractor shall prepare an as-built drawing of the system indicating:

1) Sprinkler model and location
2) Pipe size and location
3) Automatic valve model and location
4) Winterizing adapter location
5) Wire or control tube location
6) Controller location
7) Main shut-off valve and any isolation valve locations
8) Rain device location
9) Dimensioned location of buried sleeves

The as-built drawing need not be drawn to scale but must be proportionally and diagrammatically correct. The Irrigation Contractor shall retain the original Irrigation Plan on file and submit two copies to the Project Manager

1.9.2 Maintenance Service

1.9.3 Blow out entire system at end of first watering season following installation.

1.10 Electrical Supply and Controller Location

- .1 The irrigation controller location will be designated on the irrigation drawing.
- .2 The client is responsible for providing a 110-volt power supply within three feet of the controller location.

1.11 Point of Connection

- .1 The irrigation contractor will be supplied a point of connection of the size shown on the irrigation drawings.

PART 2 PRODUCTS

2.1 Pipe

.1 **Identification**

.1 All pipe will be continuously and permanently marked with the manufacturer's name or trademark, size, schedule and type of pipe, and working pressure at 21 degrees Celsius.

.2 **Delivery**

.1 Plastic pipe will be delivered to the site and stored in such a manner to provide adequate protection for the pipe ends either threaded or plain.

.3 **P.V.C. Pipe and Fittings**

.1 P.V.C. pipe will be class 160 (SDR26) direct burial pipe conforming to CS-256-63 and will be homogeneous throughout and free from visible cracks, dents, holes or foreign materials.
.2 All plastic pipe fittings to be installed shall be schedule 40 molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections.
.3 All threaded connections under pressure should be teflon taped.

.4 **Polyethylene Pipe and Fittings**

.1 All polyethylene pipe will have a minimum 75-psi pressure rating.
.2 All insert fittings shall be constructed of PVC Type 1 cell classification 12454-B adhering to ASTM standard D 2609.

2.2 Sprinklers

.1 **Spray Head Sprinklers – Rain Bird 1800 Series**

.1 The sprinkler shall be capable of operating at pressures ranging from 15 to 70 psi.
.2 The sprinkler nozzles will provide matched precipitation rates (MPR) across sets and across patterns in 5' through 15' fixed arc series nozzles.
.3 The variable arc nozzle (VAN) sets will provide infinite arc adjustment from 5 to 360.
.4 The pop-up sprinkler shall be available in 2", 3", 4", 6", and 12" full pop-up height.
.5 The sprinkler shall contain a ratcheting riser assembly for easy arc orientation once installed.
.6 The sprinkler shall have ½" NPT inlet. All sprinklers will be supplied water from the bottom inlet.
.7 When so indicated on the design, the 4" pop-up spray sprinklers in sodded areas and 12" hi-pop spray sprinklers in ground cover shall also include a pressure-regulating (PRS) device to prevent high pressure fogging to the nozzle stream. The top cap of the sprinkler will be marked with "PRS".

.2 **Rotors – Rain Bird 5000 Series**

.1 The full or part circle sprinkler shall be a single stream, water lubricated, gear drive type capable of covering a 50 feet radius at 65 PSI pressure with a discharge rate of 9.1 GPM. The part circle sprinkler shall have adjustable arc coverage of 30 to 350 degrees. The sprinkler shall be available in 4, 6 or 12-inch pop-up heights.

.2 The sprinkler shall have available 24 interchangeable nozzles: 3 Radius + MPR color-coded nozzles for maximum throw, and 6 Rain Curtain TM color-coded nozzles for superior close in watering, 6 standard nozzles and 9 low angle nozzles.

2.3 Valves

.1 **Rain Bird 100-DVF Valve**

.1 The remote control valve shall be a normally closed 24 VAC 50/60 cycle solenoid actuated, balanced pressure type capable of having a flow rate of 30 GPM with a pressure loss not exceeding 6.1 PSI. The valve pressure rating shall be up to 150 PSI.

.2 The valve body shall have 1" (FNPT) inlet and outlet.

.3 The valve shall be actuated by a low power, 0.30 amps in-rush current (7.2 VA), 0.19 amps holding current (4.56 VA).

.4 The valve shall be capable of manual on/off control.

2.4 Quick Coupling Valve

.1 **5RC One Piece Quick Coupling Valve**

.1 The quick coupling valve will be a one-piece type constructed of heavy cast brass. The cover shall be a durable, protective self-closing rubber cover. When so specified, the cover shall be a locking rubber cover (LRC).

.2 The valve will be opened and closed by a brass key of the same manufacturer having a 1" (MNPT) and 1" (FNPT) outlet. The valve throat shall have a keyway with detent positions for regulating water flow.

.3 The quick coupling valves will be installed in a 10" round valve box, with the top of the valve box flush to the ground. The quick coupling valves shall be installed on unitized swing joints with side pressure stabilizers on the valve body.

2.5 Controllers

.1 **Rain Bird ESP-16LX Modular Controller**

.1 The controller shall be of a hybrid type that combines electro-mechanical and microelectronic circuitry capable of fully automatic or manual operation.

.2 The controller shall be housed in a wall-mountable, weather-resistant plastic cabinet with a key-locking cabinet door suitable for either indoor or outdoor installation.

.3 The controller shall have a Rapid Station Test Routine (RASTER), which enables the controller to diagnose field wiring and solenoid problems.

.4 The controller shall have a base unit with 8 stations as well as three expansion slots capable of receiving station modules of either four or eight stations each to create a controller of up to 32 stations. All stations shall have the capability of independently bypassing an active rain sensor or of functioning as a normal station output.

.5 Station timing shall be from 0 minutes to 12 hours. Run time resolution shall be in 1-minute increments from 0 to 2 hours and 10 minute increments from 2 to 12 hours. The display shall show "No Run Times" or equivalent icon for 230 VAC models if no run time has been entered for any station in any program.

.6 The controller shall have four separate and independent programs which can have different start times, station timing and watering days. Each program shall have up to 8 start times available.

.7 The controller shall stack multiple start times in sequence to prevent hydraulic overload. The controller shall allow simultaneous or overlapping of program D with any other program.

.8 The controller shall be capable of operating two 24 VAC solenoid valves per station plus a master valve or remote pump start relay.

.9 The controller shall have a 365-day calendar with a permanent day off feature that allows a day(s) of the week to be turned OFF on any cycle (odd/even/1-31day cycle). A day set to "Permanent Off" shall override the normal repeating schedule and shall show the words "Day Always Off/Day Off" on the display.

.10 The controller shall have a seasonal adjust feature adjustable from 0% to 300% of the actual run time selected in increments of 1%. Seasonal adjust shall be able to affect all programs simultaneously, programs individually, or to be preset month-to-month in a given program .

.11 The controller shall have Cycle+Soak™ water management software which is capable of operating each station for a maximum cycle time and a minimum soak time to reduce water run-off. The maximum cycle time shall not be extended by water budgeting.

.12 The controller shall have a sensor circuit for connection to a rain sensor or to an underground moisture sensor system that will interrupt a scheduled watering under "wet" or "moist" conditions.

.13 The controller shall have a reset button to reset the controller in the case of micro-controller "lockup" due to power surges or frequent interruption to the power supply.

.2 **Rain Bird "Rain Stop" Rain Sensor**

.1 The rain sensor shall be a micro-electronic, solid-state type, capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a pre-selected amount

2.6 Wiring

.1 All 115 volt wiring shall conform to the local electrical codes.

.2 All 24 volt control wire between the solenoid valves and the controllers shall be #14 gauge TWU-10 solid conductor, white jacket for the common wire, and coloured for the power wire. For runs less than 500 feet, and single valve operation, 18-gauge multi-coloured conductor wire may be used. If two or more controllers are used, each unit must have their own common wire.

2.7 Manual Control And Isolation Valves

.1 All manual valves shall be bronze gate valve construction, featuring a non-rising stem and minimum operating pressure of 125 psi. Bronze full-port ball valves are also acceptable.

2.8 Valve Boxes

.1 All manual and automatic valves shall be enclosed in proper irrigation thermo-plastic Carson Brooks valve boxes, of size as required to permit 'ease of access' for servicing purposes. The boxes shall feature locking or hinged covers, with an impregnated green colour.

.2 The term "ease of access" means that every solenoid and manual valve should have adequate access for all types of maintenance.

.3 All valve access boxes shall be installed on a suitable base of gravel for proper foundation of box and easy leveling of box to proper grade, and also to provide proper drainage of the access boxes. All valve access boxes shall be provided with proper length and size extensions, wherever required, to bring the valve box level with the finish grade, unless specified to be buried below grade.

.4 Valve boxes shall be located in planting areas whenever possible.

.5 Locking bolts shall be installed in valve boxes.

2.9 Sleeves

.1 All sleeving material shall be Class 160 PVC.

.2 Separate sleeves must be provided for all electrical wiring.

2.10 Drip Irrigation

Not Applicable

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification Of Conditions - Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Consultant if pressures over 480 kPA (70 psi) or under 379 kPA (55 psi) are found to determine if some re-design of system is necessary before beginning work on system.

3.2 PREPARATION

3.2.1 Protection

.1 Repair or replace work of this Section damaged during course of the Work at no additional cost to Owner. If damaged work is new, repair or replacement shall be performed by installer of original work.

.2 Do not cut existing tree roots measuring over 50 mm (2 inches) in diameter in order to install sprinkler lines.

3.2.2 Layout of Irrigation Heads -

.1 Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.

.2 During layout, consult with Consultant to verify proper placement and make recommendations, where revisions are advisable.

.3 Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.

.4 Make certain changes are documented on record drawings.

3.3 INSTALLATION

3.3.1 Trenching

.1 Trenches for sprinkler lines and wiring will be of sufficient width (minimum of six inches (6") to permit proper handling and installation of the pipe and fittings.

.2 The first four inches (4") of backfill material over the pipe will be free of stone or any foreign objects greater than ¾ inch diameter. The top six inches (6") of backfill shall be free of rocks over one inch, or trash. Piping less than 1 ½ inches in diameter shall have a minimum cover of ten inches. Piping greater than 1-½ inches in diameter shall have a minimum cover of fifteen inches. Any road crossings shall have a minimum eighteen inches of cover.

.3 The backfill will be thoroughly compacted in six-inch lifts, and evened off with a minimum one inch of topsoil.

.4 In rocky areas, the trenching depth will be two inches below normal trench depth, to allow for placement of selected fill.

.5 All trenches that are opened during any particular working day will be closed and backfilled the same day.

3.3.2 Pulling

.1 Where soil conditions allow the pipe depths of cover described above to be met; the irrigation piping 2" or smaller may be directly installed without trenching by use of a vibratory plow. The feed blade must be equipped with a minimum bullet diameter of 1 ½ times the outside diameter of the pipe to be installed.

.2 In each of the above operations, all pipe interiors are to be (the Irrigation Contractor is responsible for) kept free from dirt, and debris. The site is to be restored to its original condition, including any damage to existing trees, shrubs, and structures, along with settlement of trenches within the warranty period.

.3 Generally, piping under concrete or asphalt will be installed by jacking, boring or hydraulic driving. Where any cutting or breaking of sidewalks, concrete work and/or asphalt is necessary, it shall be removed and replaced by the Irrigation Contractor. Permission to cut or break sidewalks, concrete and/or asphalt will be obtained from those having proper jurisdiction. Where piping on the drawings is shown under paved areas but running parallel and adjacent of planted areas or turf areas, the intent of the drawings is that the pipe be installed in the planted or turf areas.

3.3.3 Sleeving

.1 Sleeve water lines and control wires under walks and paving. Extend sleeves 150 mm (6 inches) minimum beyond walk or pavement edge. Cap sleeves until pipes and wires are installed to keep sleeve clean and free of dirt and debris.

.2 Use one water pipe maximum per sleeve. Sleeve control wiring in separate sleeve.

.3 Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

3.3.4 Installation of Pipe

.1 Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.

.2 Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 450 mm (18 inches) based on finished grade. Install remaining lateral lines with minimum of 300 mm (12 inches) of cover based on finish grade.

.3 Install pipe and wires under driveways or parking areas in specified sleeves 450 mm (18 inches) below finish grade or as shown on Drawings.

.4 Locate no sprinkler head closer than 300 mm (12 inches) from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be 25 mm (one inch) below top of mow strip, walk, or curb and have one to (3 inches) clearance between head and mow strip, walk, or curb.

.5 Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.

.6 Make solvent weld joints as follows -

.1 Do not make solvent weld joints if ambient temperature is below 6 deg C (40 deg F).

.2 Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.

.3 Apply uniform coat of 711 solvent to outside of pipe.

.4 Apply solvent to fitting in similar manner.

.5 Re-apply light coat of solvent to pipe and quickly insert into fitting.

.6 Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.

.7 Hold in position for 15 seconds minimum or long enough to secure joint.

.8 Wipe off solvent appearing at outer shoulder of fitting.

.9 Do not use excessive amount of solvent thereby causing obstruction to form on inside of pipe.

.10 Allow joints to set at least 24 hours before applying pressure to PVC pipe.

.7 Tape threaded connections with teflon tape.

.8 If pipe is larger than 50 mm (2 inches), install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines, unless otherwise detailed on Drawings.

3.3.5 Sprinkler Heads
- .1 Before installation of sprinkler heads, open control valves and use full head of water to flush out system.
- .2 Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
- .3 Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade.

3.3.6 Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.4 ADJUSTING

3.4.1 Adjust heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering or raising of heads shall be part of original contract with no additional cost to Owner.

3.4.2 Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.

3.4.3 Adjust watering time of valves to provide proper amounts of water to all plants.

PART 4 – TESTING, OPERATION AND INSPECTION

4.1 Testing

- .1 Flush all lines and ensure that all air is expelled from the system.
- .2 Inspect all visible piping, and walk all buried lines for any leakage.
- .3 If a pump is included, verify direction of rotation (if applicable), operating pressure, and any leakage.
- .4 Any repairs necessary to render the system in good working order will be completed at this time.

4.2 Operation

- .1 Verify all sprinkler settings, overlap, nozzle sizes, and operating pressures.
- .2 Adjust the flow control on automatic valves where necessary.
- .3 Program the controller into a logical sequence to comply with local watering bylaws or endeavor to accomplish heavy infrequent water cycles.
- .4 Program each station to satisfy the watering requirements of the relevant plant material.
- .5 Supply two copies of the operation manual to the Owner including As-built drawings and specifications of all materials used.
- .6 Provide training to the Owner's personnel for operation and maintenance of the system.

4.3 Inspection

.1 The system will not be considered complete and in compliance with the intent of these specifications and design until inspected by the Irrigation Consultant.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

.1 Section One, General Requirements, is part of this section and shall apply as if repeated here.

1.2 QUALIFICATIONS

.1 The work shall be carried out by skilled tradesmen in full accordance with specifications and best trade practice.

1.3 INSPECTION

.1 Obtain approval of base before proceeding with paving work.

.2 Complete all layout work and set final grades for paving.

.3 Give timely notice, in writing, when layout work is ready for inspection by consultant. Paving placed prior to inspection will be at the contractor's responsibility.

1.4 SAMPLES

.1 Submit sample prior to installation.

.2 All work shall conform to approved samples.

.3 All pavers shall be from the same production run to guarantee uniform colour throughout paved area.

1.5 PROTECTION

.1 Protect all other work from damage and contamination resulting from paving installation.

.2 Make good all damages, and clean up contaminated work at no extra cost to the owner and to the approval of the consultant.

1.6 MAINTENANCE AND GUARANTEE

.1 Maintain all pavers from time of installation until acceptance of work.

.2 Upon completion of all work, furnish a written guarantee in a form approved by the City.

.3 The guarantee shall include all paving work, including finishes and shall extend over a period of one (1) year from the date of acceptance.

PART 2 – PRODUCTS

1.7 MATERIALS

.1 Pavers to be installed as per details.

.2 Pavers to be laid as per drawing.

.3 Granular `A' to conform to MTC Specification Form 1010.

.4 Bedding sand should be well graded clean washed sharp sand with 100% passing a 8mm sieve size. No particles should pass smaller than the #200 sieve. Bedding sand specification should conform to either Can/CSA - A23.1 - M90 or ASTM C 33 standard. Limestone screenings are not acceptable as levelling bed material.

1.8 DELIVERY AND STORAGE

.1 Layout all paving stone areas and set out finished grades by means of grade stakes, clearly marked.

.2 Report any discrepancies immediately to the consultant for decision prior to installation of paving stones.

.3 Obtain approval of layout and finished grades before proceeding with work.

.4 Excavate to the minimum specified depths, as shown on drawings. Maintain subgrade parallel to finished grade in all cases.

.5 Compact sub-grade uniformly to minimum ninety-eight percent (98%) Standard Proctor Density.

.6 Place granular materials in layers not exceeding 150 mm in depth.

.7 Maintain edges of all paving stone areas straight and continuous.

PART 3 – EXECUTION

1.9 INSTALLATION

.1 Placing of setting bed:

.a Spread bedding sand evenly over prepared base, so as to avoid segregation of materials. Depth of bedding sand as per manufacturers specifications.

.b Trowel mixture immediately to obtain a smooth surface free of irregularities.

.2 .a Co-ordinate paver laying from one edged area to minimize cutting of stones.

.b Cutting of stones shall be performed with a "guillotine" type cutter as recommended by the manufacturer.

.3 All cuts shall be clean and match true to edging stones.

.4 Chipped and uneven cut stones will not be accepted.

.5 The contractor shall replace, at no extra cost to the owner, all cut stones marked as unacceptable.

.6 All paving stones shall be laid butt tight to each other.

.7 Tamp stones with a vibrator as recommended by manufacturer.

.8 Sweep sand over the paving stones in several directions until joints are full.

.9 Sprinkle paved area with a fine spray of water to ensure compaction in the joints.

.10 The finished paving surface shall be smooth and even throughout, free of any irregularities in the paving surface.

.11 Obtain approval of installation of paving work.

1.10 CLEAN-UP

.1 After completion of work, clean-up area.

.2 Remove all excess materials and equipment.

.3 Clean other areas which have been contaminated as a result of paving work.

1.11 PROTECTION AFTER COMPLETION

.1 Be responsible for protection and maintenance of paving from time of installation until acceptance of work. Repair all damages during this period at no extra cost.

END OF SECTION

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

.1 Related Work Specified Elsewhere:

i. Concrete Reinforcement, Section *03200.

ii. Cast-in-Place Concrete, Section *03300.

iii. Concrete Walks & Curbs, Section *03481.

.2 Work Installed but Furnished Elsewhere:

i. Structural Steel anchor assemblies, bolts and the like supplied under Section *05120.

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the *Ontario Building Code 2006 (O. Reg. 403/97) and any applicable acts of any authority having jurisdiction and the following:

i. CAN/CSA-A23.1-04 - Concrete Materials and Methods of Concrete Construction, Canadian Standards Association

ii. CAN/CSA-S269.3-M92 (R2003) - Concrete Formwork, Canadian Standards Association

iii. CAN/CSA-O86.1-94 - Engineering Design in Wood (Limit States Design), Canadian Standards Association.

iv. CAN/CSA-O121-M1978 (R2003) - Douglas Fir Plywood, Canadian Standards Association.

v. CAN/CSA O151-[M1978], Canadian Softwood Plywood.

vi. CAN/CSA O153-[M1980], Poplar Plywood.

vii. CAN/CSA 3-O188.0-[M78], Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.

viii. CSA O437 Series-[93], Standards for OSB and Waferboard.

ix. COFI Exterior Plywood for Concrete Formwork

.2 Where there are differences between the specifications, drawings, codes, standards or acts, the most stringent shall govern.

1.3 TOLERANCES

.1 Perform forming operations and place hardware so that finished concrete will be within the tolerances set out in CAN/CSA-A23.1.

.2 These tolerances are acceptable with regard to visual and structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.*

1.4 DESIGN OF FORMS AND RESHORING

.1 Design forms and reshoring to safely support vertical and lateral loads until they can be supported by the structure. Design formwork for loads and lateral pressures recommended in *ACI 347R/CAN/CSA-S269.3. Wood design to conform to CAN/CSA-O86.1.

PART 2: PRODUCTS

2.1 MATERIALS

.1 Forms

i. Formwork lumber: plywood and wood formwork materials to CAN/CSA-A.23.1.

.2 Waterstops: Vinylex Type RB4-316 for expansion joints and Type R4-316T for construction and control joints as supplied by Dayton/Richmond Concrete Accessories, or equal.

.3 Form release agent: non-toxic, biodegradable, low VOC product such as [Clean Strip WB (J-4) distributed by Dayton Superior][Clean Strip Ultra (J-3 V.O.C.)][Euro Wax] or approved equivalent.

PART 3: EXECUTION

3.1 CONCRETE WORK AT EXISTING STRUCTURE

.1 *Before proceeding with any work in or adjacent to the existing structure, verify that conditions are as indicated on the drawings. If they are not, do not proceed until the *Consultant has given instructions.

3.2 FORMS

.1 General

i. Design, erect, support, brace and maintain formwork to safely support vertical and lateral loads until they can be supported by the structure.*

.2 Construction

i. Form footing sides unless footings are shown to be placed against undisturbed soil.

ii. *Build top forms on sloping concrete where required to prevent flow of the concrete out of the forms. Provide vents to top forms to permit air or bleed water to escape from the forms.

iii. Mark building, grid or other lines on forms as required to permit the accurate positioning of reinforcing steel.

iv. Construct templates and supports as required to rigidly fix reinforcing dowels and anchor bolts in the forms prior to concreting.

v. Where necessary, provide suitable markers to indicate the location and configuration of continuing concrete members so that dowels and anchors can be positioned accurately in relation to their position in the continuing members.

vi. Set anchor bolts, templates, steel connection units or other inserts into the forms and secure them rigidly so that they do not become displaced during concreting. Set and secure these items to the tolerances specified and required in the appropriate Sections.

.3 Sleeves, Chases and Formed Openings

i. All openings, sleeves, recesses are not necessarily shown on the structural drawings nor are their sizes or locations shown. Refer to architectural, mechanical and electrical drawings for openings and sleeving requirements not shown, located and dimensioned on the structural drawings.

ii. No sleeves, chases and openings through structural members shall be formed without the *Consultant's approval.

iii. Where pipes or services pass through walls, form the openings by an approved sleeve or form as necessary, except where such openings are specified to be formed or sleeved by the appropriate trade. Form chases or recesses as shown or required.

3.3 CONSTRUCTION JOINTS

.1 Obtain approval from the *Consultant for location and details of construction joints not shown.

END OF SECTION 03100

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

.1 Provide all material and labour required for the completion of the Contract. Breakdown of Work by Section is for guidance only and is not necessarily complete.

.2 Work Furnished and Installed:

i. Concrete reinforcement.

ii. *Reinforcing bars for masonry.

.3 Work Furnished but not Installed:

i. *Reinforcing bars for masonry, including lintels, band courses, and piers.

.4 Work Installed but Furnished By Other Sections:

i. Anchor bolts.

.5 Related Work Specified Elsewhere:

i. Concrete Formwork, Section *03100.

ii. Cast-in-Place Concrete, Section *03300.

iii. Concrete Walks & Curbs, Section *03481.

iv. Helical Screw Piles, Section *02465.

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the *Ontario Building Code 2006 (O. Reg. 403/97) and any applicable acts of any authority having jurisdiction *and the following:

i. Manual of Standard Practice (2004), Reinforcing Steel Institute of Ontario (RSIO).

ii. CAN/CSA-A.23-94 - Concrete Materials and Methods of Concrete Construction, Canadian Standards Association.

iii. CSA-A.23.3-04 - Design of Concrete Structures, Canadian Standards Association.

iv. CSA-G30.3-M1983 (R2002), G30.5-M1983 (R1998), G304-M1983 (R1998), G305-M1983 (R1998), and CAN/CSA-G308-M92 (R1998) - series of standards for Concrete Reinforcement, Canadian Standards Association.

v. *CSA W186-M1990 (R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction, Canadian Standards Association.

.2 Where there are differences between the specifications, drawings, codes, standards or acts, the most stringent shall govern.

1.3 TOLERANCES

.1 Perform fabrication and setting so that completed work will be within the tolerances set out in CSA-A.23, and RSIO Manual.

.2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.4 *QUALIFICATIONS

.1 *Welding Reinforcement

i. *The organization and personnel undertaking the welding of reinforcement shall be qualified by the Canadian Welding Bureau under the requirements of CSA-W186.

1.5 SUBMITTALS

.1 Submit, shop drawings for reinforcement, and certificates for review by the *Consultant:

i. *Refer to Section 01300.

.2 Shop Drawings for Reinforcement

i. After *Consultant has reviewed and returned opening drawings, prepare reinforcement placing drawings and bar lists taking into account all openings and recesses.

ii. Prepare placing drawings to a minimum scale of *1:50 in a clear complete manner that will permit placing of reinforcement to be performed without reference to contract drawings. Do not reproduce the structural drawings.

iii. Detail reinforcement in accordance with the contract documents, CAN/CSA-A.23 and detailing standards in RSIO Manual.

iv. Except as noted otherwise on the drawings, provide standard hooks on reinforcement in accordance with CSA-A.23.3.

v. *Provide templates of column dowels to be fully butt welded to structural steel base plates under Section 05120.

vi. Amongst other items, indicate the following:

- Bar sizes
- spacing
- location and quantities of reinforcing
- Identify each bar with a code mark corresponding to the bar lists.

vii. Detail sections to fully illustrate placement of reinforcement at areas such as change of levels, wherever else required.

viii. Location and embedment of dowels.

.3 Certificates

i. Steel of Canadian Manufacture: Mill test certificates properly correlated to the reinforcement used for fabrication.

ii. Steel of other than Canadian Manufacture: Test data that each size and grade of reinforcement proposed meets specification requirements. Reinforcement approved for use by the *Consultant shall be identified in a manner suitable to the *Consultant. Only steel that has been approved will be accepted on jobsite.

iii. *Weldable Reinforcement: Chemical composition and verification of weldability.

iv. *Submit code marks or symbols used on reinforcement of each manufacturer so that *Consultant may readily identify grades and sizes of reinforcement.

.4 Substitutions

i. Substitution of different size bars permitted only upon written approval of *Consultant.

PART 2: PRODUCTS

2.1 MATERIALS

.1 Reinforcement

i. Deformed steel to CSA G30 Series and to the material specification shown on the drawings.

ii. *Reinforcement to be welded shall conform to the material recommendations contained in CSA-W186.

.2 Welded Wire Fabric

i. Conform to CSA-G30.5M.

.3 Support Accessories

i. Chairs, bolsters or spacers of sufficient strength to rigidly support the weight of reinforcement and construction loads. In the case of concrete exposed to view or weather the accessories shall be such that no metal is permitted to come closer than 38 mm from a formed face and 50 mm from a trowelled surface. Use precast concrete supports for exposed concrete beams and soffits and concrete cast against soil.

PART 3: EXECUTION

3.1 FABRICATION

.1 Fabricate reinforcing in accordance with CAN/CSA-A.23.

.2 Identify with a metal tag each bar with code mark corresponding to that appearing on bar list.

.3 Bend reinforcement once only and at room temperature. Do not straighten or rebend reinforcement. Do not use bars with kinks or bends not shown on the drawings.

.4 Replace bars which develop cracks or splits.

3.2 PLACING

.1 Prior to concreting, place reinforcement, support and secure against displacement in accordance with the requirements contained in RSIO Manual and to the tolerances specified in CSA-A.2. Tolerances shall be non-cumulative.

.2 Conform to requirements shown for concrete cover to reinforcement.

.3 Place reinforcement accurately and secure against displacement by using annealed iron wire ties or clips, or as otherwise specified, at intersections. Tack welding of reinforcement to secure in place will not be permitted.

.4 Secure reinforcement in walls using sufficient spacers on each face to maintain the requisite distance between reinforcement and wall face and so that vertical bars are plumb. Provide a minimum of 10 mm diameter spreader bars spaced at 2 m centres in both directions.

.5 Set column and wall dowels prior to concreting with wooden templates or other approved means.

.6 Do not drive or force reinforcement into fresh concrete.

.7 Preassemble column and beam cages as necessary. Do not "spring" or bend ties and stirrups in order to place longitudinal reinforcement.

.8 Pre-tie reinforcement for footings and lower into place so as not to disturb the soil at founding elevation.

3.3 FIELD BENDING

.1 Do not field bend reinforcement except where indicated or authorized in writing by *Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.4 WELDED WIRE FABRIC

.1 Where no reinforcement is shown, provide 152 x 152 MW9.8/MW9.8 welded wire fabric at mid-depth in slabs on grade.

.2 *Supply welded wire fabric in flat sheets on grade and install between pours.

.3 Lap ends and sides of fabric not less than 150 mm.

3.5 CONSTRUCTION JOINTS

.1 Obtain approval from the *Consultant for locating and details of construction joints not shown.

END OF SECTION 03200

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

.1 Provide all material and labour required for the completion of the Contract. Breakdown of Work by Section is for guidance only and is not necessarily complete.

.2 Work Furnished and Installed:

i. Cast-in-place concrete.

.3 Work Furnished but not Installed:

i. Concrete for masonry including lintels, band courses and piers.

.4 Related Work Specified Elsewhere:

i. Concrete Formwork, Section *03100.

ii. Concrete Reinforcement, Section *03200.

iii. Concrete Walks & Curbs, Section *03481.

iv. Helical Screw Piles, Section *02465.

v. Backfilling below base course beneath slabs and behind walls under Section *02200.

vi. Sub-grade material *including moisture barrier, Section *02200.

vii. Grouting beneath base plates bearing on masonry, Section *04100.

viii. Lifting of structural steel plates, Section *05120.

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the * Ontario Building Code 2006 under O. Reg. 403/97, and amendments O. Reg. 22,102 and 122/98, O. Reg. 152,278,593 and 597/99, O. Reg. 205/00, O. Reg. 283/01, O. Reg. 220/02, O. Reg. 304 and 305/03, O. Reg. 23 and 245/04 and O. Reg. 145, 146, 236 and 389/05 and any other applicable acts of any authority having jurisdiction and the following:

i. CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction, Canadian Standards Association.

ii. CSA-A23.3-04, Design of Concrete Structures for Buildings, Canadian Standards Association.

iii. ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete, ASTM International.

iv. *ACI-347-04 - Guide to Formwork for Concrete, American Concrete Institute.

v. CAN/CSA-S269.3-M92 (R2003) - Concrete Formwork, Canadian Standards Association.

.2 Where there are differences between the specifications, drawings, codes, standards or acts, the most stringent shall govern.

1.3 TOLERANCES

.1 Perform placing operations so that completed work will be within the tolerances set out in CAN/CSA-A23.1.

.2 These tolerances are acceptable with regard to visual and structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.4 CONCRETE MIX DESIGN

.1 Design of Mix

i. Design the mix in accordance with CSA – A23.1 so that concrete will be homogeneous, uniformly workable, and readily placeable into corners and angles of forms and around reinforcement by the methods of placing and consolidation employed on the work, but without permitting materials to segregate or excessive free water to collect on the surface. The concrete, when hardened, shall have the qualities specified.

ii. Cement Type: *10 Normal.

iii. Specified Strength: As called for on drawings.

iv. Water Cement Ratio, Slump and Air Content: As called for on the Drawings. These requirements are for concrete at the point of placing.

v. Nominal Size of Coarse Aggregate: 20 mm.

vi. Admixtures: Type WN water reducing admixture.

vii. Fly Ash: Except as noted above, cementing materials for concrete shall contain 40% fly ash by mass. Do not use fly ash in concrete that will be exposed to view and in concrete that will be exposed to freeze-thaw cycles or de-icing chemicals.

viii. Do not use recycled concrete aggregate in slabs or in concrete exposed to view. Except as noted, recycled concrete shall constitute up to 100% of the coarse aggregate for concrete.

ix. Use of calcium chloride is not permitted.

1.5 SAMPLES AND ASSISTANCE

.1 General

i. Supply samples of all materials and the following, the cost of which shall be paid for by this trade.

.2 Concrete Test Cylinders

i. Cooperate in the execution of the concrete cylinder testing program. Furnish concrete required, protect specimens against injury and loss, and assist in the sampling and storage of specimens.

ii. *Sample concrete and cast cylinders in accordance with CAN/CSA-A.23.1.

iii. In accordance with requirements of CAN/CSA-A.23.1, provide storage facilities for the initial 24 hours of site storage of all cylinders and the subsequent site storage of field cured cylinders. Suitably equip the 24 hour storage facility with humidity and temperature control equipment and maximum/minimum thermometers. It shall be sufficiently large to handle the maximum number of cylinders required at any one time.

iv. Provide sufficient field curing storage facilities so that cylinders representing the various areas can be safely stored in locations representing the curing conditions for those areas. Move the field-cured cylinder storage facilities from area to area as the work progresses.

.3 *Soil Inspection

i. Assist the testing company or soils investigation firm to make their inspections or tests.

.4 Cold Weather Concreting Plan

i. Submit for review a plan for cold weather concreting. Included as a minimum:

- Curing period for concrete selected if accelerators are to be used to reduce the length of time winter heat is required.
- Method of application of winter heat to the concrete and soil for the initial curing period, be it through construction of a heated enclosure or application of radiant, hydronic heaters such as Ground Heaters® or approved equivalent.
- Method of protection of the concrete and soil for the balance of the curing period, be it through the use of insulating blankets, straw, fill or other methods.
- Method of pre-heating of embedded elements such as reinforcing steel and cast-in inserts.

1.6 SUBMITTALS

.1 Submit the following for review by the *Consultant:

.2 Certificates

i. Prior to beginning work and when any change in materials or source of supply is proposed, provide the following certificates prepared by an approved inspection company. *The cost of this work shall be borne by the Contractor.

- Certification that aggregates and cements proposed for the work comply with requirements of specifications and CSA-A.23.3.
- Certification that compressive strength, water-cement ratio, slump, entrained air content and other specified properties will be met, using the proposed mixes.

- Give proportions by dry weight of cement, coarse and fine aggregate, type and amount of admixture or air entraining agents, and water-cement ratio, for the mix proposed for each class of concrete.
- State for each mix if fly ash is used in lieu of cement.
- *Verification that air entraining admixtures is compatible with water reducing admixtures.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Use excess concrete for: additional paving, flowable fill, storm structure covers, underground utility pipe kickers.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate a cleaning area for tools to limit water use and runoff. Cleaning area should be a portion of the site which is be paved at a later date.

.4 Carefully coordinate the specified concrete work with weather conditions.

.5 Ensure emptied containers are sealed and stored safely for disposal away from people.

.6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.7 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2: PRODUCTS

2.1 MATERIALS

.1 Concrete

i. Conform to CAN/CSA-A.23.1.

.2 Coarse Aggregate: from locally quarried non-alkali reactive rock, Mineral or Air-cooled Blast Furnace Slag

.3 Recycled Concrete Coarse Aggregate: Clean, hard, strong, durable particles, free of absorbed chemicals, coatings and other fine materials, crushed from concrete having a compressive strength not less than 35 MPa

.4 Supplementary Cementing Materials: Type F Fly Ash to CAN/CSA-A23.5

.5 Cementitious Hydraulic Slag: to CAN/CSA-A363

.6 Water: to CAN/CSA-A23.1

.7 Admixtures: Air entraining agents or water reducing admixtures conforming to CSA CAN3-A266.1.

.8 Chemical admixtures: to ASTM C494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.

.9 Concrete retarders: to ASTM C494 water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.

.10 Curing Compound: Water based curing compound conforming to CSA-A.23.1. such as Safe Cure & Seal (J-18, J-19) by Dayton/Richmond or approved equivalent.

.11 Grout Beneath Base Plates: Non-shrink flowable grout In-Pakt or equal having a compressive strength at 28 days of at least *35 MPa.

PART 3: EXECUTION

3.1 *CONCRETE WORK AT EXISTING STRUCTURE

.1 *Before proceeding with any work in or adjacent to the existing structure, verify that conditions are as indicated on the drawings. If they are not, do not proceed until the *Consultant has given instructions.

.2 *Where openings are shown to be cut into the existing structure, drill at corners and saw cut remainder such that saw cuts do not extend into structure to be retained.

3.2 FOOTINGS

.1 Found footings on naturally consolidated undisturbed soil capable of safely supporting 150 kPa within acceptable limits of settlement.

.2 Founding elevations, based upon the report of the sub-surface investigation, at which it is presumed these conditions pertain are shown on the foundation plan.

.3 Founding elevations must be verified by the sub-surface investigation firm before footings are placed.

.4 *See Section *02200 for excavation and backfilling requirements for footings *and for the procedure of adjusting contract price where changes to foundations are required.

.5 *Install footings adjacent to existing footings in the sequences indicated, and against undisturbed soil as shown, and so that the stability of the existing footings and existing slabs on grade are maintained at all times.

.6 *Prior to proceeding with the work, determine the exact founding elevations of existing footings adjacent to the new work. Report these findings to the *Consultant before proceeding further.

.7 If, upon excavating to the elevations shown, the required soil conditions are not fulfilled, or if they are fulfilled at a higher elevation, the *Consultant will provide instructions as to how to proceed.

.8 Keep a record of footing founding elevations.

.9 Construct footings in a particular area commencing from the lowest footing elevation and proceeding to the higher elevation.

.10 Proceed in a similar manner for continuous footings to walls which vary in founding elevation by commencing with the continuous footing at the lowest elevation.

.11 Remove water, disturbed soil or foreign matter from footing excavations before placing concrete. Do not permit the soil at founding elevations to soften due to the presence of water in the excavations or construction activity.

.12 *During cold weather, prevent soil adjacent to and beneath all footings from freezing. Do not pour footings on frozen soil on soil which has been allowed to freeze and thaw. If the soil at specified founding elevations is frozen or was frozen and thawed, remove affected material and found footings on unaffected soil with the required characteristics at no extra cost to the Owner.

.13 *Extras will be paid only if upon excavating to the specified founding elevations, it is found that *soil conditions do not meet the requirements set forth. No extras will be paid if *soil becomes weakened through agencies within the control of the Contractor, such as through the action of ground water, inadequate protection from weather, construction activity, over-excavation, or through undermining by the installation of nearby electrical or mechanical services.

.14 Where excavations for mechanical or electrical services, pits adjacent to foundations and the like encroach upon a *7 in 10 slope between corners of footings and bottom corners of excavations, lower footings a suitable amount so as not to exceed the *7 in 10 slope at no extra cost to the Owner.

3.3 PLACING CONCRETE

.1 Conform to requirements of CAN/CSA-A.23.1 and the following:

.2 Immediately before placing concrete, clean forms and reinforcement of foreign matter.

.3 During hot weather conditions, do not use concrete mixed more than 1 hour after introduction of mixing water or 1-1/2 hours during other periods.

3.4 PROTECTION

.1 General

i. Conform to the requirements of CAN/CSA-A.23.1 and the following to protect freshly deposited concrete from freezing, premature drying and extremes of temperature. Maintain concrete with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and to achieve the specified strength of the concrete.

.2 Cold Weather Concreting

i. Between the 15th of October of any year and the 15th of April of the following year, provide on hand and ready for use all equipment necessary for adequate cold weather protection and curing before concrete placement is begun.

ii. When fresh concrete is to be cast against existing concrete, prevent the loss of heat by extending the protection for the fresh concrete at least 600 mm over the existing.

iii. Insulate, or enclose within the protective housing, tie rods, reinforcement or metal which projects from the concrete being protected.

iv. Construct enclosures tight and safe for wind and snow loadings.

v. Maintain housing, enclosures and supplementary heat in place for entire period of protection, except that sections may be temporarily removed as required to permit placing additional forms or concrete provided the uncovered concrete is not permitted to freeze. Make up time lost from the required period of protection at the required temperature before protection is discontinued and removed.

vi. Dispose heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and dry heating within enclosures.

vii. Take particular care to maintain edges and corners of concrete at the required temperature owing to their greater vulnerability to freezing.

.3 Protection of Completed Work

i. Take suitable measures to prevent spalling and cracking damage occurring to the structure due to water freezing in expansion joints, small holes, slots, depressions and take suitable measures to prevent damage occurring to foundations and the like due to frost action in the soil or backfill.

ii. The application of de-icing salts on completed work is not permitted.

iii. During the curing period, take suitable measures to protect the surface of the concrete from pitting and loss of fines due to rain.

3.5 SLABS ON GRADE

.1 General

i. Do not place concrete slabs on grade until the specified sub-floor material has been placed, inspected and approved.

ii. Do not place concrete on a frozen sub-grade, or on one that contains frozen materials.

iii. Do not place concrete on a sub-grade that has been frozen and thawed until the sub-grade has been reviewed by the *Geotechnical Consultant and approved. If, in the *Consultant's opinion, the safe bearing capacity of the sub-grade has been reduced to below *25 kPa, remove the affected materials and replace with compacted granular fill at no additional cost to the Owner.

iv. *Place *175 mm of a *19 mm maximum size clear crushed stone followed by a *25 mm depth of *6 mm crushed stone over the sub-base to depths shown. Thoroughly roll and consolidate to the lines and levels required.

v. Upon approval of the placement of the sub-floor material and setting of reinforcing, place and consolidate concrete and finish and cure as specified herein.

.2 Joints

i. Where slabs abut adjacent construction, provide a layer of joint filler between.

ii. Saw-cut slabs on grade exposed to view in the finished building into panels as shown with a maximum length between saw-cuts equal to 30 times the slab thickness. e.g. a 100 mm thick slab will required saw-cuts at 3 m c/c. Arrange panels as shown or to the Consultant's approval.

iii. Carry out cutting in accordance with recommendations contained in ACI 302.1R but in any event between 6 and 18 hours after placement of concrete.

iv. After a period of at least 28 days, fill saw-cuts with mortar containing cement, sand and latex bonding agent. Ensure that joints to be filled are clean, dry and free of foreign matter.

v. Mask edges of saw-cuts to prevent concrete floors from becoming stained.

vi. Construction joints may be provided in slabs on grade so that pours on any one day may be kept to reasonable sizes. Locate construction joints to the Consultant's approval.

vii. In exposed concrete, provide a reglet at construction joints of the approximate width of a saw-cut and fill the reglet as specified for saw-cuts.

3.6 GROUTING BENEATH BASE PLATES

.1 Grout beneath plates bearing on concrete with an approved non-shrink flowable grout. Conform to the manufacturer's directions for mixing and placing grout. Completely fill voids below plates. Fill voids left by shims after shims are removed.

.2 During cold weather, preheat base plates and footings and maintain temperature at minimum 12 degrees C. for 6 days after grouting.

3.7 REINFORCED BLOCK LINTELS

.1 Supply and place concrete and reinforcing steel for reinforced block lintels in accordance with the requirements of Typical Detail and this specification.

.2 Accurately place and secure reinforcement in the cavity prior to concreting. Trowel top of lintel as required to permit laying of succeeding block course.

3.8 MAKING GOOD

.1 Where directed by the *Consultant, make good temporary openings left in concrete construction around pipes, ducts and the like using a mortar of the same proportions as the surrounding work. Reinforce mortar with mesh or the like where openings exceed 75 mm. Roughen existing surfaces to receive mortar or apply suitable bonding agent such that mortar will be securely bonded to existing concrete.

3.9 TREATMENT OF FORMED SURFACES *NOT DESIGNATED AS ARCHITECTURAL CONCRETE

.1 General

i. After stripping for forms, the bared surface of concrete will be inspected by the *Consultant. Do not proceed with repairs or surface treatment to concrete prior to the *Consultant's inspection.

ii. After the *Consultant's inspection, remove or cut back 25 mm, bolts, ties, nails or other metal not specifically required for construction purposes.

iii. Where no serious defects are revealed by the *Consultant's inspection, cut out areas of moderate honeycombing to sound concrete. Saturate with water and fill

with cement mortar of the same general composition as that used in the concrete.

iv. Where serious defects are found, such as large voids or extensive honeycombing, repair the defect as directed by the *Consultant.

v. Where surfaces are to be *plastered, *damp-proofed, *waterproofed or similarly finished, remove fins, ridges or bulges which would interfere with the application of the final finishes.

vi. Remove traces of form lining compound from concrete surfaces which may affect the bonding of following surface application.

.2 Surfaces Exposed to View

i. In addition to the above requirements, go over the surface, remove ties, nails, timber, inserts, minor imperfections, leaving the surface clean.

ii. Where major defects are revealed, repair as the *Consultant directs.

iii. Where in the *Consultant's opinion defects are minor, repair as follows or as the *Consultant may otherwise direct. Cut out affected areas, saturate cut out areas, voids, pit holes and form tie holes with water and fill with a cement mortar containing an approved type of latex bonding agent. Mortar mix and application shall be in accordance with the recommendations of the manufacturers of the bonding agent.

iv. After the mortar stiffens, wipe the whole surface clean such that no material remains on the surface, except that within the voids and such that finished surface is clean and smooth. Cure the patched areas by keeping moist for at least 7 days.

v. Where directed by the *Consultant, power stone concrete surfaces to remove surface imperfections remaining after the treatment noted above has been carried out.

END OF SECTION *03300

PART 1 – GENERAL

.1 Work of this Section includes:

a) Concrete sidewalks

b) Concrete curbs.

.2 The Architect will appoint an Independent Inspection and Testing firm to carry out inspection and testing as required. The Inspection and Testing company shall be an agent of the Owner and will report to the Owner through the Architect, and shall perform tests and inspections as directed by the Architect.

Concrete samples shall be taken at the point of final deposit. One set of three cylinders shall be taken from each 100 cy of concrete but not less than one set per day. One cylinder shall be crushed at 7 days, one at 28 days. Reports shall include for slump measurements and air entrainment results.

.3 Install in concrete alignment, all anchors, bolts, hangers, sleeves, ties and inserts required by other trades to be cast into concrete.

PART 2 - PRODUCTS

.1 All materials shall conform to CSA A23.1 & .2. Provide air entrainment of 5% - 7% for all concrete to remain exposed to weather.

.2 Expansion joint filler shall be "Flexcell" pre-moulded bituminous fibre by Sternson or approved equal.

.3 Reinforcing steel shall be 60 grade deformed bars to CSA G30.12.

.4 Welded wire fabric to be cold drawn steel wire conforming to CSA G30.5.

.5 The concrete mix shall be designed for the inclusion of the above admixtures so that the specified slump is maintained and the 28-day compressive strength is 30 mPa or as specified on the drawings.

.6 Slump shall be 3" maximum for all concrete unless used for pumping when slump must be approved by the Architect or Engineer.

.7 <u>The use of calcium chloride admixture in any quantity or in any form shall not be permitted.</u>

PART 3 - EXECUTION

3.1 GENERAL

.1 All concrete placing methods shall be in accord with CSA A23.

.2 All debris and ice shall be removed from the places to be occupied by the concrete.

.3 Under no circumstances shall concrete that has partially hardened be deposited in the forms. Concrete shall be placed not more than 1½ hours after leaving the plant.

3.2 REINFORCING

.1 Reinforcement shall be accurately placed and secured and shall be supported by plastic coated metal chairs or spacers, or metal hangers. A sufficient number of chairs and ties shall be used to prevent distortion due to workmen standing or working on steel.

3.3 FORMWORK

.1 Formwork shall conform to CSA A23.1.

.2 Forms shall be built to the shape, lines, and dimensions shown on the drawings. They shall be sufficiently tight to prevent leakage. They shall be properly braced and tied so as to prevent distortion and designed to facilitate cleaning prior to placing concrete.

.3 Forms shall only be removed when concrete has reached 75% of ultimate strength and with the approval of the structural engineer.

3.4 PLACING CONCRETE CURBS

.1 Provide all poured-in-place concrete curbs where shown.

.2 Construct curbs as detailed 19" deep, reinforced with 2 – 15 mm bars (6" revealed edge of curb) or as detailed shown on Drawing No. A101.

.3 Concrete sidewalks have downturned edge adjacent to paving to be 1'-0" deep, reinforced with 1 – 15 mm reinforcing bar as detailed on Drawing No. A101.

.4 Provide expansion joints of 1/ 2" asphalt impregnated fibre board at 20'-0" (6.0 m) intervals and at juncture of curb and other concrete work.

.5 Round corners with steel edging tool, as detailed on Drawing No. A101.

3.5 PLACING CONCRETE SIDEWALKS

.1 Provide all poured-in-place concrete sidewalks where shown on the drawings.

.2 Construct sidewalks shall be 5" thick concrete depth minimum on 8" compacted granular base, placed on undisturbed soil or approved subgrade.

.3 All concrete sidewalks shall have 1/ 2" asphalt impregnated fibre board expansion joints at 20'-0" intervals and at juncture with curb and building wall. Provide crack control joints at 5'-0" intervals. See drawings.

.4 Provide a broom finish on all sidewalk areas with a trowelled joint at all expansion joints and crack control joints.

3.6 SCREEDS

.1 All concrete floors are to be placed to proper graded screeds placed close enough together to permit screeding with a straight edge.

END OF SECTION

Part 1. GENERAL

1.01 SECTION INCLUDES

A. Supply and installation of self-leveling synthetic (concrete) topping/underlayment on radiant floor heating tubes over an interior structural substrate using a separation (slip) sheet, sound and/or thermal insulation and edging strips.

B. Thermal insulation blanket under topping.

1.02 RELATED REQUIREMENTS

A.	Section 06100	Rough Carpentry
B.	Section 07200	Insulation
C.	Section 15000	Mechanical

1.03 CO-ORDINATION

A. General Contractor to ensure related trades protect topping contractor's work during and for 24 to 48 hours after final topping pour.

1.04 PRE-INSTALLATION MEETINGS

A. Convene with related trades one week prior to commencing work of this Section under provisions of Section 01005 – General Requirement.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittals.

1. Product Data: Flowing synthetic concrete topping manufacturer's printed product literature for proprietary materials used in system.
2. Shop Drawings: Provide CAD drawings showing details, dimensions, extent of work, and other data necessary for the satisfactory installation of the products stated here.
3. Manufacturer's Instructions: Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets outlining hazards and safety precautions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: to have minimum of 10 projects of similar type in the past 5 years.

B. nstaller Qualifications: Applicator to be registered by synthetic topping manufacturer using manufacturer's approved pumping equipment.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ensure materials, as transported using ready-mix vehicles, are provided to site in timely fashion ready for installation.

B. Handle ready-mix product in manner to prevent adulteration, deterioration and soiling and in accordance with topping manufacturer's instructions.

C. Remove & replace damaged products at own expense and to satisfaction of Consultant.

1.08 SITE CONDITIONS

A. Ambient Conditions: Ensure building interior is enclosed and maintained at temperatures no lower than 5°C (40°F) and no higher than 30°C (85°F); and outside temperature no lower than -5°C (-20°F).

B. Any exception to the above parameters to be approved by topping manufacturer.

C. Keep windows and doors closed to avoid drafts during initial 48 hour period after placement.

D. Avoid "chimney effect" from stairwell or other vertical influences to prevent accelerated drying.

E. Cover any windows that would allow direct sunlight onto installation areas during drying period and only if direct sunlight heats topping and interior temperature to higher than 30°C (86°F) typically influenced by huge windows or glass facades.

F. Avoid continuous exposure to high interior temperatures outside of parameters outlined above, to avoid completely altering area climate.

G. General contractor to assure that the required climate and physical conditions of the site are provided to avoid possible cracks in flooring, if manufacturer guidelines are not followed.

1.09 SPECIAL WARRANTY

A. Provide a written and signed Warranty in the name of the Owner for a period of two (2) years from the date of Substantial Performance of the Work.

B. The Warranty to cover cracking of synthetic (concrete) topping.

Part 2. PRODUCTS

2.01 MANUFACTURER

A. Acceptable Synthetic Anhydrite Topping Manufacturer: DARO Flooring Constructions Inc., 30 Pennsylvania Ave., Unit 5, Concord, Ontario L4K 4A5 Tel: 905-660-6340; Toll Free 1-877-760-3276; Fax: 905-660-6340; Email: info@daro-flooring.com; Web: www.daro-flooring.com

B. Substitutions: Alternative or substitution products or materials not permitted.

2.02 DESIGN CRITERIA

A. Synthetic and anhydrite topping to provide compressive strength, after 7 days 80%, after 28 days, of 30-35 Mpa.

B. Design to meet or exceed NBC requirement of minimum Impact Insulation Class of 55.

C. Minimum thickness of topping on radiant heating to be 45 mm (1-3/4") with coverage of heating pipes minimum 30 mm (1-3/16").

D. For radiant heated basements, install minimum 64 mm (2-1/2") Type 2 or 51 mm (2") Type 3 insulation (R10) on top of structural slab subfloor to meet NBC requirement, or for all floors, with or without in-floor heating, install 6 mm (1/4") to 25 mm (1") polystyrene insulation, depending on sound/thermal rating noted on drawings.

2.03 MATERIALS

A. Synthetic Anhydrite Topping Binder: DAROTopp floor underlayment and synthetic anhydrite compound based on specially treated calcium sulphate ingredients.

B. Sand: 0-2 mm washed sand, free of organic materials meeting the requirements of synthetic anhydrite topping manufacturer.

C. Aggregate: 2-8 mm well-graded, washed aggregate, free of organics, and meeting the requirements of synthetic anhydrite topping manufacturer.

D. Water: Potable, free from impurities.

E. Separation (Slip) Sheet: Manufacturer's standard white 6 mil polyethylene sheeting.

F. Impact/Sound/Thermal Insulation: DuraFoam Type 2, Moulded expanded polystyrene closed-cell rigid insulation, to CAN/ULCS701, [i.e. Type 3 50 mm (2") thick R7.5, 1220 mm x 2440 mm (4'-0" x 8'-0") sheets, as manufactured by PlastiFab.

G. Flanking Insulation Edging Strips: Manufacturer's standard FSR edging strips, 8 mm (5/16") thick x 100 mm (4") high, with foil overlap and tearoff perforations, roll dimension 50 m (164-0").

H. Hydronic Piping Hold-down Clips: PVC DAROClips.

2.04 MIXES

A. Mix synthetic concrete topping ingredients strictly in accordance with manufacturer's instructions and under the supervision of the manufacturer's quality control specialist to required mix design as recommended for this installation prior to ready-mix truck delivery to site.

B. Using Hagermann funnel, provide on-site flow sump test to ensure mix proportions and methods have been adhered to, prior to installation, as required by manufacturer.

C. Retain test-prisms of ready-mix for every delivery. Copy of delivery notice to accompany sample for quality control purposes, and to include flow rate at both plant and site, amount of any additional water if required, arrival time, and time of installation.

D. Monitor ingredients with regular sieving. Any changes made to mix formula or gradation to be supervised by manufacturer's quality control specialist.

E. At ready-mix plant, check moisture content of sand daily to ensure proper water requirement. Recycled water not permitted.

F. Prior to loading ready-mix truck, ensure mixer is clean and free of water residue, salt or chlorides.

G. After loading topping onto ready-mix truck, check consistency of mixture. Ensure flow dimension on manufacturer's measuring disc is 240 mm (+/- 10 mm). In the event of increased distance or time to site, increase dimension by 10 mm to 20 mm only on advice of manufacturer's quality control specialist.

H. During warmer weather, employ higher water content of 250 mm flow diameter at plant and 260 mm flow diameter for longer distances to site.

2.05 FINISH

A. Natural, light beige integral colour.

Part 3. Execution

3.01 EXAMINATION

A. Before installation, examine structural alignment, smoothness and evenness of subfloor. Notify General Contractor in writing if subfloor does not comply with requirements of this Section.

B. Ensure subfloor is free of mud, oil, grease, and other contaminants prior to starting work of this Section.

C. Verify items provided by other trades are properly installed.

D. Commencement of work will imply acceptance of substrate conditions.

3.02 PREPARATION

A. Ensure installation area is free of all debris, broom clean, and dry.

B. Brush or vacuum walls approximately 150 mm (6") up from subfloor to ensure walls are sufficiently clean to receive edging strips.

C. Protect surrounding surfaces from damage due to work of this Section.

3.03 INSTALLATION

A. General

1. Install synthetic concrete flooring strictly in accordance with manufacturer's printed instructions.
2. Co-ordinate work with related work.

B. Subfloor Repairs

1. Patch larger cracks, holes and voids with standard concrete or a quick setting patching material prior to installing synthetic concrete topping.

C. Thermal/Acoustic Insulation

1. Install insulation with reflective side facing cold side of room.
2. Place sheets in parallel rows with ends staggered, and in firm contact with one another.
3. Cut end sheets to suit.
4. Tape insulation joints between each sheet.
5. Ensure insulated surfaces are suitably prepared to receive radiant heating hydronic piping.

D. Field Isolation Expansion Joints

1. Ensure joints continue completely through the synthetic (concrete) topping and are of uniform width.
2. Locate expansion joints where shown on shop drawings.

E. Edging Strips

1. Install at least 8 mm (5/16") thick flanking insulation strips around perimeter of all walls, columns and other protrusions, and hold in place using silicone caulking or sheathing tape.
2. At sidewalls, tuck foil facing of edging strips under polyethylene separation (slip) sheet for distance of 100 mm (4").
3. Leave edging strips flush with top of synthetic (concrete) topping after topping has set.

F. Separation Slip Sheet

1. Cover non-polyethylene faced insulation with 6 mil polyethylene sheeting without folds, creases, wrinkles or fishmouths. Lap edges 100 mm (4") and tape watertight with tape recommended by topping manufacturer.
2. Cut sheeting flush at walls.

G. Synthetic Concrete Topping

1. Ensure topping is mixing at normal speed and at optimal pumping consistency on ready-mix truck before installing.
2. Using topping manufacturer approved pump, apply synthetic topping evenly over floor surface holding hose reasonably close to ground, to required minimum 25 mm (1") thickness on slip sheet.
3. Ensure topping does not "leak" between laps in separation (slip) sheet.
4. Remove any levelling blocks that may have been used directly after pumping and before "dubbing" procedures.
5. Although topping is self-levelling, achieve final finish by "dubbing" surface with T-bar screed in two passes to produce smooth, level surface without air bubbles.
   a) Make first pass heavy and deep enough to create wave to help level and bring aggregates near surface.
   b) Make second pass at right angles to first, drawing lightly across surface while being careful not to break contact with dubbing screed and surface.
   c) Achieve "dubbing" within 15 minutes after placing topping.
6. Maintain ambient relative humidity of 50% or greater above topping during first 48 hours after application, avoiding rapid drying or drafts during this period.
7. After 48 hours, in which the floor has had no exposure to direct sunlight or excess drafts, employ accelerated drying procedures as necessary using heating in conjunction with continuous fresh air circulation.

3.04 SITE QUALITY CONTROL

A. SITE TESTS

1. Take at least 3 prisms of topping from each day's pour during application.
2. Test prisms as recommended by topping manufacturer in accordance with published testing values.
3. Make test results available to [Consultant] [Engineer] upon request.

3.05 CLEANING

A. Clean and make good surfaces soiled or damaged by work of this Section.

B. Remove debris and surplus materials upon completion of work.

3.06 PROTECTION

A. After installation, during drying period, protect topping as follows:

1. Use barriers, markers or signs to limit access to floor areas as necessary.

2. Use temporary wood planking for heavy wheeled or concentrated loads, or access by other trades, subject to the requirements of the work of this Section.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

The following work is included in the scope of work required in this Section:

.1 Masonry Cavity Walls

.2 Veneer Brick Masonry Work

.3 Stone Veneer Masonry on Piers and Walls

.4 Repointing existing Stone Masonry Work as indicated on the drawings.

.5 Supply and installation of Cut Stone Door Sills, Window and Wall sills & Chimney Cap.

.6 Supply and installation of Stone Fireplace Surround (Alternate Cost)

.7 Cavity Wall Insulation

.8 Composite masonry walls.

.9 Concrete block walls, bearing and non-bearing.

.10 Masonry wall ties and reinforcing.

.11 Damp Course and flashing required to be built into masonry walls.

.12 Install loose lintels

.13 Install lintels, anchors, bearing plates, wall plugs, sleeves, brackets, supports, bond and nailing strips, access panels, etc. supplied by others, which are required to be built-in. Shim and grout anchors and bearing plates as required in proper location.

.14 Install hollow metal door frames in masonry walls as required.

.15 Provide new openings in existing masonry walls where shown

1.2 WORK EXCLUDED

The following work is excluded in the scope of work required in this Section:

.1 Coping, nailing strips, wall plugs, etc. supplied under Section 06100 Rough Carpentry.

.2 Hollow metal door frames supplied under Section 08100 – Hollow Metalwork.Cavity Wall Insulation

1.3 DELIVERY

.1 Deliver cement and mortar ingredients with manufacturer's seal and labels intact. Store on a dry floor in a weatherproof shed or room. Mortar sand shall be delivered dry, and protected for the elements and foreign matter.

.2 Stockpile masonry units on platforms to keep units free from ground contact. Secure a waterproof covering entirely over each stock-pile when masonry work not in progress. Protect stockpiles at all times from weather, dirt and damage.

.3 Deliver, handle and store face brick by methods which will protect units against chipping or soiling. Store on raised platforms and keep well covered.

1.4 PROTECTION

.1 Cover tops of masonry walls with well secured, approved waterproof material while work is not in progress and until satisfactorily protected by the structure.

.2 Protect finished work at corners, sills, projections and other areas likely to be damaged with substantial covering to a height of 6'-0" above grade. Do not remove until completion of the building.

1.5 COLD WEATHER MASONRY

.1 Conform with the recommendations of the "International Masonry Industry All-Weather Council's Recommended Practices for Cold Weather Masonry Construction". Copies of the above document are available from the Ontario Masonry Contractors Association, 134 Oakdale Road, Downsview, Ontario.

.2 No admixtures shall be used without the Architect's Approval.

1.6 SAMPLES

.1 Samples of all masonry materials as required by the Architect for approval.

.2 Construction sample panels of brickwork and blockwork approximately 30 square feet in area for approval before commencing with finished work. Sample panels shall represent intended material and workmanship and after approval may be incorporated into the finished work.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Water shall be clean and potable, free from deleterious substances.

.2 Portland cement shall conform to C.S.A. A-5.

.3 Masonry cement shall be C.S.A. A-8, type "H" masonry cement for all masonry.

.4 Grout shall be high-strength, non shrinking type, Embeco #636 or equal.

.5 Sand shall be fine, sharp, granular material composed of hard strong uncoated particles; free from deleterious substances, well graded from fine to coarse, conforming to C.S.A. A82.56. Use white silica sand for mortar for all face brick.

.6 Concrete blocks shall conform to:

- C.S.A. A165.1 for hollow load bearing units.
- C.S.A. A165.3 for solid units (including 75% solid)
- C.S.A. A165.2 - 1964 for hollow non-load bearing units.
- Hollow concrete load bearing units shall have a minimum compressive strength of 2,000 p.s.i. on the net section.

- 75% solid concrete load bearing units shall have a minimum compressive strength of 2,000 p.s.i. on the net section.
- Concrete in lintels shall be 3,000 p.s.i. at 28 days. (See Structural Drawings)

.7 All blocks shall be autoclaved.

.8 Provide all necessary special concrete block units as indicated or required, such as plain ends, halves, bullnose, full bullnose, etc. Use bullnose block on all exterior corners and at door frames, where block is to receive paint finish.

.9 Blocks shall be free of all surface indentations, surface cracks or chipping. All blocks so delivered shall be culled from use for exposed purposes, but may be used where concealed, if this condition occurs within the work. Where block is to receive paint finish, chipped or cracked blocks will be removed and replaced at the expense of this Subcontractor.

.10 Damp course & concealed flashing shall be Domtar "Cop-R Flash", Standard, 1oz.

.11 Masonry reinforcing and ties shall be standard weight truss type reinforced with box ties welded every 16" o.c. that extend into the outer wythe to approximately 5/8" of the outer face. Overall measurements shall be approximately 2" less than the finished wall width. Truss ties shall be hot dipped galvanized after fabrication with wire meeting ASTM A82 CSA G30-3 specification and the galvanized coating meeting ASTM A153 Class B2 with min. coating of 1.5 oz./ft2. Truss ties shall Econo-Blok-Trus® BL34 by Blok-Lok, or equal. Cavity wall ties shall be adjustable to suit coursing where block back-up does not match brick coursing or where poured foundation walls back-up brick veneer. Provide adjustable veneer anchors at 16" o.c. vertically and 24" o.c horizontally with 9 gauge hot dipped galvanized, steel wire with sufficient cross-section to withstand 220 lbs. without exceeding yield point or breaking mortar bond. Adjustable ties shall be BL 407 with BLT9 wires by Blok-Lok, or equal.

Provide Plate Ties on veneer brick over wood frame construction with plywood substrates. Provide ties at 16" o.c. vertically and 24" o.c. horizontally with 16 gauge backer plate and face clip with a 4.76 mm diameter V-Tie. Provide Pac-Tie System, which includes AB Clip backer plate, V-Tie™ (100) and Backer Plate, as supplied by Fero Corporation, or equal. Provide sample for approval before work proceeds.

.12 Cavity wall insulation shall be foil faced Polyisocyanurate Insulation, as supplied by Johns Manville Canada Inc., 2 1/ 2" thick, R = 15.5, or equal.

.13 Adhesive for insulation shall be Bakor "Air Blok 21", Air Barrier, Vapour Barrier and Insulation Adhesive. Apply 3mm minimum full coat to achieve air barrier, vapour barrier in accordance with manufacturer's recommendations.

Air barrier for frame walls over exterior grade plywood shall be Bakor Canada, Blueskin VP 100 Air Barrier System. Install Blueskin shingle lapped with 6" min. lap at seams in all directions and terminate at base flashings. Follow manufacturer's recommendations for the installation of this product. Provide sample for approval before work proceeds.

.14 Face brick shall be clay brick, as manufactured by Belden Brick to match existing. . Size shall be Modular 8x206 Mix containing 40% Flat Set and 60% Edge Set. Size shall be modular 7 9/16" x 2 1/4" x 3 1/2". Confirm mix with supplier and provide samples for approval. Provide special solid bricks for outside corners as required for soldier courses in walls and piers. Brick is available from Mason's Masonry, 85 West Beaver Creek Drive, Richmond Hill, Ontario (905) 889-8757.

.15 Random Ashlar Stone for piers and wall repairs shall be mix to match existing stones. Provide a similar blend for piers and walls to maintain the continuity of the finish.

.16 Cut stone details for door sills at Vestibule No. 101 shall be honed granite "Forest Black" as supplied by Interex Marble Limited, or equal.

.17 Cut stone profiles for window sills, stone bands on exterior face of building below masonry, at chimney caps and at other locations as specified shall be buff Indiana Limestone (Typ).

.18 The flagstone materials required to be installed in Vestibule 101 under Section 09310 - CERAMIC TILE, shall be Credit Valley stone to match the existing being removed from the exterior entrance porch at the west entrance.

2.2 MORTARS

.1 Masonry mortar specified herein shall be mixed, adding cement, sand and water, in strict accordance with the manufacturer's direction to obtain the following mortar mix types:

1. "S" (one-half part cement, one part masonry cement, 4-1/2 parts sand) for all exterior, load bearing and below grade masonry work. Mortar strength 1,800 p.s.i. at 28 days.

2. "N" (one part masonry cement, three parts sand) for all non-load bearing interior masonry. Mortar strength: 700 p.s.i. at 28 days.

.2 Mix quantities of mortar which can be used up within one hour. Retempered or frozen mortar shall not be used.

2.2 GENERAL WORKMANSHIP

.1 All masonry work shall be in accordance with C.S.A. A-224, Masonry Code of Practice.

.2 Lay out work in running bond and to minimize cutting of units, except as detailed. Align webs of hollow units one over the other. Lay work form face side with coursing level, true to line, built square, plumb and as indicated.

.3 Joints shall be uniform in size, tooled to concave surface using a plastic pointing tool. Lay brick with 3 courses plus 3 joints equal to 200mm (7 7/8"). Joints in masonry walls to which gypsum board is to be laminated shall be struck flush.

.4 Bond adjoining masonry walls and partitions together with toothing courses where possible or metal anchors in an approved manner where toothing not possible.

.5 Anchor masonry walls to adjacent parts of structure in an approved manner.

.6 Brace walls during construction until structure provides sufficient lateral support.

.7 All lintels supporting masonry above shall be solidly shored up before any masonry is laid on them and such shoring shall remain in place for not less than seven days thereafter.

.8 Distribute exposed masonry of varying colour, tones and texture evenly over wall surface to avoid patches and streaks and to produce a homogeneous blend. Do not use units that are too contrasting in appearance for satisfactory blending.

.9 Chipped or blemished units may be used where concealed only. Defective and broken units shall be rejected. Defective units shall be removed and replaced in finished work at the expense of this Subcontractor.

.10 Do not shift or tap units after mortar has taken initial set.

.11 Do not wet masonry units before placing.

.12 Size of masonry units shall be checked while laying to avoid wide uneven joints.

.13 No part of any wall to be laid up more than 2'-0" above the rest of all walls to be leveled all around at least once in every five feet of height. Not more than 5'-0" in height of any wall to be laid in one working day.

.14 Reinforce all masonry walls, where thickness is reduced by a chase, with a four foot length of reinforcing placed on centre of chase, in the horizontal joint of every second block course.

.15 Reinforce all masonry walls over doors and openings with "Blok Lok" reinforcing in every second block course for at least five block courses above the opening. Extend reinforcing a minimum of 3'-0" each side of opening.

.16 Cope or cut with power driven abrasive cutting disc, exposed units to accommodate flush mounted electrical panels and outlets, grilles, pipes, tec., leaving 1/8" minimum clearance.

.17 Lay first course of all masonry walls in a full mortar bed. Full mortar bedding, including the cross webs, shall be used for all masonry. Use full head mortar joints for vertical joints. Take special care to prevent mortar or other substances from staining exposed masonry faces. All joints, without exception, shall be filled with mortar.

.18 Use solid block or bond beam as detailed for at least one course under bearing points, and as otherwise required for structural work.

.19 Top course of all foundation walls shall be solid block, if indicated as block wall construction.

2.3 CAVITY WALLS

.1 Cavity walls shall be reinforced and tied with 9 gauge truss type reinforcing at 16" o.c. vertically.

.2 Exterior face of interior wythe shall be clean and smooth with mortar projections and concrete fins removed.

.3 Apply continuous application of air barrier to a minimum thickness of 3 mm and fully embed insulation to exterior face of interior wythe. Fit tightly between wall ties.

.4 All butt joints shall be brought into tight contact to ensure a monolithic thermal barrier. Apply adhesive to all butt edges.

.5 Apply insulation with sliding motion to ensure good contact.

.6 Take care to avoid mortar droppings and debris in the cavity.

2.4 DAMP COURSE AND FLASHING

.1 Waterproof damp courses shall be installed at the top of all foundation walls as detailed.

.2 Provide flashing at head of all windows, over loose lintels, at base of cavity and veneered walls and directly above flashing over openings, etc. in cavity and veneered walls.

2.5 WEEP HOLES

.1 Provide weep holes at 1'-4" o.c. directly above flashing at bottom of cavity and veneered walls and directly above flashing over openings, etc. in cavity and veneered walls.

END OF SECTION

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

.1 Provide all material and labour required for the completion of the Contract. Breakdown of Work by Section is for guidance only and is not necessarily complete.

.2 Work Furnished and Installed:

i. Structural steel work, including columns, base plates, beams.

.3 Related Work Specified Elsewhere:

i. Grouting beneath column bases: Section *03300.

ii. Grouting beneath baseplates bearing on masonry: Section *04100.

iii. Concrete reinforcement: Section *03200.

.4 Work Furnished but not Installed:

i. Anchor bolts, bearing assemblies and other structural steel connections to be cast into concrete.

ii. Shelf angles and related connections to be built into concrete to receive masonry.

iii. Bearing plates and related connections for metal deck to be built into masonry or concrete.

iv. Loose lintels, shelf angles and plates to be built into masonry.

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the Building Code under *Ontario Building Code 2006 (O. Reg. 403/97) and any applicable acts of any authority having jurisdiction and the following:

i. CAN/CSA-S16.1-01 - Limits States Design of Steel Structures, ; S16S1-05, Supplement #1; and replacement pages issued June 2003 and December 2003 as Update #1 and Update #2 Canadian Standards Association.

ii. CAN/CSA-G164-M92 (R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles, Canadian Standards Association.

iii. CSA-S136-94 - Cold Formed Steel Structural Members, Canadian Standards Association.

iv. CSA-W47.1-03 - Certification of Companies for Fusion Welding of Steel Structures, Canadian Standards Association.

v. CISC/CPMA 1-73a - Performance Specification for Shop Primer, Canadian Institute of Steel Construction.

vi. CISC/CPMA 2-75 - A Quick-Drying Primer for use on Structural Steel, Canadian Institute of Steel Construction.

vii. SSPC-SP2, Hand Tool Cleaning, The Society for Protective Coatings

viii. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning, The Society for Protective Coatings

ix. SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning, The Society for Protective Coatings

x. SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning, The Society for Protective Coatings

xi. ASTM D6386, Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

.2 Where there are differences between the specifications, drawings, standards, codes or acts, the most stringent shall govern.

1.3 TOLERANCES

.1 Conform to erection tolerances specified in CAN/CSA-S16.1 Clause 28.7.

.2 Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.4 QUALIFICATIONS

.1 Be certified under the requirements of Division 1, or Division 2.1 of CSA Standard W47.1.

1.5 DESIGN

.1 General

i. Design connections and the like in accordance with the requirements of CSA S16.1.

ii. Design calculations shall be carried out by a professional engineer licensed to practice in the *Province of Ontario.

.2 Connections

i. Use types of shop or field connection shown, or in absence of such indication, use most appropriate type of connection.

ii. Design of connections shall include not only those between columns and beams, but also between such members as stiffeners, etc., and their supporting members (be they steel or masonry).

iii. Design connections to safely withstand the combined effects of shear, moment and torque at applicable design stresses.

iv. Do not weld galvanized members without the Consultant's approval.

v. *Design connections that are exposed to weather so that moisture, dirt and the like cannot gain entry to the interior of hollow built-up members.

vi. Design and detail connections so as not to interfere with architectural clearance lines or finishes.

vii. *Where connections between beams and columns and the like result in loss of bearing to the wood deck or the like, design and provide support as required.

1.6 SUBMITTALS

.1 Connection Details, Erection Diagrams, Shop Details, Erection Procedures, Field Work Details and Joist Details

i. Submit connection details, erection diagrams, shop details, erection procedures, field work details and joist details for review by the *Consultant.

ii. Do not reproduce the structural drawings to serve as erection or setting drawings without the Consultant's approval.

.2 Connection Design Details

i. Connection design details shall be prepared before the preparation of shop details and submitted to the Consultant for review that the intent of the design is met.

ii. Connection design details shall bear the signature and stamp of a qualified professional engineer licensed to practice in the *Province of Ontario

iii. Connection design details shall provide details of standard and non-standard connections and other data necessary for the preparation of shop details. Connection design details shall be referenced to the design documents or the erection drawings, or both.

.3 Erection Diagrams

i. Erection diagrams shall be submitted to the Consultant for review.

ii. Amongst other items show the following:
- General arrangement of the structure including all steel load-resisting elements essential to the integrity of the completed structure
- Principal dimensions of the structure
- Piece marks
- Sizes of the members
- Connection details.
- Bearing details.
- Holes.
- Finishes.
- Grades of steel.
- Size and type of bolts and bolt installation requirements
- Shop and field welds
- Elevations of column bases
- All necessary dimensions and details for setting anchor rods
- Sliding expansion joint bearing pad details, including materials, size and thickness of pads, setting out dimensions and load capacity.
- Required clearances and other details to receive correlative items
- Any other information necessary for the assembly of the structure

iii. Show necessary dimensions and details for setting structural steel bearings, anchorages, assemblies and the like where they interface with other building components.

iv. Co-ordinate with shop drawings of cast-in-place concrete, masonry, miscellaneous metal work, metal deck and other interfacing work.

.4 Shop Details

i. Shop details shall be prepared before fabrication and submitted to the Consultant for review.

ii. Shop details shall provide complete information for the fabrication of various members and components of the structure, including the required material and product standards; the location, type, and size of all mechanical fasteners; bolt installation requirements; and welds.

.5 Fieldwork Details

i. Fieldwork details shall be submitted for review by the Consultant whenever modifications to the approved structural details are required.

ii. Fieldwork details shall provide complete information for modifying fabricated members in the shop or on the job site. All operations required to modify the member shall be shown on the fieldwork details.

.6 Substitution

i. If the Contractor wishes to make substitutions for steel materials or sizes indicated, submit proposals with the tender with necessary calculations for review of the *Consultant.

PART 2: PRODUCTS

2.1 MATERIALS

.1 Rolled Wide Flange Sections: Conform to CSA-G40.21-M92 350W, unless otherwise noted.

.2 Rolled channels and angles: Conform to CSA-G40.21-M92 300W, unless otherwise noted.

.3 Steel plate, bars and rods: Conform to CSA-G40.21-M92 300W, unless otherwise noted.

.4 *Seamless Pipe: Conform to CSA B63-1966 (R1971) Grade B.

.5 *Hollow Structural Sections: Conform to CSA-G40.21-M92 Grade 350W, Class C.

.6 Bolts, nuts and washers: ASTM A325 M-00, galvanized when used with galvanized material.

.7 Shop paint primer: Type 1 - Water borne: Low VOCs, and not to be manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexvalent chromium and their compounds. Devguard 4020 by ICI Devoe Coatings or approved equivalent. Contractor to verify compatibility of primer with finished paint including intumescent paint where applicable.

.8 Primer for steel to receive Cafco Intumescent coating: [Devguard 4160 structural primer by ICI Devoe Coatings][Rustguard 4150-7100 Red Low Voc Shopcoat Primer by ICI Devoe Coatings][Kem Kromik Universal Metal Primer B50NZ6 by Sherwin-Williams] or approved equivalent

.9 Reinforced Inorganic Zinc Primer - Catha-coat 302H by ICI Devoe Coatings or approved Equivalent

.10 Alkyl Silicate Inorganic Zinc Coating - Catha-coat 304 by ICI Devoe Coatings or approved equivalent.

.11 Zinc Rich Coating: Galvafroid as supplied by W.R. Meadows Limited or approved equal.

.12 High Build Epoxy Coating: Devran 224 HS by ICI Devoe Coatings or approved equivalent.

.13 Sheet Rubber for Thermal Separation at Steel Connections: AB-563 EPDM, Hardness: 60±5 Shore "A" Durometer, 3 mm thickness unless otherwise indicated, as manufactured by American Biltrite or approved equivalent. Distributed by Robco (Mississauga) 905-564-6555, Goodall (Oshawa) 905-728-1658 or Chambers and Cooke (Markham) 905-475-1331.

PART 3: EXECUTION

3.1 WORKMANSHIP AND FABRICATION

.1 Conform to CAN/CSA-S16.1-94 and the following:

.2 Camber

i. Provide camber to beams and girders in a manner that will not reduce the safe load carrying capacity of the members.

.3 Provide holes to *15mm in diameter indicted at any time before shop drawings are reviewed, as required to permit the attachment of other materials such as wood blocking.

.4 Plates and shelf angles supporting masonry shall be continuous and extend full length of masonry openings. At splices, grind welds smooth where exposed to view.

.5 Openings

i. Conform to requirements shown for location, size, reinforcing and cutting of openings through structural members.

ii. Obtain written permission of *Consultant prior to field cutting or altering of structural members not shown on the drawings.

.6 Galvanized Steel

i. Detailed and fabricated steel such that it will not trap the galvanizing material.

ii. Detailed so that welding of galvanized material is not required.

iii. Provided with vent holes as required.

iv. Cleaned of all weld slag prior to galvanizing.

v. Upon completion of erection, touched up with zinc rich primer at all locations where galvanizing is damaged.

3.2 PROTECTION

.1 Steel ST-2

i. This steel type applies to all structural steel concealed from view in the finished building and not exposed to weather or high humidity environments.

ii. Clean structural steel in accordance with SSPC SP2, Hand Tool Cleaning

iii. Within one hour following cleaning, apply one coat of paint conforming to CISC/CPMA 1-73a

.2 Steel ST-7

i. This steel type applies to all structural steel which is exposed to weather or moisture in the finished building but is not designated as "architectural" such as steel within the cavity of cavity walls, not protected by a vapour barrier including:

- lintels
- shelf angles
- plates, hangers, braces etc. outside the building envelope
- exterior beams
- exterior columns
- connection materials and inserts associated with the above.

ii. Fully galvanize, in accordance with CSA G164 to a minimum zinc coating of 600 g/m^2.

.3 Steel ST-8

i. This steel type applies to all exterior structural steel which is exposed to view in the finished building, designated as "architectural steel" and intended to receive a galvanized coating including:

- Canopy columns

ii. Clean structural steel in accordance with [SSPC SP6, Commercial Blast Cleaning]

iii. Fully galvanize, in accordance with CSA G164 to a minimum zinc coating of 600 g/m^2.

.4 Except for steel which is to be left uncoated, upon completion of erection, apply primer to welds, bolts and at locations where original primer is damaged. Primer to match the primer of the base steel. For galvanized steel, touch up with zinc rich coating.

.5 Protect all steel from damage during storage, transportation and erection.

.6 *Protect weep holes at base of closed column sections that have base plates, but no cap plates.

.7 *During cold weather, protect members from damage due to water freezing in confined areas.

.8 *Provide drain holes in closed sections to prevent water build-up during erection.

3.3 ERECTION

.1 General

i. Conform to requirements of CAN/CSA-S16.1 and the following:

ii. Bracing members and anchor bolts shown are for the finished structure and may not be adequate to resist forces present during construction.

iii. Maintain temporary bracing until completion of entire structure including floor and roof decks, masonry walls and other elements which are part of the wind resisting system.

iv. Carry out erection operations, including installation of any temporary guying and shoring required, without loading portions of the existing structure already constructed in excess of its safe load carrying capacity.

v. During erection, forces or reactions in the steel frame members and their connections may exceed those on which the design is based.

vi. Determine the magnitude of such forces and reactions and take such measures as are necessary to ensure that the safety and stability of the structure is maintained until the entire structure, including floor and roof slabs is complete.

vii. Splices, other than those shown, shall not be permitted in members without the *Consultant's approval.

viii. Nuts on ordinary bolts ASTM A307 shall be prevented from working loose by use of lock washers, lock nuts, jam nuts, thread burring or other approved methods.

ix. Report to the *Consultant where members cannot be erected within the specified tolerances without modification or special procedures. Take corrective measures to the *Consultant's approval.

.2 Bearing on Concrete *or masonry

i. Set steel bases and bearing assemblies true and level at the proper elevation so that upon grouting, they will have full bearing.

ii. Unless a specific method is shown, leveling devices or steel shimming may be used to support bases prior to grouting. Subsequent to grouting, loosen the leveling devices so that all loads passs only through the bases, or remove the steel shims so that the resulting voids can be fully grouted.

iii. Lift grouted bases so that the adequacy of grouting can be examined. Conform with the requirements of the local building by-laws, but in any event, lift at least *three bases selected by the *Consultant. If defects are found, more bases will have to be raised.

.3 Lintels

i. Unless a reinforced block or concrete lintel is noted, provide loose steel lintels, as shown, over openings and recesses in masonry walls or partitions including those for mechanical or electrical services.

.4 Openings

i. No openings through structural steel members will be permitted without the *Consultant's approval.

.5 *New Steel Work to the Existing Building

i. *Before proceeding with any work at the existing building, verify that existing members are of the size and in the location indicated on the drawings. If not, do not proceed until the *Consultant has given instructions.

ii. *Make site measurements as required to verify dimensions of existing work before proceeding with the work. The Contractor shall be responsible for extra costs incurred due to proceeding without verifying site dimensions.

iii. *Adequately shore the existing structure until the permanent structure shown is installed, to ensure that no movements or damage occurs.

END OF SECTION 05120

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

.1 Provide all material and labour required for the completion of the Contract. Breakdown of Work by Section is for guidance only and is not necessarily complete.

.2 Work Furnished and Installed:

i. Steel roof over elevator shaft.

ii. Hole and edge reinforcing welded to deck.

iii. Closures.

.3 Related Work Specified Elsewhere:

i. Framing of openings in deck exceeding 450 mm in roof deck and 300 mm in floor deck and framing of edges of openings in metal deck where loss of bearing to metal deck occurs: Section 05120

ii. Steel bearing plates and related anchors to receive metal deck: Section 05120

1.2 STANDARDS, CODES AND ACTS

.1 Conform with the *Ontario Building Code 2006 (O. Reg. 403/97) and any applicable acts of authority having jurisdiction and the following:

i. CSA-S136-94, Design of Light Gauge Steel Structural Members, Canadian Standards Association.

ii. CAN/CSA-S16.1-94, Steel Structures for Buildings - Limit States Design, Canadian Standards Association.

iii. CSA-W47.1-92 (R1998), Certification of Companies for Fusion Welding of Steel Structures, Canadian Standards Association.

iv. CSA-W59 -M1989 (R1998), Welded Steel Construction, Canadian Standards Association.

v. CSSBI 10M-96, Canadian Sheet Steel Building Institute (CSSBI) Standards for Steel Roof Deck - 1976 Revised 1981 and Steel Floor Deck - 1976 Revised 1981.

vi. ASTM A108-99, Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality, American Society of Testing and Materials.

vii. ASTM A653/A653-00, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, American Society of Testing and Materials.

.2 Where there are differences between the specifications, drawings, codes, standards or acts, the most stringent shall govern.

1.3 QUALIFICATIONS

.1 Any organization undertaking to weld under this Contract shall be certified by the Canadian Welding Bureau under the requirements of CSA W47.1.

.2 Welders engaged in this work shall furnish proof that they have successfully carried out welding of gauge metal.

1.4 DESIGN

.1 Design deck in accordance with requirements of the *Ontario Building Code to safely support loadings shown or implied.

.2 Design deck such that the live load deflection of the deck shall not exceed 1/360 of the span for floor deck, nor 1/240 of the span for roof deck, except that when decks support a plastered ceiling or similar finish, the deflection due to live load shall not exceed 1/360 of the span.

.3 Design deck anchorage to the supporting framework or walls to safely resist net uplift forces shown, but not less than 0.50 kPa.

.4 Wherever possible, design units to span over three or more supports in order to obtain increased rigidity.

.7 Design and connect metal edge and closure strips to safely resist construction loads and prevent the loss of grout when the deck is concreted.

.8 Design framing for openings or holes through the roof deck up to *450 mm maximum width and in floor deck up to *300 mm maximum width measured perpendicular to the span of the deck.

1.5 SUBMITTALS

.1 Shop Drawings

i. Submit erection and fabrication drawings for review by the Consultant.

ii. Each drawing submitted shall bear the signature and stamp of a qualified Professional Engineer licensed in the *Province of Ontario.

iii. Amongst other items, show the following:
- Types of deck and their locations
- Design loads
- Net uplift pressures
- Openings and their reinforcement
- Gauge of steel deck
- Surface protective coating
- Flashings and closure plates
- Welding details
- Sufficient detail sections showing the deck's orientation to support members to facilitate erection of deck

PART 2: PRODUCTS

2.1 MATERIALS

.1 Metal Deck

i. To CSSBI 10M. Minimum steel core thickness 0.76 mm 0.030 in. except that deck exposed to view in the finished building shall have a minimum steel core thickness of 0.91 mm *0.036 in

0.76 mm = 22 ga. And 0.91 = 20 ga.

ii. Form deck with integral ribs of a shape acceptable to the *Consultant.

iii. Provide a minimum width of rib contact with the supporting steel work of 40 times the thickness of the deck.

iv. Provide sections with interlocking type side joints.

.2 Miscellaneous Metal

i. Metal cover plates, cell closures, web stiffeners, edge strips and flashings shall conform to material and finish as specified for deck and have a minimum steel core nominal thickness of 1.22 mm *0.048 in.

PART 3: EXECUTION

3.1 PROTECTION

.1 Coat surfaces of deck in accordance with CSSBI requirements for wipe coated steel designation ZF75 in according with ASTM A653/A653M, except that deck exposed to view or weather shall have a commercial grade zinc coating of at least Z275 designation in according with ASTM A653/A653M.

.4 Touch up field abrasions and welds with a brush coat of a zinc rich primer.

3.2 INSTALLATION

.1 General

i. Ensure that construction loads caused by the erection of the deck will not load structural members in excess of their design loads.

ii. Erect deck such that it is free of dirt, scale, foreign matter, dents or deformations.

iii. Adjust deck units to their final position before securing to supporting members. Supply and install steel packing between supporting members and deck to provide a minimum of 50 mm bearing. Permanently secure packing.

iv. Lap ends of *non-composite deck units a minimum of 50 mm and only over supporting members.

v. *When deck units are adjusted to their final position, anchor to supports and to members parallel to the deck span to safely resist uplift forces and lateral forces, but with not less than 19 mm diameter fusion welds at average spacing of 300 o.c. Where deck will be exposed to weather without cover, or where welding of deck is impracticable, secure deck with a minimum #12 self taping screws at an average spacing of 300 o.c.

vi. Provide a minimum of 50 mm of end bearing on supports. Fasten side joints of deck units between supports by clinching at 600 mm intervals or with 25 mm long welds at 1000 mm intervals. Secure structural flashings and the like to deck with sheet metal screws or welding.

vii. Make fusion welds of deck to supporting members well within bearing width of supporting members.

viii. Weld gauge metal to obtain satisfactory fusion between the deck and supports without damage to the deck or its supports.

ix. Provide minimum closure channels along edges of all deck parallel to span where deck is not otherwise supported.

.2 Holes Through Deck

i. Cut openings and reinforce edges as required for pipes, ducts, hoppers and the like. Indicate openings as reinforcement for openings on fabrication and erection drawings. The maximum size of an unreinforced opening is 150 mm square or in diameter. Reinforce openings having a dimension over 150 mm, but not exceeding 450 mm as required. Framing for openings with a dimension exceeding 450 mm in roof deck and 300 mm in floor deck is specified under Structural Steel Section 05120. The location of holes through decking shall be to the approval of the Consultant.

ii. Obtain actual opening and holing information before proceeding with the work. Cooperate with other trades as necessary.

END OF SECTION 05311

PART I - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Structural Steel	Section 05120
.2	Mechanical	Division 15
.3	Electrical	Division 16

1.2 SHOP DRAWINGS

.1 Submit Shop Drawings. Show and describe detail work of this Section including large scale details of members and materials, of connections, joining details, anchorage devices, dimensions, gauges, thicknesses, description of materials, metal finishing specifications, as well as all other pertinent data and information.

1.3 FABRICAT10N

.1 Design, fabricate and erect structural steel members in accordance with CAN/CSA-S16.1-M89.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Structural Steel - CAN/CSA-G40.21-M92

.2 Welding Materials - CSA W59-1989, CSA W 55.2-57;for stainless steel, ASTM A371; for aluminum, CSA-W59-1989.

.3 Sheet Steel - wiped coated, ASTM A 446; structural quality Grade A or B, maximum permissible working stress. Grade A 137,895 kPa; Grade B.154,442 kPa.

.4 Prime Paint - CGSB 1-GP-40.

.5 Bituminous Paint - CGSB-1-GP-108.

.6 Touch-up Paint - zinc rich, "Galvafroid" by W. R. Meadows of Canada Ltd. or other approved alternative.

PART 3 – EXECUTION

3.1 WORKMANSHIP

.1 Use only workmen skilled in the work of this Section. Do work to best standard practice and in accordance with laws, by-laws and regulations, which govern. Conform to the requirements of the authorities.

.2 Fit and assemble work in shop where possible. Execute work according to details and approved shop drawings. Where shop fabrication is not possible, make trial assembly in shop.

.3 Welding: CSA W59.M1989. File or grind exposed welds smooth and flush, so as to be invisible after painting.

.4 Make workmanship of best grade of modern shop and field practice known to recognized manufacturers specializing in this work. Fit joints and intersecting members accurately. Make work in true plumb, true, square, straight, level and accurate to sizes and shapes detailed, free from distortion or defects detrimental to appearance or performance.

.5 Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint, butyl tape, building paper or other approved means.

.6 Supply all fastenings, anchors and accessories required for fabrication and erection of the work. Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum and inconspicuous, spacing them evenly and setting them out neatly. Make fastenings of permanent type.

.7 Draw mechanical joints to hairline tightness & seal countersunk screws and access holes for locking screws with metal filler where these occur on exposed surface.

.8 Thoroughly clean all ferrous metals, by methods suitable to remove burrs, weld spatter, rust, loose mill scale, oil, grease, dirt and other foreign matter. Apply one coat of prime paint to all surfaces except those requiring field welding. Brush on thoroughly and work well into all crevices.

.9 After erection and installation, thoroughly clean the work and apply field touch up of same formula as shop coat to all damaged or unpainted surfaces. Work all paint well into all joints, crevices and open spaces.

.10 Galvanizing - Do all galvanizing after welding.

.11 After erection and installation, thoroughly clean the work and apply field touch up of same formula as shop coat to all damaged or unpainted surfaces. Work all paint well into all joints, crevices and open spaces.

3.2 SUPPORT STEEL

.1 Provide and install for extent noted structural steel supports and any other steel fabrications required for the following items:

.1 Entrances and Screens.
.2 Vanity supports capable of supporting 732 kg/M2.
.3 Coat rack steel tubular reinforcement capable of supporting 732 kg.M2
.4 And as may be required elsewhere

3.3 CUSTOM WOODEN HANDRAIL BRACKETS

.1 Carry an allowance of $3,000.00 to fabricate custom railing brackets to be installed at 4'-0" maximum centres. The cost for the installation of these brackets shall be carried by the General Contractor.

.2 Blocking required for the installation of these custom railing brackets will be carried by the General Contractor.

3.4 ACCESS HATCH

.1 Supply one aluminum access hatch for the sump pit for the elevator to be cast into new concrete slab at the top of the shaft. Access hatch shall be Maxam Metal Products, Aluminum Floor Door, Single Leaf Panel for Carpet or VCT Overlay, Model No. MT-4. Provide shop drawings as required under Section 01300 – Submittals.

.2 Access hatch shall have zinc plated hinges, complete with stainless steel pivot points. Be supplied with a removable cover plug operable from the top side by a removable "T" handle. The overall frame depth is 2 ½".

.3 The frame is to be installed to align with the carpet finish being provided on the floor adjacent over a glue down underpad. Review height on site prior to installation.

3.5 ROOF ACCESS LADDER & GRATING

.1 Fabricate one steel access ladder complete with all required hardware for installation by General Contractor. See drawings for complete details.

3.6 ELEVATOR PIT LADDER

.1 Fabricate one steel access ladder complete with all required hardware for installation by General Contractor. Ladder shall be 10'-4" x 24" wide, mounted at the floor of the elevator pit at the line of the first floor landing and at the top with steel brackets similar to the Access Ladder to the roof as shown in the drawings. Provide ladder rungs at 1'-0" centers with a total of 9 total rungs fabricated from 1" diameter steel tubing. Complete the work of this ladder in a similar manner to the Roof Access Ladder & Grating as shown in the drawings.

3.7 ADJUSTMENT AND CLEANING

.1 Refinish shop applied finished in field only with approval of Consultant.

.2 Clean off dirt on surfaces resulting from installation Work.

3.8 SHOP FINISH

.1 Thoroughly clean all ferrous metals, by methods suitable to remove burrs, weld spatter, rust, loose mill scale, oil, grease, dirt and other foreign matter. Apply one coat of prime paint to all surfaces except those requiring field welding. Brush thoroughly and work well into all crevices.

.2 All metal work specified in this Section shall be thoroughly painted one coat of grey metal primer of type approved by the Consultant before delivery to the Site. Metal parts in contact shall be primed before shop assembly. Should in the opinion of the Consultant priming become sufficiently damaged during erection or through lack of protection, he may require this Contractor to make good the prime coat.

.3 Back paint with asphaltic paint wherever metal is in contact with concrete, masonry or mortar.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Supply of Hollow Metal Work — Section 08100

1.2 DELIVERY AND STORAGE

.1 Accept delivery of hardware, doors and frames. Arrange for proper sequence and scheduling of delivery so as not to delay the progress of the Work. Prevent materials not reasonably required from accumulating.

.2 Provide dry storage areas. Stack materials with 6" (150 mm) min. clearance off the floor.

.3 Protect fire-retardant materials against high humidity and moisture.

1.3 PROTECTION

.1 Protect installed hardware from damage and blemishes.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Wood materials - straight, sawn square, true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified.

.2 Lumber grade and moisture content - comply with the official grading rules of NLGA for the particular lumber and grade, and structurally complying with the latest requirements of the Ontario Building Code. Comply with CSA Standard 0141 Softwood Lumber. Use only grade marked lumber.

.3 All wood materials - well seasoned NLGA, free from defects which impair strength and durability. Moisture content limit: S-GRN: Unseasoned; S-DRY: Maximum 19% moisture content: KD: Maximum 12% moisture content. Provide maximum 12% moisture control for exterior locations and 8% maximum for interior locations.

.4 Supply Pre-engineered wood structural members as shown on the drawings. Provide all Pre-engineered wooden structural sections as shown on the drawings with shop drawings and required connection details (See Structural Drawings)

.5 Supply all Pre-engineered TJI joists as required and as shown on the drawings. Submit shop drawings and manufacturers detailing and connection requirements for all conditions.

.6 Blocking, cant strips, grounds, nailing strips - NLGA No. 2 Ontario White Pine, No. 2 Red Pine, or Construction No.1 Jack Pine all complying with the grading rules of the NLGA, or Construction, Douglas Fir dense complying with COFI standard grading and dressing rules.

.7 Douglas Fir plywood - comply with CSA Standard 0121, COFI Exterior. Western softwood plywood - comply with CSA Standard 0151, COFI Waterproof glue WSP. Exposed two sides shall be grade G2S, and exposed one side shall be grade G/Solid.

.8 Wood preservative - Solignum manufactured by Sturgeons Ltd., Pentox manufactured byOsmose Wood Preserving Co. of Canada Ltd., Rez Sanding Sealer manufacturer by Monsanto Co. Ltd. or other approved manufacturer. For painted surfaces use clear type and for concealed surfaces use green tinted type. Pressure Treatment to conform to CAN/CSA-080 Series-M89.

.9 Rough hardware - nails, screws, bolts, lag screws anchors, special fastening devices and supports as required for the erection of all carpentry items.

PART 3 EXECUTION

3.1 PREPARATION

.1 Examine surfaces to receive the work of this Section and proceed only when conditions are satisfactory for a proper installation.

3.2 INSTALLATION - GENERAL

.1 Provide running members of the longest lengths obtainable.

.2 Slowly feed machine-dressed members using sharp cutters. Provide finished members free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.

.3 Machine sand Surfaces exposed in the finished work and hand sanded to an even smooth surface free of scratches.

.4 Properly frame material with tight joints and rigidly secure in place. Use glue-blocks where necessary.

.5 Design construction methods for expansion and contraction of the materials.

.6 Conceal joints and connections wherever possible. Locate prominent joints only where directed.

.7 Match joints made on the site with joints made in the shop.

.8 Unless otherwise specified glue and blind screw or nail all work. Set and fill and plug surface screws using matching wood plugs.

.9 Accurately scribe, cope and mitre members where required to produce hairline joints.

.10 Erect work plumb, level, square and to the required lines.

.11 Do not regard blocking, strapping and other rough carpentry indicated as complete or exact. Provide rough carpentry items required for the installation of the Work of other Sections.

3.3 INSTALLATION - ROUGH CARPENTRY

.1 Blocking and Grounds - Fasten wood nailers, blocking, bucks, grounds curbs, copings and strapping solidly to supporting materials in true planes so that they will remain straight and not be loosened by work of other Trades.

.2 Framing - Do all wood framing in accordance with applicable Sections of the Building Code (Ont. Reg. 413/90) and to CAN/CSA 086.1-M89 as applicable.

.3 Wood Cants and Copings - Fasten wood cant blocking to structure with 3/16" (4.5 mm) dia. bolts 30" (750 mm) o.c. Fasten curbs as indicated. Wood cants to be preservative treated.

.4 Preservative - Preserve concealed wood members in contact with exterior walls and roof before fixing in place. Preserve all other wood indicated to be preserved. Preserve wood by immersing in preservative for at least one hour

3.4 INSTALLATION - STEEL DOOR FRAMES

.1 Set frames plumb and square in their exact location. Firmly block and brace to prevent shifting. Shim up where required to ensure proper alignment and dimensions from finished floor to head of frame. Install temporary wood spreaders at mid-height.

3.5 INSTALLATION - FINISH HARDWARE

.1 Accept delivery of finish hardware and be responsible for its safe storage.

.2 Install finish hardware to template in accordance with manufacturer's written instructions. Do not modify finish hardware without manufacturer's written approval. Install finish hardware secure, plumb, level, and true to line.

.3 After installation of hardware under this Section, check opening units for correct fit and uniformity of space around perimeter of units, or between units. Provide smoothly operating opening units free from binding.

.4 Set, fit, adjust and clean hardware according to manufacturer's written instructions

.5 Do not install hardware until after painting in area is completed.

END OF SECTION

0660 **June 2, 2010 - revised May 13, 2011** **SECTION 06200 – FINISH CARPENTRY AND CABINETRY**

PART 1 – GENERAL

1.1 General Requirements

.1 Comply with requirements of Division 1.

1.2 Related Work

.1	Rough Carpentry	-	Section 06100
.2	Plastic Laminate	-	Section 06240
.2	Plumbing	-	Division 15
.3	Electrical Work	-	Division 16

.4 This Section includes the supply, fabrication and installation of all cabinetry and cabinets. Coordinate with Section 06100 and the requirements of Division 15 and 16 to ensure correct, adequate, and acceptable completion of carpentry work specified herein.

.5 All plumbing fixtures in cabinetwork shall be installed by this Section; see Division 15 for supply of plumbing fixtures.

.6 This Section includes the supply, fabrication and installation of all hardwood baseboards, door frames and trims, stair railings and stair balustrade caps, window sills and wood valences as indicated by the drawings in co-ordination with Rough Carpentry Section 06100 and the other related sections of the interior finishes.

.7 This Section includes the supply, fabrication and installation of all hardwood pieces of furniture, including lecturn stands, organ enclosure and display monitor surround, as indicated by the drawings in co-ordination with Rough Carpentry – Section 09900.

1.3 Qualifications

.1 The Work of this Section shall be provided by a specialist millwork firm established in Ontario for a minimum of five years and able to produce evidence of satisfactory completion of quality casework comparable with Work specified under this Section.

.2 All Work to conform to minimum standard for work as specified in Quality Standards for Architectural Woodwork Standards, 1st Edition, dated October 1st, 2009 as prepared by Architectural Woodwork Manufacturers Association of Canada, Custom Grade.

1.4 Intent

.1 The intent of this Section is that the casework shall be manufactured and finished at the plant, delivered to the Site and immediately installed by this Section including provision of necessary strapping, backings, bearers, rough hardware and finish hardware. Touch up finish immediately prior to completion of the Work and leave in perfect condition.

1.5 Submittals

.1 Submit Shop Drawings of all cabinetwork in accordance with Section 01300.

.2 Draw Shop Drawings in related and/or dimensional positions with sections. Scale minimum 3/4"=1'-0".

.3 Shop Drawings shall show fabrication details, materials, jointing, description of anchorage and hardware. Dimensions shall be based on actual measurements taken at the Site. Provide details and dimensions for all fittings and the like for mechanical and electrical connections to this work.

.4 Submit samples of materials, construction method and wood stain finish for Consultant's approval.

.5 Submit sample of all hardware.

.6 Submit one full size sample of proposed units of Type selected by Consultant prior to proceeding with the remainder of cabinet work.

1.6 Co-operation

.1 Co-operate with other Sections and do all cutting, fitting and making good own work for all Sections as may be necessary to carry out the true intent of the Drawings and Specifications. Examine the work and materials installed by others insofar as it affects this Work, and report to Consultant any such work not done properly.

1.7 Measurements

.1 Take necessary measurements at the Building of spaces and conditions to which work must conform or through which access is required. Take such measurements prior to fabrication of the Work of this Section and in ample time to avoid delays in the Work.

1.8 Delivery and Storage

.1 Do not deliver finished material during rain or damp weather or until "Wet Trades" have completed their work and windows are glazed or covered. Carefully protect from damage of any kind.

1.9 Warranty

.1 Provide an extended warranty in accord with the General Conditions of the Contract to five years against defects in material and workmanship including, but not limited to, de-lamination, warping and other defects detrimental to appearance and/or performance.

PART 2 - MATERIALS

2.1 Approved Manufacturer

2.1 Valley City Manufacturing Company Ltd.
P.O. Box 8578, 64 Hatt Street
Dundas, Ontario, L9H 5G2
tel. 905-628-2253
fax. 905-628-4470

2.2 Materials

.1 Provide AWMAC Custom Grade, unless otherwise indicated.

.2 All wood shall be new, straight and clean, free of sap, knots, pitch and other defects, except as permitted by grading rules.

.3 Hardwood Lumber: Conform to National Hardwood Lumber Association (NHLA) requirements, Ash Custom Grade.

.4 Softwood: to CAN/CSA-0141-91, dressed all sides used in concealed locations only except where shown otherwise. No.1 Grade White Pine.

.5 Hardwood Plywood: Conform to CSA 0115-M1982 and AWMAC Architectural Grade Select White Birch or Ash as specified. Exposed faces to be natural grade per AWMAC. Interior of doors shall be classified as exposed face.

.6 Canadian Softwood Plywood: Conform to CSA 0151-M1978.

.7 Douglas Fir Plywood: Conform to CSA 0121-M1978.

.8 Poplar Plywood: Conform to CSA 0153-M1980.

.9 Mat-Formed Wood Particleboard: Conform to CAN3-0188.1-M78, Grade R, 700 kg/m3 density.

.10 Hardboard: Conform to CGSB 11-GP-3M, Type 2.

.11 Nails and Staples: Conform to CSA B111-1974.

.12 Plastic Laminate: General Purpose Grade

.1 Standard of acceptance: WilsonArt; Arborite; Pionite; Formica

.13 Allow for continuous ¾" plywood deck to support granite countertops to be installed on cabinets in Servery 226, Women's Washroom 228, Men's Washroom 230, Washroom 111, Men's Washroom 210 and Women's Washroom 212.

.14 Glue: Waterproof synthetic resinous glue, of approved type for general Carpentry work and Urea Formaldehyde thermo-setting type for plastic laminate work. All adhesives to conform to CSA 0112-M77 Series.

.15 Solid Core doors: to CSA 0132.2, flush doors, 35 mm thick, face veneer and edge banding to match adjacent millwork.

.16 Solid Core doors: to CSA 0132.2, flush doors, 19 mm thick, face laminate and edging to match adjacent millwork

.17 Glass: clear float glass to CAN/CGSB-12.3-m76, glazing quality. All glass in cabinet work shall be tempered.

.18 Typical Furniture Finish: Finish to be satin varnish system. The individual components of the system used must be chemically compatible to assure perfect adhesion and a top quality, durable final finish. Finish to be of colour as later selected.

2.3 Cabinet Hardware

.1 Products listed herein represent standard of acceptance and may be supplied by other manufacturers of equal quality and similar appearance subject to Consultant's review and approval.

.1 Hinges for 19mm Door: Blum 91-650, 170 degrees with self-closing spring.

.2 Hinges for 35mm Doors: Hager 1279 76 x 76

.3 Door and Drawer Pulls: GSH 302 x 100mm CTC 7.5mm O.D. brushed stainless steel.

.4 Drawer Slides: KV 8400 full extension for 45kg load @ 500mm.

.5 Drawer Locks (If Requried): Olympus 078 or National Cabinet Lock C8702 or Corbin CCL 02066. .1 Keyed as directed by Consultant.

.6 Cabinet Locks: (If Required): Olympus 078 or National Cabinet Lock C8702 or Corbin CCL 02067. .1 Keyed as directed by Consultant.

.7 Slide Bolt (at inactive door of locked pair): 60mm long barrel bolt, nickel plated.
.1 Haefele 252.70.722

.8 Door Locks for 35mm Doors: (Supply from Section 08210 – Door Hardware Cash Allowance).

.9 Pilaster & clips: KV 255, 256.

.10 Grommets: Adjustable, counter-type circular grommet with wafer pin insert.
.1 K & V 58310 and 58312.

.11 Hardware finish: Chrome or Nickel-plated, unless indicated otherwise.

2.4 Fabrication - General

.1 Check job dimensions and conditions and notify the Consultant in writing of unacceptable conditions. Do not proceed until remedial instructions are received.

.2 As far as practical, assemble work at the shop and deliver to the job ready for installation. Leave ample allowance for fitting and scribing on the job.

.3 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.

.4 Comply with glue manufacturer's recommendations for lumber moisture content, glue life, pot life, working life, mixing spreading, assembly time, time under pressure and ambient temperature.

.5 Provide exposed end grain of solid members and edges of exposed plywood with matching solid hardwood edging at least 6.4 mm thick.

.6 Make all necessary cut-outs in the furniture for sinks and electrical switch and outlet boxes and pre-drill all mounting holes for faucets, fittings and outlet boxes. Refer to electrical and mechanical Drawings and specifications.

.7 Provide and install pipe covers, scribing pieces, top, bottom and/or and closures and filler panels where necessary, including wherever units require furring out or blocking to existing conduits, pipes, etc.

.8 Service cover panels to be provided at all kneehole drawer units, kneehole front rails and knee drawer table assemblies. End closing panels to be provided at all exposed ends of service strips and island/peninsula assemblies. Front filler panels to be provided where called for on Drawings and as required by field conditions.

.9 Base around all toe spaces shall be vinyl, supplied and installed by others.

2.5 Base Cabinet Construction

.1 Provide all cabinet work to be factory assembled in modular, unitized construction. Each unit shall be self supporting and designed to be bolted together with fasteners inside units with plastic plugs over fasteners. All joints to be securely glued. Fabricate units as per Drawings and as follows.

.2 Gables to be 19 mm veneered plywood on veneer core, secured to solid framing members.

.3 Provide top front, top back rails and posts of solid hardwood 19 mm x 50 mm framing member.

.4 Bottom to be 19 mm plywood on veneer core.

.5 Provide all base cabinets with minimum 100 mm high toe space of 19 mm material set back from front face of cabinets 100 mm minimum or as detailed on the drawings.

.6 Doors generally to be flush overlay 19 mm minimum veneered plywood fronts, backs with hardwood edges all four sides to match door face. Interior face of door to be considered a finished face.

.7 Back panels minimum 13 mm thick veneered plywood removable within unit where access required behind. Removable panels to have edge trim, four sides.

.8 Refer to detail Drawings for specific revisions thereto.

.9 Shelves: 19 mm minimum hardwood plywood with front edges to have edging.

.10 Drawer Construction

.1 Fronts: 19 mm veneered plywood with natural finish and hardwood edges on all four sides. Interior face may be backing sheet.

.2 Sides and back: 13 mm solid birch or maple all glued together and to front.

.3 Drawer bottom: 5 mm plywood grooved into sides, back and front members.

.4 Provide all drawers with spring hinged stops to prevent accidental removal of drawer. Provide guides and slides for all drawers. Top hung drawer slides or grooved drawer sides for runners are not acceptable.

.11 Sit all adjustable shelves on pilaster clips. Pilasters to be recessed into gables.

2.6 Upper Cabinet Construction

.1 Construct upper cabinets generally similar to base cabinets.

.2 Shelving to be as detailed, but generally 300 mm. deep unless specifically noted. Provide centre pilaster to all shelves 1200 mm long or over. Back to be 6 mm birch veneer plywood finished to match exterior.

.3 Sit all adjustable shelves on pilaster clips. Pilasters to be recessed into gables.

.4 Provide centre gable to units 1200 mm, long and also provide stiffener under bottom at front 25mm x 57 mm on all cabinets to prevent deflection.

.5 Provide extended top, bottom and exposed gables where furring out of upper cupboards is required due to pipes, conduits and the like behind to provide a flush face at walls.

2.7 Countertops

.1 Provide and install counter tops of types noted on drawings and herein specified.

.2 Provide drip groove at all exposed edges.

.3 Provide backsplashes and return backsplashes where required.

.4 Provide on all exposed edges, 3mm black PVC edging, installed on top by an edgebanding machine with heat, pressure and glue.

.5 Where joints occur, provide mechanical locktite fasteners and splines for a hairline joint. Seal joint with silicone.

.6 At window locations, finish the back of the backsplash and enclose area from bottom of top to window sill with a matching plastic laminate.

2.8 Furniture Finishing (Wood)

.1 Carefully prepare all work to receive finish. Thoroughly sand all wood surfaces to remove machine marks and make dust-free before finishing.

.2 Finish all exterior surfaces and interior of exposed cases with one coat of selected satin one coat of sealer, sanded smooth, and two coats of finish as specified. Apply finish in accordance with best practice and the resultant finish must be of highest quality for furniture use.

.3 Finish unexposed surfaces with two coats of tinted sealer including backs of all base and wall cabinets, enclosures, etc.

.4 The colour of stain shall be selected by the Consultant. Before proceeding submit prepared 300 x 300 mm finished samples of materials for approval.

2.9 Cash Allowance for Cabinetry

.1 Carry a cash allowance of $8,000.00 for the supply of all hardware as required for cabinets stand alone furniture items and wall mounted woodwork components.

PART 3 - EXECUTION

3.1 Installation

.1 Set and place all materials and components in place, rigid, plumb and secure.

.2 Provide heavy duty fixture attachments for wall mounted cabinets.

.3 Install all shelving, counter tops and sliding doors.

.4 Use draw bolts in countertop joints.

.5 At junction of plastic laminate counter, back splash and adjacent wall finish, apply small bead of sealant.

.6 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.7 After installation, fit and adjust operating hardware for wood cabinet doors, drawers and shelves.

END OF SECTION

PART I - GENERAL

1.1 INSTRUCTIONS

.1 The General Conditions, Supplementary Conditions and the requirements of Division 1, form part of this Section.

1.2 RELATED WORK

.1	Plumbing Fixtures	Division 15
.2	Rough Carpentry	Section 06100
.3	Finish Hardware	Section 08710

1.3 SAMPLES

.1 Refer to Submittal Section 01300.

.2 Submit two 300 x 300 mm (12" x 12") samples of all materials to the Consultant for approval. The samples shall be identified by the project number, date and the name of the contractor. The samples shall show colours and details of edging, forming and construction. The materials used in the building shall correspond to the approved samples.

1.4 PROTECTION

.1 Refer to Summary of Work Section 01010.

.2 Plastic laminate facing surfaces for door fronts, drawer fronts, edging and countertops shall be covered with heavy kraft paper, or all components so prepared shall be put in cartons for protection during shipment. Protect installed plastic laminate surfaces with heavy kraft paper secured in position with masking tape. Do not remove until final inspection.

.3 Comply with the printed directions issued by the plastic laminate manufacturers.

1.5 WARRANTY

.1 Plastic laminate work shall be warranteed against warpage or delamination for a period of two years from the date of Substantial Preformance of the Work. Work showing defects during this period shall be replaced or made good without delay and at no expense to the Owner.

1.6 MAINTENANCE

.1 Provide Owner with printed instructions for -Care and Maintenance of Plastic Laminate' issued by the manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Plastic laminate - Arborite, Formica, Wilsonart, Pionite, Nevamar or other approved plastic laminate conforming to CAN3-A172-M79. 1.6 mm (.062") thick standard general purpose grade for flatwork and 1.25 mm (.050") thick standard postforming grade or shaped profile sand

bends, finish, suede, and solid and wood grain colour as later selected by the Consultant from the manufacturers standard range of colours. Balancing sheet shall be the same thickness as surface sheet and shall be supplied by the same manufacturer.

.2 Cores-

.1 Particle board core conforming to CAN3-0188.1-M78 Grade H. Surface shall be smooth, dense, and free from loose particles, or defects which will telegraph through the laminate.

.2 Plywood core - fir core, poplar faced, 3, 5, or 7 ply, phenolic bonded plywood conforming to CSA 0121-M1978, graded solid faces. Faces and second ply shall be without voids, or fir plywood conforming to CSA 0121-M1978, graded solid faces, 3, 5, or 7 ply.

.3 Provide waterproof cores in all washrooms, shower areas and other areas where moisture is possible.

.3 Adhesive formulated for use in decorative laminate fabrication and to suit the conditions of the application without failure.

.1 Urea formaldehyde adhesive, conforming to CSA 0112 Series M77.

.2 Neoprene or rubber adhesive, solvent base type, of approved manufacturer.

.3 Resorcinol adhesive, conforming to CSA 0112 Series M77.

.4 Adhesive for countertops where sinks installed to be water resistant.

.4 Sealer - approved water-resistant sealer or glue.

.5 Metal or plastic trim.

.6 Draw bolts - mechanical devices of approved manufacture which can be recessed into the core of decorative laminated panels and used to draw two parts together for permanently tight joints.

.7 Fixing clips - 1.6 mm (16 ga.) steel, galvanized (or prime painted), as detailed.

2.2 FINISH SCHEDULES

.1 Refer to Room Finish Schedule on drawings and the details as provided with respect to the scope of work for plastic laminate on all faces and countertops.

2.3 WORKMANSHIP

.1 All units shall be shop fabricated. Plastic laminate shall be applied to an approved underlayment with a thermosetting adhesive.

.2 Build work plumb, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

2.4 FABRICATION

.1 Obtain the governing dimensions before fabricating items which are to accommodate or abut appliances or equipment.

.2 Veneering of plastic laminate to core material shall be done according to the laminate manufacturer's directions. All veneered work shall be backed with a balancing sheet except where exposed in the finished work, then face veneer to be applied to all exposed surfaces.

.3 Where fabrication is done at the site laminate and core materials shall be stored in the work area

for not less than 48 hours for preconditioning before bonding together.

.4 Form shaped profiles and bends as detailed, using postforming or bending grade according to manufacturer's recommendations. Core and laminate profiles shall coincide to provide continuous support and bond over the entire surface.

.5 Self Edging.

.1 Straight self edging shall be decorative laminate 1.6 mm (.062") thick.

.2 Curved self edging shall be postformed material or bending grade material or bending grade.

.3 Chamfer exposed edges of laminate uniformly, at approximately 15 mm.

.4. Do not mitre the decorative laminate sheet at edges.

.6 Joints

.1 Locate joints where indicated, where not indicated at approximately 2440 or 3660 mm. centres also include joints at corners and changes in superficial area.

.2 Accurately fit decorative laminate together to provide tight, flush, butt joints. Joints in cored panels shall be made with 6 mm (1/4" blind splines and draw bolts, one draw bolt for widths up to 150 mm (6"), two or more draw bolts at maximum 450 mm (18") o.c. for widths exceeding 150 mm (6").

.3 Seal the core at joints with sealer.

2.5 CUTOUTS

.1 Provide cutouts as required for inserts, grilles, appliances, outlet boxes and other fixtures. Radius the internal corners, chamfer the edges and seal the core.

2.5 EXAMINATION OF SURFACES AND CONDITIONS

.1 Refer to Summary of Work Section 01010.

.2 Surface and ambient temperatures shall be minimum of 20°C (70°F) at a relative humidity of between 20 to 80%.

PART 3 - PRODUCTS

3.1 **INSTALLATION - GENERAL**

.1 Install work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around the periphery and where fixed objects pass through or project into decorative laminate work to permit normal movement without restriction.

.3 Secure work by concealed means in an approved manner (or as detailed). Fasteners shall not be more than 600 mm (24") o.c. and 150 mm (6") from edges and ends. Where concealed fastening is not possible use stained trim threaded screws with matching cup washers or other approved means.

.4 Sand or chamfer site cut edges of the laminate free from chips. Radius any internal angles cuts.

Seal core edges.

.5 Isolate decorative laminate panels from direct contact with exterior metal frames.

.6 Upon completion of installation remove identification marks and clean plastic laminate surfaces. Protect as specified in 1.4 above.

.7 At junction of laminated plastic counter backsplash and adjacent wall finishes, apply small bead of sealant.

3.2 TRIM

.1 Decorative laminate trim shall be as detailed. Joints shall be kept to the minimum, with none occurring in lengths under 3000 mm (10 feet). Slightly bevel the laminate edges of joints. Secure trim with adhesive

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED

.1 To apply all membrane waterproofing to all areas as indicated on Drawings.

1.2 INSPECTION AND TESTING

.1 Conform to Inspection and Testing Section 01040.

.2 Testing will include laboratory testing of random samples of materials taken from those delivered to site.

.3 Inspection shall include the following:

.1 Examination of surfaces to receive waterproofing.

.2 Check on methods of application.

.3 Manufacturers representative shall inspect work prior to, periodically during and upon completion and provide written reports to Consultant.

.4 Provide Consultant with timely notice of the schedule for work of this Section.

1.3 QUALIFIED APPLICATORS

.1 Waterproofing shall be applied by a waterproofing specialist of recognized standing having not less than five years of proven experience in this type of Work and who has the necessary equipment and skilled mechanics to carry out the work satisfactorily, and can substantiate this to the entire satisfaction of the Consultant.

1.4 PROTECTION

.1 Comply with Manufacturer's printed recommendations respecting protection.

.2 Provide all protective measures required to prevent injury to waterproofing until work has been approved.

.3 Protect all work performed under separate Sections while the Work of this Section is being effected.

.4 Repair all damage resulting from performance of the Work of this Section, in an approved manner.

1.5 PRODUCT HANDLING

.1 Store materials in weathertight enclosure raised clear of the ground so they are protected from sunlight, weather exposure, moisture and deterioration.

.2 Comply with Manufacturer's printed recommendations for handling of materials. Ensure copy of recommendations is on site during application.

1.6 WARRANTY

.1 Warranty Work of this Section for a period of two years against any defects attributable to faulty or inadequate materials, or faulty or poor workmanship and provide prompt correction in case of failure.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Composite preformed waterproofing member system consisting of a high density, cross laminated polyethylene sheet to which a factory controlled layer of adhesive consistency rubberized asphalt has been applied. Materials as manufactured by W.R. Grace & Co., as listed herein are approved:

- Bituthene 3000 or 3100
- Bituthene P-3000 or P-3100
- Bituthene EM-3000 or
- Approved equal

.2 Liquid Membrane Bituthene LM - 3000.

.3 Protection and Drainage Board shall be *Mira*DRAIN 6000XL, a three dimensional dimpled core and geotextile fabric. *Mira*STICK adhesive or a washer headed concrete nail for securement of protection board. *Mira*DRAIN by mIRAdri moisture Protection Products.

PART 3 – EXECUTION

3.1 APPLICATION

.1 Apply primer Bituthene P-3000 to all areas as indicated on Drawings and allow to dry one hour or until tack free. Prime only areas to be covered by membrane within 24 hours. Re-prime surfaces not covered within 24 hours.

.2 Apply primers at a rate of 6 - 8 m2 per litre (250 to 350 sq ft/gal.

.3 Install Bituthene 3000 membrane in strict accordance with Manufacturer's printed instructions. Membrane shall be installed to all Basement foundation walls continuously from grade (6" below finished Ground Floor) down wall and over footing projection.

.4 Lay membrane without knuckles, fishmouths & avoid stretching the membrane.

.5 Lap all membrane 2-1/2" (63 mm) on the side laps and 6" (150 mm) on all end laps. Stagger end laps.

.6 Seal all membrane penetrations with liquid membrane to ensure complete seal.

.7 Protect all areas of membrane with protection and drainage board. Place protection and drainage board continuously around foundation wall with flat side against the wall and filter fabric toward the soil. Adhere with MiraSTICK adhesive or a washer headed concrete nail and lap joints and apply locking clips.

3.2 INSPECTION

.1 Inspect membrane for punctures, mis-aligned seams and fishmouths, apply additional layer of membrane over affected area, extending minimum of 6" (150 mm) beyond damaged area in all directions.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

.1 All thermal insulation and vapour barrier work throughout the entire Project not specified under other Sections is included in the Work of this Section, to provide a complete thermal and vapour seal within the building.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Masonry	Section 04210
.2 Rough Carpentry	Section 06100
.3 Gypsum Board System	Section 09250 (acoustic insulation)

1.3 REQUIREMENTS OF REGULATING AGENCIES

.1 Where combustible insulation or vapour barrier materials are specified herein, comply with applicable code requirements including supply and installation of approved non-combustible backing and independently supported, non-combustible insulation covering, except where noted specifically as Work of other Sections.

1.4.1 DELIVERY AND STORAGE

.1 Store packaged materials in their original wrappings or containers with manufacturer's labels and seals intact. Store flammable materials outside the building and protect from all weather hazards and open flame. Abide by all fire protection regulations imposed by the authorities having jurisdiction, and take precautionary measures to avoid fire.

.2 Do not store insulation in direct contact with the earth, road surface or floors. Place suitable forms or skids under the insulation upon delivery to protect the insulation from absorbing dampness from the surrounding terrain or floor. Cover material with approved tarpaulins and secure.

.3 In cold weather, provide warm storage for adhesives such that their consistency is suitable for ease of application.

1.5 PROTECTION

.1 Protect surfaces, and in particular the building cladding finish, from being marred or contaminated by the materials.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Fibrous Glass Batts: Glass fibre batts to CSA-AIOI type 1. (3 1/2" Batts = R 14) and (6" Batts = R20).

.2 Wall insulation shall be rigid extruded polystyrene insulation, Dow Channel Mate. Thickness as per Drawings. Location of insulation at outside face of existing and new foundation walls as noted on the drawings at Vestibule 101 and on inside of new foundation wall at Vestibule 101.

.3 Insulation Fastening channel/furring channel shall be Multi-Clinch metal channel #100, installed in accord with manufacturer's direction.

.4 Vapour Barrier:

- 6 mil polyethylene clear vapour barrier sheet for all wood stud partitions exterior walls.
- Air-Bloc 21 by Bakor for all cavity wall installations which may be required at the bearing repairs at Gridlines K-13 and M-16 (See Brick Masonry Units)

.5 Cavity Wall Insulation shall be closed cell polyisocyanurate foam insulation, using HCFC Free blowing agents with tri-laminate foil facers meeting ASTM C1289-95, Type 1, Class 1. Provide 2 1/2" (R18.2), 1220mm x 610mm by Johns Manville or by IKO Industries. Provide cutouts as required for inserts, grilles, appliances, outlet boxes and other fixtures. Radius the internal corners, chamfer the edges and seal the core.

.6 Roof Insulation shall be closed cell polyisocyanurate foam insulation, using HCFC Free blowing agents and integrally laminated to heavy, non-asphaltic, fibre reinforced, felt facers meeting CAN/ULC S704, Type 3, Class 2, CAN/ULC-S126-M and CAN/ULC S107-M. Provide 76.2 mm (3.0 inches); R=18.5, 1220mm x 1220mm (48" x48") E'NRG'Y 3 by Johns Manville, IKOTherm by IKO Industries. Provide cutouts as required for inserts, grilles, appliances, outlet boxes and other fixtures. Radius the internal corners, chamfer the edges and seal the core.

.7 Medium Density Closed Cell Sprayed Applied Polyurethane Foam Insulation for the insulation of at the perimeter truss and joists spaces, concealed cavities and inaccessible spaces with bridging and structural blocking. Closed cell spray foam is a two component zero-ozone depleting HFC blown materials that achieves thicknesses up to 12" and has an air permeability of 0.013 L/s/m2. Materials as supplied by CertainTeed (800) 424-9300, or Polar Foam PF-7300-0 Soya (519) 884-0688, or approved equal. Provide supporting documentation from supplier that the specified materials provide an acceptable vapour barrier to the inside face of the installation..

.8 Adhesives: Only as approved by board supplier; and that can be handled at temperature of 4 deg.C and over, have adequate early and permanent bond and tensile strength for application, and have a service temperature between high and low temperatures to which they will be subjected. (See Section 04210 – Brick Unit Masonry)

.9 Sound insulation shall be Roxul AFB blanket insulation batts in 16" x 48" and 24" x 48" sizes to be installed as per the drawing, as supplied by Roxul Canada Inc.

.10 Air Barriers on exterior walls shall be Bakor VP100, or approved equal. (Note: Air Barrier shall be installed on all new exterior wall surfaces. Air Barrier shall be installed on all existing walls where new aluminum siding is being installed on the funeral home and the house.)

PART 3 – EXECUTION

3.1 PREPARATION

.1 Ensure that surfaces to receive adhesive or insulation are dry, firm, straight, slightly textured for *bond, and* free from loose material, projections, ice, frost. slick, grease, oil or other matter detrimental to bond of the adhesive or uniform bedding of the insulation.

.2 Maintain surface and ambient temperatures constantly between 38 deg.C. and 10 deg.C during application and curing of adhesive except as permitted otherwise by the Consultant in writing.

.3 Report surfaces left unacceptable by other trades to the Consultant.

3.2 INSTALLATION - GENERAL

.1 Install insulation to thicknesses shown on the Drawings.

.2 Install all material. in accordance with manufacturer's printed instructions unless otherwise specified herein.

.3 In construction separating interior from exterior, locate vapour barrier on the warm-in-winter side of the insulation.

.4 Ensure a uniform, continuous thermal and vapour barrier effect. Where insulation and vapour barriers are to be provided under other Sections, coordinate the work such that thermal and vapour barrier continuity is achieved.

3.3 INSTALLATION OF INSULATION

.1 Where sheet vapour barrier is to be installed, lap all joints, ends, etc., 6".

.2 Apply adhesive to the entire surface of the substrate using notched trowels of the type recommended by the adhesive manufacturer.

.3 Where insulation adhesive is to act as a vapour barrier, trowel apply a continuous coating of adhesive at a uniform minimum thickness of 1/8" to the substrate and to all insulation board edges. Extend adhesive 4" minimum at the peripheries of the installation to facilitate sealing of the vapour barriers provided in adjacent construction.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closed Cell Spray Foam Insulation.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

B. Section 06100 – Rough Carpentry

C. Section 07100 - Dampproofing and Waterproofing: Insulation installed with waterproofing systems

D. Section 09250 - Plaster and Gypsum Board: Insulation installed in conjunction with interior wall and ceiling finish systems.

1.3 REFERENCES

A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C 1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

F. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

G. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

H. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

I. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

J. ASTM D 2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

K. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. 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.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.

B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Storage: Store materials in dry locations with adequate ventilation, protected from freezing rain, direct sunlight and excess heat and in such a manner to permit easy access for inspection and handling. Store at temperature between 55 and 80 degrees F (12.7 to 26.6 degrees C).

C. Handling: Handle materials to avoid damage.

1.8 PRE-APPLICATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent

interruption of construction progress.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not apply insulation when substrate temperatures are under 40 degrees F (4.4 degrees C) prior to installation.

C. Surfaces must be dry prior to application of spray foam. Excess humidity may cause poor adhesion, and result in product failure.

D. To avoid overspray, product should not be applied when conditions are windy.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 750 E. Swedesford Rd. P. O. Box 860 ; Valley Forge, PA 19482-0860; Toll Free Tel: 800-233-8990; or equal (Polarfoam)

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SPRAY FOAM INSULATION

A. Insulation: HFC-blown type Closed Cell Foam: CertainTeed CertaSpray Closed Cell Foam is a medium-density, MDI-based polyurethane thermoset rigid foam. When CertaSpray A-side closed cell is mixed with CertaSpray B-side closed cell under pressure in a 1:1 volumetric ratio, they react and expand into a medium-density closed cell foam with an in-place core density of 1.9- 2.2 pcf:

1. Physical and Mechanical Properties:
   a. Core Density: 1.9-2.4 pcf when tested in accordance with ASTM D 1622.
   b. Thermal Resistance (aged): 5.8 less than or equal to 2-1/2 inches / 6.4 when greater than 2-1/2 inches when tested in accordance with ASTM C 518 at 75 degrees F, (h-ft2- degrees F)/Btu.
   c. Thermal Resistance (initial): 6.4 when tested in accordance with ASTM C 518 at 75 degrees F, (h-ft2- degrees F)/Btu.
   d. Closed Cell Content: 88-95 percent when tested in accordance with ASTM D 2842.
   e. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D 1621.
   f. Tensile Strength: 23 psi when tested in accordance with ASTM D 1623.

g. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D 2842.

h. Dimensional Stability: Less than 9 percent by volume when tested in accordance with ASTM D 2126 at 75 degrees F/95 percent RH, 28 Day.

i. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E 96.

j. Air Permeability: 0.013 when tested in accordance with ASTM E 283 at 1 inch thickness, L/s/m2.

k. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.

2. Fire performance

a. Flame Spread: Less than 25 when tested in accordance with ASTM E 84.

b. Smoke: Less than 450 when tested in accordance with ASTM E 84.

3. Thermal Performance (aged): Tested in accordance with ASTM C 518 and/or ASTM C 177 at 75 degrees F (24 degrees C) mean temperature.

a. Thickness 1 inch (25 mm), R-Value 5.8 (h-ft2-degreesF)/Btu (1.0 (m2-degreesC)/W).

b. Thickness 1-12 inches (38 mm), R-Value 8.7 (h-ft2-degreesF)/Btu (1.5 (m2-degreesC)/W).

c. Thickness 2 inches (51 mm), R-Value 11.6 (h-ft2-degreesF)/Btu (2.0 (m2-degreesC)/W).

d. Thickness 2-12 inches (64 mm), R-Value 16.0 (h-ft2-degreesF)/Btu (2.8 (m2-degreesC)/W).

e. Thickness 3 inches (76 mm), R-Value 19.2 (h-ft2-degreesF)/Btu (3.4 (m2-degreesC)/W).

f. Thickness 3-12 inches (89 mm), R-Value 22.4 (h-ft2-degreesF)/Btu (3.9 (m2-degreesC)/W).

g. Thickness 4 inches (102 mm), R-Value 25.6 (h-ft2-degreesF)/Btu (4.5 (m2-degreesC)/W).

h. Thickness 4-12 inches (114 mm), R-Value 28.8 (h-ft2-degreesF)/Btu (5.1 (m2-degreesC)/W).

i. Thickness 5 inches (127 mm), R-Value 32.0 (h-ft2-degreesF)/Btu (5.6 (m2-degreesC)/W).

j. Thickness 5-12 inches (140 mm), R-Value 35.2 (h-ft2-degreesF)/Btu (6.2 (m2-degreesC)/W).

k. Thickness 6 inches (152 mm), R-Value 38.4 (h-ft2-degreesF)/Btu (6.8 (m2-degreesC)/W).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has

been completed to the point where the insulation may correctly be installed.

C. Verify that substrate and cavities are dry and free of any foreign material that will impede application.

D. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Mask and protect adjacent surfaces from overspray or dusting.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions. Product must be installed according to local code, and must be applied by a qualified applicator.

B. Apply insulation by spray method, to uniform monolithic density without voids.

C. Apply to minimum cured thickness as indicated on the Drawings or as scheduled at the end of this Section.

D. Apply to minimum cured thickness of 6 inches.

E. Apply to achieve thermal resistance R-Value of 35.2 – 38.4.

F. Apply insulation to seal voids at truss ends to prevent wind scouring of ceiling insulation.

G. Seal plumbing stacks, electrical wiring and other penetrations into attic to control air leakage.

H. Apply insulation to fill voids around bathtubs to point of accessibility.

I. Apply insulation to fill voids around doors and windows. Apply insulation to fill voids around accessible service and equipment penetrations.

J. Do not install spray foam insulation in areas where it will be in contact with equipment or materials with operating temperatures of 180 degrees F (82 degrees C) or greater.

K. Apply insulation in unvented roof spaces and cathedral ceiling areas.

L. Where building is designed to meet the specific air tightness standards of the Energy Star Program, apply insulation as recommended by manufacturer to provide airtight construction. Apply sealant to joints between structural assemblies as specified in Division 7.

M. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

A. Inspection will include verification of insulation and density.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 SCHEDULES

A. For the following locations, apply the average cured thickness indicated.

1. Thermal insulation around main drain: 6 inches.
2. Unvented roof spaces: 6 inches.
3. Voids in overhangs such as bay windows and cantilevered floors: 6 inches.
4. Exterior above grade wall cavities as shown on drawings: 6 inches.
5. Floor headers: 6 inches.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Granule surfaced glass fibre shingle roofing.

B. Moisture shedding underlayment, eaves, valley and ridge protection.

C. Associated metal flashing.

1.2 RELATED SECTIONS

A. Section 06100 – Rough Carpentry

B. Section 07260 – Vapour Retarders.

C. Section 07200 – Insulation

1.3 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM D 224 - Standard Specification for Smooth-Surfaced Asphalt Roll Roofing (Organic Felt).

C. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

D. ASTM D 3018 - Standard Specification for Class A Shingles Surfaced with Mineral Granules.

E. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).

F. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.

G. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

H. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide manufacturer's printed product information indicating material characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Provide published instructions that indicate preparation required and installation procedures.

1.5 QUALITY ASSURANCE

A. Maintain one copy of manufacturer's application instructions on project site.

B. Verify that manufacturer's label contains reference to specified ASTM standards.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Take special care when applying Ice & Water Shield and shingles when ambient or wind chill temperature is below 45 degrees F (7 degrees C). Tack ice & Water Shield in place if it does not adhere immediately to the deck.

1.7 EXTRA MATERIALS

A. Provide 100 square feet (10 square m) of extra shingles of each colour specified.

1.8 WARRANTY

A. Manufacturer's Warranty: Furnish shingle manufacturer's warranty for product(s) of this section as follows:

ASPHALT FIBER GLASS SHINGLES

1. CertainTeed Hatteras: 40-year limited warranty.

B. Warranty Supplement: Provide manufacturer's supplemental ("CertainTeed SureStart" or "SureStart Plus") warranty to cover labor and materials in the event of a material defect for the following period after completion of application of shingles:

1. First five years.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Base Bid: Provide products manufactured by CertainTeed Corporation, Architectural Support Group, P.O. Box 860, Valley Forge, PA 19482. Tel: (800) 233-8990, Fax: (610) 341-7940.

2.2 ASPHALT FIBER GLASS SHINGLES

A. **Base Bid: CertainTeed 40 Year Landmark Plus**: Conforming to ASTM D 3018. `Type I - Self-Sealing; UL Certification of ASTM D 3462, UL 997 110-mph Wind Resistance, and UL Class A Fire Resistance; heavy-duty glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; four-tab type, algae-resistant; dual self-sealing strips of CertaSeal Plus sealant; designed to resist blow-off in high wind conditions up to 110 mph.

1. Weight: 235 pounds per square (100 square feet) (11.5 kg/sq m).

2. Color: Heatherblend.

2.3 RIGID INSULATION ON NEW ROOF TOWERS

A. Rigid Insulation for sloped roof areas shall be AC Foam Nail Base Insulation in a total thickness of 4" overall, including the 7/16" APA rated OSB on the top side and a fibre reinforced felt facer on the bottom.

2.4 SHEET MATERIALS

A. Eave Protection: Grace Ice & Water Shield: cold applied, self-adhering membrane composed of a high-strength polyethylene film coated on one side with a thick layer of adhesive consisting of rubberized asphalt; provid
e material with warranty equal in duration to that of shingles being applied.

2.5 FLASHING MATERIALS

A. Sheet Flashing: ASTM A 361/A 361M; 26 gage (0.45 mm) steel with minimum G115/Z350 galvanized coating.

B. Bituminous Paint: Acid and alkali resistant type; black colour.

C. Tinner's Paint: Color as selected by Architect to coordinate with shingle colour.

D. Attic Ventilation: 1) Retain existing venting on roof of existing residence and allow for adequate roof and eave venting to satisfy the Ontario Building Code.

2.6 ACCESSORIES

A. Nails: Standard round wire type roofing nails, corrosion resistant; hot dipped zinc coated steel, aluminum, or chromated steel; minimum 3/8 inch (9.5 mm) head diameter; minimum 11 or 12 gage (2.5 mm) shank diameter; shank to be of sufficient length to penetrate through roof sheathing or 3/4 inch (19 mm) into solid wood, plywood, or non-veneer wood decking.

B. Asphalt Roofing Cement: ASTM D 4586, Type I or II.

2.6 FLASHING FABRICATION

A. Form flashing to profiles indicated on Drawings, and to protect roofing materials from physical damage and shed water.

B. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

C. Form gutters and downpipes as drawn.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions which may affect the work.

B. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

C. Verify roof openings are correctly framed prior to installing work of this section.

D. Verify deck surfaces are dry and free of ridges, warps, or voids.

3.2 ROOF DECK PREPARATION

A. Follow shingle manufacturer's recommendations for acceptable roof deck materials.

B. Broom clean deck surfaces under eave protection and underlayment prior to their application.

3.3 INSTALLATION – WATER & ICE SHIELD

A. Ice & Water Shield must be placed directly on plywood structural deck. Remove any dust, dirt, loose nails or other protrusions from the deck.

B. Apply Grace Ice & Water Shield only in fair weather at temperatures of 5 degrees C or higher. Surfacing material must also be placed at temperatures of 5 degrees C or higher.

C. Cut the membrane into 10 to 15 foot lengths and reroll. Peel back 1 to 2 feet of release paper, align the membrane on the lower edge of the roof and place the first 1 to 2 feet. Pull the release paper under the membrane and continue to peel it from the membrane. Press membrane in place. Roll lower edges firmly with a wallpaper or other hand roller.

D. Extend Ice & Water Shield a minimum 24 inches (610 mm) up slope beyond interior face of exterior wall. Side laps must be a minimum of 3½" inches and end laps 6". Do not fold membrane onto an exposed face of the roof edge.

E. For valley and ridge application, center the sheet over the valley or ridge, drape and press it into place, working from the center of the valley or ridge outward in each direction.

F. Replace existing damaged Ice and Watershield on chapel roof as required in conjunction with work undertaken to renew existing plywood substrate.

G. Note: Ice and watershield membrane shall extend to a line 2'-0" above the projected vertical junction of the outside existing masonry wall and the sloped roof plane.

3.4 INSTALLATION - PROTECTIVE UNDERLAYMENT

A. Roof Slope 4:12 or Greater: Install one layer asphalt felt shingle underlayment perpendicular to slope of roof and lap minimum 4 inches (100 mm) over eave protection.

B. Weather-lap and seal watertight with asphalt roofing cement items projecting through or mounted on roof.

3.5 INSTALLATION - METAL FLASHING

A. Weather-lap joints minimum 2 inches (50 mm).

B. Seal work projecting through or mounted on roofing with asphalt roofing cement and make weather-tight.

3.6 INSTALLATION - ASPHALT SHINGLES

A. Install shingles in accordance with manufacturer's instructions for product type and application specified.

3.7 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01200.

B. Visual inspection of the Work will be provided by Architect.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished work.

B. Do not permit traffic over finished roof surface.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tongue & Groove paneling and siding.

B. Channel Lap Siding.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry

1.3 REFERENCES

A. Western Red Cedar Lumber Association "Designer's Handbook"

B. Western Red Cedar Lumber Association "Specifying Western Red Cedar Siding".

C. Western Red Cedar Lumber Association "Installing Cedar Siding".

D. Western Red Cedar Lumber Association "Guide to Finishing Western Red Cedar".

E. NLGA - National Lumber Grades Authority "Grading Standards".

F. WCLIB - West Coast Lumber Inspection Bureau "Grading Standards".

G. WWPA - Western Wood Products Association "Grading Rules".

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Clear Cedar Channel Lap Side and Cedar T&G Siding (1" x 6" nominal size): Western Red Cedar Lumber Association'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.

C. Selection Samples: For each finished product specified, two complete sets of color chips representing manufacturer's full range of available materials and finished appearance.

D. Verification Samples: For each finish product specified, three samples, nominal size 5 1/2 inches (140 mm) square representing actual product with finished color and texture.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a member of the Western Red Cedar Lumber Association capable of providing all Western Red Cedar siding materials specified in this section.

B. Installer Qualification:

1. Installer shall have five (5) years experience installing cedar trim on the type and size of project specified by this section.

2. Installer shall be licensed, registered or otherwise approved by the local jurisdiction to install Cedar Siding.

C. Installation: Products shall be installed according to Western Red Cedar Lumber Association installation guidelines and adhere to local building code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inspect the materials upon delivery to assure that specified products have been received.

B. Store materials in safe area, away from construction traffic; store under cover and off ground, protected from moisture.

C. Keep materials clearly separated and identified with grade marks legible. Keep damaged material identified as damaged and stored separately.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 SUPPLEMENTAL MATERIALS

A. Fasteners, supports, and hangers shall be provided by manufacturers other than member organizations of the WRCLA, and conform to the requirements set forth by this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Western Red Cedar Lumber Association, which is located at: 1501 - 700 W. Pender St. Pender Place 1, Business Bldg. ; Vancouver, BC, Canada V6C 1G8; Toll Free Tel: 866-778-9096; Tel: 604-684-0266; Fax: 604-687-4930; Email: request info; Web: www.wrcla.org

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

C. Substitutions: Not permitted.

2.2 TONGUE-AND-GROOVE SIDING

A. Clear Cedar Tongue-and-Groove Siding: V-Joint 1" x 6", Western Red Cedar graded to meet NLGA "Grading Standards," paragraph 200.

1. Grade: Clear Heart.
2. Grade: A Clear and Better.
3. Pattern: V-grooved one sides (EV1S)WRCLA1.
4. Texture: Smooth faced
5. Moisture Content: Kiln Dried

2.3 CHANNEL LAP SIDING

A. Clear Cedar Channel Lap Siding: 1" x 6" Western Red Cedar graded to meet NLGA "Grading Standards," paragraph 200, and WCLIB "Grading Standards," paragraph 102.
   1. Grade: Clear Heart.
   2. Grade: A Clear and Better.
   3. Texture: Smooth faced.
   4. Moisture Content: Kiln-dried.

2.4 FASTENERS

A. Nails:
   1. Material: Hot-dipped galvanized per ASTM 153.
   2. Length: Must be sufficient to penetrate solid wood a minimum of 1 1/4"

2.5 PROTECTING FINISH

A. Water repellant, fungus and mildew resistant penetrating stain that is resistant to Ultra Violet (UV) light. See Section 09900 – Painting for finishing.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate work with related trades; scribe and cope siding boards for accurate fit. Allow installation of related work to avoid cutting and patching.

B. Select siding boards of longest possible lengths. Discard boards that are warped, twisted, bowed, crooked or otherwise defective.

3.2 INSTALLATION

A. Follow installation instructions specified in the Western Red Cedar Lumber Association's Installing Cedar Siding publication and DVD.

B. Installation must comply with local building codes and regulations.

C. Finish materials on all sides and ends. Apply touch up coating on new cuts.

3.3 ADJUSTING AND CLEANING

A. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris related to this work.

3.4 MAINTENANCE

A. Explain proper maintenance procedures to owner or owner's representative at project closeout.

B. Visually inspect siding, caulking, flashing annually for overall condition. Re-apply caulking

and coating as necessary. Adjust flashing as required.

C. The use of pressure washers is not recommended.

END OF SECTION

PART I – GENERAL

1.2 SUMMARY

1. This section includes for 8" horizontal aluminum siding, complete with backer board and associated wood products.

1.3 SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Samples of full color range for each required unit type.

1.4 WORK BY OTHERS

1. Air Barrier installation by others on existing and new plywood areas to receive new aluminum siding.
2. Replacement or repairs to plywood substrate on exterior faces of all walls receiving new aluminum siding.
3. Caulking by others.

1 .5 QUALITY ASSURANCE

1. Field Measurements: Take field measurements to assure that base course on full aluminum wall siding aligns to edge of cedar wood siding along west and north faces of the garage.
2. Undertake work in strict compliance with the manufacturer's "Aluminum Siding Installation Guide", as may be found on the Gentek website (www.Gentek.ca).

PART 2 – PRODUCTS

1. 8" Prefinished Horizontal Clapboard Aluminum Siding as manufactured by Gentek Building Products Limited, or equal. Installer to provide samples of standard colours. Colour to later selection by Consultant.
2. 1/ 4" exterior grade fir plywood to be used in 9" widths as a starter flashing.
3. Provide all asphalt impregnated fibre board backing boards as required for all siding materials.
4. 2" aluminum siding nails and other nails as required for backing aluminum.
5. Provide all required accessories to include but not be limited to drip flashings, J moulds, corner caps, inside wall flashing caps, special sections, etc. as are required to complete the work.

PART 3 – EXECUTION

3.1 EXAMINATION

1. Review the site condition of the existing and new wall areas to confirm that the new Air Barrier has been applied and ties into the base flashing provided by this contractor.

3.2 INSTALLATION

1. Undertake the work with materials and installation methods consistent with the manufacturer's "Aluminum Siding Installation Guide", as may be found on the Gentek website (www.Gentek.ca).

3.3 ADJUSTMENT AND CLEANING

1. Clean surfaces upon completion of work

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDES

.1 Substrate Preparation

.2 Vapour Retardant

.3 Roof Insulation

.4 Built-up Roofing with Base Flashing

.5 Rubberized SEBS Top Pour

.6 Aggregate Surfacing

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1	Cast-In-Place Concrete	Section 03300
.2	Steel Deck	Section 05311
.3	Rough Carpentry (Cants, Wood Blocking, etc.)	Section 06100
.4	Air Barriers (tie-ins to vertical wall)	Section 07200
.5	Flashing and Sheet Metal (counter flashings)	Section 07600
.6	Plumbing (Supply of Roof Drains)	Section 15000

1.3 PERFORMANCE REQUIREMENTS

.1 General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure during the Installers specified warranty.

.2 Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

.3 Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations of the membrane manufacturer.

.4 FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that

are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings. Roof assembly to meet the provisions of FMG's Fire/Windstorm Classification: FM 1A-90.

1.4 SUBMITTALS

.1 Provide written verification from roofing membrane manufacturer that all major roofing components are acceptable, and that the roofing system meets or exceeds regulatory agency requirements as specified.

.2 Shop Drawings: For roofing system. Include plans elevations, sections, details in compliance with performance requirements, and attachments to other Work.

.3 Manufacturer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

.4 Installer Certificates: Signed by roofing contractor certifying that roofing system complies with requirements specified in "Performance Requirements" Article for two years.

.5 Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system when required by the Owners representative.

.6 Inspection Report: Manufacturer's representative to provide documentation, [twice a week] [insert # of days per week] acknowledging acceptance of installations. Forwarded to design authority copies of roofing system manufacturer's inspection reports.

1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications: A qualified manufacturer that has UL listing and FMG approval for roofing system identical to that used for this Project.

.2 Work shall be performed by skilled, experienced personnel in strict accordance with manufacturer's instructions meeting the requirements of Manufacturer.

.3 All materials relevant to the performance of the system shall be acceptable and/or supplied by the manufacturer. (i.e. Primer, Flashing Sheet, Termination Bar, etc.)

.4 Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips, wood nailing strips, and reglets are in place.

.5 The applicator shall have a trained representative on site at all times who is responsible for on site operations.

.6 Maintain at all times the appropriate 9 kg dry chemical fire extinguisher fully charged and in operable condition at all locations where open flames are in use.

1.6 PRE-INSTALLATION CONFERENCE

.1 Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Comply with requirements for pre-installation conferences in Division 1 Section "Project Management and Coordination." Review and document methods and

procedures related to roof deck construction and roofing system including, but not limited to, the following:

1 Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

.2 Review methods and procedures related to roofing installation, including manufacturer's written instructions.

.3 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

.4 Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

.5 Review structural loading limitations of roof deck during and after roofing.

.6 Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

.7 Review governing regulations and requirements for insurance and certificates if applicable.

.8 Review temporary protection requirements for roofing system during and after installation.

.9 Review roof observation and repair procedures after roofing installation.

1.7 PRODUCT DELIVERY, STORAGE and HANDLING

.1 Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

.2 Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

.3 Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

.4 Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements. Stop work when temperature or when wind chill effect would tend to set adhesives before application and adhesion of membranes could take place.

.2 Ensure substrate is dry and frost free.

.3 Use only dry materials and apply only during weather that will not introduce moisture into the roof system.

1.9 WARRANTY

.1 Applicator to provide a Canadian Roofing Contractors' Association standard TWO (2) year recognized material and workmanship warranty, commencing from date of Substantial Performance, covering the making good of defects in workmanship in the roofing and flashing installations.

Part 2 – PRODUCTS

2.1 SHEATHING SUBSTRATE FOR STEEL DECKS:

.1 Gypsum: Georgia-Pacific Gypsum Corp., ½"(13mm) Dens-Deck Gold, 4'x8' (1200mm x 2400mm) sheets to CSA A82.27-91 over steel deck. Fasten insulation and densdeck gold boards to metal roof deck with Fas-n-Free fasteners to pass wind uplift requirement of 0-90 psf.

.2 Gypsum Adhesive: Single component, bitumen modified polyurethane adhesive, solvent free, meeting ULC and tested by Factory Mutual. Fas-n-free by Tremco Canada.

.3 Gypsum Fasteners: Provide flat-head, countersunk, self tapping screws, size, type and length in accordance with FMG requirements, corrosion-resistance provisions in FM 4470 with locking plastic plates or metal plates to CSA B35.3-1962 Tested by gypsum board manufacturer for required pullout strength.

2.1 VAPOUR RETARDENT

.1 Kraft reinforced laminated sheet, ULC listed, meeting the requirements of ASTM E96.

.2 Primer: Water based single component asphaltic primer. Tremprime WB by Tremco Canada.

.3 Adhesive: Single component, bitumen modified polyurethane adhesive, solvent free, meeting ULC and tested by Factory Mutual. Fas-n-free by Tremco Canada.

2.3 BITUMINOUS MATERIALS

.1 Roofing Asphalt: Oxidized roofing asphalt conforming to CSA A123.4-M1979 Type II.

.2 Rubberized Asphalt: SEBS polymer modified rubberized asphalt, [THERM 50] [THERM 100] by Tremco Canada.

.3 Plastic Cement: Asphaltic synthetic rubber, Polyroof by Tremco Canada.

.4 Primer: Asphalt cutback primer, conforming to CGSB 37-GP-9M. TremPrime QD by Tremco Canada.

2.4 INSULATION

.1 Roof Insulation: Closed cell polyisocyanurate foam insulation using HCFC Free blowing agents and integrally laminated to heavy, non-asphaltic, fibre reinforced, felt facers meeting CAN/ULC S704, Type 3, Class 2, CAN/ULC-S126-M and CAN/ULC S107-M. Provide 76.2mm (3.0 inches); R 18.5, 1220mm x 1220mm (48" x 48"). E'NRG'Y 3 by Johns Manville, IKOTherm by IKO Industries, ACFoam III by Atlas.

.2 Insulation Overlay: 13 mm (½ inch) asphalt impregnated fiberboard conforming to CAN/CSA-A247-M86, Type 1; asphalt-coated top and bottom, R-value 1.2/inch, ship lapped edges.

.3 Sloped Overlay at Roof Edges: 4'-0" wide asphalt impregnated fibreboards sloped from 1" to 0" conforming to CAN/CSA-A247-M86, Type 1; asphalt-coated top and bottom, R-value 1.2/inch, as supplied by PosiSlope, or equal.

.4 Insulation Fasteners for Metal Deck: Provide flat-head, countersunk, self tapping screws (size, type and length in accordance with FMG requirements, corrosion-resistance provisions in FM 4470 with locking plastic plates or metal plates to CSA B35.3-1962 Designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength.

.5 Insulation Fasteners for Wood Deck shall be as recommended by the insulation manufacturer for this application.

2.5 ROOF MEMBRANE

.1 Glass Fiber Felts: Conforming to CGSB 37-GP-64M and ASTM D2178 glass felts, Type IV.

2.6 ELASTOMERIC FLASHINGS (BASE BID)

.1 Reinforced EPDM/SBR Elastomeric Sheeting: TRA by Tremco Canada

.2 Elastomeric Bedding Adhesive: Cold-applied, one part rubberized based, bedding adhesive; Sheeting Bond AF Tremco Canada

2.7 MODIFIED BITUMEN FLASHINGS (Alternative)

.1 Modified Bitumen Base Sheet: Conforming to CAN/CGSB 37-GP-56M, 180g non-woven polyester. Thermofusible poly upper surface, to receive a torched on granular cap sheet; sanded lower surface for mopping with modified, rubberized asphalt.

.2 Modified Bitumen Cap Sheet: Modified bitumen conforming to CAN/CGSB 37-GP-56M, 250g non-woven polyester. Granular top surface, thermofusible poly bottom surface for torching application.

2.8 METAL FLASHINGS & SHEET METAL

.1 Provide all materials, fabrication and installation as described in Section 07620 Flashing and Sheet Metal, including but not limited to cap flashings, counter flashings, curb flashings, scuppers, copings, etc.

.2 Fasteners shall be supplied in accordance with the manufacturer's standard to meet the loading requirements and to maintain a weather tight installation. All exposed fasteners shall match the panel colour.

.3 Provide flashings for roof vents and curbs related to all mechanical equipment. (See Mechanical 16000.)

.4 Provide flashings for wood roof screen surrounding Mechanical equipment, as required.

2.9 ACCESSORIES

.1 Aggregate: Round river stone: 19 mm (3/4 inch) diameter free of fines and long splinters.

.2 Wood cant strips shall be 5 1/ 2" x 5 1/ 2" as carried in Rough Carpentry – Section 06100.

.3 Stack Flashings: Prefabricated aluminum sleeves as manufactured by Thaler Metal Industries or equivalent.

.4 Drains: Prefabricated drains as manufactured by Thaler Metal Industries, or equivalent.

.5 Perimeter Fasteners: 25mm (1 inch) square or round head, ring shanked galvanized or non-ferrous type, length as required to suit application.

.6 Securment Bar: Continuous 3mm x 25mm (1/8 inch x 1 inch) aluminum bar, predrilled for mechanical attachment.

.7 Sealant: Single component TX1 Roofing sealant by Sonneborn or approved equivalent.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Inspect existing conditions to ensure they are suitable for roofing work to begin. Do not proceed until unacceptable conditions are corrected. Ensure surfaces to receive roofing are clean and dry.

.2 Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.

.3 Install built-up roofing membrane system according to roofing system manufacturer's written instructions.

.4 Fill and pack all joints, cracks, seams, and openings in the deck and its appurtenances to prevent air leakage from the building interior.

.5 Coordinate installing roofing system components so insulation and roofing membrane sheets are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

.6 Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.

.7 Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.

3.2 SUBSTRATE PREPARATION:

.1 Ensure membrane substrate is rigid, dry, smooth, compatible, free of fins and sharp edges, and clean of all debris and foreign matter.

.2 Ensure all openings, walls, and projections through the roof are firmly affixed and cant strips, reglets and nailing strips are in place.

.3 Applicator shall notify design authority and General Contractor in writing of unsuitable surfaces and working conditions. Commencement of work shall imply acceptance of surfaces and working conditions.

3.3 PROTECTION

.1 Protect adjacent work, building and property from damage during roofing operations.

.2 Hang tarpaulins to protect walls where hoisting is necessary. Locate kettles so that smoke will not discolour building or adjacent buildings or enter air intakes. Keep masonry and finished surfaces clean and free bitumen.

.3 Use wood planks or minimum 10 mm (3/8") thick plywood sheathing in work areas and along work routes as required to prevent damage to steel deck, or sheathing and roofing.

.4 Keep two foam or dry type fire extinguishers on the roof within easy while roofing is in progress.

3.4 PRIMER APPLICATION

.1 Do priming of surfaces at the rate of 100-400 ft2./gal.(2-8 m2/L except where specified.

.2 Prime wood, concrete, and metal surfaces to be directly adhered with bituminous membranes; allow to dry.

3.5 METAL DECK-SHEATHING (Mechanically Attached)

.1 Mechanically attach gypsum board to the metal deck with screws and plates using one (1) fastener per 3.2 square feet.

.2 Stagger boards at least 300 mm (12 inches).

.3 Drive fasteners flush to top surface.

.4 Install boards with long axis perpendicular to ribs, with end joints fully supported.

.5 Firmly butt each board to surrounding boards. Do not jam or deform boards.

.6 Cut and fit boards where roof deck intersects vertical surfaces.

.7 Filler boards shall be minimum 450 mm (18 inches) each direction and secured with a minimum two (2) fasteners per board.

3.6 VAPOUR RETARDENT

.1 Before laying any insulation, inspect existing vapour barrier and repair damage, if any. Surface shall be free of wrinkles, air pockets, fishmouths and remain fully bonded to substrate.

.2 Adhere vapour retarder with cold insulation adhesive applied in uniform beads using an adhesive dispenser at the minimum coverage rate of 0.32 litre per sq. metres (0.66 gallons per 100 sq. ft.). Lap side 100 mm (4 inches) and lap ends 150 mm (6 inches).

.3 Firmly embed kraft laminated barrier into the adhesive providing 100 mm (4 inches) side laps and 150 mm (6 inches) end laps both sealed using adhesive.

.4 Loose lay kraft laminated barrier over deck providing 50 mm (2 inches) side laps and 150 mm (6 inches) end laps. Adhere all edge and end laps.

.5 Extend vapour retardant under cant strips and blocking.

3.7 INSULATION:

.1 Before laying any insulation, inspect vapour retardant and repair damage, if any. Surface shall be free of wrinkles, air pockets, or fishmouths.

.2 Mechanically fasten first layer of insulation to deck in accordance to manufacturer's requirements. Minimize elevation variation between boards at joints to provide level surface to accommodate subsequent roofing. Stagger joints at least 150mm (6 inches).

.3 Apply to substrate or insulation board 13 – 19 mm (1/2 inch – 1/4 inch) diameter beads, using a variable applicator. Coverage rates subject to insulation and substrate type in accordance to manufacturer's published literature for correct adhesion rates.

.4 Cover entire area of roof insulation with insulation overlay in cold applied Insulation Adhesive at a rate of 0.41 litres per sq. metre (1.0 gallons per 100 sq. ft.). Immediately after placement, walk insulation boards into adhesive to achieve solid contact. Stagger joints from base insulation. Install each board in a full mopping of hot asphalt.

.5 Lay no more roof insulation and fiberboard than can be covered on same day with roofing membrane. At conclusion of day's work, seal exposed edges. Upon resumption of work, cut and remove sealed edges, square, neat and straight.

.6 Reduce thickness of insulation at drains by 12 mm (½") for 1200 mm (4 feet) square centered on each drain to ensure free flow to drain.

3.8 CANT STRIPS

.1 Install cants at all intersections of roofing and vertical surfaces.

.2 Embed in a continuous bed of cold adhesive applied to roof insulation.

.3 Lay true to line, level and with flush, butt joints and accurate mitered corners.

3.9 ROOFING MEMBRANE INSTALLATION

.1 Install plies running perpendicular to the insulation joints.

.2 Align ply felts without stretching.

.3 Overlap starter strips 660mm (26 inches) with first ply, then overlap each succeeding ply 625 mm (24 2/3 inches). Place ply sheets to ensure water will flow over or parallel to; but never against exposed edges.

.4 Shingle in direction to shed water. Extend ply felts over and terminate beyond cants and cut evenly.

.5 Embed four plies glass-ply felt into a continuous application of rubberized asphalt at 25 lbs./100 sq.ft. (1.2 kg./m2).

.6 Do not step or walk on felts during or immediately after application until bitumen has set.

.7 Ensure minimum 6mm (1/4 inch) bitumen over flow is visible at all edge and end laps.

.8 Install each felt so that it shall be firmly and uniformly set, without voids, into hot asphalt. Thoroughly and effectively broom or roll each membrane application to ensure full adhesion.

.9 Install two plies of roofing felt and bitumen glaze coat for cutoff at end of day's operation. Remove cutoff before resuming roofing.

.10 Terminate all felt layers to outer edge of roof perimeters and top of parapets.

3.10 ELASTOMERIC FLASHINGS

.1 Wall Flashings:

.1 The exposed joint between the wall and deck shall be sealed securely to provide a complete air seal.

.2 Adhere flashing completely to flashing surface, cant and roofing with flashing adhesive.

.3 Ensure complete bond and continuity without wrinkles or voids. Lap flashing ends 100 mm (4 inches) and adhere with flashing adhesive.

.4 Flashing sheets shall be of sufficient length to extend at least 150 mm (6 inches) beyond toe of cant onto roof surface.

.5 Secure the top of the flashings to the vertical plane with termination bar. Mechanically fasten 300 mm (12 inches) O.C.

.6 Tie-in leading edge of flashing with stripping ply membrane embedded between alternative courses of stripping ply adhesive.

.7 Overcoat lap edges with stripping ply adhesive and membrane.

.2 Canted Eave:

.1 Extend reinforced elastomeric over cant and fascia and mechanically fasten strip with 38 mm (1.5 inch) common roofing nails, 200 mm (8 inches) on centre.

.2 Extend reinforced elastomeric sheeting down over cant strip and embed in flashing adhesive.

.3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm (4 inches), and adhere with flashing adhesive.

.4 Elastomeric sheeting width to sufficient length to extend at least 150 mm (6 inches) beyond toe of cant onto roof.

.5 Tie-in leading edge of sheeting with stripping ply membrane embedded between alternative courses of stripping ply adhesive.

.6 Overcoat lap edges with stripping ply adhesive and membrane.

.3 Expansion Joint(s):

.1 Fill joint with loose insulation.

.2 Install 13 mm (1/2 inch) plywood to the top of the blocking, securing on one side only.

.3 Apply foam rubber or 25 mm (1 inch) minimum thickness fiberglass insulation to the top of the plywood.

.4 Install elastomeric sheeting centered over expansion joint.

.5 Adhere sheeting completely to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.

.6 Sheeting width of sufficient length to extend onto adjacent roofing minimum 150 mm (6 inches).

.7 Lap sheeting ends 100 mm (4 inches), and adhere with flashing adhesive.

.8 Tie in leading edge of sheeting with stripping ply membrane embedded between alternative courses of stripping ply adhesive.

.9 Overcoat lap edges with stripping ply adhesive and membrane.

3.11 MODIFIED BITUMEN FLASHINGS (Alternative)

.1 Pre-cut base and cap flashings to correct length to extend onto roof, up vertical surface and over any fascia minimum 50 mm (2 inches)it pieces to be certain they are of proper size.

.2 Sheet flashings shall be laid in strips one metre wide vertical surfaces, extending on to flat surfaces of roof minimum of 100 mm (6 inches). Side laps shall be 75 mm and shall be staggered minimum of 100 mm with laps of cap sheet.

.3 Mop apply flashing base sheet. Apply rubberized asphalt, resulting in uniform adhesion over entire surface. Press in firmly for proper adhesion. Continue by bonding upper portion to wall, taking precautions not to stretch membrane. Lap all flashing strips 75 mm (3 inches) seal laps securely.

.4 Completely cover base sheet with torch applied cap sheet lapping all edges to selvage. Stagger joints in cap and base sheet. Anchor, with tin capped nails or roofing nails and disks, placed at top flashing and driven into wood blocking.

.5 Install two ply modified bitumen flashings at all joints in accordance with membrane manufacture's recommendations and make watertight connection to roof membrane.

3.12 AGGREGATE SURFACING

.1 Surfacing Application: Prior to application of flood coat, contractor shall inspect roof with manufacturer's technical representative and repair any deficiencies.

.2 Over entire roof surface apply uniform and continuous flood coat of surfacing adhesive at a rate of 2-2.4 litres/sq.metre (4-5 gals. per 100 sq.ft.).

.3 Immediately broadcast minimum 20 kg. per sq. metre (400 lbs per 100 sq.ft.) of new, clean roofing gravel. Cover flood coat material completely.

3.13 FIELD QUALITY CONTROL

.1 Manufacturer's Technical Representative: Contractor will engage a qualified manufacturer's technical representative daily to perform roof tests and inspections and to prepare test reports.

3.14 CLEAN-UP

.1 Immediately upon job completion, roof membrane and flashing surfaces shall be cleaned of debris.

.2 Clean surrounding walls, units and other surfaces of all asphalt splashes, caulking or other material.

.3 Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.

.4 Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

.5 Clean all drains gutters and downspouts of debris and ensure they drain freely.

.6 Clean adjacent roof levels and ground level areas of all construction debris and excess material.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Brick Unit Masonry	Section 04211
.2	Rough Carpentry	Section 06100
.3	Built-Up Bituminous Roofing and Waterproofing	Section 07510
.4	Aluminum Windows	Section 08500

1.2 QUALITY ASSURANCE

.1 Work of this Section shall be executed by same trade specialists performing Work under Section 07510 in accordance with practices and details of SMACNA Architectural Manual - 1972 (Sheet Metal and Air Conditioning Contractors National Association Inc.)

1.3 SUBMITTALS

.1 Submit typical 12" (300 mm) long sample of flashing indicating design method of locking and method of anchoring and corner section fabricated from materials specified.

1.4 WARRANTY

.1 Contractor hereby Warrants that Work performed under this Section shall remain free against leakage, joint spelling and similar defects in accordance with General Conditions, but for a period of five years.

1.5 INSPECTION AND TESTING

.1 Inspection and testing of this Work is included in inspection and testing of roofing and roof insulation.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Metal Flashing: Minimum 26 ga. (.0759 mm) prefinished sheet steel supplied in flat sheet stock. Colour selection to be taken from Dofasco Perspectra Series with base steel substrate with a galvalume finish. Colour to later selection by Architect.

.2 Nails: Metal Flashing: Chromium/Nickel, No.12 x 1" (25 mm) flat headed, annular threaded stainless steel.

.3 Cleats, Starter Strips and Back-up Plates:

.1 Metal Flashing: Same metal and thickness as metal flashing; cleats minimum 1-1/2" (38 mm) wide and interlocked with metal flashing; starter strips, continuous. Back-up

plates minimum 12" (304 mm) wide where adjacent lengths of cap flashing meet, fabricated of same material thickness and finish as cap flashing.

.4 Screws, Dolts and Expansion Shields: Non-ferrous metal compatible with adjacent surfaces. Exposed fastenings; same materials as metal surfaces through which they penetrate. Use cadmium plated screws with round heads suitable for soldering for galvanized Work.

.5 Solder: ASTM B32-70, 50% block tin and 50% pig lead.

.6 Flux: Commercial hydrochloric acid cut with zinc, or 10%-20% solution of orthophosphoric acid in water, for use with galvanized Work.

.7 Sealant: One component polysulphide sealant, CAN2-19-13-M82.

.8 Flashing Paint: CGSB I-GP-108c; Baker "Primer 910-02" or "Ace-of-Spades" quick drying asphaltic base paint.

PART 3 – EXECUTION

3.1 FABRICATION

.1 Where possible, shop fabricate flashing components in accordance with applicable requirements of SMACNA Architectural Manual-1972.

.2 Carry out fabrication in clean shops, located away from areas where carbon steel is torch cut, ground, or cut with abrasive wheels to ensure that carbon steel dust will not be embedded in prefinished surfaces. Clean tools and dies which have been used on carbon steel prior to fabrication to prevent contamination of surface with carbon steel dust.

.3 Form sheet metal on bending brake. Perform shaping, trimming and hand seaming on bench, where practicable, using proper sheet metal working tools.

.4 Form sections square, true and accurate to size. Flashings shall be free from distortion, waves, twists, buckles or other defects detrimental to appearance and performance.

.5 Make allowances for thermal movement when forming, installing, interlocking and soldering sheet metal Work to avoid buckling, fullness of metal Straining of joints or seams. Maximum length of flashing pieces; 8'-0" (2400 mm). Double back exposed edges at least 1/2" (12 mm) for appearance and stiffness.

.6 Fabricate flashings, copings, closures, plastic boxes, pipe sleeves and flashings for roof mounted equipment to details shown, unless otherwise indicated.

.7 Wipe and wash clean, soldered joints immediately after joint is soldered to remove acid.

.8 Where soldered joints are absolutely necessary and where approved for use in prepainted metal, clean paint off both surfaces before soldering for minimum area necessary.

.9 Expansion joints are to be located midway between all downspouts.

3.2 INSTALLATION

.1 Carry out Work in accordance with industry standard sheet metal practice with joints lapped, locked, cleated with "S" cleats & caulked or soldered as required. Hem exposed edges 1/2" (12 mm). Type of joints used shall be adequate for various conditions, subject to approval.

.2 Fabricate exposed fastening, where used, in such a manner as to prevent water penetration at point of fastening.

.3 Provide starter strips where indicated or required to present true, non-waving, leading edge. Anchor to back-up to provide rigid, secure installation.

.4 Make end joints where adjacent lengths of metal flashing meet using 12" (304 mm) long back-up flashing secured in place before installing flashing. Apply beads of caulking compound on face of back-up plate to seal ends of metal flashing. Leave 1/2"(12mm) wide space between end of adjacent lengths of metal flashings. Fabricate back-up of same material and finish as metal flashing with which it is being used. Make back-up plate exact profile of flashing allowing for thickness of flashing joints.

.5 Form metal fascia with inner edge extended over fascia top and down cant to meet roofing aggregate. Nail with roofing nails and neoprene washers at 12" (305 mm) o.c. Avoid placing nails in face of fascia, through membrane or flashing.

.6 Interlock counter flashing pieces with prepainted metal base flashing and fold locking seam into position ensuring complete sealing. Continue counter flashing down to hemmed and sprung position at base of cant and junction of aggregate.

.7 Provide underlay of resin sized paper under sheet metal installed over masonry, concrete or wood. Lay underlay dry as sheet metal Work is installed. Secure in place and lap joints 4" (100 mm).

.8 Imperfections in sheet metal Work such as holes, dents, creases, or oil-canning is cause for rejection.

.9 Repair damaged sheet metal Work, wash entire installation down, and leave in neat condition.

.10 Provide all flashings required for proper execution and completion of the Work in acceptable manner including metal flashing around mechanical and other equipment occurring on roof.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK

.1	Brick Unit Masonry	Section 04210
.2	Glass Masonry Units	Section 04270
.3	Built-up Bituminous Roofing and Waterproofing	Section 07510
.4	Flashing and Sheet Metal	Section 07610
.5	Aluminum Entrances	Section 08405
.6	Aluminum Windows	Section 08520
.7	Tile	Section 09310

1.2 APPROVED MANUFACTURERS

.1 The products of the following manufacturers are approved for use subject to meeting the specifications for the particular type of sealants listed below. However, this is not an approval to substitute another type of sealant for those specified unless the material manufacturer requests change in his product in writing to the Consultant.

.1 Tremco Ltd., or approved equal.

.2 Material manufacturers must be willing to review Shop Drawings and drawing details, visit the site to review sealant installation and provide written reports to the Consultant.

1.3 SUBMITTALS

.1 Submit samples of each sealant to 01300.

.2 Provide colour cards for Consultants selection.

.3 Submit written adhesion and compatibility approval from the sealant manufacturer for all materials to be sealed.

1.4 WARRANTY

.1 Extend warranty to ten years in writing.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Sealant for interior and exterior locations - one-part primerless, tremco "Dymonic".

.2 Sealant for interior locations where conditions of high humidity exist such as washrooms – one part silicone conforming to CGSB 19-GP.22M Tremco "Tremsil 600".

.3 Sealant for fire-stopping shall be tremco "Fyre-Sil SL", installed in accord with ULC #SP173.

.4 Colours for sealants and caulking when exposed in the finished work -Selection by the Consultant. Allow different colours for different situations and materials.

.5 Primers for sealing - as manufactured or recommended by the manufacturer of the sealing materials.

.6 Joint backing material - closed cell foam plastic circular strips, of approved manufacture, compatible with sealant and 50% greater width than joint width.

.7 Cleaning material for surfaces to receive sealant - xylol, methyl-ethyl-ketone, toloul, or as recommended by the manufacturer of the sealant.

.8 Sealants compatible for sealing vertical flat bar reinforcing joints in glass masonry units at all basement windows.

PART 3 – EXECUTION

3.1 LOCATIONS

.1 Remove all existing caulking at exterior perimeter of all windows and doors. Clean caulking residue in an approved manner and re-caulk as specified herein.

.2 Unless sealant is specified to be included in the Work of other Sections, seal with sealant at the junction of the following exterior materials and surfaces plus at other locations where sealant is essential in maintaining the continued integrity of the air vapour barrier and watertight barrier.

.1 Concrete to metal

.2 Concrete to masonry and concrete

.3 Masonry to metal

.4 Masonry to masonry, concrete and precast concrete.

.5 Metal to metal

.6 Junctions of foundation walls and footings

.7 Around pipes and services entering through unit masonry and concrete foundation walls.

.8 Perimeter of steel frames, metal panels, thresholds, framed openings

.9 Perimeter junction of hollow metal frames and screens occurring in Unit Masonry Construction, on both sides to wall

.10 Perimeter of louvre units, mechanical hoods, ducts, etc. occurring in or extending through exterior walls

.11 At expansion joints

.12 At control joints full height in exterior unit masonry construction. Vertical joints will be raked out to a depth of 12.7 mm under masonry Section 04200

.13 At control joints full height in interior face of exterior unit masonry walls.

.2 Seal at the junction of the following interior materials and surfaces using one component sealant unless covered by trim, or unless sealant is specified to be included in other sections.

.1 Concrete to metal

.2 Concrete to masonry

.3 Masonry to metal

.4 Masonry to masonry

.5 Metal to metal

.6 Metal to drywall

.7 At junctions full height of intersecting interior masonry walls including at angular corners.

.8 Around pipes and services entering through unit masonry and concrete foundation walls.

.9 Perimeter of steel frames, metal panels, thresholds, framed openings, with adjacent materials.

.10 Perimeter junction of hollow metal frames and screens occurring in Unit Masonry Construction, on both sides, to walls.

.3 Seal with mildew resistant "silicone" at the following "interior" locations:

.1 At junction between vanity counters and adjacent substrate with neat 3 mm bead.

.2 Around access panels in ceramic tile faced walls with a neat 3 mm bead.

.3 Around perimeter of piping penetration - tilework.

.4 Seal, where indicated or specified at locations other than in paragraph 3.1.1, 3.1.2 above, with a one part sealant unless sealant is specified to be included in other Sections.

.4 Fire stop all penetrations in floor and wall fire separations throughout the building.

3.2 SUPERVISION

.1 Unless specified otherwise herein comply with the recommendations and directions of the manufacturer whose materials are being used on the work.

.2 Arrange for the sealant manufacturer's technical representatives to visit the site prior to the commencement of the sealing to meet with the Contractor and the Consultant.

.3 Sealant manufacturer to visit site periodically and to provide written reports to Consultant ensuring sealant is in accordance with good trade practice, the manufacturer's recommendations and the intent of this Specification.

3.3 PREPARATION

.1 Clean all joints and spaces to be sealed.

.2 Ensure that surfaces are structurally sound, free from grease or other contaminants which may adversely affect the adhesion of the sealing materials. Use dry oil free clean compressed air stream if necessary to clean out the joint.

.3 Clean surfaces with a solvent or cleaner recommended by the manufacturer of the sealant materials.

.4 Install when surfaces and ambient temperatures are suitable for the material used.

.5 Test materials for indications of *staining or* poor adhesion before any sealing is commenced.

3.4 PRIMING

.1 If recommended by the manufacturer of the sealing materials prime joints to prevent staining, or to assist the bond, or to stabilize porous surfaces.

.2 Apply primer with a brush which will permit the priming of all joint surfaces.

3.5 INSTALLATION

.1 Install joint backing materials at all locations as detailed or where required by sealant manufacturer's printed directions.

.2 Install a bond breaker tape or packing over asphalt impregnated fibre board as recommended by sealant manufacturer.

.3 Ensure that the correct sealant depth is maintained.

.4 Finished joints shall be free of wrinkles, sags, air pockets, ridges and embedded impurities.

.5 Tool all sealant surfaces to produce a smooth surface.

.6 Remove droppings and excess sealant as work progresses and before material sets.

.7 Sealing materials shall be gun grade or tool grade consistency to suit the joint conditions.

.8 Commence sealing only after all adjacent surfaces have been painted under Painting Section.

3.6 MASKING

.1 Where necessary to prevent contamination of adjacent surfaces, mask the areas adjacent to the joints with masking tape.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Installation of Hollow Metal Door Frames in Masonry or Drywall	Section 04200 Section 06100
.2	Installation of Metal Doors and Hardware	Section 08210
.3	Finish Hardware (Supply Only)	Section 08710
.4	Painting	Section 09900

1.2 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 01300.

.2 Base shop drawing submission on Door Schedule as shown in the drawings.

.3 Clearly indicate each type of door, frame, material, gauge, mortises, reinforcements and anchors.

.4 Do not fabricate until Shop Drawings have been reviewed by the Architect.

1.3 MEASUREMENTS

.1 Where work is to be built into existing openings, measurements shall be taken on site at the actual location of the work. Fabricate the work to job measurements.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Steel Sheet - Commercial grade steel to ASTM-A568-81 Class I, hot dipped galvanized to ASTM-A525-81, ZF75 (A25).

.2 Reinforcing Steel - To CAN/CSA-G40.21-M92 Type 33W hot dip galvanized with minimum zinc coating G90 to CAN/CSA G.164-M92.

.3 Insulation - Loose fibreglass, minimum density 1.5 lbs./cu.ft. (24 kg per cu.m. Conforming to CSA-AIOI-M1983, Type 1A.

.4 Door Bumpers - Black neoprene.

.5 Primer - Zinc rich to CGSB-1-GP-181M.

.6 Core Material - Resin impregnated, rot resistant kraft honeycomb, structural small cell 1" (25 mm), weighing 80 lb (36.3 kg) per ream with density of 1.03 pcf (16.5 kg/m).

.7 Polyurethane Core: for exterior doors - rigid modified polyisocyanurate closed cell board. Density 2 pcf (32 kg/cu m) minimum, R11 (RSI 1.9) minimum.

.8 Fire rated door cores to conform to U.L.C. requirements.

2.2 METAL THICKNESS

		Gauge	inches	mm
.1	Frames & Framing	16	.060	1.5
.2	Doors			
	Face Sheets	18	.048	1.2
	Top and bottom end channels	18	.048	1.2
	Vertical Stiffeners	20	.036	0.9
.3	Accessories			
	Lock and strike reinforcement	16	.060	1.5
	Hinge reinforcement	12	.105	2.7
	Flush bolt reinforcement	16	.060	1.5
	Reinforcement for surface applied hardware	18	.048	1.2
	Mortar guard boxes	22	.030	0.76
	Jamb floor anchors	16	.060	1.5
	Jamb spreaders	20	.036	0.9
	Steel Top Caps	20	.036	0.9
.4	Anchors			
	'I' - Strap Type	16		1.5
	'L' - Strap Type	18		1.2
	Stud Type	18		1.2

PART 3 – EXECUTION

3.1 FABRICATION OF WELDED FRAMES

.1 Construct frames in accordance with details and reviewed shop drawings. Note: Dimensions of head of frames varies to suit block coursing.

.2 Mortise, reinforce, drill and tap frames and reinforcement to receive hardware using templates provided.

.3 Install 3 bumpers on strike jamb of frame for each single door and two bumpers at head of double door frames.

.4 Protect strike, hinge and overhead concealed door closer reinforcement completely by guard boxes welded to frame.

.5 Weld in 2 channel spreaders per frame, to ensure proper frame alignment.

.6 Where frames terminate at finished floor, provide floor plates for anchorage to structural slab.

.7 Cut mitre accurately and weld continuously on inside of frame profile.

.8 Grind welded corners to a flat plane, fill with metallic paste filler & sand to a uniform smooth finish.

.9 Fill surface depressions and butted joints with metallic paste and sand to a uniform smooth finish.

.10 Provide 3 T strap adjustable jamb anchors per jamb for frames up to 7'-0" (2133 mm) high to be installed in masonry walls. Provide additional anchor for each 2' (600 ..) over 7'-0" (2133 mm) high.

.11 Provide steel anchors of suitable design for frames to be installed in stud partitions. Securely wedge or weld anchor inside each jamb as follows:

.1 Frames up to 7-6" (2286 mm) high - 4 anchors per jamb.

.12 Insulate frames for exterior doors with fibreglass for full height and depth.

3.2 FABRICATION OF DOORS

.1 Construct doors in accordance with details and approved shop drawings, fully welded construction with no visible seams or joints on faces or vertical edges.

.2 Assemble doors with full sheets laminated under pressure to honeycomb core, and interior steel stiffeners. Reinforce door with 20ga steel stiffeners at 6" o.c. full height of door.

.3 Reinforce and frame openings required for glazing. Provide glazing stops with countersunk flat head screws.

.4 Mortise, reinforce, tap and drill doors and reinforcement to receive hardware using templates provided by hardware supplier. Refer to Finishing Hardware Schedule for mounting heights.

.5 Provide sound deadening and thermal insulation material to fill all voids in doors.

.6 Assemble components by means of spot or arc welding.

.7 Fit exterior doors with flush steel channel caps at top of door and seal against moisture penetration.

.8 Provide condensate weep holes at bottom of exterior doors.

3.3 SHOP PAINTING

.1 Wipe coated steel frames: touch up areas where wipe coating has been removed using zinc rich paint.

.2 Wipe coated steel doors: touch up areas where wipe coating has been removed, using zinc rich paint, and apply one full coat of rust inhibitive primer to CGSB-1-GP-105M.

.3 Uncoated Steel - Apply one coat rust inhibitive primer conforming to CGSB-1-GP-105M.

3.4 INSTALLATION

.1 Supply hollow metal frames to masonry or drywall Trades in good time for building in so that building program is not delayed.

.2 Co-operate with all Trades as required for the execution of the complete work.

.3 Hang doors on 1 1/2 pair butts unless otherwise noted.Provide 1/8" clearance at head and jambs. Hang to close fully in all cases. Check doors over metal thresholds where provided.

Clearance at sills 3/8" (9 mm).

.4 Install hardware supplied under Section 08710. Accurately set and adjust in accordance with the manufacturer's instructions.

.5 Obtain all necessary templates for drilling, tapping and other preparatory work necessary to accommodate the hardware.

.6 Install doors and screens with glazing so removable stops are in the secured side of the opening.

.7 Adjust hardware for trouble free operation.

.8 Make joints weathertight, with approved weatherstripping.

3.5 FIRE DOORS AND FRAMES

.1 Supply fire doors and frame assemblies to meet fire resistance time rating called for and carry the appropriate U.L.C. Label.

.2 Fire doors and frames shall be installed as tested and approved by a nationally recognized agency having a factory inspection service.

.3 Locate label on frame on jamb midway between top hinge and head of door frame. Provide labels on door edge, hinge side.

.4 Provide label on hanging edge of door near frame.

3.6 TOUCH UP

.1 After installation remove all rust, dirt and dust from doors and frames. Touch up with rust inhibitive primer and zinc rich paint.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Rough Carpentry	Section 06100
.2	Hollow Metal Doors & Frames	Section 08100
.3	Finish Hardware	Section 08710
.4	Glazing	Section 08800
.5	Painting	Section 09900

1.2 WARRANTY

.1 Warranty all doors for an extended period of three years against manufacturing defects, core ghosting and warping.

PART 2 PRODUCTS

2.1 MATERIALS

.1 All slab doors shall be solid core doors, conforming to CAN/CSA 0132.2 Series 90.

.2 Doors at openings 101, 102, 103, 106, 202, 203, 213 and 219 are all custom ash doors from 2 ¼' solid ash with ash frames, stained to match the existing doors at the ground floor level.

.3 Fabricate doors to thickness and sizes as indicated on the Door Schedule as shown In the drawings.

.4 Prepare doors for installation of grilles or glass as required.

.5 Undercut or rebate bottom rails as required.

.6 Core - medium density cored wood particle board.

.7 Crossband - 3 ply hardwood plywood not less than 1/8" (3 mm) thick before sanding. Face veneer 1/32" (0.79 mm) thick birch, uniform Sapwood for stain finish.

.8 Vertical and horizontal edges, stops and beads for glass and grilles to be solid ash to match veneer. Edges shall be minimum 1-1/2" (38 m.) wide by thickness of door.

.9 Stiles and rails to be low density softwood staved type minimum 3-1/4" (83 mm) wide with 3/4" (19 mm) thick hardwood edge banding. Moisture content shall not exceed 8%.

.10 Glazing beads to be flush type front edge recessed 1/8" (3 mm) at bottom. Mitre cut and fit all corners to form tight flush joints.

PART 3 EXECUTION

3.1 FABRICATION

.1 Door cores unframed, solid, laminated wood stave core construction, comprising narrow pieces of kiln dried wood, grain running vertically and end joints well staggered, solid (no voids) and electronically glue bonded. Floating core construction will not be accepted. Sand door cores both sides prior to application of faces.

.2 If particle board core or fire rated cores used, frame with 4-1/8" (105 ..) minimum wood stiles and 2-3/4" (70 mm) minimum wood rails; edge stiles with birch 3/4" (19 -) wide minimum, full length piece. Glue stiles and rails to core and apply face veneer and machine flush with door edges.

.3 Doors with lower and/or upper glazed lites shall be fabricated with solid ash rails and stiles.

.4 Seal top and bottom edges with two coats urethane finish or lacquer applied in door manufacturer's plant.

3.2 FITTING AND HANGING DOORS

.1 Hang wood doors on 1-1/2 pair of hinges for door up to 7'0" (2134 mm). On doors over 7'-0" (2134 mm) hang doors on 2 pair hinges.

.2 Undercut doors as required for carpeted areas.

.3 Neatly and accurately fit required finishing hardware.

END OF SECTION

ADDITION & ALTERATIONS TO
EGAN FUNERAL HOME
203 QUEEN STREET SOUTH
BOLTON, Ontario

GEORGE ROBB ARCHITECT

0660 **May 13, 2011** **SECTION 08363 – ALUMINUM ROLL SHUTTER**

PART 1 – GENERAL

.1 Work of this Section includes:

a) Supply and Installation of one overhead PVC roll shutters for the Servery 226.

.2 Coordinate with the work of other trades affected. (Section 06100 – Rough Carpentry, Section 06200 – Finished Carpentry, Section 09250 – Drywall Construction and Section 09900 – Painting).

.3 Supply Shop Drawings in accordance with Section 01300 – Submittal Procedure.

.4 Materials delivered to site shall remain in their shipping crate and packing until installation can be undertaken. Store delivered materials inside building under cover to prevent damage from weather or construction activities. Coordinate the delivery with the construction schedule to prevent loss or damage.

.5 Warranty – The manufacturer shall provide a written warranty that all components are guaranteed against defects in material, design and workmanship for a period of one year from the date of installation for commercial and institutional applications. The general contractor (installer) shall provide a one year guarantee that no labour charges shall be charged to undertake repairs for the rollshutter during the warranty period.

PART 2 - PRODUCTS

.1 Roll Shutter: The roll shutter shall be HQ Super Mini Roll Shutter by Talius Industries, a Rollage Manufacturing Corporation Company. The shutter shall be made from individual rollformed aluminum profiles with injected polyurethane foam core and shall have a cover width of 32mm and a thickness of 7mm. The minimum aluminum guage shall be 0.36mm. The finish shall be a baked on enamel with a dry film thickness of at least 0.05mm. The weight per square meter shall be 3.5 kg. The opening section of the roll shutter shall be 4'-0" high x 4'-7" wide.

.2 Guide Rails: The guide rails shall be Safe Rails by Talius Industries. The guide rails are to be heavy gauge aluminum extrusions fitted with two noise and weather insulating strips. All guide rails must have undergone a multiple stage chromate procedure and be painted with a baked-on paint. Guide rails to be acid, alkali and oil resistant. The guide rail is to be made of two snap together parts that prevent unauthorized access to the mounting screws. Curtain penetration in to the guide rails shall be at least 26mm (1") for sections less than 1.83M (72") wide.

.3 Panel Box Housing: The panel box housing shall be precision rolledformed from 1.0 to 1.2 mm aluminium with an electro-statically bonded and baked finish. Lower half of the panel box must be detachable for future servicing access. Panel box service lid to be secured with tamper-proof security screws on all panel boxes below 2.13m off the ground. All panels to be delivered to the jobsite covered with protective, adhesive plastic film to prevent scratching. The protective film is to be removed by installer after job completion. All panel boxes endplates from high grade aluminum alloy. Endplates must be chromed and laminated with a resistant PVC surface. The panel box style to be 5 corner. Panel box sizes to suit Rollshutters dimensions.

.4 Operation: Rollshutter shall be electrically operated. Provide a tubular 120 VAC motor installed inside the shaft. The motor unit shall be constructed with solenoid brakes, thermal overload protection switch with automatic reset and enclosed, permanently lubricated bearings and gears. All electric components that make up this motor and its housing and wiring shall be CSA and UL Certified. Each motor unit shall be controlled by a momentary-contact, three position toggle switch. The switch is to fit a normal standard electrical box. Switch location shall be as indicated on the drawings. All wiring shall be in accordance with the manufacturer's requirements and in accordance with local electrical code requirements. Supply and installation of all wiring shall be undertaken by the electrical subcontractor. Provide override for operation of door with a manual handcrank device as supplied by Talius Industries.

.5 Colour Selection: Provide a custom colour as based on colour swatches of Benjamin Moore paints. The rollshutter curtain, bottom rail, guide rails, panel box housing and any other accessories shall all receive the custom colour application. Colour to later selection by architect.

PART 3 - EXECUTION

.1 Supply and install one roll shutter units on site. Rollshutter and hardware as described herein shall be installed by an approved Rollshutter installer. The installer must be factory authorized and the installation must proceed in accordance with the manufacturer's installation instructions.

.2 The Rollshutter subcontractor will supply and use mounting hardware suitable for the mounting surface applicable, including hollow-wall and concrete anchors when necessary. The mounting hardware size is to be a minimum of 2" long - #8 screws. Mounting hardware for the guiderails are to be installed between 20cm to 30cm (8" to 12") on centres. The mounting hardware for the panel box shall be installed between 40cm and 50cm (16" to 20") on centres, horizontally along the top inside corner of the panel box, and each screw head to be supplemented with a large flat washer to avoid tearing through the sheet aluminum. Each cast aluminum end plate on a panel box to be secured with one fastener to the mounting surface, two if the Rollshutter curtain weight exceeds 22kg. (50 lbs).

.3 The rollshutter shall be installed plumb, true, square and level, free from distortion or defects affecting appearance or performance. The installer shall adjust and test moving parts to ensure smooth operation.

.4 All work shall be completed in a professional, safe and timely manner. Work shall be undertaken by this subcontractor in accordance with the construction schedule to assure the continuity of the overall schedule.

.5 Clean-up: As the work proceeds and upon completion, clean up and remove from the site all rubbish and packages. Leave all rollshutter and fixed panel parts clean.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Perimeter frame sealants	Section 07900
.2	Supply only of lock cylinders	Section 08700

1.2 SUBMITTALS

.1 Submit Shop Drawings to requirements of Section 01340 which clearly indicate materials being supplied, connections, attachments, anchorage, reinforcing, plan of swing doors, elevations, dimensions and location of openings. Show details of hardware including push/pull connections. List trade names of sealants to be used.

.2 Submit for review, 12" (300 mm) long pieces of frame material of each shape and finish specified before delivery of materials to Site.

1.3 MAINTENANCE DATA

.1 Include in "Maintenance Manual", as required under Section 01340, maintenance instructions pertaining to doors, door closers and hardware adjustment.

1.4 PRODUCT HANDLING

.1 Protect finishes with coating that will not mar, nor deface finish on removal. Leave protected coating intact until all risk of damage is past, or immediately prior to final cleaning.

1.5 WARRANTY

.1 The period stipulated in General Conditions of Contract shall be extended in writing to five (5) years.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Extruded Sections - extruded aluminum alloy Alcan 6063-T6 free from scratches and surface blemishes.

.2 Sheet and plate - 1100-H14 alloy, anodizing quality.

.3 Steel - complying with CSA Standard G40.12

.4 Glass - bearing manufacturer's labels, indicating quality and thickness.

.5 Finish Anodized aluminum window section in colour to later selection to AA-M12-C22-A4.

.6 Safety Tempered Glass - fully toughened plate or float complying with CAN/CGSB12.1, Type B, Class B. Minimum 6 mm.

.7 Glazing Tape - Vulcanized butyl tape with continuous neoprene spacer. Black colour, 440 by Tremco Manufacturing Co., or approved equal.

.8 Weatherstripping - mohair pile Schlegel inserted into keyed grooves.

.9 Inner Frame Insulation - Rigid, expanded polystyrene conforming to CAN/CGSB 51-GP-20M, or foamed-in-place polyurethane insulation conforming to CGSB 51GP-23M.

.10 Thermal Break Component - Rigid polyvinyl chloride.

.11 Accessories - Shims, spacers, expansion bolts and screws, non-ferrous; clips, angles and fastening devices, galvanized steel, CAN/CSA G40.21-M92, Grade 30OW, or Type 316 stainless steel.

PART 3 – EXECUTION

3.1 FABRICATION - GENERAL

.1 Conceal nut, bolts, screws, clips and other means of fastenings in finished work, except where shown or specified.

.2 Insert concealed steel reinforcements into all door jamb members and any other units as required, sized to adequately withstand snow and wind pressure requirement of Ontario Building Code, and action of hardware.

.3 Maintain dimensional tolerances to closest possible accuracy for various parts, and to vertical and horizontal planes.

.4 Assemble, secure, anchor, seal and make weather-tight all doors and frames in manner which does not restrict thermal movement and in strict accordance with certified Shop Drawings.

.5 In assembly of various components, make allowances for deflection of structure above; when making connections ensure that no structural load is transmitted to frame or door.

.6 No manufacturer's nameplate shall appear on exposed face of door or frame assembly (while door is in closed position).

.7 Accurately join and fit corners of doors to flush hairline joints. Weld unexposed sides leaving no surface imperfections such as pitting, discolouration or weld halo.

.8 Do all fitting and assembly as far as practicable in factory.

.9 Accurately prepare and reinforce with backing plates to ensure adequate strength, all cutouts, recesses and mortising required for hardware.

.10 Where no masonry or structural beam occurs above entrance screens, extend mullion reinforcing to under slab above for anchorage.

.11 Blast clean and galvanize all reinforcing brackets and other steel supplied under this Section in accordance with CGSB Specification 31-GP-404 and CSA Standard G164, coating weight G90. Galvanize after fabrication.

3.2 ENTRANCE SCREEN: BASE BID AND ALTERNATE PRICE

.1 **Base Bid Entrance Screen** shall be Kawneer Aluminum Curtain Wall System, 1600 Wall System with 2 1/ 2" x 6" frame with outside mounted insulated glazing units with pressure plate closure.

.2 **Alternate Price Entrance Screen** shall be Kawneer Tri Fab 451T Series.

.3 Swinging doors shall be custom 2 1/4" hardwood doors mounted on custom stops and hung with 4 hinges on reinforced frame section as required.

3.3 HARDWARE

.1 Unless otherwise specified herein, supply and install all finishing hardware associated with doors including but not limited to floor stops where required. Perform drilling necessary to install stops and other hardware items fixed to adjacent construction.

.2 All hardware as supplied under Section 08700.

3.4 ERECTION

.1 After alignment, positively lock anchorage devices to prevent movement other than that designed to accommodate deflection and thermal expansion and contraction.

.2 Erection tolerances for operable elements - consistent with smooth operations and weatherproof performance.

.3 Perform necessary drilling of concrete, masonry and steel necessary to install the work of this Section. Site located fixings to the masonry and concrete shall be stainless steel lag screws and lead shields. Bear cost of repair satisfactory to the Consultant of concrete chipped by drilling or fixing operations.

.4 Apply a heavy brush-coat of asphaltic paint to aluminum or galvanized steel placed in or in contact with concrete, masonry mortar or dissimilar metals.

.5 Make the completed installation free from objectionable noise. rattles, wind whistles, cracks or noise due to movement.

3.5 GLAZING

.1 Perform glazing associated with work of this Section. Leave labels on glass until it has been set and inspected and approved. Leave glass whole and without cracks, scratches and other defects and with settings in perfect conditions at completion, to the approval of the Consultant. Remove rejected, broken or damaged glass due to defective materials or improper setting and replace with perfect materials. Reject units producing distorted vision and replace.

3.6 ADJUSTMENTS

.1 Upon completion of the project and just prior to the handing over of the building to the Owner or at a time as directed inspect, test and adjust installation as follows:

.1 Inspect all units for damage and correct same immediately.

.2 Test and adjust all hardware and replace all faulty items.

.3 Adjust all weather-stripping so as to leave each opening unit in its most weather-tight position.

.4 Test all operable elements and ensure easy and smooth operation.

3.7 CLEANING

.1 Do all cleaning as per requirements of the Contract documents.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Sealants (other than this Section)	Section 07900
.2	Aluminum Entrances and Screens	Section 08120
.3	Glazing	Section 08800

1.2 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 01300.

.2 Show detailed window assembly, including: large scale details of members and materials, of brackets and anchorage devices and of connection and jointing details; full dimensioned layouts for positioning of brackets and anchorage devices to structures; dimensions gauges, thicknesses; glazing details, description of materials including catalogue numbers, products and manufacturer's names; aluminum alloy and temper designations, finish specifications and all other pertinent data.

.3 Submit a written adhesion and compatibility approved from sealant manufacturer stating all materials in contact with sealants are compatible with silicone sealant.

1.3 DELIVERY AND STORAGE

.1 Adequately protect aluminum and aluminum finishes to prevent damage thereto during fabrication, storage, shipping, handling and installation.

.2 Deliver, handle and store units by methods approved by manufacturer. Protect from damage and staining.

.3 Protect sills and stools after installation with boards, heavy paper or other suitable protection, secured in place, to prevent staining or scratching. Do not remove protection before final cleaning.

1.4 WARRANTY

.1 The Warranty contained in the General Conditions with respect to this Section shall be extended from one year to five years in writing.

.2 In addition to the above, insulating glass units shall carry manufacturer's standard warranty of minimum five years for defective materials and ten years for seals.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Aluminum Extrusions: Extruded shapes, CSA HA.5-G510 6063 alloy Condition T-5. Units frames by Fulton Windows, 1200-5Ar Series as supplied by Oldcastle Glass Engineering Products (800)561-9854. These window units are required to be provided on the south

and west elevations for Rooms Visitation Room 106, Sitting Room 201, Viewing Room 203 and Viewing Room 204. Provide sill cap flashing with sill extensions as required to suit cut stone window sill.

.2 Aluminum Extrusions: Extruded shapes, CSA HA.5-G510 6063 alloy Condition T-5. Units frames by Fulton Windows, 1200-5 Series as supplied by Oldcastle Glass Engineering Products (800)561-9854. This window unit is to match existing second floor window along the east elevation of the building in Reception Room 222 . Provide sill cap flashing with sill extensions as required. Aluminum frame to later colour selection by Architect.

.3 Aluminum EnduraClad Exterior Sliding Door with Screen, Pro Line as supplied by Pella Industries. Weathering stripping to be dual extruded polypropelene TPE bulb at head, jamb, sill and vent panel interlocker. Glazing shall be fully tempered float glass complying with ASTM C-1048. Silicone glazed ¾" dual seal insulating glass with argon filled Low-E glass. Exterior aluminum surface with EnduraClad multistage finish, to later colour selection by Architect. Interior wood is unfinished ready for site finishing.

.4 Thermal Break: Rigid PVC or hard rubber.

.5 Finish: To later selection by Architect.

.6 Bolts, Screws and Fasteners: Hot dipped galvanized, or cadmium plated steel or 302 stainless steel.

.7 Glass: Float glass to CAN/CGSB-12.3-M76.

.8 Insulating Units: Hermetically sealed, CAN/CGSB-12.8-M76, 6 mm clear inner pane - 1" air space, 6 mm clear outer pane (Sungate 100 glass by PPG, with Low 'E', argon filled cavity) Provide warm edge spacer in glazing units (Typical).

.9 Setting Blocks: Neoprene 4" long, 80A durometer.

.10 Steel: Brake formed, galvanized sheet steel.

PART 3 – EXECUTION

3.1 DESIGN

.1 Design and fabricate windows, brackets and anchorage devices so that when installed they will:

.1 Compensate for unevenness and dimensional differences in structure to which they are secured.

.2 Allow full expansion and contraction of window framing members without causing stress within the window assembly as a result of such expansion and contraction.

.3 Tolerate structural deflection and distortion of structure, under design criteria conditions, without imposing load on window assembly.

4 Adequately sustain themselves any superimposed wind and rain loads without allowing window framing members to deflect more than 1/200 of span under design criteria wind load.

.2 All the Work shall be designed to withstand safely a wind force as listed in Ontario Building Code based on 30 year probability and wind gust at 2.5 factor of safety.

.3 Deflection of members when under full loads shall maintain adequate clearance of glass. Maximum deflection shall not be more than 1/175 of the span of any member.

.4 Condensation: Not more than 1" high across the bottom of inside pane and none on aluminum frames under conditions of -33.3 deg. C. exterior, 22.2 degrees C. interior, 30% relative humidity interior 25 m/h wind measured on lee side of building, or zero condensation with no wind.

.5 Other performance requirements, CAN/CSA A440-M90 Classification Al, B2, C2, D2, F2.

3.2 FABRICATION

.1 New aluminum windows shall be thermally broken windows, conforming to details and these specifications, Fulton 1200 Series, or approved equal.

.2 Make profiles of framing members as shown on Drawings.

.3 Entire assembly shall be weather-tight throughout.

.4 Fabricate complete units in shop to provide minimum tolerance and hairline joints throughout.

.5 Assemble members by stainless steel screws. All connections shall be internally sealed in factory with approved sealing compound. Exposed frame sealants are not acceptable.

.6 Aluminum extrusions shall be designed to provide sufficient section modulus to safely resist imposed loads but minimum thickness of any part of the load bearing extrusion shall be 1/8". Submit design data to the Consultant.

.7 Conceal interconnecting members and fasteners in completed assembly.

.8 Do not place manufacturer's name plates, labels or any other finished means of identification on exposed or finished parts.

.9 Provide weep holes in tubular members to drain condensation.

.10 Provide an extruded rigid thermal break integrated with the inner and outer aluminum extrusions to form a rigidly interconnected assembly without the use of fasteners or other thermal bridging elements.

.11 Glass stops shall provide edge margins recommended by glass manufacturer.

.12 Paint all metal surfaces in contact with concrete or masonry, plaster, mortar or dissimilar metals with protective lacquer or bituminous coating.

.13 Mitre and full strength vulcanize joints in weather-stripping.

3.3 INSTALLATION

.1 Provide all fastenings or anchors required to be built in under work of other Sections.

.2 Use only concealed fastenings.

.3 Securely install components so that they line up square in true, straight flat and/or flush planes, plumb and level, free from distortion.

.4 Make joints neat and fine as practicable. Allow for full expansion and contraction and take into consideration climatic conditions prevailing at time of installation.

.5 Fasten galvanized steel supports and clips with galvanized bolts and fasten aluminum members with stainless steel screws and bolts.

.6 Ensure that corner joints of frames are weather-tight.

.7 Clean aluminum and glass surfaces that are to receive glazing materials with an oil removing solvent and wipe dry.

.8 Glaze windows with factory glazed wrap around vinyl glazing channels.

.9 Place setting blocks at quarter points for each light of glass.

.10 Comply with tape manufacturer's recommendations regarding use of spacers for certain glass sizes.

.11 Install glass with clean cut edges, leaving spaces for expansion and contraction between edge of glass and inside of frame as recommended by glass manufacturer.

.12 Glaze windows with minimum 7/8" double glazed hermetically sealed units. Provide frosted glass to all fixed units in Ground Floor.

.13 Finish tape and glazing wedge with straight un-waving sight lines.

.14 Conform to sealant manufacturer's written recommendations for cleaning, priming, backing and joint design to suit type and location of joint and temperature conditions at time of application.

.15 Mask adjacent surface likely to become marred with sealant or primer, using non-thermosetting easily removed masking.

.16 Apply sealant using pressure operated gun fitted with suitable nozzles approved by the sealant manufacturer. Apply in accordance with manufacturer's directions and recommendations.

.17 Apply sealant in such a manner as to assure good adhesion to sides of joints and to completely fill voids in joint. Form surfaces of sealant smooth, concave, free from ridges, wrinkles, sags, air pockets and imbedded impurities.

.18 Remove masking tape, soils and sealant which may have been deposited on surfaces near joints.

.19 Seal all window frames to adjacent materials both sides.

3.4 CLEANING

.1 When directed, inspect work and remove protective wrappings, coatings and devices and clean glass and aluminum surfaces. Use methods, which will not scratch or damage glass, paint or coatings.

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED

.1 Supply of all finishing hardware, cabinet drawer and door pulls and washroom and bathroom accessories.

.2 New door hardware shall match existing for finish, but will be lever style for barrier free access within the new parts of the work.

1.2 Work Specified Elsewhere

.1 Installation of finishing hardware for doors and washroom accessories under Section 06100 - Rough Carpentry.

.2 Installation of Cabinet hardware for doors and drawers under Section 06200 – Finished Carpentry and Millwork.

1.3 Submittals

.1 Coordinate the work of this Section with other related work and products. Provide a detailed hardware schedule.

.2 All hardware items shall be individually labeled in accordance with the itemized listing contained in the Schedule.

.3 Verify hand of all doors to ensure the hardware can be properly fixed.

.4 Provide templates for all hardware to door and frame supplier for necessary preparation.

1.4 Cash Allowances

.1 Provide a Cash Allowance, in accordance with the Supplementary Conditions of the Contract, in the amount of $42,000.00 for the supply only of all finishing hardware for doors and washroom accessories as required.

.2 The cash allowance for Finishing Hardware for cabinetwork is carried under Section 06200 Finish Carpentry and Cabinetwork.

PART I – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Hollow Metalwork	Section 08100
.2	Aluminum Entrances	Section 08404
.3	Aluminum Windows	Section 08500

1.2 WARRANTY

.1 Warranty all glass and mirrors to be free from defects in workmanship and materials of any kind for a period of five (5) years.

.2 Replace (including removal and installation) of defective glass and mirrors.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Float Glass - CAN/CGSB-12.3 M76 6 mm thick unless specified or indicated otherwise.

.2 Insulating Glass conforming to CAN/CGSB 12.8 M76.
Glazing shall be Sungate 100 glass by PPG in, Low "E" argon filled Insulated Units, with warm edge spacer typical in all exterior window units.

.3 Wired glass conforming to CAN/CGSB 12.11 Georgian Wired Reinforced.

.4 Tempered Glass – fully toughened clear plate or float complying with CAN/CGSB – 12.1, Type B, Class B, 6 mm. Provide frosted tempered glass where shown around stair enclosure.

.5 Fire Glass – For supply and installation in the Door and Screen No. 206. This fire glass shall be Firelite NT as manufactured by Technical Glass Products (800) 426-0279. It is required to meet the 45 minute rating of the floor assembly. Glazing tapes shall be non-butyl type.

.6 Foam Tape - Black, closed cell neoprene foam tape 1/2" wide adhesive back manufactured by Jacobs & Thomson Ltd., of thickness required.

.7 Glazing Tapes - Vulcanized butyl tape with continuous neoprene spacer.

.8 Mirrors - CAN/CGSB 12.5 M86 with wiped edges.

.9 Mirror Clips - continuous "J" Clips, ½" bottom and ¾" top, clear anodized aluminum.

PART 3 – EXECUTION

3.1 SITE CUTTING OF GLASS

.1 Site cutting of glass is prohibited except with the express permission of the Consultant to contrary after review of the Contractor's proposed methods.

3.2 INSTALLATION

.1 Conform to the recommendations of the Glazing Manual, Flat Glass Marketing Association, USA, 1981 edition.

.2 Cut wired and patterned glass so that pattern is parallel.

.3 Glaze partitions with single sheets of plate or float glass unless noted otherwise. Set lights on setting blocks placed at quarter points. Glaze lights with glazing tape or dry gasket glazing system, channel shape to wrap completely around glass edge, or there approved means to prevent rattle. Glaze all interior glazed doors with tempered glass.

.4 Replace loose stops in their original positions, set all screws tight, countersink all nails.

3.3 MIRRORS

.1 Install mirrors with top & bottom continuous channels. Screw channels to walls using countersunk, flathead wood screws. On drywall use toggle bolts, flathead countersunk. Provide continuous bottom channel for full width of the bottom edge of the mirror. Use ¾" channel at top edge set to allow tilt up installation of mirror. Place mirror accurately in position and fit securely into channel. Ensure that mirror is plumb and level and adjust spaces as necessary. When mirror is more than one piece, provide equal sections with tight butt joints set into continuous channels.

3.4 CLEANING

.1 As work progresses clean all glass, including mirrors and fittings. Remove all setting and glazing compounds from adjacent surfaces. Remove all finger and hand prints and other soil.

END OF SECTION

PART I – GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to CAN/CSA A-82.27-M91, and CAN/CSA A 82.31-M91 including appendices.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1	Rough Carpentry	Section 06100
.2	Hollow Metalwork	Section 08100
.3	Painting	Section 09900
.4	Mechanical	Section 15000
.5	Electrical	Section 16000

1.3 DELIVERY AND STORAGE

.1 Handle and store materials carefully to prevent damage.

.2 Obtain approval of proposed locations for stockpiling material.

.3 Do not install damaged or deteriorated material but remove from Site.

.4 Provide any necessary temporary covers, skids and the like.

.5 Materials as delivered shall bear manufacturer's name, brand name of material and where applicable, CSA classification.

1.4 ENVIRONMENTAL CONDITIONS

.1 Do not apply gypsum board or joint filler to surfaces that are damp or contain frost.

.2 In cold weather and during gypsum panel application and joint finishing, temperatures within work areas shall be within the range 12 deg. C. to 25 deg. C.

.3 Provide adequate ventilation to carry off excess moisture.

1.5 RELATIONS WITH OTHER TRADES

.1 Co-ordinate with mechanical and electrical Trades to ensure that all services are installed prior to application of wall board.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 All materials to conform to CAN/CSA A82.27-M91 unless specified otherwise. Products listed herein are produced by Canadian Gypsum Company.

.2 Gypsum Wallboard

• Plain Gyp. Board	CAN/CSA A82.27. Wallboard to be to thickness indicated on Drawings,	Location in server and washrooms.

	minimum 15.7 mm.	
• Fire Rated Gyp. Board	CAN/CSA A82.27 Type X-Fire Rated. Minimum thickness to be 15.7 mm.	Stairwells, storage rooms, exits, electrical closet, below stairs and closets as shown on drawings.
• Impact Resistant Board	CGC Sheetrock Abuse-Resistant Gypsum panels (fire resistant where required). (15.7 mm).	All walls facing interior corridors, and in visitation rooms, sitting rooms and reception room to a height of 4'-0" from floor level.

.3 Exterior sheathing shall be 12.8 mm "Dens-Glass Gold" gypsum sheathing where specified

.4 Metal Studs and Channels - .5 mm galvanized steel as manufactured by Canadian Gypsum Company or approved alternate as required.

.5 Metal Furring Channels - .5 sheet galvanized steel channel and accessories as manufactured by Canadian Gypsum Company, or approved alternate.

.6 Cold Rolled Furring Channel - 20 mm x 12.7 mm zinc coated channel weighing minimum 0.446 kg per .m.

.7 Cold Rolled Carrying Channel - 38 mm x 15 mm zinc coated channel weighing minimum 0.707 kg per m.

.8 Corner Bead and Casing Bead - 28 ga. galvanized steel with perforated flanges; one piece per location.

.9 Control Joint - CGC No. 093.

.10 Hangers : 1.3 mm galvanized steel.

.11 Tie Wire: 1.5 mm galvanized soft annealed steel.

.12 Screws - CGC Brand Screws (or approved equal) of type recommended in the selector guide on Page 5 of Canadian Gypsum Systems Folder 09250-IE.

.13 Thermal Break - Permanent adhesive faced rubberized cork, 3 mm thick by width required.

.14 Joint Treatment Material - (Joint compound, topping compound laminating compound). To ASTM C474 and C475. Use material recommended by board manufacturer for the proposed use.

.15 Reinforcing Tape - Perf-A-Tape by CGC or equal.

.16 Acoustic sealant - As manufactured by CGC, Tremco or Presstite Division of Interchemical Corporation for acoustic partitions.

.17 Acoustic Insulation - Sound attenuation blanket, un-faced and equal to CGC Thermafiber Sound Attenuation Fire Blankets or Roxul "Flexi-Batt" by Roxul Inc., thickness shown on drawings, required to obtain required S.T.C. rating.

.18 Sealing Tape - Type and brand recommended by the vapour barrier manufacturer.

.19 Ceiling Anchors - Self drilling tie wire anchors equal to Phillips "Red Head" T-32 or approved equal.

.20 Provide one column cover for the existing basement column adjacent to the former Kitchen column at gridline 6 to be Formglas 10" diameter round column cover, Series 10,000, No. 254, complete with Column Base No. 27508 and Cap to be No. 27310.

PART 3 – EXECUTION

3.1 CEILING SUSPENSION

.1 Do not regard grillage system indicated on drawings as exact or complete. The Specification for metal framing contained in Canadian Gypsum Co. Ltd. Brochure 09260-1E and/or CAN/CSA A.82.31-M91 shall govern installation conditions not covered by this Specification. The more stringent being the acceptable.

.2 Hangers

.1 Install hangers for suspended wallboard ceilings to support the grillage independent of walls, columns, pipes, ducts and the like. Erect plumb and securely anchor to the structure. Submit details of proposed method to the for approval. If so requested, test hangers to prove that anchorage is adequate to support the proposed loading.

.2 Space hangers at 1200 mm maximum O.C. along the carrying channels and not more than 150 mm from ends (or as required to conform with fire tested assemblies where applicable).

.3 Carrying Channels

.1 Space channels at 1200 mm maximum o.c. (or as required to conform with fire tested assemblies where applicable).

.2 Run channels transversely to structural framing members.

.3 Where splices are necessary, lap members at least 200 mm and wire each end with two laps; avoid clustering or lining up splices.

.4 Attach to hangers by bending hanger under runner and securely wire in place with a saddle tie.

.5 Provide 25 mm clearance between channels and abutting walls and partitions.

.4 Cross Furring

.1 Install drywall screw channels transversely across runner channels, joists or other supports.

.2 Space drywall screw channels at 600 mm o.c. and not more than 150 mm from perimeter walls. Provide 25 mm clearance between channels and abutting walls and partitions. Use closer spacing if so noted on drawings.

.3 Secure drywall screw channels to each support with approved clip or attachment; splice joints by messing minimum 200 mm and tying channels together with double strand 16 gauge tie wire.

.4 Level drywall screw channels to a maximum tolerance of 4 mm over 3600 mm.

.5 Drywall shall not be fixed directly to open web steel joists and the like. Provide cross furring as specified.

.5 Openings

.1 Frame openings with suitable channels; check clearances with respective Trades. Provide support for edges of boards at all cut-outs and openings in ceilings.

.2 Provide all additional hangers and supports for fixtures as required.

.6 Bulkheads

.1 Furr out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.

.2 Use methods and materials as previously specified in this Article.

3.2 STEEL STUD SYSTEM (PARTITION) INSTALLATION (Only as Required)

.1 Attach metal runners at floor and ceiling to structural elements with suitable fasteners located 50 mm from each end and spaced 600 mm o.c. or to suspend ceilings (where partitions noted to terminate at ceiling level) with toggle or molly bolts spaced 400 mm o.c.

,2 Position studs vertically, engaging floor and ceiling runners, and spaced 400 mm o.c., unless otherwise noted on drawings. When necessary, splice studs with 200 mm nested lap and one positive attachment per stud flange. Place studs in direct contact with door frame jambs, abutting partitions, partition corners and existing construction elements. Where studs are installed directly against exterior walls and a possibility of water penetration through walls exists, install asphalt felt strips between studs and wall surfaces.

.3 Anchor studs for shelf-walls and those adjacent to door and window frames, partition intersections and corners to ceiling and floor runner flanges with an approved crimping tool. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to - length section of runner, with a web-flange bent at each end, and secure with one positive attachment per flange.Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header.

.4 Stiffen partitions exceeding 3 m long or 2.7 m high with 19 mm cold rolled channels. Fix horizontally and provide the number of rows necessary to ensure a rigid installation. Provide other partition reinforcing necessary to support wall hung components, cupboards, closets and the like. Use 2 studs at jambs of openings and corners.

.5 Where horizontal runs of service lines are to be installed within the partition, erect studs with web openings aligned.

.6 Receive and install hollow metal frames supplied under Section 08100.

.7 Provide reinforcing and necessary stiffeners to support hollow metal frames and screens. Reinforcing to be capable of supporting screens rigidly and solid without deflection.

3.3 CHASE WALL INSTALLATION

.1 Align two parallel rows of floor and ceiling runners spaced apart as indicated. Attach to concrete slabs with concrete stub nails or power driven anchors 600 mm o.c. Attach to suspended ceilings with toggle or molly bolts 400 mm o.c. Attach to wood framing with suitable fasteners 600 o.c.

.2 Align metal studs vertically in runners, 200 mm o.c. with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor studs to floor and ceiling runner flanges with an approved metal crimping tool.

.3 Cut cross bracing to be placed between rows of studs from gypsum panels, 400 mm high by chase wall width. Space braces at quarter points not to exceed 600 mm o.c. vertically and attach to stud webs with six 25 mm screws 200 mm o.c. maximum on each side.

.4 Bracing with 64 mm metal studs may be used in place of gypsum panels. Anchor web at each end of metal brace to stud web with two 10 mm pan head screws. When chase wall studs are not opposite, install metal stud cross braces 400 mm o.c. horizon tally and securely anchor each end to a continuous horizontal 64 mm runner screw-attached to chase wall studs with the cavity.

.5 Adapt cross bracing as necessary to avoid interference with service.

3.4 WALL FURRING INSTALLATION (Only as Required)

.1 Direct Furring Channel Attachment - Attach metal furring channels, vertically or horizontally spaced 400 m o.c. to masonry or concrete surfaces with hammer-set or power-driven fasteners or concrete stub nails staggered 600 mm o.c. on opposite flanges. Nest channels 200 mm at splices and anchor with two fasteners in each wing. Where furring channel is in stalled directly to exterior wall and a possibility of water penetration through wall exists, install asphalt felt protection strip between furring channel and wall. For horizontally placed channels attach maximum 100 mm from floor and ceiling.

.2 Bracketed Furring Channel Attachment

.1 Attach adjustable wall furring brackets with serrated edges up, 900 mm o.c. horizontally, 1200 mm o.c. vertically, within 100 mm of columns or other abutting construction, within 150 mm of floor and ceiling, and as required above and below openings. Use 50 mm cut nails in mortar joints of brick or clay tile or concrete block, or in field of lightweight aggregate blocks; use 16 mm concrete stub nails or power driven nails or other suitable fasteners in monolithic concrete. Place fastener in top hole of bracket.

.2 Lay cold-rolled channels horizontally with flanges down, on furring brackets, plumb with other channels, and tie with double strand 16 ga. or triple strand 18 ga. wire at each junction with cold rolled channel.

.3 Free Standing Furring - In locations where wall furring is indicated as self-supporting, use steel studs and furring channels installed to provide a rigid frame to receive wall board.

3.5 APPLICATION OF GYPSUM BOARD

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply all gypsum board parallel to framing. Position all ends over studs. Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Stagger joints on opposite sides of partition.

.4 Apply single, double or triple layers of gypsum board to metal furring as indicated using screw fasteners.

.5 Maximumscrew spacing for single-ply gypsum board and face ply of 2-ply gypsum board to be 300 o.c.

.6 Maximumspacing of screws for base-ply of 2-ply gypsum board over steel framing to be 300 mm o.c. along edges of the gypsum board and600 mm o.c. into stud or furring channel in the field of the gypsum board.

3.6 CONSTRUCTION OF SOUND ATTENUATED PARTITIONS

.1 Install sound attenuation batts.

.2 A 6 mm continuous bead of acoustical sealant around perimeter of wall at web of top and bottom tracks and end studs. Lay gypsum board into position forcing caulking bead to fill space between gypsum board and structure.

.3 Seal full perimeter for cut-outs around electrical boxes and ducts with acoustical sealant.

.4 Provide batts in ceilings where sound batts noted.

3.7 CONSTRUCTION OF FIRE RATED PARTITIONS

.1 Where fire rated construction is required, the thickness and number of layers of board shall be governed by rating required and material used in approved assemblies.

3.8 CONSTRUCTION OF SUSPENDED AND FURRED CEILINGS

.1 Apply gypsum panels of maximum practical length with long dimension at right angles to drywall furring channels. Position end joints over furring channel web and staggered in adjacent rows.

.2 Closely fit together, ends and edges but not forced together.

.3 Fasten panels to drywall furring channels with screws spaced a maximum of 300 mm o.c. in field of panels and along abutting ends and edges.

3.9 WALL FURRING

.1 Apply gypsum panels parallel to framing. Position all edges over drywall furring channels with joints staggered in successive courses.

.2 Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Fasten panels to channels with screws spaced a maximum 300 mm oc.

3.10 APPLICATION OF ACCESSORIES

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Joints shall be made tight, accurately aligned and rigidly secured.

.2 Reinforce all vertical and horizontal exterior corners with corner bead fastened with screws 200 mm oc on both flanges along entire length of bead.

.3 Where assembly terminates against masonry or other dissimilar material, apply ledge trim over panel edge and fasten with screws or staples spaced 300 mm oc.

.4 Power drive screws at least 9mm from edges or ends of panel to provide uniform dimple 0.8 mm deep.

3.11 TAPING AND FILLING

.1 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 into panel faces.

.2 Finish corner bead and edge trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

.4 Sand dried taping compound lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

.6 Painting shall be done in accordance with Section 09900.

3.12 REQUIREMENT

.1 It is a requirement of this Section, that the resulting work shall provide plumb, straight, level, rigid, and secure installation. Failing to achieve this result shall be cause for rejection and reinstallation of this work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1. Division I - General Requirements forms an integral part of this Specification.
2. Gypsum Board System Section 09250
3. Painting Section 09900

1.2 DELIVERY, HANDLING & STORAGE

1. Receive, store, handle and protect all base materials separately to avoid contamination from other materials.
2. Store at moderate temperatures, avoiding extreme heat, freezing and direct sunlight.
3. Protect containers and contents from exposure to weather.

PART 2 - PRODUCTS

1. Sprayed Vinyl Stucco is a vinyl formulation for texturing interior surfaces above grade to be Ready-Tex Wall and Ceiling Spray Texture as manufactured by Canadian Gypsum Company, or equal.
2. Sprayed Vinyl Stucco finish shall be to match the existing. Provide sample panel for review prior to commencing work.

PART 3 - EXECUTION

1. Surfaces must be dry, clean, sound and free of oil, grease and efflorescence. Dull glossy surfaces, prime metal with a good rust-inhibitive primer. Grind plane differences and remove grinding dust and sludge.
2. Grind plane differences and remove grinding dust and sludge. Fill and level with joint compound. Reinforce and conceal drywall joints using joint tape. Fill all other damaged areas of the drywall. Repair existing damaged joints, edges and surfaces.
3. When surfaces are clean, dry and free of dust, apply a prime coat of good quality white interior latex flat wall paint with high solids content. Paint should be applied undiluted and allowed to dry before texturing is undertaken.
4. Mix Vinyl Stucco materials in an approved manner consistent with the manufacturers requirements. Assure that minimum working temperatures exist in the space being sprayed of 13° C (55° F).
5. Use 27-65 m2 (300-700 sq. ft.) per 27 kg. as an estimated coverage rate. Work in existing areas shall be executed to replicate the texture's appearance and density. All new areas shall be sprayed in a similar texture as the existing ceiling.
6. Allow the new stucco application to dry in accordance with the manufacturer's requirements prior to the application of a finished paint.

7. All existing and new stucco surfaces shall be painted.
8. Where work is being carried out in the chapel, confirm new textured surfaces match the existing prior to painting. This work will be required to be reapplied if the finish texture does not blend seamlessly with the existing materials.
9. Following each application, wash all equipment immediately with water containing household detergent.
10. Work shall be carried out by skilled workmen.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Concrete	Section 03300
.2 Masonry	Section 04200
.3 Rough Carpentry	Section 06100
.3 Gypsum Board System	Section 09250

1.2 SUBMITTALS

.1 Submit 2 random samples of each colour of ceramic tile used on this project; clearly identify with manufacturer's name, colour number and project number. Do not proceed with work until samples have been approved by Consultant.

.2 Submit 2 random samples of each colour of porcelain ceramic tile used on this project; clearly identify with manufacturer's name, colour number and project number. Do not proceed with work until samples have been approved by Consultant.

.3 Provide shop drawings indicating complete tile layout prepared for pool area, by tile manufacturer, indicating all patterns, markings, etc.

1.3 PROTECTION

.1 Protect Work of this Section against damage by other trades for minimum 72 hours after application by prohibiting passage of traffic over tile.

1.4 QUALIFICATION

.1 Contractor to require membership in good standing with the TTMAC and must have 10 years experience in the Work of this Section.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Ceramic tile for all the Washroom areas shall be 12" x 12" tile, at a supply cost of $8.00/s.f. The complete cost for installation shall be carried in the contract.

.2 Provide an allowance for the cost of granite countertops at a supply cost of $100.00/s.f.. The complete cost for fabrication, handling, protection and installation shall be carried in the contract in accordance to the details as shown in the drawings. Anticipate the provision of two different colours of granite.

.3 Carry the cost to install field stone as supplied by Section 0420 – Masonry. The field stone to be installed in the Vestibule 101.

.4 Dry Set Mortar:

.1 Mapei "Keracrete" enriched synthetic latex for job site prepared dry-set mortar.

.2 Portland Cement to CAN/CSA-A5-93, Type 10.

.3 Sand: dry silica sand 30-60.

.5 Grout: Mapei "Keracolor" sanded floor groutwith Mapei "Plastijoint" acrylic additive. Grout Colour: To later selection by Consultant.

.6 Level Cure: Mapei "Plani/Patch" compound.

.7 3/8" underlayment for the installation of tile in the washroom areas. Schluter Ditra XL or equal. Confirm adhesive compatible with plywood underlayment for approval by Consultant.

.8 Sealants: Conform to Section 07900

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Examine surfaces prepared to receive installation of tiling. If discrepancies exist, report to Consultant. Installation of any part of the Work will be construed as acceptance of such surfaces as being satisfactory.

.2 Ensure compatibility of abrasives and fillers supplied under this Section and which will bear contact with substrate materials.

3.2 INSTALLATION

.1 Regard recommendations, installation methods specified and illustrated in Terrazzo, Tile and Marble Association Manual No. 200 - 1979, and applicable manufacturer's instructions as minimum acceptable standard, except as varied by this Specification.

.2 Use tile setting method specified hereinafter.

.3 Apply by steel trowel Level Cure where required to build up existing concrete floors to elevations as noted on the Drawings or as directed by the Consultant or Owner.

.4 Obtain Consultant's approval of surfaces over, which tile is to be installed before commencing tiling.

.5 Place tile snugly around piping, fixtures and other items built in or passing through tile work. Form external angles with round edge tile extending over edge of square edge adjacent tile. Internal angles shall be formed square, carrying 1 flat tile past edge of other.

.6 Drill holes for fixing accessories of other trades.

.7 Finish surfaces flat and level or sloped and graded as required.

.8 Lay out borders and defined lines, wherever they occur, prior to setting of adjacent tile. Keep inner edges of borders against fields or wall panels straight.

.9 Cut tiles to conform to irregularities in wall lines and vertical planes along outer edges. Smooth cut edges with carborundum block or by other means to provide clean straight edges.

.10 Make joints of tiles 1/8"in width. Point joints with specified mortar or grout. Remove strings and wedges used for jointing and bracing prior to mortar or grouting.

.11 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.

.12 Finished tile to be clean and free of tiles which are pitted, chipped, cracked or scratched.

3.3 CLEANING

.1 Clean tile work progressively as work proceeds. Do not allow mortar to stain absorbent tile. Do not use acids for cleaning. Seal in accordance with TTMAC recommendations using TTMA certified products only.

.2 Conform to Section 07900 for Sealants.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1. Division I - General Requirements forms an integral part of this Specification.
2. Gypsum Board System Section 09250
3. Painting Section 09900

1.2 DELIVERY, HANDLING & STORAGE

1. Receive, store, handle and protect all wall covering herein specified as supplied by the Owner.
2. Install all wall coverings herein specified. Supply all adhesives, tools and accessories related to this installation.

PART 2 - PRODUCTS

1. Vinyl wall fabric as selected by the Owner/Consultant shall be as follows:

Width:	54"	
Weight;	22 oz. per l/yd	
Packaging:	30 yard bolt	
Backing:	Fabric	
Surface:	P.V.C. Vinyl	
Adhesive:	Recommended Liquid Vinyl Adhesive (L.V.A.)	
Fire Rating:	Flame Spread	15
	Fuel Contributed	5
	Smoke Density	25

Provide a $16.00/sq.yd allowance for the supply of this material.

2. All adhesive shall be as recommended by the wall covering supplier.
Any alternate adhesives must be accepted by the wall covering supplier.

3. The quantity of vinyl wall covering required for this work shall include the additional amount required to be supplied to the manufacturer of the Operable Partition as outlined in Section 10650 - OPERABLE PARTITION. This Subcontractor shall include in their overall allowance for the vinyl wall coverings the additional cost for the materials as will be required to be supplied to the Operable Partition Subcontractor. The Operable Patition Subcontractor shall be responsible to confirm the total quantity of material that will be required for their installation of this vinyl wall covering on their partitions. The Operable Partition Subcontractor shall remain responsible for the installation and protection of these vinyl wall coverings on their Operable Partition panels.

PART 3 - EXECUTION

1. All walls should he clean, and sanded or scraped smooth. They should be

free of rough spots, irregularities, in the surface, and all holes or indentations. New gypsum board or drywall should be primed with two coats of oil based (alkyd) primer sealer before hanging. Primer application should be allowed to dry completely. The wall coverings should be allowed 24 hours to acclimatize to the area of installation. Installation shall commence only when normal temperature and humidity conditions approximate those conditions which will exist when the building is occupied. Start of work will indicate the acceptance of the wall surfaces as being satisfactory.

2. Be sure that the wall covering is of the same pattern and colour specified by the Architect. Install all sheets of the wall covering in the sequence that they are cut from the roll. Apply an even coat of adhesive to the wall covering, and do not allow adhesive to dry too thoroughly before applying the sheet to the wall. All sheets should be smoothed out with squeegee and given final knifing with broad knife. All air bubbles must be removed, and no wrinkles, gaps, or over-laps shall exist. All sheets shall be secure and all excess paste removed before applying next sheet.

3. Wall coverings shall be applied by skilled workmen. All seams must be close and neat. After installation, the wall covering shall be firmly bonded to surface of all wall areas. The surfaces shall be cleaned as the work progresses, and all adhesive residue, trimmings, and debris cleaned up and removed from the job site.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Not applicable

1.2 SUBMITTALS

.1 Submit samples as per Section 01300.

1.3 MAINTENANCE MATERIAL

.1 At the completion of the work, deliver to site a minimum of one box of each colour of tile for maintenance purposes. Boxes to be sealed and fully labeled.

.2 Submit at final invoicing a signed receipt for this maintenance material.

PART 2 - PRODUCTS

2.1.1 MATERIALS

.1 Primers and Adhesives; those recommended by tile and base manufacturers and which will produce good and permanent waterproof bond between wall surfaces and cove base.

.2 Tile: Conforming to CSA A126.1-M1984. Vinyl composition asbestos free, 12" x 12" x 1/8" (300 mm x 300 mm x 3 mm).

.3 Tile: Excelon by Armstrong World Industries, Flextile or approved alternate, colour as selected by Consultant.

.4 Vinyl Sheet Goods: Natrual Fusion by Armstrong, or equal (Colour and pattern to later selection by Consultant).

.5 Base: 4" x 1/8" (102 mm x 3 mm) thick, continuous rubber by Johnsonite. Colour as selected at a later date by the Consultant.

.6 Sealer: Type approved by flooring manufacturer.

.7 Wax: Type approved by flooring manufacturer.

.8 Metal Edge Trim: Aluminum or brass alloy with lip of edge strip extending under and with shoulder finishing flush with top of resilient floor.

PART 3 - EXECUTION

3.1 INSPECTION

.1 Check floor surfaces for evidence of carbonation, dusting, excessive moisture or other defects affecting bond of adhesive. Ascertain nature of curing and/or sealing compound used on concrete and its compatibility with flooring adhesive. Take all required remedial measures. Remove compounds if necessary to ensure that adhesive bonds to concrete.

3.2 INSTALLATION

.1 General

.1 Do not start installation of resilient flooring until all other trades have completed their work and just prior to completion of building.

3.3 PREPARATION

.1 On concrete floors, level depressions and cracks with non shrinking latex joint filler. Report large cracks to Consultant. Do not proceed until remedied. Prime surface with approved primer. On wood structural subfloors supply ¼" poplar underlay in strict adherence to the manufacturer's specifications.

.2 Thoroughly clean concrete floors or wooden underlayment of any substances deleterious to bond of adhesive.

3.4 APPLICATION - RESILIENT FLOORING

.1 Apply adhesive uniformly with an approved notch-tooth spreader at the recommended rate. Do not spread more adhesive than can be covered before initial set takes place. Use waterproof adhesive throughout.

.2 Lay out each area to be tiled symmetrically from its axis. Adjust starting line so width of border tile shall be at least one half tile. Distribute tiles having varying tones or texture evenly over entire floor area to avoid patches or streaks, and to produce homogeneous blend. Reject tiles having undue variations in colour, shade and texture. Make tile joints flush, uniform, in straight lines and as inconspicuous as possible. Lay tile so that directional patterns of tiles are parallel to each other.

.3 Lay out tiles so that joints parallel to axis of room are continuous.

.4 Cut tile around excessively heavy or fixed objects. Roll tile with 150 lb (68.04 kg) roller immediately after laying. Lay tile so that it is flush with adjacent floor surfaces.

.5 Install metal edge strips at unprotected edges of resilient flooring.

3.5 APPLICATION – SHEET GOODS FLOORING

.1 Install flooring in strict adherence to the manufacturers recommenations.

.2 Apply precut sheet goods to glued substrate and roll to assure full adhesion and eliminate any air

pockets. Complete installation in accordance with manufacturer's specifications. Installation of transition strips at doorways to adjacent materials will require the installation of an vinyl or metal reduction strip.

3.6 APPLICATION - COVE BASE

.1 Fill cracks and level irregularities of surfaces to which base is to be applied with filler approved by adhesive manufacturer so as to provide solid backing over entire area behind base. Cement cove base to vertical surfaces so that gaps do not occur behind base, so that front lip of base cove bears firmly and uniformly on floor surface, and so that good and permanent bond is produced between base and surface to which it is applied. For right angled external corners use preformed matching cove corner units. Make end joints flush with gap.

.2 At wall ends and openings where ends of preformed corners come close together or touch or overlap, cut each corner unit equally so that a neat, inconspicuous joint is formed in middle of wall end or opening or so that filled gap, if gap is necessary, is not less than 1-1/2" (38 m) wide and located in middle of wall or end of opening.

3.7 ADJUST AND CLEAN

.1 Remove surplus adhesive from face of tiles as work progresses. Upon completion of work remove all markings and heel scuffs.

.2 Vinyl Composite Tile shall be cleaned, sealed, waxed and polished immediately after installation.

.3 Clean and wax the day prior to turnover to Owner.

.4 Sheet goods should be protected during construction and cleaned the day prior to turnover to the Owner.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Concrete	Section 03000
Rough Carpentry	Section 06100

1.2 SCOPE

.1 Supply and install all carpet as specified herein with borders as shown on Floor Finish Plan Drawings No. A903 and A904 and indicated on the Room Finish Schedule.

.2 Supply and install all adhesives, tools and related equipment and other incidental material required for this installation.

.3 The Installation of the carpet within the Egan Funeral Home shall be undertaken in Four Stages as outlined by the description of the work included in Section 01010 - Scope of Work.

1.3 PROTECTION

.1 Prevent adhesive from soiling carpet or adjacent surfaces.

.2 The area to be carpeted shall be free of other trades and exposed only to minimum foot traffic during initial installation and for 24 hours thereafter.

1.4 PREPARATION

.1 Before commencing installation of carpet, review all details in connection with the installation with the Architect.

.2 Test concrete surfaces with moisture meter before commencement of this work. Perform one test for each 80 square feet of floor area. Do not install carpet if moisture content is greater than 12%.

.3 Thoroughly vacuum all surfaces prior to installation and remove dust with damp cloth.

.4 Surfaces to be carpeted shall be thoroughly cleaned of oil grease or other substances detrimental to proper installation.

.5 Ambient working temperature shall be not less that 70F (20 C) and surface temperature shall not be less than 65F (18 C).

PART 2 – PRODUCTS

.1 The carpet shall be a 32 oz. solution dyed nylon carpet with action back. The carpet is a Custom Crossley Pindot, No. 1003245-003 as supplied by The Sullivan Source Inc., (416) 538-6336.

.2 The carpet underpad shall be a 1/4" Treadmore Rubber double stickdown undercushion, or equal. Provide samples for approval.

.3 Adhesive shall be Robert's direct glue down adhesive for double glue down applications.

.4 Seaming adhesive shall be as recommended by the carpet manufacturer.

.5 Provide all carpet base with hemmed edge. Colour of hemmed edging shall be to later selection.

.6 Carpet to meet standards as outlined by Section 14240 Hydraulic Elevator.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

.1 Installation shall be by this trade contractors own mechanics, skilled in the approved technique of carpet installation.

.2 Lay out required number of widths to cover entire area.

.3 Check for uniformity of colour. Off colour or other imperfect carpet shall be removed and replaced with proper material.

.4 Carpet shall be laid in as large sections as is possible with seams located in light traffic areas.

.5 All carpet shall be installed to provide a smooth, even continuous appearance conforming to the configuration of the surface beneath.

.6 Seams shall be inconspicuous.

.7 At doorways where carpet is joined, locate seams under door in its closed position.

.8 In all locations where carpet meets hard surface flooring, install edge cap. Mechanically fasten edge cap to prevent loosening.

.9 Finish carpet at under floor outlets and access panels in a manner approved by the carpet manufacturer.

.10 No seams shall be allowed closer than 12 feet in width of carpet on floor area.

.11 For border inserts, cut borders to specified dimension and ensure edges are finished with Latex coating to prevent unravelling.

3.2 DOUBLE GLUE DOWN UNDERPAD INSTALLATION

.1 Underpad shall be installed by the Double Glue Down method, in accordance with the manufacture's printed directions for this application.

.2 Spread adhesive using a notched trowel with notches 1/8" deep, 1/8" wide and 1/ 10" apart.

.3 Snap a chalk line on the floor in the exact location of the first seam.

.4 Lay out carpet at chalk line, roll back from edge and apply band of adhesive approximately three feet wide on either side of the line.

.5 Fold underpad on one side of line into cement and roll out any air bubbles toward seam.

.6 Apply a bead of seaming adhesive to cut edge at level of backing.

.7 Fold second width into position and roll out any air bubbles toward seam.

.8 Remove any excess adhesive immediately.

.9 Roll up un-cemented portion of each width in turn, apply cement and unroll underpad into cement.

.10 Install remaining width in the same manner.

.11 Roll each floor area immediately after underpad is in position in cement using a roller of at least 15 pounds in weight.

.12 Carpet shall be installed directly over the fully adhered underpad in accordance with the manufacturer's printed literature regarding a double glue down application. Undertake the installation of the carpet over the underpad in strick adherence to the manufacturers requirements.

.13 Spread adhesive using a notched trowel with notches 1/8" deep, 1/8" wide and 1/ 10" apart.

.14 Snap a chalk line on the floor in the exact location of the first seam.

.15 Follow the manufacturers recommendations for trimming the factory finished edge of carpet for butt joining.

.16 Lay out carpet at chalk line, roll back from edge and apply band of adhesive approximately three feet wide on either side of the line.

.17 Fold carpet on one side of line into cement and roll out any air bubbles toward seam.

.18 Apply a bead of seaming adhesive to cut edge at level of backing.

.19 Fold second width into position and roll out any air bubbles toward seam.

.20 Remove any excess adhesive immediately.

.21 Roll up un-cemented portion of each width in turn, apply cement and unroll carpet into cement.

.22 Install remaining width in the same manner.

.23 Roll each floor area immediately after carpet is in position in cement using a roller of at least 15 pounds in weight.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Shop priming of structural steel under Section 5A - Structural Steel.

.2 Priming and finishing of certain items under Section 58 - Miscellaneous Metals.

.3 Identification painting for mechanical and electrical equipment shall be provided by trade supplying equipment.

.4 See Room Finish Schedule on Drawings.

1.2 EXAMINATION

.1 Examine Specifications for various other trades, become familiar with their provisions regarding their painting. Paint or finish surfaces that are left unfinished by requirements of other Sections.

.2 If woodwork, metal or any other surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding, puttying operations, notify Architect in writing, or assume responsibility for and rectify any unsatisfactory finish resulting.

1.3 SUBMITTALS

.1 Prepare sample panels as requested by the Architect for approval before proceeding with the work. Approved sample panels shall serve as minimum workmanship standards for work of this Section.

.2 Supply Owner with one gallon of each colour and type of finishing material specified under this Section upon completion of the work.

1.4 STORAGE & PROTECTION

.1 Store paint, thinners, and other volatile materials in locked, well ventilated room away from excessive heat, accordance with current safety and regulatory standards.

.2 Used wiping cloths shall be stored in closed metal cans containing water. Cans shall be removed from the building after each day's work.

.3 Provide CO fire extinguisher in paint storage room.

.4 Post 'WET PAINT- signs while work is in progress and drying. Post "NO SMOKING" signs in paint storage room.

.5 Provide adequate ventilation at all times for protection against toxic fumes.

1.5 INSPECTION & TESTING

.1 Notify the Architect and paint manufacturer one week before painting begins.

.2 The paint manufacturer's representative shall visit the site weekly, or more often it requested, to enforce compliance with this Specification. Written reports shall be submitted to the Architect after each visit.

.3 Moisture readings must be taken on all surfaces requiring same using an electronic moisture meter; eg. ~ plaster, concrete, masonry, etc. Do not proceed with painting if readings above 12% are indicated. Promptly notify Architect if such conditions exist.

.4 Where one coat of paint has been applied, the work shall be inspected and approved by Architect before application of succeeding costs, otherwise no credit for coat applied will be given. Subcontractor automatically assumes responsibility to recoat work in question. Notify Architect when each coat has been applied and is completed for inspection and approval.

.5 Upon completion of the work of this Section, inspect all painted surfaces and repaint the damaged and unsatisfactory arms however mused. Damage mused by another trade shall be repaired by this trade and the cost for such repair shall be borne by the General Contractor or the trade musing the damage.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Formulae listed in Painting Schedule shall be manufactured by the Sherwin Williams, Para or approved equal, and applied in strict accordance to manufacturer's directions. Colours to later selection by the Architect.

2.2 PAINTING SCHEDULE

(a) Exterior Work:

1 .Iron and steel, control panels, doors, handrails, ornamental iron, etc.:

Ist Coat - Alkyd Rust Inhibiting Primer
2nd Coat - Alkyd - Gloss
3rd Cost - Alkyd - Gloss

2. Galvanized metal:

Ist Coat - Cement and Oil Primer
2nd Coat - Oil-Alkyd Finish - Gloss
3rd Coat - Oil-Alkyd Finish – Gloss

3. Wood Siding:

Ist Coat – Pigmented Oil Stain
2nd Coat – Pigmented Oil Stain

4. Wood Soffits:

Ist Coat – Clear Stain Wax (Cabot's #01 natural)(Or Equal for exteriors)
2nd Coat - Clear Stain Wax

(b) Interior Work:

1 . Softwood (Natural Finish):

(Wood frames, trim, paneling, and other exposed wood surfaces)
Ist Coat - Clear Stain Wax (Cabot's #01 natural)
2nd Coat - Clear Stain Wax

2. Hardwood (Stain Finish):

Ist Coat - Pigmented Oil Stain
2nd Coat - Alkyd Interior Satin Varnish
3rd Coat - Alkyd Interior Satin Varnish

3. Gypsum Board:

Ist Coat - Latex Primer Sealer
2nd Coat - Latex Finish Cost - Eggshell
3rd Coat - Latex Finish Coat - Eggshell

4. Concrete and Concrete Block (Gloss Finish):

Ist Coat - Latex Block Filler
2nd Coat - Alkyd - Gloss
3rd Coat - Alkyd - Gloss

5. Concrete and Concrete Block (Eggshell Finish):

1st Cost - Latex Primer Sealer
2nd Cost - Alkyd - Semi-Gloss
3rd Cost - Alkyd - Semi-Gloss

6. Miscellaneous Metals including shop primed cabinets, doors, control panels, door and screen frames, ornamental iron rails, registers, tanks, vents, etc.:

Ist Cost - Spot prime scratched or abraded arms or completely cost Alkyd Metal Primer
2nd Cost - Alkyd Semi-Gloss
3rd Cost - Alkyd Semi-Gloss

PART 3 – EXECUTION

3.1 PREPARATION

.1 All surfaces to be painted shall be clean, dry, free from all dust, dirt, plaster, mortar, rease, asphalt or other extraneous material that will affect the finished work.

.2 Wood surfaces shall be sanded smooth, removing any tool marks, and dusted clean. Nail holes, cracks, and defects to be puttied up only after the correct priming coat is dry. Fine sending and dusting shall be carried out between coats. Work shall not proceed 0 moisture content is over 12%.

.3 Gypsum board must be carefully inspected to ensure property filled joints, sanded smooth and flush with adjacent plaster board, so that completed paint work will be uniform in texture and

sheen. Fill small nicks or holes with patching compound and sand smooth.

.4 Concrete and masonry surfaces must be clean, free from all contamination with a moisture content no higher than 12%. Scrape off mortar nibs or cement spatter. Remove form oil by washing with Xylol. Remove efflorescence by dry brushing or washing with a dilute solution of muriatic, acid - 1 part commercial muriatlc acid to 20 parts water by volume - followed by complete rinsing with clean water. Mildew shall be removed by the application of one part sodium hypochloride (Javex) to three parts water. If dirt is also in evidence, add 1/2 lb. trisoclium phosphate to 1 gallon of the above solution. Scrub surface well and follow with a thorough clean water rinsing.
Very smooth concrete must be etched to achieve maximum adhesion. A solution of 1 part commercial muriatic, acid to 2 parts water by volume shall be applied to the concrete at the rate of 50 to 100 square fast to the gallon. After all foaming and bubbling action is complete, flush surface with high pressure clean water to remove cement laitence

.5 Ferrous metal shall be cleaned of all rust and mill scale to the satisfaction of the Architect and paint manufacturer's representative using the best method to reach this end, sandblasting, needle-gun, chipping, power or hand wire brushing. Weld flux shall be power tool cleaned and washed with water to remove alkali contaminants.

.6 Shop coated steel or iron shall have oil or grease contamination removed by solvent washing. Touch up abraded areas with rust inhibiting primer identical to that used for shop coating.

.7 Wash all galvanized metal surfaces thoroughly with mineral spirits and wipe clean using plenty of clean cloths.

3.2 WORKMANSHIP

.1 All work shall be executed by skilled and experienced workmen over clean, dry surfaces according to manufacturer's directions and under the supervision of the manufacturers representative.

.2 Application shall be by brush or roller. In special areas or under special conditions, spray equipment my be used on approval of the Architect.

.3 Coatings must be applied in a dust-free atmosphere with ambient temperatures not less than 10 deg. C Controlled ventilation must be provided during application and drying.

.4 No exterior painting shall be undertaken at temperatures 100C or less or immediately following rain, frost or dew, or when surfaces are damp or in the hot sun.

.5 Wood primer or undercoat must be applied by brush and well worked into the wood grain, cracks, splits and recessed nail heads. Priming costs on gypsum board, etc. must be spread evenly and completely to ensure good hold-out of succeeding costs of paint.
Each coat applied shall be thoroughly dry before the next cost is applied.
Follow manufacturer's directions for dry time.

.6 All finishes shall be uniformly applied, cleanly cut in, free from runs, holidays, sags, or variation of colour or sheen.

.7 Exposed door edges shall be finished the same colour and finish as door faces. Hidden edges to be sealed with two costs of varnish or paint. End grain of plywood, where seen, shall be filled and finished to match adjacent paneling.

.8 Nail holes, cracks, or splits in wood to be filled after priming cost is dry. After priming, nicks or

Imperfections in gypsum board shall be filled with suitable filler, sanded smooth and spot primed prior to top coating.

.9 Block filler shall sea] block with no pinholes allowed.

.10 Formulae specified are intended to cover surfaces perfectly. If, in the painter's opinion, formulae will not provide a first class finish, report same to Architect before commencing work. If surfaces are not covered perfectly, additional coats shall be applied at no additional cost to the Owner.

.11 Second, or intermediate paint coats should be lightened 10% to 25% from the Finish Coat colour.

3.3 APPLICATION

.1 All exposed surfaces shall be painted or finished as noted on the Room Finish Schedule as shown on the drawings.

.2 Do not paint aluminum, copper, stainless steel, chrome, plastic laminate, plates, washroom fixtures, manhole or catchbasin covers, unless specifically noted.

.3 All other surfaces shall be painted or finished except where specifically noted as unfinished.

.4 In areas indicted as unfinished on the Room Finish Schedule, painting is not required except for doom and frames, windows and frames, railings, steel stairs, insulation on mechanical equipment, pipes and fittings, and other items requiring protection including electrical panels in colours selected by the Architect.

.5 Interior of pipes or ducts visible through grille work shall be painted two coats of black matte finish.

.6 In all mass of doubt, whether a surface is to be painted or not, consult the Architect for final decision.

.7 Back prime interior wood before installation with appropriate primer.

.8 Back prime exterior wood trim before installation with Exterior Primer.

.9 Finish closets, cabinet interiors same as adjoining rooms, unless otherwise specified. Give drawer insides one cost pure white shellac and one coat of varnish.

END OF SECTION

PART I – GENERAL

1.2 SUMMARY

1. This section includes manufactured toilet compartments
1. Types of toilet compartments include:
   .1 Metal, Powder Coated Baked Enamel
2. Construction styles of toilet compartments include
   .1 Floor mounted, overhead Braced

1.3 SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data for materials, fabrication end installation including catalog cuts of anchors, hardware, fastenings, and accessories.
3. Shop drawings for fabrication and installation of compartment assemblies that are not fully described by architectural drawings. Provide template layouts and installation instructions for anchorage devices built into other work.
4. Samples of full color range for each required unit type.

1 .4 QUALITY ASSURANCE

1. Field Measurements: Take field measurements prior to component fabrication to ensure proper fitting of work.
2. Coordination: Furnish inserts and anchorages that must be built into other work for installation of toilet compartments and related items.

PART 2 – PRODUCTS

1. Floor mounted, top braced toilet partitions shall be baked enamel finished metal panels. Supply of washroom toilet partitions shall be sourced from one of the following manufacturers:
   A. Hadrian Manufacturing Inc.,
   B. Bobrick Washroom Equipment Ltd. or
   C. Watrous Sales Inc. shall be acceptable manufacturers.
2. Hinges: Heavy duty, self closing.
3. Slide Bolt and Keeper: Stainless steel with emergency access.

4. Hook: Combination robe hook and door stop complete with rubber bumper.
5. Door pull: Stainless steel
6. Fasteners: Stainless steel tamperproof type.
7. Anchors: As recommended by partition manufacturer
8. Partition enclosure for barrier free stall shall be internally reinforced to receive grab bars as required adjacent to the toilet locations in accordance with manufacturers requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

1. Take field dimensions of work upon which the work of this Section depends before fabrication. Field adaptation of work fabricated in error or without field check will not be allowed without Consultant's approval.

3.2 INSTALLATION

1. Erect work straight, plumb, true, level and secure to prevent distortion or displacement.
2. Clearance between panels and pilasters, and walls shall not exceed ¾" (19 mm).
3. Fasten panels and pilasters to walls with brackets. Fasten headrails to walls with brackets. Join lengths of headrails only at pilasters.
4. Clearance at vertical door edges shall be uniform and shall not exceed 3/16".
5. Secure brackets to wall with only:
    1. 1 ½" (38 mm) long expansion shields in solid masonry,
    2. Toggle bolts in cells of hollow masonry units,
    3. Sheet metal screws into metal framing at metal stud partitions.
6. Use only fasteners that match material and finish of fastened work where exposed to view.
7. Work shall include installation of partitions complete with anchorage of pilasters to supports, fastening of panels and pilasters to each other and to hanging of doors and attachment of bracing and specified hardware.

3.3 ADJUSTMENT AND CLEANING

1. Adjust operating hardware to work smoothly and without force. Adjust hinges of toilet partition doors so that all doors remain open to the same degree when unlatched.
2. Remove and replace damaged or defective work from site at no cost to the Owner.
3. Remove from all work, soil and dirt deposits resulting from fabrication and installation.
4. Provide final cleaning in accord with Division 1.

END OF SECTION

PART 1: GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Manually operated, paired panel operable partitions.

B. Related Sections include the following:

1. Division 3 Sections for concrete tolerances required.
2. Division 5 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
3. Division 6 Sections for wood framing and supports, and all blocking at head and jambs as required.
4. Division 9 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project with a minimum of 10 years experience in installing operable partitions. Installer employment resumes may be requested at any time by consultant or client.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Operable Partitions."

1.4 SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

C. Shop Drawings: Show location and extent of operable partitions. Include plans, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

D. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

E. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.6 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Partition Warranty period: Two (2) years from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, PRODUCTS, AND OPERATIONS

A. Manufacturers: Provide products by the following:

1. Modernfold, Inc. by LPA Solutions. Contact Mike Vetzal 905-728-7659 mvetzal@lpadesign.ca

B. Products: Provide the following product:

1. OP-01: Acousti-Seal #932 manually operated paired panel operable partition to suit opening size of dividing wall space between Visitation Room 203 and 204.

2.2 OPERATION

A. OP-01: Acousti-Seal #932: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.

C. Final Closure:

1. OP-01: Horizontally expanding panel edge with removable crank

2.3 PANEL CONSTRUCTION

A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. Panels thicker than 76mm will not be accepted. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel skin shall be:

1. OP-01: Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction:

a. 50 STC

C. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:

1. OP-01: Full leaf butt hinges, attached directly to the panel frame. Welded hinge anchorplates within panel shall further support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights:

1. OP-01: 50 STC - 8 lbs./square foot

2.4 PANEL FINISH

A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be:

1. OP-01: To be Vinyl Wall Fabric to match Selection for Room. The cost for the supply and installation of this material, for 54" wide vinyl wall fabric to match the material selected for the walls in the room shall be the same and from the same dye lot and batch. Co-ordinate ordering of material with General Contractor.

B. Panel Trim: No vertical trim required or allowed on edges of panels. Top and bottom panel trim of one consistent color:

1. OP-01: To Be Advised

2.5 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal bottom floor seals shall be:

1. OP-01: Modernfold IA2 Bottom seal. Automatic operable seals providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50-inch (13mm) to -1.50-inch (38mm) which automatically drop as panels are positioned, without the need for tools or cranks.

2.6 SUSPENSION SYSTEM

A. A. OP-01: #17 Suspension System

1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
   a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

2.7 OPTIONS

A. Available accessories/options:

B. OP-01: Pocket Doors: Acousti-Seal Pocket Doors by Modernfold, Inc., with same construction, finish, and appearance as the adjacent panels.

C. Pocket Door configuration shall be manually operated: Type II double door hinged to a jamb on each side and closing in the center.

PART 3: EXECUTION

3.1 INSTALLATION

A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

B. Install operable partitions and accessories after other finishing operations, including painting have been completed.

C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

PART I – GENERAL

1.2 SUMMARY

1. This Section includes for the supply and installation of a gas fireplace unit complete with all connections, piping and flue in accordance with the manufacturer's requirements.
2. This Section includes for the supply and installation of a precast concrete fireplace surround in accordance with the manufacturer's requirements.

1.3 SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data for materials, fabrication end installation including catalog cuts of anchors, hardware, fastenings, and accessories.
3. Shop drawings for fabrication and installation of compartment assemblies that are not fully described by architectural drawings. Provide template layouts and installation instructions for anchorage devices built into other work.
4. Samples of any alternate finishes associated with the fireplace unit and sampling of the precast colours for the fireplace surround.

1 .4 QUALITY ASSURANCE

1. Provide all required documentation to allow for the co-ordination with the work associated with the construction of the chimney and wall recess area in a timely manner to accommodate the schedule of the work.
2. Provide manufacturer's literature outlining the warrantee policy for the precast concrete fireplace surround.

PART 2 – PRODUCTS

1. Provide one natural gas fireplace unit complete with all rough-in kits, chimney flue and exterior chimney cap and flue, insert enclosure, wall mounted control unit and portable control unit as supplied with the Valor, Horizon Model 534ILN, Natural Gas Direct Vent Gas Fireplace Heater. This unit shall be supplied with a stone ledge rock liner.
2. The fireplace surround shall be the Fraser surround complete with the 4" x 4" wall mounted tiles to match and the 12" x 16" floor tiles to form a 16" deep flush threshold with the adjacent carpet finishes. The colour of the fireplace surround shall be to later selection by the consultant.
3. Provide all mounting hardware and materials to allow for the secure mounting of the fireplace.
4. Provide for the compatible adhesives as recommended by the manufacturer of the precast tiles and surround to allow for the secure mounting and placement of these tiles.
5. Provide the appropriate grout and caulkings required for the installation of the fireplace surround and the tile insert and the floor hearth area.

PART 3 – EXECUTION

3.1 EXAMINATION

1. Take field dimensions of work upon which the work of this Section depends and confirm that the rough in hearth and flue areas require with the manufacturer's requirements.

3.2 INSTALLATION

1. Erect work straight, plumb, true, level and secure to prevent distortion or displacement.
2. Clearance between fireplace assemblies and adjacent framed walls and drywall openings shall be in accordance with the manufacturer's requirements.
3. Fasten components of the fireplace chimney in accordance with the manufacturer's requirements.

3.3 ADJUSTMENT AND CLEANING

1. Adjust fireplace and the remote wall mounted controller and portable controller to confirm that the operation of the fireplace and the controls are all in accordance with the manufacturer's requirements.
2. Prior to occupancy of this area of the building, undertake a full cleaning of the unit, including the glass surface. Provide the Owner with a bottle of the manufacturer's recommended cleaning solution for the glass panel.
3. Provide the Owner a demonstration on the use and care of the unit and the associated precast concrete surround.

END OF SECTION

1.GENERAL

1.1 DESCRIPTION

.1 Work of this section includes:

.1 Supply and installation of Hydraulic passenger elevators as shown and specified.

Elevator work includes:

.1 Commercial, standard pre-engineered holeless hydraulic passenger elevators.

.2 Elevator car enclosures, hoistway entrances and signal equipment.

.3 Jacks.

.4 Operation and control systems.

.5 Accessibility provisions for physically disabled persons.

.6 Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.

.7 Materials and accessories as required to complete the elevator installation.

.2 Related Sections:

.1 Section 03300 Cast-In Place Concrete: Installation inserts, sleeves and anchors in concrete.

.2 Section 04200 Masonry: Installing inserts, sleeves and anchors in masonry, grouting of hoistway entrances.

.3 Section 05120 Structural Steel and Section 05311 Metal Deck and Section 05500 Metal Fabrications:

a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.

b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.

.4 09555 Carpet and Section 09900 Painting: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.

.5 Division 15000 Mechanical Plumbing:

a. Sump pit and oil interceptor.

.6 Division 15000 Mechanical HVAC:

a. Heating and ventilating hoistways and machine rooms.

.7 Division 16000 Electrical:

a. Providing electrical service to elevators, including fused disconnect switches.

b. Emergency power supply, transfer switch and auxiliary contacts.

b. Heat and smoke sensing devices.

c. Convenience outlets and illumination in machine room, hoistway and pit.

d. Handset in car connected to intercom system. Auxiliary emergency alarm bell in location outside hoistway including wiring to controller.

1.2 SUBMITTALS

.1 Product data: Submit product data for the following:

- .1 Elevator car enclosures and hoistway entrances.
- .2 Operation, control and signal systems.
- .3 Car finishes.

.2 Shop Drawings in accordance with Section 01300 Submittals:

- .1 Show equipment arrangement in the machine room/control space, pit and hoistway. Provide plans, elevations, sections specific to this installation, and details for assembly, erection, anchorage, and equipment location.
- .2 Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information. Indicate any variations from specified requirements.
- .3 Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
- ,4 Indicate electrical power requirements and branch circuit protection device recommendations.

.3 Colour Selection: Submit colour charts of exposed finishes and materials for colour selection.

- .1 When requested, submit samples of exposed finishes and materials selected for the elevator system materials and components.

.4 Manufacturer Certificate: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

.5 Operation and maintenance data. Include the following:

- .1 Operation and maintenance instructions.
- .2 Parts list with recommended parts inventory.

1.3 QUALITY ASSURANCE

.1 Manufacturer Qualifications: An approved manufacturer from these listed in this section.

- .1 Must be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances and all other major parts of the elevator operating equipment.
  - a. The major parts of the elevator equipment shall be manufactured in North America and not be an assembled system.
- .2 The manufacturer shall have a documented, on-going quality assurance program.

.2 Installer Qualifications: Elevator manufacturer or an experienced installer approved by

elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

.3 Regulator Requirements:

.1 ASME A17.1 Safety Code for Elevator and Escalators, CAN 3-B44, latest edition or as required by the local building code.

.2 Building Code: Ontario Building Code.

.3 NFPA 70 National Electrical Code.

.4 NFPA 80 Fire Doors and Windows.

.5 Americans with Disabilities Act Accessibility Guidelines (ADAAG).

.4 Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1 ½ hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

.5 Inspection and Testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.

.1 Arrange for inspections and make required tests.

.2 Deliver to the Owner upon completion and acceptance of elevator work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver elevator materials, components and equipment in manufacturer's protective packaging.

.2 Store materials in a dry protected area provided by others. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling or deterioration.

1.5 PROJECT CONDITIONS

.1 Prohibit Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the Owner.

.2 Painting:

.1 Except as otherwise specified, paint all metal work provided by the elevator manufacturer and installer.

.2 Provide all ferrous metals installed in the hoistway shop primed with a rust inhibitive primer.

1.6 WARRANTY

.1 Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.

1.7 MAINTENANCE

.1 Furnish maintenance and call back service for a period of 12 months for each elevator from date of Substantial Completion. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.

2. PRODUCTS

2.1 MANUFACTURERS

.1 Manufacturer:

.1 The elevator specified herein is a hydraulic elevator as manufactured by ThyssenKrupp Elevator, Model AMEE 50 or equal

.2 Materials, General

.1 Colours, patterns and finishes: As selected by the Architect from manufacturer's full range of standard colours, patterns and finishes.

.2 Steel:

.1 Shapes and bars: Carbon

.2 Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.

.3 Finish: Factory-applied baked enamel.

.3 Stainless Steel:

.1 Shapes and bars: No. 4 brushed or No. 8 polished stainless.

.2 Tubing: No. 4 brushed or No. 8 polished stainless.

.4 Bronze:

.1 Drawn pipe: Red brass.

.2 Sheet: Muntz metal.

.3 Extrusions: Architectural bronze.

.5 Aluminum:

.1 Sheet and plate: Commercial quality.

.2 Extrusions: Commercial quality

.6 Nickel Silver: Extrusions with polished finish.

.7 Plastic Laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.

.8 Glass: Clear laminated safety glass, complying with ANSI Z97.1, nominal 9/16" thickness.

.9 Carpet: As supplied for the remainder of the funeral home extend new carpet into the elevator cab. Must meet Class B fire-resistance rating when tested in accordance with ASTM E84. See Section 09555 – Carpet.

2.2 HOISTWAY EQUIPMENT

.1 Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed.

.2 Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

.3 Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

.4 Guide Shoes: Slide guides shall be mounted on top and bottom of the car.

.5 Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

.6 Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two Single jack assemblies typically mounted in the front structure of the car, with two telescopic sections designed to extend in a sychronized manner when oil is pumped into the Assembly. Each section shall be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system, which will not allow for seal movement or displacement during the course of operation. The Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor.

.7 Each jack section shall have a bleeder valve to discharge any air trapped in the section. **NOTE: INVERTED PISTONS ARE NOT ACCEPTABLE.**

.8 Terminal Limit Switches: Place limit switches in the hoistway near the terminal landings. Limit switches shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

.9 Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

.10 Failure Protection: Design electrical control circuit so if a malfunction occurs, due to motor starter failure, oil becoming low in the system, or the car failing to reach a landing in the up direction within a predetermined time, the elevator car will automatically descend to the lowest terminal or other designated landing. If power operated doors are used, the doors will automatically open when the car reaches that landing to allow passengers to depart. The doors will then automatically close and all control buttons, except the "door open" button in the car station, shall be made inoperative.

.11 Wiring, Piping and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade oil as specified by the manufacturer of the power unit.

.12 Emergency Terminal Shopping Device: Provide emergency terminal stopping devices for

speeds over 100 FPM. The emergency terminal stopping device shall operate independently of the normal terminal stopping device if it should fail to slow the car down at the terminal landing as intended. Stopping devices shall not be prevented from functioning by a single short circuit caused by a combination of grounds or by other conditions.

.1 Normal and emergency terminal stopping devices shall not control the same controller switches unless two or more separate and independent switches are furnished, two of which shall be closed in either direction of travel to complete the circuit to the control valve solenoids in the down direction and to complete the circuit to the pump motor for the up direction of travel.

2.3 POWER UNIT

.1 Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:

.1 Oil reservoir with tank cover.

.2 An oil hydraulic pump.

.3 An electric motor.

.4 Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and levelling valve, and electro-magnetic controlling solenoids.

.2 Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quite operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

.3 Drive: Drive shall be by direct coupling with the pump and motor submerged in the oil reservoir or by multiple V-belts and sheaves of number and size to ensure maximum factor of safety. Drive type shall be determined based primarily on the load on the car, travel and speed.

.4 Motor: Standard manufacturer motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.

.5 Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.

.1 Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.

.2 Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.

.3 Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

.4 Lowering valve and levelling valve shall be adjustable for down start speed,

lowering speed, levelling speed and stopping speed to ensure smooth "down" starts and stops.

.5 The levelling valve shall be designed to level the car to the floor in the direction the car is travelling after slowdown is initiated.

.6 Power controller shall contain electrical contractors, electro-mechanical switches and current overload relays. Mount components in a NEMA-1 enclosure. Logic control system shall be microprocessor based and protected from environmental extremes and excessive vibrations.

2.4 HOISTWAY ENTRANCES

.1 Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening.

.1 Manufacturer's standard entrance design consisting of 14 gauge frames with 2 inch (50 mm) profile, 18 gauge doors, hangers, hanger supports, hanger covers, fascia plates, sight guards and necessary hardware.

.2 Elevator wall interface with hoistway entrance assembly shall comply with elevator manufacturer's requirements.

.3 Doors: Flush construction

a. Main landing: ASTM A 366 steel panels, factory-applied baked enamel finish.

b. Typical landings: ASTM A 366 steel panels, factory-applied backed enamel finish.

.4 Frames: Formed construction.

a. Main landing: Cold-rolled sheet steel with factory-applied baked enamel finish.

b. Typical landing: Cold-rolled sheet steel with factory-applied baked enamel finish.

.2 Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Interlocks shall be designed to prevent movement of the car away from the landing until the doors are locked in the closed position as defined by code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at the landing or is in the levelling zone and stopping at that landing.

.3 Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.

.1 Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.

.2 Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.

.3 Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

.4 Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminium at the main landing and at typical landings.

2.5 CAR ENCLOSURE

.1 Car Enclosure:

.1 Walls: Cab type TKLP, durable wood core finished on both sides with high pressure plastic laminate.

.2 Canopy: Reinforced 14 gauge cold-rolled steel with hinged exit. Finish: Two coats factory applied reflective baked enamel.

.3 Ceiling:

a. Frame finish: Factory-applied baked enamel finish. Colour selected from manufacturer's standard selection chart.

b. Panel finish: Steel, factory applied baked enamel finish.

c. Lighting configuration for the cab shall be Island Type Halogen Downlight (Wood Cove), stainless steel finish No. 4.

.4 Cab Columns, Front, and Transom: Provide panels faced with brushed stainless steel.

.5 Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hand doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.

a. Door Finish: Steel: ASTM A 366 steel panels, factory-applied baked enamel finish.

d. Cab Sills: Extruded aluminium, mill finish.

.6 Handrail: Provide 1.5" diameter continuous metal baron side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails have a stainless steel, No. 4 brushed finish.

.7 Ventilation: Two speed exhaust fan mounted on the car top.

.8 Protection Pads: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.

.9 Finish Floor: Finished flooring to be provided by others with a maximum thickness of 3/8". (Carpet supplied & installed under Section 09555 – Carpet)

.2 Car top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.6 DOOR OPERATOR

.1 Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil check or other deviations are not acceptable.

.1 No Un-necessary Door Operation: Car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as the next car up.

.2 Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.

.3 Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.

.4 Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door movement is obstructed for a field programmable time, a buzzer will sound. If the multiple beam infra-red door protection system detects a person or object while closing, the doors will stop and resume closing after the obstruction has been removed.

.5 Limited Door Reversal: If the doors are closing an infra-red beam is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.

.6 Door Open Sentinel: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then open six times to try and correct the fault.

.7 Door Close Sentinel: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then close six times to try and correct the fault.

.8 Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

.2 Door Protection Devices: Provide a door protection system using 154 microprocessor controlled infrared light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen. A mechanical reopening device is not acceptable.

2.7 CAR OPERATING STATION

.1 Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The panel shall consist of the following pushbuttons, key switches and indicators:

.1 The bottom of the Car Operation Station shall contain the "door open", "door close", "alarm" buttons and a keyed "emergency stop" switch.

.2 The Intermediate area of the station shall contain floor buttons, which illuminate when a call is registered and remain illuminated until the call is answered. Raised

floor indications and handicap symbols shall be located to the left and immediately adjacent to the floor buttons. No applied symbols or floor indications or symbols on the buttons shall be permitted.

.3 The next level shall contain supplied options switches.

.4 The top of the Car Operating Station shall contain fire service features, including operating instructions, in accordance with ASME A17.1 and any local code.

.2 Position Indicator: A position indicator shall be contained above floor push buttons. As the car travels, its position in the hoistway shall be indicated by the illumination of the alpha/numeric character corresponding to the landing which the elevator is stopped at or passing.

.3 Emergency Light: Emergency light, capacity plate and elevator number shall be integrated into the top module. The emergency light shall consist of white LED's and be capable of putting out a minimum of four (4) foot candles, one foot in and four foot in front of the car swing panel. The emergency light will illuminate automatically upon loss of the building's normal power supply.

.4 Emergency Communications System: Provide an emergency communications device mounted integrally within the swing return. Emergency communications device shall comply with Americans and Disabilities Act (ADAAG) requirements.

.5 Auxiliary Operating Panel: Not required.

.6 Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

.7 Include the following special controls:

.1 Independent service switch

.2 Inspection switch

.3 Two speed fan/light switch

.4 Certificate frame

2.8 CONTROL SYSTEMS

.1 Controller: The elevator control system shall be microprocessor based and software oriented and be linked together for purposes of communication by a serial communications link. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landing.

.1 Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be cancelled when answered.

.2 When the car is travelling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has

been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is travelling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.

.3 When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be cancelled upon the stopping of the car at the landing.

.2 Microprocessor: Locate the main microprocessor and car controller in the elevator machine room, control space or hoistway.

.1 Microprocessor for door operator shall reside in the door operator and control all functions of the elevator door(s). Communication to the car controller shall be serial.

.2 Electronic selector shall reside on the car top and contain shall effect transducers that detect magnetic fields. Magnets, corresponding to floor positions and top/bottom of hoistway are mounted on a perforated metal tape that runs the length of the hoistway.

.3 Provide Simplex Selective Collective Operation, with automatic and independent service.

.4 Provide a key operated switch in the elevator for the purpose of removing the car from normal operation. When the switch is in the "independent service" position, the elevator will bypass all landing calls and answer only car calls. The operator will have complete control over the operation of the car.

.5 Emergency Power Operation: (Battery Lowering 10-DOC) When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to the lowest floor and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature is included in the elevator contract and does not utilize a building-supplied standby power source.

.6 Limited Access Features: None required.

2.9 HALL STATIONS

.1 Hall Stations, General: Provide buttons with red-illuminating LED halos to indicate that a call has been registered at that floor for the indicated direction. Provide 1 set of push button risers. Provide on set of push button risers with faceplates having a brushed stainless steel finish.

.1 Each terminal station shall contain one illuminating push button.

.2 Each intermediate station shall consist of two illuminating push buttons, one for the up direction and one for the down position.

.3 Phase 1 fire fighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

.2 Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

.3 Hall Position Indicating: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. Faceplate shall match hall stations. Provide at main landing only.

.4 Hall lanterns: Not required for this application.

2.10 MISCELLANEOUS ELEVATOR COMPONENTS

.1 Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspection interior parts without removing unit from oil line. Rubber hose without blowout proof features will not be acceptable.

.2 Vibration Pads: Mount vibration pads under the power unit assembly to isolate the unit from the building structure.

.3 Sound Insulating Panels: When pump and motor are not submerged, provide panels manufactured of reinforced 14 gauge steel with 1 inch (25 mm) thick 1-1/2 pound fibreglass core attached to interior and mounted on all four open sides of the power unit frame.

.4 Sound Isolating Couplings: When pump and motor are not submerged, install a minimum of two isolation couplings in the oil line in the machine room between pump and jack.

3. EXECUTION

.1 Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

.2 Submit Manufacturer's Certificate noted in 1.2 Submittals.

.3 Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

.4 Notify Consultants of my conditions, which would prevent acceptance and certification of elevator by Authorities.

3.1 INSTALLATION

.1 Install elevator systems components and coordinate installation of hoistway wall construction.

.1 Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installations and approved shop drawings.

.2 Comply with the National Electrical Code for electrical work required during installation.

.2 Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

.3 Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

.4 Set both jacks on pit floor and align plumb to ensure proper balanced operation.

.5 Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn Parts. Comply with AWS standards for workmanship and for qualification of welding operators.

.6 Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designated by the Contractor to ensure dimensional coordination of the work.

.7 Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

.8 Sound isolation: Mount rotating, vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent the transmission of vibrations to the structure, and eliminate sources of structure-borne noise from the elevator system.

.9 Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

.10 Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascias and toe guards after rough walls are finished. Set sill units accurately aligned and slightly above finish floor at landings.

.11 Lubricate operating parts of system where recommended by manufacturer.

3.2 FIELD QUALITY CONTROL

.1 Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.

.2 Advise Owner, Contractor, Architect and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.3 ADJUSTING

.1 Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.4 CLEANING

.1 Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a nonabrasive surface; shall not be cleaned with bleached-based cleansers.

.2 At completion of elevator work, remove tools, equipment and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.5 PROTECTION

.1 At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.6 DEMONSTRATION

.1 Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

.2 Make final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.7 ELEVATOR SCHEDULE

.1 Elevator Quantity

- .1 Elevator Model: AMEE 50 I Holeless Twinpost
- .2 Rated Capacity: 5000 lbs.
- .3 Rated Speed: 100 ft./min. nominal
- .4 Operation System: TAC20
- .5 Travel: 11'-6 ½"(±) (To Be Confirmed on Site)
- .6 Landings: 2 total
- .7 Openings:
  - a. Front: 2 required openings
  - b. Rear: 0 openings
- .8 Hoistway Size: 8'-2" wide x 10'-2"deep
- .9 Clear Car Inside: 5'-8" wide x 8'-5"deep
- .10 Cab Height: 8 nominal
- .11 Hoistway Entrance Size: 4'-6" wide x 7'-0" high
- .12 Door Type: Two Speed Side Opening
- .13 Power Characteristics: 600 volts, 3 Phase, 60 Hz.
- .14 Seismic Requirements: Zone 1

END OF SECTION

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Part 1 General

1.1 References

.1 ASME B1.20.1-1983 (R1992) - Pipe Threads, General Purpose (Inch)

.2 ASME B16.1-1998 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800

.3 ASME B16.3-1998 - Malleable-Iron Threaded Fittings

.4 ASME B16.29-1994 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV

.5 ASTM A 53/A53M-99b - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

.6 ASTM A 126-95e1 (1991) - Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings

.7 ASTM A 197/A197M-98 (1992) - Specifications for Cupola Malleable Iron

.8 ASTM A 307-97 - Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

.9 ASTM B 306-99 - Specification for Copper Drainage Tube (DWV)

.10 ASTM D 1784-99a - Specifications for Rigid (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

.11 ASTM F 477-99 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

.12 ANSI/AWWA C110/A21.10-98 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids

.13 ANSI/AWWA C111/A21.11-95 - Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

.14 ANSI/AWWA C900-97 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch Through 12 Inch for Water Distribution

.15 CSA A60.1-M1976 (R1992) - Vitrified Clay Pipe

.16 CSA A60.3-M1976 (R1992) - Vitrified Clay Pipe Joints

.17 CSA B70-97 - Cast Iron Soil Pipe, Fittings, and Means of Joining

.18 CSA B137.3-93 - Rigid Poly(Vinyl Chloride) (PVC) Pipe for Pressure Applications

.19 CSA B158.1-1976 (R1992) - Cast Brass Solder Joint Drainage, Waste and Vent Fittings

.20 CSA B181.1-96 - ABS Drain, Waste, and Vent Pipe and Pipe Fittings

.21 CSA B181.2-96 - PVC Drain, Waste, and Vent Pipe and Pipe Fittings

.22 CAN/CSA-B182.1-M92 - Plastic Drain and Sewer Pipe and Pipe Fittings

.23 CAN/CSA-B182.2-M95 - PVC Sewer Pipe and Fittings

.24 CSA B182.11-95 - Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings

1.2 General

.1 Pipe and fittings specified in this Piping Standard may not be available in all trade sizes. It is Contractor's responsibility to use only piping materials and fittings which are "stocked" sizes, in accordance with pipe sizes indicated on Drawings or in Specifications.

1.3 Within Building Area and to 1.5m (5'-0") Outside Building - Buried Sections

.1 NPS 8" and Smaller:

.1 Pipe and Fittings

.1 ABS or PVC drainage pipe and fittings with bell and spigot ends and conforming to CAN/CSA-B182.1-M92 or B182.2-M. Rubber ring gaskets integral with bell. Install in accordance with CSA B182.11-95 and with manufacturer's instructions.

1.4 Above Ground Sections - Drain and Vent Piping

.1 NPS 3" and Smaller:

.1 Pipe and Fittings

.1 Type DWV hard drawn copper drainage tube conforming to ASTM B 306-99 with wrought copper or cast brass solder joint drainage fittings to ASME B16.29-1994 and CSA B158.1-1976 (R1992) respectively.

.2 NPS 4" and Larger:

.1 Pipe and Fittings

.1 Cast iron soil pipe and fittings conforming to CSA B70-97. Use plain end pipe and fittings joined with neoprene sleeves with stainless steel gear type clamps except where local authorities do not approve their use, in which case use bell and spigot pipe and fittings with lead and oakum joints.

END OF SECTION

Part 1 General

1.1 References

.1 ASME B16.9-1993 - Factory-Made Wrought Steel Buttwelding Fittings

.2 ASME B16.12-1998 - Cast Iron Threaded Drainage Fittings

.3 ASTM A 47/A47M-99 - Specification for Ferritic Malleable Iron Casting

.4 ASTM A 53/A53M-99b - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

.5 ASTM A 183-98 (1990) - Specification for Carbon Steel Track Bolts and Nuts

.6 ASTM A 234/A234M-99 - Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

.7 ASTM C 14-99 - Specification for Concrete Sewer, Storm Drain and Culvert Pipe

.8 ASTM C 76-99 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

.9 ASTM C 443-98 (1990) - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

.10 ASTM D 2000-99 - Classification System for Rubber Products in Automotive Applications

.11 ASTM F 477-99 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

.12 CSA A60.1-M1976 (R1992) - Vitrified Clay Pipe

.13 CSA A60.3-M1976 (R1992) - Vitrified Clay Pipe Joints

.14 CSA B70-97 - Cast Iron Soil Pipe, Fittings, and Means of Joining

.15 CSA B181.1-96 - ABS Drain, Waste, and Vent Pipe and Pipe Fittings

.16 CSA B181.2-96 - PVC Drain, Waste, and Vent Pipe and Pipe Fittings

.17 CAN/CSA-B182.1-M92 - Plastic Drain and Sewer Pipe and Pipe Fittings

.18 CAN/CSA-B182.2-M95 - PVC Sewer Pipe and Fittings

.19 CSA B182.11-95 - Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings

.20 CSA B242-M1980 (R1998) - Groove and Shoulder Type Mechanical Pipe Couplings

1.2 General

.1 Do not use black steel pipe for storm water drainage where it will be concealed in walls, pipe chases or partitions.

.2 Pipe and fittings specified in this Piping Standard may not be available in all trade sizes. It is Contractor's responsibility to use only piping materials and fittings which are "stocked" sizes, in accordance with pipe sizes indicated on Drawings or in Specifications.

1.3 Within Building Area and to 1.5m (5'-0") Outside Building - Buried Sections

.1 Buried Sections:

.1 Pipe and Fittings

.1 ABS or PVC drainage pipe and fittings with bell and spigot ends and conforming to CAN/CSA-B182.1-M92 or B182.2-M95. Rubber ring gaskets to be integral with bell. Install in accordance with CSA B182.11-95 and with manufacturer's instructions.

.2 Above Floor Piping up to Roof Hoppers:

.1 Pipe and Fittings

.1 Cast iron soil pipe and fittings conforming to CSA B70-97. Use plain end pipe and fittings joined with neoprene sleeves with stainless steel gear type clamps except where local authorities do not approve their use, in which case use bell and spigot pipe and fittings with lead and oakum joints.

END OF SECTION

Part 1 General

1.1 References

.1 ASTM B 62-93 - Specification for Composition Bronze or Ounce Metal Castings

.2 ASTM B 88-99 - Specification for Seamless Copper Water Tube

.3 ANSI/AWWA C104/A21.4-95 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water

.4 ANSI/AWWA C110/A21.10-98 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids

.5 ANSI/AWWA C111/A21.11-95 - Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

.6 ANSI/AWWA C151/A21.51-96 - Ductile-Iron Pipe - Centrifugally Cast

1.2 Buried Piping - NPS 3" and Smaller

.1 Type "K" soft annealed copper tubing conforming to ASTM B 88-99 with no joints permitted below ground. Bend tubing using approved tube bender. Use type "K" soft annealed copper tubing for trap seal primer piping to traps installed in concrete floors.

1.3 Above Ground Piping NPS 3" and Smaller

.1 Pipe:

.1 Type "L" hard drawn copper tubing conforming to ASTM B 88-99.

.2 Fittings:

.1 Wrought copper, solder joint, pressure type. Provide solder to threaded adapters at screwed valves or equipment.

.3 Unions:

.1 All bronze construction with ground joint and either solder joint or screwed ends as required. Provide dielectric unions or couplings at all connections between copper tubing and ferrous piping.

1.4 Valves

.1 General:

.1 For pipe sizes 3" and less, furnish valves manufactured by Jenkins, Crane, or Kitz. Named manufacturer catalogue numbers are specified to indicate quality and features required.

.2 Provide bronze valves with bodies made of bronze conforming to ASTM B 62-93.

.3 Use gate and globe valves of a design which permits valve to be re-packed under pressure, when fully open.

.4 Provide valves with manufacturer's name or trade mark, figure number, and pressure rating, cast or stamped on valve body.

.5 Provide globe and check valves with composition discs with manufacturer's recommended disc for type of service on which they are to be used, unless otherwise specified.

.6 Provide iron body valves with renewable seats.

.2 NPS 3" and Smaller:

.1 Gate Valves

.1 Class 125 bronze body, wedge disc, non-rising stem and solder ends.

.2 Jenkins Fig. 313

.2 Globe Valves

.1 Class 125 bronze body, composition disc and solder ends.

.2 Jenkins Fig. 106BP

.3 Ball Valves

.1 Class 125 bronze body, screwed or solder ends, teflon seats, Viton "O" rings, bronze ball, lever handle with plastic protector, and bottom, end or split access to ball.

.2 Jenkins Fig. 31

.4 Check Valves

.1 Class 125 horizontal swing check, bronze body and disc, solder ends, regrindable seats and discs.

.2 Jenkins Fig. 4093

END OF SECTION

Part 1 General

1.1 References

.1 ASME B1.20.1-1983 (R1992)) - Pipe Threads, General Purpose (Inch)

.2 ASME B16.3-1998 - Malleable-Iron Threaded Fittings

.3 ASME B16.5-1996 - Pipe Flanges and Flanged Fittings

.4 ASME B16.9-1993 - Factory-Made Wrought Steel Buttwelding Fittings

.5 ASME B16.11-1996 - Forged Fittings, Socket-Welding and Threaded

.6 ASTM A 47/A47M-99 - Specification for Ferritic Malleable Iron Castings

.7 ASTM A 53/A53M-99b - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

.8 ASTM A 105/A105M-98 - Specification for Forgings, Carbon Steel, for Piping Components

.9 ASTM A 181/A181M-95b - Specifications for Forgings, Carbon Steel For General Purpose Piping

.10 ASTM A 197/A197M-98 (1992) - Specifications for Cupola Malleable Iron

.11 ASTM A 234/A234M-99 - Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

.12 ASTM A 307-97 - Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

.13 ASTM B 62-93 - Specification for Composition Bronze or Ounce Metal Castings

.14 ASTM B 88-99 - Specification for Seamless Copper Water Tube

.15 CSA B242-M1980 (R1998) - Groove and Shoulder Type Mechanical Pipe Couplings

1.2 Buried Piping

.1 Pipe and Fittings:

.1 Type "K" soft annealed copper tubing conforming to ASTM B 88-99 with no joints permitted below floor. Bend tubing using approved tube bender.

.2 Protect all joints and fittings with Shaw "Shrink-Sleeves" or a coating of Denso Paste wrapped with Denso Tape applied with at least 50% overlap.

1.3 Above Floor Piping, 2" and Smaller

.1 Pipe:

.1 Type "L" hard drawn copper tubing conforming to ASTM B 88-99. Type "L" soft annealed copper tubing may be used within convector enclosures.

.2 Fittings:

.1 Wrought copper solder joint pressure type, with IPS to copper adapters at screwed connections.

.3 Unions:

.1 All brass construction with ground joint and either solder joint or screwed ends as required. Provide dielectric unions or couplings at all connections between copper tubing and ferrous piping or equipment.

1.4 Valves

.1 Provide bronze valves with bodies made of bronze conforming to ASTM B 62-93.

.2 Use gate and globe valves of a design which permits valve to be re-packed under pressure when fully open.

.3 Provide valves with manufacturer's name or trade mark, figure number, and pressure rating, cast or stamped on valve body.

.4 Provide globe, angle and check valves with composition discs with manufacturer's recommended disc for type of service on which it is to be used, unless otherwise specified.

.5 Install plug valves in hot water piping at heating coils for balancing purposes where noted on Drawings.

.6 NPS 2" and Smaller:

.1 Gate Valves - Jenkins Fig. 1324, Class 125 bronze body, wedge disc, non-rising stem and solder ends.

.1 Jenkins
.2 Crane
.3 Kitz

.2 Ball Valves - Use Jenkins Figure 201J or 202J, 2760 kPa (400 psig) W.O.G., compact pattern bronze ball valves. Use valves with extension stems when installed in insulated piping.

.1 Jenkins
.2 Crane
.3 Kitz

.3 Globe Valves - Jenkins Fig. 1310, Class 125 bronze body, composition disc and solder ends.

.1 Jenkins
.2 Crane
.3 Kitz

.4 Check Valves - Jenkins, Fig. 4093, Class 125 horizontal swing check, bronze body and disc, solder ends, regrindable seats and discs.

.1 Jenkins
.2 Crane
.3 Kitz

END OF SECTION

Part 1 General

1.1 References

.1 ASME B16.3-1998 - Malleable-Iron Threaded Fittings

.2 ASME B16.5-1996 - Pipe Flanges and Flanged Fittings

.3 ASME B16.9-1993 - Factory-Made Wrought Steel Buttwelding Fittings

.4 ASTM A 53/A53M-99b - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

.5 ASTM A 105/A105M-98 - Specification for Forgings, Carbon Steel, for Piping Components

.6 ASTM A 181/A181M-95b - Specifications for Forgings, Carbon Steel For General Purpose Piping

.7 ASTM A 197/A197M-98 (1992) - Specifications for Cupola Malleable Iron

.8 ASTM A 234/A234M-99 - Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

.9 ASTM A 307-97 - Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

.10 ASTM B 88-99 - Specification for Seamless Copper Water Tube

.11 CAN/CSA-B137.4-92 - Polyethylene Piping Systems for Gas Services

.12 CAN/CSA-Z184-M92 - Gas Pipeline Systems

1.2 Buried Piping

.1 Pipe:

.1 Schedule 40 ERW or CW black carbon steel pipe conforming to ASTM A 53/A53M-99b Grade B with plain ends and factory applied Shaw "Yellow Jacket" of 22 mil minimum thickness polyethylene.

.2 Fittings:

.1 Class 2000 forged steel socket weld fittings conforming to ASTM A 105/A105M-98 Grade 2.

.2 Protect joints and fittings with Shaw "Shrink-Sleeves", or a coating of Denso Paste wrapped with Denso Tape applied with not less than 50% overlap.

.3 Cathodic Protection:

.1 Isolate buried piping between two buildings at both ends with dielectric unions, and protect by at least one 1 kg (2 lb.) magnesium sacrificial anode every 30 m

(100 ft.) of run, welded to the buried gas pipe, to manufacturer's installation instructions.

1.3 NPS 2" and Smaller Above Floor Piping (exposed)

.1 Pipe:

.1 Schedule 40 ERW or CW black carbon steel pipe conforming to ASTM A 53/A53M-99b Grade B, with threaded ends.

.2 Fittings:

.1 Class 150 black malleable iron screwed fittings conforming to ASTM A 197/A197M-98 and ASME B16.3-1998.

.3 Unions:

.1 Class 250 black malleable iron "Dart" type with brass to brass seat.

1.4 NPS 2" and Smaller Above Floor Piping (concealed)

.1 Pipe:

.1 Schedule 40 ERW or CW black carbon steel pipe conforming to ASTM A 53/A53M-99b Grade B, with bevelled ends.

.2 Fittings:

.1 Schedule 40 carbon steel buttwelding fittings conforming to ASTM A 234/A234M-99 WPB Grade B and ASME B16.9-1993.

1.5 Valves - Aboveground

.1 Furnish valves manufactured by Rockwell-Nordstrom, Newman-Milliken, or Walworth. Named manufacturer catalogue numbers are specified to indicate quality and features required.

.2 Provide valves with the manufacturers name or trade mark, figure number and pressure rating cast or stamped on the valve body.

.3 NPS 2" and Smaller:

.1 Class 175 wrench operated lubricated plug valve with semi-steel body, tapered plug and screwed ends.

.2 Rockwell-Nordstrom Fig. 142

END OF SECTION

Part 1 General

1.1 References

.1 ASME B31.5-1992 - Refrigeration Piping

.2 ASTM B 280-99 - Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

.3 CSA B52-05 - Mechanical Refrigeration Code

1.2 Rating

.1 Low Side - 1034 kPa (150 psig)

.2 High Side - 2068 kPa (300 psig)

1.3 Pipe

.1 Type ACR hard drawn copper tubing.

.2 Hard drawn copper tubing conforming to ASTM B 280-99.

.3 Provide deoxidized and dehydrated tubing, identified by the manufacturer as being suitable for refrigeration service and with ends factory sealed.

1.4 Fittings

.1 Heavy wrought copper, solder joint type with adapter fittings where screwed connections are necessary.

1.5 Flexible Hose

.1 To be provided on all refrigerant line connections to all equipment with reciprocating or rotating elements.

.2 Provide hoses of all bronze construction with braided wire exterior jacket and union connection on one end, with a minimum length of 6 times the diameter of the hose. Use Flexonics or Anaconda hoses, suitable for 150 C (300 F) max. temperature and 2760 kPa (400 psi) working pressure.

1.6 Sight Glass

.1 To be provided in refrigeration piping.

.2 Provide sight glass with combination moisture and liquid indicator feature and extended ends for solder joint connection.

1.7 Filter Dryer

.1 To be provided in refrigeration piping.

.2 Provide replaceable cartridge type filter dryer.

1.8 Unions

.1 150 C (300 F) maximum temperature rating, 2760 kPa (400 psi) working pressure, brass tail piece adaptors for copper tubing, forged steel flanges, steel bolts, bronze nuts and asbestos-free fibre gasket.

.2 Henry Valve Company Type P30.

1.9 Shut-off Valves

.1 135 C (275 F) max. temperature rating, 3100 kPa (450 psi) working pressure, bronze body, forged brass wing cap seal, back seating, molded ring packing, forged brass bolted bonnet with bonnet seal, solder ends.

.1 Globe - Henry Valve Co. Type 203.

.2 Angle - Henry Valve Co. Type 216.

1.10 Check Valves

.1 150 C (300 F) max. temperature rating, 3100 kPa (450 psi) working pressure, floating piston, teflon seat disc, bronze body, solder ends.

.2 Henry Valve Co. Type 205.

1.11 Construction Details

.1 Install piping to conform to applicable requirements of ASME B31.5-1992 Code for Pressure Piping Section 5 "Refrigeration Piping" and CSA B52-05 "Mechanical Refrigeration Code" latest issue.

.2 Make solder type joints with "sil-fos" silver solder or similar high melting point solder having a melting point of at least 538 C (1000 F). Remove all interior parts of refrigerant specialties and valves before applying heat to the joint.

1.12 Testing and Evacuation

.1 Test procedure and evacuation procedures to conform to ASME B31.5-1992.

.2 Test pressure in accordance with CSA B52-05.

1.13 Charging System

.1 Provide all refrigerant required for testing and charging the system.

.2 Purge refrigerant piping with anhydrous nitrogen prior to making connection to pre-evacuated equipment to ensure removal of all moisture and non-condensible gases.

.3 Completely evacuate to 67 Pa, seal and leave for 24 hours, re-evacuate to 67 Pa, and charge all components of refrigeration system not evacuated by manufacturer, in accordance with manufacturer's printed recommendations.

.4 Under no circumstance shall the refrigeration compressor be used to evacuate the system. Accomplish evacuation with a vacuum pump at an ambient temperature not less than 2 C (35 F) to ensure removal of all moisture and non-condensible gases.

.5 After testing, evacuation and charging is completed, allow system to operate under normal conditions for a minimum period of 24 hours, at which time, moisture indicator should indicate a dry system. If it does not so indicate, change dryer and operate unit for another 24 hours. Repeat this procedure until moisture indicator indicates a thoroughly dry system.

END OF SECTION

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Section 15010 applies to and governs work of all Sections of Division 15.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 References

.1 CAN/CGSB-1.40-M89: Primer, Structural Steel, Oil Alkyd Type.

.2 CAN/CGSB-24.3-92: Identification of Piping Systems.

.3 ANSI B31.1 to B31.9 inclusive: Piping.

.4 CSA B51-97: Boiler, Pressure Vessel and Pressure Piping Code.

.5 CSA B214-07: Installation code for hydronic heating systems

.6 ANSI/AWWA C651-92.

1.3 Description

.1 Provide work in accordance with full intent and meaning of Drawings and Specifications as required to result in complete operating systems.

.2 Drawings show arrangement and general design. Work is suitably outlined on Drawings with regard to sizes, locations, general arrangements and installation details. Mains and connections thereto are indicated more or less in diagram except where in certain cases Drawings may include details giving exact locations and arrangements required.

.3 Classify and apportion materials and performance of labour to several trades involved in accordance with local customs, rules, regulations, jurisdictional awards, decisions, insofar as they may apply and as required to efficiently execute work involved in this Contract.

.4 The word "Provide" where used in the Contract Documents, is to be interpreted as "supply and install".

1.4 Electrical Requirements

.1 General:

.1 Comply with requirements of Ontario Electrical Safety Code.

.2 All equipment specified in Division 15 or shown on Mechanical Drawings to be supplied and installed by Division 15 and wired by Division 16 unless

specifically indicated otherwise. Generally, all wiring above 50 volts by Division 16 and all low voltage control wiring below 50 volts by Division 15 unless otherwise indicated.

.3 The nominal electrical service available for mechanical equipment is 600 volts, 3 ph, 60 Hz, and 208 volts, 3 ph, 60 Hz, unless specifically stated otherwise on Drawings.

.4 Provide motors with all electrically driven equipment furnished under this Contract.

.5 If Consultant gives approval of substitution of any item of mechanical equipment, include and pay for all necessary electrical changes (labour, materials, overhead, etc.) due to substitution of equipment.

.6 Starters, Disconnects, Motor Control Centres, etc.:

.1 As specified in Division 16, Electrical.

.7 Identification of Electrical Equipment:

.1 As specified in Section 16010, Electrical General Requirements.

.2 Identification of Motors:

.1 Provide all motors with brass tags attached by small chain loop, bearing equipment identification of driven equipment as described on Mechanical Equipment Schedules. Stamp or engrave identification information with lettering of 9 mm (3/8") high min.

.3 Wiring:

.1 Provide power and control wiring as defined under respective Sections of Divisions 15 and 16. Refer to and conform with Division 16 for details of raceways, boxes, wiring, colour coding, etc.

1.5 ELECTRIC MOTORS

.1 Unless specified otherwise, use CSA approved motors with the following characteristics:

.1 370 watts (1/2 hp) and under - 115 volt, 60 hertz, single phase

.2 560 watts (3/4 hp) and over - 208/575 volt, 60 hertz, three phase

.2 Motors 370 watts (1/2 hp) and under: Use continuously rated squirrel cage induction type with capacitor start, CEMA "N" starting characteristics and a minimum of Class "A" insulation, unless specified otherwise.

.3 Motors 560 watts (3/4 hp) and over: Use continuously rated squirrel cage induction type with CEMA "B" starting characteristics and a minimum of Class "B" insulation.

.4 Use drip-proof type motor with a 1.15 service factor, unless specified or required otherwise by the motor location. Totally enclosed motors must be fan cooled and have a 1.0 service factor.

.5 Provide motors of adequate size and type for intended service. Unless stated otherwise, use ambient temperature of 40°C (104°F).

.6 Unless specified otherwise, starters for electric motors will be provided by Division 16.

.7 Where multi-speed motors are specified, ensure that motors are compatible with starters supplied under Division 16.

.8 All motors exposed to the outdoors to be TEFC.

.9 All motors 0.75 kW (1 hp) and above, use high efficiency type motors in accordance with ASHRAE/IES 90.1-1989 Standard. Submit with Shop Drawings the following information:

.1 Motor manufacturer's name
.2 Motor serial number
.3 Enclosure type
.4 Speed
.5 Efficiency nameplate reading

1.6 Submittals

.1 General:

.1 See Controls, Section 15900, for additional requirements.
.2 See Performance Testing, Recording, and Balancing, Section 15950, for additional requirements.

.2 Shop Drawings:

.1 Submit shop drawings for equipment supplied by Division 15 and as herein listed. Supplement shop drawings with brochures where necessary or as required. The initial submission of shop drawings for any one trade shall include a checklist of all related specified items for that trade to ensure complete submittal and review.
.2 Submit 8 (eight) copies of such drawings or brochures to Consultant for review. If items are not as specified, resubmit 8 (eight) corrected copies.
.3 Prepare shop drawings specifically for this work by qualified drafters, and in sufficient detail, to avoid decisions being made in shop or field.
.4 General shop drawings showing more than one size or model will not be considered unless properly marked up.
.5 Include performance data and characteristic curves with all fan and pump shop drawings.
.6 Submit suspension system shop drawings for all suspended equipment. Indicate location of suspension for equipment, maximum load at each of suspension points, size of suspension rods or members and details of supplementary structural steel framing members.
.7 Include wiring diagrams and schematics for equipment which has electrical controls or devices furnished with equipment. Wiring diagrams alone are not sufficient; schematic and interconnecting drawings, and sequence of operation of equipment are required for review.
.8 Clearly indicate materials and/or equipment being supplied, all details of construction, finish, accurate dimensions, capacities and performance on shop drawings and brochures. Have all drawings certified correct for construction by manufacturer, before submission. Identify equipment shop drawings with

designations as indicated on Drawings or in Specifications. If not complied with, shop drawings will not be reviewed and will be returned to Contractor.

.9 Each shop drawing and/or brochure must bear stamp and signature of responsible official in Contractor's and Subcontractor's organization, for each submission, as evidence that drawing has been checked against requirements as called for in Specifications and Drawings. Also, in cases where equipment attaches to and/or where there is external wiring connecting to other equipment, check that it has been properly coordinated with this equipment, whether supplied under this or other contracts.

.10 Revisions to shop drawings will not be allowed, after they are reviewed, unless further review and submission is required.

.3 Record Drawings:

.1 Maintain an accurate dimensional record of underground piping and deviations and changes in above ground piping, ductwork and equipment from Contract Drawings. Transfer this information to two sets of record drawings filed at project site and submit to Consultant at completion of project.

.4 Operation and Maintenance Instruction Manuals:

.1 Provide three copies of complete operation and maintenance instructions for equipment furnished under this Contract.

.2 Bind instructions in loose-leaf 3-ring binders. When only one volume is required, provide a complete index. When more than one volume is required, include in first book a complete index of all volumes and an individual index in each succeeding volume. Include following manuals:

.1 Control shop drawings and operating sequence, including wiring of components.

.2 Wiring diagram of control panels.

.3 Non-dimensional layout showing location of all electrical devices on mechanical equipment.

.4 Operating instructions, including start-up and shut-down procedure.

.5 Maintenance instructions, including preventive maintenance instructions for components of equipment.

.6 Lubricating instructions and recommended cycle of lubrication for each item of equipment, including various types of lubricants.

.7 Complete parts list of assemblies and their component parts, showing manufacturer's name, catalogue number, and nearest replacement source.

.8 List of recommended spare parts and quantity of each item to be stocked.

.9 Manufacturers' warranties and guarantees.

.10 Above applies to component parts of equipment, whether they are manufactured by Supplier of equipment or are supplied as a component part of item of equipment.

1.7 Quality Assurance

.1 Regulatory Requirements:

.1 Conform to governing Municipal and Provincial Codes, Rules and Regulations and/or Authorities having jurisdiction.

.2 Codes and Standards referred to hereinafter are by inference, in each case, latest issue of the Specified Code or Standard, including all revisions and amendments thereto as adopted and published at date of bid closing.

.3 Do all work and supply all equipment in accordance with requirements and recommendations of latest issue of applicable standards and codes of:

.1 National Standards of Canada (NSC)

.2 Canadian General Standards Board(CGSB)

.3 Canadian Standards Association (CSA)

.4 American National Standards Institute (ANSI)

.5 American Society for Testing and Materials (ASTM)

.6 American Society of Mechanical Engineers (ASME)

.7 Ontario Regulation 423/06 (Ontario Building Code) (OBC)

.8 Ministry of Housing Ontario Regulation 189/94 and 190/94

.9 Non-Venting of Refrigerants Ontario Regulation 413/94

.10 Halon Fire Extinguishing Equipment Ontario Regulation 388/97

.11 Ontario Fire Code(OFC)

.12 Ontario Ministry of Labour

.13 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

.14 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.4 Boilers, pressure vessels and fittings installed in pressurized system must be constructed, tested, approved and installed in accordance with Laws and Regulations of Technical Safety and Standards Association (TSSA) - Pressure Vessels Safety Branch.

.5 Install natural gas piping and equipment to conform with applicable requirements of CSA-B149.1-05, Natural Gas and Propane Installation Code

.6 Install equipment or devices for discharging products of fuel burning equipment to atmosphere in accordance with laws and regulations of Ontario Ministry of Environment, Air Pollution Control Act.

.2 Non-Venting Refrigerants:

.1 Do work in accordance with Ontario Regulations 189/94 and 190/94 under The Environmental Protection Act applying to all refrigerants.

.2 Discharge no refrigerant (venting or release) into environment.

.3 Comply with all applicable regulations and/or Authorities having jurisdiction concerning use, sale and disposal of refrigerants, use and disposal of refrigerant containers and required certification for handling, servicing and sale of refrigerants and refrigerant containing equipment.

.3 Permits and Fees:

.1 Obtain all permits required for installation of mechanical trades work, arrange for inspections tests therewith and pay all costs for permits, inspections, and associated fees. Obtain permits immediately after notification of award of Contract.

.2 Obtain copies of Drawings, from the [Consultant] [Architect]), for submission with application for permits.

1.8 Site Conditions

.1 Existing Service:

.1 Do not shut down or make connections to any existing service without written permission of the Consultant.

1.9 Changes in the Work

.1 Changes to the contract requiring additions to or deletions from the work of this Division shall be carried out upon written request of the Consultant. Extras to the contract or credits shall be submitted with a complete cost breakdown as follows:

.1 Materials, quantities and unit prices for all equipment required or deleted.

.2 Unit man hours per Item .1.

.3 Total material cost.

.4 Total man hours.

.5 Hourly rate. (Refer to Supplementary Conditions and General Contract).

.6 Total overhead and profit. (Refer to Supplementary Conditions and General Contract).

.2 Equipment and material costs shall be accepted at net costs only.

.3 Additional invoices, time sheets, and other evidence of costs shall be provided upon request by the Consultant to justify charges for additional work.

.4 Prices not submitted in this format will not be accepted.

1.10 Cash Allowances

.1 Refer to ...?

Part 2 PRODUCTS

2.1 Materials and Equipment

.1 Use materials and equipment as specified herein, or specified equivalent. Design of mechanical systems has been based on first listed supplier and model number/size stated in Equipment Schedules.

.2 Where an item of material or any equipment is specifically identified by a manufacturer's trade name and/or catalogue number, make no substitution except as provided for in Paragraphs 3, 4 and 5 below.

.3 In the case of some items of equipment, one or more additional names of acceptable equal manufacturers are listed in the Clause describing an item or a group of items. The design, layout, space allocation, connection details, etc., are based on the products named first in the description of each item. The products named first in the description of each item establish the quality of manufacture, and design standards, for all other

manufacturers of that item. The general approval indicated by listing the names of other manufacturers is to establish the quality of manufacture and design standards only and is subject to final review of shop drawings, performance data, test reports, production samples (if required) by [Consultant] [Architect], and equipment shipped to site. Ensure that the products used meet the requirements specified as shown on the Contract Drawings.

.4 Suppliers wishing to submit other items of equipment for approval as an equal to those specified must apply to the Consultant at least 14 days before Tender closing date. Requests must be accompanied by complete description and technical data on the items proposed. Approval for substitution of equipment will only be given on the understanding that all details, accessories, features and performance meet the Specifications unless otherwise stated. Deviations from the Specifications must be stated in writing at time of application for approval.

.5 Include in the Tender the equipment named in the Specifications or approved as an equal as in Paragraph 3 above. This will form the Base Bid. Any number of alternative bids, as defined below, may be included in addition to the Base Bid.

.6 Items of equipment by Manufacturers, not named in the Specifications, may be offered as alternatives to the manufacturers named in the Specifications. The alternative proposals must be accompanied by full descriptive and technical data, together with the statement of amount of addition or deduction from the Base Bid, if the alternative is accepted. Prior approval by the Consultant is not required on items submitted as alternative bids.

.7 After execution of the Contract, substitution of equipment will be considered only if equipment accepted cannot be delivered in time to complete the work in proper sequence, or if the manufacturer has stopped production of the accepted item. In such cases, requests for substitution must be accompanied by proof of equality and difference in price and delivery, in the form of Certified Quotations from suppliers of both specified and proposed equipment. Credit any decrease in price, involved in substitution, to the Owner by reduction of the Contract Price. The Contractor will not be reimbursed for any such increase in price.

.8 Where equipment other than the equipment used as a basis for design, layout and space allocation is used, produce and submit revised layouts of equipment, pipes, ducts, etc., in the areas affected. Submit these Drawings with the Shop Drawings. Failure to produce these Drawings is an indication by the Contractor that they are not required and the original space allocations are adequate for the substituted equipment.

.9 Name the Sub-Contractors and Manufacturers in the Bid as indicated in Clause "List of Mechanical Sub-Contractors and Manufacturers".

2.2 Drives and Accessories

.1 Drives:

.1 Select v-belt drives for 150 percent of motor size rating. Provide sheaves of cast iron construction with machined grooves. Provide sheaves of 75 mm (3") size and larger diameter with taper lock bushings. Statically and dynamically balance all sheaves as an operating unit. For multi-belt drives use matched sets.

.2 Provide adjustable pitch sheaves on motors of less than 11 kW (15 HP) rating, with diameter range selected to obtain specified RPM, of the driven equipment, at approximately the mid-point setting of the sheave.

.3 Provide solid type drive sheaves on motors of 11 kW (15 HP) and greater. Should such sheaves not provide design requirements under operating conditions, supply and install a new drive sheave of proper size at no additional cost to the Owner.

.4 Submit drive data with shop drawings of each item of driven equipment.

.2 Lubricating Devices:

.1 Furnish equipment with oil reservoirs with level indicators, or pressure grease fittings. Where fittings are not readily accessible, provide extended tubes to an accessible location. Grease fittings may be Zerk or Alemite but all fittings on project shall be one type.

.3 Drive Guards:

.1 Furnish guards, of all welded construction, on exposed rotating parts or elements and on all drives including the following:

.1 v-belt drives

.2 flexible couplings

.3 gear drives

.2 Provide total enclosure type guards for V-belt drives, on all equipment except fan drives, fabricated of min. 1.3 mm (18 ga.) black sheet steel with hinged side to allow access for lubrication, inspection or removal of the drive parts. Maximum clearance of openings in guards, to rotating parts, must not exceed 13 mm (1/2"). Make provision for slide rail adjustment.

.3 Provide guards for V-belt drives, on fans, as specified above except that sides of enclosure shall be 13 mm (1/2") mesh, 2.7 mm (0.105") wire screening.

.4 Provide tachometer holes at shaft centres, reinforced as required to maintain rigidity of guard.

.5 Fabricate guards, over flexible couplings, between motor and driven equipment of min. 1.3 mm (18 ga.) black sheet steel, readily fastened to the equipment baseplate and readily available. Leave a clearance of approx. 13 to 25 mm (1/2" to 1") between the guard and the coupling, and extend theguard to within 13 mm (1/2") of both motor and driven equipment housing.

.6 Rework any substandard guards, supplied with mechanical equipment, to conform to above requirements.

.4 Access Doors

.1 Acceptable Manufacturers:

.1 Ancon LeHage

.2 E.H. Price

.3 Titus

.2 Supply access doors for installation by other trade sections in wall or ceilings where accessibility is required for operation and/or maintenance of concealed valves, traps, cleanouts, dampers, VAV boxes and control equipment, etc. Unless otherwise specified on Drawings or in other Divisions of Specifications, or as

required to replace or repair said equipment, provide access doors at least 200 mm x 200 mm (8" x 8") size, fabricated of bonderized steel, with concealed hinges and screwdriver lock. Provide doors of a type and fire rating, where applicable, to suit particular type of wall or ceiling construction in which they are to be installed.

.3 Provide key locks where required, at each valve location for servicing. Use tamper proof screws for fastenings where security required.

.5 Welding Studs

.1 Graham
.2 Omark
.3 Nelson

.6 Concrete Inserts and Anchors

.1 ITW "Redhead"
.2 Star "SSS"
.3 USM "Parabolt"

.7 Pipe Sleeve Seal

.1 Thunderline "Link-Seal" Series LS

.8 Beam Clamps

.1 Grinnell
.2 Myatt
.3 Carpenter & Paterson

.9 Concrete Grouts

.1 Sika "Sikagrout 212"
.2 Master Builders "Embeco 636"
.3 Meadows V-3

.10 Bonding Agents

.1 Sika "Sikadur 32" Hi-Mod

.11 Drive Couplings

.1 Falk
.2 Fast
.3 Thomas

.12 Motors, Starters, Disconnects, Motor Control Centres

.1 Refer to Division 16.

.13 Cable Markers

.1 Electrovert Type Z
.2 Brady
.3 Mystik

.14 Pipe Hangers

.1 Grinnell
.2 Myatt
.3 Carpenter & Paterson

.15 Insulation Bearing Plates

.1 Grinnell
.2 Myatt
.3 Pipe Shields, Inc.

.16 Pipe Labels, Identification Tapes and Tags

.1 Brady
.2 Safety Supply Co.
.3 S.M.S.

.17 Firestopping

.1 Use only service penetration firestop components and assemblies certified by ULC in accordance with ULC-S115-M95 "Standard Method of Fire Tests of Firestop Systems".

.18 Isolating Unions

.1 Epco
.2 Marpac "Petro"
.3 Corrosion Service

.19 Caulking Compounds

.1 Denso-Plast
.2 Execution

Part 3 EXECUTION

3.1 Protection

.1 Protect all work and materials, before and after erection, from weather and other hazards, and keep in a clean and orderly manner.

.2 Protect pipe ends, valves, and parts of equipment left unconnected to prevent damage or intrusion of foreign matter. Provide pipe caps for threaded male connections, and plugs for threaded female connections.

.3 Protect plumbing fixtures and mechanical equipment, having a baked enamel finish, by covering with polyethylene sheet securely held in place. For additional requirements refer to Section 01001, General Requirements.

3.2 General Installation Requirements

.1 General:

.1 Conform with applicable requirements of Occupational Health and Safety Act and Regulations for Construction Projects.

.2 Measurements and Deviations:

.1 Where any parts of the mechanical work are specifically located by dimensions on Drawings, check and verify these dimensions on site prior to installation.

.2 Before installing piping, review architectural, structural, and electrical drawings with mechanical drawings. Where interference may occur, and departures from arrangements as shown are required, consult with other trade sections involved, come to agreement as to changed locations or elevations, and obtain approval of Consultant for proposed changes, before proceeding with work.

.3 Examine work of other trade sections and contractors, prior to commencement of mechanical installations. Report in writing, to Consultant, any discrepancies which will affect mechanical installations. Failure to do so shall be considered acceptance of conditions.

.4 Where Site conditions require minor deviations from indicated arrangements or locations, make such changes on approval of Consultant without additional cost to Owner.

.5 Should any discrepancies occur during installation of mechanical work, which will necessitate major revisions to mechanical trades work or work of other trade sections or contractors, notify Consultant immediately and obtain his written authorization before proceeding with the work.

.3 Scaffolding and Hoisting Equipment:

.1 Refer to and comply with requirements of Section 01001, General Requirements.

.2 Do not drill, cut or weld building steel, or building structure, for erection of materials or equipment, without prior written approval of Consultant.

.4 Overloading:

.1 During installation of mechanical work, do not load any part of building structure with load greater than it is capable of bearing. Bear full responsibility should any accident occur or damage result through violation of this requirement.

.2 Any temporary supports, used during installation, must be as strong as permanent supports.

.5 Attachment to Building Construction:

.1 Use welding studs of size not larger than 10 mm (3/8") for attaching miscellaneous materials and equipment to building steel. If weight of materials or equipment require bolts or studs larger than 10 mm (3/8") dia., use steel clips or brackets, secured to building steel by welding or bolting as approved by Consultant.

.2 Use self drilling expansion type concrete inserts for securing miscellaneous equipment and materials to masonry or concrete construction already in place, of sufficient number and size to prevent concrete from breaking away. Use of powder or power actuated fasteners will not be allowed unless prior written approval is obtained from Consultant.

.3 Install all inserts required for attachment of hangers, for suspension of ductwork, piping and equipment.

.6 Flashings:

.1 Furnish and set all required counter-flashings for gas vent stacks.

.2 Furnish and set all required stack flashings, for mechanical roof penetrations, unless they are noted to be supplied and installed by roofing trade.

.7 Cutting and Patching:

.1 Do not cut or drill holes through floors, roof or structural members before obtaining permission from the Consultant.

.2 For penetrations through walls, not required to have a fire rating, seal all spaces between pipe or pipe and surrounding wall construction with a fire-rated foam sealant. Use 3M Fire Barrier or Dow Fire Stop UL Classified fire rated foam sealant. Do this as the work progresses to avoid leaving inaccessible holes at completion of the job. For penetrations through parts of the building assembly, required to have a fire resistance rating or acting as a fire separation, see Clause 'Firestopping and Smoke Seal' in this Section.

.3 Where pipes and ducts are shown passing through existing walls, floors, and roof, cut and patch the necessary openings. Include the cost of all cutting and patching in the Lump Sum Contract Price for the work of Division 15. Before drilling holes through floors or roof slabs, accurately locate and note sizes for each required hole. Get approval of Consultant before any cutting is started.

.4 Remove and replace ceiling, where necessary, to complete the work of this Division, unless this work is specifically included in another Division.

.5 Should cutting, repairing, and patching of previously finished work, of other trades, be required to allow installation of mechanical work, pay all costs for trade section concerned to perform work.

.8 Firestopping and Smoke Seal:

.1 Provide a ULC Listed firestop system to seal around all piping, tubing, ducts, conduits, electrical wires and cables, and other similar mechanical services which penetrate part of a building assembly required to have a fire resistance rating or a fire separation. Refer to Architectural Drawings and Specifications Section 07840 "Firestopping" for building assembly and fire separation types and locations.

.2 For all penetrations through horizontal fire separations, required to have a fire resistance rating, use firestop systems with a FT rating not less than the fire resistance rating for the fire separation. This includes the sealing of any sleeves provided for future uses. In all other locations, use firestop systems with a F rating not less than the fire protection rating required for closures in the building assembly, required to have a fire resistance rating, or in the fire separation.

.3 For duct fire damper assemblies, caulk around interface of retaining angles with fire separation (both sides); and around interface of retaining angles with fire damper sleeve assembly (both sides). Use ULC listed firestop caulking material and apply in strict accordance with manufacturer's instructions.

.4 Before starting any work on site, submit detailed Shop Drawings to both the Consultant and the local Building Inspection Authority for their review and comments. Include:

.1 Manufacturer's technical product data and installation instructions for each specific type and location of penetration.

.2 Certification that proposed firestopping materials and assemblies comply with CAN4-115-M.

.3 ULC Listings with copies of ULC Data Sheets for each specific type and location of penetration.

.4 Make penetration types and locations on set of white prints. At completion of project, transfer this information to "As-Built" Drawings.

.9 Roof and Floor Openings:

.1 Locations and dimensions of curbs and roof and floor opening framing, where indicated on Drawings, are based on arrangement to suit above named supplier. Be responsible to verify actual size requirements of openings, and notify Consultant immediately in case dimension of unit supplied and connecting ductwork/piping, etc. are at variance with dimensions given on Drawings.

.2 Bear costs for modification of curbs and floor/roof openings resulting from failure to notify Consultant prior to fabrication or construction of opening framing and curb.

3.3 Equipment Installation

.1 General:

.1 Erect equipment in a compact, neat and workmanlike manner. Align, level and adjust for satisfactory operation. Install in such a manner that connecting and disconnecting of piping and accessories can be made readily and that all parts are easily accessible for inspection, operation, maintenance and repair.

.2 Install and start up items of equipment in complete accordance with the manufacturer's printed installation and operating instructions.

.2 Noise and Vibration:

.1 Select noise and vibration levels of equipment and systems to conform to design intent. If unnecessary noise or vibration should be created by any mechanical equipment and systems, and transmitted to occupied portions of building or other mechanical work, make all necessary changes and additions as approved by Consultant without additional cost.

.3 Lubrication:

.1 Lubricate all equipment prior to start up, in accordance with manufacturer's printed instructions. Provide all lubrication including sufficient quantity for drainage and refilling of oil sumps, or similar items when required by manufacturer's instructions.

.4 Equipment Bases and Pads:

.1 Section 03300, Cast-In-Place Concrete shall provide concrete work for this Division.

.2 Advise Consultant of any required changes in locations, dimensions of concrete structures, installation of anchors for equipment and related data at reasonable time to avoid disruption of work sequence.

.3 Assist in the supervision of concrete work installed for mechanical work that is included under work of Section 03300.

.4 Verify size of bases indicated on Drawings with actual requirements and advise Consultant and respective trade sections if change in size or shape of pad is required.

.5 Construct bases and pads at least 150 mm (6") high unless specifically stated or indicated as less on Drawings or directed by Consultant. Extend bases 75 mm (3") beyond centreline of anchor bolts or to a minimum of 50 mm (2") beyond equipment base. Chamfer all upper perimeter edges of base.

.6 Supply anchor bolts and sleeves, to trade section constructing bases, in sufficient time for setting in formwork, prior to placing concrete, and provide anchor bolt location drawing or template for locating anchor bolts. Check anchor bolt locations for proper position before concrete is poured.

.7 Setting and alignment of all equipment with rotating elements such as pumps, fans, or similar items must be carried out by millwrights to lines established with an engineer's level. Shim equipment, as required, using standard brass or bronze shim stock of suitable thickness to provide proper level and alignment. Re-check alignment prior to start-up of equipment.

.8 On approval of Consultant, concrete pads of 150 mm (6") maximum thickness may be poured by Section 03300 under equipment, after equipment is set in place, with concrete fully vibrated into place under equipment base plate. Coordinate this work with Section 03300.

.9 Ensure non-shrink, non-ferrous grout, of 25 mm (1") minimum thickness, is applied by Section 03300 between equipment base and concrete pad or foundation.

.10 Check equipment settings for equipment mounted on concrete pads, or foundations, prior to grouting by Section 03300.

3.4 Piping Construction Methods

.1 General:

.1 Unless specified otherwise herein, construct and install all piping in accordance with ANSI Sections B31.1 to B31.9 as applicable to service, except that soldered joints will not be permitted in compressed air piping.

.2 To avoid unnecessary cutting of masonry, provide inserts, sleeves and anchors to other trades for building in as work proceeds. Arrange with other trades to leave openings, slots and chases, to accommodate later installation of mechanical work.

.3 Inspect pipe and fittings for soundness and clean of all dirt and other foreign matter immediately prior to installation. Reject all damaged items.

.4 Install piping in most direct, straight, and functional manner possible. Except where otherwise shown, install all vertical lines plumb, and run horizontal lines parallel to building walls. Install piping close to walls, partitions and ceilings. On multiple runs of piping, space piping to allow for installation of insulation and for proper operation and servicing of valves.

.5 Ensure that trenches for piping, below grade, are dry and firm when laying pipe.

.6 In fill areas, provide a minimum clearance of 100 mm (4") on all sides of pipe passing under or through building grade beams, to prevent possible damage from settling of building. If a greater settlement can be expected, increase the clearance to prevent possible damage.

.7 Conceal all piping in finished areas and rooms within walls or ceilings, and in furred spaces elsewhere. Provide access doors or panels, as herein specified, for access to concealed piping specialties etc.

.2 Expansion and Contraction:

.1 Install all piping so as to be free from strain and distortion due to expansion and contraction as governed by requirements of ANSI B31.1, except as hereinafter modified. Allow for expansion and contraction by offsets, expansion U-bends or loops. Do not use expansion joints of any type unless specifically indicated on Drawings or specified under another Section of Division 15 for a particular installation.

.2 Base provision for expansion and contraction on 25 mm (1") movement per 30 m (100 feet) of steel pipe and 38 mm (1-1/2") movement per 30 m (100 feet) of copper or brass pipe for each 55°C (100°F) temperature difference from 21°C (70°F) ambient. Fabricate expansion bends in steel pipe from pipe sections and long radius welding elbows.

.3 Use swing or swivel joints, on all steam or hot water heating piping, for connections from mains to risers and from risers to radiation and other heating units. Use at least five fittings from main to riser including tee in main. Use at least four fittings from riser to heating unit including tee in riser.

.3 Piping Subject to Freezing:

.1 Where horizontal or vertical piping is run along an outside building wall, and concealed in a pipe space, circulation of interior air shall be maintained in the pipe space by means of an air grille(s), located at the top and the bottom of the pipe space, facing the interior of the building.

.2 Where horizontal piping is run in a ceiling space under uninsulated roof, the insulated pipe shall be encased in slab insulation on both sides and top and circulation of interior air shall be maintained in the encasement by means of air grilles, located in the ceiling below, facing down into the interior of the building. The spacing of grilles shall not be less than 3000 mm o.c.

.4 Lines, Grades and Slopes:

.1 Install piping in conformity with elevations and grades indicated on Drawings, using axis lines and bench marks provided under Section 01001, General Requirements; verify such axis lines and bench marks. Each trade shall lay out his work and be responsible for lines, elevations, measurements, etc., required for installation of his work.

.2 Slope piping drains and sewers as indicated on Drawings. Install so that slope between elevations indicated on the Drawings is even and constant.

.3 Install liquid and air lines free of pockets and pitch to drain, at low points in line, with valves or traps installed as required for drainage of the lines.

.4 When slope is not indicated on Drawings, install piping to following slopes:

.1 Drainage piping: 1:50 on drains of NPS 3 size and less and 1:100 on drains of NPS 4 and larger. In special circumstances as provided for under the Codes and Regulations and express approval of Consultant, drains of NPS4 size and larger may be laid at a lesser slope.

.2 Domestic water lines: pitch to low points so that all lines may be completely drained.

.3 Hot water heating, chilled water and condenser water lines: slope up 1:500 in direction of flow.

.4 Steam and condensate lines: slope down 1:500 in direction of flow.

.5 Compressed air, natural gas, fuel oil: slope down 1:1000 in direction of flow.

.5 Immersion Wells and Sensing Bulbs:

.1 Where a temperature sensing bulb or immersion well is installed in piping of NPS 2-1/2 size and less, increase the tee fitting and piping in which bulb or well is inserted, a minimum of one pipe size larger than adjoining pipe, to prevent restriction of flow of liquid.

.2 To improve heat transfer, pack all immersion wells in piping for liquids up to a temperature of 150°C (300°F), with a mineral type grease, prior to installation of sensing bulb.

.6 Pipe Joints:

.1 Ream all pipe ends and thoroughly clean all dirt, cuttings, and foreign matter from pipe after cutting and threading. Thoroughly clean all fittings, valves and equipment before connections are made. Cut copper tubing with a tube cutter and clean the joining surfaces of the tubing and fitting with fine emery cloth. Wipe clean with a dry cloth.

.2 Make screwed joints with Teflon tape or Masters metallic compound. Apply compound to the male threads only. Take particular care to prevent the compound from reaching the interior of the pipe or fittings.

.3 Install sleeve type couplings for cast iron plain end soil pipe, ie., Titan Foundry Type MJ, or Bibby MJ Series 2000, in strict accordance with manufacturer's printed instructions.

.4 Make joints, on cast iron bell and spigot soil pipe, with either neoprene compression type preformed gaskets such as Bibby "Bi-seal", or lead and oakum with a minimum of 0.5 kg (1 lb.) of leadper 25 mm (1") of pipe diameter, and caulk in such a manner to produce a permanently tight joint. Cold caulking compound in cord form, such as W.R. Meadows PC4, may also be used. Assemble preformed neoprene gaskets to manufacturer's printed instructions.

.5 Assemble mechanical joint, on ductile iron pressure pipe with cast iron gland, rubber sealing gasket, and high strength malleable iron bolts, in accordance with manufacturer's printed instructions.

.6 Install couplings, fittings, etc., on grooved end piping systems, in accordance with manufacturer's printed instructions.

.7 Make soldered joints, on copper tubing, in accordance with the following usage:

.1 Dom. Hot and Cold water: lead free with matching flux

.2 Drain, Waste, Vent: 50/50 with matching flux

.3 Hot water heating: 95/5 with matching flux

.8 Do not use core type solder. Use solder conforming to ASTM requirements.

.9 Make carbon steel welded joints, in compliance with latest acceptable practices, by electric arc welding, gas metal arc welding, or oxy-acetylene gas welding.

.10 Employ qualified welders holding a current up-to-date Provincial Certificate and Rating for process, as required by Provincial Regulations, for the works involved in this Contract.

.11 Conform to ANSI B31.1 Section IX for welding and be responsible to ensure that supervisory staff, fitters, and welders, are fully conversant with requirements laid down, by that Standard, prior to the commencement of welding.

.12 Unless more stringent methods of inspections are specified, the Consultant will visually inspect welded joints for fusion of metal, icicles, alignment, or similar items. Remove any defects and remake the joint to consultant's satisfaction.

.13 For welding of materials, other than carbon steel, conform to the requirements specified in relevant section of Specifications.

.14 Subject all steam, condensate, nitrogen and air lines, to a 10% radiography of welded joints in accordance with ASME Boiler and Pressure Vessel Code Section V.

.15 If more than the allowable number of welds prove to be unacceptable, pay all costs for a complete radiographic test of all joints in affected piping system. Re-weld and re-test unacceptable joints at no additional cost to the Owner.

.7 Unions and Flanges:

.1 Provide unions or flanges in following locations:

.1 For by-passes around equipment, control valves, devices in piping systems, and elsewhere indicated on Drawings.

.2 At connection to steam traps and in by-passes around traps.

.3 At connections to equipment (locate between shut-off valve and equipment).

.4 In screwed, or solder joint, drainage tubing at inlet side of trap.

.2 Do not conceal unions and/or flanges in walls, partitions or ceilings unless access thereto is provided.

.3 Provide dielectric unions, or isolating type companion flanges, at all connections between copper tubing and ferrous piping.

.4 Assemble flanged joints with appropriate flanges, gaskets, and bolting. Provide clearance between flange faces such that connections can be gasketed and bolted tight, without undue strain on pipingsystem, with flange faces parallel and bores concentric. Centre gaskets on flange faces so as not to project into bore. Lubricate bolts before assembly to assure uniform bolt stressing. Machine off raised face flanges, when joining to a flat companion flange, and use a full face gasket.

.8 Fittings:

.1 Use of couplings between fittings, valves, and equipment, will not be permitted except on long runs in pipe sizes NPS 2 or smaller. Where length of pipe between fittings requires a connection, make the joint by welding. Do not use running couplings in any pipeline.

.2 Fittings, and ancillary items installed in systems operating at pressures in excess of 103 kPa (15 psig), must be registered in accordance with CSA B51-97.

.3 Use eccentric reducing fittings in locations where piping changes size, and at connections to equipment and control valves, to provide proper drainage or venting of lines. Do not use bushings.

.4 Tee connections in welded piping may utilize either of the following:

.1 Factory fabricated standard buttweld fittings.

.2 Bonney Forge "Weldolets", "Thredolets" or "Sockolets".

.3 Mitring, notching, or direct welding of branches to mains, will not be permitted.

.5 Use standard pipe fittings for changing direction of piping. Mitred joints, or field fabricated pipe bends, are not permitted. Use long radius welded steel elbows unless short radius elbows are specifically authorized by the Consultant.

.9 Piping Connections to Mains:

.1 Make branch connections of steam, gas, and compressed air lines, to respective horizontal piping of larger diameter, to upper quadrant oflarger pipe.

.2 Make down feed piping connections, to horizontal supply and return water mains, on bottom quadrant of mains.

.10 Sleeves:

.1 Install sleeves where piping passes through foundations, above grade floors, and walls. Fabricate sleeves of Schedule 40 black steel pipe or type "K" copper tubing. Use 1 mm (20 ga.) galvanized sheet steel where installed in above grade drywall partions.

.2 Sleeves for piping passing through roofs will be supplied and installed under this Division, unless specifically indicated to be provided by other Sections, or Contracts, or under Roofing Section.

.3 Make sleeves large enough to pass full thickness of pipe covering where same is used, and with sufficient clearance between pipe and sleeve to allow for any lateral movement of piping due to expansion and contraction.

.4 Terminate sleeves flush with finished ceilings, walls and floors on grade. For piping passing through floors above grade extend sleeve a minimum of 75 mm (3") above the floor.

.5 For pipes entering structures from below grade, seal annular space between sleeve and pipe with prefabricated seals.

.6 In case of pipes passing through fire walls or through walls, partitions or floors, which are considered as serving as fire stops, and in partitions around washrooms, seal space around pipe, and in sleeve, in accordance with preparation and application requirements of Section 07840, Firestopping.

.7 Fill sleeves for future use with lime mortar.

.8 Assume all responsibility for setting of all sleeves, necessary for this work, in masonry walls during construction, or in concrete forms before concrete is poured.

.9 Coat exterior surface, of all ferrous material sleeves, with a heavy asphalt emulsion.

.11 Escutcheon Plates:

.1 Provide escutcheon plates on bare piping passing through finished walls or floors.

.2 Use escutcheon plates made of cast brass or stamped metal. Escutcheon plates to be heavy chromium plated and, if constructed in two pieces, fitted with substantial hinges and positive latches. Provide plates with tempered springs to ensure positive attachment to pipe.

.12 Valves:

.1 Supply and install valves in all locations indicated on Drawings, at all piping connections to equipment, at all connections to control valves or control devices, and where required for sectionalizing a system or floor.

.2 Use gate, butterfly, or ball valves, as indicated on Drawings, for shut-off purposes. Use balancing valves for throttling purposes.

.3 Install check valves wherever required to ensure flow of liquid in one direction.

.4 Provide drain valves with hose thread outlet connection, or valve with long nipple on outlet, at all low points of each water system, and above all riser or branch stop valves, for proper drainage of lines.

3.5 Sterilization of Potable Water Systems

.1 Flush each system, after completion, by allowing full flow of water through system for a period of fifteen minutes, or longer when directed by Consultant.

.2 After flushing of the system is completed, provide a 24 hour contact sterilization treatment by treating the water with 50 ppm of chlorine as recommended in AWWA Specification C-651. After sterilization period has elapsed, flush system to reduce chlorine content to an acceptable level.

3.6 Pipe Hangers and Supports

.1 General:

.1 Support or suspend all piping with necessary hangers, structural supports and/or brackets as shown on Drawings and/or as required, to prevent sagging, warping and vibration and to allow for movement due to expansion and contraction. Place hangers and supports close to fittings, valves and/or other heavy parts.

.2 Do not allow loads, of any nature, to be transmitted through piping connections to equipment not specifically designed for such loads. Where flexible connections are not called for at connections to equipment, support pipe by stands attached to both pipe and supporting structure so that force in any direction is not transmitted to the equipment.

.3 Provide suitably dampened spring hangers for first three supports from equipment connection on piping subject to excessive movement or shock from any source, thermal expansion and contraction, selected in accordance with ANSI B31.1. Where it is evident that no undue loads will be transmitted to equipment by system concerned, i.e. small bore connections to comparatively large equipment, cold service piping not subject to shock, etc., then spring hangers may be omitted.

.4 Use trapeze type hangers, where pipes are grouped together, unless specifically indicated otherwise on Drawings. Suspend horizontal member by adjustable rods

with locking feature for maintaining level and slope. Space trapeze type hangers based on closest interval required by any pipe supported thereon. Provide any auxiliary steel required to support trapeze between building steel.

.5 Do not hang any pipe, from another pipe, unless specifically indicated on Drawings.

.2 Saddles and Roller Supports:

.1 Provide saddles at roller supports for piping carrying liquids at 10.5°C (51°F) or higher. Weld saddles to black or galvanized steel piping. Refinish galvanized surfaces, destroyed by welding, with a zinc rich paint such as W.R. Meadows "Galvafroid".

.3 Hangers:

.1 For all insulated piping up to NPS 4, carrying liquids at temperatures 10.5°C (51°F) and higher, use standard weight clevis hangers with level adjustment and locknut.

.2 For insulated lines of NPS 4 dia. and larger, carrying liquids at temperatures 10.5°C (51°F) or higher, use adjustable roller type hangers with locknuts, and rollers of sufficient width to clear outside diameter of insulation on piping. Support rollers at both ends either by a yoke, swivel type hanger or by 2 adjustable rods with locknuts.

.3 For insulated piping carrying liquids at a temperature of 10°C (50°F) or less, use elongated clevis type hangers, with clevis of sufficient width to fit over insulation bearing plate.

.4 Provide insulation protection bearing plates at all hangers and supports for piping carrying liquids at a temperature of 10°C (50°F) or less. Install temporary spacers between plate and the pipe equal to thickness of insulation specified. (Refer to Section 15250, Thermal Insulation).

.5 Bearing plates may be either shop fabricated, or manufactured plates of size required to properly fit outside diameter of pipe insulation.

.6 Fabricate bearing plates conforming to the following table for various pipe sizes:

Pipe Size (NPS)	Length of Plate		Thickness of Plate	
	(mm)	(in)	(mm)	(ga)
½ through 1½	130	(5)	1.2	(18)
2	150	(6)	1.52	(16)
2½	200	(8)	1.52	(16)
3	230	(9)	1.52	(16)
4 and up	250	(10)	1.52	(16)

.7 Form bearing plates to outside dia of adjoining pipe insulation and extend plate up to the horizontal centre line of pipe.

.8 For non-insulated piping use clevis type of wrought steel construction with adjustable rod, level locking feature and backnuts.

.9 For copper tubing provide copper coated hangers. Regulations of some municipalities require that copper tubing be taped with a plastic tape at hanger

location, or hanger be provided with a plastic insert. Meet these requirements when required, in which case the copper coating may be omitted on the hanger.

.10 Attach hanger rods, to building structure, by means of malleable iron beam clamps, concrete inserts, and/or approved anchors as herein specified.

.4 Hanger Spacing:

.1 For horizontal runs of plumbing and drainage piping comply with hanger spacing requirements of OBC Part 7 (Plumbing).

.2 For horizontal runs of black or galvanized steel pipe, other than for plumbing service, do not exceed maximum distances between supports and with minimum diameter rods as follows:

Pipe Size (NPS)	Distance		Dia. of Rod	
	(m)	(ft)	(mm)	(in)
Up thru 1¼	1.8	(6)	10	(3/8)
1½	1.8	(6)	10	(3/8)
2	3.05	(10)	10	(3/8)
2½ & 3	3.66	(12)	12	(1/2)
4	4.27	(14)	16	(5/8)

.3 Provide additional hangers in locations where there are concentrated loads such as valves, specialties, etc.

.4 For horizontal runs of copper tubing for services other than plumbing, do not exceed 1.8 m (6 ft.) between hangers for lines up to and including NPS 3/4 and 2.4 m (8 ft.) for lines of NPS 1 and larger.

.5 For horizontal runs of piping fabricated of PVC for services other than plumbing, do not exceed 1.0 m (40 in) for pipe that is 12 to 25mm (½ to 1 in NPS), 1.8 m (72 in for pipe that is 32 to 100 mm (1-1/4 to 4 in NPS), and 2.4 m for pipe that is 150 to 300 mm (6 to 12 in NPS).

.6 In a horizontal run, PEX tubing shall be supported at intervals not exceeding 800 mm (32 in), unless otherwise specified by the manufacturer.

.5 Vertical Piping Supports:

.1 Support vertical plumbing and drainage piping as required by OBC Part 7 (Plumbing), unless more stringent requirements are specified herein.

.2 Support cast iron soil pipe at every floor and other piping at every other floor unless otherwise required by expansion conditions or otherwise specified.

.3 Support bottom of riser with base fitting set on concrete pier, or by hanger located at top of riser pipe and as close to riser as possible.

.4 For supports at intermediate floors, use Grinnell Fig. 261 or approved equal steel extension pipe clamp, bolted securely to pipe. Rest ends of clamp on the pipe sleeve or on the floor.

.5 Provide lateral stability, of vertical piping, by fabricated brackets or malleable iron extension type split hangers. Run vertical piping at columns in the column webs, on either or both sides of the column, unless otherwise directed by the Consultant.

.6 In a vertical run, non-metallic distribution piping shall be supported at its base where the run turns vertical. The distance between supports on a vertical run shall be no greater than 2000 mm (80in).

.6 Anchors and Guides:

.1 Supply and install anchors where indicated on Drawings and/or as required to maintain permanent location of pipe lines. Construct anchors, for steel or galvanized pipe, of approved steel straps and/or rods. For anchoring copper lines use copper plated anchors, or provide insulation bands between tubing and clamps, if steel straps or rods areused. Install anchors and guides in an approved manner.

.1 Acceptable Materials: Grinnell #256 or Myatt.

3.7 Excavating, Backfilling and Rough Grading List

.1 Section 02315, Excavating, Trenching and Backfilling, to provide excavating, backfilling and rough grading for Mechanical Work.

3.8 Disconnection and Demolition of Existing Work

.1 Disconnect and seal off mechanical equipment and services as required on Site.

.2 Be responsible for demolition and removal of mechanical equipment and services designated for removal on Drawings and as required by work, unless otherwise specified under Section 02221, Demolition.

.3 Mechanical work being removed under Section 02221, Demolition, shall be carried out under supervision of this Division. Do all disconnecting and capping prior to authorizing removal.

3.9 Miscellaneous Steel

.1 Supply and install miscellaneous structural supports, platforms, and braces, as required to hang or support all equipment, piping, ductwork and similar items, unless Drawings or other Sections of Specifications state otherwise. Do all work in accordance with Section 05500, Metal Fabrications.

.2 Where equipment is required to be floor mounted on stands or legs, use structural steel members of welded construction, or steel pipe and fittings, suitably braced and fitted with mild steel floor pads, or pipe flanges if using pipe and fittings. Submit shop drawings of proposed stands, for review, to the Consultant.

.3 Where ceiling or wall mounting is indicated or required, provide a suspended platform, bracket or shelf, constructed with standard steel members and steel plates, and of welded construction throughout. Provide rod hangers attached to building steel, by beam clamps, or to precast structure. Provide additional structural steel, as required between building steel, where beam spacing does not meet requirements. Inserts shall not be used unless specifically indicated on Drawings or approved by Consultant for any particular item of equipment. Attach brackets or shelves to vertical member, or sections of building structure, as herein specified.

3.10 Painting

.1 Painting and Cleaning:

.1 Touch up minor damage to finish on equipment with standard factory applied baked enamel finish. If, in the Consultant's opinion, the damage is too extensive to be remedied by touch up, replace damaged equipment.

.2 Clean steel by scraping, wire brushing or other effective means to remove base scale, rust, oil, dirt or other foreign matter.

.3 Apply 1 coat of zinc chromate iron oxide primer, conforming to CAN/CGSB-1.40-M89, to all miscellaneous steel.

.4 In field touch up all bolt heads and nuts, and previously unpainted connections and surfaces, damaged during erection, with primer as hereinbefore specified.

.5 Give two coats of primer to all surfaces which will be inaccessible after erection.

.6 Thoroughly remove all foreign matter, from steelwork, on completion of installation.

.2 Painting work Supplied by Sections 09911 & 09912, Interior & Exterior Painting:

.1 Finish painting of prime painted steel work specified herein and as indicated on Drawings.

.2 Painting of interior surfaces of air ducts that are visible through grilles and louvres (one coat of flat black paint to limit the line of sight).

.3 Complete painting of insulated (unless finished with PVC jacketing) and bare pipes.

.3 Supervision Supplied by Division 15:

.1 Provide assistance, in form of supervision, to Sections 09911 and 09912.

3.11 Pressure Tests

.1 Make specified pressure tests on all piping included in this Contract. Furnish all pumps, compressors, gauges and connectors necessary for tests.

.2 Conduct tests in presence of the Consultant and all other personnel of governing authorities having jurisdiction. Notify all parties in ample time to permit them to be present. Conduct tests before piping is painted, covered or concealed.

.3 Conduct hydrostatic tests for a minimum period of 2 hours, or longer when requested by Consultant or governing authority, at test pressure specified under respective Sections of Specifications.

.4 During this time the pressure shall remain constant and the exterior surfaces of pipe or fittings shall not show any cracks or other form of leak.

.5 For pneumatic tests, first pressurize system with air to approximately one-half specified pressure, but not to exceed 345 kPa (50 psig), and examine all joints for leaks with a soapsuds solution. After required repairs have been made and the soap test has been met satisfactorily, pressure system with air to test pressure specified under respective Section of Specifications.

.6 Conduct final tests on natural or propane gas piping in accordance with requirements of local Utility or governing authority. If feasible, make tests when ambient air temperature is approximately constant. Take into account corrections for pressure change, due to temperature differential, as approved by Consultant.

.7 Disconnect pumps or compressors, used for applying test pressure, during test period.

.8 Disconnect and/or remove equipment or specialties not designed to withstand test pressure during test. Reconnect same after completion of test.

.9 Promptly correct any defects that develop through tests and re-test to complete satisfaction of Consultant and other parties involved.

.10 Forward copies of all final tests on all pressure and drainage piping, and a copy of governing authority approvals, to Consultant immediately on acceptance of tests and/or approvals.

.11 Final payment for work will not be made until above has been received.

3.12 Performance Testing and Balancing

.1 Assume responsibility for testing, balancing, and placing all air handling and liquid systems in operation.

.2 Retain independent Balancing Firm to balance air and water handling systems.

.3 Provide all instruments required to test and balance systems. Install test probe inlets in ductwork and equipment in locations selected by Consultant. Balance systems in accordance with design requirements indicated on Drawings. Report to Consultant immediately any deficiencies in systems or equipment performance resulting in design requirements being unobtainable.

.4 On completion of testing and balancing of all systems, submit to Consultant a typewritten report (3 copies) of findings, including complete data of pump and fan performance, static pressures, air and water flow rates, final readings at all outlets, and ampere readings of all motors, taken at motor terminals when equipment is operating under full load conditions.

.5 Submit with each copy of report, complete sets of duct layout prints neatly marked in red ink, showing all locations at which test readings were taken, air volume, velocity and static pressure in each supply and return duct, and final reading at all outlets. Obtain duct layout prints for mark-up purposes from Consultant.

.6 Submit with each copy of report, complete sets of piping layout prints neatly marked in red, showing all locations at which test readings were taken, and flow measurement. Show differential pressure across pumps. Obtain piping layout prints from Consultant.

3.13 Cleaning, Testing and Approval Records

.1 Maintain records of all pressure tests, flushing and sterilization tests, glycol/water concentrations, inspections and approvals by Plumbing Inspector, and similar items and

forward these to the Owner on completion of work. Provide Consultant with copy of records on completion of each test, cleaning operation, and similar items.

3.14 Adjustment and Operation of Systems

.1 When work is complete, adjust all equipment items, of various systems, for proper operation within framework of design intent, and operating characteristics as published by equipment manufacturer.

.2 Additional instructions are specified under respective Sections of this Division.

.3 Consultant reserves right to require services of an authorized representative of manufacturer in the event that any item of equipment is not adjusted properly. Arrange for such services and bear all incurred costs thereof. After completion of adjustments, place the systems in full operating condition and advise Consultant that work is ready for acceptance.

3.15 Acceptance

.1 After all equipment has been installed and adjusted and all systems balanced, conduct performance tests in presence of Consultant. Arrange time for these tests at convenience of Consultant and Owner. Conduct tests under climatic circumstances to ensure complete and comprehensive tests and of such a manner and duration as Consultant may deem necessary.

.2 During these tests, demonstrate correct performance of all equipment items and of systems they comprise. Should any system or any equipment item fail to function as required, make such changes, adjustments or replacements necessary to meet performance requirements. Repeat tests until these requirements have been fully satisfied and all systems accepted by Consultant.

3.16 List of Mechanical Sub-Contractors and Manufacturers

.1 In the Bid Documents, name the Sub-contractors listed below. Use only one name for each item.

.1 Sub-Contractors:

.1 Testing and Balancing
.2 Insulation
.3 Outside Services
.4 Sheet Metal
.5 Plumbing and Heating Piping

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Use the latest edition of codes, acts, regulations, and standards listed.

1.2 System Description

.1 Gas Supply:

.1 From the existing gas meter, route as indicated on the drawings.

1.3 Quality Assurance

.1 Regulatory Requirements:

.1 Give necessary notices, obtain permits, pay fees and supply certificates as evidence that work as installed conforms with laws and regulations of governing authorities before final certificate of payment is issued by Owner.

.2 Determine detailed requirements of authorities having jurisdiction and conform to those requirements.

1.4 Protection

.1 Provide barriers, as required, in accordance with the Occupational Health and Safety Act.

.2 Protect trees and shrubs, as required, from damage.

1.5 Underground Services

.1 Notify required authorities in advance of planned excavations adjacent to their services and have them locate their services.

.2 Take care not to damage or displace encountered known and unknown services. When such services are encountered during execution of work, immediately notify Consultant and protect, brace and support active services. Where repairs changes or abandonment to these services become necessary, the following rules and procedure shall apply:

.1 Known Services: Repair promptly at no expense to Owner.

.2 Unknown Services: Repair promptly on Consultant's instruction. Submit complete breakdown of cost of work. Amount approved will be added to Contract Sum.

1.6 Project Conditions

.1 Occupant Considerations:

.1 Carry out work at such times and in such manner that use of Site, building and existing services will be interfered with as little as possible and with minimum inconvenience to occupants.

.2 Coordinate and obtain approval from Consultant for interruption of any essential services.

Part 2 PRODUCTS

2.1 Natural Gas Pipe

.1 Pipe:

.1 Schedule 40 ERW or CW black carbon steel pipe conforming to ASTM A 53/A53M-99b Grade B with plain ends and factory applied Shaw "Yellow Jacket" of 22 mil minimum thickness polyethylene.

.2 Fittings:

.1 Class 2000 forged steel socket weld fittings conforming to ASTM A 105/A105M-98 Grade 2.

.2 Protect joints and fittings with Shaw "Shrink-Sleeves", or a coating of Denso Paste wrapped with Denso Tape applied with not less than 50% overlap.

2.2 Pipe Bedding Materials:

.1 Class "B" Bedding: For pipeline materials except polyvinyl chloride (PVC), fill under pipe and up to centreline, well graded crushed stone or gravel conforming with ASTM C 33-99ae1. For PVC pipe, fill under pipe and up to centreline, Granular "A".

.2 From centreline of pipe to minimum depth of 300 mm (12") above top of pipe, use selected granular backfill. Backfill to be well graded granular material ranging in size from medium gravel to fine sand.

2.3 Backfill Materials Above Pipe Bedding:

.1 Trenches Below Areas not Subjected to Vehicular Traffic: From 300 mm (12") above top of pipe to subgrade of finish surface, use approved materials obtained from Site excavations, free from clods and stones over 76 mm (3") in diameter, waste material, organic material, debris or frozen portions. If sufficient quantity of materials is not available from excavations, use imported fill having same or better characteristics.

Part 3 EXECUTION

3.1 Excavating

.1 Contract Sum shall include for excavation in all types of strata except that classified as rock.

.2 If rock is encountered within limits of excavation immediately notify Consultant. Do not proceed with further excavation in area concerned until instructed. If rock excavation is required, it shall be paid for in accordance with the General Requirements of the Contract.

.3 Excavate with suitable machinery or by hand as may be necessary to depth and dimensions indicated on Drawings. Keep excavation free of water at all times by

pumping or system of drainage as required. Protect excavation to prevent damage or erosion by water, frost or other conditions.

.4 For watermains excavate to sufficient depth to provide minimum earth cover of ..... m (.....') for frost protection.

.5 For Class "C" bedding excavate trenches by machine to 50 mm (2") above pipe invert elevation. Complete final excavation by hand and shape to contour of pipe and couplings.

.6 Cut and trim banks of excavations evenly as nearly vertical as possible and shore if required to prevent caving-in.

.7 Keep bottom of excavation clean and clear of loose material. Slope or grade as required.

.8 Provide shoring in accordance with requirements of Occupational Health and Safety Act, 1980 and Regulations for Construction Projects and all other regulations of Ministry of Labour.

.9 Notify Consultant immediately if unstable ground which is unsuitable for bearing of pipes or any excessive seepage zones are encountered. Consultant will decide on method of pipe installation and/or corrective measures to be implemented.

.10 When Excavating Rock:

.1 Rock excavation shall include solid rock in ledges, stratified deposits, unstratified masses and conglomerate deposits or any other material so firmly cemented by natural processes as to present characteristics of solid rock, being so hard or so firmly cemented that, in opinion of Consultant, it is not practical to excavate and remove with power shovel except after thorough and continuous drilling and blasting.

.2 Excavation of rock by blasting shall be undertaken by qualified explosive expert who will supervise blasting, subject to approval of Consultant.

.3 If rock removal is required close to buildings, make pre-blast survey of existing conditions for acceptance by Consultant before any blasting is commenced.

.4 Execute blasting operations in accordance with requirements of Occupational Health and Safety Act, 1980 and Regulations for Construction Projects.

.5 Totally indemnify Owner against claims for injury or damage to persons or property due to blasting operations and repair any damage to buildings and/or property resulting from such operations.

3.2 Pipe Laying

.1 Handle, lay, bed, join and cover pipes in such manner as to preclude any possibility of damage thereto.

.2 Clean pipe before laying and protect from dirt and water infiltration.

.3 Lay and join pipes in accordance with written manufacturer's instructions and generally in straight lines and to required even grades.

.4 Use Class "B" bedding for sanitary and storm sewers and watermains.

.5 Use Class "C" bedding for watermains.

.6 Where pipes enter or leave maintenance hole catch basin or other structure, support pipes to first joint on compacted 19 mm (3/4") crushed stone bed or concrete cradle. Stone bed shall extend laterally between trench walls down to trench bottom from first pipe joint to face of wall through which pipes pass.

.7 Handle, lay and join ductile iron pipe and fittings in accordance with ANSI/AWWA C600.

.8 Handle, lay and join asbestos-cement pipe and PVC plastic pipe in accordance with manufacturer's written instructions. Ensure 1 copy of these instructions are available at any time for inspection in Contractor's field office.

.9 Handle, lay and join concrete pipe in accordance with Ontario Concrete Pipe Association installation manual or ANSI/AWWA M9-79 manual for concrete pipe installation.

.10 Install concrete anchor blocks at all bends, tees, caps and plugs on pressure pipelines.

.11 Handle and install precast maintenance holes and catch basins in accordance with Ontario Concrete Pipe Association guidelines for ordering, handling, and installing precast maintenance holes.

.12 Form concrete benching in maintenance holes to provide smooth unobstructed flow channel in bottom of maintenance hole with slopes of 8:1.

.13 Install fire hydrants and gate valves in conformance with manufacturers published recommendations.

.14 Provide water service connections in conformance with requirements of the local authority.

.15 Provide cathodic protection for ferrous piping. Prime and coat thermite weld connections.

.16 Backfilling:

.1 Obtain Consultants review of trenches before starting to backfill. Place backfill in maximum 150 mm (6") thick uncompacted layers. Compact each layer before placing next. Backfill trenches carefully to prevent injury to work and subsequent settlement and execute backfilling generally as follows:

.17 Pipe Bedding:

.1 For Class "B" bedding place minimum of 150 mm (6") of specified granular backfill below pipe invert elevation and compact to 98% of Standard Proctor density, ASTM D 698.

.2 For Class 'C" bedding where trench bottom is of compact relative density or denser, trim base soil to pipe shape without compaction. Where trench bottom is loose in relative density, base soil will require compaction to 98% Standard Proctor density before soil is shaped to support pipe.

.3 For all pipe bedding classes, after pipe is laid, backfill trench up to pipe centreline with specified backfill material and compact to 98% of Standard Proctor density. Backfill trench from above pipe centreline to 300 mm (12") above pipe in maximum uncompacted layers of 150 mm (6") thickness and compact to 90% of Standard Proctor density.

.18 Backfill Above Pipe Bedding:

.1 Backfill trenches in areas subjected to vehicular traffic with approved, specified material from 300 mm (12") above top of pipe to sub-base level and compact to 98% of Standard Proctor density.

.2 Backfill trenches in areas not subjected to vehicular traffic with approved specified material from 300 mm (12") above top of pipe to subgrade and compact to 95% of Standard Proctor density.

.3 Use equipment suitable for compaction work required and to satisfaction of Consultant.

.4 Add water during compaction only to raise moisture content of backfill material to optimum.

.19 Field Quality Control

.1 Testing and Disinfection of Watermains:

.1 Carry out test on watermains in presence of Consultant.

.2 Commence leakage tests when trenches are partially backfilled. Complete backfilling after tests are completed and reviewed by Consultant.

.3 Apply and maintain pressure of ..... kPa (..... psi) for 2 hours without further pumping; make good excessive leakage or weeping by repairing pipelines and continue tests until amount of leakage is reduced to allowable limits. Allowable leakage shall be AWWA standards for type of pipe used.

.4 Disinfect watermains, in accordance with ANSI/AWWA C651 and requirements of local authorities.

.5 Flush watermains after disinfection solution has been in lines for at least 3 hours at pipeline extremities. Flush until water is equal chemically and bacteriologically to Municipal or other permanent water supply.

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Mechanical General Requirements, Section 15010.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 References

.1 CAN/ULC-S102-M88 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/CGSB-51.9-92 - Mineral Fibre Thermal Insulation for Piping and Round Ducting.

.3 CAN/CGSB-51.10-92 - Mineral Fibre Board Thermal Insulation.

.4 CAN/CGSB-51.11-92 - Mineral Fibre Thermal Insulation Blanket.

.5 CAN/CGSB-51.20-M87 - Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.6 SMACNA - Sheet Metal and Air Conditioning Contractors National Association.

1.3 Description Of Work

.1 Thermal insulation to piping, ductwork and equipment, including but not limited to following:

- .1 Domestic cold water piping and city water piping;
- .2 Hot water piping (domestic and hydronic heating systems);
- .3 Storm and sanitary drain piping (as noted in Part 2);
- .4 Existing mechanical services (piping, equipment or ductwork) where existing insulation has been removed in part or entirely as part of Work;
- .5 Refrigerant piping;
- .6 Sheet metal work.

.2 Do not insulate following systems and equipment:

- .1 Natural gas piping;
- .2 Vertical sections of rainwater leaders (except in high humidity areas such as shower rooms and locker rooms);
- .3 Vertical sections of exposed sanitary drainage piping;
- .4 Heating system expansion tanks.

.3 Following equipment will be factory insulated:

.1 Domestic hot water heaters;

.2 Variable volume terminal boxes

.3 Inline fans.

.4 Refer to Section 15700, Air Distribution, for internal ductwork insulation.

1.4 Quality Assurance

.1 Provide new, undamaged insulating materials of types specified for each application.

.2 Qualifications of Applicators - Use skilled insulation applicator with established reputation and specializing in this type of work.

1.5 Regulatory Requirements

.1 Comply with OBC and requirements of local and Provincial authorities having jurisdiction.

.2 Provide fire retardant type insulation materials, coverings and adhesives with flame spread/smoke developed ratings not exceeding 25/50 when tested in accordance with CAN/ULC-S102-M88.

.3 Properly identify insulation materials, coverings and adhesives when required by Federal and/or Provincial Health and Safety WHMIS legislation.

1.6 Delivery, Storage and Handling

.1 Deliver, store and keep insulation materials in original cartons or containers until immediately prior to application. Keep dry during shipping and storage.

.2 Keep adhesives in original containers with manufacturer's name and catalogue number clearly stated. Protect contents against freezing.

Part 2 PRODUCTS

2.1 Domestic Cold Water And City Water Piping

.1 Fibrous glass split sectional pipe insulation conforming to CAN/CGSB-51.9-92 25 mm (1") thickness with factory applied vapour barrier jacket and self-seal lap joint.

.2 Micro-Lok with AP-T jacket by Schuller International Inc., or Alley K with all purpose AP-T jacket by Manson Insulation Inc., or 850 with ASJ/SSL jacket by Knauf Fiber Glass.

.3 Fire retardant elastomeric closed cell foam or neoprene tubing of 10 mm (3/8") nominal thickness may be used instead of fibrous glass insulation on cold water runouts to plumbing fixtures, not exceeding 1.5 m (5') in length, applied in accordance with manufacturer's printed instructions using recommended adhesive.

.4 AP/Armaflex by Armstrong Industries Inc., or Therma-Cel (polymer foam) by Nomaco, or Rubatex by Rubatex Corporation.

2.2 Hot Water Piping (Domestic And HW Heating Systems)

.1 Fibrous glass split sectional pipe insulation of the thickness hereinafter specified with factory applied vapour barrier jacket and self-seal lap joint.

.2 Micro-Lok with AP-T jacket by Schuller International Inc., or Alley K with all purpose AP-T jacket by Manson Insulation Inc., or 850 with ASJ/SSL jacket by Knauf Fiber Glass.

HOT WATER PIPING – Pipe Insulation Thickness							
Fluid Design Operating Temperature °F	Insulation Conductivity		Pipe Size (NPS) and Insulation Thickness (in)				
	Conductivity Btu-in/(h-ft^2-°F)	Mean Rating Temp. °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
105-140	0.22-0.28	100	0.5	0.5	1.0	1.0	1.0

2.3 Storm and Sanitary Drain Piping

.1 Insulate exposed horizontal above floor storm and sanitary drain piping within building, and concealed horizontal storm drains.

.2 Insulate vertical sections of rainwater conductors between body of roof drain and horizontal section of pipe, also any exposed vertical piping in high humidity areas such as locker and shower rooms.

.3 Insulate exposed waste pipe of handicapped lavatories.

.4 Insulation shall be fibrous glass split sectional pipe insulation conforming to CAN/CGSB-51.9-92 of 25 mm (1") thickness with factory applied vapour barrier jacket and self-seal lap joint.

.5 Micro-Lok with AP-T jacket by Schuller International Inc., or Alley K with all purpose AP-T jacket by Manson Insulation Inc., or 850 with ASJ/SSL jacket by Knauf Fiber Glass.

2.4 Refrigerant Piping

.1 Insulation for refrigerant suction, liquid and by-pass lines, both above and below roof shall be 19 mm (3/4") nominal thickness of fire retardant elastomeric closed cell foam or neoprene tubing.

.2 AP/Armaflex by Armstrong Industries Inc., or Therma-Cel (polymer foam) by Nomaco, or Rubatex by Rubatex Corporation.

2.5 Sheet Metal

.1 Insulation for exposed rectangular ductwork shall be rigid board conforming to CAN/CGSB-51.10-92 of 48 kg/m3 (3 lb/cu.ft.) density, 38 mm (1-1/2") thickness, and reinforced foil flame resistant kraft facing.

.2 814 series Spin-Glass with FSK facing by Schuller International Inc., or AK Board with FSK facing by Manson Insulation Inc., or Elevated Temperature 850 Board by Knauf Fiber Glass.

.3 Insulation for concealed rectangular ductwork and concealed and exposed round ductwork shall be flexible duct insulation of 12 kg/m3 (3/4 lb/cu.ft.) density, 38 mm (1-1/2") thickness, with reinforced foil flame resistant kraft facing.

.4 Microlite Type 75 with FSK facing by Schuller International Inc., or Alley Wrap with FSK facing by Manson Insulation Inc., or Duct Wrap with FSK facing by Knauf Fiber Glass.

2.6 Sealants and Adhesives

.1 Supply sealants and adhesives as recommended by manufacturers - 85 -20 and 60-38 by Foster, or 230-39 and 130-11 by Bakor Inc.

2.7 Surface Finishes

.1 Ductwork and Equipment:

.1 Finish exposed field insulated ductwork, vessels, equipment and accessories in Boiler Rooms, Mechanical Rooms, Equipment Rooms and areas where vehicular traffic could damage insulation, with ULC listed, plain weave cotton fabric (canvas) of 220 g/m² (6 oz.) weight, properly pasted in place with approved fire resistive lagging adhesive.

.2 Maritex 3451-RW by Alpha, Diplag 60 by Clairmont, Thermocanvas by S. Fattal

.3 Finish exposed insulated ductwork, installed outdoors, with field installed sheet metal ductwork, fabricated and installed in conformance with "SMACNA" standards and Section 15700 requirements. Fabricate ductwork from aluminum sheet metal. Silicone seal all joints and make weather tight connections. Thin wall jacketing materials will be rejected.

.4 Finish field insulated vessels, equipment and accessories insulated with elastomeric closed cell foam or neoprene insulation with full coating of white acrylic latex as recommended by insulation manufacturer.

.2 Piping:

.1 Finish exposed insulated piping, valves and fittings in Mechanical Rooms and Boiler Rooms, and on Barrier Free lavatory traps with PVC jacketing. PVC must have attained 25/50 fire rating, based on CAN/ULC-S102-M88 testing.

.2 Sure-Fit system by Sure-Fit Systems Inc., Zeston PVC by Schuller International Inc.

.3 Finish exposed insulated piping, valves and fitting outdoors, with field or factory applied metal jacket of 0.4 mm (0.0016") thick, plain or stucco embossed aluminum, with longitudinal "snap-lock", or lapped joints caulked with silicon and butt joints secured with alloy straps and mechanical fasteners. Provide jacketing complete with factory attached protective liner.

.4 Finish piping, valves and fittings indoors and outdoors insulated with elastomeric closed cell foam or neoprene with full coating of white acrylic latex as recommended by insulation manufacturer.

Part 3 EXECUTION

3.1 Preparation

.1 Clean surfaces to be insulated to remove grime, grease, oil, moisture or other matter. Ensure insulation is applied to clean dry surfaces.

.2 Apply insulation at ambient temperature conditions in accordance with insulation or adhesive manufacturer's recommendations.

.3 Do not apply insulation until piping, heat tracing, ductwork and equipment has been tested, inspected, verified, and accepted by Consultant.

3.2 Installation

.1 General:

.1 Perform insulation work in accordance with latest trade application methods. Obtain Consultants approval of methods intended to be used.

.2 Apply insulation neatly and tightly in unbroken lengths and with ends of sections firmly and squarely butted or engaged together. Lap canvas or other specified wrapping over joints and cement down with adhesive. Extend insulation through sleeves in walls (except fire walls) or other openings in building to make insulation and vapour barrier continuous and of uniform diameter.

.3 Terminate insulation at each side of fire walls and pack space between wall sleeve and duct or pipe as specified in Section 15700, Air Distribution.

.4 Replace insulation removed from existing piping or ductwork to make tie-in connections with new insulation. Cut back existing insulation sufficient distance to make neat and firm butt joint between old and new insulation.

.5 At expansion joints in piping, apply insulation over sleeve of 1.6 mm (16 gauge) metal, fabricated to fit around expansion joint without restricting its movement. Fabricate sleeve so it can be removed to allow for repacking and lubrication of expansion joint without damaging adjoining insulation. Extend sleeves min of 75 mm (3") longer than expansion joint, fit with insulation retaining flanges and with means of maintaining position of sleeve over expansion joint.

.6 Where piping is specified to be heat traced, provide oversized insulation to accommodate tracing cable specified in Division 16.

.2 Hot and Cold Water Piping:

.1 Apply 75 mm (3") wide butt strips of same material as factory applied jacket. Seal both longitudinal and butt joint strips with Foster 85-20 or Bakor 230-39 vapour barrier fire resistive lap sealer, or secure with self seal lap joints where provided.

.2 Insulate fittings, flanges and valves with fibrous glass insulation of same thickness as adjoining pipe insulation and finish with pre-moulded PVC cover, securely fastened and sealed to adjoining pipe covering with Foster 85-75 or Bakor 230-39 to form vapour proof joint.

.3 Do not insulate screwed unions and final connections to fixture.

.4 Terminate insulation at each end of unions with Partek Hilcote insulating and finishing cement, trowelled on bevel.

.3 Storm and Sanitary Drain Piping:

.1 Build up insulation at joints and fittings with 2 or more layers of insulation to form unbroken surface over joint, coupling or fitting.

.4 Refrigerant Piping:

.1 Apply and finish insulation in accordance with manufacturer's printed instructions, using recommended adhesives and finishes.

.5 Sheet Metal:

.1 Apply insulation to following ductwork systems and components:

.1 Supply ducts between roof top air handling units and underside of roof construction.

.2 Fresh air intakes between inside face of wall or underside of roof to inlet collar for heating, ventilating and air conditioning units.

.3 Mixing boxes of air handling units.

.4 Plenum, transition and spacer sections between components of built-up air conditioning units.

.5 Supply air ductwork downstream of air conditioning units.

.6 Other ductwork as noted on Drawings.

.7 Minimum of 3 m (10') of exhaust duct behind registers in high humidity areas such as Shower Rooms.

.2 Secure insulation on exposed rectangular ductwork with welded impaling pins and speed washer type fasteners at 300 mm (12") centres. Provide minimum of 2 rows of fasteners on each side of duct.

.3 In addition to mechanical fasteners, adhere insulation to duct with Foster 85-20 or Bakor 230-38 fire resistive adhesive applied to duct in 150 mm (6") wide strips at 450 mm (18") centres. Tightly butt joints and breaks in insulation and seal with Foster 30-35 or Bakor 130-11 fire resistive mastic and 75 mm (3") wide scrim foil pressure sensitive tape. Cut off protruding ends of welded pins and cover speed washers with same tape to ensure smooth application of exterior jacket.

.4 Fasten insulation to concealed rectangular ductwork and to both concealed and exposed round ductwork with Foster 85-20 or Bakor 230-38 adhesive, applied in 150 mm (6") wide strips at 300 mm (12") centre. Tightly butt edges and joints and seal with Foster 30-35 or Bakor 130-11 fire resistive mastic and 75 mm (3") wide pressure sensitive scrim foil tape. Use tying cord only to temporarily secure insulation until adhesive has set. Remove prior to application of exterior jacket.

.5 Insulate access doors or removable panels in ductwork as separate units to permit opening or removal without damage to adjoining insulation.

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Mechanical General Requirements, Section 15010.

.3 Conform to Section 16010, Electrical General Requirements.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 References

.1 ASME - Boiler and Pressure Vessel Code, Section VIII.

.2 ASME Standards - American Society of Mechanical Engineers

.3 CAN/ULC-S618-1992 - Magnesium and Zinc Anode Assemblies and Zinc Reference Electrodes

.4 CGA Standards - Canadian Gas Association

.5 CSA Standards - Canadian Standards Association

.6 National Electrical Code Standards

.7 Ontario Ministry of Consumer and Commercial Relations - Pressure Vessels Safety Branch

.8 ULC Standards - Underwriters' Laboratories of Canada.

1.3 System Description

.1 Supply and installation of complete and operational plumbing and drainage systems in accordance with Drawings and Specifications.

.2 Storm drainage system within building(s) including roof drains and connection to buried storm sewer 1.5 m (5') outside building wall.

.3 Sanitary drainage system within building(s) including connection to buried sanitary sewer 1.5 m (5') outside building wall.

.4 Excavation, bedding, and back-filling of pipe trenches for buried piping inside building and as indicated on drawings.

.5 Potable (domestic) cold water piping within building and to 1.5 m (5') outside building wall.

.6 Natural Gas piping distribution as indicated on drawings.

.7 Domestic hot water piping to plumbing fixtures from connection to water heater.

.8 Plumbing specialties.

.9 Plumbing fixtures and fittings.

.10 Hot water storage tank and heater(s).

.11 Sump pumps.

.12 Circulation pumps.

1.4 Quality Assurance

.1 Regulatory Requirements:

.1 Comply with requirements of Ontario Building Code, Part 7 (Plumbing) O.Reg. 403/97, Ministry of Housing and Local Municipal Authorities.

.2 Comply with latest issue of Codes, Standards and Regulations, including revisions and amendments thereto as adopted and published at date of bid closing.

1.5 Connections Services

.1 Natural Gas Supply:

.2 Make arrangements with local Gas Company for installation of the new gas piping as indicated on the drawings to the existing meter. Pay for costs levied by Gas Company for provision, installation, and connection of this service and any necessary upgrades to the existing metering equipment.

Part 2 PRODUCTS

2.1 Pipe, Fittings and Valves

.1 Following Piping Standards form part of Contract Documents and are bound at end of Section 15010, General Mechanical Requirements:

.1 Standard 001 Sanitary Drain and Vent Piping

.2 Standard 002 Storm Drain Piping

.3 Standard 005 City Water Piping

.4 Standard 008 Potable Hot and Cold Water Piping

.5 Standard 010 Natural Gas Piping

.2 Where like products are used in quantity, such as accessories, valves, specialties, furnish products of 1 manufacturer only for each category of product.

2.2 Roof Drains (RD)

.1 General:

.1 Furnish plumbing and drainage specialties manufactured by Watts, Zurn or Enpoco. Watts catalogue numbers are specified to indicate quality and features required. Furnish sizes as indicated on Drawings.

.2 Depending on type of roof construction or construction schedule, roof drain assemblies could be included in roofing Sections. Check with Design Coordinator and select appropriate statement from following:

.3 Furnish roof drains with lacquer finished cast iron body, removable bayonet locking mushroom type metal dome strainer, non-puncturing waterproofing membrane flashing clamp with integral gravel stop, and bottom outlet to suit type of pipe used.

.4 Wood Roof Deck:

.1 Standard roof drain: Watts Series RD-100-BD.

.2 Controlled flow roof drain: Watts Series RD-100-ABD.

.3 Furnish underdeck clamp and roof sump receiver.

2.3 Floor Drains (FD)

.1 Furnish floor drains with tapped primer connection in drain body.

.2 Washrooms and Kitchens:

.1 Watts FD100 epoxy coated cast iron body with membrane clamp, weep holes, non-puncturing flashing collar, adjustable 13 mm (½") thick, 125, 150 or 175 mm (5", 6" or 7") dia polished nickel bronze strainer, and push-on, caulked or "MJ" bottom outlet.

.3 Trench Drains (Drawing Reference TR):

.1 General: The surface drainage system shall be Meadrain EN 1000 complete with D load Move ductile iron Profix grating and EN1000 inline catch basin complete with sediment bucket.

.2 Materials: The channel system bodies shall be manufactured from polymer concrete with built in cast iron edge rail, 5% built in sloped channel with end cap same as system.

.3 Grates : Ductile iron move grate to be D load rated. With non-bolted stainless steel Profix cover locking system. After removal of grates there shall be uninterrupted access in the trench to aid maintenance.

.4 Catch Basin : EN 1000 in-line catch basin shall be deep system of polymer concrete with integrated cast iron rail, pre-formed knockout for connections, and Profix MOVE ductile iron D class grate. Sediment bucket to be included.

.5 Installation: Sealant shall be used during installation to be placed between joints before final placement. The trench drain system shall be installed in accordance with the manufacturer's installation instructions and recommendations. Grate removal bar to be included.

.6 System to be supplied by Northstar @ 1-800-871-4547.

.4 Floor Drain Traps and Primers:

.1 Furnish each floor drain installation with deep seal "P" trap unless otherwise indicated. Furnish trap primer connection tapping to conform with Code requirements.

.2 Prime floor drains connected to sanitary drainage system.

.3 Furnish Watts MS-810 trap seal primer valves with cast brass body, vacuum breaker and NPS ½" sweat connections.

.4 Where floor drain trap is not within reasonable distance from plumbing fixture, furnish automatic flush tank for priming of trap, Crane No. 7-170 ½ L, or American Standard No. AF-4104L, complete with automatic syphon, tank liner, concealed top cover, bottom supply and screw driver stop.

.5 As alternative to automatic flush tanks for remote floor drains, furnish PPP Model P-1 trap primers and distribution units, as supplied by S-M-S Ltd.

2.4 Cleanouts (CO)

.1 Furnish drainage cleanout fittings in drainage piping at locations indicated on Drawings, at base of each vertical stack or rainwater leader, as required to comply with applicable plumbing code.

.2 For buried piping furnish flush floor type cast iron ferrule cleanout with push-on, MJ, inside caulked or spigot connection outlet, and nickel brass frame and cover suitable for type of floor in which it is to be installed, e.g. tile, terrazzo, carpet, concrete.

.3 Light Duty Areas: Watts Series CO-200-R-1 (non-membrane floors), Watts Series CO-100-C-R-1 (membrane floors)

.4 Heavy Duty Traffic Areas: Watts Series CO-200-RX-1 (non-membrane floors).

.5 Exposed Locations: Furnish Watts CO-200 and/or Watts CO-460 cleanouts, as required, for cast iron piping in exposed locations or in accessible pipe chases with cast iron epoxy coated body with straight threaded, coated plug having tapered shoulder that seats against lead seal.

.6 Furnish cleanout for copper stack piping in exposed locations or in accessible pipe chases with bronze cleanout tee, bronze ferrule and cover, secured to ferrule by bronze cap screws.

.7 Where cleanouts are concealed in walls, furnish access cover on wall - Type of cover to suit wall surface and construction.

.8 Unless otherwise indicated on Drawings, furnish cleanouts at base of vertical sanitary stacks or rainwater leaders with bolted cover, neoprene gasket, and brass cap screws or bolt studs.

2.5 Shock Absorbers

.1 Furnish water hammer shock absorbers in hot and cold domestic water lines generally located at far ends of mains, at branch lines to each flush valve and quick closing valve, and at dead ends of branch piping or to groups of plumbing fixtures, or to isolated individual plumbing fixtures.

.2 Enpoco "Water Hammer Arrestors" or Watts Series "Shok-Gards" or S-M-S P.P.P. type II, sized in accordance with P.D.I.-WH201.

2.6 Frost Proof Wall Hydrants (FPWH)

.1 Non-freeze box type, for flush mounting in wall, with NPS hose connection, self-draining, integral hose end vacuum breaker, hinged locking cover, galvanized wall sleeve, ground joint union elbow adapter and operating key.

.1 Enpoco HY20VBNB

.2 Watts HY-725

.2 Verify wall thickness at each hydrant location to ensure correct hydrant length.

2.7 Hose Bibbs (HB)

.1 Rough brass construction with hose end spout, of size indicated, mounted 1050 mm (3'-6") above floor, and with vacuum breaker.

.1 Cambridge Brass No. 32W201

.2 Emco No. 3710 or 3714

2.8 Backwater Valves

.1 Epoxy coated cast iron body, hub inlet, spigot outlet, removable bronze valve disc and seat, and access cover. In finished areas, furnish Watts BV-230-R nickel bronze frame and round scoriated type cover.

.1 Enpoco E5100

.2 Watts BV200

2.9 Flexible Hose on Submersible Pump Discharge

.1 Heavy duty material conducting hose with wire and fabric reinforcing, flanged or union ends and of size and length shown on Drawings.

.2 Acceptable Manufacturers:

.1 Dunlop

.2 Uniroyal

.3 Goodall

2.10 Strainers

.1 Strainers on lines NPS 2" and under: "Y" pattern, 125# (862 kPa) bronze body, screwed ends and screwed cleanout.

.2 Strainers on lines NPS 3" and larger: "Y" pattern, 125# (862 kPa) cast iron body, flanged ends and bolted cleanout cap.

.3 Screen material for strainers: 20 mesh stainless steel unless otherwise noted.

.4 Provide NPS ≤" globe valve on blow-off connection of strainers NPS 3" line size and larger.

.5 Acceptable Manufacturers:

.1 Erwel
.2 Spirax Sarco
.3 Streamflo

2.11 Thermometers

.1 Tubular glass type, with 230 mm (9") scale, red appearing mercury in lens front tube, cast aluminum case, brass stem complete with separable socket, adjustable angle hinge assembly and combination Fahrenheit/Celsius scale with graduations of 2 F and 1 C.

.2 Furnish thermometers with scale range approximately double operating range of particular system in which they are to be installed, and with range selected to provide normal operating temperature readings at mid-point of scale range.

.3 Furnish thermometers with stems and stainless steel separable sockets of sufficient length to provide for proper insertion in piping or equipment in which they are installed, and as required to ensure correct temperature readings.

.4 Acceptable Manufacturers

.1 Trerice
.2 Ashcroft
.3 Weiss

2.12 Pressure Gauges

.1 Cast aluminum case and black finish, phosphor bronze bushed rotary movement, bronze Bourdon tube, 114 mm (4½") dial with combined kilopascal and psi scale, safety blowout back and overload stops to prevent damage to case due to excessive pressure.

.2 Furnish pressure gauges with dial range indicating operating pressure at approximately mid-point on dial, with 1% accuracy and graduated for direct reading to 7 kPa (1 psi).

.3 Acceptable Manufacturers

.1 Trerice
.2 Winters
.3 Ashcroft

2.13 Backflow Preventers

.1 Double Check Valve Type (DCVA): Watts No. 709 double check valve assembly, tested and certified under ASSE Standard 1012 and CSA B64.5, with brass or cast epoxy coated body and stainless steel working parts, strainer and primary and secondary check valves. Check valve seats and disks to be replaceable.

.2 The following manufacturers of the above equipment will be considered equal, subject to requirements of Clause "Material and Equipment":

.3 Acceptable Manufacturers:

.1 Watts

.2 Wilkins/Zurn

.3 Febco

2.14 Drain Valves

.1 Furnish NPS ½" brass sediment faucets with hose outlets, at low points of water piping systems in order to completely drain each system, and also in any other location noted on Drawings.

.2 Acceptable Manufacturers:

.1 Emco - 10740

.2 Cambridge Brass - 32W200

2.15 Make-up Water Valves

.1 Furnish water feeder valves in domestic water lines to heating, cooling systems where indicated on Drawings. Valves shall be line size and complete with relief valve and strainer.

.2 Acceptable Manufacturers:

.1	Taco	-	No. 329
.2	Armstrong	-	No. RD11
.3	Watts	-	No. U5LP

2.16 Water Pressure Reducing Valves

.1 Furnish pressure reducing valves in potable water lines where shown on Drawings. Furnish spring loaded valve with cast iron body, synthetic rubber diaphragm, solid bronze trim, of size, capacity and pressure reduction as indicated on Drawings.

.2 Provide suitably sized relief valve and pipe to drain.

.3 Acceptable Manufacturers:

.1 Leslie "Hi-Flo" Class WK

.2 Singer

.3 Trerice

2.17 Relief Valves

.1 Furnish ASME rate pressure relief valves capable of relieving flow at 25% above working pressure. Body construction and type of trim shall be suitable for specific service.

.2 Acceptable Manufacturers:

.1 Watts

.2 Fisher

.3 Consolidated

2.18 Gas Pressure Reducing Stations

.1 Approved Manufacturers:

.1 Pressure reducing valves:

.1 Fisher type S200 Series

.2 Leslie

.2 Safety relief valves:

.1 Fisher 289 Series

.2 Leslie

.2 General:

.1 Furnish pressure reducing stations in arrangement and of capacity indicated on Drawings to reduce natural gas pressure from ..... kPa (..... psig) to pressures noted, complete with gas pressure regulating valve, relief valve, vents to atmosphere with openings turned down and protected by screen, isolating valves and pressure gauges on both sides of pressure reducing station.

.2 Furnish safety relief valves where required, sized so that combined capacity of relief port of gas regulator and of relief valve will provide relief capacity equal to total capacity of pressure reducing station.

2.19 Plumbing Fixtures

.1 General:

.1 Furnish CSA approved plumbing fixtures, of make, type and size specified on the drawings, of manufacturer's standard design and material specification as indicated by trade name and/or catalogue number, and as described.

.2 Furnish plumbing supplies and fixture trim of CSA approved plumbing brass with chrome plated finish, and of make and type specified. Furnish each item bearing name of manufacturer, or identifying trademark.

.3 Acceptable Manufacturers:

.1 Plumbing Fixtures: American Standard, Crane

.2 Plumbing Brass: American Standard, Crane, Emco, Delta, Waltec, Cambridge Brass

.3 Mop Service Sink, Stern-Williams, Fiat

.4 Thermostatic Mixing Valves: Haws, Symmons, Powers, Leonard

.5 Flush Valves: Cambridge Brass, Crane, Sloan, Zurn, Waltec

.6 W. C. Seats: Beneke, Moldex, Viceroy

.7 Fixture Carriers: Watts, Zurn, Enpoco

.2 Plumbing Fixture Carriers:

.1 Lavatories: Watts CA-411 or CA-411-WC, as required, heavy duty carriers for wall-hung lavatories with concealed arm support and pipe uprights welded to steel base plates.

.2 Urinals: Watts No. CA-311 heavy duty urinal carrier with pipe uprights welded to steel base plates.

2.20 Domestic Water Heater - Gas Fired (HWT-101)

.1 Acceptable Manufacturers:

.1 Bradford White
.2 Rheem / Ruud
.3 AO Smith
.4 Lochinvar

.2 Use Bradford White Combi2 model DW2TW50 (or equal) natural gas-fired combination domestic water heater and system water heater complete with glass-lined tank; double wall glass coated steel heat exchanger; cathodic protection; powered burner; intermittent ignition controls; flammable vapour sensor; flame arrestor; gas train complete with main and pilot automatic gas valves; gas pressure regulator; air proving switch for blower operation; heavy gauge insulated steel jacket with baked enamel finish; flame port inspection opening; skid mounting; T & P gage; low water cutoff; ASME rated T&P valve; barometric draft regulator; 120V control circuit; and drain valve

2.21 Circulators

.1 Acceptable Manufacturers:

.1 SA Armstrong
.2 Grundfos
.3 Taco

.2 Furnish domestic hot water circulators of capacity, size, and electrical characteristics indicated on Drawings.

.3 Furnish "in-line" type circulators of all-bronze construction circulators, with stainless steel shaft, polypropylene impeller, oil-lubricated bronze sleeve bearings, mechanical seal, direct connected to motor.

2.22 Submersible Sump Pump

.1 Acceptable Manufacturers:

.1 SA Armstrong
.2 Grundfos
.3 Taco

.2 Furnish submersible sump pump of size, capacity and electrical characteristics indicated on Drawings.

.3 Furnish pump of (bronze) (cast iron) construction, with stainless steel shaft, semi-open type bronze impeller to pass solids of 32 mm (1¼") diameter, and integrally cast base and discharge elbow.

.4 Furnish motor with built-in thermal overload protection, and sealed from contact with pumped fluid.

.5 Furnish pump controlled automatically by a diaphragm actuated, factory set, integral liquid level control, complete with 3 m (10') long ULC approved waterproof, 3 wire power cable with U-ground moulded plug.

Part 3 EXECUTION

3.1 Piping and Equipment Construction Methods

.1 General:

.1 Install work of this Section to applicable requirements of Section 15010, General Mechanical Requirements.

.2 Piping:

.1 Install complete plumbing, drainage and vent piping within washrooms, in accordance with reviewed shop drawings showing final run-out connections to fixtures, equipment, and in accordance with code requirements, standard trade practice and as specified herein.

.2 Arrange piping within pipe spaces behind washroom fixtures to allow unimpeded access to piping for servicing.

.3 Excavating, Bedding and Backfilling:

.1 Refer to and comply with requirements in Section 02222, Earthwork and Related Work, pertaining to excavation and backfill materials and methods.

.4 Balancing Valves:

.1 Where 2 or more branches are fed from domestic hot water recirculating line, provide each return branch with a ball valve.

.5 Trap Seal Primers:

.1 Install trap seal primer valve in cold water supply line to nearest plumbing fixture (preferably water closet) and run NPS ½" Type K copper piping to primer connection on drain body. Obtain Consultant's approval for location of primer valves prior to installation.

.2 Install trap primer tank in truss space or other suitable location as directed by Consultant, or as indicated on Drawings. Refer to Piping Standard 008 and Drawings for piping.

.6 Air Handling Equipment Drains:

.1 Provide drains from fan casings, air handling equipment and low points in ductwork in locations and in arrangements indicated on Drawings or required by design. Drain piping shall be as specified for sanitary drainage, with deep seal copper trap. Provide trap seal equivalent to not less than 1½ times maximum static pressure in duct system.

.7 Piping Specialties:

.1 Install strainers, thermometers, gauges, in locations noted on Drawings.

.2 Mount gauges and thermometers, where practical, not higher than 2.4 m (8'-0") from floor or platform and locate so they can be easily read from floor or platform. Install gauges with lever handle gauge cock and NPS ¼" connecting tubing.

.3 Provide backflow preventers wherever connection is made between any system conveying potable water and system carrying non-potable water or any other liquid, and where indicated on Drawings.

.8 Venting

.1 Vent all fixture in accordance with local and provincial regulation. Run vents as directly as possible and grade properly to drain back to the fixture connection. Connect the bottom of all vent stacks into soil or waste stacks for drainage. Conceal vents in walls and ceilings in finished areas. Carry vent stacks through roof where shown or where required and project at least 24" above roof deck.

.2 Carry vent, waste and soil stacks through roof as required. Use Lexsuco Vent Stack and make a watertight joint at roof. Supply all flashing materials.

3.2 Testing Backflow Preventors

.1 Test backflow preventors in accordance with CAN/CSA B64.10-94, local and municipal by-laws. Provide written test reports to governing authority and copy the Consultant.

3.3 Plumbing Fixtures

.1 Install wall hung lavatory and urinal hanger brackets supplied with fixtures to wall by means of 10 mm (") bolt studs welded to steel anchor plates embedded within wall. In locations where pipe space is provided behind wall, extend bolt studs through wall and anchor with steel back-plates. Ensure proper placement and positioning of anchor plates and bolt studs during wall construction.

.2 Install wall-hung water closets, urinals, and lavatories with chair carriers in conformance with manufacturer's published recommendations for each particular installation with due regard to construction and piping details.

.3 Rough-in and install plumbing fixtures and drinking fountains at recommended height for normal or handicapped use as applicable to location.

.4 Insulate waste of handicap lavatory with 25 mm (1") thick insulation as described in Section 15250, Thermal Insulation. Cover with pre-formed factory white PVC cover.

.5 Caulk all around bases of mop service sinks and other built-in equipment. Seal all edges which abut walls and floors.

3.4 ROUGHING-IN

.1 Where shown on Drawings, rough-in hot and cold water systems, drain and vent.

.2 Cap off all piping and provide shutoff valves on hot and cold water piping.

.3 Obtain roughing-in details for future equipment from Owner before starting work. Rough-in according to details received.

3.5 Equipment

.1 Set equipment in place, align, connect and place in operation with:

.1 Controls set for efficient, stable operation.

.2 Initial lubrication completed.

.3 Connections and required safety devices installed.

.2 Protect equipment from damage during and after installation, and on completion of work ensure that equipment is free from cracks, scratches, discolourations, tool marks, and other defects. Thoroughly clean finished surfaces before acceptance of work.

.3 Install heater vents complete with necessary supports, hangers, braces, roof flashing, storm collar, and round top.

3.6 Flushing and Sterilization

.1 Sterilize water piping connected to Municipal water supply in accordance with applicable articles in Section 15010, General Mechanical Requirements.

.2 Flush water piping, regardless of service, by allowing full flow of water through pipe for at least 15 minutes. Perform flushing before connections to equipment are made.

.3 Remove and clean strainer screens after flushing operation is completed and again after initial operation of systems.

3.7 Pressure Control Systems - Make-up Water

.1 Provide pressure control system in accordance with Drawings.

.2 Set reducing valve to hold an excess pressure of 35 kPa (5 psi) above highest pressure in system.

.3 Provide suitably sized relief valve and pipe to drain. Set relief valve 210 kPa (30 psi) higher than reducing valve.

3.8 Testing

.1 Test piping in accordance with procedures outlined in Section 15010, General Mechanical Requirements, and/or as specified and in Consultant's presence.

.2 Test sections as authorized by Consultant to accommodate construction schedule. However, test complete systems on completion of work.

.3 Test drainage piping and potable water piping in accordance with requirements of the Ontario Building Code, Part 7 (Plumbing), O. Reg. 160/93, Ministry of Housing and with any additional requirements of applicable local By-laws.

.4 Test following services with compressed air or inert gas at 1½ times working pressure, but in no event less than 345 kPa (50 psig).

.1 Natural Gas Piping

End of Section

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Section 15010, Mechanical General Requirements.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 References

.1 ASME Unfired Pressure Vessel Code, Section VIII

.2 ASTM A 283/A283M-98 - Specification for low and Intermediate Tensile Strength Carbon Steel Plates

.3 CAN/ULC-S603-1992 - Tanks, Underground, Steel for Flammable and Combustible Liquids

.4 CAN/ULC-S603.1-1992 - Galvanic Corrosion Protection Systems for Steel Underground Tanks

.5 UCL-S615-M98 - Tanks, Underground, Reinforced Plastic, for Petroleum Products

.6 CAN/CGA-B149.1-05

.7 CSA B51-97 - Boiler, Pressure Vessel, and Pressure Piping Code

.8 CSA B52-05 - Mechanical Refrigeration Code

.9 CSA W59-M1989 (R1998) (R1998) - Welded Steel Construction (Metal Arc Welding)

.10 CTI Certification Standard STD-201

.11 CTI Acceptance Test Code ATC-105

.12 SSPC SP-5

.13 SSPC SP-6.

1.3 Description

.1 Section includes labour, materials and equipment required to provide complete and satisfactory installations of piping and equipment in accordance with full intent and meaning of Drawings and Specifications. Principal items of work include but are not limited to following:

.1 Gas distribution piping inside building from connection to meter/regulating station.

.2 Hot water heating boilers and accessories, pumps and piping systems.

.3 Vent stacks, breechings for gas fired heating equipment.

.4 \

.5 Expansion tanks and air separators for heating piping systems.

.6 Piping specialties.

.7 Chemical treatment and feed systems.

Part 2 PRODUCTS

2.1 Pipe, Fittings and Valves

.1 For types of pipe, fittings and valves for services in this Section refer to following Piping Standards attached to Section 15010, General Mechanical Requirements.

.1 Standard 00006 Service Water Piping

.2 Standard 00009 Hot Water Heating Piping

.3 Standard 00010 Natural Gas Piping

.2 Wherever possible, provide valves supplied by one manufacturer.

.3 Do not use pipe of NPS 3-1/2 and 5 for piping systems covered by this Section.

2.2 Specialties

.1 Strainers:

.1 Approved Manufacturers:

.1 Spirax Sarco

.2 Armstrong

.2 "Y" type, Class 125 cast iron body strainer with removable monel screen and bolted cleanout plug on flanged strainers and screwed cleanout on screwed strainers. Maximum Pressure Drop 6 kPa (0.9 psig). Provide screwed strainers for sizes NPS 2 and smaller and flanged strainers for sizes NPS 2-1/2 and larger.

.3 "Y" type, Class 250 semi-steel body strainer with removable monel screen and bolted cleanout plug on flanged strainers and screwed cleanout on screwed strainers. Provide screwed strainers for sizes NPS 2 and smaller and flanged strainers for sizes NPS 2-1/2 and larger.

.4 Provide strainers in equipment rooms and where indicated with NPS 3/4 blow-off globe valves.

.5 Furnish screen with perforations as follows:

Type of Service	Screen Perforation (dia)

H.W. Heating	
Make-up Water	

.2 Thermometers:

.1 Approved Manufacturers:

.1 Trerice

.2 Winters

.3 Weiss

.2 Stem type thermometers: Trerice BX9 series Industrial 230 mm (9") scale, adjustable angle type, with red appearing mercury lens front tube, and cast aluminum case.

.3 Dial type thermometers: Trerice No. L80742 Seriessolid liquid filled, 114 mm (4-1/2") dial size, universal angle type, with linear scale, black cast aluminum case, chrome plated ring, bronze bushed brass movement with adjustable pointer.

.4 Select scale ranges to best suit application and operating conditions, with graduations in both Fahrenheit and Celsius degrees for direct reading to 1°C and 2°F and accuracy of 1 to 1-1/2%.

.5 Provide sensing bulbs suitable for medium being measured. Furnish bulbs in air ducts with approved mounting flange and bulbs in piping or equipment with stainless steel separable wells.

.3 Pressure Gauges:

.1 Approved Manufacturers:

.1 Trerice

.2 Winters

.3 Weiss

.2 Select dial ranges to indicate operating pressure or vacuum at approximately mid-point on dial, with 1% accuracy.

.3 Standard gauges: Trerice No. 600 series with cast aluminum case, and black finish, phosphor bronze bushed rotary type movement, bronze bourdon tube, 114 mm (4-1/2") dial with combined PSI and kilopascal scale.

.4 Differential Pressure Gauges: Trerice No. 600-DF Series with cast aluminum case and black finish, phosphor bronze bushed rotary movement, bronze bourdon tubes, 114 mm (4-1/2") dial with combined PSI and kilopascal scale.

.5 Select dial ranges 50% greater than developed static pressure of system with 1% accuracy.

.6 Provide gauges for use on steam systems with dampener.

.7 Use isolating pet cocks on pressure gauges.

.8 Install gauges in strict conformity to manufacturer's written instructions.

.9 Provide pressure gauges on both sides of each converter, pump, heating coil, cooling coil and chiller.

.4 Air Vents:

.1 Approved Manufacturers:

.1 Maid-O-Mist

.2 Taco Hy-Vent

.3 Braukmann EA122

.2 Provide automatic air vents, complete with drip trays, at high points of water piping systems and also in any other location noted on Drawings. Connect discharge to nearest funnel or hub drain or as indicated on Drawings. Provide manual air vents in locations noted on Drawings.

.5 Air Separators:

.1 Approved Manufacturers:

.1 Armstrong

.2 Taco

.3 Bell and Gossett

.2 Furnish air separators in water and glycol/water piping systems where indicated on Drawings. Use Armstrong Series VA line size Vortex Air Separator with steel shells designed for 860 kPa (125 psig) working pressure. Furnish separators NPS 2 and larger with shell heads, flanged connections, (strainer) (without strainer), and mounting legs or brackets.

.6 Drain Valves:

.1 Approved Manufacturers:

.1 Crane

.2 Emco

.3 Cambridge Brass

.2 Provide 13 mm (1/2") brass sediment faucets with hose thread outlets at low points of water and compressed air piping systems in order to completely drain each system, and also in any other location noted on Drawings.

.7 Thermostatic Temperature Control Valves:

.1 Approved Manufacturers:

.1 Honeywell-Brauckman

.2 Tour & Andersson Ltd.

.2 Provide Honeywell-Brauckman Series "T104F" modulating thermostatic control valves complete with remote sensing bulb and valve mounted adjustment, or remote sensing and dial face adjustment, as indicated on drawings. Use Series "V110" valve body. Provide straight through, angle, or reverse angle configuration as required to suit existing wall-fin piping configuration. Initially set temperature, on units with remote sensing bulb, to 22.2 C (72 F).

.3 Where remote sensing and dial face adjustment is indicated on drawings, supply control valves with 4.9 m (16 ft.) capillary tube attached to sensor in dial face adjustment. Shorter lengths will be permitted if location of thermostat permits. Mount thermostats 1400 (4.6') above finished floor.

.4 Where remote sensing bulb and valve mounted adjustment is indicated on drawings, supply control valves with 1980 (6.5') capillary tube attached to sensing bulb.

.5 Provide line sized valves.

.8 Thermostatic Drain Valves:

.1 Provide NPS 3/4 automatic thermostatic drain valves at trap locations noted on Drawings, Armstrong "Thermodrain" or Watts equivalent.

.9 Balancing Valves:

.1 Approved Manufacturers:

.1 Tour & Andersson Ltd.

.2 Armstrong

.2 For sizes 50 mm (2") and under , use Tour & Andersson Series STAD/STAS series valve with adjustable hidden memory for tamper proof balancing, cast copper alloy body complete epoxy resin coating , self sealing test points for pressure, temperature sensing probes, protective cap and end connections to suit piping system.

.3 For sizes 65 mm (2½") and over, use Tour & Andersson STAF/STAG series valve with adjustable hidden memory for tamper proof balancing, cast copper alloy body complete epoxy resin coating , self sealing test points for pressure, temperature sensing probes, protective cap and end connections to suit piping system.

.10 Flexible Piping Connections:

.1 Approved Manufacturers:

.1 Flexonics

.2 United Flexible (Indufab)

.2 Furnish flexible metal hoses on piping connections to heating and cooling coils, on suction and discharge connections to pumps, and in piping systems where indicated on Drawings.

.3 At coils provide Flexonics RW-81 or RW-91 hoses suitable for minimum working pressure of 1034 kPa (150 psig).

.4 Furnish flexible hoses up to NPS 2 of braided bronze construction with screwed ends and union nut and nipple. Hoses NPS 2-1/2 and over to be braided stainless steel construction with Class 150 flanges. Furnish standard hose length for normal industrial vibration.

.5 At pumps provide Flexonics Model BBN hoses up to NPS 2 and BSF on piping NPS 2-1/2 and larger.

.6 Firmly support or guide piping adjacent to flexible connection to prevent pipes from swaying.

.11 Expansion Compensators:

.1 Unless otherwise shown in other locations on Drawings, provide expansion compensators only on hot water heating piping within convector enclosures, and only on NPS 2 steel pipe, and NPS 3 and less for copper tubing.

.2 Provide compensators with 2-ply bellows, with pressure external to bellows, limit stops, internal guides and anti-torque device.

.3 Provide compensators of steel construction with stainless steel bellows and threaded ends, for installation in steel piping, and of bronze construction with sweat ends for installation in copper tubing.

.4 Provide compensators with union nut on 1 end, and model as follows:

Manufacturer	Steel	Bronze
Flexonics	H	HB
United (Indufab)	XS-2	XB-2

.5 Provide for expansion in piping within buildings, other than in convector enclosures, with expansion loops, guides and anchors located where indicated on Drawings. Securely fasten anchors and guides to building structure in approved manner.

.12 Expansion Joints:

.1 Approved Manufacturers:

.1 Flexonics

.2 United Flexible

.3 Adsco

.2 Where expansion joints are indicated on Drawings in steel pipes NPS 3 and larger provide ring controlled type with stainless steel bellows, flanged ends, anchor type bases (where required), corrugations as noted on Drawings and suitable for minimum working pressure of 1034 kPa or 1725 kPa (150 psi) (250 psi) steam.

.13 Anchors and Guides:

.1 Anchor piping at points indicated on Drawings, using substantial structural steel angles, channels or plates well secured to building structure, in approved manner.

.2 Unless otherwise detailed on Drawings, use pipe alignment guides of same make as expansion joints. Space guides as recommended by manufacturer or as indicated on Drawings.

.3 Furnish guides with internal spider of cast or carbon steel, securely clamped to pipe and welded carbon steel outer cylinder.

2.3 Diaphragm Tanks

.1 Approved Manufacturers:

.1 Amtrol

.2 Armstrong

.3 Taco

.2 General:

.1 Use Amtrol Model (...) diaphragm tank, complete with butyl rubber bladder, constructed, tested and stamped in accordance with Section VIII of the ASME Code for a working pressure of 860 Kpa (125 psi) and pre-chared to the minimum operating pressure. [_____] L ([_____]

USgal) total tank volume, [_____] L ([_____] USgal) acceptance volume.

2.4 Pumps (Vertical In-Line)

.1 Approved Manufacturers:

.1 Armstrong
.2 Taco
.3 Bell and Gossett

.2 Pumps:

.1 Use Armstrong Series Series 4380 vertical in-line centrifugal pumps designed for minimum 1034 kPa (150 psig) working pressure. Use radially split casing design with cast iron casings and all bronze impellers. Provide suction guide and combination shutoff, balancing and check valve with each pump. See Equipment Schedule for Series, capacities and details

.2 Provide Series 4380 pumps with "Armseal" mechanical seals and stainless steel shaft sleeves. Provide pumps complete with all necessary auxiliary seal piping.

.3 Provide Armstrong Suction Guide Type SG, pot type elbow strainer sized to match pump inlet flange. Use cast iron body, steel guide vanes, strainer of 3 mm (1/8□) stainless steel mesh, plus a fine mesh brass startup strainer. Inlet to match pipe size indicated. Design for maximum working pressure of 1034 kPa (150 psig) and a hydrostatic test pressure of 1380 kPa (200 psig).

.4 Provide Armstrong Model FTA angle type combination shutoff, balancing and check valve with positive spring loaded seating, flanged cast iron body, bronze disc and seat, and stainless steel stem and spring. Size to match associated pump. Design for maximum working pressure of 1200 kPa (175 psig).

.5 Support pump from structure independent of piping, or from floor with pipe leg support with steel saddle at top and standard IPS floor flange.

.6 Starters and power wiring to pump motors from starters by Division 16.

2.5 Circulating Pumps (Horizontal In-Line)

.1 Approved Manufacturers:

.1 Armstrong
.2 Taco
.3 Bell and Gossett

.2 Pumps:

.1 Use Armstrong In-the-Line circulators with cast iron bodies, suitable for minimum 860 kPa (125 psig) working pressure. See Equipment Schedule for models, capacities and details.

.2 Provide pumps with close coupled motor, of manufacturer's standard construction for service, and cast iron body, alloy steel shaft with copper shaft sleeve and carbon seal suitable for maximum water temperature of 107 C (225 F).

.3 Starters and electrical wiring by Division 16.

2.6 Under Floor Heating System

.1 Equivalent Manufacturers:

.1 Wirsbo

.2 Heatlink

.2 General:

.1 Furnish and install, in accordance with the recommendations of the floor heating manufacturer, a hydronic floor heating distribution system as indicated in drawings. System shall use cross-linked polyethylene tube meeting ASTM Standard F876. Tubes shall be rated 180F @ 100psi and shall have an integral oxygen diffusion barrier to reduce the potential of system corrosion.

.2 System shall be complete and shall include system design, tubes, tube bend supports, tube tie- wires, heat emission sheets (if required), valves, fittings, manifolds, manifold supports, telestats (valve actuators), temperature sensors, 115/24V AC (ULC approved) transformer, all required controls, and equipment cabinets. Tube shall be warranted for 25 years. Associated accessory items furnished by the manufacturer shall be warranted for 24 months from date of sale.

.3 Scope of Work:

.1 Included - all labour, materials, transportation, equipment and services to install a hydronic heating system where indicated on the Drawings.

.4 Conditions:

.1 Shop Drawings - are to be complete with system layout, schematic, controls, descriptions of materials, details and installations shall be submitted for approval.

.2 All Components - of system shall be provided by one manufacturer including tubing, tubing fittings, manifolds, manifold support brackets, wire ties, tubing and bend supports.

.3 Design - The hydronic floor heating system is to be designed in accordance with requirements indicated on drawings and parameters specified below.

.1 Inlet water temperature 110F

.2 Outlet water temperature 90F

.3 Maximum system head loss 2.2 psig

.4 Flow rate 2.1 usgpm.

.4 Installation - The Under Floor Heating System is to be installed in accordance with applicable code requirements and manufactures published recommendations. Provide the services if the manufacturer to supervise assembly of the system and to commission the system. Pay for all associated costs.

.5 Warranty - Tubing shall carry a twenty-five (25) year non-prorated warranty against failure due to manufacturing defect or exposure to stress cracking agents. This warranty is to include tubing embedded in concrete. Manifolds and other auxiliary components shall be warranted for twenty-four (24) months.

.5 Products and Materials:

.1 Tubing:

.1 Tubing embedded in concrete shall be cross-linked polyethylene, rated at 180°F maximum working temperature and up to 100 psi working pressure in accordance with ASTM Standard F876, as manufactured by Wirsbo.

.2 Tubing shall be of cross-linked polyethylene manufactured by the "Engel Method". The tubing shall have an oxygen diffusion barrier capable of limiting oxygen diffusion through the tubing to less than .1 g/m3/day (at 400°C).

.3 The minimum bend radius for cold bending of the tubing shall not be less than (8) times the outside diameter. Bends with a radius less than stated will require the use of a bend support as supplied by the tubing manufacturer.

.4 Tubing embedded in concrete shall be secured to a welded wire fabric or approved alternate fabric (provided by others) with wire ties provided by pipe manufacturer. Spacing of wire ties shall be maximum of thirty-six (36) inches for straight lengths of tubing and a minimum of three (3) ties per 1800 mm turn.

.2 Manifolds - shall be of cast bronze construction and shall have integral circuit balancing valves (and individual circuit control valves). Supply and return manifolds shall be able to vent air from the system. Manifolds shall be provided with support brackets and tube bend supports. Manifolds shall be isolated from supply and return piping with valves that are suitable for isolation and balancing.

.3 Tube Fittings - shall be manufactured of dezincification resistant brass. These fittings must be supplied by the tubing manufacturer. The tube fitting consists of an insert, a compression and a nut.

.4 Supply and Return Piping to Manifolds:

.1 Piping shall be metal pipe of cross-linked polyethylene tubing with an integral oxygen diffusion barrier.

.2 Fittings will be compatible to the tubing material used. Fittings used with the cross-linked polyethylene shall not permit excessive oxygen permeation.

.5 Equipment cabinets:

.1 Provide galvanized steel equipment cabinets, where indicated on drawings, complete with locking covers, to house manifolds, valves, etc.

.2 Equipment cabinets to be prime painted with a baked on enamel finish. Colour selection shall be by Architect.

.6 Installation:

.1 Hydronic heat tubing that is embedded in concrete shall be installed in accordance with the manufacturer's recommendations.

.2 Installation shall follow the shop drawing for tubing layout and spacing.

.3 Prior to the installation of concrete around the tubing, the system shall be charged with water to a pressure of 40 psi. The system shall remain at this pressure for a minimum of 24 hours to ensure system integrity.

.4 During installation of concrete that is to embed the tubing, the tubing shall remain charged with water to a minimum pressure of 40 psi until the concrete has set.

2.7 Water Treatment Systems

.1 Acceptable Manufacturers:

.1 Drew Industrial

.2 Dearborn

.3 Calgon

.2 General:

.1 Provide water treatment systems for heating systems.

.2 Division 16 will supply and connect power wiring to each system as noted on Electrical Drawings.

.3 Provide signal wiring between corrosion probes and respective timer control centre for each treatment system.

.3 Boiler Water Treatment:

.1 To protect metal surfaces of water systems against corrosion and to prevent scale deposits, feed chemical into system. Then use chromate corrosion inhibitor at rate required to operate at not less than 100 ppm "M"-alkalinity.

.2 To feed corrosion and scale prevention chemicals into system, provide following feed equipment for each hot water systems:

.1 Provide chemical bypass feeder, steel construction, 7.6 litre (2.0 USgal) capacity, designed for 1200 kPa (175 psig) working pressure, and side stream filter. Include valve kit consisting of two 20 mm (3/4") isolating valves and one 20 mm (3/4") drain valve.

.2 For each hot water system, provide corrosion probe with 4-20 mA signal output for remote monitoring as part of corrosion test loop assembly including valve, strainer and coupon holders.

.4 Pre-operational Cleaning of Hot Water Systems:

.1 Prior to chemical cleaning, inspect systems to ensure removal of heavy debris and excessive oil or dirt. Install temporary strainers on suction of each circulating pump. Make provision for temporary connections between supply and return mains in distribution system to permit circulation of cleaning solution and install temporary by-pass around cooling tower fill. Provide 25 mm (1") pipe connection on suction side of circulating pumps of each system for admission of cleaning solution.

.2 Flush systems to remove loose dirt and hydrostatically test to detect excessive water losses. Check rotation of circulating pumps.

.3 Add Drew Industrial CSW-600 industrial cleaner at concentration of 7.6 L/3785 L (2 gal/1000 gal) of water in systems and circulate for 24 to 72 hours at temperature between 21-60 C (70-140 F).

.4 Drain systems, refill with fresh water and circulate for minimum of 4 hours to flush out remaining chemical solution.

.5 Following flushing, drain and refill systems with fresh, clean water treated with corrosion inhibitor.

.5 Supervision:

.1 Include, by supplier of water treatment systems, supervision and assistance during installation for clean-out and start-up procedures and adequate water conditioning program to control corrosion, scale and algae. Arrange for water conditioning company to instruct operating personnel for period of not less than 2 days duration before acceptance of installation by Consultant. Provide 4 copies of written operating instructions on treatment dosages, control charts and test procedures to complete satisfaction of Consultant.

.2 Include monthly visit by treatment supplier for first year's operation, to check operation and to conduct tests of pertinent water treatment systems and submit written report on same.

.3 With respect to cooling tower system, corrosion rate is not to exceed 0.05 mm (.002") per year (maximum depth of pitting) as set up under standard ASTM procedures. Provide 3 test coupons in each corrosion test loop assembly.

.6 Treatment Supplies:

.1 Supply chemicals required for initial cleaning and start-up of systems and years supply of chemicals for normal operation.

.2 Provide Ucartherm, or approved equal, IBS-40 inhibited Ethylene glycol, premixed by Manufacturer at a ratio of 40% by weight Glycol to Deionized Water. Mixture is to provide freeze protection down to -25°C (-13°F) and burst protection down to -55°C (-67°F). The premixed fluid is to contain corrosion inhibitors, buffers, and an antifoam agent.

Part 3 EXECUTION

3.1 Connections To Existing Services

.1 Make arrangements with Owner and obtain permission to tie into existing services at time acceptable to all parties.

.2 Replace or repair any insulation or covering removed from existing lines to permit tie-ins with new materials as specified for new work.

3.2 Water Treatment Systems

.1 Install all water treatment equipment as shown and in accordance with manufacturer's recommendations. Provide all necessary piping and accessories.

3.3 Piping and Equipment Construction Methods

.1 General:

.1 Install of Control Valves supplied by Section 15900, Automatic Controls.

.2 Gauges, Thermometers and Temperature Immersion Wells:

.1 Install pressure gauges and thermometers in locations indicated on Drawings or specified. Mount gauges not higher than 2.5 m (8') from floor or operating platform.

.2 Install gauges and thermometers as recommended by manufacturer.

.3 Fill immersion wells with high temperature mineral grease prior to insertion of thermal bulb.

.4 Install immersion wells so they do not restrict flow of liquids in piping. Increase size of piping as required to prevent restriction.

3.4 Flushing and Sterilization

.1 Flush hot water heating water piping as specified under Article "Water Treatment".

.2 Flush other piping as outlined in Section 15010, General Mechanical Requirements.

.3 Clean sections of new piping which cannot be isolated for flushing purposes, prior to fabrication, and also where possible after welding of joints, by swabbing interior of pipe with swabs soaked with caustic solution to remove loose scale, oil and dirt from entire length of piping.

3.5 Testing Of Piping

.1 General:

.1 Test piping in Consultant's presence, in accordance with testing requirements specified in Section 15010, General Mechanical Requirements and with tests and test pressures hereinafter specified for various services.

.2 Lines may be tested in sections as authorized by Consultant to accommodate construction schedule. However, test complete systems on completion.

.2 Water:

.1 Hydrostatically test water piping at 862 kPa (125 psig) pressure.

.3 Natural Gas:

.1 Conduct final tests on natural gas piping in accordance with Ontario Gas Utilization Code and with requirements of local Gas Company or governing authority.

3.6 Balancing of Piping Systems

.1 Adjust and balance systems in accordance with procedures outlined in Section 15010, General Mechanical Requirements.

End of Section

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Mechanical General Requirements, Section 15010.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 References

.1 AMCA - Air Movement and Control Association

.2 ANSI/ASHRAE 52-1976 - Methods of Testing Air-Cleaning Devices used in General Ventilation for Removing Particulate Matter

.3 ASTM A 167-99 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

.4 ASTM A 525-93 - Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process

.5 CGA - Canadian Gas Association

.6 CSA - Canadian Standards Association

.7 CSA C22.2 No. 113-M1984 (R1993) Fans and Ventilators

.8 FM - Factory Mutual

.9 ANSI/NFPA 90A-1996 - Air Conditioning and Ventilating Systems

.10 ANSI/NFPA 90B-1996 - Warm Air and Air Conditioning Systems

.11 SMACNA - Sheet Metal and Air Conditioning Contractors' National Association

.12 ULC - Underwriters' Laboratories of Canada

1.3 Systems Description

.1 Provide systems of heating, ventilating and air conditioning in accordance with Contract Documents including but not limited to following:

- .1 Heating and ventilating units
- .2 Air conditioning units
- .3 Supply, return and exhaust fans

.4 Grilles, registers and diffusers

.5 Ductwork systems

.6 Cleaning, testing, balancing and adjusting of mechanical systems

.7 Vibration isolation

1.4 Information Requirement

.1 Advise appropriate trade sections of actual size requirements for products provided under this Section, taken from certified shop drawings, of roof and wall openings prior to construction of openings and curbs. Bear costs for modifications to curbs or openings resulting from delay of this information.

Part 2 PRODUCTS

2.1 Pipe, Fittings and Valves

.1 Furnish pipe, fittings and valves as required in accordance with Piping Standards appended to Section 15010, General Mechanical Requirements.

2.2 Accessories

.1 Attachments:

.1 Furnish ULC Approved and Listed beam clamps to secure hanger rods, angles and straps to structural steel members. Furnish clamps of type that rod load is transmitted concentrically to structural member centreline. "C" and "I" beam side clamps and similar clamps shall not be allowed.

.2 Alternately, support all ductwork and other equipment using wire rope cable terminated by Cable Locks. All Cable Locks shall have an Ultimate Breaking Strength (U.B.S.) of at least 5 times the wire rope published Working Load Limit (W.L.L.). All wire rope shall have a U.B.S. of at least 5 times the published W.L.L. Wire ropes shall be of the size and spacing per the manufacturer's printed specifications. Wire Rope and Cable Locks shall be as supplied by Duro Dyne Corporation, or approved equal.

.2 Tape Sealant:

.1 Furnish closed cell neoprene separation tape between mechanical equipment and curb mountings.

2.3 Finned Tube Radiation

.1 Acceptable Manufacturers:

.1 Runtal

.2 General:

.1 Radiators shall be manufactured of cold rolled low carbon steel, fully welded and consisting of header pipes at each end. Connected by flat oval water tubes.

.2 Provide tube wall thickness of 0.048" for standard pressure delivery.

.3 Radiator header pipes shall be square 0.109" min. wall thickness and include all necessary supply, return and air vent connections. Internal baffling is provided as required.

.4 Standard piping connections shall be ½" NPT taper threaded sockets, located in either side, or vertical positions. Air vent connections are 1/8" NPT taper threaded sockets.

.5 Provide radiator rated for a working pressure of 56 psi max and tested at 74 psi.

.6 Radiator expansion shall not exceed 0.016 inch per linear foot at 215 degrees F. Expansion compensation to be provided in the piping as require, by others.

.7 Radiators shall be cleaned and phophatized in preparation for the power coat finish.

.8 Radiators shall be painted with a gloss powder coat finish, for a total paint finish of 2 to 3 mils.

.9 Wall mounting brackets shall be provided with the radiators.

.10 All necessary pipe trims; shutoff, balancing, and control valves; air vents; and, accessories shall be provided with the radiators.

.11 Refer to Drawings for details of enclosures, mounting spacing, heights.

2.4 Roof Top Units (Drawing Reference RTU)

.1 Acceptable Manufacturers:

.1 Carrier

.2 Trane

.3 Lennox

.2 General:

.1 Outdoor roof mounted self-contained packaged (constant volume) (VAV) (multizone) air conditioning unit with gas heating (electric heating) (hot water coils) and direct expansion cooling and in compliance with CSA, CGA, ULC and FM requirements. Provide complete factory assembled unit prewired and piped with factory installed controls.

.2 Unit size and performance as indicated on drawings. Rating to be in accordance with ANSI/ARI 360-86 and 270.

.3 Provide (vertical) (horizontal) supply and return duct connections.

.3 Cabinet:

.1 Construct weathertight cabinet of 1.0 mm thick galvanized steel panels bonderized and coated with baked enamel finish (of manufacturers standard colour) (as specified).

.2 Frame of heavy gauge welded steel construction, galvanized after construction and equipped with lifting lugs.

.3 Provide hinged and gasketed panels for easy access to all internal parts for servicing or replacement.

.4 Factory insulate all surfaces with 25 mm, 24 kg/m3 density coated fibreglass insulation.

.4 Fans:

.1 Indoor Fan: Centrifugal forward-curved belt-driven fan with statically and dynamically balanced rotor. Mount fan and motor on vibration isolation base(s) and separate from casing with flexible connection.

.2 Outdoor Fan: Direct driven (dual speed) (variable speed) propeller type fan, coated steel wire guard and discharging air vertically.

.3 Power Exhaust: Propeller type exhaust fan with belt drive and integral damper.

.5 Compressors:

.1 (Multiple) semi-hermetic (hermetic) type compressors factory mounted on spring vibration isolators and flexible suction and discharge connections, oil sight glass, compressor discharge valves, liquid line service valves, thermal expansion valves, oil pressure switch, crankcase heater, and automatic pump down system with control to liquid line solenoid valve.

.2 Accomplish capacity reduction with (hot gas bypass) and cylinder unloading. Provide head pressure controls capable of operation to -30 C outdoor air temperature.

.6 Coils:

.1 Aluminum fins mechanically bonded to seamless copper tubes. Braze all joints and bell tube sheet openings to prevent tube wear.

.7 Gas Heating:

.1 Induced draft combustion with intermittent spark ignition and redundant gas valve.

.2 Tubular heat exchanger of minimum 20 gauge aluminum silicon alloy coated steel.

.8 Electric Heating:

.1 Factory installed nickel chromium electric resistance type helical coil finned tube heating element.

.9 Filter Rack and Air Filters:

.1 Provide filter rack complete with 50 mm (2") thick low velocity disposable glass fibre filters of 80% arrestance to ASHRAE Standard 52-76 Test Method.

.2 100 mm (4") thick high-efficiency pleated disposable filters of 25-30% efficiency to ASHRAE Standard 52-76 Test Method.

.10 Economizer:

.1 Factory installed fully modulating type economizer capable of simultaneous economizer and compressor operation.

.2 Provide all hardware and controls required to provide cooling with outside air and capable of introducing up to 100% outdoor air.

.11 Fabricated Roof Curb:

.1 Factory fabricated 16 gauge galvanized steel with wood nailer strip.

.12 Controls:

.1 Provide all safety controls for the gas heating (electric heating) including all interlocks and air flow proving switches to meet CGA and CSA requirements. Provide smoke sensors in return duct to NFPA Standards, low limit on supply, and freeze protection on steam or hot water coils.

.2 Provide completely self contained demand-oriented solid state control system with minimum 2 cool, 2 heat staging capable of responding to a variable space temperature signal.

.3 Space thermostats of the dual setpoint type for heating and cooling with adjustable dead band between heat and cool.

.4 Provide compressors with the following safety controls as a minimum: overcurrent protection with manual reset, over-temperature, low-pressure switch, and high-pressure switch.

.5 Refrigeration controls to include the following:

.1 condenser fan, evaporator fan and compressor contactors

.2 24 volt control transformer

.3 safety controls for high and low

.4 two independent refrigerant circuits

.5 anti-short cycle to prevent compressor cycling

.6 outside air thermostat to prevent compressor operating below 4.4 C (40 F).

.6 Provide control panel with each unit. Control panel to have the following functions:

.1 system selector switch with heat-off-cool

.2 fan selector switch with on-auto

.3 static indicators - filter clogged

.4 system on.

2.5 Roof Curb Attenuation

.1 Provide roof curb attenuation in roof-mounted air conditioning unit as follows:

.1 Provide two layers of 25 mm (1") thick high density insulating board on roof deck. Stagger board joints, board to be butted tightly to sides of ductwork and curb.

.2 Seal all joints and edges with acoustic sealant.

.2 Advise Consultant when this work is complete, for his review. Seal joints to satisfaction of Consultant.

2.6 Sheet Metal Work

.1 General:

.1 Furnish sheet metal work in accordance with material specifications and construction details specified herein, and conforming to standard and recommended practices as defined by SMACNA Duct Construction Standards.

.2 For Air Handling Systems serving first and second floors, furnish ductwork constructed to SMACNA 1020 pa (1" W.G.) pressure class and seal class "C".

.3 Furnish ductwork of galvanized steel sheet. Provide satin coat finish, for painting, where exposed to view.

.4 Furnish ducts of sizes indicated on Drawings. Where ducts are to be furnished with internal acoustical liner, adjust duct size to accommodate acoustic liner thickness, with clear inside dimensions as indicated on Drawings.

.5 Fabricate ductwork free from vibration, rattle or drumming under operating conditions. Furnish necessary reinforcements, bracing, framing, gasketting, to comply with performance criteria.

.6 Continuously solder or seal joints in exterior air intake ducts and plenums to prevent dripping of moisture through joints. Furnish 38 mm (1-1/2") drain flange in low point of such ductwork.

.2 Rectangular Ductwork Type:

.1 For longitudinal joints on rectangular ductwork, furnish Pittsburgh Lock joints tightly closed along full length of seam.

.2 Fabricate rectangular duct elbows, transition sections and take-off fittings of metal 1 gauge heavier than thickness specified for duct in which they are installed. Furnish elbows of standard radius design with inner radius equal to width of elbow unless shown otherwise, with Pittsburgh Lock seams, and with ends to match transverse joints of duct.

.3 Where elbows are indicated as square type, provide air turning vanes of double blade construction.

.4 Cross-break flat surfaces between joints, or between joints and intermediate reinforcements, to prevent vibration or buckling.

.5 Seal joints on rectangular ductwork with high velocity duct sealer, 3M EC800, Foster #30-02, Hardcast Iron Grip #601, Duro-Dyne S-2 or Transcontinental Equipment "MP". Do not use duct tape.

.3 Supports and Hangers - Rectangular Ductwork

.1 Except where indicated otherwise on Drawings, furnish strap hangers of galvanized sheet stock with edges folded over for ducts up through 760 mm (30") width. Bend strap hanger around bottom of duct for minimum of 38 mm (1-1/2") and attach to sides and bottom of duct. Furnish mild steel rod hangers of 10 mm (3/8") dia minimum size for ducts over 760 mm (30") in width and furnish 38 mm x 38 mm x 3 mm (1-1/2" x 1-1/2" x 1/8") steel angle across bottom of duct and attach hanger to angle (not duct).

.4 Round Ductwork - General:

.1 Seal joints in round ductwork with high velocity duct sealer as specified for round ductwork.

.2 Furnish ninety degree elbows with smooth centre line radius of 1.5 times duct diameter. Alternatively, furnish elbows of 5 piece construction, subject to prior approval of Consultant.

.3 Furnish 45 elbows of 3 piece construction.

.4 Furnish branch connections to mains of eccentric conical configuration.

.5 Furnish buried round ductwork as specified herein, except fabricate duct from galvanized steel shop coated both inside and outside with PVC.

.6 In lieu of standard spiral lock seam ductwork, "Uni-Rib" duct as manufactured by United Sheet Metal may be furnished for above floor installations in sizes 375 mm (15") and larger.

.5 Round Ductwork - Low to Medium Pressure:

.1 Construct round ductwork to specifications established by National Warm Air Heating Association. Use spiral lock seam type duct.

.2 Lap slip joints in direction of flow. Make external diameter of edged end same as internal diameter of belled end on slip joints. Seal entire surface of overlap with high velocity duct sealer compound before sections. Construct butterfly disc type balancing dampers of 10 gauge metal, with well rounded edges set in round sheet metal housing with pliable rubber packing glands. Securely rivet slip joints and angle joints.

.6 Flexible Type Round Ducts:

.1 Furnish flexible type round ductwork between trunk supply duct and drops ceiling diffusers (maximum 30° offset from vertical), and where indicated on Drawings.

.2 In ceiling areas and spaces used as return air plenums, furnish flexible duct of polymeric liner bonded to wire spiral, Flexmaster “Fab 4" or Thermaflex equivalent.

.3 For duct located in areas NOT used as return air plenums, furnish insulated type flexible duct with polymeric liner bonded to wire spiral, Thermaflex M-KE or Flexmaster equivalent.

.4 Furnish flexible duct bearing ULC approved labels and conforming to flame spread and smoke developed ratings as required by code.

.5 Furnish sealed joints between flexible duct and rigid ductwork or equipment, made with non-flammable high velocity duct sealer, applied in accordance with duct manufacturer's recommendations, and gear type nylon strap connectors.

.7 Flexible Duct Connections:

.1 Acceptable Manufacturers:

.1 Duro-Dyne "Grip-Loc Type SMFN"

.2 Ventfabrics "Ventglas"

.2 Furnish flexible duct connections between fans and/or air handling units and connecting ductwork, between unit components, in ducts at building expansion joints, and in other locations indicated on Drawings.

.3 Furnish flexible connectors of heavy glass fabric double coated with neoprene and attached to 0.6 mm (24 ga) metal strips 75 mm (3") wide. Furnish flexible connectors with length of fabric between metal strips of minimum 75 mm (3") for ducts of maximum size in either dimension or diameter of 750 mm (30") or less, and 150 mm (6") for ducts of 775 mm (31") size and larger.

.8 Turning Vanes:

.1 Acceptable Manufacturers:

.1 Hart and Cooley "Ducturns"

.2 Duro-Dyne "Duro Vane RV-2"

.2 Provide hollow air foil type turning vanes in ductwork where indicated on Drawings and in 90 square duct elbows, fabricated of same material as duct in which they are installed.

.9 Balancing Dampers:

.1 Furnish balancing dampers, manually operated opposed blade type, or butterfly blade type, fabricated from galvanized steel sheet of thicknesses specified herein.

.2 Furnish factory built opposed blade type balancing dampers, with galvanized channel type frames, non-binding pre-lubricated type linkage, and blades fabricated of minimum 1.6 mm (16 ga) core thickness material. Furnish damper blades of 200 mm (8") maximum width, and of length coinciding with frame opening on horizontal plane to maximum 1200 mm (48").

.3 Furnish opposed blade balancing dampers complete with inter-connecting linkage, manual operator and locking type quadrant as required for synchronous operation and setting of blades.

.4 Furnish butterfly blade balancing dampers for round ducts (other than fume exhaust system) fabricated of 1.6 mm (16 ga) metal and with locking type quadrant.

.10 Volume Extractors:

.1 Furnish Titus Model AG225 extractors with #3 manual operator and mounting bracket, where noted on Drawings.

.11 Fire Dampers:

.1 Furnish fire dampers of hinged, fusible link type with channel frames, blades and housing, ULC labelled and conforming to ANSI/NFPA 90A-1996 requirements. Furnish "Type B" fire dampers for rectangular or square ductwork and "Type C" fire dampers for round ductwork.

.2 Furnish fire dampers and frame constructed of same material as duct in which they are installed.

.12 Relief Dampers:

.1 Acceptable Manufacturers:

.1 Farr Model PR-IO (American Warming and Ventilating Inc.)

.2 Furnish counterbalanced type relief dampers of size indicated on Drawings and as specified herein.

.3 Furnish parallel blade type dampers with 50 mm x 13 mm x 3 mm (2" x 1/2" x 1/8") steel channel frame, 1.6 mm (16 ga) aluminum blades, steel axles with ball bearings, complete with adjustable counterbalances, counterweights, and inter-connecting linkage.

.4 Furnish relief dampers with factory setting for vertical mounting, horizontal air flow, and static pressure indicated on Drawings.

.13 Access Doors in Ductwork:

.1 Furnish access doors in ductwork and for plenums to allow servicing, maintenance, and inspection of control dampers, fire detectors, both sides of fire dampers, control elements, bearings and as indicated on Drawings. Furnish access doors at least 300 mm x 150 mm (12" x 6") unless duct dimensions

prevent, or as required. Where motors are installed within unit or duct, furnish access door large enough to permit removal of same.

.2 For installation in insulated ductwork and plenums, furnish access doors of 0.8 mm (22 ga) thick galvanized steel sheet double panel construction with approved 25 mm (1") thick insulating filler, in flanged collar flush with face of finished insulation.

.3 Furnish access doors for installation in uninsulated ductwork and plenums from 18 gauge (1.2 mm) galvanized steel sheet, with door frames welded in place.

.4 Furnish access doors in air conditioning and ventilation systems with heavy continuous hinges, 3 heavy sash fasteners and sponge neoprene gaskets to ensure air-tight fit at operating pressure.

.14 Probe Inlets:

.1 Furnish probe inlets with Ventlok No. 699 or Duro-Dyne IP-1 or IP-2 Test Opening Enclosures complete with locking cap, chain, gaskets, insulating plug, and extensions for insulated ductwork.

.2 Furnish probe inlets in main supply and return ducts, inlet and outlet side of fans, and other locations as required by Testing and Balancing Trade, to permit testing, balancing and measurement of air quantities and static pressure in air handling systems.

2.7 Acoustic Duct Insulation

.1 Acceptable Manufacturers:

.1 Fiberglas
.2 Manson
.3 Partek

.2 General:

.1 Furnish rigid coated duct liner conforming to ANSI/NFPA 90A-1996 and 90B, of 25 mm (1") thickness and 72 kg/m3 (4.5 lb/cu.ft) density.

.2 In high velocity ductwork furnish perforated or expanded metal inner liner over acoustic insulation.

.3 Mechanical Insulation Clips:

.1 Fasten duct liner with plate type impaling pins and self-locking washers, "Stic-Klips" as manufactured by Eckels Industries, or "Tactoo" Series T; or furnish weld pins and self locking washers as manufactured by Continental Stud Welding Ltd. Furnish fasteners for securing pins of size and length as required by insulation weight, thickness, fastener spacing and design.

.4 Adhesives and Sealants:

.1 Furnish Foster No. 81-99 or Bakor No. 230-04 fire retardant adhesive for adhering insulation to sheet metal work. Seal joints with Foster No. 30-36 or Bakor No. 120-09 mastic sealant.

2.8 Air Terminal Units (Drawing Reference VAV)

.1 Acceptable Manufacturers:

.1 Carrier
.2 E.H. Price
.3 Titus
.4 Nailor

.2 General:

.1 Construct boxes of minimum 22 gauge galvanized steel. Line boxes with aluminum foil lined 19 mm (3/4") thick, 24 kg/mn (1.5 lb/ftn) density fibreglass insulation. Provide a discharge sound atttenuator with each unit.

.2 Use assemblies which are pressure independent and capable of being easily reset to any airflow between 0 and maximum. Factory set boxes for minimum 50% airflows. Provide dampers with gasket stops and leakage less than 2% of rated air flow at 750 Pa (3in wg) inlet satic pressure. Provide VAV boxes complete with, Model SP200 Velocity Pressure Sensor.

.3 Provide hot water reheat coil mounted in enclosure with access door. Size enclosure to match variable air volume control assembly. Use 1 or 2 row coils with capacities as detailed in Drawing Equipment Schedule.

.4 Submit unit discharge sound power level data and casing radiation sound power level data for each size box to consutant when submitting shop drawings.

.5 Do not exceed total air pressure drops indicated on drawings.

.6 Actuator/controllers to be provided by Section 15900, Automatic Controls. These divices may be installed by the manufacturer at the Contractors discretion.

2.9 Air Terminal Units (Drawing Reference BPB)

.1 Acceptable Manufacturers:

.1 Carrier
.2 E.H. Price
.3 Titus
.4 Nailor

.2 General:

.1 Furnish air terminal units of type, model and size as indicated in schedules on Drawings.

.2 Furnish single duct by-pass box assemblies, with insulated galvanized steel sheet casing.

.3 Provide hot water reheat coil mounted in enclosure with acccess door. Size enclosure to match air volume control assembly. Use one or two non coils with capacities as detailed in Drawing Equipment Schedules.

.4 Furnish mechanical volume regulators fabricated from non-ferrous metals, stainless steel, or approved long-life plastics.

.5 Factory preset maximum and minimum air volume indicated on Drawings.

.6 Furnish casings acoustically treated and fully insulated with acoustical, vapour-sealed glass fibre.

.7 Furnish units with electronic controls for sequence of operations indicated on drawings.

.8 See Equipment Schedule for capacities and details of all components.

2.10 Diffusers, Registers and Grilles

.1 Acceptable Manufacturers:

.1 E.H. Price
.2 Titus
.3 Nailor

.2 General:

.1 Refer to Drawings for accessories, neck size, dimensions, capacity, of grilles, registers and diffusers.

.2 Catalogue numbers of first named supplier are listed in schedules on Drawings to show required type and style.

.3 Furnish supply diffusers and registers to deliver indicated air quantities indicated with throw to reach intended space limits without increasing sound level of room. Furnish blank-off baffles where required. Furnish equalizing deflectors on diffusers and in other locations as indicated or required.

.4 Coordinate placing of diffusers, registers and grilles in ceilings with electrical and ceiling installation trades and exact location to final approval of Consultant.

.5 Furnish linear supply and return diffusers with either natural anodized aluminum finish or baked enamel finish as listed in Schedules.

.6 Unless otherwise noted, furnish other grilles, registers and diffusers shop prime painted.

.7 For air supply to specific light-air troffers in flat ceilings provide boots to connect to lighting fixtures as indicated on Drawings. Furnish bootsfor attachment to lighting fixtures ordered for installation. Connect flexible supply air duct to neck of boot.

.8 For air supply to coffered ceilings provide boots suitable for attachment to air slot on coffered ceilings as required and where shown on Drawings. Connect flexible supply air duct to neck of boot.

.9 Supply door grilles to Section 08110, Steel Doors and Frames for installation. Coordinate with Section 08110.

.10 On all ceiling-mounted grilles, registers and diffusers which require fire dampers, use non-asbestos Nailor-Hart, Type CK-2000 Thermal Blanket for fire protection.

2.11 Fans

.1 General:

.1 See Drawings for types, details and capacities.

.2 Provide felt edged backdraft dampers on all systems which are not provided with automatic control dampers.

.3 Size V-belt drives for 150% of motor nominal horsepower. Provide belt guards.

.4 Use fixed drive pulleys on fans greater than 0.75 kW (1 hp). Use adjustable drive pulleys on fans 0.75 kW (1 hp) or less.

.5 Use arrangement and motor location to suit fan location.

.6 Use bearings of ball bearing type, grease lubricated. Provide extended grease fitting where required for easy access.

.7 Use fan classification in accordance with A.M.C.A. Pressure Limitations. Use a minimum of Class I construction on all fans unless specified otherwise. Submit certified Fan Performance Curves and fan sound level ratings based on A.M.C.A. Standards to Consultant with Shop Drawings.

.8 Where 2-speed or multi-speed motors are specified in the Equipment Schedule(s), provide motors which will be compatible with starters. See Division 16 requirements.

.2 Roof Mounted Exhaust Fans:

.1 Use Greenheck Fan and Ventilator Corp., Model GB, centrifugal exhaust fan with spun aluminum housing. Mount motor and drive housing on vibration isolators and seal from exhaust air stream. Provide prefabricated sound curb with a minimum height of 380 mm 15"). Provide spark-proof wheel. Provide birdscreen, gravity backdraft damper and safety disconnect switch.

.3 Ceiling Exhaust Fans:

.1 Use Greenheck Fan and Ventilator Corp., Model SP exhaust fan, complete with backdraft damper, acoustically insulated housing and air inlet grille. Sound level rating not to exceed 3.8 Sones. Use centrifugal wheel with motor suitably grounded and mounted on rubber vibration isolators. Locate terminal box inside housing. Design fan motor and wheel to be removable without disturbing housing.

.4 Approved Manufacturers:

.1 Roof and Wall Exhaust Fans:

.1 Greenheck
.2 Cook
.3 ACME

.2 Ceiling Exhaust Fans:

.1 Greenheck
.2 Cook
.3 ACME

2.12 Outdoor Air Intakes and Exhaust Air Outlets

.1 Approved Manufacturers:

.1 Greenheck
.2 Jenn-air

.2 General:

.3 See Drawings for types, details and capacities.

.4 Fresh Air Intakes:

.1 Gravity relief vents with spun aluminum cover, welded aluminum curb cap and galvanized bird screen. Furnish exhaust air outlets complete with backdraft dampers.

.2 Furnish exposed metal parts pre-finished to later colour selection by Architect.

.5 Exhaust Air Outlets:

.1 Aluminum relief ventilator with birdscreen, insulated hood, and base to suit curb.

2.13 Outdoor and Exhaust Air Hoods

.1 Fresh air intake and exhaust air hoods of black steel construction of size, shape and arrangement as indicated on Drawings.

.2 Finish both interior and exterior surfaces with rust inhibitive primer and finish coat, colour selection by Architect.

Part 3 EXECUTION

3.1 Installation - General

.1 Install of Control Dampers supplied by Section 15900, Automatic Controls.

.2 Refer to and comply with applicable requirements specified in Section 15010, General Mechanical Requirements.

.3 Structural steel framing, supports, braces, as required or indicated on Drawings, to hang or support equipment are provided in conformance with Section 05500, Metal Fabrications.

.4 Prior to start-up of fans, blow out complete systems of ductwork with high velocity air for not less than 2 hours using where possible installed air handling equipment to full capacity and by blanking off duct sections to achieve required velocity. Do not install air filters prior to blow- out of ductwork systems. Use auxiliary portable blowers for cleaning where installed fan systems are not adequate to blow out complete system free from dust and dirt.

.5 After duct systems have been blown out, clean interior of plenums, coils, and register, grille or diffuser outlet collars with industrial type vacuum cleaner. On completion of cleaning process, install filters before placing systems in final operation.

3.2 Sheet Metal Work

.1 General:

.1 Install ductwork in arrangement indicated on Drawings in accordance with standards and recommended practices off ASHRAE and SMACNA. Provide required offsets and transitions, whether specifically indicated or not, to facilitate duct arrangement and to avoid interference with building structure, piping, equipment and services.

.2 Install ductwork in locations and at elevations appropriate to ceiling height indicated on Drawings. Where required to be concealed, install ductwork in

furred spaces provided in walls and ceilings. Where there is no provision for concealed ductwork, install as close as possible to walls, partitions and overhead structures to attain maximum headroom and clearance.

.3 Install sleeves where ducts pass through walls or floors. Pack space between duct and sleeve with mineral wool and seal both ends with non-inflammable fire resistant sealing compound. Install sheet metal closure plates on each side of wall to cover sleeve.

.4 At air intakes, exhausts and open ends in ductwork install removable galvanized screens securely fastened in place.

.5 Install gasketted flanged joints at duct connections to air conditioning units, coils.

.6 Install air terminal units and silencers independently of ductwork, with rods or angles of sizes adequate to support load.

.7 Install beam clamps or supplementary steel to secure hanger rods, angles and straps to structural steel framing.

.8 In suspended ceiling areas, adjust final location of grilles and diffusers to suit reflected ceiling plan.

.9 Where shape of duct changes, install transition piece so that angle of side of transition piece does not exceed 15 from straight run of duct being connected, unless indicated otherwise on Drawings.

.10 In office area paint interior of ductwork for at least 600 mm (24") behind supply and exhaust grilles with matte black paint so as to render ductwork invisible from occupied space.

.11 Slope exhaust ductwork up away from register in areas having high humidity, and without seams in bottom of duct for at least 3 m (10') of duct run behind register.

.12 Slope fresh air intake ducts down at 1:100 to permit moisture induced by air intake to be drained. Install 38 mm (1-1/2") drain flange in bottom of duct at low point and run drain line to nearest floor drain or as noted on Drawings.

.2 Below Grade Ductwork:

.1 For rectangular ductwork below grade, seal joints watertight. Install to slope indicated on Drawings.

.2 For round ductwork installed below grade, make joints watertight and fasten, tape and seal as recommended by duct manufacturer. Install to slope indicated on Drawings.

.3 Supports and Hangars - Rectangular Ductwork:

.1 Install supports and hangers at intervals not over 2400mm (8'-0") centres for ducts up to 1500 mm (5'-0") in width and at 1200 mm (4'-0") centres for ducts 1500 mm (5'-0") in width and over.

.2 Miscellaneous steel angles or channels as required between joists or building steel for structural support of duct where building framing spacing does not coincide with required hanger spacing shall be provided under this Section in Conformance with Section 05500, Metal Fabrications.

.4 Round Ductwork:

.1 Secure joints with sheet metal screws and seal with tape or sealant.

.5 Flexible Type Round Ductwork

.1 Furnish sealed joints between flexible duct and rigid ductwork or equipment, made with non-flammable high velocity duct sealer, applied in accordance with duct manufacturer's recommendations, and gear type nylon strap connectors.

.2 Furnish flexible type round ductwork between trunk supply duct and drops ceiling diffusers (maximum 30° offset from vertical), and where indicated on Drawings.

.6 Flexible Duct Connections:

.1 Install flexible connectors with fabric in folds, not drawn tight.

.2 Install guides to prevent flexible connection from collapsing on suction side of fans.

.3 For installation between sections of air handling units, install flexible connectors suitable for connecting to flanges of casings where so provided.

.7 Balancing Dampers:

.1 Install dampers at locations in supply and return ductwork where main ducts are split into 2 more trunks, at branch duct connections to individual diffusers, grilles, terminal units, and were indicated on Drawings.

.2 Use butterfly or opposed blade damper on duct sizes up to and including 300 mm (12") equivalent round duct diameter.

.3 Use opposed blade type dampers on duct sizes above 300 mm (12") equivalent round duct diameter.

.8 Fire Dampers:

.1 Install fire dampers in accordance with suppliers instructions, complete with retaining angles on both sides of wall or floor and fastened to damper collars.

.2 Install fire dampers complete with adjacent access door as required to permit re-opening of damper and replacement of fusible link.

.9 Relief Dampers:

.1 Install steel angle or channel frames at wall openings as required to mount relief damper (complete with fire damper) as indicated on Drawings.

.10 Access Doors in Ductwork:

.1 Install access doors in ductwork and in plenums to allow servicing, maintenance, and inspection of control dampers, fire dampers, fire detectors, control elements, bearings and as indicated on Drawings.

.11 Probe Inlets:

.1 Install probe inlets in ductwork at locations as specified under Part 2 - Products.

.2 Locate probe inlets sufficient distance from elbows or transition sections to ensure stable readings of non-turbulent air and install 75 mm (3") from corners and at 150 mm (6") centres across long side of duct.

.12 Acoustic Duct Insulation:

.1 Install internal acoustic insulation in specific sections of ductwork and/or plenums as indicated on Drawings.

.2 Adhere insulation to ductwork or plenums by bedding in strips of adhesive supplemented by impaling clips or weld pins spaced at 300 mm (12") oc with self-locking washers. Apply adhesive at 50% coverage, in 150 mm (6") strips. Cut off ends of welded impaling pins after application of self-locking washers. Seal butt joints of insulation with mastic sealant applied to edges of insulation. Coat joints and self-locking washers after installation with 2 coat application of mastic sealant, and with open mesh glass fabric embedded in mastic between first and second coat.

.3 In high velocity ductwork install perforated or expanded metal inner liner over acoustic lining.

3.3 Air Terminals

.1 Install air terminal units with at least 4 duct diameters of straight duct upstream of inlet.

3.4 Fans

.1 After installation of fans, rotate fan shafts at least once every month until acceptance of Work by Consultant.

.2 Install roof mounted ventilators on curbed roof openings in accordance with manufacturer's instructions.

.3 Install separation tape sealant between fan and curb.

3.5 Field Quality Control

.1 Testing of Ductwork:

.1 Inspect and test ductwork for air leakage at joints and connections to equipment, under normal operating conditions. Provide systems leakage tests to SMACNA Class 12 requirements.

.2 Test ductwork before ducts are insulated, painted or concealed.

.3 Immediately correct defects discovered during tests and retest systems to complete satisfaction of Consultant.

3.6 Roof Curb Insulation

.1 Provide roof attenuation under roof mounted air conditioning units as follows:

.1 Mount all new rooftop units on prefabricated roof curbs.

.2 Apply two layers of 25mm (1") thick 4.5 lb/ft density, insulating board on roof deck. Stagger board joints. Board section to be butted tightly to sides of ductwork and curb.

.3 Seal all board joints and edges with acoustic sealant.

.2 Advise consultant when this work is complete, for his review. Seal joints to satisfaction of Consultant.

3.7 Balancing of Air Handling Systems

.1 Balance air handling systems in accordance with Section 15010, General Mechanical Requirements and as specified herein.

END OF SECTION

Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Mechanical General Requirements, Section 15010.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

.5 Control installation shall be undertaken by control manufacturer.

1.2 Work Provided by Division 16

.1 Power wiring to control air compressors and refrigerated air dryers by Division 16.

.2 Power at 120/1/60 will be provided under Division 16 in each mechanical room and area as required by control systems.

.3 Division 16 to provide branch circuit wiring for lighting control panels and mount same as specified herein. Controls contractor is responsible for communication wiring interconnecting these panels.

.4 Electrical interlock wiring of equipment specified under other Sections of Division 15 is responsibility of trade section installing that equipment, unless indicated otherwise.

1.3 Products Furnished but not Installed Under this Section

.1 Automatic control valves as indicated on drawings to be installed by section 15600.

.2 Temperature sensing well.

1.4 System Description

.1 Supply and install standalone Direct Digital Control system complete with sensors, actuators, direct digital controllers, supervisory computer, compressed air supply, electrical control wiring and pneumatic piping resulting in complete and operating control system capable of providing functions specified and performing aspects of sequence of operations. Use product standard with manufacturer who will guarantee ongoing parts availability and factory trained field support for 5 years after system acceptance.

.2 Supply and install of electrical wiring including raceways for components furnished under this Section. Install wiring in accordance with governing electrical authority and requirements of Division 16. Include wiring between control components and wiring from these components to electrical circuits of equipment being controlled.

.3 Install controls supplied with equipment unless noted otherwise

1.5 Submittals

.1 Shop Drawings:

.1 Prepare and submit shop drawings for equipment and systems covered by this Section. As minimum include following:

.1 Complete catalogue data and installation instructions for each control component.

.2 Valve schedule with pipe sizes, flow rates, design and actual pressure drops.

.2 As-Built Shop Drawings:

.1 Provide complete and approved as-built shop drawings detailing equipment, installation details.

1.6 Quality Assurance

.1 Regulatory Requirements:

.1 Use U.L.C. listed or labelled electrical components for 25 volts and above.

.2 Comply with ANSI/NFPA 90A-1996 Flame/Smoke/Fuel contribution rating of 25/50/0 and applicable local building codes and requirements for equipment or piping used in conditioned air stream, spaces or return air plenums.

.3 Install system in accordance with requirements of local codes and authorities having jurisdiction.

Part 2 PRODUCTS

.1 Approved Manufacturers

.1 Johnson Controls

.2 Honeywell

.3 Siebe

.2 Electrical Wiring

.1 General:

.1 Conform with requirements of local electrical authority, Ontario Building Code and, unless otherwise indicated, requirements of Division 16.

.2 Low Voltage Signal Wiring:

.1 Install low voltage signal wiring in accordance with control manufacturer's recommendations. Run wiring in protective conduit or on trays, If wiring picks up unwanted noise, correct problem replacing or rerouting wire at no addition expense to Owner.

.3 Identification of Equipment

.1 Identify each piece of equipment with nameplate identifying equipment and functions with letter and number designation.

.4 Automatic Control Valves

.1 General:

.1 Characteristics of control valves shall be suited to required application.

.2 Pressure Rating:

.1 Pressure rating of control valves shall be suited to piping requirements as listed under other Sections of this Division.

.3 Valve Capacity:

.1 Size valves for flows in accordance with following permissible pressure drops:

.1 Chilled water coil valves - 3 psig.

.2 Hot water coil valves - 3 psig.

.3 Steam coil valves - critical pressure

.4 Hot water convectors - 1 psig.

.4 Load Sequencing:

.1 For capacities of modulating steam valves greater than 2000 lbs./hr., supply 2 valves and sequence, size 1 for 2/3 and other for 1/3 capacity.

.5 Valves:

.1 Valves 1-1/2 through 2": screwed bodies.

.2 Valves 2-1/2" and larger: flanged bodies.

.3 Valves 1/2" through 1-1/4" may have female NPT inlet and male NPT union outlet.

.4 5/8" valves used for terminal application may have SAE 45 flared inlet and outlet.

.5 Valves shall be suitable for 125 PSIG working pressure.

.6 Provide 2-way valves with equal-percentage flow characteristics.

.7 Provide 3-way mixing valves with linear throttling characteristics for each inlet. Under conditions of equal and constant pressure drop, total flow through valve not to change more than 10% as throttling plug is modulated from one extreme position to other.

.8 Provide valves for water duty to 200 F complete with stainless-steel stems, brass throttling plugs, bronze valve seats, and spring-loaded Teflon-cone packing.

.9 Provide valves for use with medium and hot temperature hot water up to 350 F at static pressures up to 250 psig, or steam at inlet pressures up to 150 psig, with bronze body, stainless steel metal-to-metal seat, throttling plug, and stem.

.10 Select valve actuators to provide proper control and close-off as required by application.

.11 Provide valves with actuators larger than 6 square inch effective area with valve positioners, whether required for sequencing or not, in order that correct valve positioning is independent of stem friction and pipeline pressure factors.

.12 Control contractor responsible for selection of proper control valves for project including sizing, pressure rating, flow coefficient, flow characteristic, close-off rating and allowable leakage factor.

.13 Isolation and control valves 4" and over may be butterfly type.

.5 Input/output Devices

.1 Temperature Sensors:

.1 Provide temperature sensors compatible with digital controllers for space, duct, fluid, and outside air sensing. Accuracy to 0.25°C over range of -40 to +100°C and with demonstrated stability of 0.25°C per year.

.2 Provide solid state thin film or wire wound RTD temperature sensors.

.3 Install sensors in threaded nipple in water or steam lines in stainless steel wells. If permanent thermometer is not located at sensing point, install a second well adjacent for temperature verification purposes.

.4 Provide room temperature sensors with concealed setpoint adjustment and blank covers. Provide room temperature sensors located in private offices with user accessible setpoint adjustment, setpoint indication and space temperature indication.

Part 3 EXECUTION

3.1 General

.1 Provide necessary control devices and application software to carry out described sequences of operation.

3.2 Sequence of Operations

.1 See Drawings for required sequence of operations

End of Section

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Part 1 General

1.1 General Requirements

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to Mechanical General Requirements, Section 15010.

.3 Conform to Electrical General Requirements, Section 16010.

.4 Conform to Division 16 requirements for Motors, Starters and Wiring.

1.2 Work by Other Trade Sections

.1 Adjusting, calibrating, modifying or operating any installed equipment or control to be provided by other Sections.

.2 Testing and checking of equipment supplied by other trade Sections, except where such equipment forms integral part of mechanical systems.

1.3 References

.1 Perform testing and balancing in accordance with current issue of SMACNA Standards. Use recently calibrated instruments and state date of calibration in reports.

1.4 Definitions

.1 BALANCING - To proportion and regulate flows within distribution system (subsystems, branches, mains, terminals and similar items) at appropriate pressures in accordance with design intent. This includes setting discharge volume and patterns of terminal devices, and individual return and exhaust air volumes.

.2 TESTING - To measure, interpret and report in writing, such parameters as may be required to verify design compliance and as hereafter specified.

1.5 Description

.1 Work to be performed under this Section includes, without limiting to, performance testing and balancing of heating, ventilating, air conditioning and liquid system, including labour, materials and equipment required to carry out Work under this Contract. Co-operate with other Sections of Division 15 which will operate systems and make any required adjustments to systems to meet specified and intended performance.

.2 Principal items of work are as follows:

.1 Performance testing and balancing of air and liquid systems.

.2 Survey installed automatic controls and verify their functional performance.

.3 Rechecking of testing and balancing during alternate (heating/cooling) season.

1.6 Design Requirements and Performance Requirements

.1 Balance systems to performance parameters indicated on Drawings and in Specifications. If interpretation, clarification or additions to performance parameters are required, request such information from Consultant.

.2 Balance systems to within following tolerances:

.1 Duct Leakage Rates (at operating pressures)

.1 Low pressure ducts: 0 to 0.5 kPa (0 to 2" W.G.) - 5% of full flow

.2 Air Flow Rates

.1 Under 70 L/S (150 cfm) - 10% of flow

.2 Over/at 70 L/S (150 cfm) - 5% of flow

.3 Water Flow Rates

.1 Hydronic Heating - 5% of flow

1.7 Submittals

.1 Reports:

.1 Submit following:

.1 Site visit reports

1.8 Quality Assurance

.1 Qualifications:

.1 Use independent Testing and Balancing Firm with minimum of 5 years experience in this type of work to carry out performance testing and balancing.

Part 2 Products

2.1 Materials

.1 Supply test equipment required to perform work of this Section.

Part 3 EXECUTION

3.1 General

.1 Site Visits:

.1 Visit Site as required prior to testing and balancing systems to advise respective trades of requirements for probe inlets. Submit report to Consultant after each Site visit.

.2 Coordination and Cooperation:

.1 Testing and Balancing Firm shall co-operate by giving adequate prior notification of request for services of tradesmen, and co-ordinating his efforts so that items requiring replacement and/or delivery time (sheaves, motors, and other similar items) are tested as early as possible.

.2 Co-operate with Testing and Balancing Firm and provide following assistance and/or services:

.3 Schedule sufficient time so that initial testing and balancing can be completed before occupancy begins and co-ordinate with trades involved.

.4 Provide and install balancing devices, test connections access openings, balancing probe inlets and plugs.

.5 Clean and pre-run equipment, filters, and place heating, ventilating and air conditioning systems into full operation and continue same during each working day of testing and balancing.

.6 Provide immediate labour from pertinent mechanical trades and tools, equipment and materials to make equipment and system alterations and adjustments, as required including control adjustments.

.7 Make available equipment data (shop drawing, performance data and operating instructions) to Testing and Balancing Firm.

.8 As part of co-ordination effort, be responsible for systems having been constructed and adjusted to provide optimum performance. Any re-adjusting required as result of spot checks by Consultant shall be done at no additional cost to Owner.

3.2 Procedure

.1 General:

.1 Review pertinent Drawings, Specifications, shop drawings, interference drawings and other documentation to become fully familiar with systems and their specified and intended performance.

.2 Provide equipment and instruct sheet metal trade on proper use for conducting duct leakage tests. Conduct first test as way of instruction to above tradesmen in presence of Consultant.

.3 Test relative barometric pressures in various building areas, as deemed necessary by Consultant and at least in areas served by different systems.

.4 Operate, test and balance air systems over their entire design range of operation including minimum and maximum fresh air, return air and supply air. Fully simulate both heating and cooling conditions. Record sufficient data to verify compliance with design requirements.

.5 Balance air systems before balancing water systems.

.2 Data Required:

.1 Submit following data as minimum. If required by Consultant, provide for additional data. Indicate where tests were not specifically made. Do not repeat design data or other values not specifically tested. Use units consistent with equipment schedules.

.1 Fans:

.1 Manufacturer

.2 Model and Serial number

.3 Rated flow

.4 Rated RPM

.5 Rated pressures (suction and discharge)

.6 Measured flow
.7 Measured RPM
.8 Measured pressures (suction and discharge)
.9 Pulley size, type and manufacturer
.10 Belt size and quantity

.2 Pumps:
.1 Manufacturer
.2 Model and Serial number
.3 Rated flow
.4 Rated Head
.5 Rated pressures
.6 Measured discharge pressure (full flow and no flow)
.7 Measured suction pressure (full flow and no flow)
.8 Measured flow at operating conditions
.9 Operating head
.10 Operating RPM

.3 Air Systems (including inlets and outlets):
.1 Grille, register or diffuser reference number and manufacturer
.2 Grille, register or diffuser location
.3 Design velocity
.4 Design flow
.5 Measured velocity
.6 Measured flow

.4 Heat Transfer Equipment:
.1 Manufacturer, type and serial number
.2 Following are to be provided for both heated and heating medium:
.1 Design Inlet and outlet temperatures
.2 Design pressure drop
.3 Design flow rate
.4 Measured inlet and outlet temperatures
.5 Measured pressure drop
.6 Measured flow rate

.3 Initial Testing:

.1 On completion of testing, adjusting and balancing of systems, submit 3 typewritten copies of full report on tests, adjustments, and balancing performed to consultant, including following:
.1 Summary of systems
.2 Testing methods and instrumentation
.3 Air systems testing and balancing data
.4 Liquid systems testing and balancing data

.5 Alternate Season Testing

.2 Check testing and balancing of heating, ventilating and air conditioning systems and water flow conditions at flow meter locations approximately 6 months from acceptance date of initial testing and balancing report, as advised by Consultant. Include items which could not be adequately completed during initial balancing due to their seasonal character. Include temperatures and pressures of gauges and outdoor and indoor conditions.

.4 Deficiencies:

.1 Report any deficiencies in systems or equipment performance resulting in design requirements being unobtainable immediately to Consultant.

.5 Acceptance:

.1 Substantial performance shall be considered reached when initial Balancing Report is accepted by Consultant and in opinion of Consultant systems have been satisfactorily installed, operated tested, balanced, and adjusted to meet specified and intended performance.

.2 Substantial performance will not depend upon alternate season testing as specified hereafter, however, make such relevant repairs or modifications deemed necessary during this rechecking as part of guarantee of work.

.3 Total performance of work shall not be considered reached until alternate season testing and balancing is completed and final report submitted and accepted by Consultant.

.6 Additional Testing:

.1 Consultant may request such additional testing in connection with this project as he deems necessary. Additional testing and balancing shall be performed at rates quoted and costs shall be withdrawn from allowance for Testing and Balancing work as approved by Consultant.

END OF SECTION

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END OF TABLE

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Requirements, Division 01, and any Supplementary General Requirements of the Contract as bound herein shall form a part of this Division and shall be carefully read and strictly adhered to.

.2 The requirements of this Section shall apply to and govern the work of all Sections of this Division and shall be read as an integral part of each Section.

.3 The Electrical Drawings and these Specifications are complementary to each other and each forms a part of this contract. In the event of discrepancies between Drawings and Specifications, the more restrictive conditions of the two shall apply, unless a written clarification is obtained from the Consultant.

.4 Misinterpretation of any requirement of either the Drawings or Specifications will not relieve this Division of responsibility to complete the work. If in doubt, contact the Consultant for written clarification. If clarification is not sought the Consultant`s decision shall be final and binding on the Contractor.

1.2 SYSTEM DESCRIPTION

.1 Supply all labour, tools, equipment, materials and transportation required for the installation of wiring, testing and proper operation of the complete systems as shown on the Drawings, as specified herein, or as reasonably inferable from both.

.2 Work to be Supplied and Installed

.1 The work of this Division includes, but is not limited to supply and installation of the following systems:

.2 Secondary Distribution (120/208V and 600V)

.3 Emergency Lighting

.4 Lighting

.5 Wiring Devices

.6 Fire Alarm System

.7 Communication System

.8 Electric Heating System

.9 Wiring for Other Trades

.10 Renovations and Removal of Existing Equipment

1.3 REFERENCES

.1 The Specifications for the Divisions as listed below shall govern the work of all Sections of this Division.

.1	Concrete	Division 03
.2	Doors and Windows	Division 08

.3	Painting	Division 09
.4	Specialties	Division 10
.5	Conveying Systems	Division 14
.6	Mechanical	Division 15

1.4 WORKMANSHIP

.1 Only first class workmanship by skilled electricians will be accepted, not only with regards to durability, and safety, but also with regard to its neatness of installation, and overall accessibility. Present a neat and clean installation on completion to the satisfaction of the Consultant. Any unsatisfactory workmanship shall be replaced at no extra cost.

.2 Employ a competent foreman to supervise the electrical work of this division throughout the construction unless otherwise approved by the Consultant.

.3 Employ qualified and experienced tradespeople employed to perform specific work such as installation or testing of specific systems including motor controls and programming, fire alarm systems, special systems, etc.

1.5 DRAWINGS

.1 Drawings which accompany these specifications are diagrammatic and show the power distribution, number and general location of the electrical equipment, outlets and required circuiting. They do not show all structural and mechanical details, and are not intended to be shop or working drawings.

.2 Do not scale drawings but use only dimensions which are shown. Where exact building dimensions and details are required, use only figured dimensions on the Architectural or Structural Drawings or job site dimensions.

.3 Make changes or additions to the electrical system as indicated or required by the Structural or Architectural Conditions at no extra cost to the contract.

.4 No deviations from the Drawings or Specifications will be permitted without written authorization from the Consultant.

1.6 RECORD DRAWINGS

.1 The Consultant will provide extra sets of white prints on which the Contractor shall make, as the job progresses, all deviations and approved changes from the original drawings. One set of prints shall be maintained at the job site and day-by-day changes or deviations shall be recorded.

.2 Two complete sets of Record Drawings, accurately marked up in red ink, must be submitted to the Engineer for approval before the final certificate of acceptance is issued. These drawings shall be clearly labelled `As Built' and shall indicate all deviations, changes and addenda from the original construction drawings.

1.7 SHOP DRAWINGS

.1 Submit shop drawings, in accordance with the General Requirements, Division 01.

.2 Equipment shop drawings shall clearly indicate the name of manufacturer, weight, dimensions, the catalogue number, any wiring diagrams, and the Engineers designation from the drawings.

.3 Shop drawings shall be submitted, and reviewed obtained prior to ordering of equipment.

.4 Re-submit all shop drawings if so requested by the Consultant until REVIEWED.

.5 Shop drawings required by supply utilities shall be submitted to both the Consultant and the supply utility for approval.

.6 Review of shop drawings by the Consultant does not relieve the Division of the full responsibility of correct dimensions, quantities, and compliance with applicable Codes and Standards.

.7 The review of shop drawings by the Consultant is only for maintaining general conformance to the design concept. His review does not include approval for the actual design or quality of the equipment nor does it mean that the equipment will fit.

.8 Submit shop drawings for items as outlined in each section of this Division.

.9 The Consultant shall only review shop drawings which bear both the stamp and signature of the General Contractor, and this trade.

.10 Failure to comply with any of the aforementioned conditions for shop drawings shall result in the return of the shop drawings without review.

1.8 PERMITS AND FEES

.1 Obtain and pay for all permits and fees required for the execution and inspection of the electrical work and pay all charges incidental to such permits.

.2 Before commencing work, prepare working drawings and submit them along with all other material required to the Electrical Safety Authority (ESA)and obtain their approval. The contract drawings and specifications may be used for this submission.

.3 Arrange and pay for any special inspection of equipment specified if and when required.

.4 On completion of the electrical work, obtain and submit to the Consultant the ESA Unconditional Inspection certificate together with the maintenance manuals.

1.9 RULES & REGULATIONS

.1 Provide all materials and installation in accordance with the latest editions of the Canadian Electrical Code, Ontario Electrical Safety Code, CSA Standards and Bulletins, the ESA Special Inspection, The Ontario Fire Marshal and any other more restrictive requirements of all applicable Municipal and Provincial Codes and Regulations.

.2 CSA Standards and bulletins, either named or un-named, which govern the installation of materials required in this Division shall form an integral part of this Specification and are to be read in conjunction with it.

.3 All changes and alterations required by an authorized Inspector of any authority having jurisdiction shall be complied with as part of this contract and shall be carried out without extra charge.

.4 The Contract Drawings show the minimum standard acceptable regardless of any lesser standards set by any Codes or Regulations having jurisdiction.

1.10 CO-OPERATION OF TRADES

.1 Read Specifications and Drawings of other trades and conform with their requirements before proceeding with any work specified in this Division related to the other trades.

.2 Co-operate with all other trades on the job, so that all equipment can be satisfactorily installed, and so that no delay is caused to any other trade.

1.11 EXAMINATIONS

.1 Before submitting tenders, carefully examine the Architectural, Structural, Electrical and Mechanical Drawings and all Specifications having a bearing on the work of this Division. Visit the site of the building and thoroughly ascertain that the work of this Division can be carried out satisfactorily without any changes to the Drawings or Specifications. No extras will be allowed for anything which would have been revealed in the course of such an examination.

.2 Prior to commencing the work, examine the proposed locations of equipment and fixtures of other trades. Report any defects or interference with the work of this Division in writing to the Consultant. Work shall not commence until any discrepancies adversely affecting the work of this Division are remedied.

.3 Fully understand the function of the systems described in this Division. Have no doubt as to the extent of the systems and/or materials and labour required. Contact the Consultant for clarification. No extras will be allowed to complete systems inadequately installed or not fully operational.

1.12 ABBREVIATIONS & DEFINITIONS

.1 Abbreviations used on Electrical Drawings and in this Division are generally listed below:

.1	O.B.C.	Ontario Building Code
.2	C.S.A.	Canadian Standards Association
.3	A.W.G.	American Wire Gauge
.4	V. (KV)	Volt (Kilovolt)
.5	W. (KW)	Watt (Kilowatt)
.6	A. or AMP	Ampere
.7	F.H.P.	Fractional Horse Power
.8	E.M.T.	Electrical Metallic Tubing
.9	C.	Conduit
.10	E.C.	Empty Conduit
.11	I.F.	Inside Frosted Lamp

.12	Trans.	Transformer
.13	F. @	Fused at
.14	S.P. (D.P.)	Single Pole (Double Pole)
.15	S.N.	Solid Neutral
.16	Disc. SW	Disconnect Switch
.17	D.P.D.T.	Double Pole Double Throw
.18	D.P.S.T.	Double Pole Single Throw
.19	L.P.	Lighting Panel
.20	P.P.	Power Panel
.21	W.P.	Weatherproof
.22	M.H.	Mounting Height
.23	O.E.S.C.	Ontario Electrical Safety Code
.24	N.F.P.A.	National Fire Protection Association
.25	N.F.C.	National Fire Code
.26	H.P.	Horse Power
.27	E.E.M.A.C.	Electrical Equipment Manufacturer's Association of Canada
.28	A.N.S.I.	American National Standards Institute
.29	A.S.T.M.	American Standard Testing and Materials
.30	U.L.C.	Underwriter Laboratories of Canada
.31	R.T.	Rain Tight
.32	F.A.	Fire Alarm
.33	EXP	Explosion Proof
.34	ESA	Electrical Safety Authority

.2 Wherever the words "approved", "satisfactory", "directed", "permitted", "inspected", "instructed", "required", "submit", "order", or similar words or phrases are used in the specification, it shall be understood, unless the context implies otherwise, that the words "by (to) the Consultant" follows.

.3 Wherever the word "provide" is used in this specification or on the drawings, it shall be understood, unless the context implies otherwise, that it is equivalent to "supply and install".

1.13 ELECTRICAL EXTRAS & CREDITS

.1 Changes to the contract requiring additions to or deletions from the work of this Division shall be carried out upon written request of the Consultant. Extras to the contract or credits shall be submitted with a complete cost breakdown as follows:

.1 Materials, quantities and unit prices for all equipment required or deleted.

.2 Unit man hours per Item .1.

.3 Total material cost.

.4 Total man hours.

.5 Hourly rate. (Refer to Supplementary Conditions and General Contract).

.6 Total overhead and profit. (Refer to Supplementary Conditions and General Contract).

.2 Equipment and material costs shall be accepted at net costs only.

.3 Additional invoices, time sheets, and other evidence of costs shall be provided upon request by the Consultant to justify charges for additional work.

.4 Prices not submitted in this format will not be accepted.

1.14 OPERATING & MAINTENANCE MANUALS

.1 Provide four sets of operating and maintenance brochures from the manufacturers for all items and pieces of equipment. Assemble into three manuals and include a Table of Contents, a Weekly, Monthly, and annual Maintenance Schedule listing all equipment required to be serviced at these intervals. Include the description of the equipment, maintenance and operation required, wiring diagram, parts list, name and address of selling and service representative and any test results required.

1.15 GUARANTEE

.1 Upon completion of the work of this Division and prior to final payment, provide to the owner a written guarantee that for one year from the date of acceptance, any defect in workmanship or materials will be corrected at no cost to the Owner except where Owner misuse, neglect, or abnormal conditions have caused the defect. Fluorescent lamps and H.I.D. lamps shall be guaranteed 120 days and incandescent lamps 60 days.

.2 This guarantee shall not supersede any longer Guarantee (in time) furnished by the manufacturer of a piece of equipment but shall govern all other material or workmanship.

1.16 INSPECTION

.1 All work and materials covered by these Specifications shall be subject to inspection at any time, by the Consultant or the Owner's Representative.

.2 If the Consultant or Owner's representative finds that any material or workmanship does not conform with these specifications this Division shall remove such materials and/or correct such workmanship within 5 days of notification by the Consultant or Owner's representative.

1.17 FINAL INSPECTION

.1 This Division shall notify the Consultant when the final inspection for the work of this Division shall be performed. Defects or deficiencies found during this inspection shall be corrected to the satisfaction of the Consultant before final payment is made.

1.18 DAMAGE TO OTHER WORK

.1 This Trade shall be responsible for all damages to his own work or the work of other trades caused by the execution of work by this Division.

.2 Protective covers on or around equipment and materials to prevent damage during construction is the responsibility of this Division, both for his work and the work of other Divisions affected by this Division.

Part 2 PRODUCTS

2.1 MATERIALS & EQUIPMENT

.1 All materials and equipment supplied under this Division shall be of Canadian Manufacturer unless otherwise specified. All materials and equipment are to be new, and conform to CSA Standards and be thus approved.

.2 Materials specified with the manufacturer's name, type, bulletin no., etc., are to establish type and quality of material required, not to limit the selection to those specified.

.3 Material or equipment specified by technical description shall be provided with the best commercial qualities obtainable for the purposes described.

.4 Maintain uniformity of manufacturer, type, and style, within a particular group of equipment or class or type of fixture.

.5 Requests for extra money, time or equipment substitution due to late ordering of equipment will not receive any consideration.

2.2 ALTERNATES AND SUBSTITUTIONS

.1 Whenever a substitute or alternate product not listed in the Specifications is proposed for approval, this Contractor shall guarantee that such proposed substitutes or alternates will not adversely affect the space requirements allocated on the drawings for the material or item or plant or equipment specified. He shall agree to bear any additional expense incurred by the Owner, himself and other Contractors due to the use of proposed substitutes or alternates, particularly in connection with any required changes in the work and any additional material and installation costs by any other part of the project.

.2 Equipment manufacturers and sub-contractors submitting alternates or substitutes for this contract shall, upon written request of the Engineer qualify themselves to have the experience in the successful manufacture and/or installation of the type of work and quality of materials specified and shown.

.3 Requests for approval shall be accompanied by complete specifications for the equipment, showing dimensions, ratings, photometrics, cost reductions, etc.

.4 No substitutions or alternates will be allowed after tender close.

.5 Any equipment installed, without the Consultant's written approval, shall be removed and the correct equipment installed at the Electrical Contractor's expense.

.6 In the event the approved alternate equipment is not available for any reason, the specified equipment shall be installed, any and all costs incurred shall be by this Division.

.7 When proposing an alternative product, the Contractor shall make the Consultants aware of any structural, architectural, mechanical, or electrical design changes necessary to accommodate the alternative product. The contractor is responsible for paying all costs incurred, which may result, from the acceptance of the alternative. Any cost savings anticipated must include all additional costs incurred, for any changes, to the original design.

Part 3 EXECUTION

3.1 GENERAL REQUIREMENTS

.1 The location of any panels, equipment, outlet, raceway and wiring may be changed by the Consultant if the new location is within a limit of 3 metres radius of the original location. Provide changes without extra cost if requested before installation in the original location.

.2 Do not install wall mounted equipment at locations where built-in furniture or other equipment is to be installed. In cases of conflict, install equipment above the built-in furniture and clear the trim by approximately 150 mm (6") unless otherwise instructed by the Consultant.

.3 Arrange for openings in the walls and floors for transportation and installation of large and heavy equipment. Extra charges for cutting and making good of walls or floors for the work will not be accepted.

.4 Mount all equipment plumbed-true.

.5 Adjust phase loading on all panels and switchgear so as not to exceed a 10% phase imbalance of current at operating load conditions.

.6 Megger test all feeders prior to energizing. Submit test results in maintenance manuals.

.7 Measure voltage at all feeder supply connectors and at the load connections and insure that the voltage drop between supply point and load does not exceed that allowed by the O.E.S.C. Change all feeders to eliminate any problems discovered. Tests to be conducted at normal operating conditions. Provide a written report to indicate all measured values for all major equipment feeders and all panels and secondary distribution.

.8 Co-ordinate with the Architectural, Structural and Mechanical trades for the installation and location of electrical conduit, boxes, and fittings to avoid conflicts and provide a neat appearance. Consult with the Architectural, Structural and Mechanical Drawings for details of their work to facilitate co-ordination.

.9 Upon completion of the electrical work provide the final unconditional certificate of acceptance from ESA.

3.2 STORAGE OF MATERIALS

.1 Proper facilities for a workshop, tool shop, office space and protection of materials and equipment shall be provided by this Division, at the job site for the material for this Division.

.2 Exact on-site locations to be determined by the General Contractor. This Division shall be responsible for any losses or damage incurred to on-site material.

.3 Store all material, equipment, panels, luminaries, etc. in a dry, clean place and cover with polyethylene covers if necessary to preserve factory finish.

3.3 WASTE AND SURPLUS MATERIALS

.1 Under this Division at all times keep the premises free of accumulation of waste and surplus materials resulting from the work of this Division.

.2 On completion of the contract, this Division shall remove all the scrap and debris resulting from the work of this Division from the site.

.3 Remove all tools, scaffolding and surplus materials after completion and acceptance of the work. Clean all equipment such as panel boxes, luminaries, switches receptacles, etc., of all dirt and paint, at the time of final acceptance of the work.

.4 Prior to final acceptance this Division shall remove all construction dust and dirt from all equipment installed by him. This shall include the interiors of panel, fixtures and switchgear.

3.4 SLEEVES, HOLES AND PATCHING

.1 Supply and set all necessary sleeves for this contract prior to pouring of concrete. There will be no allowance for holes or sleeves missed during initial construction.

.2 Holes through concrete structural members shall be schedule 40 steel pipe sleeves. Holes through walls are to be properly flashed and made weather-proof as required under Division 07. All holes through concrete or steel structural members shall be approved by the Structural Consultant.

.3 Provide cutting and patching as specified under the General Conditions and Supplementary General Conditions.

.4 All cutting, patching, sleeves and grouting is to be done by fully qualified craftsmen of that respective trade. All costs for cutting and patching required by this Division are to be included in the tender.

.5 Holes through exterior walls and roof membranes shall be properly flashed and made weatherproof by qualified craftsmen of their respective trade.

.6 All cutting, patching, sleeving, etc. shall be carried out under the direct supervision of the General Contractor, and to the satisfaction of the Consultant.

3.5 GROUNDING AND TESTING

.1 Under this Section, test all equipment and wiring supplied and installed in this contract at any time requested by the Consultant. Provide all metres materials and labour to carry out these tests. All readings shall conform to the requirements of the Local and Provincial codes which apply to this Specification.

.2 Test Shall Include:

.1 Voltage reading on near full load at main service switch, distribution panel feeders, transformer feeders, and load connection points for Mechanical & Electrical equipment.

.2 Amperage readings of service and each panel feeder.

.3 Ground fault insulation resistance.

.4 Continuity of metal raceways.

.5 Operation of each piece of equipment and system for correct function.

.3 Test to include:

.1 The following

.1 Voltage at distribution panels.

.2 Voltage at load connections for mechanical equipment.

.3 Amperage - Panel feeders.

.4 Ground fault insulation tests.

.5 Continuity of metal raceways.

.6 Operation of each piece of equipment and system for correct function.

.4 Written records of the tests performed indicating date of test, equipment name, purpose of test, device used for testing and measured results.

3.6 CORROSION, PROTECTION AND TOUCH-UP

.1 All miscellaneous ferrous metal items such as mounting angles, channels, unistruct, rod or pipe hangers, bases, insets, etc., shall be delivered to the job with a shop coat primer to prevent rust and corrosion. Prime paint all cut metal or damaged finishes on the job. Finish painting of these items if exposed, is specified in Division 9.

.2 All priming shall be free of runs or drips. Scratches, chipped or rough items will not be accepted. Sand smooth and refinish.

.3 All shop painted equipment damaged in transit or during installation shall be touched-up to match existing finishes.

.4 Protection of installed materials from abuse and damage during construction shall be the responsibility of the Electrical Contractor. Provide all necessary protective coatings or shields to prevent damage to installed equipment until final acceptance by the Owner.

3.7 EQUIPMENT IDENTIFICATION

.1 Identify all equipment such as panels, cabinets, contactors, starters, disconnect switches, transformers, switchgear, etc. with labels as specified below.

.2 The junction boxes of all power and lighting systems shall be labelled indicating circuits contained within.

.3 Labels shall be 3 mm (1/8") thick lamacoid plates, black with 6 mm (1/4") white lettering, mechanically fastened to the equipment.

.4 Mount nameplates on the top inside cover on all panels and on the front cover of equipment for the respective system.

.5 The wording on these plates shall conform generally with that used in these Specifications and on the Drawings. All fused disconnects to include size and type of fusing on equipment name plate. All panels to have mains voltage indicated. Panels nameplates to indicate from where and which distribution they are fed from.

.6 Mechanically fasten nameplates directly on the equipment. For small size equipment install nameplates on the wall above or under equipment.

.7 Submit the wording for all nameplates and panel schedules to the Consultant for approval prior to makeup and installation.

.8 Colour code all conduits and conductors and metallic sheathed cables according to the following standards:

.1 Colour to be min. 25 mm (1") band of plastic tape or spray bomb on conduits and metallic cables; 50 mm (2") band on conductors.

.2 Colour code at entrance/exit to wall, ceiling, or floor and minimum 15 m (50') intervals.

.3 Conductor colour code.

.1 Green – Ground

.2 White – Neutral

.3 Red, Blue, Black, - Phase - 250 V or less

.4 Systems colour code for conduits and metallic cables.

.1 Grey - 120/208V

.2 Green – Telephone

.3 Red - Fire Alarm

.4 Blue - Special Systems

.5 Brown - Auxiliary Power.

3.8 MOUNTING AND MOUNTING HEIGHTS

.1 Provide all special supports and bases for the work of this trade. Every conduit run shall have at least one hanger support. Only approved conduit hangers shall be used; perforated pipe straps shall not be used.

.2 Support every outlet box, junction box, panel tub, etc., be independent of the conduits running to it.

.3 Support all ceiling mounted devices in public corridors by ready rods secured into concrete slabs.

.4 No splitter trough, disconnect switch, starter or other piece of equipment shall be mounted on a wall or panel with the underside of the equipment less than 460 mm (18") above the floor except for floor mounted equipment or wall mounted equipment over 1500 mm (5'-0") high which shall be mounted with the top side of the equipment 2100 mm (7'-0") above the floor or as directed in the field.

.5 Panels for mounting of equipment shall consist of #10 gauge USS steel on an angle iron frame for wall mounted panels. The complete panel is to be thoroughly cleaned of all dirt, rust and loose material and be given two coats of grey enamel before mounting any equipment.

.6 In areas of combustible construction mount service box and panelboards on spacers to provide 50 mm (2") ventilated distance between back of the panel and the backboard.

.7 Refer to the Architectural elevations when provided or referred to details on Electrical Drawings.

.8 Install switches, receptacles, outlets, etc., on one common centre line, one above the other, when shown on the drawings in a grouping.

.9 Dimensions refer to the centre line of equipment above the finished floor unless otherwise shown or specified. Mounting heights in stairwells refer to the floor, landing or stair tread directly below the equipment.

.10 Install equipment at heights as follows:

.1	Open panelboards 600 mm (24") from floor to bottom, and 1820 mm (72") to top, consult Consultant for variations.		
.2	Power and Lighting		Standard
	.1	Circuit Breaker Panels	<<72" to top>>
	.2	Individual Safety Switches	<<60" O/C>>
	.3	Individual Motor Control	<<60" O/C>>
	.4	Convenience Receptacles	<<18" O/C>>
	.5	Above Counter Receptacles	<<42" O/C>>
	.6	Light Switches	<<47" O/C>>
	.7	Wall Lights	Top of luminaire to top of door trim, unless noted otherwise.
.3	Fire Alarm System		
	.1	Manual Pull Stations	<<47" O/C>>
	.2	Signal Devices	<<90" O/C>>
	.3	End of Line Resistors	<<60" O/C>>
.4	Communication System		
	.1	Telephone Cord Set	<<18" O/C>>
	.2	Computer Data Outlet	<<18" O/C>>

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1	General Conditions	Division 1
.2	General Electrical Provisions	Section 16010

1.2 SCOPE OF WORK

.1 Work to be Supplied and Installed

- .1 Raceways
- .2 Armoured Cable
- .3 Wire and Cables
- .4 Wire Connections and Devices
- .5 Outlet Boxes
- .6 Pull and Junction Boxes
- .7 Cabinets
- .8 Supporting Devices
- .9 Access Panels

1.3 QUALITY ASSURANCE

.1 Install all equipment to the minimum of Ontario Electrical Safety Code Standards, unless stricter standards are indicated on the drawings or in this specification. In all situations the more restrictive standard of material and installation shall apply.

1.4 REFERENCES

.1 CSA Standards C22.2 No. 62, Surface Raceways and Lighting Fixture Raceways and Fittings.

.2 CSA Standards C22.2 No. 83, Electrical Metallic Tubing.

.3 CSA Standards C22.2 No. 211.0, General Requirements and Methods of Testing for Non-Metallic Conduit.

.4 CSA Standards C22.2 No. 211.1, Rigid Types EB1 and DB2/ES2 PVC Conduit.

.5 CSA Standards C22.2 No. 211.2, Rigid PVC Conduit.

.6 CSA Standards C22.2 No. 211.3, Rigid Fibreglass Reinforced Epoxy (RE) Conduit and Associated Fittings.

.7 CSA Standard CAN3-C21.2, Control Cable for Low Energy Circuits.

.8 CSA Standard C22.2 No. 35, Extra-Low-Voltage Control Circuit Cables, Low-Energy Control Cable, Extra-Low-Voltage Control Cables.

.9 CSA Standard C22.2 No. 38, Thermoset Insulated Wires and Cables.

.10 CSA Standard C22.2 No. 48, Nonmetallic Sheathed Cable.

.11 CSA Standard C22.2 No. 51, Armoured Cables.

.12 CSA Standard C22.2 No. 52, Service-Entrance Cables.

.13 CSA Standard C22.2 No. 75, Thermoplastic-Insulated Wires and Cables.

.14 CSA Standard C49.3, Aluminum Alloy 1350 Round Wire, All Tempers, for Electrical Purposes.

.15 CSA Standard C68.3, Power Cables with Thermoset Insulation.

.16 CSA Standard C22.2 No. 227.1, Electrical Nonmetallic Tubing.

.17 CSA Standard C22.2 No. 227.2, Flexible Liquid-Tight Nonmetallic Conduit.

.18 CSA Standard C22.2 No. 227.3, Flexible Nonmetallic Tubing.

.19 CSA Standard C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Metal Conduit.

.20 CSA Standard C22.2 No. 45, Rigid Metal Conduit.

.21 CSA Standard C22.2 No. 85, Rigid PVC Boxes and Fittings.

.22 CSA Standard C22.2 No. 18, Outlet boxes, Conduit Boxes and Fittings.

.23 CSA Standard C22.2 No. 40, Cutout, Junction and Pull Boxes.

.24 CSA Standard C22.2 No. 65, Wire Connectors.

1.5 SUBMITTALS

.1 Submit shop drawings for the following pieces of equipment:

.1 Fire Rated Access Panels

.2 Submit to the Consultant, in writing, a schedule of proposed feeders to be used if different than those specified on the drawings or in this specification.

Part 2 PRODUCTS

2.1 GENERAL

.1 Where more than one manufacturer is named for an item, proposed item must meet all qualifications of the specification.

.2 All materials of similar type shall be of one manufacturer.

2.2 RACEWAYS

.1 Flexible Metal Conduit

.1 May be used:

.1 In or on buildings of combustible or non-combustible construction.

.2 Flexible metal conduits less than ½" (12 mm) internal diameter may be used for runs of not more than 5 ft. (1.5 m) for the connection of equipment.

.2 Rigid PVC Conduit

.1 May be used above and below ground:

.1 For exposed and concealed work in accordance with the rules for threaded rigid metal conduits and with a separate grounding conductor installed within the conduit.

.2 Shall not be used:

.1 With wiring for exit signs, emergency lighting, emergency power, and fire alarm systems except where embedded in at least 2" (50 mm) of masonry or poured concrete or installed underground.

.3 Rigid PVC conduit shall not be used where enclosed in thermal insulation.

.4 Rigid PVC conduit shall not be used where exposed to temperatures in excess of 75oC.

.3 Liquid-Tight Flexible Conduit

.1 May be used in dry, damp, and wet locations where a flexible connection is required.

.2 3/8" (9.5 mm) liquid-tight flexible conduit of not longer than 5 ft. (1.5 m) may be used for the connection of equipment.

.3 Shall not be used:

.1 Where subject to mechanical damage.

.2 As a general service raceway.

.3 In length greater than that essential for the degree of flexibility required.

.4 Where exposed to liquids or vapours having an injurious effect on the outer jacket.

.5 Where the temperature will exceed 60oC unless approved otherwise.

.6 Where low temperatures may cause injury to the conduit when flexing.

.7 Without a separate grounding conductor installed within the conduit.

.4 Electrical Metallic Tubing (EMT)

.1 May be used:

.1 For exposed or concealed work in or on buildings or portions of buildings of either combustible or non-combustible construction.

.2 Shall not be used:

.1 Where subject to mechanical injury.

.2 For direct earth burial.

.3 In wet locations including wet concrete or masonry slabs.

.4 Where exposed to corrosive vapours unless suitable protected.

.5 Surface Raceways

.1 Shall be used in dry locations only.

.2 Shall not be used where concealed or subject to severe physical damage unless approved otherwise.

.6 Provide all empty raceways and raceway systems complete with outlet boxes, coverplates, fish wire, bushings, caps, etc. Install nylon cords for all fish wires.

.7 Size all raceways to suit the number and type of conductors they are carrying and of sufficient size to permit easy removal of conductors at any time. Where raceway sizes are shown on the drawings, these sizes are minimum and in no case shall they be reduced.

.8 Colour code surface and exposed parts of raceways and all conduits as specified in Section 16010.

2.3 ARMOURED CABLE

.1 Armoured cable when used for final drops to lighting fixtures shall not exceed 10' (3 m) in length.

.2 AC-90 shall be allowed for branch circuit wiring in stud walls but shall not exceed 10' (3 m) in length exposed in ceiling.

.3 Where single or multi-copper-conductor armoured cables are being used for service feeders, secondary feeders, sub-distribution feeders, panel feeders, risers, etc., and being of the type approved to be installed, may be used:

.1 In or on buildings of either combustible or non-combustible construction.

.2 Underground.

.3 Embedded in concrete.

2.4 CONDUCTORS

.1 Use T90 or RW-90, copper conductor building wires rated at 600 Volt, X-Link insulation and approved for the respective installation.

.2 Where a particular type of insulation is specified, or shown, that type of wire shall be used.

.3 Use minimum # 12 copper wire unless otherwise specified in other Sections of this Division.

.4 All conductors shall be colour coded consistent with the Ontario Electrical Safety Code, and Section 16010.

.5 Conductors up to and including # 10 may be solid copper. Larger conductors shall be stranded.

.6 Size conductors for a maximum of 2% voltage drop from the supplying panel to the farthest outlet in the circuit and large enough to be protected by the fuse or circuit breaker in the circuit.

.7 All joints must be approved solderless pressure connectors or insulated crimped connections terminated in boxes or fittings of adequate size.

.8 Conductors up to 1/0 AWG shall be copper. Conductors 1/0 AWG and larger may be substituted with aluminum conductors sized for the equivalent current rating capacity of the copper conductors. Submit proposed equivalent conductors and sizes for review by the Consultant.

2.5 WIRE CONNECTIONS AND DEVICES

.1 Conductors of the following materials shall have connectors as specified:

	Wire	Connector Material
.1	Copper(C) to Copper(Cu)	Copper or Cu/AL
.2	Cu to Aluminum(A.L.)	AL or Cu/AL
.3	AL to AL	AL or Cu/AL
.4	Al to Panelboard; Transformer	AL or Cu/AL
.5	Cu to Panelboard; Transformer	Cu or Cu/AL

2.6 OUTLET BOXES

.1 Use outlet boxes described in locations as indicated. P.V.C. equipment boxes are permitted in parking garage and in poured concrete walls. For wall boxes single gang boxes only have been indicated.

Location		Box No.
Ceilings		54151
Ceilings -	Concrete slab	54571
Cavity Walls -	Flush mounting, Switches	1004 (120V)
Cavity Walls -	Flush mounting Receptacles, System outlets,	52151 c/w plaster ring
Exterior Walls -	Flush mounting	FS Type
Surface Mounting -	Interior walls Switches	1151 (120V)
Surface Mounting -	Interior walls Receptacles, System outlets,	5215 or 52171

Surface Mounting - Exterior	Type C-143
Masonry Walls - Flush mounting	MBD-(120V) or MBD-HV-(347V)
Masonry Walls - Flush mounting System Outlets, Telephone	MBD-2

.2 Ganged boxes shall be of solid construction. Sectional (assembled) boxes will not be permitted.

2.7 PULL BOXES AND JUNCTION BOXES

.1 Size pull boxes and junction boxes for the dimensions and cubic inch capacity as required by the O.E.S.C. for the application.

.2 Pull boxes and junction boxes shall be constructed of code gauge steel, primed and painted, complete with screw-on or hinged covers.

.3 Where pull boxes are indicated on the drawings, these shall be provided sized as indicated and to code requirements.

.4 Junction boxes in hazardous locations shall be sealed type filled with caulking compound, approved for such locations.

2.8 EQUIPMENT ENCLOSURE - CABINETS

.1 Cabinets to be code gauge steel, prime coated, c/w locking door flush lock and latch assembly and concealed flush hinges of type as listed below:

.1	CSA Enclosure 1:	Indoors in ordinary locations
.2	CSA Enclosure 2:	Indoor drip-proof
.3	CSA Enclosure 3:	Outdoor weatherproof
.4	CSA Enclosure 4:	Water-tight
.5	CSA Enclosure 5:	Dust-tight

2.9 BACKBOARDS

.1 All backboards to be 19 mm, good one side, fir plywood prime painted white and finish painted with two coats of ANSI #61 grey enamel paint.

.2 Size of backboard to be as indicated on drawings but in no case shall the backboard be less than 150 mm (6") larger in length and width than the piece of equipment which it supports.

2.10 SUPPORTING DEVICES

.1 Every conduit shall have at least one support. Only approved conduit will be accepted. Perforated pipe straps, tie wrap or wood support for conduits or outlet boxes etc., will not be accepted.

.2 Single conduit runs: Galvanized conduit straps, ring bolt type hangers or P.V.C. saddles.

.3 Horizontal multiple raceways runs: Conduit rack with minimum 25 percent spare capacity. Trapeze style hanger on threaded rod with precast or after set concrete inserts.

.4 Vertical multiple runs: Channel with conduit fittings.

2.11 ACCESS PANELS

.1 Sheet steel construction with factory applied prime coat of paint. Positive latch system. Minimum 18 gauge steel.

.2 Provide hinged doors for all access panels with a size of 450 x 450 (18" x 18") or larger.

.3 Where the access door is located in a fire rated assembly or a fire separation having a fire resistance rating, provide access doors which are ULC listed for the required fire resistance rating allowed by the Ontario Building Code.

Part 3 EXECUTION

3.1 GENERAL

.1 All equipment, devices and panels to be mounted plumbed-true.

.2 All equipment and panel labels to be mounted level.

.3 Provide a separate conductor and raceway system for each of the following: each separate system.

3.2 RACEWAYS

.1 Locate raceways at least 150 mm (6") clear of steam pipe, flues and similar items.

.2 All conduit and raceways to be concealed in all finished areas. Where exposed, they shall be neatly grouped and installed parallel to the building lines. Exposed raceways and conduit are permitted only in service areas, utility rooms such as Mechanical and Electrical Rooms. Exposed raceways in other areas are only permitted with the approval of the consultant and must be Wiremold steel type (or approved equal) with all accessories for complete systems.

.3 Conduit must be plugged and kept clean and dry during installation; be free from kinks or foreign matter; and all cut or threaded ends reamed.

.4 Use flexible raceways, P.V.C. jacketed in damp or wet locations and for final connections to all vibrating or moving equipment such as motors, fans, transformers, etc.

.5 Conduit installed in masonry to be coordinated with masonry trade.

.6 Support of metallic non-flexible conduit shall be as follows:

.1 Within 300 mm (12") of connected device then; within 3' (1 m) of every junction box, cabinet, coupling, or fitting, and at spacings for the points of support not greater than the following:

.1 15' (1.5 m) for 1/2" (12 mm) and 3/4" (19 mm) conduit.

.2 6'-6" (2 m) for 1" (25 mm) and 1 1/4" (32 mm) conduit.

.3 10-0" (3 m) for 1 1/2" (38 mm) and larger conduits.

.7 Flexible metal conduits shall be secured at intervals not exceeding 5'-0" (1.5 m) and within 1'-0" (300 mm) of outlet box or fittings except for lengths not over 3'-0" (900 mm) at terminals which require flexibility.

.8 Support of nonmetallic non-flexible conduit shall be as follows:

.1 Within 12" (300 mm) of connected device then; at spacings not to exceed 3' (1 m) of junction boxes, cabinets, couplings, or fittings and at spacings for the points of support not greater than the following:

.1 2'-6" (750 mm) for 1/2" (12 mm), 3/4" (19 mm) and 1" (25 mm) conduit.

.2 4'-0" (1.2 m) for 1 1/4" (32 mm) and 1 1/2" (38 mm) conduit.

.3 5'-0" (1.5 m) for 2" (50 mm) conduit.

.4 1'-0" (1.8 m) for 2 1/2" (65 mm) and 3" (75 mm) conduit.

.5 6'-6" (2.1 m) for 3 1/2" (84 mm), 4" (100 mm) and 5" (125 mm) conduit.

.6 8'-0" (2.5 m) for 6" (150 mm) conduit.

.9 Where the Consultant determines additional support is required, this shall be provided without cost to the Owner.

.10 Conduit entries to boxes shall be secured with locknuts and bushings

.11 Conduit for low voltage/communications/AV/etc. systems shall be secured with locknuts, nylon bushings and be clearly labelled with opposite point of origin when entering boxes. Permanent markings with indelible ink.

.12 Where conduits are proposed to pass through structural members, written approval must be obtained from the Structural Consultant.

.13 A separate grounding conductor shall be installed in all flexible conduits and P.V.C. conduits.

.14 Provide pull boxes every 30 m (100') of conduit run to facilitate installation of cable & wire.

.15 Fishwire to be 2.5 mm (3/16") nylon cord.

.16 Conduits penetrating fire separations shall be caulked with an approved material to maintain the integrity of the separation.

.17 Maximum number of 90 degree bends in low voltage/communications/AV/etc. system raceways is two, after this an acceptable pull box shall be installed.

3.3 ARMOUR CABLE

.1 Provide acceptable insulating bushings between armour and conductors at all terminations.

.2 Provide acceptable cable straps within 300 mm (12") of any box or fitting and at 1.5 m (5') or less intervals throughout its length.

.3 Where aluminum armour comes in contact with copper water pipes a permanent non-metallic sleeve shall be installed to prevent galvanizing action.

3.4 CONDUCTORS

.1 Conductor length for parallel feeders to be identical.

.2 Wire and cable used for feeders is to be free of splices throughout its length.

.3 For runs greater than 30 m (98') minimum wire size increases to # 10 AWG.

.4 Keep different voltage systems in separate raceways;

.1 347/600V - System 1
.2 120/208V - System 2
.3 24V - System 3.

3.5 WIRE CONNECTIONS AND DEVICES

.1 All joints and connections of aluminum conductors shall be sealed with an oxide inhibitor such as Penetrox.

.2 All pressure connectors shall be tightened to the manufacturers stated pressures, for the wire size used.

3.6 OUTLET BOXES

.1 See Section 16010, Part 3 for mounting heights.

.2 Mount all boxes, plumbed-true on vertical installations. Mount level on horizontal installations.

.3 All boxes to be installed flush mounted except in rooms as noted in raceways service areas, utility rooms such as Mechanical and Electrical Rooms.

.4 All boxes to be supported independent of conduits or cables.

.5 Test all boxes for continuity of ground through the box where the conduit is the grounding means.

.6 Openings in all boxes shall be punched or cut, no burning of holes allowed.

.7 Fill all K.O. holes not used with proper K.O. filler plates.

.8 Keep access doors to a minimum by locating equipment in easily accessible locations.

.9 Door swings are to be determined from the Architectural prints for switch locations.

.10 A variation of location of 3 m (10') shall be provided without cost to the Owner if requested before installation of equipment. Confirm location prior to installation.

3.7 PULL BOXES AND JUNCTION BOXES

.1 Install pull and junction boxes so they are supported independent of raceways.

.2 Install pull boxes after every 30 m (100') of continuous raceway.

.3 Locate pull boxes above accessible ceiling spaces in inconspicuous locations wherever possible.

.4 Colour code pull boxes to indicate system involved.

.5 Label all pull boxes with circuits of origin and systems within. Permanent markings with indelible ink.

3.8 EQUIPMENT ENCLOSURES

.1 Mount all surface mounted equipment enclosures on an approved fire rated backing, or unistrut channels.

.2 All recessed enclosures shall have trim for recessed mounting.

.3 Enclosures mounted in finished areas shall be finished to match surrounding finishes.

.4 Terminate wiring in screw type terminal blocks or strips.

3.9 SUPPORTING DEVICES

.1 Install supporting devices to maintain headroom and clearances as described for conduits and conductors. Maintain a neat appearance and follow building lines where possible.

3.10 ACCESS PANELS

.1 Provide access panels where required for electrical equipment concealed in walls, partitions or floors. Location and type of access panels shall be to the Consultant's approval.

.2 Paint access panels to match surrounding decor or as directed by the Consultant on site. The General Requirements, Division 01, and any Supplementary General Requirements of the Contract as bound herein shall form a part of this Division and shall be carefully read and strictly adhered to.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1	General Electrical Provisions	Section 16010
.2	Basic Materials and Methods	Section 16100

1.2 SYSTEM DESCRIPTION

.1 Work to be Supplied and Installed

.1 Supply the following equipment:

- .1 Switches
- .2 Receptacles
- .3 Cover plates

1.3 QUALITY ASSURANCE

.1 Acceptable Manufacturers:

- .1 Hubbell
- .2 Leviton
- .3 Cooper Industries
- .4 Pass & Seymour Legrand

1.4 SUBMITTALS

.1 Submit shop drawings for the following:

- .1 Switches
- .2 Receptacles
- .3 Cover plates

Part 2 PRODUCTS

2.1 SWITCHES

.1 All switches shall be specification grade, silent operation, slow make, slow break design, rated for 20A at 120/277V OR 347/600V.

.2 Switches to be single pole, 3-way or 4-way, as indicated on the drawings.

.3 Colour to be ivory.

.4 All switches to be of the same manufacturer throughout.

2.2 RECEPTACLES

.1 Duplex Receptacles

.1 Specification grade, rated 15A or 20A, 125VAC, U-ground type, parallel blade, EEMAC 5-15R or 5-20R (t-slot) configuration.

.2 Colour to be (ivory).

.2 Ground Fault Interrupter Receptacle

.1 Rated 15A or 20A, 125VAC, U-grounded type, Class A requirement, trip level 4-6 mA, parallel blade, with test and reset switches, EEMAC 5-15R or 5-20T (t-slot) configuration.

.2 Colour to be (ivory).

.3 Dryer Receptacle

.1 Rated 30A, 250V, grounded, straight blade type, EEMAC #6-30R, complete with mounting plate.

.4 All receptacles to be of the same manufacturer throughout.

2.3 COVER PLATES

.1 Cover plates to be:

.1 In office areas - (ivory/stainless steel).

.2 In food service areas - (stainless steel).

.3 In service areas - (pressed galvanized).

.4 In wet locations - (Lexan, hinged gasketted while-in-use type).

.5 In outdoor location – (cast, hinged, gasketted, padlockable, while-in-use)

.2 Cover plates to be of the same manufacturer as the device covers.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Mount all devices level and flush against supporting wall.

.2 Do not mount devices back to back.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100

1.2 SYSTEM DESCRIPTION

.1 Work Supplied and Installed By This Division

.1 Feeder disconnects, local motorized equipment isolating switches, and local electrical equipment isolating disconnects.

1.3 REFERENCES

.1 Regulatory Agencies

.1 CSA Standard C22.2 No. 4 Enclosed Switches
.2 CSA Standard C22.2 No. 111 General Use Switches
.3 CSA Standard C22.2 No. 55 Special Use Switches
.4 O.E.S.C.

1.4 QUALITY ASSURANCE

.1 All equipment to be installed to minimum of Ontario Electrical Safety Code Standards, unless indicated otherwise on these drawings or in this specification.

1.5 SUBMITTALS

.1 Submit shop drawings for the following pieces of equipment:

.1 Disconnects

Part 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

.1 Where more than one manufacturer is named for an item, proposed item must meet all qualifications of the specification.

.2 All materials of similar type shall be of one manufacturer.

2.2 MANUFACTURERS

.1 Acceptable Manufacturers: Schneider Canada, Siemens, Eaton Cutler Hammer

2.3 DISCONNECT SWITCHES

.1 This section governs local disconnect switches to be located adjacent to, or in close proximity to motorized equipment.

.2 Single Phase Motors:

.1 Fractional horse power motors less than ½ h.p. use rated general use switches. Provide EEMAC type 3R enclosure where required.

.2 ½ h.p. or greater use h.p. rated, 2 pole, single throw, toggle, disconnect switches in EEMAC type 1 general enclosure. Provide EEMAC type 3R enclosure where conditions require it.

.3 Polyphase Motors:

.1 Provide h.p. rated disconnect switches to interrupt all the line voltage supply lines to the motor. Each motorized piece of equipment and/or each motor of a piece of equipment shall be provided with a local disconnect at the motor. Provide EEMAC type 1 enclosures in dry locations. Provide EEMAC type 3R enclosures in damp or wet locations or exposed to the weather. Disconnect shall be single throw design, quick make, quick break, with reinforced fuse caps where required. Provide lock-off feature.

2.4 CIRCUIT DISCONNECTS

.1 This section governs the use of disconnects for the purpose of local isolation switches for non-motorized electrical equipment and feeder circuits.

.2 Size disconnect switches for isolation and feeder protection as required by the connected load conditions or as indicated on the drawings. The more stringent of the two requirements shall govern in each situation.

.3 Provide fuse holders designed for the correct fuses as indicated on the drawings.

.4 Switch operation shall be quick make, quick break design with arc quenching facilities at the contacts.

.5 Provide sufficient size contact area for the ampere rating of the switch and the connected load to be interrupted.

Part 3 EXECUTION

3.1 INSTALLATION

.1 All equipment to be mounted plumbed-true.

.2 All labels to be mounted level.

.3 Provide proposed wording for all electrical equipment labels to the consultant for review and approval prior to installing the labels.

3.2 DISCONNECT SWITCHES

.1 Provide a separate self-supporting structure to support the disconnect device where the equipment or adjacent walls are not capable of supporting the device.

.2 Use weather tight connections to all EEMAC type 3R enclosures.

.3 Label each disconnect switch to indicate the device it controls.

3.3 CIRCUIT DISCONNECTS

.1 Mount circuit disconnects securely to the structural elements of the building. Where the structure is not present or not of sufficient capacity to support the additional weight of the electrical equipment, provide sufficient reinforcing or construct additional facilities to support the load.

.2 Use weather tight connections to all EEMAC type 3R enclosures.

.3 Label each disconnect switch to indicate the device it controls.

.4 On all fused equipment, provide a label indicating fusing size and type on the outside of the fused equipment.

END OF SECTION

Part 1 **General**

1.1 **General Requirements**

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

1.2 **System Description**

.1 Work Supplied and Installed by This Division

.1 Provide fuses as specified.

.2 Provide three spare fuses of each type and size installed.

1.3 **References**

.1 CSA Standard C22.2 No. 106.

.2 UL Standard 198C.

1.4 **Submittals**

.1 Submit shop drawings in accordance with Division 1.

.2 Submit fuse melting and clearing time-current characteristic and current-limiting performance data for each fuse type and size above 200 Amps.

Part 2 **Products**

2.1 **General Requirements**

.1 HRC fuses rated 600 amperes and smaller shall be CSA certified HRCI-J fuses, of the type(s) specified below, and shall be in accordance with CSA Standard C22.2 No. 106 or specification C22.2 No. 106 with HRC-J fuse dimensions and current-limiting performance in accordance with the appropriate ULC standard as specified below.

.2 Fuse interrupting rating shall be 200,000 amperes RMS symmetrical, unless otherwise noted.

.3 Time Delay fuses shall carry 500% of rated current for a minimum of ten seconds and shall be labelled "Time Delay" by the manufacturer. (Exception: fuses rated 250V, 15-30A, an 8 second delay is permitted).

.4 Select fuses to provide a fully co-ordinated system for both overload and short circuit fault conditions.

.5 Application of all fuses shall comply with the Canadian Electrical Code - Part I and local inspection authority regulations.

.6 Unless otherwise noted on the drawings, Time Delay fuses for overcurrent protection of motor circuits are to be rated up to 150% of motor full-load current.

2.2 Manufacturers

.1 Manufacturers: Buss, Gould Shawmut, Federal Pioneer.

2.3 Fuses

.1 Service Entrance, Feeder, Motor and Transformer Circuit Fuses (600 Amperes or smaller)

.1 Rated 1 to 600 amperes, 600 volts AC, fuses shall be CSA certified HRCI-J(Class J) Time Delay with dimensions and current-limiting performance in accordance with CSA Standard C22.2 No. 106 or ULC Standard 198C for Class J fuses. Ratings as shown. HRCI-JY fuses are not acceptable.

2.4 Fuse Storage Cabinet

.1 Provide a suitably sized, hinged cover, locking, metal enclosure to contain fuses as outlined in Sentence 1.2.1.2.

.2 Provide lamicoid label indicating 'Spare Fuse Cabinet'.

Part 3 Execution

3.1 Delivery And Storage

.1 Ship fuses in original containers.

.2 Store spare fuses in original containers in fuse storage cabinet.

3.2 Installation

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Prior to energization of any circuit, verify that the correct fuse is installed: a) for the calculated or assumed circuit capacity; b) for proper equipment and conductor protection requirements.

.3 Follow co-ordination curves to ensure correct fuse is placed in proper device.

.4 Install fuse storage cabinet in main Electrical Room in close proximity to the main service switch.

END OF SECTION

Part 1 **General**

1.1 **GENERAL REQUIREMENTS**

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100.

1.2 **SYSTEM DESCRIPTION**

.1 This section only applies to circuit breakers rated for voltages of 600 Vac and lower.

.2 Description of Work.

.1 Provide circuit breaker as indicated in panel board schedules.

1.3 **REFERENCES**

.1 Ground Fault Circuit Interrupters CSA C22.2 No.144.

.2 Moulded Case Circuit Breakers CSA C22.2 No.5.

1.4 **SUBMITTALS**

.1 Submit shop drawings for the following:

.1 Circuit breakers.

Part 2 **PRODUCTS**

2.1 **GENERAL**

.1 Quick-make quick-break design, c/w arc quenching device, trip free handle, thermal overload protection and instantaneous magnetic trip, ambient temperature compensating type. Breaker frame size and mounting type to match required interrupting capacity and panel type.

.2 Two pole and three pole breakers are to have a common trip.

.3 Minimum interrupting capacity - as listed on the drawings.

Part 3 **EXECUTION**

3.1 **INSTALLATION**

.1 All breakers shall be identified as per Section 16100.

.2 Install breakers as required.

.3 Ensure all breakers mounted in a panel have the interrupting capacity required for that piece of equipment.

END OF SECTION

Part 1 **General**

1.1 **GENERAL REQUIREMENTS**

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100.

1.2 **SYSTEM DESCRIPTION**

.1 Provide a complete grounding system throughout.

1.3 **REFERENCES**

.1 O.E.S.C. Section 10

Part 2 **Products**

Part 3 **Execution**

3.1 **GENERAL**

.1 Grounding shall conform to Section 10 of the O.E.S.C.

.2 Provide bonding conductors to all metal piping and all metal parts of building structure. Fasten the bonding conductors as both ends.

.3 Bond Xo point of all transformers to ground first, then bond metal housing.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1	Basic Materials and Methods	Section 16100
.2	Grounding	Section 16450

1.2 SYSTEM DESCRIPTION

.1 Work to be Supplied and Installed By This Division

.1 Dry type distribution transformers.

1.3 REFERENCES

.1 Regulatory Agencies

.1 CSA Standard C9.1-M1981 and CSA Standard C22.2 No.47-1977.

1.4 QUALITY ASSURANCE

.1 Install equipment to the minimum of Ontario Electrical Safety Code requirements, unless stricter standards are indicated on the drawings or in this specification. In all situations, the more restrictive standard of material and installation shall apply.

1.5 SUBMITTALS

.1 Submit shop drawings for the following pieces of equipment:

.1 Dry-Type Distribution Transformers.

.2 Shop drawings shall include manufacturers specified values for the following parameters: Rated no-load transformer loss (%), Rated full-load coil losses (kW), Transformer impedance (%) and Transformer X/R ratio.

Part 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 Hammond

.2 Rex

.3 Delta

.4 Siemens

.5 Marcus

.6 Bemag.

2.2 MATERIALS

.1 Dry-core, self cooled, indoor rated in a EEMAC-1 type ventilated enclosure, suitable for floor mounting.

.2 All coils shall be wound with electrolytic copper only.

.3 Transformer ratings as follows:

.1	KVA rating:	as indicated on the drawings.
.2	Primary voltage:	600V Delta connected for 3 phase.
.3	Secondary voltage:	120/208V grounded wye for 3 phase.
.4	Insulation:	Class H 220oC.
.5	Sound rating:	60 dB or less.
.6	Temp. rise:	150oC.
.7	'K' Factor:	13

.4 The magnetizing current shall not exceed 2% of the rated primary full load.

.5 Provide copper ground bus and copper core grounding strap.

.6 All leads from coils shall be brazed to terminals.

.7 Provide vibration isolators between the transformer core and the enclosure.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install transformers where shown on drawings. Install wall mounted, floor mounted or suspended as specified in the transformer schedule on drawings.

.2 Install external vibration isolators between transformer base and mounting surface.

.3 Locate transformer away from adjacent walls to allow for free air flow. Distance from walls shall be as per O.E.S.C. requirements.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100

.2 Circuit Breakers Section 16182

1.2 SYSTEM DESCRIPTION

.1 Work to be Supplied and Installed:

.1 Panel boards.

1.3 QUALITY ASSURANCE

.1 Acceptable Manufacturers:

.1 Schneider Canada

.2 Siemens

.3 Eaton Cutler Hammer

1.4 REFERENCES

.1 Panel boards C.S.A. Standard C22.2 No. 29

1.5 SUBMITTALS

.1 Submit shop drawings for the following:

.1 Panel boards.

Part 2 PRODUCTS

2.1 GENERAL

.1 Code gauge steel construction, finished in baked grey enamel, with removable front cover and panel trim for surface or recessed mounting as applicable.

.2 Panel design to provide easy access to neutral bar.

.3 Provide locking front cover with 2 keys. Lock to be recessed in door for a flush appearance.

.4 Provide typed directory card behind plastic film in metal frame.

2.2 PANEL BOARDS

.1 Minimum current rating - 100A mains.

.2 Minimum branch circuits - 12

.3 Bolt-on breaker design.

.4 Mains material - Aluminum or tinned copper bus, rated 3 phase, 4 wire (unless noted otherwise on drawings).

.5 Minimum interrupting capacity of panels shall be as indicated on the drawings. Panel interrupting capacity maybe achieved by series rating the panel with upstream over-current protection devices, in which case panel must be identified as such by manufacturer with permanent labelling. Manufacturer's must be consulted when series rating equipment.

Part 3 EXECUTION

3.1 INSTALLATION

.1 All equipment to be mounted, plumbed true.

.2 Mounting heights to be as noted in Section 16010 or as amended by the drawings.

.3 All recessed panels to be mounted with suitable flush trim.

.4 Provide lamicoid nameplates mechanically fastened to the electrical equipment to identify each panel. Letter size to be as described in Section 16010.

.5 All recessed panels shall have one (1) spare 1 ¼" conduit with pull string to accessible ceiling space in area it serves.

3.2 FIELD QUALITY CONTROL

.1 Provide spot checks on all terminations as directed by the Consultant. Tighten all loose connections discovered.

END OF SECTION

Part 1 **GENERAL**

1.1 **GENERAL REQUIREMENTS**

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Divisions 01 as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100

1.2 **SYSTEM DESCRIPTION**

.1 Description of Work

.2 Provide and install lighting fixtures complete with lamps, ballasts and all mounting hardware and trim required for the type of mounting and the architectural conditions.

1.3 **REFERENCES**

.1 O.E.S.C. Section 30.

1.4 **SUBMITTALS**

.1 Submit shop drawings for the following:

.1 Light fixtures
.2 Lamps
.3 Ballasts

Part 2 **PRODUCTS**

2.1 **GENERAL**

.1 Provide materials as specified herein or approved equals as defined in the General Electrical Provisions, paragraph 2.2.

.2 Fixtures shall be complete with all mounting hardware for a finished installation.

2.2 **MANUFACTURERS**

.1 Acceptance of alternate manufacturers and equipment as specified must be approved by the Consultant in writing prior to tender closing.

2.3 **MATERIALS AND EQUIPMENT**

.1 Fixtures

.1 All Other Fixtures: See lighting fixture schedule on drawings.

.2 Lamps

.1 Incandescent:

.1 40W Double life crystal bent tip candelabra – B10 base (confirm) Rated 3000 hrs, 130V – Osram/Sylvania Double Life Lamps or equal

.2 120W Par38 Tungsten Halogen – E26 Medium Socket (confirm) Rated 3000 hrs, 130V – Osram/Sylvania Capsylite PAR38 or equal.

.3 100W Double life A19 rated 2000 hrs, 130V – Osram/Sylvania Double Life Lamps or equal.

.2 Fluorescent:

.1 28W T5 Mini-Bipin. 3000K 20,000 hours programmed start. Osram/Sylvania Penetron High Performance or equal

.2 28W T5 Mini Bipin 3500K 20,000 hours programmed start. Osram/Sylvania Penetron Hight Performance or equal

.3 Compact Fluorescent:

.1 26W quad tube 4-pin G24q-3 base. 2700K 12,000 hrs. Osram/Sylvania Ecologic CF26DD/E/827/ECO or equal

.4 LED – chips must be manufactured by Osram or Cree.

.3 Ballasts

.1 Fluorescent Fixtures:

.1 High efficiency Oscram/Sylvania Quicktronic or equal

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install fixtures complete with all mounting hardware and trims for a neat, finished appearance.

.2 Insure that all fixtures installed in built-in enclosures can be serviced for lamp changing, ballast changing, etc.

.3 All lay-in lens and hinged frame lens fixtures to have minimum 3 mm (1/8") thick lens.

.4 Install all fixtures plumbed true.

.5 Co-ordinate fixture locations with other trades on site prior to rough-in.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100

1.2 SYSTEM DESCRIPTION

.1 Exit signs complete with LED lamps and all mounting hardware and trim required for the type of mounting and the architectural conditions.

.2 Emergency lighting units consisting of batteries, chargers, transfer devices, emergency lighting heads, etc. and any interconnected wiring.

1.3 REFERENCES

.1 Equipment shall be approved by C.S.A. and carry appropriate labels.

.2 O.B.C. Section 3.4.5.

1.4 SUBMITTALS

.1 Submit shop drawings for the following:

.1 Exit fixtures.
.2 Emergency Lighting Unit Equipment
.3 Emergency Lighting Heads

1.5 QUALITY ASSURANCE

.1 Acceptable manufacturers:

.1 Emergi-Lite
.2 Canlyte Uniglo
.3 Lumacell
.4 Lithonia
.5 Beghelli
.6 Aimlite

Part 2 PRODUCTS

2.1 EXIT FIXTURES

.1 Exit Fixtures - Thin profile design, rigid metal frame with cast aluminum minimum #12 gauge face plates, single or double, satin finish, red plastic lens for lettering; c/w LED lamps for AC and DC operation, inverter and knock out directional arrows.

.2 Lamps

.1 Red LED lamps rated for minimum 200,000 hours of continuous operation.

2.2 EMERGENCY BATTERY UNIT

.1 All emergency battery units to be CSA C22.2-141 approved.

.2 All units to be complete with long life, sealed lead acid batteries, battery charger, high charge indicator, test button, A.C. "ON" indicator, 120 VAC cord set, mounting brackets and automatic transfer to emergency power supply on normal power failure. D.C. voltage to be as indicated on the drawings. Minimum battery capacity to be 125% of the total connected D.C. load.

2.3 EMERGENCY LIGHTING HEADS

.1 Unless otherwise specified on the drawings, provide double heads with Micro type, 9 watt, high intensity tungsten lamps, of the same manufacturer as the emergency battery units.

2.4 COMBINATION EMERGENCY BATTERY UNITS AND EXIT FIXTURES

.1 Emergi-Lite or equal 6 VDC sealed lead acid medium life batteries, battery charger, transfer switch, extruded aluminum housing. Single or double face exit sign as required and 2 EF-9 heads. [9W H.I.T. micro heads] Battery rated 18 watt hours minimum.

2.5 Refer schedule on drawings.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install fixtures complete with all mounting hardware and trims for a neat, finished appearance.

.2 Install exit fixture wiring in a separate raceway system circuited to a separate breaker in the respective AC distribution panel. Provide lock on for breaker handles, paint red and identify as "EXIT LIGHTING CIRCUIT".

.3 Install exit fixture DC wiring in a separate raceway system; connect to nearest emergency battery unit equipment. Size conductors for maximum 5% voltage drop from point of supply to load.

.4 AC and DC power supplied at voltages specified.

.5 Complete emergency lighting system shall be capable of 30 minutes of continuous operation in a power failure. Size battery accordingly for connected load.

.6 Mount battery units and lighting heads as high as possible to the finished ceiling, unless specified otherwise, so as not to obstruct the movement of the emergency heads.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Divisions 01 as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1 Basic Materials and Methods Section 16100

1.2 SYSTEM DESCRIPTION

.1 Description of Work

.1 Provide and install a complete lighting control system as described in this specification and detailed on the drawings.

.2 Lighting control system shall be complete with motion sensors and any required power packs and dimmers.

1.3 REFERENCES

.1 O.E.S.C. Section 30.

1.4 SUBMITTALS

.1 Submit shop drawings for the following:

.1 Motion Sensors

.2 Dimmers

Part 2 PRODUCTS

2.1 GENERAL

.1 Provide materials as specified herein or approved equals as defined in the General Electrical Provisions, paragraph 2.2.

2.2 MANUFACTURERS

.1 Acceptance of alternate manufacturers and equipment as specified must be approved by the Consultant in writing prior to tender closing.

.2 Specification and design is based on Wattstopper. Equal products with the same performance will be considered.

2.3 MATERIALS AND EQUIPMENT

.1 Wall Switch Occupancy Sensors.

.1 Line voltage passive infrared wall switch with detection signature processing, zero-cross technology, vandal resistant lens, off delay from 5-30 minutes with smartest option, indicator LED, settable audio and/or visual alert, built-in light level sensor and override. Output rated 120VAC, 0-800W, 1/6HP or 230/277VAC, 0-1200W. Optional output rating of 347VAC, 0-1500W.

.1 Wattstopper PW-100 or PW-100-347 or approved alternate. Colour to match other devices on project. Refer to Section 16140.

.2 Line voltage passive infrared dual relay wall switch with detection signature processing, zero-cross technology, vandal resistant lens, off delay from 5-30 minutes with smartest option, indicator LED, settable audio and/or visual alert, built-in light level sensor controls second relay, and override. Output rated 120VAC, 0-800W, 1/6HP or 230/277VAC, 0-1200w

.1 Wattstopper PW-200 or approved alternate. Colour to match other devices on project. Refer to Section 16140.

.2 Incandescent Dimmer Switch

.1 Lutron #N-1000ML, single gang, 1000W rated.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Provide training to the owner's representative on the operation and maintenance of the system. Demonstrate the operation to the owner's representative. Provide full documentation of all aspects of the installation and maintenance to the owner.

END OF SECTION

Part 1 General

1.1 General Requirements

.1 Conform to the Sections of Division 1 as applicable.

.2 Conform to the General Electrical Requirements, Section 16010.

1.2 Description of Work

.1 Provide fire alarm wiring for systems as shown on Drawings and in these Specifications.

.2 Ensure that equipment manufacturers provide all information regarding wiring requirements before tendering. Be responsible for added cost of wiring and changes due to additional manufacturer's requirements.

.3 Low voltage wiring for CCTV and Audio-Visual systems by others – conduits by electrical division. Refer to drawings and Section 16760 Communications System Raceways.

Part 2 Products

2.1 General

.1 Wiring requirements may vary with use of alternate systems. Verify with system manufacturer to ensure proper wiring prior to installation.

2.2 Power Wires

.1 Wiring - solid copper conductors, type TWH 600 volt insulation in raceways. Minimum #12 AWG.

2.3 Fire Alarm Wires and Cables

.1 Wiring - solid copper conductors, type AWM-105, 300 volt insulation in raceways. (Securex).

.2 Size all wires for box, signal, auxiliary or any other circuit as recommended by the control panel manufacturer or not less than 16 gauge for individual conductors pulled in raceway and #18 gauge minimum size for cable assemblies. Insulation shall be coloured as follows:

.1 One red and one black for fire alarm box circuits

.2 One blue and one brown for fire alarm signal circuits

.3 Yellow and orange for ancillary fire alarm circuits.

.3 Cables for interior connections of annunciators and local extended circuits: #18 gauge, 300 volt, available in 10, 20 or 30 conductors, solid copper conductors, 105oC flame retardant P.V.C. insulation, outer jacket 105oC flame retardant P.V.C. red, marked "(UL) power limited fire protection signalling circuit cable," certified by C.S.A. and listed by

U.L., accepted by Ontario Electrical Inspection Authority by technical memo of July 31, 1984. (Based on Securex-Canada Wire).

2.4 CCTV and Audio Visual Systems

.1 Wiring and installation of wiring by others. Conduit provided by electrical contractor. Refer to Section 16760 Communications Systems Raceways

2.5 Security System

.1 Wiring and installation of wiring shall be provided by others.

Part 3 EXECUTION

3.1 Installation

.1 No splices of signal or communication conductors is permitted in any circumstance.

.2 Provide separate raceway systems for the fire alarm signalling device, fire alarm initiating devices, security system, and P.A. system.

.3 Provide fire stop material around all raceways which penetrate fire walls or fire separations.

.4 All conductors in one raceway shall be rated for the maximum voltage in conductors in that raceway.

.5 Use cable ties or dividers to group conductors whenever possible.

.6 Any discrepancies between drawings and site conditions are to be brought to the engineers attention for clarification.

.7 All wires shall be numerically tagged at both ends. Where wires pass through a junction box provide tags on all conductors, and all ends.

3.2 Field Quality Control

.1 Perform spot checks on concealed wiring as directed by the Engineer to show colour coding of system conductors at junction boxes.

.2 Provide as built wiring diagrams of each system to show wiring routes used and number of conductors and sizes at each junction point in the system.

END OF SECTION

Part 1 **General**

1.1 **General Requirements**

.1 Conform to the Sections of Division 1 as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

1.2 **Related Work**

.1	Basic Methods and Materials	Section 16100
.2	Signal, Communication Wires and Cables	Section 16710

1.3 **Summary**

.1 This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.

.2 Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

.3 The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

.1 Fire alarm and detection operations for single stage, zoned, electrically supervised fire alarm system.

.2 Control and/or monitoring of air handling equipment, door hold-open devices, fire suppression systems, and other equipment as indicated in the drawings and specifications.

1.4 **QUALITY ASSURANCE**

.1 The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and CFAA (Canadian Fire Alarm Association) certified technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

.2 Installer Qualifications: A factory-authorized installer is to perform the work of this section.

.3 Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories of Canada, Inc. (ULC), and shall bear the "ULC" label.

1.5 **REFERENCES**

.1 The system and all associated operations shall be in accordance with the following:

.1 Ontario Building Code Sections 3 and Section 11.

.2 CAN/ULC-S537, Standard for the Verification of Fire Alarm Systems

.3 CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems

.4 CAN/ULC-S527, Standard for Control Units for Fire Alarm Systems

.5 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems

.6 OESC Section 32.

1.6 SYSTEM DESCRIPTION

.1 General: Provide a complete, single stage, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein. Include all additional necessary materials.

.2 Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download. To accommodate this capability, the download of a new Panel program will be transferred to a "secondary" configuration memory bank, while the Panel continues to function on the "primary" configuration memory bank.

.3 Any systems not complying with this requirement must provide a documented cost allowance to finance the deployment of a comprehensive fire watch team. The fire watch team will be present before, during and after the Panel re-program commences, and until the new changes have been verified in compliance with CAN/ULC-S537.

.4 History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

.5 Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.

.6 Wiring/Signal Transmission:

.1 Transmission shall be hard-wired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.

.2 System connections for initiating, signalling line circuits and notification appliance circuits shall be Class B or Class A as appropriate.

.3 Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

.7 Remote Access:

.1 FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem using the public switched telephone system or a private switched telephone system.

.2 A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.

.3 FACP shall have the capability to provide third party access through a serial interface connection and be agency listed for specific interfaces and for the purpose.

.4 FACP shall have the capability to provide remote access via an Internet/Intranet Interface. The Internet interface shall provide an alternative access to system information using the familiar interface of a standard Internet browser. A remotely located fire professional can use this access to analyze control panel status during non-alarm conditions and can also use this information to assist local fire responders during alarm conditions. In reaction to system events, the Interface will have the ability to broadcast email notification messages to recipients programmed via a standard web-browser interface.

.8 Required Functions: The following are required system functions and operating features:

.1 Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

.2 Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to an existing remote central station service transmitter.

.3 Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciators, indicating the location and type of device.

.4 General Alarm: A system general alarm shall include:

.1 Indication of alarm condition at the FACP and the annunciator(s).

.2 Identification of the device /zone that is the source of the alarm at the FACP and the annunciator(s).

.3 Operation of audible and visible notification devices throughout the building until silenced at FACP.

.4 Closing doors normally held open by magnetic door holders.

.5 Shutting down supply and return fans serving zone where alarm is initiated. Duct detectors and Air Handling Shutdown addressable relays are additional required devices under this contract. Note new devices indicated on drawings.

.6 Notifying the local fire department.

.5 Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and valve tamper switch, the system shall operate as follows:

.1 Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator(s).

.2 Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.

.3 Record the event in the FACP historical log.

.4 Transmission of supervisory signal to remote central station.

.5 Restoring the condition shall not automatically cause the Supervisory LED to clear. Only via a subsequent activation of the System Reset feature will restore the system to normal.

.6 Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.

.6 System Reset

.1 The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."

.2 Should an alarm condition continue, the system will remain in an alarmed state

.7 A manual evacuation switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

.9 WALKTEST: The system shall have the capacity of 8 programmable passcode protected one-person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

.1 The city circuit connection and any suppression release circuits shall be bypassed after the testing group.

.2 Control relay functions associated to one of the 8 testing groups shall be bypassed.

.3 The control unit shall indicate a trouble condition.

.4 The alarm activation of any initiation device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.

.5 The unit shall automatically reset itself after signaling is complete.

.6 Any opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound a code for 4 seconds indicating the trouble condition.

.10 Analog Smoke Sensors:

.1 Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values

.2 Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

.3 Programmable Sensitivity: Photoelectric Smoke Sensors shall have 8 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.

.4 Sensitivity Testing Reports: The FACP shall provide sensor reports that meet CAN/ULC -S537 and -S536 sensitivity test requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.

.5 The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Central Monitoring Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

.6 The FACP shall continuously perform an automatic self-test on each sensor, which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

.7 Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity. Each Multi-Sensor shall be programmable to work as a device that provides independent heat sensor and smoke sensor functionality, or as a device that also provides combination smoke-heat alarm functionality. No hardware changes will be required to select Independent Smoke or Heat vs. Combination detection operation.

.8 Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

.9 Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet to allow the building owner/operator to verify that Annual Inspections and corresponding testing of smoke sensors has been conducted in accordance with CAN/ULC-S536 and -S537 smoke detector testing requirements.

.11 Audible Alarm Notification: By horns in areas as indicated on drawings. Horns to produce synchronized Temporal pattern electronic signal.

.12 Audible/Visible Alarm Notification: By combination horn strobes in areas as indicated on drawings.

.13 Fire Suppression Monitoring:

.1 Water flow: Activation of a water flow switch shall initiate general alarm operations.

.2 Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

.3 WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.

.14 Power Requirements

.1 The control unit shall receive AC power via a dedicated fused disconnect circuit.

.2 The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 30 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.

.3 All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.

.4 The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.

.5 The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.

.6 The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.

.7 The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.

.8 Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.7 SUBMITTALS

.1 General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

.2 Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

.3 Wiring diagrams from manufacturer.

.4 Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.

.5 System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all

voltage conditions per ULC standards and Building Code requirements.

.6 System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label wording indicating location or use of IDC, NAC, relay, Sensor, and auxiliary control circuits.

.7 Operating instructions for FACP.

.8 Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual specific to this installation. Provide the names, addresses, and telephone numbers of service organizations.

.9 Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.

.10 Record of field tests of system. Copy of verification certificate.

1.8 MAINTENANCE SERVICE

.1 Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.

.2 Basic Services: Systematic, routine maintenance visits on a quarterly basis at times scheduled with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.

.3 Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.

.4 Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.9 EXTRA MATERIALS

.1 General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:

.1 Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.

.2 Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.

.3 Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

.2 Detector or Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

Part 2 PRODUCTS

2.1 Manufacturers:

.1 The equipment and service described in this specification are those supplied and supported by SimplexGrinnell.

.2 Subject to compliance with requirements, provide equal products by one of the following:

.1 SimplexGrinnell
.2 GE Edwards Systems Technology
.3 Notifier
.4 Mircom

.3 Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.

2.2 FIRE ALARM CONTROL PANEL (FACP)

.1 General: Comply with CAN/ULC-S27, "Standard for Control Units For Fire Alarm Systems."

.2 The following FACP hardware shall be provided:

.1 Base panel(s) with beige cabinet and glass door, 120 VAC input power.
.2 2,000 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
.3 2000 points of annunciation where one (1) point of annunciation equals:
.1 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
.2 1 LED on panel or 1 switch on panel.
.4 From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FACP LCD Display.
.5 Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.
.6 One Auxiliary electronically resetable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
.7 One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
.8 Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).

.9 Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.

.10 The FACP shall support (5) RS-232-C ports and one Service Port.

.11 Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.

.3 Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system is performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

.4 Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.3 REMOTE LCD and LED ANNUNCIATOR

.1 Provide where required a remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.

.2 Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.

.3 Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.

.4 Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

.5 The LCD shall display the following information relative to the abnormal condition of a point in the system:

.1 40 character custom location label.

.2 Type of device (e.g., smoke, pull station, waterflow).

.3 Point status (e.g., alarm, trouble).

.6 Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable when the LCD is placed in "disabled" mode. Acknowledge, Silence and Reset operation shall be the same as the FACP.

.7 LCD annunciator consisting of red LEDs and labels for annunciator of alarm, initiating zones only.

2.4 EMERGENCY POWER SUPPLY

.1 General: Components include battery, charger, and an automatic transfer switch.

.2 Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 30 minutes.

2.5 ADDRESSABLE MANUAL PULL STATIONS

.1 Description: Addressable single- or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

.2 Protective Shield: Where required provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.6 SMOKE SENSORS

.1 General: Comply with CAN/ULC-S529, "Standard for Smoke Detectors for Fire Alarm Systems." Include the following features:

.1 Factory Nameplate: Serial number and type identification

.2 Operating Voltage: 24 VDC, nominal.

.3 Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore to normal operation.

.4 Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

.5 Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.

.6 Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

.7 Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that type of sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.

.8 The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

.9 Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

.10 Removal of the sensor head for cleaning shall not require the setting of addresses.

.2 Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type.

.3 Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.

2.7 Duct Smoke Sensor:

.1 Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.

.2 Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.

.3 The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.

.4 Duct Housing shall provide a relay control trouble indicator Yellow LED.

.5 Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.

.6 Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.

.7 Duct Housing shall provide a magnetic test area and Red sensor status LED.

.8 For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

.9 Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.

.10 Provide a NEMA 4X weatherproof duct housing enclosure for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.8 HEAT SENSORS

.1 General: Comply with CAN/ULC-S529, "Standard for Smoke Detectors for Fire Alarm Systems." Include the following features:

.2 Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

.3 Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

.4 Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 117-deg F, 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for 3-deg C, 15-deg F or 20-deg F per minute.

.5 Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.9 ADDRESSABLE CIRCUIT INTERFACE MODULES

.1 Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.

.2 Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two-wire pair running from an appropriate power supply as required.

.3 There shall be the following types of modules:

.1 Type 2: Line Powered Monitor Circuit Interface Module

.1 This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

.2 This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.

.2 Type 4: Line Powered Control Circuit Interface Module

.1 This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

.4 All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LED's shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.10 MAGNETIC DOOR HOLDERS

.1 Description: Units shall be listed to ULC-S533 and/or ULC-S132. Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate. Unit shall operate from a 120VAC, a 24VAC or a 24VDC source, and develops a minimum of 25 lbs. holding force.

.2 Material and Finish: Match door hardware.

2.11 STANDARD ALARM NOTIFICATION APPLIANCES

.1 Audible/only: Horn shall be listed to ULC-S525. Housing red, fire retardant nonpact resistant thermoplastic with white "fire" lettering. Horns to consist of electronic multiple frequency signal controlled to produce a temporal pattern signal with a minimum sound pressure level of 85dBA at 10' (3 m) and 24 Vdc. Horn shall mount directly to a standard single gang, double gang or 4" square electrical box. Provide wire guard where indicated. Provide adaptation plate as required to mount on existing FA bell outlet box.

.2 Audible/Visible: Audible horn as per 2.11.1 above. Strobe shall be listed to ULC-S526. The strobe shall consist of a xenon flash tube and associated lens/reflector system. The A/V enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Strobe appliances shall be provided with minimum flash intensities of 75cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific appliance.

.3 Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a March Time cadence operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.

.4 Accessories: The contractor shall furnish the necessary accessories.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Wire alarm initiating circuits, manual and automatic, so that red and black wires start as a pair at fire alarm control panel and end at an end-of-line resistor, mounted in suitable box adjacent to last manual station of each individual alarm initiating circuit. Connect detectors and manual stations between red and black wires at each outlet, cut red and black wires at each outlet and connect to four terminal screws provided on units, red to red and black to black. These connections ensure supervision of circuit wiring to their respective circuits as shown on Drawings.

.2 Install wiring for alarm initiating circuits in separate raceway system from the alarm signal circuits.

.3 Wire all alarm signals in accordance with requirements by manufacturer and operation. Install resistor for signal circuit in suitable box adjacent to last signal device. If diodes are used, install in outlet box of last signal device of signal circuit and indicate on signal.

.4 Provide required number of signal circuits and wire alternatively meaning that signals on same circuit shall not be horizontally adjacent to each other.

.5 Insure continuity of ground through all raceways from ground buss in control panel to each device junction box.

.6 Take power for control panel from bus on load side of main disconnecting device as described in Section 32 of Electrical Safety Code. Make connection using approved lugs. Connect ground cable to ground bus at control panel.

.7 Clear all wiring of shorts, opens and grounds on completion of work.

.8 Install external power regulator close to control panel and connect to 120 V, 60 Hz supply for fire alarm system in accordance with manufacturer's instructions.

.9 Mount detectors on ceiling as per CAN4-S524-M91 standard unless otherwise specified herein with minimum and maximum distances as required for respective type of detector, at highest point where variations in ceiling height exist. Do not mount detectors on sides, undersides, or less than 300 mm from walls, beams, joints, ducts, open web steel joists or any structure projecting below actual ceiling height and less than 600 mm from air handling or heating outlets.

.10 Should interference from obstruction, lamp positions, air outlets or heat radiating surfaces be encountered in locating any detector where shown, locate detector as near as possible to shown position, clear of obstacles, but maintain a clear space of 600 mm on ceiling, below and around.

.11 Identify signal circuit, alarm initiating circuit, auxiliary circuit and all other wiring at fire alarm control panel, annunciator, terminal boxes or elsewhere on completion of work with appropriate marking labels. Mark single conductors with suitable self adhesive type, indelible numbered markers, identify cables with a clear polyester tag, attaches with a self-locking TY-RAP.

.12 Provide, install and connect wiring and interconnecting wires and cables as specified herein, as required by control panel manufacturer and as shown on Drawings.

.13 Equipment Removal: Disconnect and remove the existing fire alarm equipment and restore damaged surfaces. Package operational fire alarm and detection equipment that has been removed and deliver to the Owner. Remove from the site and legally dispose of the remainder of the existing material.

.14 Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

.15 Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.2 INSTALLATION SEQUENCE

.1 The main existing Edwards 6500 fire panel is to be removed and replaced with a new fire alarm panel containing adequate zone cards and signal circuits to re- terminate all existing

zones and signal circuits. 2 addressable circuits with the capability of handling any mix of 255 devices shall also be included. The panel program shall then be downloaded and the panel verified for proper operation.

.2 All remote annunciators must also be replaced with new LCD annunciator(s), at the same time as the main fire panel and verified operational. Existing wiring between the new fire panel and the new annuciator(s) shall be used.

.3 A full facility wide test and inspection as per ULC536 shall take place, and reports submitted to the consultant before any further work commences.

.4 One at a time individual initiation circuits (zones) shall have the EOL resistor replaced and hardwired devices changed to addressable devices. Verification shall take place at the end of each circuit switchover to addressable before any further work commences. Verification as per ULC537.

.5 When initiation circuit switchover is complete, notification device change out from bells to horns and/or horn strobes is to take place.

.6 One at a time individual notification circuits shall have the EOL resistor replaced and bells changed to horns and/or horn strobes. Verification shall take place at the end of each circuit switch over before any further work commences. Verification as per ULC537.

.7 Installation additional new addressable, initiation devices, AHU shutdown relays, and addressable sprinkler alarmed supervisory modules. Refer to drawings for exact number of devices.

.8 Where new addressable devices are added the electrical contractor is to extend the addressable channel from the closest device, tapping into the circuit only under the direct supervision on the CFAA technician involved.

.9 When new notification devices are added, the electrical contractor is to extend the notification circuit from the closest device, tapping into the circuit only under the direct supervision of the CFAA technician involved.

.10 Upon completion of the installation a complete facility wide test and inspection as per ULC536, 2004 shall take place. The final test and inspection report shall be submitted to the consultant within 1 week of completion.

3.3 SYSTEM OPERATION

.1 Upon activation of any alarm initiating device (e.g. manual station, smoke detector, heat detector, sprinkler device), system shall operate as follows:

.2 Annunciate respective zone at the fire alarm control panel.

.3 Activate all signal appliances in the alarm mode.

.4 Provide for silencing signal manually by authorized personnel at the control panel after one minute of operation.

.5 Send signal to monitoring agency or fire department via telephone line.

.6 Provide for automatic signal silencing after 20 minutes.

.7 Provide for "Silent Test", preventing signal appliance operation during maintenance or system test.

.8 Sound alarm signal again as outlined herein, if a subsequent alarm from another initiating circuit is activated.

.9 Activation of ancillary devices, i.e.: release all door hold open devices; and provide fan shutdown.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

.2 Installation personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

.1 Factory trained and certified.

.2 Canadian Fire Alarm Association (CFAA) Fire Alarm Certified personnel.

.3 Certified by a provincial or local authority.

.4 Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

.3 Pre-testing: Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new units and retest until satisfactory performance and conditions are achieved.

.4 Only directly prior to verification, all smoke detector protection shall be removed, and all smoke detectors shall be thoroughly cleaned.

.5 Inspect and check each individual device in entire system for proper connection, supervision and function in accordance with CAN4-S537-M86. Any detector, manual pull station and signal not installed within requirements of CAN4-S524-M86 shall be identified in remarks column of verification report and be brought to the Consultant's attention prior to his acceptance test. Obtain a verification certificate and verification report from verifying agency showing each device checked, and that this work has been carried out. Utilize standard verification forms similar to Canadian Fire Alarm Association (C.F.A.A.) forms.

.6 Inspection and checking shall include smoke testing of each ionization or photoelectric smoke detector when installed with similar material found in area protected. Submit smoke detectors sensitivity calibration reading, as read on place of installation as part of verification report.

.7 Arrange with Consultant, manufacturer of control equipment and all other installers of related and connected equipment (extinguishing systems, fans, doors, elevators and other

equipment) to have a final functional acceptance test, giving ample notice to all parties concerned to be present.

.8 Tests may include:

.1 Spot check of devices to ensure proper connections and supervision.

.2 Operation of an alarm initiating device on each detection circuit to verify required operation of alarm devices, annunciator and other installations.

.3 Testing of all signal devices for correct operation and function.

.4 Testing of smoke detector with similar material found in area to be protected.

.9 Provide a 4.0 hrs. familiarization and instruction period, to familiarize user and local superintendent with working and function of system and equipment.

.10 All testing methods are to be ULC approved. Do not use open flame or methods which will damage detectors. All testing methods are to be approved by the engineer prior to actual testing.

.11 Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

.12 Minimum System Tests: Test the system according to the procedures outlined in CAN/ULC-S537.

.13 Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

.14 Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

.15 Final Test, Certificate of Completion, and Certificate of Occupancy:

.1 Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5 CLEANING AND ADJUSTING

.1 Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

.2 Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6 TRAINING

.1 Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.

.2 Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours training.

.3 Schedule training with the Owner at least seven days in advance.

END OF SECTION

Part 1 **General**

1.1 **GENERAL REQUIREMENTS**

.1 Conform to Division 01, General Requirements and Section 16010, General Electrical Provisions as applicable.

1.2 **Related Work**

.1 Raceways Section 16100

1.3 **Description of Work**

.1 Provide an empty raceway system for the handicapped access system as shown on the drawings. Provide pull wire in each raceway.

.2 System Includes:

- .1 Outlet boxes for door control switches
- .2 Raceways
- .3 120 VAC power supply
- .4 Low voltage cables and wiring

.3 Provide power to system points as indicated on the drawings.

Part 2 **Products**

2.1 **General**

.1 Raceways, outlet boxes and cover plates are specified under other sections of this division. Minimum raceway size is 19 mm (3/4"), unless otherwise indicated.

.2 Equipment required for system to be provided by system supplier. All wiring to be provided by Division 16 unless otherwise indicated on drawings or in specs.

.3 Fish wires - pull wires - minimum 3 mm (1/8") nylon braided cord.

.4 Outlet boxes locations and sizes to be confirmed with the H/C equipment supplier prior to installation of same.

Part 3 **Execution**

3.1 **Installation**

.1 LB fittings shall not be used in raceway system, use long radius bends.

.2 Provide a minimum 12 mm (1/2") E.M.T. raceway from each outlet to its specified destination. Raceways must be continuous throughout length, unless indicated otherwise by riser drawings.

.3 Provide pull boxes at max. 30 m (l00') intervals for all continuous raceways longer than 30 m.

.4 Colour code raceways as described in Section 16010.

.5 Provide all cutting and patching.

.6 All raceways required for the system must be coordinated and approved with the equipment supplier prior to installation.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions, Supplementary General Conditions and Sections of Division 01, as applicable.

.2 Conform to General Electrical Provisions, Section 16010 as applicable.

.3 Related Work

.1	General Electrical Provisions	Section 16010
.2	Basic Materials and Methods	Section 16100
.3	Mechanical	Division 15

1.2 System Description

.1 Work to be Supplied and Installed

.1 Supply the following equipment:

.1 Exhaust Fans (as listed on drawing schedule)

1.3 Submittals

.1 Submit shop drawings for the following:

.1 Exhaust Fans

Part 2 Products

2.1 Exhaust Fans

.1 The basis for this specification is Broan. Equal products by Nutone and Air King will be approved.

Part 3 Execution

3.1 Installation

.1 Co-ordinate all work with Division 15.

.2 Division 16 shall make ALL power terminations of exhaust fans and provide line voltage controls.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Conform to Division 1, General Requirements and Section 16010, General Electrical Provisions.

1.2 RELATED WORK

.1	Raceways	Section 16100
.2	Conductors	Section 16100

1.3 DESCRIPTION

.1 Provide a complete electric heating system including electric heating appliances and control devices as shown on the drawings and as described in this specification.

1.4 REGULATORY AGENCIES

.1 Installed system must meet the requirements of the Electrical Safety Authority - Inspection Department.

.2 All equipment must be CSA approved for its intended use.

1.5 QUALIFICATION OF MANUFACTURERS

.1 Manufacturer of electric heating products must be able to demonstrate satisfactory installations of his products for a minimum of two years.

1.6 SHOP DRAWINGS

.1 Submit shop drawings for all electric heating equipment and all control devices proposed.

.2 Label equipment on shop drawings according to the engineer's designations from the drawings.

Part 2 PRODUCTS

2.1 MANUFACTURERS

.1 The following manufacturers of electric heating equipment are acceptable:

.1 Chromalox
.2 Ouellet
.3 Westcan
.4 Stelpro

2.2 MATERIALS AND EQUIPMENT

.1 Baseboard Heaters

.1 Standard watt density (900 W/M heater element supported on Zytel bushings to eliminate expansion noises. Twenty gauge steel body and front panel minimum. Oven baked painted surfaces throughout housing, integral wire raceway. Wattages as noted on the drawings.

.2 Colour: Standard White or Beige.

.2 Fan-Forced Heaters

.1 Recess mounted surface mounted as indicated on drawings, fan-forced electric heaters, with built-in tamperproof thermostat, tubular finned heating element, bottom air exhaust, minimum 150 CFM rated fan, factory lubricated fan motor, 18 gauge steel front panel, high temperature limit switch with automatic reset. Provide backbox for type of mounting.

.3 Built-In Thermostats

.1 Bi-metal type, designed to fit into convector or heater unit. Single pole rated 20 Amps at 347V, tamperproof design.

.4 Wall Mounted Thermostats

.1 Line voltage design, DPST, rated for 5000w at 240V, with heat anticipator, and adjustable high limit device factory set at maximum temperature of 23 C (75 F).

Part 3 EXECUTION

3.1 SYSTEM OPERATION

.1 For built-in thermostats, the bi-metal strip, acting in conjunction with the temperature will turn the heating circuit off and on for an individual heating unit.

3.2 INSTALLATION

.1 Install convector units in locations as indicated on the drawings centering the units in spaces whenever possible.

.2 Fasten convector units securely to the structural elements.

.3 Install convector units after painting and floor finishes are completed.

.4 Provide proper back box for recessed fan-forced units and securely fasten to the structural members. Locate units to avoid swinging doors and creating obstructions in corridors and walkways.

3.3 FIELD QUALITY CONTROL

.1 At final inspection, provide spot tests to demonstrate that equipment is functional.

.2 Touch up all damaged paint to heater units as directed by the Owner/Engineer.

END OF SECTION

Part 1 **General**

1.1 **GENERAL REQUIREMENTS**

.1 Conform to Division 1, General Requirements and Section 16010, General Electrical Provisions.

1.2 **Scope of Work**

.1 Related Work Specified Elsewhere

.1	Plumbing	Section 15400
.2	General Piping and Equipment	Section 15805
.3	Air Distribution	Section 15700
.4	General Electrical Provisions	Section 16010
.5	Basic Materials and Methods	Section 16100

.2 Work to be Supplied and Installed

.1 Complete power supply wiring and equipment for all mechanical motors, etc.

.2 Complete wiring for control of mechanical systems, with a voltage 100 V.A.C. or larger.

.3 Complete empty conduit system for low voltage (100V or less) controls as indicated on the Drawings, or specified herein.

.4 Supply and installation of control transformers as indicated on the Drawings, and specified elsewhere, within this Division.

.3 Work Installed and Furnished by Others

.1 Installation of all motors specified in Division 15.

Part 2 **Products**

2.1 **Materials**

.1 Materials specified herein are as defined in the General Electrical Provisions, Section 16010, Item 2.2.

2.2 **Motor Schedule**

.1 Generally motors will be supplied with voltages as follows:

.1 Up to and including 1/2 H.P., 120 V single phase, 60 Hz.

.2 Above 1/2 H.P., 208V, 3 phase, 60HZ.

.2 Provide wiring and equipment, etc., as shown for the respective motors. Refer to Mechanical Schedule on drawings for complete requirements. Equipment includes, but is not limited to, the following:

.1 Exhaust Fans

.2 Pumps
.3 Motorized Dampers
.4 Make-Up Air Units
.5 Zone Damper Boxes
.6 Humidifiers

Part 3 Execution

3.1 General

.1 Motor lock off switches may be H.P. rated light switches, where applicable.

.2 Empty conduits from the thermostat, or thermostat outlet box to be stubbed above accessible ceiling spaces, unless noted otherwise.

.3 Provide all necessary 120/24 VAC control transformers for the control system as indicated on the Drawings, 24V connection by Division 15.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform to Division 1, General Instructions and Section 16010, General Electrical Provisions.

.2 Related Work Specified in Other Sections

.1	Elevator General Provisions	Section 14205
.2	Elevators	Section 14210
.3	Raceways	Section 16100
.4	Conductors	Section 16100
.5	Signal, Communication Wire and Cable	Section 16710

1.2 Description

.1 Power service connections, communication (telephone) service connections, fire alarm signal, and associated conduit and wire for elevator cab lighting and ventilation and power to elevator sequence controller.

1.3 Work not included

.1 Installation shall comply with the following codes and regulations:

.1 Ontario Building Code

.2 Ontario Electrical Safety Code

.3 Canadian Standards Association CAN3-B44 (latest addition) Safety Code for Elevators.

Part 2 Products

2.1 Elevator Power Distribution Centre - Hydraulic Elevator

.1 208V, 3 phase, 3 wire, supply to fused switch complete with HRC time relay fuses in EEMAC 1 enclosure for elevator motor.

.2 120V supply to fused switch complete with HRC time delay fuses in EEMAC 1 enclosure for cab lighting.

.3 Fused switch for elevator motor to be complete with fourth pole for emergency descent as required by elevator manufacturer.

Part 3 Execution

3.1 Distribution Assemblies

.1 Provide lamicoid nametag indicating function of each breaker/disconnect. Co-ordinate wording with elevator contractors.

3.2 Equipment Wiring

.1 Elevator machine room light switch, elevator power disconnect devices, and cab light power disconnect devices placed on lock side of machine room door within elevator machine room. Co-ordinate location of lights, machines, and equipment installed in the elevator pits and machine rooms with elevator installer on site.

3.3 Installation

.1 Provide 3/4" plywood backboards for all distribution equipment.

.2 Connections in the elevator control equipment will be by the elevator installers.

.3 Provide all changes as required by the local elevator inspector.

END OF SECTION