DAVENPORT SHELTER –
2019 RENOVATION AND
ELEVATOR UPGRADES

348 DAVENPORT ROAD
TORONTO, ONTARIO

BID DOCUMENTS AND
TECHNICAL SPECIFICATIONS

PREPARED FOR: THE CITY OF TORONTO, FACILITIES MANAGEMENT
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RJC Job No.: TOR.121290.0002

Date: Issued for Tender & Permit – July 31, 2019

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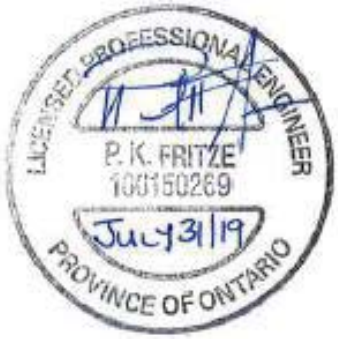
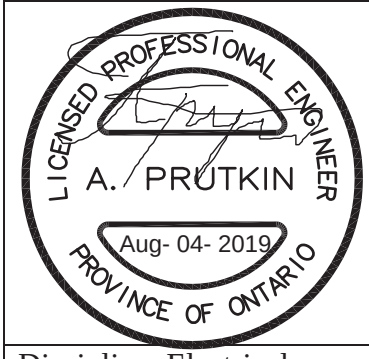
		
Discipline: Architectural Name: David Colussi	Discipline: Structural Name: Paul Fritze	Discipline: Mechanical Name: Alla Prutkin
		
Discipline: Electrical Name: Alla Prutkin	Discipline: Name:	Discipline: Name:

END OF SECTION

1.0 GENERAL

The drawings listed below will be included in the General Contractor/ Owner agreement and will become part of the contract.

Drawing No.	Drawing Title	Date
	Cover Page	**July 2019**
GN0.1	**General Notes**	**July 2019**
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S1.1	**Basement 2 Waterproofing Plan**	**July 2019**
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M0.1	**Mechanical Legend, Drawings List and Schedules**	**August 2019**
M1.1	**Basement 1 & 2 – Plumbing Demolition & New Layout**	**August 2019**
M1.2	**Level 2, 3 and 4 – Plumbing Demolition & New Layout**	**August 2019**
M2.1	**Level 2, 3 and 4 – HVAC Demolition & New Layout**	**August 2019**
M3.1	**Level 2, 3 and 4 – Fire Protection New Layout**	**August 2019**
M4.1	**Mechanical Specification**	**August 2019**
E0.1	**Electrical Legend, Drawing List, Notes and Schedules**	**August 2019**
E0.2	**Single Line Diagram – Demolition**	**August 2019**
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E1.1	**Basement 1 & 2 – Power Demolition & New Layout**	**August 2019**
E1.2	**Level 2, 3 and 4 – Power Demolition & New Layout**	**August 2019**
E2.1	**Level 2, 3 and 4 – Lighting Demolition & New Layout**	**August 2019**
E3.1	**Electrical Specification**	**August 2019**

END OF SECTION

1.0 CONTRACT FORM

The form of the contract between the accepted Bidder and the Owner will be the Standard Construction Document CCDC No. 2, 2008 Stipulated Price Contract revised to include amendments as set out in City of Toronto's Supplementary Conditions for the CCDC 2 2008 Construction Contract.

END OF SECTION

CITY OF TORONTO

SUPPLEMENTARY CONDITIONS TO CCDC 2-2008

STIPULATED PRICE CONTRACT

July 2018

AMENDMENTS TO THE STIPULATED PRICE CONTRACT, CCDC2-2008

The Standard Construction Document for Stipulated Price *Contract*, English version, consisting of the Agreement Between *Owner* and *Contractor*, Definitions, and General Conditions of the Stipulated Price *Contract*, Parts 1 to 12 inclusive, governing same is hereby made part of these *Contract Documents*, with the following amendments, additions and modifications:

1. AGREEMENT BETWEEN OWNER AND CONTRACTOR

1.1 ARTICLE A-3-CONTRACT DOCUMENTS

1.1.1 Amend paragraph 3.1 by adding the following after the words, "The General Conditions of the Stipulated Price Contract":

- "These Supplementary Conditions

-The Specific Conditions, if any

-*Drawings*

-*Specifications*"

1.2 ARTICLE A-5 – PAYMENT

1.2.1 Delete paragraph 5.3 – Interest, in its entirety.

1.3 ARTICLE A-6 – RECEIPT AND ADDRESSES FOR NOTICES IN WRITING

1.3.1 Amend paragraph 6.1, by deleting the words, "or by facsimile" in the second sentence, the words, "facsimile or other form of" in the fourth sentence, and the words, "facsimile number" wherever they appear.

2. DEFINITIONS

2.1.1 Delete Definition 4, "*Consultant*", and replace it with the following:

"The '*Consultant*', shall be the person or entity designated as the *Consultant* by the *Owner*, from time to time.

2.1.2 Add a new Definition, "*Act*", as follows:

"'*Act*" means the *Construction Act* (Ontario), as amended."

2.1.3 Add a new Definition, "*OHSA*", as follows:

"'OHSA' means the Occupational Health and Safety *Act* (Ontario)."

2.1.4 Add a new Definition, "*Submittals*", as follows:

"*Submittals*

Submittals are documents or items required by the *Contract Documents* to be provided by the *Contractor* in accordance with the *Contract Documents* such as:

- *Shop Drawings*, samples, models, mock-ups to indicate details or characteristics, before the portion of the *Work* that they represent can be incorporated into the *Work*; and

- As-built drawings and manuals to provide instructions to the operation and maintenance of the *Work*.

2.1.5 Add a new Definition, "*WSIB*", as follows:

"'*WSIB*' means the Workplace Safety & Insurance Board."

2.1.6 Add a new Definition "*Daily Work Records*", as follows:

"'*Daily Work Records'* mean daily records detailing the number and categories of workers and hours worked or on standby, types and quantities of *Construction Equipment*, and descriptions and quantities of *Product* utilized."

3. GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

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

3.1 GC 1.1 - CONTRACT DOCUMENTS

3.1.1 Delete paragraph 1.1.7.1 in its entirety and replace it with new paragraph 1.1.7.1:

"1.1.7.1 If there is a conflict within the *Contract Document*s, the order of priority of documents, from highest to lowest, shall be:

any amendment to the *Agreement* between the *Owner* and the *Contractor*,

the Agreement between the *Owner* and the *Contractor*, as amended by these Supplementary Conditions

the Definitions,

Specific Conditions

Supplementary Conditions,

the General Conditions,

the *Drawings*,

Division 1 of the *Specifications*,

Technical *Specifications*,

material and finishing schedules."

3.1.2 Delete paragraph 1.1.8 in its entirety and replace it with new paragraph 1.1.8:

"1.1.8 The *Owner* shall provide the *Contractor*, without charge, up to ten copies of the *Contract Documents*. If requested by the *Contractor*, the *City* shall provide additional copies at the cost of printing handling and shipping."

3.1.3 Amend paragraph 1.1.9 by deleting the period at the end and replacing it with ", which shall not unreasonably be withheld."

3.2 GC 1.3 – RIGHTS AND REMEDIES

3.2.1 Amend paragraph 1.3.2 by deleting the word, "*Consultant*" and replacing it with "his representative".

3.3 GC 1.4 - ASSIGNMENT

3.3.1 Delete paragraph 1.4.1 in its entirety and replace it with the following:

"1.4.1 The *Contractor* shall not assign the *Contract*, either in whole or in part, without the written consent of the *Owner*."

3.4 GC 2.1 – AUTHORITY OF THE CONSULTANT

3.4.1 Delete paragraph 2.1 in its entirety and replace it with new paragraph 2.1:

"2.1.1 The *Consultant* will be the *Owner*'s representative during construction and until the issuance by the *Consultant* of a certificate at completion of the *Work* ("Completion Certificate") or the issuance by the *Consultant* of a certificate of final acceptance ("Final Acceptance Certificate") whichever is later. All instructions to the *Contractor* including instructions from the *Owner* will be issued by the *Consultant*. The *Consultant* will have the authority to act on behalf of the *Owner* only to the extent provided in the *Contract Documents*.

2.1.2 The *Consultant* will inspect the *Work* for its conformity with the plans and *Specifications*, and record the necessary data to establish payment quantities under the schedule of tender quantities and unit prices or to make an assessment of the value of the *Work* completed in the case of a lump sum price contract.

2.1.3 The *Consultant* will investigate all claims of a change in the *Work* made by the *Contractor* and issue appropriate instructions.

2.1.4 In the case of non-compliance with the provisions of the *Contract* by the *Contractor*, the *Consultant*, after consultation with the *Owner*, will have the authority to suspend the *Work* for such reasonable time as may be necessary to remedy such non-compliance. The *Contractor* shall not be entitled to any compensation for suspension of the *Work* in these circumstances.

3.5 GC 2.2 - ROLE OF THE CONSULTANT

3.5.1 Amend paragraph 2.2.3 by deleting the second sentence thereof.

3.5.2 Amend paragraph 2.2.7 by deleting the words "except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER."

3.5.3 Delete paragraph 2.2.16 and replace it with the following:

2.2.16 The *Consultant* and the *Contractor* will jointly conduct reviews of the *Work* to determine the date of *Substantial Performance of the Work* and completion of the *Work* as provided in GC 5.4 SUBSTNATIAL PERFORMANCE OF THE WORK and GC 5.7 – FINAL PAYMENT, respectively.

3.6 GC 2.4 - DEFECTIVE WORK

3.6.1 Amend paragraph 2.4.1 by adding the following at the end, "at no additional cost to the *Owner*"

3.6.2 Add new subparagraphs 2.4.1.1 and 2.4.1.2:

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

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

3.7 GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

3.7.1 Delete subparagraphs 3.2.2.4 and 3.2.2.5 in their entirety.

3.8 GC 3.4 - DOCUMENT REVIEW

3.8.1 Delete paragraph 3.4.1 in its entirety and replace it with new paragraph 3.4.1:

"3.4.1 The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency or omission the *Contractor* may discover. Such review by the *Contractor* shall comply with the standard of care described in GC 3.14 STANDARD OF CARE. Except for its obligation to make such review and report the result, the *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the *Contractor* shall not proceed with the *Work* affected until the *Contractor* has received corrected or missing information from the *Consultant*."

3.8.2 Add new paragraph 3.4.2:

"3.4.2 If the *Contractor* finds discrepancies in and/or omissions from the *Contract Documents* or has any doubt as to the meaning or intent of any part thereof, the *Contractor* shall immediately notify the *Consultant*, who will provide written instructions or explanations. Neither the *Owner* nor the *Consultant* will be responsible for oral instructions."

3.9 GC 3.5 - CONSTRUCTION SCHEDULE

3.9.1 Add the following sections 3.5.1.1.1 to 3.5.1.1.5

"3.5.1.1.1 The schedule shall take into account the sequence of construction and the completion dates contained in the information for bidders and the tender submission package;

3.5.1.1.2 Only computerised type schedules will be accepted;

3.5.1.1.3 The schedule must show the *Project* critical path and the critical path must be identified in a contrasting colour (red) from the other activities;

3.5.1.1.4 The schedule must clearly show, in weekly intervals, the logic and timing of major activities, proposed start dates and estimated duration for activities;

3.5.1.1.5 The schedule must have a level of detail sufficient to identify the *Contractor* and each specific *Subcontractor* and their respective parts of the *Work* and the specific location thereof."

3.10 GC 3.6 – SUPERVISION

3.10.1 Amend paragraph 3.6.1 by adding the following after the words, "competent representative", "who shall be a Competent Person, as that term is defined in the *Occupational Health and Safety Act,"*, and by deleting the last sentence, and replacing it with the following, "The *Contractor* shall not be entitled to change the Competent Person without the prior written authorization of the *Owner*, which shall not be unreasonably withheld."

3.10.2 Add paragraphs 3.6.3 to 3.6.7 as follows:

"3.6.3 The *Contractor* shall furnish competent and adequate staff, who shall be in attendance at the *Place of the Work* at all times, as necessary, for the proper administration, co-ordination, supervision and superintendence of the *Work*; organize the procurement of all *Product* and *Construction Equipment* so that they will be available at the time they are needed for the *Work*; and keep an adequate force of skilled workers on the job to complete the *Work* in accordance with all requirements of the *Contract Documents*.

3.6.4 Prior to commencement of the *Work*, the *Contractor* shall select a competent and experienced full time *Project* manager (the "Project Manager") who shall be in attendance at the *Place of the Work* or on the road and engaged in the *Work* at all times, and a competent and experienced full time site supervisor (the "Site Supervisor") who shall be in attendance at the *Place of the Work* at all times. The Project Manager shall have full responsibility for the prosecution of the *Work*, with full authority to act in all matters as may be necessary for the proper co-ordination, supervision, direction and technical administration of the *Work*, who shall attend site meetings in order to render reports on the progress of the *Work* and who shall have authority to bind the *Contractor* in all matters related to this *Contract*. The Project Manager and the Site Supervisor shall be satisfactory to the *Owner* and shall not be changed except for good reason and with the prior written approval of the *Owner*, which shall not unreasonably be withheld. The Project Manager may be the same person as the competent representative set out in section 3.6.1.

3.6.5 The Project Manager and Site Supervisor shall represent the *Contractor* at the *Place of the Work* and notices and instructions given to the Project Manager and/or the Site Supervisor shall be held to have been received by the *Contractor*.

3.6.6 The *Owner* acting reasonably, shall have the right to order the *Contractor* to remove from the *Project* any representative or employee of the *Contractor, Subcontractors* or *Suppliers* who, in the opinion of the *Owner*, are a detriment to the *Project*.

3.6.7. The *Contractor* shall provide the *Owner* and the *Consultant* with the names, work addresses and telephone numbers of the Project Manager, the Site Supervisor and other responsible field persons who may be contacted for emergency and other reasons during non-working hours."

3.11 GC 3.7 - SUBCONTRACTORS AND SUPPLIERS

3.11.1 Add a new paragraph 3.7.1.4, as follows:

"3.7.1.4 at all times ensure full compliance with all of the *Owner*'s policies including the *Owner*'s Fair Wage Policy, and its collective agreements."

3.11.2 Delete paragraphs 3.7.3, 3.7.4, and 3.7.5 in their entirety, and replace them with sections 3.7.3, 3.7.4, 3.7.5, 3.7.6, 3.7.7, and 3.7.8 as follows:

"3.7.3 The Contractor may subcontract any part of the *Work*, subject to these General Conditions and any limitations specified in the *Contract Documents*.

3.7.4 The *Contractor* shall notify the *Consultant*, in writing, of its intention to subcontract. Such notification shall identify the part of the *Work* and the *Subcontractor* with whom it is intended to subcontract.

3.7.5 The *Contractor* shall not, without the written consent of the *Owner*, and whose consent shall not be unreasonably withheld, change a *Subcontractor* who has been engaged in accordance with this General Condition.

3.7.6 The *Contractor* shall preserve and protect the rights of the *Owner* with respect to that part of the *Work* to be performed under subcontract and shall enter into agreements with the intended *Subcontractors* to require them to perform their *Work* in accordance with the *Contract Documents* and shall be as fully responsible to the *Owner* for acts and omissions of the *Contractor's Subcontractors* and of persons directly and indirectly employed by them as for acts and omissions of persons employed directly by the *Contractor*.

3.7.7 The *Owner's* consent to subcontracting by the *Contractor* shall not be construed as relieving the *Contractor* from any obligation under the *Contract* and shall not impose any liability on the *Owner*. Nothing contained in the *Contract Documents* shall create a contractual relationship between a *Subcontractor* and the *Owner*.

3.7.8 The *Contractor* and all associated *Subcontractors* shall be subject to the *Owner's* policies, including any Fair Wage Policy, if any, as may be adopted by the *Owner* from time to time, and any of the *Owner's* or legislated labour trades requirements. Failure to comply with these policies or requirements may lead to termination of the *Contract*, or rejection of a *Subcontractor*, as the case may be."

3.12 GC 3.8 - LABOUR AND PRODUCTS

3.12.1 Paragraph 3.8.2 is amended by adding the following sentence to the end:

"The *Contractor* shall not change the source of supply of any *Product* without the written authorization of the *Consultant*."

3.12.2 Amend paragraph 3.8.3 by adding the following at the end thereof:

"and shall not employ any persons on the *Work* whose labour affiliation (or lack thereof) is incompatible with other labour employed in connection with the *Work* or at the *Place of the Work*."

3.13 GC 3.11- USE OF THE WORK

3.17.1 Amend section 3.11.2 by adding the words, ", individuals and the area adjacent to the work.", at the end thereof.

3.14 GC 3.12- CUTTING AND REMEDIAL WORK

3.18.1 Amend paragraph 3.12.1 by adding the word, "coring," before the word, "cutting".

3.15 GC 3.13- CLEANUP

3.15.1 Amend paragraph 3.13.2 by adding the following at the end thereof, "all to the satisfaction of the *Consultant* and the *Owner*, acting reasonably."

3.15.2 Add a new paragraph 3.13.4 as follows:

"3.13.4 The *Owner* shall have the right to back charge cleaning to the

Contractor if the cleaning is not completed within 24 hours of written notice to clean and the *Owner* shall have the right to back charge the cost of damage to the *Place of the Work* caused by the *Contractor*'s, *Subcontractor's* or *Supplier's* transportation in and out of the *Place of the Work* if not repaired within 5 *Working Days* of written notice to repair or before final payment, whichever is earlier."

3.16 GC 3.14 – STANDARD OF CARE

3.16.1 Add new General Condition 3.14 as follows:

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

3.14.2 The *Contractor* further represents covenants and warrants to the *Owner* that there are no pending, threatened or anticipated claims that would have a material effect on the financial ability of the *Contractor* to perform its *Work* under the *Contract*."

3.17 GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER

3.17.1 Delete GC 5.1.1 and 5.1.2 in their entirety and replace them with "Intentionally left blank."

3.18 GC 5.2 - APPLICATIONS FOR PROGRESS PAYMENT

3.18.1 Amend paragraph 5.2.4 by deleting the words "calendar days" and replacing them with "Working Days".

3.18.2 Amend paragraph 5.2.7 by adding the following at the end thereof:

"Any *Products* delivered to the *Place of the Work* but not yet incorporated into the *Work* shall remain at the risk of the *Contractor* notwithstanding that title has passed to the *Owner* pursuant to GC 13.1 OWNERSHIP OF MATERIALS."

3.18.3 Add new paragraphs 5.2.8, 5.2.9 , 5.2.10, 5.2.11, 5.2.12, and 5.2.13 as follows:

"5.2.8 The *Contractor* shall submit a *WSIB* clearance certificate and a Statutory Declaration of Progress Payment Distribution by Contractor in a form acceptable to the *Owner* with each application for progress payment.

5.2.9 The *Contractor* shall, within 21 days of the signing of the *Contract*, and prior to the first claim for monthly payment, submit to the Owner a detailed breakdown of the lump sum tender price for the purpose of establishing monthly payments. The *Owner*, acting reasonably, reserves the right to modify costs allocated to the various breakdown items to prevent unbalancing.

5.2.10 Payment for mobilizing and setting up plant, temporary buildings and services, premiums and other disbursements, shall be prorated based on the value of the *Work* performed during a billable period..

5.2.11 Payment for bonds and insurance will be paid 100 per cent on the first progress payment, provided that respective invoices are submitted as proof of payment.

5.2.12 An “as-built” item shall be identified on the cost breakdown with a corresponding fair and reasonable value for the purpose of ensuring that the as-built information drawings are given due diligence. A detailed description of as-built information/drawings performed for that month shall accompany the invoice.

5.2.13 Prior to applying for any payment from the City, the *Contractor* shall submit a monthly projected/estimated payment schedule based on the detailed construction schedule and the *Contract Price* for the duration of the *Contract*."

3.19 GC 5.3 - PROGRESS PAYMENT

3.19.1 Amend subparagraph 5.3.1.2 by adding the following sentence at the end thereof:

"For clarity, the ten calendar day period referenced in this paragraph shall not commence until such time as the *Consultant* has determined that he has received from the *Contractor* all required documents supporting the invoice and evidencing the *Work* being invoiced, all to the *Consultant's* reasonable satisfaction."

3.19.2 Amend paragraph 5.3.1.3 by deleting the number "20" and replacing it with the number, "30", and by deleting everything after the word "after" and replacing it with the following:

"the *Consultant* and the *Contractor* have reached mutual agreement on the amount of the invoice evidencing the *Work* being invoiced with required supporting documents. The Owner shall retain, from funds owing under the Contract, the statutory holdbacks required under the *Act*. Unless otherwise specified in the Contract Documents, no letter of credit or demand-worded holdback will be accepted or used to retain any part of the statutory holdbacks required under the *Act*."

3.20 GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK

3.20.1 Delete paragraph 5.4.3 in its entirety and replace it with the following:

"Immediately prior to the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor*, in consultation with the *Consultant*, shall establish a schedule for completion of the *Work* and correcting deficient *Work*, and the construction schedule shall be deemed to be amended to include this completion schedule."

3.20.2 Add new paragraphs 5.4.4 and 5.4.5:

"5.4.4 Prior to submitting its written application for *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* all:

.1 guarantees;

.2 warranties, completed as per paragraph 12.3.6;

.3 certificates;

.4 testing and balancing reports;

.5 distribution system diagrams;

.6 spare parts;

.7 maintenance/operation manuals;

.8 training manuals;

.9 samples;

.10 reports and correspondence from authorities having jurisdiction in the *Place of the Work;*

.11 *Shop Drawings*, and marked up *Drawings*;

.12 completed as-built drawings in the latest edition of a Computer Assisted Design Drawing software program;

.13 inspection certificates;

and other materials or documentation required to be submitted under the *Contract*, together with written proof acceptable to the *Owner* and the *Consultant* that the *Work* has been substantially performed in conformance with the requirements of municipal, governmental and utility authorities having jurisdiction in the *Place of the Work.*

5.4.5 Where the *Contractor* is unable to deliver the documents and materials described in paragraph

5.4.4, then, provided that none of the missing documents and materials interferes with the use and occupancy of the *Project* in a material way, and except as described herein, the failure to deliver shall not be grounds for the *Consultant* to refuse to certify *Substantial Performance of the Work.* However, certification of *Substantial Performance of the Work* may be withheld if the *Contractor* fails to deliver maintenance manuals, as required in paragraph 5.4.4.7, or completed as-built drawings, as required in subparagraph 5.4.5.12. Any documents or materials not delivered in accordance with paragraph 5.4.5 shall be delivered as provided in paragraph 5.7.1.2 of GC 5.7."

3.21 GC 5.5 - PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

3.21.1 Delete paragraph 5.5.1.2 in its entirety,

3.21.2 Amend paragraph 5.5.2 by deleting the words "and the statement " from line 1, and adding the following at the end of the paragraph:

"The Substantial Performance Statutory Holdback Release Payment Certificate will be a payment certificate releasing to the Contractor the statutory holdback due in respect of Work performed up to the date of Substantial Performance of the Work. Payment of such statutory holdback shall be due 61 days after the date of publication of the Certificate of Substantial Performance but subject to the provisions of the *Act* and subject to GC 5.5.4 ."

3.21.3 Delete paragraph 5.5.3 in its entirety.

3.21.4 Amend paragraph 5.5.4 by deleting the last sentence and replacing it with the following: "In accordance with the *Act*, the *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* and, the Owner acting reasonably, may retain any amounts in respect of claims of third parties made to the Owner in respect of the *Contract* or the *Work*, and in respect of any claims the *Owner* may have against the *Contractor*."

3.22 GC 5.6 - PROGRESSIVE RELEASE OF HOLDBACK

3.22.1 Amend paragraph 5.6.1 by deleting the period at the end of the first sentence and substituting ",subject to, and in accordance with, the terms of this GC 5.6." and by deleting the last sentence thereof and by adding the following as paragraphs 5.6.1.1, and 5.6.1.2:

"5.6.1.1 The holdback in respect of a subcontract shall be released 61 days after the date the subcontract is certified complete , provided the *Contractor* submits the following to the *Consultant*:

(a) a document satisfactory to the *Consultant* that will release the *Owner* from all further claims relating to the subcontract, qualified by stated exceptions such as holdback monies;

(b) evidence satisfactory to the *Consultant* that the *Subcontractor* has discharged all liabilities incurred in carrying out the subcontract;

(c) a satisfactory clearance certificate or letter from the Workplace Safety and Insurance Board relating to the subcontract; and

(d) a copy of the contract between the *Contractor* and the *Subcontractor* and a satisfactory statement showing the total amount due to the *Subcontractor* from the *Contractor*."

5.6.1.2 The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* and any amounts in respect of claims of third parties made to the City in respect of the *Contract* or the *Work*. "

3.23 GC 5.7 - FINAL PAYMENT

3.23.1 Amend paragraph 5.7.1 by renumbering it as 5.7.1.1 and adding the following subparagraph as 5.7.1.2,.

"5.7.1.2 The *Contractor*'s application for final payment shall be accompanied by any documents or materials not yet delivered pursuant to paragraph 5.4.4. The *Work* shall be deemed not to be performed until all of the aforementioned documents have been delivered, and the *Owner* may withhold payment in respect of the delivery of any documents in an amount determined by the *Consultant* in accordance with the provisions of GC 5.8 WITHHOLDING OF PAYMENT."

3.23.2 Amend paragraph 5.7.4 by deleting the number, "5" and replacing it with "60".

3.24 GC 6.2 - CHANGE ORDER

3.24.1 Add new paragraphs 6.2.3 and 6.2.4 as follows:

"6.2.3 Work on a Lump Sum Basis

6.2.3.1 Any agreement reached by the *Owner* and *Contractor* on an adjustment of the *Contract Price* on either a lump-sum or unit price basis shall be subject to the conditions contained in this paragraph 6.2.3.

6.2.3.2 Where a change in the *Work*, is performed by the *Contractor*'s own forces, the negotiated lump sum price for change in the *Work*, or negotiated unit price(s) for each unit priced item shall be all-inclusive, except HST and mark-up as provided hereafter, and shall include, without limitation, all costs, charges, expenses and fees whatsoever required or related to perform such change, or such unit priced item. The *Contractor* shall be allowed a mark-up to a maximum amount of 15% of the lump sum price, or aggregate of unit items and applicable unit price(s), for such change, net of taxes on the first $100,000 and 10% thereafter. The *Contractor* shall provide a written quotation identifying each amount to be charged for transportation, labour, *Product*, *Construction Equipment* and services and all other costs for the performance of the *Work*. The HST, as applicable, shall be identified separately in a manner satisfactory to the *Owner*.

6.2.3.3 Where a change in the *Work* is performed by a *Subcontractor's* forces, the *Subcontractor's* lump sum price for change in the *Work*, or unit price (s) for each unit priced item shall be all-inclusive, except HST and mark-up as provided hereafter, and shall include all of its costs, charges, expenses and fees whatsoever required or related to perform such change, or such unit priced item. The *Contractor* shall provide a written quotation with back-up documentation from the *Subcontractor* identifying each amount to be charged for transportation, labour, *Product*, *Construction Equipment* and services and all other costs for the performance of the *Work* and the total price charged by the *Subcontractor*. The *Subcontractor* shall be allowed a mark-up to a maximum amount of 15% of the lump sum price, or aggregate of unit items and applicable unit price(s), for such change, net of taxes on the first $100,000 and 10% thereafter. The *Contractor* is allowed a maximum mark-up of 10% on the total price charged by the *Subcontractor* to the *Contractor* for such change, net of taxes and *Subcontractor* mark-up. The HST, as applicable, shall be identified separately in a manner satisfactory to the *Owner*.

6.2.3.4 In the event any of the change in the *Work*, contains items or parts that, in the opinion of the *Consultant*, are the same or equivalent to items for which the *Contractor* submitted unit prices in the tender submitted by the *Contractor*, then the prices in the tender shall be the prices paid by the *Owner* for that work or parts of the work in respect of any such change in the *Work*.

6.2.3.5 Where a change in the *Work* is performed either by the *Contractor* or a *Subcontractor*, and requires *Construction Equipment*, reasonable rental charges for *Construction Equipment*, such as tractors, bulldozers, ditching machines, air compressors, compactors, concrete mixers and graders, for the actual time required in operation for the performance of the *Work* must be agreed upon before commencing the *Work*.

6.2.3.6 The mark-ups provided for in paragraph 6.2.3.2 and 6.2.3.3 shall constitute the only compensation the *Contractor* shall be entitled to for any and all overhead, profit, incidental and administrative costs whatsoever related to the change, including but not limited to, costs relating to superintendence and supervision, shop drawing production, estimating, site office and home office expenses, workers tools, temporary facilities and controls, and coordination of any and all *Work*-related activities.

6.2.3.7 No claim whatsoever for a change in the *Contract Time*, delay, prolongation charges, remobilization or otherwise shall be permitted with respect to a change, unless first authorized by the *Consultant* and approved by the *Consultant* and set out in the *Change Order* or *Change Directive*, as the case may be, by the *Owner*.

6.2.3.8 No compensation for any change in the *Work* shall be allowed unless such change is first ordered in writing by the *Consultant* and authorized by the *Owner*.

6.2.4 Work on a Time and Material Basis

6.2.4.1 Where agreement is not reached on a lump-sum or unit price basis for a change in the *Contract Price* arising out of a change in the *Work*, the *Owner* may choose to issue a *Change Order* for *Work on a Time and Material Basis*, in which case the following provisions in this section 6.2.4 shall apply:

6.2.4.2 For the purposes of this paragraph 6.2.4, the following definitions apply:

Cost of Labour: means the amount of wages, salary, travel, travel time, food, lodging or similar items and Payroll Burden paid or incurred directly by the *Contractor* to or in respect of labour and supervision actively and necessarily engaged on the *Work* based on the recorded time and hourly rates of pay for such labour and supervision, but shall not include any payment or costs incurred for general supervision, administration or management time spent on the entire *Work* or any wages, salary or Payroll Burden for which the *Contractor* is compensated by any payment made by the *Owner* for *Construction Equipment*.

Cost of Product: means the cost of *Product* purchased, or supplied from stock, and valued at current market prices, for the purpose of carrying out extra *Work*, by the *Contractor*, or by others when such arrangements have been made by the *Contractor* for completing the *Work*, as shown by itemized invoices.

Operated Rented Construction Equipment: means rented *Construction Equipment* for which an operator is provided by the supplier of the *Construction Equipment* and for which the rent or lease includes the cost of the operator.

Payroll Burden: means the payments in respect of workplace insurance, vacation pay, employment insurance, sickness and accident insurance, pension fund and such other welfare and benefit payments forming part of the *Contractor*'s normal labour costs.

Rented Equipment: means *Construction Equipment* that is rented or leased for the special purpose of *Work on a Time and Material Basis* from a person, firm or corporation that is not an associate of the lessee as defined by the *Securities Act*, R.S.O. 1990, Chapter c.S.5, as amended, and is approved by the *Consultant*.

Road Work: means the preparation, construction, finishing and construction maintenance of roads, streets, highways and parking lots and includes all work incidental thereto other than work on structures.

Sewer and Watermain Work: means the preparation, construction, finishing and construction maintenance of sewer systems and watermain systems, and includes all work incidental thereto other than work on structures.

Standby Time: means any period of time which is not considered *Working Time* and which together with the Working Time does not exceed 10 hours in any one *Working Day* and during which time a unit of

Construction Equipment cannot practically be used on other work but must remain on the site in order to continue with its assigned task and during which time the unit is in fully operable condition.

Structure Work: means the construction, reconstruction, repair, alteration, remodelling, renovation or demolition of any bridge, building, tunnel or retaining wall and includes the preparation for and the laying of the foundation of any bridge, building, tunnel or retaining wall and the installation of equipment and appurtenances incidental thereto.

The 127 Rate: means the rate for a unit of *Construction Equipment* as listed in OPSS.PROV 127, Schedule of Rental Rates for *Construction Equipment* Including Model and Specification Reference, which is current at the time the *Work* is carried out or for *Construction Equipment* which is not so listed, the rate which has been calculated by the *Owner*, using the same principles as used in determining The 127 Rates.

Work on a Time and Material Basis: means changes in the *Work* approved by the *Consultant* for payment on a time and material basis. The *Work on a Time and Material Basis* shall be subject to all the terms, conditions, *Specifications* and provisions of the *Contract*.

Working Time: means each period of time during which a unit of *Construction Equipment* is actively and of necessity engaged on a specific operation and the first 2 hours of each immediately following period during which the unit is not so engaged but during which the operation is otherwise proceeding and during which time the unit cannot practically be transferred to other work but must remain on the site in order to continue with its assigned tasks and during which time the unit is in a fully operable condition.

6.2.4.3 *Daily Work Records* prepared as the case may be by either the *Contractor*'s representative or the *Consultant* and reporting the labour and *Construction Equipment* employed and the *Product* used for *Work on a Time and Material Basis*, shall be reconciled and signed each day by both the *Contractor*'s representative and the *Consultant*.

6.2.4.4 Payment as herein provided shall be full compensation for all labour, *Construction Equipment* and *Product* to do the *Work on a Time and Material Basis* except where there is agreement to the contrary prior to the commencement of the *Work on a Time and Material Basis*. The payment adjustments on a time and material basis shall apply to each individual *Change Order* authorized by the *Consultant*.

6.2.4.5 The *Owner* will pay the *Contractor* for labour employed on each time and material project at 135% of the *Cost of Labour* up to $3000, then at 120% of any portion of the *Cost of Labour* in excess of $3000.

6.2.4.6 The *Owner* will make payment in respect of *Payroll Burden* for *Work on a Time and Material Basis* at the *Contractor*'s actual cost of *Payroll Burden*.

6.2.4.7 At the *Owner*'s discretion, an audit may be conducted in which case the actual *Payroll Burden* so determined shall be applied to all *Work on a Time and Material Basis*.

6.2.4.8 The *Owner* will pay the *Contractor* for *Product* used on each time and material project at 120% of the *Cost of Product* up to $3,000, then at 115% of any portion of the *Cost of Product* in excess of $3,000.

6.2.4.9 The *Owner* will pay the *Contractor* for the *Working Time* of all *Construction Equipment* other than rented *Construction Equipment* and *Operated Rented Construction Equipment* used on the *Work* on a *Time and Material Basis* at the *127 Rates* with a cost adjustment as follows:

(a) Cost $10,000 or less - no adjustment;

(b) Cost greater than $10,000 but not exceeding $20,000 - payment $10,000 plus 90% of the portion in excess of $10,000; and

(c) Cost greater than $20,000 - $19,000 plus 80% of the portion in excess of $20,000.

6.2.4.10 The *Owner* will pay the *Contractor* for the *Working Time* of *Rented Equipment* used on the *Work on a Time and Material Basis* at 110% of the invoice price approved by the *Consultant* up to a maximum of 110% of the 127 Rate. This constraint will be waived when the *Consultant* approves the invoice price prior to the use of the *Rented Equipment*.

6.2.4.11 The *Owner* will pay the *Contractor* for the *Working Time* of *Operated Rented Construction Equipment* used on the *Work on a Time and Material Basis* at 110% of the *Operated Rented Construction Equipment* invoice price approved by the *Consultant* prior to the use of the *Construction Equipment* on the *Work on a Time and Material Basis*.

6.2.4.12 The *Owner* will pay the *Contractor* for *Standby Time* of *Construction Equipment* at 35% of the 127 Rate or 35% of the invoice price whichever is appropriate. The *Owner* will pay reasonable costs for *Rented Equipment* where this is necessarily retained in the *Place of the Work* for extended periods agreed to by the *Consultant*. This will include *Rented Equipment* intended for use on other work, but has been idled due to the circumstances giving rise to the *Work on a Time and Material Basis*.

6.2.4.13 In addition, the *Owner* will include the *Cost of Labour* of operators or associated labourers who cannot be otherwise employed during the standby period or during the period of idleness caused by the circumstances giving rise to the *Work on a Time and Material Basis*.

6.2.4.14 *Rented Equipment* idled by the circumstances giving rise to the *Work on Time and Material Basis* to be returned to the lessor until the work requiring the *Rented Equipment* can be resumed. The *Owner* will pay such costs as result directly from such return.

6.2.4.15 When *Construction Equipment* is transported, solely for the purpose of the *Work on a Time and Material Basis*, to or from the *Place of the Work*, payment will be made by the *Owner* only in respect of the transporting units. When *Construction Equipment* is moved under its own power it shall be deemed to be working. *Construction Equipment* rates shall be subject to the approval of the *Consultant*.

6.2.4.16 Notwithstanding any other provision of this Section, no payment shall be made to the *Contractor* for or in respect of hand tools or equipment that are tools of the trade.

6.2.4.17 For changes in the *Work*, where the *Work* is performed by a *Subcontractor* the *Owner* shall pay the *Contractor* a mark up in the amount of 10 % of the first $10,000 plus 5 % of the amount in excess of $10,000.

6.2.4.18 No further markup will be applied regardless of the extent to which the *Work* is assigned or sublet to others. If *Work* is assigned or sublet to an associate, as defined by the Securities Act no markup whatsoever will be applied.

6.2.4.19 At the start of the *Work on a Time and Material Basis*, the *Contractor* shall provide the applicable labour and *Construction Equipment* rates not already submitted to the *Consultant* during the course of such work.

6.2.4.20 Separate summaries shall be completed by the *Contractor* according to the standard form "Summary for Payment of Accounts on a Time and Material Basis". Each summary shall include the order number and covering dates of the *Work* and shall itemize separately labour, *Product* and *Construction Equipment*. Invoices for *Product*, Rented *Construction Equipment* and other charges incurred by the *Contractor* on the *Work on a Time and Material Basis* shall be included with each summary.

6.2.4.21 Each month the *Consultant* will include with the monthly progress payment certificate, the costs of the *Work on a Time and Material Basis* incurred during the preceding month all in accordance with the

Contract administrative procedures and the *Contractor*'s invoice of the *Work on a Time and Material Basis*.

6.2.4.22 The final "Summary for Payment of Accounts on a Time and Material Basis" shall be submitted by the *Contractor* within 60 days after the completion of the *Work on a Time and Material Basis*."

3.25 GC 6.3 - CHANGE DIRECTIVE

3.25.1 Delete paragraph 6.3.7.1 in its entirety and replace it with the following:

".1 salaries, wages and benefits paid to personnel in the direct employ of the *Contractor*, applying the labour rates set out in the wage schedule in the *Contract Documents* or as otherwise agreed between the *Owner* and *Contractor* for personnel,

(1) carrying out the *Work*, including necessary supervisory services;

(2) engaged in expediting the production or transportation of material or equipment, at shops or on the road;

(3) engaged in the preparation of *Shop Drawings*, fabrication drawings, coordination drawings and *Contract* as-built drawings, or,

(4) including clerical staff engaged in processing changes in the *Work*."

3.25.2 Amend paragraph 6.3.8 by adding the words "except for paragraph 6.3.14" after the word "*Contract*" in the first line.

3.25.3 Add new paragraph 6.3.14 as follows:

"6.3.14 For greater certainty, and without limitation, the cost of performing the *Work* attributable to the *Change Directive* does not include, and no payment shall be made for:

.1 head office salaries and benefits and all other overhead or general expenses, except only for the salaries, wages and benefits of personnel described in paragraph 6.3.7.1 and the contributions, assessments or taxes referred to in paragraphs 6.3.7.2;

.2 capital expenses and interest on capital;

.3 general clean-up, except where the performance of the *Work* in the *Change Directive* causes specific additional clean-up requirements;

.4 wages paid for project managers, superintendents, assistants, watch persons and administrative personnel, provided the Change Directive does not result in an extension of *Contract Time*;

.5 wages, salaries, rentals, or other expenses that exceed the rates that are standard in the locality of the *Place of the Work* that are otherwise deemed unreasonable by the *Consultant*;

.6 any costs or expenses attributable to the negligence, improper *Work*, deficiencies, or breaches of *Contract* by the *Contractor* or *Subcontractor*;

.7 any cost of quality assurance, such as inspection and testing services, charges levied by authorities, and any legal fees unless any such costs or fees are pre-approved in writing by the *Owner*."

3.26 GC 6.5 - DELAYS

3.26.1 Amend paragraphs 6.5.1, and 6.5.2 by deleting the period at the end of each paragraph, and substituting the following words, ", but excluding any consequential, indirect or special damages, loss of profit, loss of opportunity or loss of productivity resulting from such delay."

3.26.2 Add new subparagraphs 6.5.6, 6.5.7, 6.5.8 and 6.5.9 as follows:

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

6.5.7 The *Contractor* shall be responsible for the care, maintenance and protection of the *Work* in the event of any suspension of construction as a result of the delay described in paragraphs 6.5.1, 6.5.2 or 6.5.3. In the event of such suspension, the *Contractor* shall be reimbursed by the *Owner* for the reasonable costs incurred by the *Contractor* for such care, maintenance and protection, but excluding the costs of the *Contractor*'s head office personnel. The *Contractor*'s entitlement to costs pursuant to this paragraph 6.5.7, if any, shall be in addition to amounts, if any, to which the *Contractor* is entitled pursuant to paragraphs 6.5.1, 6.5.2 or 6.5.3.

6.5.8 Without limiting the obligations of the *Contractor* described in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS and GC 9.4 – CONSTRUCTION SAFETY, the *Owner* may, by *Notice in Writing*, direct the *Contractor* to stop the *Work* where the *Owner* determines that there is an imminent risk to the safety of persons or property at the *Place of the Work*. In the event that the *Contractor* receives such notice, it shall immediately stop the *Work* and secure the *Project* site. The *Contractor* shall not be entitled to an extension of the *Contract Time* or to an increase in the *Contract Price* unless the resulting delay, if any, would entitle the *Contractor* to an extension of the *Contract Time* or the reimbursement of the *Contractor*'s costs as provided in paragraphs 6.5.1, 6.5.2 or 6.5.3.

6.5.9 The *Contractor* recognizes and agrees that the *Owner* will suffer financial loss if the *Work* is not completed within the time specified in the *Contract*. The *Contractor* also recognizes the delays, expenses and difficulties involved in proving the actual loss suffered by the *Owner* if the *Work* is not completed on time. Accordingly, instead of requiring any such proof, the *Contractor* agrees that as liquidated damages for delay (but not as penalty) the *Contractor* shall pay to the *Owner*, as liquidated damages, an amount per day, as designated in the Specific Conditions of Contract for each and every day's delay from the specified time for completion of the *Work* until actual completion of the *Work*, and it is further expressly acknowledged and agreed by the *Contractor* that:

(a) this amount is a reasonable estimate of the actual damage that will be incurred by the *Owner* due to any failure to complete the *Work* within the time required by this *Contract*;

(b) the *Owner* may deduct the amount due under this section from any monies that may be due or payable to the *Contractor*, whether under this *Contract* or any other agreement;

(c) the liquidated damages provided for in this section shall be without prejudice to any other remedy to which the *Owner* is entitled at law or in equity."

3.27 GC 6.6 CLAIMS FOR CHANGE IN CONTRACT PRICE

3.27.1 GC 6.6.1 - 6.6.6 are deleted in their entirety and replaced with the following:

"6.6.1 Claims for a change in the Contract Price shall be determined in accordance with GC 8, as amended."

3.28 GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, STOP THE WORK, OR TERMINATE THE CONTRACT

3.28.1 Amend paragraph 7.1.2 by adding the following sentence to the end:

"Failure by the *Owner* to provide such notice shortly after the default has occurred shall not constitute condonation of the default."

3.28.2 Add a new paragraph 7.1.5.5 as follows:

".5 charge the *Contractor* for any damages the *Owner* may have sustained as a result of the default."

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

3.29.1 Delete paragraphs 7.2.1, and 7.2.3.1 in their entirety.

3.29.2 In paragraph 7.2.2, insert the words "other than the City of Toronto" after the words "public authority" in the second line.

3.29.3 Delete subparagraph 7.2.3.4 and replace it with the following:

".4 the *Owner* violates the requirements of the *Contract* to a substantial degree"

3.29.4 Delete paragraph 7.2.5 and replace it with the following:

"7.2.5 If the default cannot be corrected within the 5 *Working Day*s specified in paragraph 7.2.4, the *Owner* shall be deemed to have cured the default if it

.1 commences the correction of the default within the specified time; and

.2 provides the *Contractor* with an acceptable schedule for such correction; and

.3 completes the correction in accordance with such schedule."

3.29.5 Add new paragraph 7.2.6:

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

3.30 GC 8.0 – DISPUTE RESOLUTION

3.30.1 Delete Part 8 in its entirety and replace it with the following:

"8.0 DISPUTE RESOLUTION

8.1.1 Continuance of the *Work*

Unless the *Contract* has been terminated or completed, the *Contractor* shall in every case, after serving or receiving any notification of a claim or dispute, verbal or written, continue to proceed with the *Work* with due diligence and expedition. It is understood by the parties that such action shall not jeopardize any claim it may have.

8.1.2 Record Keeping

Immediately upon commencing *Work* that may result in a claim, the *Contractor* shall keep *Daily Work Records* during the course of the *Work*, sufficient to substantiate the *Contractor*'s claim, and the *Consultant* shall keep *Daily Work Records* to be used in assessing the *Contractor*'s claim, all records to be in accordance with the requirements of the *Contract*.

8.1.3 The *Contractor* and the *Consultant* shall attempt to reconcile their respective *Daily Work Records* on a daily basis, to simplify review of the claim, when submitted. If the *Contractor* and the *Consultant* fail to reconcile their respective *Daily Work Records*, then the *Contractor* shall submit its *Daily Work Records* as part of its claim, whereby the resolution of the dispute about the *Daily Work Records* shall not be resolved until there is a resolution of the claim.

8.1.4 The keeping of *Daily Work Records* by the *Consultant* or the reconciling of such *Daily Work Records* with those of the *Contractor* shall not be construed to be acceptance of the claim.

8.2 Claims Procedure

8.2.1 The *Contractor* shall give verbal notice to the *Consultant* of any situation which may lead to a claim for additional payment immediately upon becoming aware of the situation and shall provide written notice to the *Consultant* of such situation or of any express intent to claim such payment, within seven days of the commencement of any part of the *Work* which may be affected by the situation or shall form part of the claim.

8.2.2 The *Contractor* shall submit detailed claims as soon as reasonably possible and in any event no later than 30 days after completion of the *Work* affected by the situation. The detailed claim shall:

a) identify the item or items in respect of which the claim arises;

b) state the grounds, contractual or otherwise, upon which the claim is made; and

c) include the records maintained by the *Contractor* supporting such claim.

In exceptional cases the 30 days may be increased to a maximum of 90 days with approval in writing from the *Consultant*.

8.2.3 Within 30 days of the receipt of the *Contractor*'s detailed claim, the *Consultant* may request the *Contractor* to submit any further and other particulars as the *Consultant* considers necessary to assess the claim. The *Contractor* shall submit the requested information within 30 days of receipt of such request.

8.2.4 Within 90 days of receipt of the detailed claim, the *Owner*, or if authorized by the *Owner*, the *Consultant*, shall advise the *Contractor*, in writing, of the *Owner*'s opinion with regard to the validity of the claim.

8.3 Negotiations

8.3.1 The parties shall make all reasonable efforts to resolve their dispute by amicable negotiations and agree to provide, without prejudice, open and timely disclosure of relevant facts, information, and documents to facilitate these negotiations.

8.3.2 Should the *Contractor* disagree with the opinion given in paragraph 8.2.4, with respect to any part of the claim, the *Consultant* shall enter into negotiations with the *Contractor* to resolve the matters in dispute. Negotiation shall occur on three levels; first, with the *Consultant*, second, with the *Owner*'s Manager level, and third, with the *Owner*'s Director, General Manager or Executive Director level. Corresponding level shall be involved in the discussions on behalf of the *Contractor*. Any agreement reached with the *Consultant* shall be subject to the *Owner*'s approval. Prior to commencement of construction the *Owner* and the *Contractor* shall meet to determine the names of the representatives at the three levels of discussion. These names shall be put in writing, to be used in the event of a dispute in issue.

8.3.3 Discussions with the *Consultant* shall be completed as soon as possible and shall be limited to a period of no more than 30 days following receipt of the opinion given in paragraph 8.2.4. Manager level discussion shall be completed as soon as possible following failed discussions with the *Consultant*, and shall be limited to a period of no more than a further 30 days. The Director, General Manager or Executive Director level discussion shall be completed as soon as possible following failed manager level discussions, and shall be limited to a period of no more than a further 30 days.

8.3.4 Each party shall be responsible for elevating an issue to the next level of negotiation, if the issue has not been resolved at the current level. The *Contractor* or *Consultant* shall notify the other properly in writing if he or she wishes to pursue an issue to the next level of negotiation.

8.3.5 Where a negotiated settlement cannot be reached, or it is agreed that payment cannot be made in accordance with paragraph 6.2.3 or paragraph 6.2.4, the parties may, upon mutual agreement, proceed in accordance with clause paragraph 8.4, Mediation.

8.4 Mediation

8.4.1 If a claim is not resolved satisfactorily through the negotiation process in paragraph 8.3, and the *Contractor* wishes to pursue the issue further, the parties may, upon mutual agreement, utilize the services of an independent third party mediator.

8.4.2 The mediator shall be mutually agreed upon by the *Owner* and *Contractor*.

8.4.3 The mediator shall be knowledgeable regarding the area of the disputed issue. The mediator shall meet with the parties together or separately, as necessary, to review all aspects of the issue. The mediator may provide the parties with his or her non-binding without prejudice settlement recommendation, on the day of the mediation.

8.4.4 Each party is responsible for its own costs related to the use of the third party mediator process. The costs of the third party mediator shall be equally shared by the *Owner* and *Contractor*.

8.5 Payment

8.5.1 Payment of the claim shall be made no later than 30 days after the date of resolution of the claim or dispute. Such payment shall be made according to the terms of Part 5, Payment.

8.6 Rights of Both Parties

8.6.1 Unless the parties agree otherwise, no action taken under paragraphs 8.1 to 8.6, by either party shall be construed as a renunciation or waiver of any of the rights or recourse available to the parties.

8.7 Arbitration

8.7.1 If a claim is not resolved satisfactorily through the negotiation process, or mediation if utilized, either party may request an arbitration of the dispute and the parties, by mutual agreement, may submit such dispute to arbitration and the provisions of the Ontario *Arbitration Act, 1991*, as amended, shall apply to such arbitration, including the provisions for appeal therein except as otherwise provided in this section 8.7. Notwithstanding this, in the case of claims for amounts less than $150,000, exclusive of H.S.T., the provisions of subsection GC 8.7 to 8.11, Arbitration, shall be mandatory if requested by either party, and the matter shall proceed to arbitration if not resolved through the said negotiation or mediation processes.

8.7.2 If the Parties engage in arbitration to resolve the issue, notification to that effect shall be communicated in writing to the *Consultant* within 30 days of completing the negotiations referred in paragraph 8.3, or, if the parties proceed to mediation under paragraph 8.4, within 30 days of completing that mediation.

8.7.3 The parties shall be bound by the decision of the arbitrator.

8.7.4 The rules and procedures of the Arbitration Act, 1991, S.O. 1991, c.17, as amended, shall apply to any arbitration conducted hereunder except to the extent that they are modified by the express provisions of paragraphs 8.7 to 8.11.

8.8 Arbitration Procedure

8.8.1 The following provisions are to be included in the agreement to arbitrate:

.1 All existing actions in respect of the matters under arbitration shall be stayed pending arbitration;

.2 All then unresolved claims and matters to be settled are to be set out in a schedule to the agreement. Only such claims and matters as are in the schedule shall be arbitrated; and

.3 Before proceeding with the arbitration, the *Contractor* shall confirm that all matters in dispute are set out in the schedule.

8.9 Appointment of Arbitrator

8.9.1 The arbitrator shall be mutually agreed upon by the *Owner* and *Contractor* to adjudicate the dispute.

8.9.2 Where the *Owner* and *Contractor* cannot agree on a sole arbitrator within 30 days of the notification of arbitration noted in paragraph GC 8.7.2, the *Owner* and the *Contractor* shall each chose an appointee with 37 days of the notice of arbitration.

8.9.3 The appointees shall mutually agree upon an arbitrator to adjudicate the dispute within 15 days after the last appointee was chosen or they shall refer the matter to the Arbitration and Mediation Institute of Ontario Inc. which shall select an arbitrator to adjudicate the dispute within 7 days of being requested to do so.

8.9.4 The arbitrator shall not be interested financially in the *Contract* nor in either party's business and shall not be employed by either party.

8.9.5 The arbitrator is not bound by the rules of evidence which govern the trial of cases in court but may hear and consider any evidence which the arbitrator considers relevant.

8.9.6 The hearing shall commence within 90 days of the appointment of the arbitrator.

8.10 Costs

8.10.1 The arbitrator's fee shall be equally shared by the *Owner* and the *Contractor*.

8.10.2 The fees of any independent experts and any other persons appointed to assist the arbitrator shall be shared equally by the *Owner* and the *Contractor*.

8.10.3 The arbitration hearing shall be held in a place mutually agreed upon by both parties or in the event the parties do not agree, a site shall be chosen by the arbitrator. The cost of obtaining appropriate facilities shall be shared equally by the *Owner* and the *Contractor*.

8.10.4 The arbitrator may, in his or her discretion, award reasonable costs, related to the arbitration.

8.11 The Decision

8.11 The reasoned decision shall be made in writing within 90 days of the conclusion of the hearing. An extension of time to make a decision may be granted with consent of both parties. Payment shall be made in accordance with Part 5, Payment."

3.31 GC 9.1 - PROTECTION OF WORK AND PROPERTY

3.31.1 Delete subparagraph 9.1.1.1 in its entirety and replace it with new subparagraph 9.1.1.1:

"9.1.1.1 errors in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in GC 3.14 STANDARD OF CARE."

3.31.2 Amend paragraph 9.1.1.2 by adding the word, "negligent" at the beginning thereof.

3.31.3 Add new paragraphs 9.1.5 and 9.1.6 as follows:

"9.1.5 Without in any way limiting the *Contractor*'s obligations under this GC 9.1, should the *Contractor* or any *Subcontractor* or *Supplier* cause loss or damage to trees or other plantings, whether owned by the *Owner* or third parties, the *Contractor* shall be liable for the replacement cost of the trees or other plantings damaged, including the cost of any arborist or other *Consultant*, and such costs may be deducted by the *Owner* from amounts otherwise owing to the *Contractor*.

9.1.6 The *Contractor* shall neither undertake to repair and/or replace any damage whatsoever to the *Work* of other *Contractor*s, or to adjoining property, nor acknowledge the same was caused or occasioned by the *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*. However, where there is danger to life or public safety, the *Contractor* shall take such emergency action as it deems necessary to remove the danger."

3.32 GC 9.4 - CONSTRUCTION SAFETY

3.32.1 Delete paragraph 9.4.1 in its entirety and substitute new paragraph 9.4.1:

"9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations and practices required by the applicable construction health and safety legislation and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work*."

3.32.2 Add new paragraphs 9.4.2, 9.4.3 and 9.4.4:

"9.4.2 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owne*r:

.1 a current WSIB clearance certificate;

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

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

9.4.3 The *Contractor* shall indemnify and save harmless the *Owner*, its agents, officers, directors, employees, consultants, successors and assigns from and against the consequences of any and all safety infractions committed by the *Contractor* under OHSA, including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the *Owner* is not covered by insurance, provided that the indemnity contained in this paragraph shall be limited to costs and damages resulting directly from such infractions and shall not extend to any consequential, indirect or special damages.

9.4.4 The *Owner* undertakes to include in its contracts with other contractors and/or in its instructions to its own forces the requirement that the other contractor or own forces, as the case may be, will comply with directions and instructions from the *Contractor* with respect to occupational health and safety and related matters."

3.33 GC 10.1 - TAXES AND DUTIES

3.33.1 Add the following to the end of paragraph 10.1.1:

"Any *Value Added Taxes* (including Harmonized Sales Tax), where applicable, shall be listed as line items separate from the total *Contract Price*."

3.33.2 Delete paragraph 10.1.2 and replace it with the following:

"Any increase or decrease in costs to the *Contractor* due to changes in such included taxes and duties at the time of the bid closing shall increase or decrease the *Contract Price* accordingly. For greater certainty, the *Contractor* shall not be entitled to any mark-up for overhead or profit on any increase in such taxes and duties."

3.33.3 Add new paragraphs 10.1.3, 10.1.4, 10.1.5, and 10.1.6, as follows:

"10.1.3 Where the *Owner* is entitled to an exemption or a recovery of sales taxes, customs duties, excise taxes or *Value Added Taxes* applicable to the *Contract*, the *Contractor* shall, at the request of the *Owner* or the *Owner's* representative, assist with the application for any exemption, recovery or refund of all such taxes and duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the *Owner*. The *Contractor* agrees to endorse over to the *Owner* any cheques received from the Federal or provincial governments, or any other taxing authority, as may be required to give effect to this paragraph.

10.1.4 The *Contractor* shall maintain accurate records of *Construction Equipment*, *Product* and component costs reflecting the taxes, customs duties, excise taxes and *Value Added Taxes* paid.

10.1.5 Any refund of taxes, including, without limitation, any government sales tax, customs duty, excise tax or *Value Added Tax*, whether or not paid, which is found to be inapplicable or for which exemption may be obtained, is the sole and exclusive property of the *Owner*. The *Contractor* agrees to cooperate with the *Owner* and to obtain from all *Subcontractors* and *Suppliers* cooperation with the *Owner* in the application for any refund of any taxes, which cooperation shall include but not be limited to, making or concurring in

the making of an application for any such refund or exemption, and providing to the *Owner* copies, or where required, originals of records, invoices, purchase orders and other documentation necessary to support such applications or exemptions or refunds. All such refunds shall either be paid to the *Owner*, or shall be a credit to the *Owner* against the *Contract Price*, in the *Owner's* discretion. The *Contractor* agrees to enable, assist with and submit to any reasonable audit requested by the *Owner* with respect the potential refunds under this paragraph.

10.1.6 Customs duties penalties, or any other penalty, fine or assessment levied against the *Contractor*, shall not be treated as a tax or customs duty for the purpose of this GC 10.1"

3.34 GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

3.34.1 Add to the end of paragraph 10.2.4, the following:

"The *Contractor* shall notify the Chief Building Official or the registered code agency where applicable, of the readiness, substantial completion, and completion of the stages of construction set out in the Ontario Building Code. The *Contractor* shall be present at each site inspection by an inspector or registered code agency as applicable under the Ontario Building Code."

3.34.2 Delete paragraph 10.2.6 and replace it with the following:

"10.2.6 If the *Contractor* fails to notify the *Owner* and the *Consultant* in writing, fails to obtain direction as required in paragraph 10.2.5, and/or performs work that it knows or ought to have known that contravenes any laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes, the *Contractor* shall be responsible for and shall correct the violations thereof, and shall bear the costs, expenses, and damages attributable to the failure to comply with the provisions of such laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes, and, notwithstanding any limitations described in paragraph 12.1.1, shall indemnify and hold harmless the *Owner* and the *Consultant* from and against any claims, demands, losses, costs, damages, actions, suits or proceedings resulting from such failure or breach of law."

3.34.3 Add a new paragraph 10.2.8 as follows:

"10.2.8 Without limiting the generality of any other provision in the *Contract Documents*, the *Contractor* shall cause all certificates to be furnished that are required or given by the appropriate governmental or quasi-governmental authorities as evidence that the *Work* as installed conforms with the laws and regulations of any authorities having jurisdiction over the *Place of the Work*, including, without limitation, certificates of compliance for the *Owner*'s occupancy or partial occupancy. The certificates are to be final certificates giving complete clearance of the *Work*, in the event that such governmental or quasi-governmental authorities furnish such certificates."

3.35 GC 10.3 PATENT FEES

3.35.1 Amend paragraph 10.3.1 by adding the words, "indemnify and" before the words, "hold the", in the second line.

3.35.2 In paragraph 10.3.2, add the words, "by the *Owner*", after the words, "supplied to the *Contractor*"

3.36 11.1 INSURANCE

3.36.1 Delete paragraph 11.1 in its entirely and replace it with the following:

"11.1 INSURANCE

11.1.1 Without restricting the generality of paragraph 12, Indemnification, the *Contractor* shall provide,

maintain and pay for the insurance coverages listed in this General Condition under paragraphs 11.1.2, 11.1.3,11.1.4, and 11.1.5. Insurance coverage in paragraphs 11.1.6, and 11.1.7 will only apply when so specified in the *Contract Documents*.

11.1.2 Commercial General Liability Insurance

.1 Commercial General Liability Insurance shall provide that the policy:

a) is in the amount of Five Million Dollars ($5,000,000), per occurrence;

b) includes the *Owner* (City of Toronto), its Boards, Agencies and Commissions and subsidiary operations, as applicable, and the *Consultant* as additional insureds with respect to liability arising out of the operation of the insured for which a contract is issued by the *Owner*; and,

c) has provision for a cross liability and/or severability of interest, contractual liability, *Owner*'s and *Contractor*'s protective liability, broad form property damage, contingent/and or employer's liability, products and completed operations, non owned automobile liability and, if applicable to the insured operations as detailed in the *Contract Documents*, coverage for blasting, pile driving and collapse.

.2 The *Contractor* shall maintain in force such policies of insurance specified by the *Contract Documents* at all times from the commencement of the *Work* until the end of any Warranty Period set out in these General Conditions of Contract or as otherwise required by the *Contract Documents*.

.3 The *Contractor* shall maintain completed operations coverage for a period of six (6) years from Substantial Performance of the *Contract*, unless otherwise indicated in the *Contract Documents*. On an annual basis the contractor shall submit to the City a renewal Certificate or a replacement policy prior to the expiration date of the existing policy without notice or demand by the City. If the *Contractor* fails to do so, any limitation period for claiming indemnity described in the *Contract Documents* will not be binding on the *Owner*.

.4 "Claims Made" insurance policies will not be permitted.

11.1.3 All Risk Property Insurance (Builders' Risk or Installation Floater)

.1 The *Contractor* shall provide, maintain and pay for a policy of all risk property insurance. The policy shall be maintained from the commencement of *Work* until 10 days after *Substantial Performance of the Work* and shall be written on a replacement cost basis on all *Products*, supplies and equipment and/or systems, including boiler and machinery, if applicable, that forms part of the *Work*. The policy may be in the form of a Builder's Risk or Installation Floater, as appropriate to the *Project*. The *Owner* shall be included as an additional insured and a joint loss payee on the Builder's Risk Insurance Policy.

11.1.4 Automobile Liability Insurance

.1 The *Contractor* shall provide, maintain and pay for a policy of automobile liability insurance in respect of all licensed owned/leased vehicles that will be utilized in the performance of the *Work*, unless otherwise required by the *Contract Documents*. This policy of automobile liability insurance shall have limits of not less than Two Million Dollars ($2,000,000).

11.1.5 Contractor's Equipment Insurance

.1 The *Contractor* shall provide, maintain and pay for a policy of all risks *Contractor's* equipment insurance covering construction machinery and equipment used and owned by the *Contractor* for the performance of the *Work*, including boiler insurance on temporary boilers and pressure vessels. This policy shall be in a form acceptable to the *Owner* and shall not allow subrogation claims by the insurer against the *Owner*. Upon

agreement of the *Owner*, approval may be provided to the *Contractor* to waive the equipment insurance requirement for the purpose of this *Contract*.

11.1.6 *Contractor*'s Pollution Liability Insurance

.1 Where specified in the *Contract Documents*, the *Contractor* shall provide, maintain and pay for a policy of pollution liability insurance. The policy shall have a limit of not less than Two Million Dollars ($2,000,000) per claim limit. The policy shall cover third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from the *Contractor*'s operations and completed operations (i.e. *Work* performed). The policy shall be kept in force for 24 months from the date of *Substantial Performance of the Work*. The *Owner* shall be included as an additional insured on this policy.

11.1.7 Use and Occupancy of the *Work* Prior to Completion

.1 Should the *Owner* wish to use or occupy part or all of the *Work* prior to *Substantial Performance of the Work*, the *Owner* will give 30 days' written notice to the *Contractor* of the intended purpose and extent of such use or occupancy. Prior to such use or occupancy the *Contractor* shall notify the *Owner* in writing of the additional premium cost, if any, to maintain property and boiler insurance, which shall be at the *Owner*'s expense. If because of such use or occupancy the *Contractor* is unable to provide coverage, the *Owner* upon written notice from the *Contractor* and prior to such use or occupancy shall provide, maintain and pay for property and boiler insurance insuring the full value of the *Work*, including coverage for such use or occupancy, and shall provide the *Contractor* with proof of such insurance. The *Contractor* shall refund to the *Owner* the unearned premiums applicable to the *Contractor*'s policies upon termination of coverage.

.2 The policies shall provide that, in the event of a loss or damage, payment shall be made to the *Owner* and the *Contractor* as their respective interests may appear. The *Contractor* shall act on behalf of both the *Owner* and the *Contractor* for the purpose of adjusting the amount of such loss or damage payment with the insurers. When the extent of the loss or damage is determined the *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except that the *Contractor* shall be entitled to such reasonable extension of *Contract Time* relative to the extent of the loss or damage as the *Consultant* may decide in consultation with the *Contractor*.

11.1.8 Payment for Loss or Damage

.1 The *Contractor* shall be entitled to receive from the *Owner*, in addition to the amount due under the *Contract*, the amount at which the *Owner*'s interest in restoration of the *Work* has been appraised, such amount to be paid as the restoration of the *Work* proceeds and in accordance with the requirements of Part 5.0. In addition the *Contractor* shall be entitled to receive from the payments made by the insurers the amount of the *Contractor*'s interest in the restoration of the *Work*.

.2 The Contractor shall be responsible for deductible amounts under the policies.

11.1.9 Insurance Requirements and Duration

.1 Unless specified otherwise, the duration of each insurance policy shall be from the date of commencement of the *Work* until 10 days after the date of final acceptance of the *Work*, as set out in the Final Acceptance Certificate.

.2 Prior to commencement of the *Work* and upon placement and at renewal, amendment or extension of all or any part of the insurance, the *Contractor* shall promptly provide the *Owner* with confirmation of coverage on the *Owner*'s certificate of insurance form or on a form acceptable to the *Owner*, without notice or demand by the *Owner*. The insurance documents shall be signed by the insurer or an authorized representative of the insurer.

.3 If the *Owner* receives notice of cancellation for nonpayment of the insurance premium, the *Owner* may,

but is not obliged to, pay the premium of any policy of insurance required to be maintained herein and make a formal demand for reimbursement of such costs from the *Contractor*. If the *Contractor* fails to pay the cost of the insurance placed by the *Owner* within 15 days of the date on which the *Owner* made a formal demand for reimbursement of such costs, the *Owner* may deduct the costs thereof from monies which are due or may become due to the *Contractor*.

.4 The *Contractor* shall, on request, promptly provide the *Owner* with a certified true copy of each insurance policy exclusive of information pertaining to premium or premium bases used by the insurer to determine the cost of the insurance. The certified true copy shall include a signature of the insurer or the underwriter or the broker.

.5 All insurance policies taken out by the *Contractor* shall be placed with insurers licensed to write business in the Province of Ontario.

.6 The insurance policies required pursuant to this clause shall be primary and shall not call into contribution any insurance available to the *Owner*.

.7 The amount of the deductible for the purpose of this *Contract* shall not be more than $25,000.00.

.8 The *Contractor* shall maintain such forms of insurance as the *Owner*, acting reasonably, may require from time to time, in amounts and for risks against which a prudent *Contractor* would insure."

.9 Each policy (except for the policy of automobile insurance required under section 11.1.4) shall contain an endorsement requiring the insurer(s) to notify the City of Toronto in writing, by registered mail, at least thirty (30) days, (fifteen (15) days if cancellation is due to non-payment of premium), prior to any cancellation of the Contractor's insurance."

3.37 GC 11.2 – CONTRACT SECURITY

3.37.1 Delete the last sentence in paragraph 11.2.2.

3.37.2 Add new paragraph 11.2.3 as follows:

"11.2.3 The premiums for the bonds required by the *Contract Documents* are included in the *Contract Price*."

3.38 GC 12.1 - INDEMNIFICATION

3.38.1 Delete paragraphs 12.1.1 through 12.1.6 and replace them with the following:

"12.1.1 The *Contractor* shall indemnify and hold harmless the *Owner* and each of the *Owner's* elected officials, officers, employees and agents (hereinafter referred to collectively as the "Indemnitees") from and against all claims, demands, actions, suits or proceedings which may be brought against or made by third parties, hereinafter called "claims", directly or indirectly arising or alleged to arise out of the performance of or the failure to perform any of its obligations under the *Contract Documents*.

12.1.2 The *Contractor* shall indemnify and hold harmless the *Owner* and the Indemnitees from all and every claim for damages, royalties or fees for the infringement of any patented invention or copyright occasioned by the *Contractor* in connection with the *Work* performed or *Product* furnished by the *Contractor* under the *Contract*.

12.1.3.1 The Owner shall indemnify and hold harmless the Contractor from and against all claims, demands, actions, suits or proceedings ("claims") in respect to claims against the Contractor by third parties that arise out of the Contractor's direct involvement in this Contract provided such claims are directly caused by the

negligent act or omission of the Owner, and then only to the extent the loss or damage was caused by the Owner.

12.1.3.2 The *Owner* shall indemnify and hold harmless the *Contractor*, its agents, officers and employees from and against all claims, demands, losses, expenses, costs, damages, actions, suits, or proceedings arising out of the *Contractor*'s performance of its obligations under the *Contract Documents* which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the *Place of the Work*. The *Contractor* expressly waives the right to indemnity for claims other than those stated above.

12.1.4 The *Contractor* shall pay to the Indemnitees, or any of them, on demand any loss, costs, damages and expenses which may be sustained, incurred or paid by the Indemnitees, or any of them, in consequence of any such action, suit, claim, lien, execution or demand and any moneys paid or payable by the Indemnitees in settlement or in discharge or on account thereof. If the *Contractor* fails to make such payment, all such mentioned loss, costs, damages and expenses and all such moneys so paid or payable may be deducted from any moneys of the *Contractor* then remaining in the possession of the *Owner* on account of the *Work* or from moneys payable by the *Owner* to the *Contractor* on any account whatever or may be recovered from the *Contractor* or its Surety, as the case may be, in any court of competent jurisdiction as moneys paid at their request. The *Contractor* hereby authorizes and empowers the *Owner* or the *Consultant* as the case may be, or their Solicitor, for the time being, to defend, settle or compromise any of such actions, suits, claims, liens, executions or demands as the *Owner* or the *Consultant*, as the case may be, or their said Solicitor may deem expedient. The *Contractor* shall ratify and confirm all the acts of the *Owner* or the *Consultant* or their Solicitor in that behalf, and shall pay to such Solicitor on demand his or her reasonable costs of any such defense, settlement and/or compromise, and that in default of such payment the same may be deducted from any moneys payable by the *Owner* to the *Contractor* on any account whatever."

3.39 GC 12.2 - WAIVER OF CLAIMS

3.39.1 Amend paragraphs 12.2.1 through 12.2.10 as follows:

"GC 12.2 WAIVER OF CLAIMS

12.2.1 In the first line, change the words "fifth calendar day before the expiry of the lien period" to "twenty-fifth calendar day before the expiry of the lien period after substantial performance is declared or published as". In the fourth line, add the words “claims for delay pursuant to GC 6.5 DELAYS, claims for an increase in the *Contract Price*, pursuant to GC 6.6 CLAIMS FOR A CHANGE IN THE CONTRACT PRICE” after the word “limitation”.

12.2.1.1 Change the words “*Notice in Writing of* claim” to “*Notice in Writing of* Claim” and change the words “sixth calendar day before the expiry of the lien period"” to “twenty-sixth calendar day before the expiry of the lien period after substantial performance is declared or published as”.

12.2.1.3 Delete paragraph 12.2.1.3 in its entirety.

12.2.2 Change the words “in paragraphs 12.2.1.2 and 12.2.1.3” to “in paragraph 12.2.1.2”. Change the words “*Notice in Writing of* claim” to “*Notice in Writing of* Claim”.

12.2.5 Delete the number "395" and substitute the number "760".

12.2.6 Change the words “*Notice in Writing of* claim” to “*Notice in Writing of* Claim”.

12.2.7 Change “The party” to “The *Contractor*". Change the words ““*Notice in Writing of* Claim” to “*Notice in Writing of* Claim”. 12.2.9 Delete paragraph 12.2.9 in its entirety.

12.2.10 Delete paragraph 12.2.10 in its entirety.

3.40 GC 12.3 – WARRANTY

3.40.1 Amend paragraph 12.3.1 by deleting the words, "one year", and replacing them with the words, "two years", and by adding the following at the end of the paragraph, "With respect to equipment installed at the request of the *Owner*, and successfully operating at its intended design capacity before completion of the work, the warranty period shall be two years from the date the equipment commenced its successful operations.

3.40.2 Amend paragraphs 12.3.3, 12.3.4, and 12.3.6 by deleting the words, "one year", and replacing them with the words, "two years".

3.40.3 Add the following clauses as 12.3.7, 12.3.8, and 12.3.9"

"12.3.7 Any *Product* or equipment requiring excessive servicing during the warranty period (or free maintenance period, if applicable) shall be considered defective and the warranty (or free maintenance period) shall be deemed to take effect from the time that the defect has been corrected so as to cause excessive servicing to terminate.

12.3.8 Following *Substantial Performance of the Work*, and without limiting the *Contractor*'s warranty under this GC 12.3, the *Contractor* shall assign to the *Owner*, to the extent assignable, the benefit of all warranties and guarantees relating to the *Work*. The assignment shall expressly reserve the right of the *Contractor* to make any claims under such warranties and guarantees and such assignment shall in no way prejudice any rights of or benefits accruing to the *Contractor* pursuant to such warranties and guarantees.

12.3.9 The provisions of the GC 12.3 – WARRANTY shall not deprive the *Owner* of any action, right or remedy otherwise available to the *Owner* for the *Contractor*'s failure to fulfill its obligations or responsibilities under the *Contract* and shall not be construed as a waiver of claims in favour of the *Contractor* or as a limitation on the time in which the *Owner* may pursue such other action, right or remedy. The warranties set out in the *Contract* are not supplemental to and do not limit or preclude the application of any other conditions and warranties, express or implied, by law or trade usage."

PART 13 - OTHER PROVISIONS

3.41 Add New PART 13 As Follows:

"**GC 13.1 - OWNERSHIP OF MATERIALS**

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

GC 13.2 - CONSTRUCTION LIENS

13.2.1 In the event that a written notice of lien is delivered to the *Owner* in respect of the *Project* by or through a *Subcontractor* or *Supplier*, and provided the *Owner* has paid all amounts properly owing under the *Contract*, the *Contractor*, at its own expense and within ten (10) days, shall ensure that such written notice of lien is withdrawn as required in the *Act*.

13.2.2 In the event that the *Contractor* fails to conform with the requirements of 13.2.1, the *Owner* may set off and deduct from any amount owing to the *Contractor*, all costs and associated expenses, including legal fees and disbursements reasonably incurred to secure a written withdrawal of the notice of lien. If there is no amount owing by the *Owner* to the *Contractor*, then the *Contractor* shall reimburse the *Owner* for all of the said costs and associated expenses.

GC 13.3 - CONTRACTOR DISCHARGE OF LIABILITIES

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

GC 13.4 – DAILY REPORTS/DAILY LOGS

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

13.4.2 The *Contractor* shall also maintain records, either at its head office or at the job site, recording manpower and material resourcing on the *Project*, including records which document the activities of the *Contractor* in connection with GC 3.5, and comparing that resourcing to the resourcing anticipated when the most recent version of the schedule was prepared pursuant to GC 3.5. The *Contractor* shall make these records available to the *Owner* and/or the *Consultant* for inspection, upon reasonable notice.

GC 13.5 - PUBLIC STATEMENTS

13.5.1 The *Contractor* shall not publish, issue or make any statements or news release, electronic or otherwise, concerning the *Contract*, the *Work*, or the *Project*, without the express written consent of the *Owner*."

GC 13.6 OWNER'S SET-OFF

13.6.1 In addition to and without limiting any other rights the *Owner* may have under this *Contract* and at law, the *Owner* may retain from monies owing to the *Contractor* under this *Contract* an amount sufficient to cover any outstanding or disputed liabilities including the cost to remedy deficiencies, the reduction in value of substandard portions of the *Work*, claims for damages by third parties, undetermined claims by the *Owner*, and any assessment due the Workplace Safety and Insurance Board.

END OF SUPPLEMENTARY CONDITIONS

1.0 GENERAL

Work under this Contract includes the phased renovation of the existing building and upgrade of the existing passenger elevator at the Women's Shelter at 348 Davenport Road, in the City of Toronto in the Province of Ontario.

1.1 DESCRIPTION OF EXISTING SITE AND STRUCTURE

The building is a 4-storey structure with 2 basement levels. The existing building has an approximate plan area of 330 square metres (3,600 square feet) with a current GFA of 894 square metres (9,736 square feet). The building is located on the east side of Davenport Road, south of Dupont Street.

The building is owned by the City of Toronto – Shelters, Support and Housing Administration and houses a Women's Shelter operated by the YWCA. The Shelter provides housing for up to 54 residents.

1.2 DESCRIPTION OF WORK

1. It is the Contractor's responsibility to provide all labour, material, equipment and supervision to complete the renovations outlined in this specification taking into account all site conditions, noise restrictions, work area restrictions, protection requirements, accessibility restrictions, phasing restrictions, etc. No extras will be entertained for inconveniences after the award of this Contract.

2. In particular the work, briefly described below, applies to all sub-scopes and phases of the work and includes, but is not necessarily limited to the following:

    1. The installation and maintenance of hoarding, dust protection and construction signage around each phase of the work as described in Section 01 56 00 - Protection of Work and Property.

    2. The design, installation and maintenance of all temporary works necessary to carry out the work and maintain full access and regular operation of the existing building, in accordance with General Notes Drawing Section 7.0 Temporary Works and Specification Section 01 52 00.

    3. Coordination of removal and relocation of existing furniture and equipment.

    4. Temporary removal and relocation of all wall mounted fixtures, services, signs, etc. as required to maintain full operation of the existing shelter facility. Reinstate upon completion of work.

5. Protection in place of all fixtures, finishes, equipment, furniture, etc. to remain which cannot be feasibly relocated, within the area of work.

6. Repair all areas damaged by construction activity; specifically, the Contractor shall repair all damage resulting from the Construction to the satisfaction of the Consultant including repainting of surfaces in accordance with these Specifications which have been damaged.

7. Final cleaning of structure, fixtures, piping, etc., and the disposal all waste products and/ or debris generated by the construction activity as well as any material present in the work area prior to the commencement of the Work. The areas requiring cleaning shall consist of all areas affected by the Work.

3. In general, the work has been divided into three (3) main sub-scopes, with specific phasing:

1. Level 2 to 4 Renovation Work in the Existing Shelter Facility
2. Basement Renovation Work
3. Elevator Modernization

Refer to the Phasing Drawings and Section 01 11 01 – Use of Site for specific phasing requirements for each sub-scope.

4. In particular, the work of each sub-scope, briefly described below, includes, but is not limited to the following:

Level 2 to 4 Renovation Work in the Existing Shelter Facility:

1. Removal of the existing partition walls, doors, screens and finishes on the 2nd to 4th floors, as indicated. Stockpile items to be re-used, dispose of items being replaced.
2. Construction of new washrooms on the 2nd and 3rd floors.
3. Construction of new staff offices on the 2nd and 3rd floors.
4. Installation of new power door operators at barrier-free washrooms on 2nd and 3rd floors.
5. Construction of new vestibule partition wall and reinstatement of existing door and screen on 4th floor.
6. Installation of new millwork on 2nd floor.
7. Modification of the existing and installation of new HVAC, plumbing and sprinkler works, associated with the above scopes of work, connected to the existing systems.

8. Modification of the existing and installation of new electrical power distribution, lighting, fire alarm, communications and security system works, associated with the above scopes of work, connected to the existing systems.

Basement Renovation Work:

1. Removal and disposal of the existing partition walls, doors and finishes on the Basement 1 and 2 levels.
2. Localized urethane crack injection and installation of a new crystalline waterproofing system on the interior of the existing basement level foundation walls.
3. Replacement of the existing sump pumps in Basement 2 level.
4. Installation of new communications and electrical services to the basement 2 level to facilitate relocation of temporary staff workstations.

Elevator Modernization:

1. Modernization of the existing passenger elevator including:
   - .1 Replacement of cab finishes.
   - .2 Replacement of existing controls.
   - .3 Replacement of existing hydraulic cylinder.
   - .4 Painting of elevator pit and machine room floors and in-pit equipment.
   - .5 Replacement of existing power unit.
   - .6 Replacement of oil temperature control equipment.
   - .7 New floor designation signage.
   - .8 Replacement of car station and buttons.
   - .9 New cab lighting and fan.
   - .10 New hands-free intercom or telephone.
   - .11 New alarm bell.
   - .12 New card reader system in elevator cab.
   - .13 New door protection, operator, and interlocks on each level.
   - .14 Replacement of hall door equipment as required.
   - .15 New hoistway door unlocking devices and access switches.
   - .16 Replacement of hall push button stations on all levels and position indicator on ground floor.
2. Modification of the existing and installation of new HVAC and sprinkler works associated with the above scopes of work, connected to the existing systems.
3. Modification of the existing and installation of new electrical power distribution, lighting, fire alarm, communications and security system works associated with the above scopes of work, connected to the existing systems.

1.3 WORK SEQUENCE

1. The work areas will be available as of **7:00 AM Monday, September 30, 2019**. Contractor to confirm start date. All work outlined in these specifications are to be complete by **7:00 PM Friday, March 13, 2020** providing for a construction schedule of **24** weeks.

1.4 PHASING OF THE WORK

1. In order to successfully complete the proposed renovation while minimizing the disruption to the facility, the work must be phased and each area of work must be completely enclosed to accommodate the repairs and protect the patrons from inconvenience and injury.

2. Operation of the facility must be maintained at all times.

3. The renovation is to be performed as indicated and in the recommended sequence on phasing drawings **P1.1 to P3.1**.

4. Alternate work sequencing may be proposed by the Contractor for review and acceptance by the Owner. Deviation from the recommended sequence of work on the phasing drawings shall not be undertaken without the written approval of the Owner.

1.5 CONSTRUCTION SCHEDULE

1. In conjunction with and in a form acceptable to the Consultant and the Owner's Representative, provide within (5) working days after award of contract a detailed schedule indicating the following parameters.

   .1 Start date and completion date for each Phase of the work.

   .2 Start and completion dates for each major renovation scope and milestone in each phase of work.

   .3 Allowance for coordination of furniture moving and equipment relocation by others.

   .4 Allowance for submission, review and revision of shop drawings.

   .5 Co-ordination of all related scopes between on another.

.6 Shutdown of existing building services (e.g. power, water, HVAC, elevator, sprinkler, etc.)

.7 Undertaking of odorous or dust generating work.

.8 Daily and weekly schedule for manpower and equipment, hours of operation and crew sizes.

2. The construction schedule shall reflect completion of all work under the Contract within the specified time and in accordance with these Specifications.

3. If the Contractor desires to make a major change in the method of operation after commencing construction, or if the schedule fails to reflect the actual progress, the Contractor shall submit to the Consultant a revised construction schedule in advance of beginning revised operation.

4. Should the progress of work fall behind schedule, the Contractor will be responsible for working additional hours or increasing workforce as required to meet the specified completion date.

5. The Contractor shall submit a revised construction schedule showing delays and additional measures to complete the project by the specified completion date.

6. Provide detailed 2-week look ahead schedules if requested by Owner or Consultant.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

Not applicable

END OF SECTION

1.0 GENERAL

1.1 CONTRACTOR'S USE OF SITE

.1 The building is to remain open throughout the course of the Work. The Contractor shall have complete and sole use and access to the designated work areas during the specified work hours unless otherwise authorized by the Owner during the course of the Work.

.2 The Contractor shall sign in with YWCA staff daily and advise them of the planned daily site activity, as outlined in the schedule. Coordinate work and use of elevator with the YWCA so as to minimize disruption to the regular operation of the facility.

.3 The Contractor shall co-ordinate their work schedule with the Owner so as to minimize disruptions of the building. No work shall be performed until approved by Owner.

.4 It is the Contractor's responsibility to ensure the building remains operational at all times and to perform work as required to ensure that access to exits and entrances are available to the building users at all times.

.5 The Contractor is to provide the Owner and YWCA with a schedule that lists all areas to be occupied or restricted at least five (5) working days prior to occupying or restricting those spaces.

.6 The Contractor shall advise the Owner of furniture and services requiring relocation and coordinate moving of these items by the YWCA or Owner's mover.

.7 The Contractor is to provide the Owner and YWCA with a schedule that lists all temporary disruptions or shutdowns to existing building services (e.g. power, water, HVAC, sprinkler, elevator, etc.) in order to carry out the work at least five (5) working days prior to carrying out work which will disrupt of shutdown existing building systems. The Contractor shall not disrupt or shutdown existing building systems without the authorization of the Owner and YWCA.

.8 Temporary services disruptions or shutdowns shall be no longer than 3 hours in duration, unless otherwise arranged with and approved by the Owner and YWCA. Install temporary switches, valves, disconnects, etc. or provide temporary power, water, etc. per Section 01 52 00 to facilitate longer shutdowns if required. Off hours work, as approved by the YWCA and Owner, may be required, at no extra cost to the Contract.

.9 The Contractor shall notify the Owner and YWCA of odorous or dust generating work and take measures to contain odours and dust to the work area per Section 01 56 00 – Protection of Work and Property.

.10 All site access shall be via the main building entrance off Davenport Road. The rear loading area is restricted to YWCA staff use at all times. Coordinate material and equipment deliveries at off peak times as to minimize disruption to the facility.

.11 The Contractor, their trades and suppliers shall not impede regular traffic flow in the Designer's Walk Laneway during performance of the work, deliveries, parking, material storage, etc.

.12 It is the Contractor's responsibility to control traffic and to redirect if necessary to allow access to building areas outside of the work area. Any required traffic rerouting and the work sequence shall be closely co-ordinated with the Owner.

.13 Provide signage of professional quality, barriers and hoarding necessary to protect the public from construction and Contractor operations, to secure the work area, and to route traffic through or around the work areas as designated. Signage indicating that building renovations are being performed and we are sorry for the inconvenience must be provided at each entrance. Refer to drawings and specification Section 01 56 00 - Protection of Work and Property for a list and the locations of non-standard construction signage that must be supplied by the Contractor. These signage requirements are in addition to any standard signs required to control and/or reroute traffic or maintain public safety.

.14 Hoarding and dust protection is to be provided around each area of work in accordance with specification Section 01 56 00 - Protection of Work and Property. Each phase of the work is to be sealed to prevent the release of construction dust into other areas.

.15 Contractor shall implement temporary measures to maintain satisfactory interior air quality, temperature, and ventilation during performance of the Work.

.16 The use of all noise generating equipment is to be in accordance with all local by-laws and ordinances.

.17 Do not unreasonably encumber site with materials or equipment.

.18 Do not overload slab areas with equipment or stored materials. Review all equipment weights and loading procedures with Consultant prior to commencing work.

.19 Do not close or obstruct or store materials in roadways, sidewalks or passageways without prior approval from the Owner. Do not interfere with safe passage to and from the building and adjacent public sidewalks and roads.

.20 The Contractor shall be provided with a designated space for a small field office and material and equipment storage area. All material and equipment which cannot be stored within this area shall be delivered and removed daily.

.21 The Contractor is responsible to maintain access to all stairwells and elevator shafts. Under no circumstances shall these areas be obstructed unless otherwise approved by the Owner. Comply with all necessary emergency egress requirements, in consultation with the relevant authorities having jurisdiction.

.22 The Contractor is responsible to maintain access to the Staff Offices, Resident Dormitories, Storage and Mechanical/Electrical Rooms at all times.

.23 Move stored products or equipment which interferes with operations of the building, Owner, or Tenants.

.24 General Contractor to obtain and pay for all necessary approvals to locate equipment or materials on city property **excluding the building permit.**

.25 Protect all existing elements to remain. Typical items include, but are not limited to light fixtures, walls, plants, finishes, windows, doors, etc.

.26 Protect all utilities, gas mains, electrical conduit, etc. that must remain in service throughout the construction period.

.27 During transportation of materials or equipment through occupied areas, ensure the public, property, and finishes are protected from damage. All damage caused by the Contractor is to be repaired or rectified at the Contractor's expense.

.28 The Contractor shall make allowance in their price to cover all costs of temporary removal and replacement and/or relocation of existing electrical wiring and mechanical hardware required for completion of the work.

.29 Propane powered equipment is not permitted within interior areas.

.30 The Contractor is required to use Davenport Road for delivery and removal of material for duration of the project. Disposal bins, supply trucks, etc. are to be located on Davenport Road. Contractor to be responsible for all required permits.

.31 Maintain free access routes for ambulance, fire emergency vehicles, garbage trucks, etc.

.32 The Contractor's staff, including all subtrades, suppliers, delivery personnel or any other person visiting the site under the Contractor's direction or engagement, shall behave and conduct themselves professionally. Validated complaints lodged against the Contractor by the YWCA, City of Toronto, site occupants or the Consultants shall result in the immediate and permanent removal of the individual on the Contractor's staff from the site for the remainder of the duration of the project.

1.2 HOURS OF WORK

.1 Use of all equipment to be restricted in accordance with local and municipal noise by-laws and regulations.

.2 All Work on Levels 1 to 4 shall be performed between the hours of **9:00 AM to 5:00 PM** MONDAY through FRIDAY.

.3 All Work on Basement Levels 1 and 2 shall be performed between the hours of **7:00 AM to 7:00 PM** MONDAY through FRIDAY and **9:00 AM to 5:00 PM** SATURDAY.

.4 Work outside of the hours noted above shall not be permitted without written approval from the Owner and YWCA.

1.3 EFFECT ON BUILDING AND SITE

.1 The Contractor shall schedule their operations to minimize the interruption of the normal use of the site and building and to comply with laws, by-laws, ordinances, rules and regulations relating to the Work.

.2 The Contractor shall be responsible for arranging for the location of all existing utilities prior to construction and protection of the same during constriction.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

Not applicable

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Cash Allowances
.2 Contingency Allowances
.3 Determination of Actual Costs
.4 Adjustment of Contract Price

1.2 ALLOWANCES

.1 Allowances include for the following:

.1 Supply and Install Product

.2 Inspection and Testing

.2 Unless otherwise specified, amounts for each allowance includes:
.1 Actual product cost
.2 Applicable taxes and tariffs
.3 Freight, handling, unloading, and storage
.4 Contractor services
.5 Labour for installation and finishing
.6 Construction machinery and equipment
.7 Authorized expenditures

.3 Value Added Taxes do not form a part of the allowances.

.4 Contractors overhead and profit to be included as follows:

.1 Overhead and profit for each cash allowance will be included in Contract Price.

.2 Overhead and profit for contingency allowance, as noted in Supplementary Conditions for CCDC 2 2008 Contract.

.5 Contractor will provide the Owner with at least three (3) competitive prices for work of each allowance, except where the Base Building Contractor is sole-sourced. The Owner shall determine actual costs as specified in Paragraph 8.

.6 Additional expenditures not identified as part of the allowances will be submitted for review by the Owner and where deemed applicable authorized in writing by the Owner.

.7 Notification in writing by the Owner, is required prior to the Contractor executing work outlined under each allowance.

.8 The Owner will provide the Contractor with applicable documentation, equipment, and products within the time specified, or where such time is not specified, in sufficient time to permit the construction schedule to be maintained.

1.4 CASH ALLOWANCE – SECURITY, I.T. AND COMMUNICATIONS WORK

.1 Include in Stipulated Sum, a cash allowance of **$50,000.00** for removal, temporary relocation and reinstatement of I.T. and security equipment in the Basement 1 level I.T. closet to facilitate the work, installation and connection of new security, I.T. and communications lines. Contractor's coordination and rough-in costs shall be included in the base bid price and shall not be paid via this allowance.

.2 The Base Building Contractors are:

Security:	Stanley Convergent Security Solutions Inc. Contact: Justin Briffa – Commercial Security Account Manager Cell: 416-873-0445 Office: 289-290-7117 Email: Justin.briffa@sbdinc.com
Communications And Paging:	Bell Business Markets Contact: Roger D. Vachon – Project Manager – Structured Cabling Solutions Office: 905-540-7442 Fax: 877-232-0822 Email: roger.vachon@bell.ca
I.T.:	YWCA Toronto Contact: Jimmy Liew – Manager of I.T. Office: 416-961-8100 x303 Email: jliew@ywcatoronto.org

1.5 CASH ALLOWANCE – INSPECTION AND TESTING

.1 Include in Stipulated Sum, a cash allowance of **$50,000.00** for material testing and inspection services specified herein or at the request of the Consultant by an

Independent Testing Agency selected by the Owner. Reimbursement of the material tester's services shall be via this allowance **for passing results only.** Testing services for non-compliant materials or installation shall be borne by the Contractor.

1.6 CONTINGENCY ALLOWANCE

.1 Include in Stipulated Sum, a contingency allowance of **$150,000.00** for project incidentals. Includes unforeseen work related to the Project.

1.7 DETERMINATION OF ACTUAL COSTS

.1 Invoices, bills of sale, and notes payable for actual cost of items and services covered in an allowance amount shall be submitted by the Contractor for verification by the Owner.

.2 Trade discounts and refunds shall be credited to Owner.

.3 Where applicable the valuation for a change shall be in accordance with Supplementary Conditions.

1.8 ADJUSTMENT OF CONTRACT PRICE

.1 When actual costs are determined for each allowance the Contract Price will be valued accordingly by a Change Order.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 SUBSTITUTION OF MATERIALS PRIOR TO BID CLOSING

.1 Where products or systems have been specified by trade name, no substitution will be allowed except where alternatives have been approved prior to bid closing.

.2 Where a specified product or system is not available at the time of bid, the bidder must inform the Consultant in writing so that they may advise all bidders of proposed changes. In the event that the Bidder fails to do so, the Consultant will choose a substitute product suitable for the application at the time of construction.

1.2 REQUEST FOR APPROVAL OF ALTERNATIVES

.1 Contractors and suppliers of products or systems that have not been specified may apply for approval of their product or system as an "alternative".

.2 Requests for approval must reach the Consultant at least seven (7) working days prior to the bid closing. The Consultant will advise applicants of the status of their request three (3) working days prior to bid closing.

.3 Request for approval shall include sufficient information for the Consultant to satisfactorily review the alternative. This may include the following:

- .1 Project name and number.
- .2 Specification sections to which the product or system applies.
- .3 Description of proposed substitution, including manufacturer's material specifications, manufacturer's preparation and application requirements and manufacturer's warranties.
- .4 Sample of product indicating surface finish and material thickness to be applied under this Contract.
- .5 Installation history of proposed alternative including:
  - .1 projects and locations
  - .2 approximate value of contract
  - .3 approximate size of projects
  - .4 number of years in use
  - .5 type of usage
  - .6 name of owner and consultant involved.

.4 When submitting alternatives to specified materials or equipment, Bidders shall include in their Bid any changes in the Work required to accommodate the alternatives. A later claim for an addition to the Contract Price due to changes in the Work that are necessitated by the use of the alternatives will not be considered.

1.3 APPROVAL OF ALTERNATIVES

.1 An addendum will be issued prior to bid closing if an alternative is approved. No alternative materials or equipment will be considered after bid closing.

.2 Products or systems that have been approved as alternatives may be substituted for specified products and systems as outlined in the addendum.

.3 When substitution of any proposed alternative into the work -- either in whole or in part -- affects other parts of the work, the Contractor shall assume full responsibility and bear the associated costs. The Contractor will also be responsible for paying for any drawing changes required as a result of the substitution.

.4 Cost savings arising from approved alternative products or systems are to be credited to the Contract and the Contract Price will be adjusted accordingly.

.5 The Consultant reserves the right to reject any or all requests for approval.

.6 No substitutions will be permitted without the approval of the Consultant in the form of an addendum.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 PROJECT CO-ORDINATION

.1 The Contractor is responsible for co-ordination of Trades. Lines of demarcation between Contractors and Trades or trade and trade are solely the responsibility of the Contractor.

.2 Contractor is responsible for co-ordination with the Owner of all on-site activity as it affects the operation of the building.

1.2 NOTIFICATION FOR FIELD REVIEW

.1 The Contractor is to notify the Consultant at least 24 hours in advance for field review. No work shall be covered or concealed until reviewed by the Consultant unless Contractor is informed that a field review will not be performed. Such review does not absolve the Contractor from their responsibility to perform the work in accordance with the Contract Documents.

.2 The Consultant shall notify the designated testing company for material sampling and testing.

.3 The Contractor shall provide the Consultant with safe access to any part of the Work requiring field review.

.4 The Owner may be present during field review at the Owner's discretion.

1.3 SUPERINTENDENCE

.1 The Contractor is to provide a full time Superintendent who is to be on-site on a continuous basis during the execution of the work. The Superintendent shall have a mobile phone at all times during Working hours to allow for communication with the Consultant or Owner.

.2 The Superintendent shall be satisfactory to the Owner and the Consultant and shall not be changed without the Consultant or Owner's consent.

.3 Superintendence shall be deemed not satisfactory and changes or additions to the superintendence may be demanded when control, organization or co-ordination of the Work is not satisfactory, or, the quality of the Work does not meet the requirements of the Contract Documents, or directions given in accordance with the Contract Documents are not followed, or, progress is behind schedule.

1.4 CONTRACTOR BEHAVIOUR AND DECORUM

.1 The Contractor's staff, including all subtrades, suppliers, delivery personnel or any other person visiting the site under the Contractor's direction or engagement, shall behave and conduct themselves professionally. Validated complaints lodged against the Contractor by the YWCA, City of Toronto, site occupants or the Consultants shall result in the immediate and permanent removal of the individual on the Contractor's staff from the site for the remainder of the duration of the project.

.2 The Contractor will be responsible for communication of behaviour and decorum expectations to those members of their staff, as noted in 1.4.1 above, attending site.

.3 Vulgar language, slurs, harassment, etc. by the Contractor's staff shall not be accepted at any time during the project and may be grounds for removal from site, per 1.4.1 above.

.4 The Contractor shall be responsible for replacing staff removed from site, as required to carry out the work and maintain the construction schedule. Delays due to removal of the Contractor's staff due to behaviour and decorum are the sole responsibility of the Contractor.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

Not applicable

END OF SECTION

1.0 GENERAL

1.1 DOCUMENTS

.1 This section, along with the drawings, forms part of the contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 WORK INCLUDED

.1 Administration of Project Meetings.

.2 Pre-Construction Meetings.

.3 Progress Meetings.

1.3 ADMINISTRATION OF PROJECT MEETINGS

.1 The Consultant shall preside at meetings.

.1 A representative of the Consultant shall record the minutes, include significant proceedings and decisions, and identify "action by" parties.

.2 The Consultant shall reproduce and distribute copies of the minutes to meeting participants, affected parties not in attendance, the Owner and Contractor.

.2 The Consultant shall:

.1 Schedule and administer project meetings unless otherwise noted.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each unscheduled meeting three (3) days in advance of meeting date to the Contractor and Owner. The Contractor is to notify relevant Subcontractors.

.3 The Contractor shall provide physical space and arrange for meetings on site.

.4 Representatives of Contractor, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the party each represents.

1.4 PRE-CONSTRUCTION MEETING

.1 After award of Contract, a meeting of all parties in the Contract shall be held to discuss and resolve administrative procedures and responsibilities.

.2 Representatives of the Owner, Consultant, Contractor, major Subcontractors, and construction review personnel will attend.

.3 The Consultant shall establish a time and location of the meeting and shall notify concerned parties at least five (5) days before the meeting.

.4 Agenda to include the following:

.1 Appointment of official representatives of participants of the Work.
.2 Schedule of Work, progress scheduling.
.3 Shop drawings (if required) and schedule of shop drawing submissions.
.4 Requirements of temporary facilities, site signage, hoarding, dust protection, offices, storage sheds, utilities, fences.
.5 Delivery schedule of critical equipment.
.6 Site security.
.7 Contemplated change orders, procedures, approvals required.
.8 Take over procedures, acceptance, warranties.
.9 Monthly progress claims, administrative procedures, holdbacks.
.10 Appointment of inspection and testing agencies or firms.
.11 Insurance, transcript of policies.

1.5 PROGRESS MEETINGS

.1 During the course of Work, the Consultant or the Contractor shall schedule progress meetings every two weeks. Further progress meetings may be scheduled by the Consultant, Contractor, or Owner as required to expedite the Work.

.2 The Consultant, Contractor, major Subcontractors involved in the Work, and Owner when required, are to attend.

.3 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems which impede construction schedule, conflicts.

.4 Progress, schedule during succeeding work period.

.5 Corrective measures and procedures to regain projected schedule.

.6 Revisions to construction schedule.

.7 Review of off-site fabrication delivery schedules.

.8 Review submittal schedules; expedite as required.

.9 Maintenance of quality standards.

.10 Pending changes and substitutions, Notices of Proposed Change, Change Orders.

.11 Review proposed changes effect on construction schedule and on completion date.

.12 Other business.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

.1 This section specifies general requirements and procedures for Contractor's submission of shop drawings, product data, samples and mock-ups to Consultant for review. Additional specific requirements for submissions are specified in the project specifications.

.2 Do not proceed with work until relevant submissions are reviewed by Consultant.

.3 Present shop drawings, product data, samples and mock-ups in SI metric units. Where items or information is not produced in SI units, converted values are acceptable.

.4 Contractor's responsibility for errors or omissions in any submission is not relieved by Consultant's review of the submission.

.5 Notify Consultant, in writing at time of submission, of any deviations from the requirements of Contract Documents that form part of submissions. Also indicate the reasons for the deviations.

.6 Contractor's responsibility for deviations from the requirements of the Contract Documents in submissions is not relieved by Consultant's review of the submissions unless Consultant provides written acceptance of the identified deviations.

.7 Make any changes in submissions that Consultant may require consistent with the Contract Documents and resubmit where directed by Consultant.

.8 Notify Consultant in writing of any revision other than those requested by Consultant when resubmitting.

1.1 SUBMISSION REQUIREMENTS

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Submit electronic copies of product data, manufacture's catalogue sheets, brochures, literature, performance charts and diagrams.

.3 Comply with the following requirements in regard to submission of product data:

- .1 Delete information not applicable to project.
- .2 Supplement standard information to provide details applicable to project.
- .3 Provide certification of compliance to applicable codes.
- .4 Provide manufacture's certification as to current production.

.4 Allow 5 working days for Consultant's review of each submission.

.5 Accompany submissions with an electronic transmittal letter that contains:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Identification and quantity of each shop drawing, product data and sample.
.5 Other pertinent data.

.6 Submission shall include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.
.6 After Consultant's review, distribute electronic copies to relevant affected subcontractors.

1.2 SHOP DRAWINGS

.1 Prior to commencing work, provide electronic copies of shop drawings pertaining to installations and fabrications required by the Contract for the Consultant's review. Full-size hard copy submissions are also to be provided if requested by the Consultant. Unless noted otherwise, shop drawings shall be submitted for the following work:

.1 Doors and glazing.
.2 Millwork.
.3 Elevator modernization.

.2 As part of the design team's field services, the relevant design professional will review shop drawings pertaining to work shown on their respective drawings by means of an appropriate rational sampling procedure and will comment on the accuracy with which the Contractor prepared the shop drawings.

.3 Review of shop drawings is for the sole purpose of ascertaining conformance with the general design concept and is not an approval of the detail design inherent in the shop drawings. The design responsibility shall remain with the Contractor submitting the shop drawings.

.4 Review of shop drawings shall not relieve the Contractor of their responsibility for errors and omissions in the shop drawings or for meeting all requirements of the Contract Documents.

.5 The Contractor is solely responsible for information pertaining to the fabrication process, techniques of construction and installation, and for co-ordination of the work of all subcontractors.

.6 Cross-reference shop drawing information to applicable portions of Contract Documents.

1.3 PRODUCT DATA

.1 Product data: manufactures catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.

.2 Submit electronic copies of product data.

.3 Sheet size: 215x280 mm.

.4 Delete information not applicable to project.

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

.6 Cross-reference product data information to applicable portions of Contract Documents.

1.4 SAMPLES

.1 Samples: examples of materials, equipment, quality, finishes, workmanship.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

.3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

1.5 MOCK-UPS

.1 Mock-ups: field-erected examples of work complete with specified materials and workmanship.

.2 Erect mock-ups at locations acceptable to Consultant.

.3 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 RESPONSIBILITIES OF THE CONTRACTOR

.1 The Contractor shall be solely responsible for quality control methods and procedures to ensure performance of the work in accordance with the Contract Documents, including work performed by all subtrades and specialty contractors.

.2 The Contractor shall be responsible for inspection and testing as required by the Contact Documents, statutes, regulations by-laws, standards or codes or any other jurisdictional authority.

.3 The Consultant shall be provided adequate notice for timing of site reviews or activities requiring the Consultant's attendance. At minimum 24 hours' notice shall be provided.

.4 The Contractor's work shall be generally complete when the Consultant's review is called for.

.5 The Contractor shall not conceal any work prior to the Consultant's review. Work which has been concealed by the Contractor may be required to be exposed at the discretion of the Consultant. The Contractor shall expose work which has not been reviewed and reinstate covering finishes or material, at no additional cost to the Contract, even if covering finishes or material was installed in conformance with the Contract.

.6 The Contractor shall notify the Consultant of any clarifications required in order to complete the work indicated on the drawings. The Contractor is responsible for fully understanding the requirements of the Contract Documents during bidding. No cost of schedule extras will be entertained due to misunderstanding of design intent indicated in the Contract Documents.

.7 The Contractor shall verify by certification that specified products and manufacturers retained meet the requirements of reference standards specified in the applicable specifications sections.

.8 Conduct testing, balancing and adjustment of equipment and systems specified and modified by the work in applicable mechanical and electrical specifications sections by and independent third party testing company. Provide written certification reports as part of close-out documentation.

1.2 RESPONSIBILITIES OF THE CONSULTANTS

.1 The Consultants shall provide field review only for the work shown on their respective drawings and specifications. This review is not a "full-time" review but is a periodic review at their sole discretion in order to ascertain that the work is in general conformance with the Contract Documents.

.2 Field review services by the Consultants is not carried out for the benefit of the Contractor, nor does it make the Consultants guarantors of the Contractor's work.

.3 The Consultants' field review services do not relieve the Contractor of their responsibilities in Section 1.1.

.4 The Consultants are not responsible for the acts, errors or omissions of the Contractor or their subtrades, specialty contractors or any persons performing any of the work or for the failure of any of them to carry out the work in accordance with the Contract Documents.

1.3 INSPECTION AND TESTING BY THE OWNER

.1 The Consultant, on behalf of the Owner, may appoint an independent inspection and testing agency to carry out review of part or all of the work for conformance to the Contract Documents. Such costs for inspection and testing will be paid for by the Owner.

.1 Additional expenses incurred by the Owner for inspection and testing as a result of Contractor deficiencies or non-conforming Work shall be at the Contractor's expense.

.2 Inspections and testing by an independent company will be made promptly. Uncover for examination any Work concealing the Work to be reviewed prior to review or without approval of the Consultant. The Contractor shall make good such Work per Section 1.1.5.

.3 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will determine the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done, either during manufacture, fabrication, or at Site, the Contractor shall provide the proper facilities, access and assistance.

1.4 INSPECTION AND TESTING

.1 The Contractor shall provide or adhere to the requirements of Source and Field Quality Control identified in other specification sections.

.2 This section and the requirements of other specifications sections shall be read in conjunction with one another. The Contractors shall seek clarification if Testing and Inspection requirements conflict or are unclear.

.3 Information pertaining to the responsibilities of an independent testing and inspection agency and their function retained by the Owner and which may be specified in other specifications sections shall be exempted from these requirements. Such information is included in the Section for the Contractor's information only.

.4 The Contractor shall not limit their responsibility for quality control of the work and ensuring the requirements of the Contract Documents are met solely by the inspection and testing identified in the Contract Documents.

1.5 QUALIFICATIONS OF INSPECTION AND TESTING AGENCIES

.1 Inspection and testing agencies shall be certified by the Standards Council of Canada (SCC) or Canadian Council of Independent Laboratories (CCIL).

.2 Independent testing agencies engaged shall provide the necessary equipment, labour, supervision, materials, methods of recording and evaluations, calibration of equipment and personnel with requisite expertise to conduct tests precisely and as specified in reference standards.

.3 Independent testing agencies shall submit certificates of calibration made by an accredited calibrator verifying calibration of equipment and its accuracy within the last twelve (12) months, at the request of the Consultant.

1.6 RESPONSIBILITIES OF INSPECTION AND TESTING AGENCIES

.1 Review the Contract Documents in order to determine the extent of testing and inspection required.

.2 Notify the Consultant of any omissions or discrepancies in the work inspected or tested.

.3 Perform testing and inspection specified in the Contract Documents in accordance with the reference standards and as requested by the Consultant.

.4 Provide competent, experienced personnel to perform testing and inspection services when notified by the Contractor or Consultant that the applicable work is being performed. Inspection and testing personnel shall cooperate with the Contractor and Consultant in order to maintain the daily and overall work schedule.

.5 Notify the Contractor and Consultant of deficiencies, irregularities in the Work immediately when they are observed and document in written reporting.

.6 Inspection and testing agencies shall not perform the work of the Contractor and shall not authorize:

.1 Performance of the Work that is not in strict accordance with the Contract Documents.
.2 Approval, certification, acceptance of any part of the Work.

1.7 INSPECTION AND TESTING PROCEDURES

.1 Perform specified testing and inspection is accordance with the Contract Documents and the reference standards referenced therein, unless otherwise approved.

.2 Observe and report on conformance of the Work with the requirements of the Contract Documents.

.3 Ensure that testing and inspection personnel are on site or at fabricator's operations for full duration of the performance of the work being reviewed, unless otherwise directed by the Consultant or indicated in the Contract Documents.

.4 Identify samples and sources of materials.

.5 Review and report on progress of work. Report on count of units fabricated and inspected at fabricator's operations.

.6 Observe and report on conditions of significance to work in progress at the time of review or at the fabricator's operations. Include where applicable and if critical to the work in progress:

.1 Time and date of review.
.2 Environmental conditions such as temperature of air, materials and adjacent surfaces.
.3 Humidity of air, moisture content of material and adjacent materials.
.4 Presence of sunlight, wind, rain, snow, or other weather.

.7 Include all information critical to inspection in reports.

.8 Ensure that only materials from work and intended for use therein are tested.

.9 Determine locations of work to be tested, unless otherwise directed by the Consultant.

1.8 TOLERANCES

.1 Unless specifically indicated otherwise, work shall be plumb, level square and straight.

.2 Unless otherwise defined in the technical specification sections or required for proper function of equipment, services, mechanical or electrical systems or to accommodate existing conditions, the following definitions shall govern:

.1 Plumb or level: plumb or level within 1mm in 1m.
.2 Square: within 10 seconds of 90 degrees.
.3 Straight: within 1mm under a 1m long straightedge.
.4 Flush:
1. Within 6mm for exterior concrete, masonry and paving materials
2. Within 1mm for concrete, masonry, tile or similar surfaces
3. Within 0.05mm for other interior surfaces

.3 Allowable tolerances shall not be cumulative.

1.9 REFERENCE STANDARDS

.1 Review the Contract Documents for the applicable reference standards quoted. Comply with the reference standards during performance of the work and the performance of inspection and testing.

1.10 DEFICIENCIES

.1 Deficiencies are defined as products, material workmanship, cleanliness, protection measures, or other parts of the Contract Documents for which the Contractor or their subtrades are responsible, which do not comply with the requirements of the Contract Documents.

.2 Deficiencies identified by the Consultant shall be tracked by the Contractor throughout construction for correction. The Contractor shall correct all deficiencies promptly upon notification and notify the Consultant of the corrected deficiency.

.3 Deficient products, materials and workmanship found at any time prior to the completion of the Contract will be rejected regardless of previous inspections, testing, and reviews of the Work.

.4 The Contractor shall be responsible for all delays and expenses as a result of deficiencies and their rectification.

.5 Photographs of completed work or deficiency correction in lieu of a field review may be accepted by the Consultant at their discretion only. This does not relieve the Contractor of their responsibilities identified above.

1.11 DOCUMENTS ON SITE

.1 The Contractor shall have access to the following documents in hard and/or soft copy for the use of the Contract, Consultant and Owner:

- .1 Contract Documents, including specifications, drawings, addenda, and other modifications to the Contract Documents.
- .2 "Reviewed" or "Reviewed as Modified" Shop Drawings.
- .3 Project Construction and Shop Drawings Schedules.
- .4 Site Instructions, Change Orders and Change Directives
- .5 Field Test and Site Review Reports.
- .6 Reports from Authorities Having Jurisdiction.
- .7 Building and other applicable permits.
- .8 Daily Log including:
  - .1 Weather conditions.
  - .2 Trades on site and their start and finish times.
  - .3 Dates quantities and particulars of waterproofing work.
  - .4 Visits to site by the Owner, Consultants, Jurisdictional Authorities, Testing and Inspection agencies, Material and Equipment Supplier Representatives.
- .9 Material Safety Data Sheets per WHMIS and the OHSA.
- .10 As-Built drawings recording as-built conditions, instructions, changes to structure, equipment, wiring, plumbing, and conditions concealed.
- .11 Copies of applicable codes.
- .12 Copies of available original building construction documents.

1.12 DRAINAGE

.1 Layout and construct work to ensure positive drainage is provided to floor drains, ditches, site drains and catch basins, as set in their final position, preventing undrained areas and/or ponding.

.2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.

.3 Report to the Consultant in writing prior to executing the work affected, in case adequate drainage cannot be provided.

.4 Account for all finishes and product thicknesses prior to installing drainage.

.5 Flood test existing floors to located low spots for new drain installation if required.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 TEMPORARY UTILITIES

.1 Provide and pay for where specified, locate where directed, and maintain temporary facilities for the Work and for all Subcontractors, and remove them upon completion of the Work.

.2 Where specified to provide utilities, make all arrangements with the public utilities, obtain all necessary permits, provide or pay for connections and pay all respective fees.

.3 ELECTRICAL POWER

.1 Discuss available power with the Owner's Representative prior to bidding.

.2 The Contractor shall pay for any alternations to the electrical system which may be needed to accommodate the Contractor's equipment. Co-ordinate any required alterations with the Owner's Representative. Reinstate the system to its original condition upon completion.

.3 The Owner shall pay for electrical consumption.

.4 WATER SUPPLY

.1 Contractor shall pay for the cost of any temporary water connections or alterations which are required to perform the Work.

.2 The Owner shall pay for water consumed.

1.2 TEMPORARY LIGHTING

.1 Provide and maintain temporary lighting for safe demolition and working conditions conforming to Ontario Occupational Health and Safety Act.

.2 Illumination must be provided and maintained on all floors and stairs affected by the Work.

.3 Contractor is to have an emergency generator and lighting system available to be used in a situation where the existing lighting system becomes inoperative due to the Work and cannot be repaired within a two (2) hour period. Once the repair is complete, the temporary lighting system may be removed.

.1 If the damaged lighting cannot be repaired within the specified period, the Contractor must promptly notify the Owner.

.2 If the Contractor does not repair the damaged lighting within the specified time and does not promptly notify the Owner, the Owner reserves the right to repair the damage and deduct the cost from the Contract.

.4 Temporary lighting requirements discussed herein shall also apply to all subcontractors.

1.3 TEMPORARY TELEPHONE

.1 Provide and pay for a mobile telephone for the Contractor's own use and, as required, the use of Consultant and Owner.

1.4 TEMPORARY FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of the Work as required by governing codes, regulations and by-laws.

1.5 TEMPORARY FIRST AID FACILITIES

.1 Provide well stocked and maintained first aid kits within the site office that are adequate to meet the requirements and hazards of the Work.

.2 Maintain material Safety Data Sheets (MSDS) for all material being used at the project site. Ensure the SDS are readily available to the Consultant, Owner and Contractor's forces.

1.6 TEMPORARY SANITARY FACILITIES

.1 Provide temporary sanitary facilities at the time of initial mobilization and maintain them throughout the course of the work. An exception will be granted to this requirement only where Owner has confirmed in writing that on-site washrooms are available for Contractor use.

.1 Sanitary facility is to include an odourless flushing chemical type temporary toilet that is properly enclosed, weatherproof, and serviced periodically as required.

.2 The building toilets and facilities shall not be used by the Contractor's forces unless approved by Owner

1.7 TEMPORARY FIELD OFFICES AND SHEDS

.1 Provide or construct work sheds for storage of tools, equipment and materials, which may be damaged by weather.

.2 Provide and maintain a field office for the Contractor's personnel that is equipped with lights, power, and tables for drawing examinations.

.3 Maintain sheds in a clean and orderly condition to the Consultant's satisfaction.

.4 Provide suitable hardware and locks on doors to sheds to reasonably secure them and keep locked when unsupervised.

.5 Field sheds shall be weather tight and have floors elevated above grade.

.6 Relocate sheds as required by the progress of the Work. Remove sheds from the Site when directed or when they are no longer required.

1.8 TEMPORARY BARRIERS AND ENCLOSURES

.1 Provide hoarding, fencing, barriers, barricades and plant protection as required by the authorities and specified herein to protect persons and property, public and private. Refer to Section 01 56 00 - Protection Work and Property for signage and hoarding requirements.

.2 Maintain barriers in sound, clean and, where required, painted, condition throughout the Work.

.3 Keep Site clear of unauthorized signs.

.4 Provide barriers with required warning lights and signs.

.5 Hoarding, fencing, barriers and barricades are to be constructed and supported in such a manner that no sharp projections that can cause personnel injury are created.

.6 Remove hazards requiring barriers as soon as possible.

.7 Remove barriers at time of turn-over of the Work to the Owner.

.8 Exterior enclosures shall be constructed to protect the work area from environmental conditions (i.e. weather tight) that may affect schedule.

1.9 SECURITY

.1 Take all necessary precautions to guard site, premises, materials and the public at all times other than when supervised work is in progress.

1.10 PROTECTION OF THE WORK DURING CLOSE-DOWN

.1 Should the project be closed down for any cause, assume all responsibility for its proper protection during such period.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

Not applicable

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED

.1 Protection of the Work, Work in Progress, Property and Persons by all Sections.

1.2 WALK-THROUGH INSPECTION OF SITE

.1 Prior to start of Work, Contractor, Consultant and Owner will perform walk-through inspection of site and inspection of elevators to determine existing conditions. Contractor to pay for elevator service personnel during inspection.

.2 The Contractor is to perform a thorough inspection of the site prior to the start of work and provide a written notice to the Consultant that details all damaged property as well as all items that appear to be of poor working order or appearance (i.e. sign, fixtures, dirt, etc.).

.3 Upon receiving this notice, the Consultant and the Owner will review the validity of the items listed.

.4 If written notice is not given within five (5) days of commencement of Work, it will be assumed that the Contractor has reviewed the site and has accepted the condition of the property as being free of damage.

.5 Any damages not listed as part of the written notice of clause 1.2.2 above found after the completion of the work will be the sole responsibility of the Contractor to rectify. These rectifications shall be completed in a timely and satisfactory manner.

.6 The project will not be considered substantially performed if the cost to correct these outstanding deficiencies is greater than the limits outlined in the Construction Lien Act.

1.3 THE WORK, WORK IN PROGRESS, PROPERTY AND PERSONS

.1 Protect the Work during construction from damage.

.2 Provide protection as required to protect work in progress and other property from damage and to provide suitable conditions for the progress of finishing work.

.3 Provide means for protecting occupied areas below the Work when affected by the performance of work (e.g. plumbing and electrical connections, through-slab coring, etc.).

.4 Take reasonable and required measures, including those required by authorities having jurisdiction, to protect the public and those employed on the Work from bodily harm.

.5 Comply with requirements of The Ontario Occupational Health and Safety Act for Construction Projects.

.6 The Contractor shall be prepared to provide respirators, dust protection, ear protection for those employed by the Consultant and Owner at the Site.

.7 Direct all Subcontractors to protect their own work, existing property, adjacent public and private property and work of other Sections from damage while working.

1.4 CONSTRUCTION SIGNAGE

.1 Contractor shall provide all required signage necessary to protect the public from the construction, and to inform patrons that construction activity is in process.

.2 Additional signs may be required at the discretion of Owner or Consultant as construction progresses. No extras will be entertained for signage requirements after tenders close.

.3 All signage required are to be "Standard Construction Signs" (i.e. orange background with 150mm high black letter or decals). All signage to be of professional quality and design.

.4 Typical signage that may be required as follows:
- .1 Keep Out
- .2 Danger – Due to:
- .3 Caution
- .4 Watch Your Step
- .5 No Parking, with directional arrows, etc.

.5 Signage will be required at all entrances to the work area. This signage shall consist of the standard "Men at Work" sign with an additional sign (special order) indicating that the area is temporarily under construction and we are sorry for the inconvenience.

.6 Signage is required at all entrances to the work area. Signs to indicate that this area is temporarily closed for construction.

.7 Typical additional non-standard signage that will be required is as follows:
- .1 Building Renovation In Progress – Sorry For The Inconvenience
- .2 This Area Closed Due to Construction – Do Not Enter
- .3 Entrance To Building (with directional arrow)
- .4 Proceed With Caution (with directional arrow)
- .5 Elevator Modernization In Progress. Please Use Stairs.
- .6 Washroom Closed. Sorry For the Inconvenience.
- .7 Stairs Closed. Please Use Other Stairwell.
- .8 Floor Is Closed From 9:00 AM to 5:00 PM.
- .9 This Floor Closed To Access By Elevator.
- .10 Stairs Closed. Emergency Access Only.

.8 All non-standard signage is to be of adequate size (discuss with Consultant prior to ordering) with orange background and large black letters and decals. Plywood backing is sufficient. All signs are to be of professional quality.

.9 All signage is to be securely fastened directly to hoarding or, if signage is required and hoarding is not available, the signs are to be securely fastened to 2 screw jack (post shores) which are fully tightened to the floor and ceiling finishes. Signs and posts are to be installed in such a manner that projections that may cause public injury are not created.

1.5 CONSTRUCTION BARRIERS AND ENCLOSURES

.1 All work areas are to be completely enclosed by hoarding and dust protection and only accessible to the Contractor, the Owner and the Consultant.

.2 Contractor shall supply and construct hoarding, barriers and enclosures as indicated in these specifications, drawings and as directed by the Consultant or Owner as the construction progresses.

.3 No extras shall be entertained for hoarding, barriers and enclosures after tenders close unless the scope of work is significantly changed.

.4 **The work areas are to be completely enclosed to keep the dust generated by the construction activity from escaping into the other areas of the building.**

.5 **The Contractor is responsible for any damage to mechanical equipment, motors, elevator equipment, etc. resulting from dust contamination.**

.6 **The following types of enclosures/ hoarding systems will be required for this construction project:**

.1 **Type 1 - Full Height Dust Protection**

This system consists of full height poly-weave tarping fastened to 2" x 4" construction grade wood nailers wedged tight to the floor and ceiling with 2 x 4 studs or post shores at 4'-0" c.c. The seams of the poly-weave tarping, if any , are to be fastened together with duct tape.

.1 The main purpose of this system is to control dust and keep it from escaping from the work area, thus must be dust tight.

.2 This system shall be supplied to enclose all areas until Type 2 hoarding can be erected or if daily hoarding erection and take down are required.

.3 Install and remove daily as indicated on the phasing drawings.

.2 **Type 2 - Full Height Temporary Metal Stud Partition Wall**

This system consists of full height metal stud partition walls with ½" drywall fastener to the interior and exterior sides fastened to the floor slab and ceiling structure. The interior seams of the drywall sheets shall be covered with duct tape. Provide locking hollow metal swing doors to access the work area as indicated, per specification sections 08 10 00 and 08 71 00.

.1 The main purpose of this system is to control dust and keep it from escaping from the work area, thus must be dust tight.

.2 This system shall be supplied to provide a finished semi-permanent demarcation line between the dormitory areas of the Shelter and the Work Area.

.3 Install and remove upon completion of the work. Repair affected finishes.

.4 Drywall and metal studs may be re-used where salvageable and in good condition.

.5 In general, install Type 2 hoarding per Sections 09 11 00 and 09 25 00.

.7 Exterior side of Type 2 hoarding is to be painted white. The Contractor shall be responsible to maintain the condition of hoarding and for additional painting of hoarding required to cover graffiti.

.8 All seams in poly-weave tarping and hoarding are to be taped together to provide dust tight enclosure.

.9 Anchor holes are to be repaired after construction hoarding has been removed. Contractor to repair all finishes and painted surfaces damaged by fastening materials used as part of the hoarding and protection systems.

.10 Restrict access for unauthorized personnel by placing barricades or posting guards around areas of the Work. Unauthorized personnel shall mean the public and anyone not directly concerned with the execution, supervision or inspection.

1.6 EXISTING BUILDINGS, CURBS, ROADS AND LANES

.1 Protect existing buildings, structures, curbs, roads and lanes. If, during work, any existing items are damaged, repair or replace them.

.2 Provide pavement, curb and sidewalk protection for public thoroughfares and the Work in progress as required by the authorities and to protect public property and the Work.

1.7 CONTROL OF CONSTRUCTION GENERATED DUST, DEBRIS, FUMES, ETC.

.1 Dust, dirt, construction debris, water and fumes from the work areas must not be permitted to enter areas of the building or rooms in or adjacent to work areas.

.2 Protection shall be provided for all entrance and exit ways, floors, walls and all standing fixtures, air intakes, exhaust fan openings, floor drains, elevators and equipment rooms against dust, spillage or overspray of materials and/or damage during the construction period. The required protection shall consist of but is not limited to the following:

.1 Filter cloth in all floor drains within the work area

.2 Filter cloth over all intake and exhaust louvers, ducts and openings

.3 Poly-weave tarping over doorways and around the exterior perimeter of work area to prevent the escape of dust & debris from the work area.

.4 Protect sprinkler heads with Polyethylene or filter cloth to prevent dust build up

1.8 PROTECTION OF EXISTING EXPOSED FACILITIES

.1 Existing lighting system is to be protected from damage or removed and re-installed upon completion of repairs.

.2 If Contractor wishes to use existing lighting system as an alternate to installing temporary light, Contractor shall assume all responsibility for damages incurred.

.3 All exposed conduit, fixtures, attached devices, sprinkler fire system plumbing, mechanical system components, louvres and ducts are to be protected against the accumulation of dust, debris and damage. The Contractor will be responsible to correct any damages to these systems at their own expense. Contractor to promptly report any damage to the Owner and the Consultant.

.4 Inspect materials, equipment and components to be re-used or turned over to the Owner. Note their condition and advise Consultant in writing, of any defects or conditions which would affect their removal and re-use, prior to removal.

.5 Prior to commencing Work, contact the Owner to locate all protective or alarm systems and sensors. All services shall be protected against damage or interruption. All claims resulting from damage shall be the responsibility of the Contractor.

.6 Contractor must notify Owner’s Representative, or Property Manager of any fault or alarm to the main fire alarm panel immediately. When Contractor’s activities result in charges to Service the fire alarm panel or alarm system, the Contractor shall bear all costs.

.7 Any damage to the paint finish of the walls or columns caused by the construction shall be repaired by the Contractor at no cost to the Owner.

1.9 OVERLOADING

.1 Load no part of the structure during construction with a load greater than its designed capacity.

.2 Submit equipment weights and construction procedures to the Consultant for review prior to commencing the Work.

.3 Make every temporary support as strong as the designed permanent support.

1.10 FIRE PROTECTION

.1 Take necessary precautions to eliminate fire hazards and to prevent damage to the Work, building materials, equipment and other property both public and private having to do with the Work. Inspect the Work at least once a week for this purpose.

.2 Store and locate products and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner. Place approved types of firefighting equipment in vicinity of products packed in this type of crate or carton until permanent fire protection and equipment are available.

.3 Store no flammable products such as paint or fuel in the parking garage without the Owner's permission in writing.

.4 Tarpaulins to be fire-resistant.

.5 Open fires or burning of rubbish or debris are not permitted on the Site.

.6 Provide temporary fire watches as required if sprinkler system is temporarily decommissioned as part of the work.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 MANUFACTURERS' INSTRUCTIONS

.1 Unless otherwise specified, comply with Manufacturer's latest printed instructions for materials and installation methods. Supply copies of these instructions to Consultant prior to commencing work.

.2 Notify Consultant in writing of any conflict between the Contract Documents and Manufacturer's instructions.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and maintain packaged materials with Manufacturer's seals and labels intact.

.2 Immediately remove rejected materials from the Place of the Work.

.3 Storage and handling of materials shall conform to Ontario Occupational Health and Safety Act and Manufacturer's instructions.

.4 Toxic or hazardous materials shall be secured in a locked storage area.

.5 All containers to be labeled in accordance with WHMIS regulations.

.6 All containers to be labeled with material expiration dates. Materials older than the expiry date shall not be used on the Work and shall be removed immediately from the site.

.7 Provide Owner and Consultant with electronic copies of all Safety Data Sheets (SDS) and maintain hard copies on site.

2.0 PRODUCTS

2.1 MATERIALS

.1 Use new products unless otherwise specified.

.2 Provide electronic copies of maintenance instructions and material literature for finished surfaces prior to Substantial Performance.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL`

1.1 DESCRIPTION OF WORK INCLUDED

.1 Provide all labour, material, equipment and services necessary to clean the building, structure, fixtures, piping etc. and dispose of all waste products and debris in the work area as indicated on the Contract Documents.

.2 Provide all labour, material, equipment and services necessary to clean the building, structure, fixtures, piping, etc. outside the work area if debris generated by construction has affected these areas.

1.2 GENERAL REQUIREMENTS

.1 Conduct cleaning and disposal operations to comply with the local and municipal ordinances and anti-pollution laws and the building management.

.2 Store volatile wastes in covered metal containers and remove from premises daily.

.3 Prevent accumulation of wastes which create hazardous conditions.

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

.5 Co-ordinate requirements for ventilation and waste disposal operation with the Owner/Property Manager.

1.3 REFERENCES

.1 Waste Control Regulation - Ontario Environmental Protection Act.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Use only cleaning materials and equipment approved by the Manufacturer of the surface to be cleaned, and only as recommended by the cleaning material Manufacturer.

3.0 EXECUTION

3.1 PRIOR TO CONSTRUCTION

.1 Prior to the submission of a Bid for this project, the Contractor shall examine the site to determine its condition with respect to debris and dust.

.2 At the time when cleaning is to be performed, it will be the Contractor's responsibility to clean the site of all debris generated by the construction as well as any existing debris, unless otherwise indicated in the contract document.

.3 No extras will be entertained for site cleaning after the Contract is awarded.

3.2 WASTE REMOVAL AND CLEANING DURING CONSTRUCTION

.1 The Contractor to perform all required cleaning during construction.

.2 Maintain the Place of the Work and adjacent public properties free from accumulations of waste materials and rubbish.

.3 Provide on-site containers for collection of waste materials and rubbish.

.4 Store volatile wastes in covered metal containers. All wastes that create hazardous conditions must be removed from the premises daily.

.5 Disposal of waste products to be performed in strict accordance with the product Manufacturer's Safety Data Sheet and in accordance with the provincial Waste Control Regulations.

.6 Seal off all work areas to prevent dust and debris generated by construction from affecting other areas, including areas required for construction access. Any dust and debris that escapes from the work area is to be cleaned up in a timely fashion. If it is deemed by the Consultant that cleaning has not been performed in a timely fashion, the Owner may contract an independent cleaner to rectify the situation. The cost of the independent cleaner will be back-charged to the Contractor.

3.3 FINAL CLEANING

.1 Contractor is responsible to clean all areas affected by the Work to an as new condition. Remove all debris generated by construction.

.2 Remove all grease, dust, dirt, stains, labels, fingerprints, over-spray and other foreign materials immediately prior to the Owner's final inspection. Clean to "as new" condition.

.3 Prior to the work being considered Substantially Performed, the Contractor shall remove their surplus products, tools, construction machinery and equipment not required for the performance of the remaining work. Contractor shall also remove waste products and debris other than that caused by other Contractors or their employees not involved with the Work and leave the Site clean and suitable for occupancy by the Owners unless otherwise specified.

.4 Prior to the Work being considered Totally Performed, the Contractor shall remove their remaining products, tools, construction machinery and equipment.

.5 All vertical and horizontal surfaces, systems, fixtures and equipment, etc. shall be cleaned of all dust, grease or spray accumulations.

.6 Contractor to return all adjacent storerooms, mechanical rooms, mechanical equipment, lobbies, stairwells, duct work, etc. to the Owner in a dust-free condition.

.7 Floors shall be swept clean and then mopped.

END OF SECTION

1.0 GENERAL

1.1 TAKE OVER PROCEDURE

.1 Contractor's Review

.1 The Contractor and their Subcontractors shall conduct a review of the work and correct all noted deficiencies.

.2 The Contractor shall notify the Consultant, in writing, of satisfactory completion of the "Contractor's Review" after the correction of all noted deficiencies and shall request a "Consultant's Review".

.2 Consultant's Review

.1 The review team shall consist of the Consultant and the Contractor. The Owner or their representative shall attend at their option.

.2 The Consultant will prepare a list of deficiencies noted during the "Consultant's Review" and will issue the list to the Contractor.

.3 The Consultant will determine the value of work associated with any outstanding deficiencies noted during the Consultant's Review. Payment of these retained funds will be withheld until the deficiencies have been rectified to the satisfaction of the Consultant and Owner.

.4 The Contractor shall correct all deficiencies indicated on the list in a timely and satisfactory manner.

.3 Final Review

.1 The Contractor shall request a "Final Review" when the Contractor is satisfied that all deficiencies have been corrected. The request shall be made in writing.

.2 The "Final Review" shall be conducted by the Consultant and the Contractor. The Owner or their representative will attend at their discretion.

.4 Certificate of Substantial Performance

.1 The Contractor must submit a request in writing to the Consultant for a Certificate of Substantial Performance.

.2 The Contractor shall comply with the following during Contract close-out:

.1 The requirements of the Construction Lien Act.

.2 The requirements of the Workers Compensation Act.

.3 All other contractual requirements

.5 Total Performance

.1 Immediately following the issuance of the Certificate of Substantial Performance, the Consultant, in consultation with the Contractor, will establish a reasonable date for the "Total Performance of the Work".

.2 The Contractor shall supply all guaranties and review certificates in accordance with the requirements of the Contract Documents prior to the date established for "Total Performance of the Work".

.6 Release of Holdback

.1 The lien holdback amounts will be released pursuant to the Construction Lien Act.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

Not applicable

END OF SECTION

1.0 GENERAL

1.1 WARRANTY/ GUARANTY PERIOD

.1 Provide a three (3) year minimum warranty for all Work of the Contract, including a guaranty secured by Performance Bond for the first 2 years, commencing on the date of substantial performance.

.2 Extended warranties beyond the three (3) year minimum period are outlined below.

.1 to the Consultant that is signed by the Contractor and Manufacturer.

1.2 CRYSTALLINE WATERPROOFING SYSTEM WARRANTY

.1 Total warranty period of five (5) years:

1. First two (2) years, secured by the Performance Bond as noted above, commencing on the date of Substantial Performance (as confirmed by the Consultant).

2. Third, fourth and fifth years - extended warranty, unsecured by bond, commencing on the expiration of the Performance Bond. Joint Warranty by Coating Applicator and Manufacturer Submit signed certificate to Consultant.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

3.1 REMEDIAL WORK UNDER GUARANTY/WARRANTY

.1 Perform any required warranty repair work for the duration of the warranty period at no extra cost.

.2 Notice will be provided to the Contractor during the warranty period within thirty (30) days of the discovery of any defect in the Work. The Contractor shall take necessary steps to protect the area against further damage immediately upon receipt of notice and shall take corrective action to make good any damage incurred. The Contractor shall schedule repair work with the Owner and shall make every attempt to make good the defects within three (3) weeks of notice.

.3 Remedy is to be at no cost to the Owner and is to include all labour, material, equipment, and supervision necessary to make good defective areas of the Work and any damages incurred to obtain access to defective areas.

.4 The Contractor must reimburse the Owner for any resulting assessment costs incurred to define the extent of the defect and for costs incurred to test the repaired defect to confirm acceptability of repairs.

.5 The Contractor must reimburse the Owner for all associated costs incurred due to closure of the areas requiring repair under warranty.

.6 Warranty periods for areas requiring repair are to be extended by the amount of time lapsed between issuance of notice and completion of remedial work. The warranty/ guaranty period will then re-commence upon completion of the remedial work.

.7 Warranties are not to be deemed to restrict any liability of the Contractor arising out of any applicable law.

END OF SECTION

1.0 GENERAL

1.1 RECORD DRAWINGS

.1 Consultant will provide Contractor two sets of white prints for record drawing purposes.

.2 The Contractor to maintain project record drawings and record deviations from Contract documents accurately in red ink and mark on one set of prints.

.3 Record following information:

.1 Field changes of dimension and detail.
.2 Changes made by Change Order, Change Directive, or Supplemental Instruction.
.3 Deviation from electrical and mechanical installations shown on drawings.
.4 Other significant deviations that are concealed in construction and cannot be identified by visual inspection.
.5 Type and location of repairs not indicated on the construction drawings.
.6 Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

.4 At completion of contract and prior to final review, neatly transfer "as-built" records to second set of white prints using a fine red marker. Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand, but shall be neat and accurate. Add at each drawing title block note: "AS-BUILT RECORD". Circle on List of Drawings each title and number of drawings marked with "as-built" records.

.5 Submit both sets of "as-built record" drawings to Consultant on completion of Contract and before the final payment.

.6 Make project record drawing available at all times for reference purposes and for review by the Consultant. Provide reproducible prints to Consultant at regular intervals but not less than once each month.

.7 If the project is completed without significant deviations from contract drawings, declare this in writing and submit to Consultant in lieu of project record drawings.

1.2 OPERATION AND MAINTENANCE MANUALS

.1 Submit electronic copies of Manufacturers' printed operation and maintenance manuals for requirements requested within those specification Sections.

.2 Provide original Manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance as requested within the related specification sections.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

Not applicable.

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED IN SECTION

.1 Various demolition and removals of existing and for provision of new work, as shown on architectural drawings.

.2 Restoration of damaged or disturbed Work.

.3 Removal of surplus materials from the site.

1.2 RELATED SECTIONS

.1 Architectural demolition requirements for existing and new work - Divisions 2 through 16.

1.3 QUALIFICATIONS

.1 Work of this Section shall be executed by a company having a minimum of five (5) years continuous experience and able to deploy adequate equipment and skilled personnel to complete Work expediently in an efficient and orderly manner.

1.4 EXAMINATION

.1 Examine existing property. Determine nature and extent of materials to be removed.

.2 Examine adjacent properties. Determine extent of protection required.

1.5 SALVAGE

.1 Unless otherwise noted, materials from demolition shall become property of Contractor who shall promptly remove all salvageable material and debris from Site.

.2 Do not sell material on Site.

.3 The Owner will review Site prior to commencement of demolition and instruct the Contractor, in writing, as to the items to be retained for re-use or be turned over to the Owner.

.4 Store material to be salvaged, neatly on wooden pallets, where directed by Owner.

.5 Remove and store indicated items for future use by Owner. Remove, handle and transport such items to storage area designated on Drawings or to an area within the site designated by Owner. Perform such work carefully and with diligence to prevent any damage to the items during removal and in storage.

1.6 MAINTAINING TRAFFIC HAULING OPERATIONS

.1 Maintain and preserve Owner's access requirements within, to and from existing building in areas where demolition and removal work is being carried out.

.2 Do not close, obstruct, place or store material in Owner's driveways and passageways. Conduct operations with minimum interference with roads, streets, driveways, user traffic and passageways.

1.7 HAULING OPERATIONS

.1 Maintain roadways and paving in the hauling areas clean on a daily basis and as required by Municipal authorities.

1.8 SAFETY REQUIREMENTS

.1 Undertake Work and effect arrangements required by authorities having jurisdiction for protection of public.

.2 Coordinate posting of danger signs conspicuously around property. Close doorways and thoroughfares giving access to area of demolition with barricades.

.3 Provide a competent, experienced supervisor in charge of the Work and on Site while Work is in progress.

.4 Demolition of spray or trowel-applied asbestos can be hazardous to health. Stop work and notify the Construction Manager immediately should material resembling spray or trowel-applied asbestos be encountered in the course of demolition work, which has not already been identified. Do not proceed until written instructions have been received from the Owner.

.5 Should any suspect designated substance not already identified, be encountered, cease work in the immediate area and immediately report, to the Owner. Owner is responsible for removal of designated substances.

1.9 LIFE AND FIRE SAFETY

.1 Provide fire extinguishers in acceptable locations to fire prevention authorities and of type suitable to enable personnel to cope with fire occurring during progress of Work.

1.10 DEMOLITION DRAWINGS

.1 Submit for approval; drawings, diagrams or details showing sequence of disassembly work and supporting structures.

.2 Submissions, if required, are to bear stamp of qualified professional engineer registered in Province of Ontario.

1.11 PROTECTION

.1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, parts of existing building to remain. Make good damage caused by demolition.

.2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify Owner.

.3 Provide temporary weather enclosures to requirements of Division 1.

.4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.5 Provide and maintain necessary fire extinguishers throughout the work to the approval of the Fire Marshal, and located at convenient and accessible points.

.6 Protect work to remain against damage of any kind.

.7 Protect building floors and roofing against damage from operations under this Section, including lifting, moving, rolling, etc., of materials. Use 12.7 mm (1/2”) thick plywood covers with ends mechanically joined, over floor for any such handling. Over roof, provide 19 mm (3/4”) thick plywood under laid with 1” thick polystyrene insulation board adhered to same. Provide same when working from, or over roof surfaces. Be responsible for repairs to flooring or roofing for any damage caused. Execute such repairs to the satisfaction of, and at no cost to Owner.

2.0 PRODUCTS

Not applicable

3.0 EXECUTION

3.1 INSPECTION

.1 Visit and examine the site and note all characteristics and features affecting the Work of this Section.

.2 Ensure all services, whether buried; built-in or exposed are properly identified as to position, type of service, size, direction of flow.

.3 Inspect materials, equipment, components to be re-used or turned over to the Owner. Note their condition and advise the Consultant in writing of any defects or conditions which would affect their removal and re-use.

3.2 PREPARATION

.1 Prevent movement, settlement or damage of elements of the existing building which are to remain. Provide bracing, shoring and supports as required. Protect existing surfaces not to be restored from damage during concrete removal procedures.

.2 Cut and/or cap existing services within the work area, if any, prior to start of Work as required, but do not affect the services of areas not under construction or essential to the ongoing operation of the building.

.3 In all cases, exercise all reasonable care during removal operations to avoid damaging items to be salvaged, re-used, or items that are not part of the Scope of Work.

.4 Seal off all work areas to prevent dust and debris from affecting other areas outside of work area. Prevent public access to areas being repaired.

.5 Tape and/or seal and provide protection to all mechanical and electrical services and all fire alarm and security devices still functioning adjacent to the work areas to prevent damage resulting from dust, water, or impact.

.6 Cover floor drains as required to prevent concrete, abrasive blasting debris or any other material from entering the drains. Ensure that all drains continue to operate as required during construction.

.7 Remove or protect in place all surface mounted or permanent fixtures not to be demolished from damage during demolition procedure.

.8 Apply filter cloth to all exhaust and ventilation vents within work area to prevent dust generated by the construction activity from escaping.

.1 Contractor shall clean or replace filter cloth if the filter cloth becomes unsuitably dirty as determined by Consultant.

3.3 DEMOLITION

.1 Execute Work in accordance with requirements of authorities having jurisdiction.

.2 At end of each day's work, leave Site in a safe condition and erect safety barriers and lights as required. Ensure that no parts of existing structure are in danger of collapsing.

.3 Perform demolition work where not specifically indicated, but required to make provisions for new Work.

.4 Provide any additional materials, labour and services required, not specifically mentioned or shown on Drawings, but necessary for proper completion of Work.

.5 Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

.6 Leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of areas not to be demolished from exterior elements.

.7 Demolition of concrete shall be performed by percussive techniques to prevent damage to the embedded reinforcing to remain and the supporting structural steel framing below.

.8 Provide shoring to support the slab when removals reduce its load-carrying capacity, as directed by the Consultant. No payment will be made for such shoring as it is to be included in the cost of repair as outlined in these documents.

.9 Materials forming permanent part of the building that require removal become contractor's property and must be removed from site daily, unless such materials

are otherwise specified or shown on Drawings to be reused under this Contract (or turned over to Owner). Remove materials not suitable for reuse as shown on Drawings (as specified) from site.

.10 Leave building in a "broom-clean" condition on completion of work to Owner's satisfaction.

.11 Clean existing surfaces specified to receive new applied finishes to assure proper adherence.

.12 Clean existing surfaces to receive paint finish to paint manufacturer's written specifications and/or recommendations.

.13 Confine operations and workers to those parts of the building which are defined on Drawings, and exercise great care not to damage existing construction beyond that necessary for the carrying out new work and make good any such damage in every respect.

.14 Do not disturb adjacent items designated to remain in place.

.15 All required re-painting due to damage, overspray, etc. is the Contractor’s responsibility.

3.4 WASTE DISPOSAL

.1 Disposal of waste products and material is to be in strict accordance with the product manufacturer’s material safety data sheets and in accordance with the governing waste control regulations.

.2 The existing drainage system is not to be used to dispose of project wastes and / or materials.

.3 Store volatile wastes or material in covered metal containers. All wastes which create hazardous conditions must be removed from the premises daily.

END OF SECTION

1.0 GENERAL

1.1 GENERAL INSTRUCTIONS

.1 Read and be governed by Conditions of the Contract and Sections of Division 1.

1.2 SECTION INCLUDES:

.1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication Work in accordance with the Contract Documents.See Architectural Drawings and Details

1.3 QUALITY ASSURANCE

.1 Execute Work of this Section only by a Subcontractor who has adequate plant, equipment, and skilled workers to perform Work expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past five years.

1.4 REFERENCE

.1 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.2 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.4 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.5 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.6 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.7 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.8 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.9 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.10 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.

.11 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.12 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.13 CAN/CGSB 1.40-M, Primer, Structural Steel, Oil Alkyd Type.

.14 CGSB 1-GP-181, Organic Zinc Rich Primer.

.15 CGSB 85-GP-16M, Painting Galvanized Steel.

.16 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.17 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

.18 National Association of Metal Manufacturers (NAAMM) Metal Finishes Manual, 2006

1.5 DESIGN CRITERIA

.1 Work of this Section which functions to resist forces imposed by dead and live loads shall conform to requirements of jurisdictional authorities.

.2 Design work of this Section and applicable shop drawings shall be carried out by a qualified professional engineer licensed to practice in the Place of Work.

.3 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.6 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Clearly indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.3 Shop drawings shall be sealed by a qualified professional engineer licensed to designs structures and registered in Place of the Work.

1.7 DELIVERY, STORAGE AND HANDING

.1 Label, tag or otherwise mark Work supplied for installation by other Sections to indicate its function, location in building and shop drawing designation.

.2 Protect Work from damage during delivery, storage and handling.

2.0 PRODUCTS

2.1 MATERIALS

.1 General:

.1 Unless detailed or specified otherwise, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.

.2 Include materials, products, accessories, and supplementary parts necessary to complete assembly and installation of Work of this Section.

.3 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharply defined profiles.

.2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.

.3 Welding materials: CSA W48 and CSA W59-M.

.4 Primer paint: CAN/CGSB-1.40-M or CPMA 1.73a.

.5 Drilled inserts: Mega by ITW Construction Products or HSL by Hilti Inc. heavy-duty anchors, sizes as shown, or as per Structural.

2.2 FABRICATION

.1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.

.2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed shop drawings.

.3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal Work unless otherwise found acceptable by the Consultant.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.

.5 Execute shop welding to requirements specified.

.6 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to the Consultant's acceptance.

.7 Assemble members without twists or open joints.

.8 Correctly size holes for connecting Work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.

.9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 FABRICATED ITEMS

.1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.

.2 Where work is required to be built into work of other Sections supply such members to respective Sections.

.3 Miscellaneous steel brackets, supports, angles and fabrications

.1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.

.2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

2.4 ANCHORS AND FASTENING

.1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.

.2 Use self drilling expansion type concrete anchors for attaching to masonry and concrete

.3 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.5 WELDING

.1 Perform welding by electric arc process.

.2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:

.1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.

.2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.

.3 CAN/CSA W117.2-M - for safety.

.3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.

.4 Test welds for conformance and remove Work not meeting specified standards and replace to Consultant's acceptance.

2.6 SHOP PAINTING

.1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.

.2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.

.4 Clean but do not paint surfaces being welded in field.

.5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.

.6 Do not prime machine finished surfaces, but apply an effective anti-rust compound.

.7 Take precautions to avoid damage to adjacent surfaces.

3.0 EXECUTION

3.1 EXAMINATION

.1 Take site measurements to ensure that Work is fabricated to fit surrounding construction, around obstructions and projections in place, or as shown on Drawings, and to suit service locations.

3.2 INSTALLATION

.1 Install Work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding Work and as required for proper performance.

.2 Include with Work of this Section anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities. Weld to CAN/CSA-S16.1-94.

.3 Countersink holes provided for wood screws where wood is attached to Work of this Section.

.4 Attach Work to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of three (3).

.5 Attach Work to exterior concrete and masonry with non-shrink epoxy grout to support load with a safety factor of three (3).

.6 Insulate between dissimilar metals or between metal, and masonry or concrete with bituminous paint to prevent electrolytic action.

.7 Grout metal posts, pickets, balusters, and the like, in metal sleeves cast into concrete, with non-shrink quick setting epoxy anchor cement, unless detailed otherwise. Fabricate sleeves of 75 mm (3") minimum depth.

.8 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

3.3 FIELD PAINTING

.1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

3.4 ADJUSTMENT AND CLEANING

.1 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

3.5 PROTECTION

.1 Maintain protection of Work of this Section from time of installation until final finishes are applied or to final cleanup.

END OF SECTION

1.0 GENERAL

1.1 DEFINITION

.1 Architectural woodwork: Shall mean custom fabricated cabinetry, counters/countertops, wood door frames, custom fabricated wall/ceiling panels.

1.2 QUALITY ASSURANCE

.1 The "Quality Standards" of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), Edition 2, 2014 together with authorized additions and amendments, shall be used as a reference standard and shall form part of this Project Specification.

.2 Where modifications to the AWMAC Quality Standards contained within the Manual are included in this Project Specification, then such modifications shall govern in case of conflict.

.3 Any references in Custom or Premium grade in this Specification shall be as defined in the AWMAC Quality Standards.

.4 Any item not given a specific quality grade shall be Premium grade as defined in the AWMAC Quality Standards.

.5 All architectural woodwork to be used in the Project shall meet the requirements of the AWMAC Quality Standards for the particular grade specified.

.6 References in this Specification to part and item numbers mean those parts and items contained within the AWMAC Quality Standards Manual.

1.3 SUBMITTALS

.1 Shop Drawings:

.1 Prepare and submit to the Consultant for review Shop Drawings for architectural woodwork in accordance with 01 33 00.

.2 Shop Drawings shall show wood and metal construction details of all architectural details of all general arrangements, locations of all service outlets: typical and special installation conditions; materials being supplied and all connections, attachments, anchorage and location of exposed fastenings, as applicable, field measured dimensions and coordination with other trade Contractors.

.3 Shop Drawings shall incorporate plans, elevations, sections and details for all architectural woodwork included in this Section.

.4 No Work shall be fabricated until the Shop Drawings have been reviewed and all other related submittals, and samples as required by the Specifications, have been approved by the Consultant.

.5 Submission of Consultant's Drawings for Shop Drawings is not acceptable.

.2 Shop Drawings:

.1 Provide 3 samples of each plastic laminate, wood veneer and solid polymer surface to Consultant for review.

.3 Brochures:

.1 The architectural woodwork manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork are not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

1.4 PRODUCTS HANDING AND STORAGE

.1 The architectural woodwork manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork are not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

.2 Architectural woodwork delivery, storage, and handling shall be in accordance with AWMAC Quality Standards.

.3 Delivered materials which are damaged in any way or do not comply with these Specifications will be rejected by the Consultant and shall be removed from the job site and replaced with acceptable materials.

1.5 WARRANTY

.1 Warrant labour, materials and Workmanship against defects and deficiencies for a period of two (2) years after the date of Substantial Performance.

2.0 PRODUCTS

2.1 MILLWORK

.1 General: Use clean stock only and comply with AWMAC Quality Standards grades as indicated

.2 **Plastic Laminate (Plam)**: 1.6 mm thick, (allow for a maximum of 2 colours)

.1 Manufacturer: Abet Laminati, Wilsonart, Nevamar, Pionite or Formica

.2 Colour: to be selected by Consultant from full colour range

.3 Hardwood lumber: moisture content 12 % or less in accordance with National Hardwood Lumber Association (NHLA) and AWMAC premium grade.

.1 Species: poplar where scheduled to receive paint finish, white oak where scheduled to receive stain finish.

.4 Plywood: veneer core, softwood, 19 mm thick typical unless otherwise indicated.

.1 Softwood: to CSA 0151.

.2 Fir to CSA0121-M1978.

.3 Hardwood plywood: to CSA O115.

.4 Poplar plywood (PP): to CSA O153, standard construction

.5 Where plywood is used for wall construction, the Flame Spread rating must be 150 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.6 Where plywood is used in ceiling construction, the Flame Spread rating must be 25 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.5 Particle board: not permitted

.6 Medium density fiberboard (MDF): to ANSI A208.2, density 769 kg/m. Medium density fiberboard must:

.1 meet the performance requirements of ANSI A208.2.

.2 be manufactured such that formaldehyde emissions do not exceed [0.15] ppm (180 g/m) when tested in accordance with ASTM E 1333.

.3 contain at least [15] % recycled materials by weight.

.4 Where MDF is used for wall construction, the Flame Spread rating must be 150 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.5 Where MDF is used in ceiling construction, the Flame Spread rating must be 25 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.7 Sealant: As per 07 90 00.

2.2 MILLWORK HARDWARE

.1 As per Drawings/details.

2.3 MILLWORK FINISHING - GENERAL

.1 Finish all interior millwork surfaces in plastic laminate, unless otherwise indicated.

2.4 FABRICATION - GENERAL

.1 Obtain all on-Site dimensions before fabricating items. Obtain all relevant data and incorporate provisions for items of equipment enclosed by millwork.

.2 Verify wall alignment prior to proceeding with fabrication. Site conditions at variance with reviewed Shop Drawings shall be specifically noted on reviewed Drawings and forwarded to Consultant. Variances, due to Site conditions necessitating revisions to Shop Drawings shall be accepted prior to fabrication.

.3 Fabricate running members in maximum standard lengths obtainable for the particular species wherever possible.

.4 Fit all joints tight. Locate joints at points which will not interfere with, affect strength or detract from appearance of materials.

.5 Securely fasten intersecting framing members together at corners in an approved manner. Reinforce as required for rigid assembly designed for applicable loads.

.6 Wherever practicable, install, fit and adjust all hardware specified, in shop.

.7 Incorporate adequate provisions for scribing and fitting to adjoining surfaces in a manner acceptable to Consultant.

.8 Provide for and incorporate provisions to recognize inherent shrinkage characteristics of materials specified.

.9 Casework core material: 19 mm veneer core plywood.

.10 Casework edge trim: Plastic laminate with plastic laminate millwork and solid wood lippings with wood veneer millwork.

.11 Plastic laminate finish at all exposed surfaces, including cabinet/drawer interiors unless noted otherwise.

2.5 ACCESSORIES

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; stainless steel finish elsewhere.

.2 Wood screws: to CSA B35.4 stainless steel, type and size to suit application.

.3 Splines: wood.

.4 Adhesive: recommended by manufacturer.

.5 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

3.0 EXECUTION

3.1 JOB CONDITIONS

.1 Job conditions for installation of architectural woodwork shall be as specified under AWMAC Quality Standards.

3.2 INSTALLATION

.1 Cabinet and Casework: Install in accordance with Section 705 of the AWMAC Quality Standards.

.2 Paneling and Trim: Install in accordance with Section 706 of the AWMAC Quality Standards.

.3 Finish Hardware: Install finish hardware in accordance with Section 711 of the AWMAC Quality Standards.

.4 All cutting and fitting of trim around fixtures and receptacles to be done as no extra cost to Contract.

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED

.1 Provide all labour, material, equipment, and supervision to install crystalline waterproofing at the interior surfaces of all foundation walls, on the first and second basement levels, as designated on the Drawings. Work includes:

.1 Preparation of all surfaces.
.2 Detailing all cracks and joints.
.3 Patching voids and grinding rough surfaces smooth.

1.2 SITE EXAMINATION

.1 Bidders shall visit the Place of the Work and review the wall surfaces to receive crystalline waterproofing. Rough surfaces may require additional surface preparation.

.2 Bid shall include all costs of preparation and patching of rough surfaces. No extras for surface preparation or additional material will be entertained after bid closing.

1.3 REFERENCES

.1	ASTM C109/C109M-16A:	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-in or 50-mm cube specimens).
.2	ASTM C321-00 (2012):	Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
.3	ASTM C348-14:	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
.4	ASTM C452-15:	Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate.
.5	ASTM C596-09 (2017):	Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
.6	ASTM C944/944M-12:	Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating-Cutter Method.
.7	NSF 61-2016:	Drinking Water System Components - Health Effects (Includes Amendment)
.8	AASHTO T-259-02 (2017):	Method of Test for Resistance of Concrete to Chloride Ion Penetration (90 day ponding test).

1.4 SUBMITTALS

.1 Provide Safety Data Sheets (SDS) for each Product.

.2 Contractor shall submit non-typical waterproofing system details for conditions not accommodated for in the Contract Documents.

.3 Contractor shall submit manufacturer's product data and specifications for each product utilized in the waterproofing system installation, including:

.1 Laboratory test or data that validates product compliance with the specified performance criteria.

.2 Test reports with magnified photos that demonstrate crystal growth within the concrete.

.3 Test reports that demonstrate the product's capability to seal cracks up to 0.3 mm that appear after the application.

.4 Contractor to submit manufacturer's written certification that the proposed system, as specified and detailed, fully complies with specified performance requirements.

.5 Contractor is to submit installation procedures to the Consultant for review prior to starting work, including surface preparation requirements.

.6 The crystalline waterproofing applicator shall submit certificates confirming the following:

.1 Crystalline waterproofing applicator is presently a licensed applicator of the crystalline waterproofing system.

.2 The applicator has a minimum experience of at least 5 projects of similar nature in past 5 years.

.3 The applicator has undergone training provided by product manufacturer.

.4 The system will meet the performance requirements specified in this section for the duration of the warranty.

.7 Contractor to submit certificate signed by the Contractor and waterproofing system manufacturer certifying the following:

.1 Surfaces to receive systems were acceptable and found to be satisfactory to receive the waterproofing system, per the manufacturer's requirements and these Specifications. Application of waterproofing shall imply acceptance of surfaces.

.2 Crystalline waterproofing was applied in accordance with manufacturer's recommendations and these Specifications.

.3 Completed waterproofing system conforms to system described herein.

.8 Any existing conditions that may adversely affect the bonding or performance of the coating shall be brought to the attention of the Consultant, in writing, for resolution prior to installation of the coating.

.9 Contractor shall provide electronic copies of maintenance instructions for finished surfaces prior to Substantial Performance of the Work.

1.5 PRE-INSTALLATION MEETING

.1 Prior to start of work, the Consultant, Contractor, and crystalline waterproofing Subcontractor shall meet and review the requirements of Contract Documents and site conditions. The meeting will also allow for co-ordination and discussion of any other relevant matters. Consultant will record minutes and distribute to all those in attendance.

.2 No changes to requirements of the Contract Documents discussed at the meeting are to be incorporated into the work unless confirmed by Change Order.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver Products to the Place of the Work and store off the ground under appropriate cover to protect against moisture in accordance with manufacturer's instructions.

.2 Deliver Products in manufacturer's unopened containers fully identified with brand, type, grade, class, and all other qualifying information.

1.7 ENVIRONMENTAL CONDITIONS

.1 Do not install coating when ambient air temperature or substrate temperature is less than 5° Celsius. Install temporary heaters to maintain installation temperatures when required.

.2 Maintain substrate base and ambient air temperatures above 5° Celsius for a minimum of 48 hours prior to, during, and 72 hours after installation. Maintain temperatures for a longer period if required to ensure materials adequately cure.

.3 Do not apply products to frozen or frost filled surfaces.

.4 Exercise caution when concrete surface temperatures are high. Delay waterproofing system installation, or cool installation areas, if required to meet manufacturer's requirements for application of materials.

.5 Protect installed materials from moisture damage or dust contamination until adequately cured.

.6 All working conditions shall meet the requirements of the Ontario Occupational Health and Safety Act.

2.0 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Crystalline waterproofing to be a blend of rapid-hardening Portland cement, specially treated quartz sand, and a compound of active chemicals.

.2 The waterproofing system is to provide the following performance characteristics:

.1 Potable water certification in accordance with NSF 61-2016.

.2 Permeability: 0.00 cm/sec permeability at 1.5 MPa or 148 m over 20 days testing period on negative side.

.3 Compressive strength when measured in accordance with ASTM C109/C109M-16A: 70.3 MPa at 28 days.

.4 Flexural strength when measured in accordance with ASTM C348-14: 5 MPa at 28 days.

.5 Bond strength when measured in accordance with ASTM C321-00 (2012): 4.7 MPa at 14 days.

.6 Abrasion resistance when measured in accordance with ASTM C944/944M-12: 1.28 g.

.7 Sulphate resistance when measured in accordance with ASTM C452-15: 0.0012 % at 28 days.

.8 Chloride ion penetration when measured in accordance with AASHTO T-259-02 (2017): 99.99 % resistant at 6 mm, 100 % at 25 mm depth.

.9 Bond of reinforcement when measured in accordance with ASTM C321-00 (2012): No loss of bond due to waterproofing material.

.10 The system shall be totally waterproof and thermally compatible with the substrate under applicable service conditions.

.11 The system shall not allow moisture penetration at termination details.

.12 Adhesion of the coating, primer, and surface patching material to the concrete substrate shall meet or exceed 1.0 MPa.

.13 The system shall not debond or crack excessively.

.14 The waterproofing system is to be free of leaks and defects for the duration of the warranty period, with exception of structural crack locations that are 0.3 mm wide or wider.

2.2 MATERIAL

.1 Approved Crystalline Waterproofing Systems are:

.1 Permaquik 200 Crystalline Waterproofing manufactured by Tremco.
.2 MasterSeal 500 as manufactured by BASF.
.3 CN2000 as manufactured by Kelso Coatings.

.2 Water to be potable, clean, clear, non-alkaline, and free of salts and other harmful elements.

.3 Patching compounds used to repair surface imperfections, honeycombs, tie holes, seal strips, fillets, coves, etc. are to be a ready-mixed crystalline waterproofing and repair mortar recommended by waterproofing system manufacturer. Patching compounds shall have the following characteristics:

.1 Compressive strength when measured in accordance with ASTM C109/C109M-16A: 52.5 MPa at 28 days.

.2 Flexural strength when measured in accordance with ASTM C348-14: 4.8 MPa at 28 days.

.3 Shrinkage when measured in accordance with ASTM C596-09 (2017): Minimum 0.093 % at 28 days; plus 0.073 % at 120 days.

.4 Plugging compound for active water penetrations to be an accelerating agent for capillary waterproofing products or a pulverized rapid-setting cement.

3.0 EXECUTION

3.1 PREPARATION

.1 Protect adjacent surfaces not designated to receive waterproofing.

.2 Remove existing paints and finishes, grease, oil, and contaminates from substrate. Use high-pressure water blasting, wet or dry abrasive blasting, wire brush, steam cleaning, or other methods recommended by waterproofing manufacturer to produce surfaces suitable for application of waterproofing.

.3 Follow manufacturer's instructions to clean and prepare surfaces and seal cracks and joints.

.4 Route out construction joints and visible cracks that exceed 0.3 mm in width to a 20 mm width and minimum 20 mm depth.

.5 Remove all protrusions, work back to sound concrete and chisel out any spalled or honeycombed areas.

.6 Roughen form tie holes.

.7 Stop water leakage according to manufacturer's plugging specifications.

.8 Install items such as anchors, plates, supports etc. prior to installation of waterproofing.

.9 Rinse surfaces to be waterproofed to achieve a saturated surface dry (SSD) state prior to applying waterproofing system. Surfaces shall be moist but not wet when waterproofing system is applied. Remove all surface water on horizontal surfaces.

3.2 EXAMINATION

.1 Examine substrates that waterproofing system is to be installed on, the adjoining construction, and existing site conditions affecting installation. Rectify any unsatisfactory conditions prior to proceeding with work.

.2 Verify the following substrate conditions prior to application of waterproofing:

.1 Substrate condition is in accordance with manufacturer's requirements and these Specifications.

.2 Concrete surfaces have open pores and wood float finish on horizontal surfaces.

.3 Concrete surfaces are free of voids, spalled areas, loose aggregate and sharp protrusions, and with no coarse aggregate visible.

.4 Curing compounds or surface hardeners incompatible with waterproofing have not been used on concrete.

3.3 INSTALLATION

.1 Mix waterproofing material in proportions recommended by manufacturer.

.2 Apply waterproofing material in accordance with manufacturer's specifications and recommendations.

.3 Cavity Fill:

.1 Prime cavities at cleaned and prepared cracks, tie holes, etc. with patching compound in mortar consistency flush to surface prior to waterproofing material installation.

.2 Apply patching compound in lifts per manufacturer's instructions for larger spalled or honeycombed areas.

.4 Horizontal and Vertical Construction Joints: Prime seal strips and reglets in pre-formed 25 mm x 25 mm cavities with waterproofing material and then fill construction joints flush to surface with patching compound in mortar consistency. Apply waterproofing coat overtop of joint once preparation work has fully cured.

.5 Vertical Surfaces:

.1 Apply base coat of waterproofing material in slurry consistency at uniform rate of 0.70 to 0.75 kilograms-per-square-metre. Apply using appropriate compressed air spray equipment, stiff masonry brush, or stiff broom.

.2 After base cost has reached initial set, and while still tacky, apply finish slurry coat of waterproofing mixture at 0.70 to 0.75 kilograms-per-square-metre. Apply so that the final brush or broom strokes leave a parallel, uniform texture.

3.4 CURING

.1 Follow manufacturer's instructions for curing and hardening of waterproofing material.

.2 Protect surfaces from rain, frost, and drying.

3.5 CLEANING

.1 Remove left-over and foreign material that resulted from the Work at the Place of the Work.

.2 Clean adjacent surfaces and materials.

3.6 WARRANTY REQUIREMENTS

.1 Repair defects and damage that appear during the warranty period at no cost to Owner and to Consultant's satisfaction.

END OF SECTION

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY

.1 Section Includes: Furnishing of all labour, materials, services and equipment necessary for the supply and installation of firestopping as indicated on drawings and as specified.

.2 Related Work:

.1 Joint Sealants: Section 07 92 00

.2 Gypsum Wall Board: Section 09 25 00

.3 Mechanical: Division 15

.4 Electrical: Division 16

1.3 REFERENCES

.1 Shop Drawings:

.1 CAN4-S115-M85, "Standard Method of Fire Tests of Firestop Systems".

1.4 SUBMITTALS

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

.2 Product Data: Submit three copies of manufacturer's specification and installation instructions for each type of material required. Include data substantiating that materials comply with specified requirements.

.3 Shop Drawings: Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.4 Samples: Submit duplicate 300 mm x 300 mm (12" x 12") samples showing actual firestop material proposed for project.

1.5 DELIVERY, STORAGE, & HANDLING

.1 Comply with manufacturer's recommendations for handling, storage and protection during installation.

.2 Do not allow materials to become wet or soiled, or covered with ice or snow.

1.6 JOB CONDITIONS

.1 Examine substrate and the conditions under which the insulation work is to be performed. Do not proceed with firestopping work until unsatisfactory conditions have been corrected.

1.7 FIRE-RESISTANCE RATINGS

.1 Ratings of firestop systems shall be not less than the fire-resistance ratings noted on drawings and required by authorities having jurisdiction for firestopping of the floor, wall, ceiling and roof assemblies involved.

.2 Ratings of firestop assemblies for service penetrations shall be not less than the fire resistance rating of the floor, wall, ceiling or roof assembly being penetrated.

.3 Use only ULC tested firestopping assemblies as approved by the Consultant prior to firestop installations.

2.0 PRODUCTS

2.1 MATERIALS

.1 Firestopping Systems: In accordance with CAN4-S115-M85. All firestopping systems installed shall be from single manufacturer. Trade Contractors shall coordinate with General Contractor.

.1 Accepted Products:

1. "Fire & Smoke Containment Systems" by Tremco Ltd., Construction Division.
2. "Firebarrier Firestop Systems" by A/D Fire Protection Systems Inc.
3. "Fire Protection Products" by Electrical Products Division/3M.
4. "Firestop Systems" by Hilti (Canada) Limited
5. Or approved alternative

.2 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115-M85 and not to exceed opening sizes for which they are intended.

.3 Firestop System Rating: Equal to fire separation rating as noted on drawings.

.2 Service Penetration Assemblies: Certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.

.3 Service Penetration Firestop Component: Certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.

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

.5 Firestopping at openings intended for ease of re-entry such as cables: Elastomeric or resilient seal; do not use cementitious or rigid seal at such locations.

.6 Firestopping at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: Elastomeric or resilient seal; do not use a cementitious or rigid seal at such locations.

.7 Primers: To manufacturer's recommendation for specific material, substrate, and end use.

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

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

.10 Sealants for vertical joints: Non-sagging.

.11 Plastic laminate finish at all exposed surfaces, including cabinet/drawer interiors unless noted otherwise.

3.0 EXECUTION

3.1 PREPARATION

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

.2 Prepare surfaces in contact with firestopping materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

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

3.2 INSTALLATION

.1 Install firestopping material and components in accordance with ULC certification and manufacturer's instructions.

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

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

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

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

3.3 INSPECTION

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

3.4 SCHEDULE

.1 Firestop at:

.1 Edges of floor slabs and rated roof slabs at slab edge covers, aluminum windows/curtain wall.

.2 Deflection space at top of fire-resistance rated masonry and gypsum board walls.

.3 Intersections of fire resistance rated masonry walls to concrete and to gypsum board walls and of fire-resistance rated gypsum board walls to concrete and to masonry.

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

.5 Penetrations through fire-resistance rated floors, ceilings and roofs.

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

.7 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.8 Firestopping around mechanical and piping assemblies penetrating fire separations by Division 15 - Mechanical. Firestopping systems and products to be coordinated with this specification section.

.9 Firestopping around electrical assemblies penetrating fire separations by Division 16 - Electrical. Firestopping systems and products to be coordinated with this specification section.

3.5 CLEAN-UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for sealant Work in accordance with the Contract Documents.

.2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.

1.2 REFERENCES

.1 ASTM C834, Specification for Latex Sealants.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 SUBMITTALS

.1 Product data: Submit copies of Product data in accordance with the Conditions of the Contract describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Samples: Submit following samples in accordance with the Conditions of the Contract

.1 Two samples of sealant/caulking, for colour selection.
.2 Two samples of back-up material and primer for physical characteristics.

1.4 QUALITY ASSURNACE

.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 SITE CONDITIONS

.1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 WARRANTY

.1 Submit a warranty for Sealant Work in accordance with General Conditions, except that warranty period is extended to 2 years. Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces. Warranty shall be for complete replacement including affected adjacent Work.

2.0 PRODUCTS

2.1 MATERIALS

.1 General:

.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

.2 Sealant **Type A**: ASTM C920, Type M, Grade NS, Class 25; Two-part, Polyurethane non-sag type, in standard colours selected.

.1 Sikaflex 2C-NS by Sika Canada Inc.

.2 Dymeric 240 by Tremco Ltd.

.3 Sealant **Type B**: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.

.1 786 Mildew Resistant Silicone Sealant by Dow Coming Inc.

.2 Tremsil 200 Silicone Sealant by Tremco Ltd.

.4 Sealant **Type C**: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).

.1 Tremflex 834 Silconized Sealant by Tremco Ltd.

.2 CRL 800 Acrylic Latex Caulk with Silicone by CR Laurence Ltd

2.2 ACCESSORIES

.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible w ith primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

.3 Bond breaker: Type recommended by material manufacturers.

.4 Void filler around the window frames to be one part expanding polyurethane foam.

.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 MIXING

.1 Follow manufacturers instructions on mixing, shelf and pot life.

3.0 EXECUTION

3.1 PREPARATION

.1 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.

.2 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.

.1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.

.2 Ensure recess is dry.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.

.3 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

.4 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.

.5 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.

.6 Prime sides of recess, in accordance with sealant manufacturer's instructions.

.7 Condition products for use in accordance with manufacturer’s recommendations.

3.2 INSTALLATION

.1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.

.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth stains or other defects.

.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

.3 Make sealant bead uniform in colour.

.4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.

.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.

.6 Clean recesses and re-apply sealant.

.7 Remove masking tape immediately after joints have been sealed and tooled.

3.3 CLEANING

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.4 SCHEDULE OF LOCATIONS

.1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally seal following locations:

1. Concrete, masonry, wood and stone to metal.
2. Wood to masonry, concrete and stone.
3. Metal to metal.
4. All dissimilar materials.

.2 Sealant **Type A**:

1. Exterior joints between masonry and steel or aluminum.
2. Exterior joints between masonry and shelf angle.
3. Exterior joints between steel or aluminum and concrete or masonry.
4. Interior and exterior control joints, except in floors.
5. Door frames, louvre frames, interior and exterior side.

6. Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.

7. Seal thresholds.

.3 Sealant **Type B**:

1. Control joints in tiled areas.

2. Between vanity and tile.

3. Between vanity and mechanical fixtures/fittings.

4. Between access panels and tile.

5. Between tiles and adjacent materials.

.4 Sealant **Type C**:

1. Perimeter of interior windows.

2. Perimeter of firehose cabinets.

3. Junction between drywall and masonry.

END OF SECTION

1.0 GENERAL

1.1 DOCUMENTS

.1 This section along with the Drawings forms part of the Contract Documents and is to be read, interpreted and co-ordinated with all other parts.

1.2 WORK INCLUDED

.1 Provide all labour, material, equipment and supervision to:

.1 Prepare leaking wall cracks and joints as directed by the Consultant and inject to waterproof. **Approximate quantity: 150 metres**

.2 After waterproofing crack injection is complete, grind off all extraneous material and repair surface with concrete patch material to leave a smooth surface.

1.3 PERFORMANCE REQUIREMENTS

.1 The sealed crack shall not leak.

1.4 SUBMITTALS

.1 The system Manufacturer shall submit certificates confirming the following:

.1 The Contractor is presently a licensed applicator.

.2 The Contractor has a minimum of three (3) years of direct applicable waterproofing experience.

.2 The Contractor shall submit with bid a description of the products and methods to be used, to seal wall cracks.

.3 Submit copy of the appropriate safety and technical data sheets within seven (7) days of arrival of equipment and material on site.

2.0 PRODUCTS

2.1 MATERIALS

.1 Resin shall be a single component urethane based Polymer, which reacts with water to form an elastic, durable, water-insoluble gel, which will not dehydrate or degrade and is chemically and physically stable in its described usage.

.2 Resin shall be capable of bonding to damp concrete.

.3 Material shall exhibit elongation characteristics of minimum 300% at break.

2.2 EQUIPMENT

.1 Injection shall be performed using equipment approved by the resin Manufacturer and shall be capable of continuous pumping at constant pressures.

2.0 EXECUTION

3.1 PREPARATION

.1 Contractor shall identify leaking cracks to be injected and confirm with the Consultant prior to the work. Contractor shall notify Consultant immediately of any additional leaking cracks discovered.

.2 Contractor shall flush the cracks prior to grouting by injecting diluted phosphoric acid (5% concentration) and flushing extensively afterwards until all traces of acid are eliminated.

3.2 INSTALLATION

.1 Comply with all manufacturer's recommendations. Contractor to submit technique of injection to Consultant for review and acceptance prior to work.

.2 Install grout packers, intersecting the crack in the middle of the wall.

.3 Provide a sufficient number of packers to allow the water to travel from packer to packer and to create a continuous seal in the crack after the work is complete. The spacing between the packers shall be approximately 75% of the wall thickness.

.4 Seal the crack between the packers with epoxy gel or latex modified mortar. Prepare wall cracks and joints on foundation levels as designated by the Consultant (including removal of any existing unacceptable contaminants) and inject to waterproof.

.5 Inject the polyurethane grout to create a continuous seal in the crack.

.6 The grouting pressure shall not exceed 3 MPa (450 psi) at the header.

.7 In heavily leaking areas, provide additional grout holes, where required, to ensure complete filling of the cracks after the initially injected grout has cured.

.8 Grind off the sealing material grout on walls flush with the wall and remove injection ports to complete the grouting operation. After waterproofing crack injection is complete patch with top surface patch material to leave a smooth surface.

3.3 WORKMANSHIP

.1 All work shall be performed by trained technicians experienced in the use of injected resins and the related specialized equipment.

.2 The available drawings indicate the wall thickness is approximately 250 mm. The Contractor is encouraged to confirm actual thickness by site measurement. Contact the Consultant to obtain permission to drill test holes. Patch all test holes to match the existing.

.3 No extras will be entertained based on discrepancies between the above and actual thickness, after bid closing.

.4 Prepare wall and slab cracks and joints on foundation levels as designated by the Consultant (including removal of any existing unacceptable contaminants) and inject to waterproof.

.5 After waterproof crack injection is complete, grind off all extraneous materials and patch with top surface patch material to leave a smooth surface.

.6 Ensure all safety precautions required by the manufacturer are carried out.

3.4 CLEAN UP

.1 Scrape clean wall surface affected by the Work.

.2 Remove all debris and surplus material from the site and leave work area in a condition acceptable to the Consultant.

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED

.1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.

.2 Steel panels, fixed or removable, flush or rabbetted, similar in construction to steel doors, for use in steel frame product.

.3 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.

1.2 REFERENCES

.1 ANSI/NFPA 80-1999, Standard for Fire Doors and Fire Windows

.2 ASTM A653/A653M-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM C553-02, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications

.4 ASTM C578-05, Specification for Rigid, Cellular Polystyrene Thermal Insulation

.5 STM C591-01, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation

.6 ASTM C592-04, Specification for Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction

.7 ASTM C1289-05a, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.8 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies

.9 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

.10 CGSB 41-GP-19MA (1984), Rigid Vinyl Extrusions for Windows and Doors

.11 CSA W59-2003, Welded Steel Construction (Metal Arc Welding)

.12 CSDMA, Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000

.13 CSDMA, Selection and Usage Guide for Steel Doors and Frames, 1990

.14 CSDMA, Recommend Specifications for Commercial Steel Door and Frame Products – 08 11 00, 2006

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Indicate each type of door, frame, steel, construction and core.

.3 Indicate material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, paneled or louvered) and arrangement of standard hardware.

.4 Include schedule identifying each unit, with door marks and numbers related to numbering on drawings and door schedule of the Architect.

.5 Contractor responsible for coordination and installation of products provided under this Section shall;

.1 Verify and provide to the contractor responsible for the supply of steel door and frame products, actual opening sizes and field conditions by field measurement before fabrication. Submittal drawings shall reflect measurements and conditions provided, and product manufactured accordingly. Coordinate field measurements with fabrication and construction schedules to avoid delays.

.2 Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.

.6 Warranty

.1 Materials and workmanship shall be warranted by the manufacturer for a period of one (1) year from date of substantial performance.

2.0 PRODUCTS

2.1 MATERIALS

.1 Acceptable Materials: Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

.2 Steel: Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.1 Interior Doors: Face sheets shall be 0.042 in. (1.0 mm) minimum thickness.

.3 Door Core Materials

.1 Fiberglass: Loose batt type, density 24 kg/m3 (1.5 pcf) minimum, conforming to ASTM C553 or ASTM C592.

.4 Primers

.1 Rust inhibitive touch-up only.

.5 Miscellaneous

.1 Door Silencers. Single stud rubber/neoprene type

.2 Exterior Top Caps. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.3 Frame Thermal Breaks. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

2.2 FABRICATION – FRAME PRODUCTS

.1 Interior frame product shall be 18 gauge. Interior frames and window assemblies shall be welded type construction. Interior transom frames shall be welded type construction. Interior sidelight assemblies shall be welded type construction.

.2 Frame product shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Mortised cutouts shall be protected with steel guard boxes.

.4 Frame products shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.5 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm (60") provide two (2) anchors, and an additional anchor for each additional 760 mm (30") of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from the top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum. Fasteners for such anchors shall be provided by others.

.6 Minimum reinforcing, anchor and other component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.7 Each door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings, except on gasketed frame product.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.9 Fire-rated frame products shall be provided for those openings requiring fire protection as determined and scheduled by the Architect. Frames, transom and sidelight assemblies shall be listed for conformance with CAN4-S104. Window assemblies shall be listed for conformance with CAN4-S106. All fire-rated frame products shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated frame products shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers

.10 Provide grout guards fabricated from not less than 0.016 in. (0.4 mm) thick steel at all hardware mortises on frame product to be grouted.

2.3 WELDED TYPE

.1 Frame product shall be accurately mitered or mechanically jointed.

.2 As defined in Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", frame product perimeter corner joints shall be:

.1 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.

.3 Joints at mullions, sills and center rails shall:

.1 Be coped accurately, butted and tightly fitted.

.2 At intersecting flush profile faces, be securely welded, filled and ground to a smooth, uniform, seamless surface.

.3 At intersecting recessed profile faces, be securely welded to concealed reinforcements, with exposed hairline face seams.

.4 At all other intersecting profile elements, have exposed hairline face seams.

.4 Welding shall conform to CSA W59.

.5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two (2) holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm (6") of the base of the jamb, shall be substituted.

.6 Weld in two (2) temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.

.7 Glazing stops shall be formed steel channel, minimum 16 mm (0.625") height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access, when advised by the contractor responsible for coordination or installation, as specified on the Architect's drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.

.9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.

.10 Refer to drawings/details/schedules for frame depth/throat opening sizes

2.4 FABRICATION - DOORS

.1 General

.1 Interior doors shall be welded stiffener construction.

.2 Longitudinal edges shall be continuously welded, filled and sanded with no visible edge seams.

.3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for template hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.4 Hole 12.7 mm (0.5") diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm (0.5") diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.5 Doors shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.6 Top and bottom of doors shall be provided with inverted, recessed, welded steel channels. Exterior doors, and where otherwise scheduled by the Architect, shall be provided with flush steel top caps.

.7 Minimum reinforcing and component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.9 Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the

Architect. Such products shall be listed for conformance with CAN4-S104. All fire-rated doors shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated doors shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.10 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.

.2 Welded Stiffener Construction

.1 Both face sheets for exterior doors shall be formed from a sheet of 18 gauge steel.

.2 Both face sheets for interior doors shall be formed from a sheet of 18 gauge steel.

.3 Doors shall be reinforced with vertical stiffeners, securely welded to each face sheet at 150 mm (6") on center maximum.

.4 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.

3.0 EXECUTION

3.1 SITE STORAGE AND PROTECTION OF MATERIALS

.1 Doors and frame product shall be removed from their wrappings or coverings upon receipt on site, be stored in a vertical position, and be spaced with blocking to permit air circulation between them.

.2 All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported, in writing, to the supplier.

.3 All damages incurred during shipment shall be noted on the carrier's Bill of Lading and immediately reported, in writing, to the supplier.

.4 Any scratches or disfigurement of doors or frame product caused by shipping or handling shall be promptly cleaned and touched-up with a zinc-rich primer.

.5 All materials shall be properly stored on planks or dunnage, out of water and covered to protect from damage from any cause.

3.2 INSTALLATION

.1 Prior to installation, remove temporary shipping spreaders.

.2 Prior to installation, the area of floor on which the frame is to be installed, and within the path of the door swing, shall be checked and corrected for flatness.

.3 Door and frame product shall be checked for correct size, swing, rating and opening number.

.4 Caulk perimeter of frames between frame and adjacent material.

.5 Set frames plumb, square, level and at correct elevation.

.6 Fire-rated door and frame product shall be installed in accordance with the terms of their listings, NFPA-80, or the local Authority Having Jurisdiction (AHJ).

.7 Secure anchorages and connections to adjacent construction.

.8 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1200 mm (48") in width.

.9 During the setting of frame product, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

.10 Grout guards and junction boxes are intended to protect hardware mortises and tapped holes from masonry grout of 4 in. (101 mm) maximum slump consistency that is hand troweled in place.

.11 Frame products are not intended or designed to act as forms for grout or concrete. Grout hollow metal sections in "lifts" or take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.

.12 Keep hollow metal surfaces free of grout, tar, and/or other bonding materials or sealers. Promptly clean grout, tar, and/or other bonding materials or sealers off of frame product and doors.

.13 Remove wood spreaders after frames have been built-in.

.14 Make allowance for deflection to ensure structural loads are not transmitted to frame product.

.15 Install doors, and hardware in accordance with hardware templates and manufacturer's instructions.

.16 Adjust operable parts for correct clearances and function.

.17 Install louvers, glazing and door silencers.

.18 Finish paint in accordance with Section 09 91 00.

END OF SECTION

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements listed in Division 1.

.2 Furnish, deliver and install finish hardware.

.3 It is intended that the following list of hardware will cover finish hardware to complete the project. Bring to the Architect's attention any omissions, discrepancies that will affect work in this section during the bidding period.

1.2 QUALITY ASSURANCE

.1 Meet all requirements of the local building code and all other applicable regulations.

.2 Qualified suppliers must have in their employ a Certified A.H.C. (Architectural Hardware Consultant) as licensed by the Door and Hardware Institute. The supplier must have a minimum of two (2) years experience furnishing hardware for similar projects. Only firms that can extend manufacturers warranty to the project are to be considered as suppliers.

.3 Inspection of supplied Finishing Hardware will be done by a Certified A.H.C. A complete Site Inspection Report will be issued to the Architect.

1.3 SUBMITTALS

.1 Upon request, provide mounted samples of hardware items to be supplied.

.2 Prepare and submit two (2) copies of a detailed hardware schedule listing product numbers, size and finishes. Include two (2) sets of catalog cuts.

.3 Furnish other sections with two (2) complete sets of hardware templates for related fabricating and installation.

.4 Where electrical hardware is to be supplied, provide wiring diagrams showing all wire termination points. Where electrical hardware is to be supplied and installed provide the contractor with riser diagrams listing the correct wire runs and back box sizes as well as 115 VAC requirements.

.5 Where required in Division 1, provide two (2) operating manuals for the owners use. Include copies of the hardware schedule, templates, installation instructions and all maintenance data.

2.0 PRODUCTS

2.1 SEE HARDWARE SCHEDULE

3.0 EXECUTION

3.1 INSPECTION

.1 The consultant will inspect all the door openings to ensure the specified products are supplied and installed in accordance with the manufacturers instructions. A written report will be furnished to the Architect detailing openings where products are missing, installed incorrectly or in need of proper adjustment.

3.2 INSTALLATION

.1 The general contractor shall obtain a copy of ANSI/DHI A115.1G-94,"Installation Guide for Doors and Hardware". It is the intent of this document to be used as a reference guide in the proper handling, storage, and installation of finishing hardware, and doors and frames. This document can be obtained through the Door and Hardware Institute.

.2 Other trades installing hardware must follow all manufacturers instructions including door closer adjustment, handing of locksets as required, and degree of door swing. Advise the consultant if door frames are not square and plumb and prevent proper door hardware installation.

.3 Use only the original manufactures fasteners for the installation of all hardware products. Drill and tap doors and frames, where required, to properly install finishing hardware products.

.4 Mount hardware to suit door elevations. Unless otherwise directed by the consultant, install hardware at the following mounting heights:

Lockets	40”	(1015mm)
Exit device	40”	(1015mm)
Push/Pull	42”	(1065mm)
Deadlock	48”	(1200mm)

.5 Manufacturers of specified products are responsible to instruct hardware installers in the proper installation methods of their products.

3.3 FIELD QUALITY CONTROL

.1 Verify each door leaf opens closes and latches. Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements. Test access control system and electrified hardware devices for proper operation, owner to sign off on verification of operation. Verify electric door release hardware operates properly upon activation of the fire alarm system.

.2 Perform bi-monthly on-site inspections during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

.3 Before completion of the work but after the hardware has been installed, submit a certificate to the architect stating that final inspection has been made and that hardware has been checked for installation and operation by a technician from the manufacturer and hardware consultant

3.4 ADJUSTING AND CLEANING

.1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

.2 Adjust doors with self-closing devices or automatic closing devices for operation after the HVAC system is balanced and adjusted. Adjust spring power of non sized door closers to close and latch the door.

.3 Hardware to be left clean and free of disfigurements.

.4 Instruct owner personnel in the proper operation, adjustment and maintenance of hardware.

.5 Check locked doors against approved keying schedule.

3.5 PROTECTION

.1 Protect hardware from damage during construction. Wrap locks, panic hardware, and fire exit hardware, door pull trim with kraft paper or plastic bubble materials to protect finish from damage until date of substantial completion. Remove and reinstall or where necessary, use temporary hardware to maintain finish in new condition and maintain manufacturer’s warranty.

3.6 HARDWARE SCHEDULE

.1 See Drawings for Schedule of Finishing Hardware.

END OF SECTION

1.0 GENERAL

1.1 DESCRIPTION OF SYSTEM

.1 Non-load bearing steel framing includes non-load bearing steel studs framing members for interior framing systems (eg., partition walls, framed bulkheads, furring, etc.) as well as interior suspension systems (eg., supports for ceilings, suspended bulkheads, etc.).

.2 Lightweight Steel Framing includes Axial Load Bearing Studs where indicated.

1.2 REFERENCES

.1 CSA S136 North American Specification for the Design of Cold-Formed Steel Structural Members

.2 AISI North American Standard for Cold-Formed Steel Framing – Product Data.

.3 ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

.5 ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.6 ASTM A1003 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-coated for Cold-Formed Framing Members

.7 ASTM C645 Standard Specification for Nonstructural Steel Framing Members

.8 ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.9 ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.10 ASTM E413 Classification for Rating Sound Insulation

.11 ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

.12 ASTM E1190 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

.13 CAN/ULC S101 Standard Methods of Fire Endurance Tests of Building Construction and Materials

.14 CSSBI LSF Technical Bulletin Volume 7, Number 1 Maximum Height Tables for Interior Non-Load Bearing Partitions.

1.3 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non load bearing interior steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULS-S101.

.2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413.

.3 Retain a Professional Engineer registered in the province of Ontario to design the Lightweight Steel Framing System where indicated in drawings; to prepare, seal and sign all shop drawings; and to perform field review. Shop drawings shall show both design and installation requirements.

1.4 DESIGN CRITERIA

.1 Conform to the requirements of fire-rated assemblies as scheduled in drawings/details which have been tested in accordance with CAN/ULC-S101 and provide fire resistance ratings as indicated.

.2 For Interior non-load bearing studs, conform to minimum design thickness, web depth and flange width as outlined in CSSBI Maximum Height Tables for interior non-load bearing partitions.

.3 A non-load bearing (non-structural) member is defined as a member in a steel-framed system which is limited to transverse (out-of-plane) load of not more than 480 PA, a superimposed axial load, exclusive of sheathing materials, of not more than 1460 N/m, or a superimposed axial load of not more than 890 N.

.4 A load bearing (structural) stud may be used in a non-load bearing application; however, non-load bearing members (studs or track) may never be used in a load bearing (axial and/or wind loading) applications.

.5 Track for interior walls and non-load bearing walls located at exterior walls shall have a thickness of not less than the thickness of the corresponding studs and shall have not less than 31.8 mm flanges.

.6 Connections between light steel framing members shall be by sheet metal screws, welding or crimping.

.7 Load bearing assemblies/applications/details:

.1 Design shall be based on Limit States Design principles using factored loads and resistances.

.2 Loads and load factors shall be in accordance with the National Building Code of Canada.

1.5 SUBMITTALS

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

.2 Product data: For each product indicated.

.3 Submit shop drawings clearly indicating all construction details including connections and anchor requirements. Indicate type, size and spacing of fastening devices. Indicate design loads. Include seal and signature of Professional Engineer registered in the Province of Ontario for all components requiring structural design.

2.0 PRODUCTS

2.1 MATERIALS

.1 Non-load bearing Steel Framing, General

.1 Steel sheet components shall comply with ASTM C645 requirements for metal, unless otherwise indicated.

.2 Steel for non-load bearing members shall have metallic coatings that conform to ASTM A653M or ASTM A792M with minimum metallic coating weights (mass) of Z120 and AZM150 respectively. Alternative coatings shall be permitted to be used if proven to have equivalent corrosion protection.

.3 Framing members shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) for conditions indicated.

.2 Suspension System Components

.1 Tie wire shall comply with ASTM A641/A641M zinc-coated, soft-annealed, 1.21 mm minimum diameter, or of a material and size having equivalent corrosion resistance and strength.

.2 Hanger attachments to concrete: Anchors shall be fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 2 times that imposed by construction as determined by testing by an independent testing agency according to ASTM E488.

1. Type: Post-installed, expansion anchor

.3 Power-actuated fasteners, suitable for application indicated, shall be fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 2 times that imposed by construction as determined by testing by an independent testing agency according to ASTM E1190.

.4 Carrying Channels

.1 Channels shall conform to ASTM C754 and shall be cold-firmed from steel with minimum 228 MPa yield strength and 1.37 mm base steel thickness.
.2 Channels shall have a minimum coating of Z120 galvanizing in accordance with ASTM A653/A653M. Other coatings (eg. Aluminum-zinc alloy to ASTM A792/A792M) providing equal or better corrosion protection may also be used.
.3 Carrying channels shall have minimum 12.7 mm wide flanges and minimum depth of 38 mm.

.5 Furring Members

.1 Furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and with minimum 12.7 mm wide flanges and a depth of 19.1 mm.
.2 Steel stud shall be manufactured from steel in accordance with the AISI North America Standard for Cold-Formed Steel Framing

(Product Data) and shall have a minimum base Steel thickness of 0.455 mm and depth as indicated on drawings

.3 Hat-shaped, rigid furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and minimum depth of 22.2 mm. The minimum width of furring attachment flanges shall be 12.7 mm.

.4 Resilient furring channels are designed to reduce sounds transmission and shall have a minimum depth of 12.7 mm.

.6 Steel Framing for Framed Assemblies

.1 Steel studs and track shall be in accordance with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have minimum base steel thickness of 0.455 mm and a depth as indicated on drawings.

.2 Slip-Type Head Joints: Where indicated, provide one of the following:

1. Deflection Track: steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and width to accommodate depth of studs.
2. Single Long-Leg Track: track complying with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) with 50.8 mm deep flanges in thickness not less than indicated for studs, installed with studs frication-fit into top track and with continuous bridging located within 305 mm of the top studs to provide lateral bracing.
3. Double-Track System: track complying with AISI North American Standard for Cold-Formed Steel Framing (Product Data), inside track with 50.8 mm deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction fit inside track.

.3 Flat Strap and Backing Plate

1. Sheet steel for blocking and bracing in length and width indicated
2. Minimum base steel thickness is 0.455 mm.

.4 Channel bridging shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm with minimum 12.7 mm wide flanges and depth of 19.1 mm.

.5 Hat-shaped, rigid furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have minimum base steel thickness of 0.455 mm, a minimum depth of 22.2 mm. The minimum width of furring attachment flanges shall be 12.7 mm.

.6 Resilient furring channels are designed to reduce sound transmission and shall have a minimum depth 12.7 mm.

.7 Furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and with minimum 12.7 mm wide flanges and a depth of 19.1 mm.

1. Furring Brackets: adjustable, corrugated-edge of steel sheet with minimum base steel thickness of 0.79 mm.
2. Tie wire shall comply with ASTM A641/A641M zinc-coated, soft-annealed, 1.21 mm minimum diameter, or of material and size having equivalent corrosion resistance and strength.

.8 Z-shaped Furring: with slotted web or non-slotted web, face flange of 31.8 mm, wall attachment flange of 22.2 mm, and depth steel thickness of 0.455 mm, and depth required to fit insulation thickness indicated.

.9 Fasteners for Metal Framing: of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates in accordance with ASTM C1002.

.10 Isolation strip at exterior walls: provide one of the following:

1. Asphalt-saturated organic felt: ASTM D226, Type 1 (no. 15 asphalt felt), perforated.
2. Foam gasket: adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

3.0 EXECUTION

3.1 EXAMINATION

.1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

.1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Suspended Assemblies: coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangars at spacing required to support the work and that hangars will develop their full strength.

.1 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

.2 Coordination with Sprayed Fire-Resistive Materials

.1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling track to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 600 mm o.c.

.2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

.1 Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

.1 Gypsum Plaster Assemblies: also comply with requirements in ASTM C841 that apply to framing installation.

.2 Portland Cement Plaster Assemblies: also comply with requirements in ASTM C1063 that apply to framing installation.

.3 Gypsum Veneer Plaster Assemblies: also comply with requirements in ASTM C844 that apply to framing installation.

.4 Gypsum Board Assemblies: also comply with requirements in ASTM C840 that apply to framing installation.

.2 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

.3 Install bracing at terminations in assemblies.

.4 Do not bridge building control and expansion joints with non-load bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

.1 Install suspension system components in sizes and spacings indicated on drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

.2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

.3 Suspended hangers from building structure as follows:

.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

1. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

.2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

1. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

.3 Wire Hangers: secure by looping and wire tying, either directly to structure or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

.4 Do not attach hangers to steel roof deck unless otherwise approved.

.5 Do not attach hangers to permanent mental forms. Furnish cast-in-place hanger inserts that extend through forms.

.6 Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

.7 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.4 For fire-resistance-rated assemblies, wire tie furring channels to supports.

.5 Installation Tolerances: install suspension systems that are level to within 3 mm in 3.6 m measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

.1 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

.2 Install studs so flanges within framing system point in same direction.

.1 Space studs as follows:

1. Single-layer application: 406 mm o.c., unless otherwise indicated.
2. Multilayer application: 406 mm o.c., unless otherwise indicated.
3. Tile backing panels: 406 mm o.c., unless otherwise indicated.

.3 Install track floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions of structure.

.1 Slip-Type Head Joints: where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies die to deflection of structure.

.2 Door Openings: screw vertical studs at jambs to jamb anchor clips to door frames; install track section (for cripple studs) at head and secure to jamb studs.

.1 Install two studs at each jamb, unless otherwise indicated
.2 Install cripple studs at head adjacent to each jamb stud, with a minimum 12.7 mm clearance from jamb stud to allow for installation of control joint in finished assembly.

.3 Other Framed Openings: frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

.4 Fire-Resistance-Rated Partitions: install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

.5 Sound-Rated Partitions: install framing to comply with sound-rated assembly indicated.

.4 Direct Furring

1. Screw to wood framing
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 610 mm o.c.

.5 Z-Furring Members

1. Erect insulation as specified and hold in place with Z-furring members spaced 610 mm o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 610 mm o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior

corners, space second member no more than 305 mm from corner and but insulation to fit.

.6 Installation Tolerance: install each framing member so fastening surfaces vary not more than 3 mm from the plane formed by faces adjacent framing.

END OF SECTION

1.0 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C1396 Standard Specification for Gypsum Board

.2 ASTM C 475-94, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C 514-94, Specification for Nails for the Application of Gypsum Board.

.4 ASTM C 557-93a, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.5 ASTM C 840-95, Specification for Application and Finishing of Gypsum Board.

.6 ASTM C 954-93, Specification for Steel Drill Screws for the Application of Gypsum Board.

.7 ASTM C 1047-94, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.8 ASTM C1177-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

.9 ASTM C1178M -08, Standard Specification for Coated Glass Mat Water Resistant Gypsum Backing Panel

.10 ASTM C1658-06, Standard Specification for Glass Mat Gypsum Panels

.11 ASTM C1629M-06, Standard Classification for Abuse Resistant Non Decorated Interior Gypsum Panel Products and Fiber Reinforced Cement Panels

.12 ASTM D3273-00, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

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

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-1988, Building Materials and Assemblies, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.2 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10C, maximum 21C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

2.0 PRODUCTS

2.1 MATERIALS

.1 **Standard Gypsum Board: to ASTM C1396, Type X, 15.9mm (5/8" thick, 1200mm (4'-0") wide x maximum practical length.**

.2 **Cement Board to ASTM C1325, 15.9mm (5/8") thick, 1220mm (4'0") wide x maximum practical length. Use throughout all washroom/shower locations scheduled to receive full height FRP panel finish.**

.3 **Abuse Resistant Gypsum Board; Heavy duty glass mat facers with dense water resistant treated gypsum core to ASTM C1658 and ASTM C1629, Type X, 15.9mm (5/8") thick, 1220mm (4'0") wide x maximum practical length. Score of 10 (no mould growth) as per ASTM D3273). Provided to 1220mm (4'-0") above finished floor at all areas not scheduled to receive FRP Wainscotting.**

.4 Steel drill screws: to ASTM C 1002.

.5 Stud adhesive: to CAN/CGSB-71.25 ASTM C 557.

.6 Laminating compound: as recommended by manufacturer, asbestos-free.

.7 Shadow gap: Bailey D300 Metal trim, CGC Dur-a-bead or Nicolson Rollforming No 114, fillable edge trim, 0.55mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A 525-93; perforated flanges; one piece length per location. To be used at the junction of all dissimilar materials and/or as detailed.

.8 Corner bead: Bailey D100-90, 90-degree corner trim fillable edge trim, 0.55mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A 525-93; perforated flanges; one piece length per location.

.9 Control joints: No 093 Zinc Control Joints by CGC Inc or Nicholson Rollforming. To be installed where indicated on drawings.

.10 Sealants: in accordance with Section 07 90 00 - Joint Sealers.

.11 Acoustic sealant: concealed purpose made, non-skinning, non hardening type to CAN/CGSB-19.21-M87, as manufactured by Tremco or Monsey-Bakor, USE Hickson

.12 Sound attenuation insulation (acoustic batt insulation type 'C')

.1 Mineral or fiberglass sound attenuation batt or boards to ULC S702 and as required by fire rated tests.

.2 Thickness: full stud thickness or as otherwise stated on the Drawings and Schedule.

.13 Joint compound: to ASTM C 475, asbestos-free. Latex resin base, possessing good adhesion, mixed with fresh, unadulterated water having no detrimental effects on compounds. Type recommended by manufacturer for application indicated.

.14 Joint reinforcing tape; for gypsum board; 50mm (2") x 0.3mm (0.01") thick perforated paper with chamfered edges. **Use alkali resistant glass-fiber tape at cement board locations**.

.15 1 hour rated walls to be filled with absorptive material processed from rock or slag with a mass of at least 2.8 kg/m^2 for 89mm thickness and completely filling the wall cavity.

3.0 EXECUTION

3.1 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C 1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.10 Install wall furring for gypsum board wall finishes in accordance with ASTM C 840, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.2 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply 12 mm (1/2") diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts in partitions where perimeter sealed with acoustic sealant.

3.3 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Miter and fit corners accurately, free from rough edges. Secure at 150mm o.c. using contact adhesive for full length.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers

.6 Construct control joints of preformed units two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints

.8 Locate control joints where indicated at changes in substrate construction at approximate 10m spacing on long corridor runs at approximate 15m spacing on ceilings.

.9 Install control joints straight and true

.10 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true

.12 Splice corners and intersections together and secure to each member with 3 screws.

.13 Install access doors to electrical and mechanical fixtures specified in respective Sections.

.1 Rigidly secure frames to furring or framing systems.

.14 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces

.15 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.16 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.17 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.18 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.19 Mix joint compound slightly thinner than for joint taping.

.20 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.21 Allow skim coat to dry completely for walls receiving high gloss paint and where indicated.

.22 Fasten board to metal support members by metal gypsum board screws at, 9.5mm (0.374") minimum to, and 12.7mm (1/2") maximum from, center of joints. Space screw:

.23 Fasten board to metal support members by metal gypsum board screws at, 9.5mm (0.374") minimum to, and 12.7mm (1/2") maximum from, center of joints. Space screw:

.1 At ceilings of fire rated board at 200mm (8") o.c. at edges and in field unless indicated otherwise.

.2 At walls of fire rated board at 200mm (8") o.c. at edges and 305mm (12") o.c. in field Locate screws opposite one another in adjacent panels unless indicated otherwise.

.3 At typical board walls at 400mm (16”) o.c. at edges and field unless noted otherwise.

.4 At typical board ceilings at 305mm (12”) o.c. at edges and field unless noted otherwise.

.24 When installing fiberglass mat faced mould and moisture resistant gypsum board, do so as per manufacturers recommendations. Tape joints with self adhesive fiberglass tape and embed the tape in setting type compound. Finish joint with two layers of all purpose joint compound. High build primer should be applied to surface before painting. As with regular paper faced gypsum board, in areas where gloss paint is to be applied or in areas of critical light a skim coat should be applied to the surface before priming and painting.

END OF SECTION

1.0 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM F 2195 Standard Specification for Linoleum Tile Floor Covering.

.2 ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.3 ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

.4 ASTM F 1861 Standard Specification for Rubber Wall Base.

.5 ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.6 ASTM F 1482 Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.

.7 ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

.8 ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

.9 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

.10 ASTM E 492 Standard Test Method for Laboratory Measurement of lmpact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine.

.11 ASTM E 989 Standard Classification for Determination of lmpact lnsulation Class (llC).

1.2 SUBMITTALS

.1 Product Data: Submit manufacturer's current printed Product literature, Specifications, installation instructions, and field reports in accordance with Section 01 33 00 – Submittals.

.2 Shop Drawings: Submit Shop Drawings to indicate materials, details, and accessories in accordance with Section 01 33 00 – Submittals.

.3 Samples: Submit duplicate sample pieces of rubber wall base material.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data and warranty for rubber wall base for incorporation into manual specified in Section 01 77 00 – Contract Close-Out.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Installer experienced in performing Work of this section who has specialized in installation of Work similar to that required for this Project.

.1 Engage installer certified by flooring manufacturer

.2 Certificate: Submit certificate indicating installer qualification.

.2 Mock-Ups: Install at Project site a job mock-up using acceptable Products and manufacturer approved installation methods. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and Workmanship standard. Comply with Division 1 Quality Control Section.

.1 Mock-Up location as directed by Consultant.

.2 Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 General: Comply with Division 1 Product Requirements Sections.

.2 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

.3 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.4 Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.1 Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68º F (20º C) for at least 48 hours prior to the installation.

1.6 PROJECT CONDITIONS

.1 Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive flooring should be clean, fully enclosed and weathertight. The permanent HVAC must be fully operational, controlled and set at a minimum of 68º F (20º C) for a minimum of seven days prior to, during, and seven days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.

.2 Temperature Requirements: Maintain air temperature in spaces where Products will be installed for time period before, during, and after installation as recommended by manufacturer.

.1 Temperature Conditions: 68º F (20º C) for a minimum of seven days prior to, during, and seven days after the installation.

1.7 SEQUENCING AND SCHEDULING

.1 Finishing Operations: Install rubber wall base after finishing operations, including painting and ceiling operations, have been completed.

1.8 WARRANTY

.1 Project Warranty: Refer to "Conditions of the Contract" for Project warranty provisions.

.2 Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

.1 Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.9 MAINTENANCE

.1 Extra Materials: Deliver to Owner extra materials from same Production run as Products installed. Package Products with protective covering and identify with descriptive labels. Comply with Division 1 Contract Close-Out (Maintenance Materials) Section.

.1 Quantity: Furnish quantity of flooring units equal to 5% of amount installed for each colour/pattern. Extra material to be Provided from same dye lot as installed material.

.2 Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

2.0 PRODUCTS

2.1 RUBBER WALL BASE (RB)

.1 Rubber thermoplastic wall base to ASTM F1861 consisting of a blend of a thermoplastic and rubber backing covered with a durable colored top layer

.1 Type: rubber (100% PVC free, phthalate free and Red list chemical free).

.2 Dimensions: 63.5mm high x 6.4mm thick x 2440mm lengths

.3 Surface burning: Class A per ASTM E84/NFPA 253, FSR 50/SDS 175 per CAN/ULC-S102.2

.4 Colour: To be determined by Consultant from full colour range.

.5 Acceptable Products: Canada Base 410 by Canada Base Company or equivalent per 01 25 13.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's Product data, including Product technical bulletins, Product catalog installation instructions, and Product carton instructions for installation.

.2 Verify spacing of plumbing fixtures and toilet compartments that affect installation of toilet room accessories.

3.2 EXAMINATION

.1 Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for Product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test).

.2 Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed.

3.3 PREPARATION

.1 Adjacent Surfaces Protection: Protect adjacent Work areas and finish surfaces from damage during Product installation.

.2 Surface Preparation:

.1 Mechanically remove all surface contaminants such as paint, oil, grease, varnish, adhesive as well as various other products such as treatment compounds.

3.4 INSTALLATION: BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

.8 Heat weld base in accordance with manufacturer's printed instructions.

3.5 CLEANING

.1 Cleaning: Remove temporary coverings and protection of adjacent Work areas. Repair or replace damaged installed Products. Clean installed Products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from Project site and legally dispose of debris.

.1 Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.

.2 Sweep and vacuum floor after installation.

.3 Do not wash floor until after time period recommended by flooring manufacturer.

.4 Damp mop flooring to remove black marks and soil.

3.6 PROTECTION

.1 Protection: Protect installed Product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion

3.7 MAINTENANCE PROCEDURES

.1 General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Seamless, resinous, waterproof, decorative, brightly coloured quartz broadcast aggregate, epoxy floor system with integral cove base.

1.2 SUMMARY

.1 Definitions: Resinous epoxy flooring system includes a penetrating, two component primer, free flowing epoxy formulation including resin, hardener and reactive flow enhancers, brightly colored, quartz silica aggregate broadcast and a two-component, high performance, UV resistant, clear epoxy sealer.

1.3 SUBMITTALS

.1 Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with project requirements.

.2 Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring material required, applied to a rigid backing, in color and finish indicated.

.1 For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

1.4 QUALITY ASSURANCE

.1 Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, aggregates, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity.

.2 Pre-Installation Conference

.1 General contractor shall arrange a for flooring manufacturer/installer representative to attend a regularly scheduled site meeting not less than thirty days prior to starting work to review site conditions and project installation with Owner and Consultant.

.3 ISO 9001: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

.2 All materials used shall be factory blended and packaged in single, easy to manage batches to eliminate on site blending errors. Only the on-site weighing of catalyst will be allowed.

.3 Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85°F/16 and 30°C.

1.6 PROJECT CONDITIONS

.1 Concrete or masonry substrates shall be properly cured for a minimum of 30 days and shall be tested to ensure relative humidity or water vapour emission rates are in accordance with Manufacturer's recommendations. A vapor barrier or exterior applied waterproofing membrane must be present for concrete slabs below grade.

.2 Utilities, including electric, water, heat (air temperature between 32 and 85°F/0 and 30°C) and finished lighting to be supplied by General Contractor.

.3 Job area to be free of other trades during, and for a period of 4 hours, after flooring system installation.

.4 Protection of finished flooring system from damage by subsequent trades shall be the responsibility of the General Contractor.

1.7 WARRANTY

.1 Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

2.0 PRODUCTS

2.1 RESINOUS FLOORING SYSTEM

.1 5 mm thick, 100% solids, decorative, quartz aggregate broadcast flooring system with integral cove base comprised of an epoxy primer, mortar base, undercoat, broadcast media and epoxy sealer.

.2 Physical Properties: Provide flooring system in which minimum physical properties of the complete system, including primers, fillers, aggregates, and sealers, and when tested in accordance with standards or procedures referenced below, are as follows:

Compressive Strength (ASTM C-579)	10,000 psi
Tensile Strength (ASTM D-638)	2,000 psi
Flexural Strength (ASTM C-580)	4,000 psi
Hardness (ASTM D-2240, Shore D)	85-90
Impact Resistance (ASTM D-2794)	>160 in·lbs
Abrasion Resistance (ASTM D-4060, CS-17, 1 kg Load, 1,000 cycles)	0.06 gm max. weight loss
Bond Strength (ASTM D-7234) (100% concrete failure)	>400 psi
Heat Resistance Limitation	140oF/60oC (for continuous exposure) 200oF/93oC (for intermittent spills)
Slip Resistance Index (ASTM F-1679, when tested wet)	0.90
Water Absorption (ASTM C-413)	0.1%

.3 Acceptable Manufacturers/Products:

.1 Sikafloor Quartzite HDB System as distributed by Sika (including Sikafloor-156^{CA}, Sikafloor Aggregate PT, Sikafloor Broadcast Quartz Aggregate, and Sikafloor-2002)

.2 Equivalent products per Specification 01 25 13.

.4 Colour/Pattern:

.1 To be selected by Consultant from full manufacturer colour range.

2.2 GROUT (SLOPE TO DRAIN)

.1 A fast setting epoxy-based grout used to build up floor levels and slopes to drain as indicated on drawings/details.

.2 Acceptable product: Sikafloor-156^{CA} screed mortar manufactured by Sika, or equivalent products per Specification 01 25 13.

2.3 WATERPROOF MEMBRANE

.1 Acceptable product: Sikalastic-390 Membrane or equivalent products per Specification 01 25 13.

2.4 ACCESSORIES

.1 Joint Sealant: Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated. Allowances should be included for Sikaflex-1c SL joint fill material, and Sikaflex Concrete Fix concrete crack treatment.

.2 Primer: As recommended by manufacturer.

.3 Patching compound: As recommended by manufacturer.

3.0 EXECUTION

3.1 PREPARATION

.1 Concrete Substrate: Concrete preparation shall be by mechanical means and may include use of diamond grinder, sander, shotblast method and / or other mechanical means for removal of bond inhibiting materials such as curing compounds, dust,

form release agents or laitance. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

.2 Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

.3 Verify that concrete substrates are dry.

.1 Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75 percent.

.2 Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. of slab in 24 hours.

.3 Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

.4 Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

3.2 APPLICATION

.1 General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic surface of thickness indicated, uninterrupted except at expansion joints or other types of joints (if any), indicated or required.

.2 Primer: Mix and apply primer over properly prepared substrate throughout all areas required by resinous flooring system in strict adherence to manufacturer's installation procedures and coverage rates.

.3 Mortar (Sloped to drain): Spread and compact mortar system with 3” x 12” steel finishing trowel producing slope as indicated on drawings.

.4 Waterproof Membrane: apply waterproof membrane with a notched squeegee to a uniform dry film thickness of 500-625 microns (20-25 mil), and/or as per manufacturers written instructions.

.5 Cove Base: Mix material according to manufacturer's recommended procedures. Apply cove base material immediately after mixing using preformed cove trowels

to a height of 150mm (6") where indicated on the room finish schedule/details, before applying flooring. Cove base shall be finished smooth and free of all possible waves, undulations, and other surface defects. Minor imperfections shall be mechanically removed prior to application of topcoat.

.6 Undercoat: Mix material according to manufacturer's recommended procedures. Apply undercoat material immediately after mixing using squeegees or premium nap rollers. Coloured, quartz aggregate shall be broadcast into the wet undercoat until refusal. Excess aggregate shall be removed following appropriate cure time. Strict adherence to manufacturer's coverage rates shall be maintained.

.7 Topcoat: Apply topcoat(s) and sealer in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer. Strict adherence to manufacturer's coverage rates shall be maintained.

3.3 TERMINATIONS

.1 Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.

.2 Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

.3 Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

.4 Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

.1 Treat control joints to bridge potential cracks and to maintain monolithic protection.

.2 Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

.3 Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

.1 The right is reserved to invoke the following material testing procedure(s) at any time, and any number of times during period of flooring application.

.2 The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

.3 Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

.4 The General Contractor shall engage service of an independent coating inspector to perform core tests to verify installation thickness meets the requirements of the specification. Installer shall repair to the Architect’s satisfaction any damage in the flooring system.

.5 If test results show materials being used do not comply with specified requirements, flooring contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials

3.6 CURING, PROTECTION AND CLEANING

.1 Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours after application.

.2 Protect flooring system from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor shall be responsible for protection and cleaning of surfaces after final coats.

.3 Cleaning: Remove temporary covering and clean resinous flooring system prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring system manufacturer. General Contractor shall be responsible for cleaning of the surfaces prior to inspection.

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

.1 This section includes labor, materials and other services necessary to complete vinyl wall coverings.

.2 Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 REFERENCES

.1 General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

.2 American Society for Testing & Materials (ASTM):

.1 AST ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 ASTM D5420 Gardner Impact Exceeds 160 inch pounds

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements: Provide hygienic wall covering which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

.2 Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:

.1 Submit a layout diagram indicating the location of each panel and joining method.

.3 Samples: Provide 3no 6”x6” samples of material in each colour/texture.

.4 Quality Assurance Submittals: Submit the following:

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.

.5 Closeout Submittals: Submit the following:

.1 Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

.2 Warranty: Warranty documents specified herein

1.4 SUBMITTALS

.1 Product Data: Submit manufacturer's current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01 33 00 - Submittal Procedures including but limited to the following:

.1 Submit a layout diagram indicating the location of each panel and joining method.

.3 Samples: Provide 3no 6"x6" samples of material in each colour/texture.

.4 Quality Assurance Submittals: Submit the following:

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties

.2 Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.

.5 Closeout Submittals: Submit the following:

.1 Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

.2 Warranty: Warranty documents specified herein

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

.2 Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.

.1 Mock-Up Size: 4' x 8'

.2 Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

.3 Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE & HANDLING

.1 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

.2 Deliver, store and handle panels in accordance with Section 01 61 00 – Material and Equipment.

.3 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.4 Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

.5 Store panels in temperature-controlled environments. Leave protective blue film on panel until ready to use.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Deposit all packaging materials in appropriate container on site for recycling or reuse.

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Keep all discarded packaging away from children.

1.8 PROJECT CONDITIONS

.1 Temperature Requirements: If storage temperature is below 65F (18C), hygienic wall panels must be moved to a warmer place and allowed to reach this temperature before installation. For further information, refer to manufacturers current Installation Guide.

.2 Maintain air temperature and structural base temperature at installation area between 65F (18C) and 80F (26C) for 48 hours before, during and 24 hours after installation.

1.9 WARRANTY

.1 Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

.2 Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

.3 Warranty Period for Hygienic Wall Panels shall be 10 years commencing on Date of Substantial Completion.

1.10 EXTRA MATERIALS

.1 Provide extra materials of product and adhesives in accordance with Section 01780 - Closeout Submittals.

.2 Provide 64sqft (6m2) of extra materials in one piece and from same production run as installed materials (for each colour/texture scheduled).

.3 Clearly identify each wall panel and each container of adhesive.

.4 Deliver to Owner, upon completion of the work of this section and store where directed.

2.0 PRODUCTS

2.1 MATERIALS

.1 100% pure vinyl, extruded, homogenous, semi-rigid PVCu sheet containing no plasticizers or fillers. Acceptable Manufacturers:

.1 Whiterock as manufactured by Altro

.2 Equivalent products as per Specification 01 25 13.

.2 Panels

.1 Thickness: 0.10" (2.5 mm); Panel Width: 4’ (1.22m) Panel Height: Either 8’ or 10’ (2.5m or 3m); Weight 4’x8’ Panel: 24 lbs (10.4 kg) Weight 4’x10’ Panel: 29 lbs (12.7 kg).

.1 Colour: to be selected by Consultant from Standard Colour range. Allow for 1 field colour and 3 accent colours.

2.2 ACCESSORIES

.1 Vinyl welding rod: Acceptable material:

.1 Altro weld rod

.2 Joint Strips/Accessories:

.1 1-Part Stainless Steel Joint Strip – A855 Brushed Steel

.2 1-Part Transition Strip –G832

.3 1-Part Start and Edge Trim – G833

.4 Stainless Steel Capping – [A865 Brushed Steel] Length 8’

.3 Acrylic Adhesive: For dry, climate controlled areas, use AltroFix W49, a one-part, water-based, acrylic adhesive as recommended by manufacturer.

.4 Polyurethane Adhesive: The default adhesive for most installations, suitable for wet area, non-climate controlled areas, and non-absorbent surfaces, use AltroFix W39, a two-part resin-based polyurethane adhesive as recommended by manufacturer. Provide written confirmation adhesive is compatible with liquid applied waterproof membrane as per item 5 below.

.5 Acrylic polymer based, liquid applied elastomeric waterproof membrane (to be applied to tile backer substrate at washroom/shower areas): Liquid Waterproofing Membrane by USG Durock or equivalent.

.6 Caulking and Sanitary Sealant:

.1 Altro Sanitary Sealant Sealant, Colour: to be selected by Consultant

2.3 SOURCH QUALITY

.1 Source Quality: Obtain wall products from a single manufacturer.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions and product label instructions for installation.

3.2 EXAMINATION

.1 Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 SUBSTRATE PREPARATION

.1 Walls should be smooth and level. High points must be removed and low points filled with filler intended for the substrate and environmental conditions.

.2 Wall tiles must be fixed firmly to the wall. As long as the tile edges do not protrude you do not have to skim grout joints.

.3 Surfaces must be permanently dry and free from all substances that may contribute to adhesive bond failure.

.4 Remove loose paint and conduct an adhesive bond test with paint.

.5 Exterior walls must be adequately damp-proofed and insulated.

.6 Dry wall substrates should be paint ready.

.7 Apply liquid waterproof membrane where scheduled.

3.4 PREPARATION

.1 All surfaces must be free from dust and cleaned prior to installation. The working environment must also be dust free. Failure to comply with these conditions will reduce the bond strength between the adhesive and substrate which may cause panels to de-bond.

.2 Very absorbent / porous substrates (particularly plaster finishes and unprimed sheetrock) must have a proprietary sealer e.g. PVA primer or similar, applied to the surface a minimum of 12 hours prior to the installation.

.3 All electrical switches, power points etc., should be in a first fix / installation state. All electrical equipment should only be moved or altered by a qualified electrician.

.4 All plumbing should have pipe-work removed to a first fix or installation state and "tails" left protruding from the substrate. Panels can then be drilled and slid over the pipe tails. All holes should be drilled 1/8" (3mm) oversize to allow for expansion, then sealed with Mastic caulking. Plumbing should always be done by a qualified plumber.

.5 Hot pipes and steam pipes should be insulated and a 1/8" to 1/4" (3-6mm) expansion gap should be created when installing panels around these pipes, then sealed with Mastic caulking.

.6 All pipes, fixing bolts, etc. extending through the panels should have a minimum 1/8" (3mm) expansion gap and be sealed using Mastic caulking.

.7 If fitting to door frames, these must be in place prior to installation of panels.

.8 Prior to installation, it is advisable to complete any painting which comes in contact with panels, as sealant used at junctions is non-paintable.

.9 Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to the prevailing operational conditions

.10 The panels must be stored on a level flat surface off the ground (risk of condensation on the panels if stored on damp surfaces). Storage on uneven surfaces could cause the panels to distort prior to installation.

.11 First, check the room using a 6' (2 m) level to ensure all walls are flat, paying particular attention to the corners, window reveals, and door entrances. These need to be inspected to ensure they are free of any debris or irregularities, which could prevent the panels laying flat to the substrate after the adhesive has been applied and the panel installed.

3.5 INSTALLATION

.1 **Heat Weld System installation shall be provided throughout**. Install panels in accordance with the manufacturers current published Installation Guide. All joints should be joined by Heat Weld Application methods as detailed in manufacturers installation guide.

3.6 FIELD QUALITY REQUIREMENTS

.1 Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.1 Site Visits: 1

3.7 CLEANING

.1 Panels can be cleaned with a diluted soap/detergent solution, such as Altro 44 Cleaner.

.2 When cleaning the panel surface, we recommend the temperature of water does not exceed 140° F (60° C).

.3 Pressure cleaning with hot water may be used with the pressure nozzle a minimum of 2 feet (600mm) away from the surface.

.4 To reduce the buildup of static, cleaning the panels with an anti-static solution is recommended.

.5 Stubborn stains use AltroClean 44 cleaner or equivalent alkaline cleaner.

.1 Remove construction debris from project site and legally dispose of debris.

3.8 PROTECTION

.1 Do not install near open heat sources (ovens, etc). Stainless steel panels should be used in such areas.

END OF SECTION

1.0 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittals.

.2 Section 01 61 00 – Material and Equipment.

.3 Section 01 77 00 – Contract Close-Out.

1.2 REFERENCES

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Conform to latest MPI requirements for interior painting work including preparation and priming

.4 Materials primers, paints, fillers, thinners, solvents, etc. shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.

.7 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.

1.5 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Consultant for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Consultant for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.6 QUALITY CONTROL

.1 When requested by Consultant prepare and paint designated surface, area, room or item in each colour scheme to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.7 DELIVERY, HANDLING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Material and Equipment.

.2 Labels shall clearly indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Compliance with applicable standard.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in a well ventilated area with temperature range 7 C to 30 C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

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

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

1.8 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces

.2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Contractor and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

1. Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 C.

.2 Substrate temperature is over 32 C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is less than 3 C variance between the air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

2. Perform no painting work when the maximum moisture content of the substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block

.2 15% for wood.

.3 12% for plaster and gypsum board.

3. Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

4. Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:

.1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected

1.9 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Section 01 77 00 – Contract Close-Out.

.2 Submit – (one) four litre can of each type and colour of primer, stain, and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

2.0 PRODUCTS

2.1 MATERIALS

.1 Paint and fillers shall be manufacture's premium quality, of type and brand herein specified and listed under "Paint Product Recommendations" premium grade as covered in the association manual, latest edition, for specific uses and only as supplied by **Pratt & Lambert Co., Benjamin Moore & Co., Para Paints Canada Inc., ICI Paints (Canada) Inc, (Glidden), Sherwin Williams Canada Inc., Pittsbugh Paints**. Paint material such as linseed oil, shellac, turpentine and the like, and any of the materials not specifically mentioned herein but required for first class work with finish specified shall be highest quality product of approved manufacturer. Where specific products are indicated in painting schedule, use product manufacturer as specified.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with "Environmentally Friendly" rating are acceptable for use on this project.

.4 Water-borne surface coatings must be manufactured and transported in a manner that steps of process, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.5 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.6 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.0 C or greater.

.7 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

.1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.8 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" rating.

.9 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.

.10 Recycled water-borne surface coatings must not contain:

.1 Lead in excess of 600.0 ppm weight/weight total solids.

.2 Mercury in excess of 50.0 ppm weight/weight total product.

.3 Cadmium in excess of 1.0 ppm weight/weight total product.

.4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.

.5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.11 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

.1 Consultant will provide Colour Schedule after Contract award.

.2 Interior Colours will be based upon the selection of two (2) base colours and three (3) accent colours. No more than eight colours will be selected for the entire project and no more than three colours will be selected in each area. Include for 25% dark tones.

.3 Selection of colours will be from manufacturers full range of colours.

.4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.5 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Consultant's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte of Flat finish	0 to 5	10 max
G2	Velvet Finish	0 to10	10 to 35
G3	Eggshell Finish	10 to 25	10 to 35
G4	Satin Finish	20 to 35	35 min
G5	Semi-Gloss Finish	35 to 70	
G6	Gloss Finish	70 to 85	
G7	High Gloss Finish	➢ 85	

.2 Gloss level ratings of painted surfaces shall be as specified herein and as noted on Finish Schedule.

2.5 INTERIOR PAINTING SYSTEMS

.1 Plaster and Drywall: Int 9.2A Latex (G3) finish over latex sealer.

.2 Plaster and Gypsum Board Ceilings: Int 9.2A Latex (G1) finish over latex sealer.

.3 Wood trim: Int 6.4A (G5) finish over alkyd sealer.

.4 Concrete Unit Masonry: PT: Int 4.2A Latex (G3) finish.

.5 Structural steel & metal fabrications: Int 5.1E (G5) finish.

.6 Galvanized metal/zinc coated steel: Int 5.3L (G5) finish.

.7 Use fire retardant paint on fire rated plywood sheets behind electrical panels.

All Finishing System Codes are from the Ontario Painting Contractors Association.

3.0 EXECUTION

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

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

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, Plaster and Gypsum Board: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Wood: 15%.

3.3 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Consultant.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants and general public in and about the building.

.5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.

.6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Consultant.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 Do not apply paint until prepared surfaces have been accepted by Consultant.

3.5 APPLICATION

.1 Method of application to be as approved by Consultant. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Consultant.

.4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.6 Sand and dust between coats to remove visible defects.

.7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges and behind wall mounted items.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red, if required.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

.1 Advise Consultant when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.8 RESTORATION

.1 Clean and re-install all hardware items removed before undertaking painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

1.0 GENERAL

1.1 SUMMARY

.1 This section includes toilet and bath accessories in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:

.1 Surface, partition and recessed mounted toilet and bath accessories indicated on the Drawings and Schedules.

.2 Related work:

.1 Wall backing required to secure accessories

.2 Glazing

.3 Unit masonry

.4 Gypsum wallboard systems

.5 Plumbing fixtures

.6 Countertops

1.2 SUBMITTALS

.1 Comply with requirements of Section 01 33 00 – Submittals.

.2 Provide required number copies of:

.1 Product data sheets.

.2 Installation instructions.

.3 Service and parts manual.

1.3 WORK INCLUDED

.1 Toilet Room Accessories

1.4 REFERENCES (INCLUDING BUT NOT LIMITED TO)

.1 Ontario Building Code (latest edition)

.2 City of Toronto Barrier Free Design Guidelines (latest edition)

1.5 QUALITY ASSURANCE

.1 Model numbers for toilet room accessories manufactured by Frost Products Limited, are listed to establish a standard of quality for design, function, materials, workmanship, and appearance. The following manufacturers may be submitted for evaluation by the architect by following the conditions of the Alternatives Section 01 25 13. The architect shall be the sole judge as to the acceptability of all products submitted for substitution.

.1 Bobrick Washroom Equipment, Inc.

.2 American Specialties, Inc.

.3 Bradley

.2 Accessories with tumbler locks shall be keyed alike with the exception of coin boxes in vending equipment.

.3 Regulatory Requirements

.1 Operation of accessories shall comply with guidelines set forth by the Ontario Building Code and the City of Toronto Barrier Free Design Guideline. Documentation and samples to be provided to architect upon request.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 Deliver items in manufacturer's original unopened protective packaging.

.2 Store materials in original protective packaging to prevent physical damage or wetting.

.3 Handle so as to prevent damage to accessories.

1.7 WARRANTY

.1 Furnish one year guarantee against defects in material and workmanship on all accessories.

.2 In addition to the above the following shall apply:

.1 Welded stainless steel framed mirrors shall have a fifteen year guarantee against silver spoilage.

2.0 PRODUCTS

2.1 TOILET ROOM ACCESSORIES SCHEDULE

.1 Provide the following toilet and bath accessories in the locations indicated on the drawings/schedules:

Type	Model/Series	Description
W1	Frost 941TG	18”x30” Mirror, tempered glass, 1 per washroom lavatory and/or as shown on drawings
W2	Dyson Airblade V HU02	Sprayed nickel finish, surface mounted hand dryer, ADA compliant, 120V
W3a	Frost 1001 24 SP	24” straight grab bar, SS peened finish, concealed mounting snap flange, 1 per accessible toilet
W3b	Frost 1003 30x30 SP	30”x30” 90-degree grab bar, SS peened finish, concealed mounting snap flange, 1 per accessible toilet
W4	Bobrick B-983	Vandal Resistant Coat Hook, 2 per toilet room
W5	Napkin Disposal	Owner Supplied, Contractor Installed
W6	Soap Dispenser	Owner Supplied, Contractor Installed
W7	Toilet Paper Dispenser	Owner Supplied, Contractor Installed

3.0 EXECUTION

3.1 INSPECTION

.1 Check wall open for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of backing within wall.

.2 Verify spacing of plumbing fixtures and toilet compartments that affect installation of toilet room accessories.

3.2 INSTALLATION

.1 Install accessories at locations and heights indicated, straight, plumb and level and in accordance with manufacturer's installation instructions.

.2 Install items with non-corrosive anchoring devices.

.3 Installation methods shall conform to manufacturer's recommendations for backing and proper support.

.4 Conceal evidence of drilling, cutting, and fitting to room finish.

.5 Fit flanges of accessories snugly to wall surfaces.

3.3 ADJUSTMENT AND CLEANING

.1 Upon completion of the work, or when directed, remove all traces of protective coatings or paper.

.2 Adjust accessories for proper operation. Test mechanisms, hinges, locks and latches and where necessary adjust and lubricate.

.3 Clean and polish exposed surfaces prior to final installation.

.4 Deliver accessories schedule, keys, and parts manual as part of project closeout documents. For owner's permanent records, provide two sets of the following items of manufacturer's literature:

.1 Technical data sheets of each item used for the project.

.2 Service and parts manuals.

.3 Name of local representative to be contacted in the event of need of field service or consultation.

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED

.1 Supply and install all labour, materials, equipment, and services required for modernization of the following equipment.

.1 A single passenger elevator.

1.2 MAINTENANCE: 2 YEARS

.1 Provide maintenance of the equipment in accordance with the City of Toronto Elevator Maintenance documents (RFP 6718-18-0180 dated July 25, 2018) for a period of 2 years after Substantial Performance.

1.3 CODES, BY-LAWS, AND REGULATIONS

.1 Provide equipment and perform work in accordance with all local, provincial and federal codes, by-laws, and regulations.

.2 Provide equipment and perform work in accordance with the latest edition of the B44 Safety Code for Elevators and any other code which may govern the installation.

.3 At the time of bid submission and during the contract provide written notification of any proposed changes in codes, by-laws, or regulations which might affect the work.

1.4 PERMITS AND CERTIFICATES OF INSPECTION

.1 Arrange and pay for all necessary permits, certificates, approvals, variances, and inspections.

.2 Prior to Substantial Performance, arrange and pay for a safety inspection of the equipment by the regulatory authority.

1.5 WARRANTY: 2 YEARS

.1 Warrant the work performed, materials, performance, and workmanship for a period of 2 years from the date of Substantial Performance of the project.

.2 Correct defects which develop within the above mentioned time period.

.3 For duration of the warranty, the Contractor shall supply monthly and annual reports summarizing performance and operations of the unit including the following KPIs: call backs including a breakdown emergency, entrapments, equipment failures, uptime (or unit availability), et cetera.

1.6 SHOP DRAWINGS AND SAMPLES

.1 Supply for approval shop drawings and samples of exposed finishes.

.2 Supply at a minimum drawings showing the general arrangement layout, machine room layout, fixtures, entrances, and cab finishes.

.3 Review of drawings and samples does not include verification of measurements and does not imply approval of changes from the specifications.

1.7 WIRING DIAGRAMS AND MANUALS

.1 Prior to substantial performance, supply to the Owner, three sets of manuals describing in detail the operation of the equipment and special features.

.1 Detail the operation for special features such as independent service, emergency power operation, Firefighter's Emergency Operation, intercommunication, and security operation.

.2 Supply, as part of the manual, as-built drawings.

.3 Full copy of the TSSA submission and copies of any variances.

.4 Copy of any TSSA directives.

.5 Copy of MCP and log book.

.6 Maintenance details included into the warranty.

.7 Recommended spare parts list.

.8 All as-built drawings for machine rooms must be laminated.

.2 Provide electronic copies of the submission on USB drive (not disc).

.3 Prior to substantial performance, supply to the Owner, a manual detailing proper maintenance procedures for the equipment.

1.8 TRAINING

.1 At completion of the job, provide a training seminar for the Owner's staff. Provide a review of the documentation and operation of the equipment and features along with. required training for MCP and maintenance log.

1.9 TRADE MARKS

.1 Arrange that no piece of the equipment which is visible to the general public has any trade mark, company name, or logo.

1.10 BARRIER-FREE ACCESS

.1 Arrange the controls and fixtures to meet barrier-free access requirements Appendix E of the B44 Safety Code for Elevators (latest edition).

1.11 FIXTURES

.1 Unless indicated otherwise in the Specifications or Drawings, provide a choice of fixtures from a third party supplier and your standard products.

.2 Provide vandal-resistant buttons with LED illumination and stainless steel targets.

1.12 PAINTING

.1 Except for machined and non-rusting surfaces, paint the machine room and hoistway equipment with rust inhibiting primer.

1.13 PAYMENT SCHEDULE

.1 Payments for progress will be based on the following schedule and be subject to a 10 percent holdback:

Upon provision of shop drawings & engineering:	15 %
Upon delivery of material and commencement of work:	40 %
Upon completion of the elevator:	40 %
Upon completion of the group and provision of required documentation:	5 %

1.14 BUILDING OCCUPIED

.1 This building is occupied and normal operations will have to take place during construction.

.2 Avoid undue noise or occupant inconvenience in public areas.

.3 In cases where undue noise or occupant inconvenience is required, advise the Owner in advance and make mutually agreeable arrangements including performing the work outside of normal building hours at no additional cost to the Owner.

1.15 SCHEDULE / ACCELERATION OF WORK

.1 Submit with the bid a schedule for the work.

.2 If it appears that the schedule is not going to be met, dedicate additional personnel to the site, work overtime, and take whatever other action is required to bring the project back on schedule at no additional cost to the Owner.

1.16 EXISTING SITE CONDITIONS

.1 Ensure that the equipment is designed and installed to suit existing site conditions.

.2 Verify all dimensions on site in order to do a flawless job.

1.17 REMOVAL OF RUBBISH AND EXISTING EQUIPMENT

.1 Remove from the job site all garbage, keep the site neat and clean during construction, and leave the site in a neat and clean condition upon completion of the work.

.2 Deliver to the Owner any replaced existing equipment that the Owner wishes to retain. Otherwise, remove and take possession of such equipment.

1.18 REFURBISHMENT OF EXISTING EQUIPMENT

.1 Refurbish the retained equipment to as-new condition.

1.19 PROTECTION OF PROPERTY

.1 Protect the Owner's property from injury or loss arising out of the execution of this contract.

.2 Protect the floor so that movement of equipment does not damage the building. Move equipment outside of normal building hours or at a time acceptable to the Owner.

1.20 HOARDING AND BARRICADES

.1 Provide any required hoarding, barricades, or partitions in the hoistway.

.2 When possible, arrange that work is performed inside the hoistway with the hall doors closed. When it is necessary to work with the hall doors open, provide protective barricades.

.3 Provide hoarding and barricades of a design acceptable to the Owner.

1.21 OPERATING CONDITIONS

.1 Provide equipment capable of operating when the ambient temperature is between 5 and 35 degrees Celsius (40 and 95 degrees Fahrenheit).

.2 Provide equipment capable of operating when the power supply voltage is within 10 percent of the rated voltage and the frequency is within 5 percent of the rated frequency.

1.22 INSPECTION AND ACCEPTANCE

.1 Provide a meter and test weights (full load) along with an adjuster and helper to assist the engineer with a final acceptance inspection.

1.23 NON-PROPRIETARY EQUIPMENT

.1 Provide completely generic equipment that can be maintained, adjusted, and diagnosed without the use of proprietary tools and/or information. Provide any and all required tools and information required to maintain the equipment.

.2 Provide controllers from one of the following companies:

.1 GAL Manufacturing Corporation.

.2 Automatisation JRT Inc.

.3 Motion Control Engineering.

.3 Arrange the equipment such that there are no time, date, trip, or other counters that would shut down the equipment or change its operation.

2.0 EQUIPMENT

2.1 DESCRIPTION

.1 Modernize a single direct acting hydraulic elevator as follows:

.1 Existing contract speed of 0.64 m/s (125 fpm) plus or minus 5.0 percent.

.2 Existing capacity of 1135 kg (2500 lb).

.3 Existing single speed side opening entrances with a width of 1070 mm (3'6") and a height of 2135 mm (7'0").

.4 Existing floors served: front openings at levels B2, B1, G, 2, 3, and 4.

.5 Existing hoistway, pit, and overhead dimensions.

2.2 HYDRAULIC CYLINDER REPLACEMENT

.1 Replace the hydraulic cylinder.

.2 Provide an hydraulic jack of sufficient size to lift the gross load the height specified.

.3 Factory test the jack unit to ensure adequate strength and freedom from leakage. Do not use brittle material such as grey cast iron in the jack construction.

.4 Provide a jack unit consisting of a plunger of heavy seamless steel tubing accurately turned and polished, a stop ring electrically welded to the plunger to prevent the plunger leaving the cylinder, an internal guide bearing, packing or seal of suitable design and quality, a drip ring around the casing top, and a cylinder made of steel pipe and provided with a pipe connection and air bleeder.

.5 Do not re-use the plunger and cylinder head.

.6 Weld brackets to the jack casing for supporting the elevator on pit channels.

.7 Provide a second (safety) bulkhead in the lower ends of the cylinder.

.8 Encapsulate the cylinder in a PVC plastic pipe to protect it from corrosion. Provide a water and air tight seal for the portion of the cylinders extending below the pit floor.

.9 If required, drill or excavate the hole for installation of the jack.

.10 Provide a minimum 2.5 mm (12 gauge) steel casing the full depth of the hole.

.11 Retain the existing oil lines and identify them where accessible outside of the elevator machine room or hoistway with the markings “Elevator Hydraulic Line” in letters that are at least 19 mm (0.75") high in a contrasting color. Ensure that the markings are visible after installation and applied at intervals not greater than 3000 mm (9'10").

2.3 POWER UNIT

.1 Provide a power unit comprised of an oil tank, hydraulic pump, electric motor, control valves, oil level gauge, and oil pressure gauge.

.2 Provide a pump and motor designed for oil hydraulic use and smooth, quiet operation.

.3 Provide a control valve assembly containing a relief valve, a check valve, a levelling valve, and a manual lowering valve.

.4 Provide a tank shut off valve and a gate valve between the power unit and the jack.

.5 Unless the power unit is submerged in the oil tank, enclose it with steel panels and sound-deadening material.

.6 Provide a hydraulic muffler in the oil line.

.7 Provide a motor with a rating of 30 kW (40 hp).

.8 Provide sound and vibration isolation pads such that there is no direct contact between the power unit and the building structure.

2.4 OIL TEMPERATURE CONTROL

.1 Provide equipment to maintain the hydraulic oil at a temperature of between 32 and 43 degrees C (90 and 110 degrees F).

2.5 OIL HEAT EXCHANGER

.1 Provide a heat exchanger complete with fan, pump, and thermostat control (do not provide software control).

2.6 SOLID STATE (REDUCED VOLTAGE) STARTING

.1 Provide solid state starting such that the motor starting current does not exceed twice the full load running current.

2.7 CONTROLLER

.1 Provide a microprocessor based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, static drive units, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels.

.2 Provide the control software on read-only memory with spare capacity to allow for future software modifications and extensions.

.3 Provide separate regulated power supplies for each microprocessor system.

.4 Install wiring in a neat workmanlike manner with all field wiring terminated at labelled and identified stud blocks. Do not connect more than 2 wires to any single terminal.

.5 Label each electrical component in the controller with alpha-numeric identification that matches that shown on the as-built wiring diagrams. All labelling should be printed. No hand written labels allowed.

.6 Mount the identifications for plug-in components on the controller adjacent to the component. Do not mount the designation on the plug-in component.

.7 Ensure that the elevator control system will restart after a loss of normal power.

.8 Provide software and firmware updates over the life of the installation at no charge to the Owner.

.9 Provide rubber sound and vibration isolation pads such that there is no direct contact between the controller cabinet and the building structure.

.10 Provide a maintenance diagnostic tool together with the controller. The diagnostic tool shall be the property of the City.

2.8 HOISTWAY FLOOR IDENTIFICATION

.1 Provide identification of each floor level on the hoistway side of the hall doors using numerals or letters at least 150 mm (6") in height.

2.9 SLIPPER GUIDES

.1 Provide new spring mounted slipper guides located at the top and bottom of the car frame. Provide guides that are self-aligning and self lubricating with replaceable nylon liners in order to ensure smooth and quiet operation.

2.10 FLOOR DESIGNATIONS

.1 Provide floor designations a minimum 50 mm (2") high and raised at least 0.8 mm (0.03") with Braille on both sides of the hall door entrance jambs located with a centerline of 1525 mm (60") above the floor to identify the floor level.

2.11 PIT STEEL

.1 Remove any rust from the pit steel, buffers, buffer supports, and guide rails and re-paint with rust inhibiting paint.

2.12 PAINTING

.1 Paint the pit and machine room floors.

2.13 CAB FINISHES

.1 Re-finish the cab interiors as follows:

.1 Skin the car door, return panels, and header above the car doors in brushed stainless steel.

.2 Provide on the side walls (2 panels each) raised vertical hang-on panels finished in plastic laminate (colour to be selected by the Consultant) with brushed stainless steel binders, reveals, and kickplates.

.3 Provide on the rear wall (3 panels) raised vertical hang-on panels in mirror finish stainless steel (sample to be submitted for approval) with brushed stainless steel binders, reveals and kickplates.

.4 Provide bushed stainless steel cylindrical handrails 38 mm (1.5") in

diameter on the side and rear walls at a height of 915 mm (36") from the finished floor to the top of the handrail.

.5 Provide a brushed stainless steel six panel suspended ceiling with hairline joints and an LED down light in each panel.

.6 Provide resilient sheet flooring to match adjacent elevator lobby floor finish (Mondo linoleum tiles).

.2 Submit for approval drawings of the cab design and lists of options for fixtures, interior materials, finishes and colours.

2.14 CAB PROTECTIVE PADS

.1 Provide one set of cab protective pads that cover all walls and the cab front return panel along with pad hooks.

2.15 CAR STATION

.1 Provide one applied car station.

.2 Incorporate in each car station floor push buttons, door open and close buttons, and other fixtures required for normal operation.

.3 Provide for each floor button a call registered light and momentary audible tone.

.4 Provide a Firefighters' Emergency Operation panel.

.5 Provide below the car station a locked service cabinet containing devices other than those used for normal operation including a light switch, a fan switch, a keyed emergency stop switch, an emergency light test switch, and a 110 volt receptacle.

.6 Locate the car station controls at a height between 890 mm (35") and 1220 mm (48") from the cab floor with the emergency controls and door operating buttons grouped together at the bottom.

.7 Provide buttons of at least 19 mm (0.75") size with arabic numerals at least 16 mm (0.63") high and braille located to the left of the button.

.8 Engrave the car station with the elevator capacity, identification number, government installation number, and other markings required by code.

2.16 CAR POSITION INDICATOR

.1 Provide a digital (dot matrix or segmented) car position indicator located above the car station with a minimum 50 mm (2") high display.

.2 Provide continuous indication of the elevator location.

2.17 CERTIFICATES AND LICENCES

.1 Do not install any certificates or licences in the cab. Arrange and pay for a variance from the TSSA for this if required.

2.18 VOICE SYNTHESIZER

.1 Provide a voice synthesizer for the elevator.

.2 Provide a microprocessor based control unit in the machine room along with a speaker in the elevator cab.

.3 Provide an automatic verbal announcement of each floor at which the elevator stops.

.4 Provide a system that will handle a variety of other messages and indications as may be required by the Owner at a later date.

.5 Set the volume at 10 decibels above ambient.

.6 Arrange that the volume is adjustable over a range of 40 to 80 decibels.

.7 Measure the noise levels using a sound level meter set to the "A" scale for a fast response and provide a written report to the Owner.

2.19 BATTERY OPERATED EMERGENCY CAB LIGHTING

.1 Provide battery operated emergency cab lighting.

.2 Arrange the lighting to go on immediately in the event of a loss of normal elevator cab lighting.

.3 Provide a charging unit that will re-charge the battery when normal power returns and keep the battery fully charged at all times.

.4 Mount the light fixture out of view above the cab ceiling or in the car station.

.5 Provide an emergency lighting test switch in the car station service cabinet.

2.20 HANDS-FREE INTERCOMMUNICATION/TELEPHONE

.1 Provide a hands-free two-way voice intercommunication / telephone system with a lobby rescue station.

.2 Provide a hands-free intercommunication station with automatic dialer integrated into the car station to meet barrier-free access requirements.

.1 Arrange that the device transmits a pre-recorded location message prior to initiating voice communication.

.2 Provide a push button identified as “PHONE” to initiate communication along with a speaker.

.3 Identify the button with a raised international symbol for telephones and Braille markings.

.4 Arrange that actuating the “PHONE” button in the car station will cause the handset in the lobby rescue station (and any remote handsets if provided) to ring. If the handset is not picked up within 30 seconds, transfer the call via the telephone line to a 24 hour off-site monitoring station (telephone number and service to be arranged by the Owner).

.5 Provide visual indication which is activated to acknowledge that the communication has been established. Extinguish the visual indication when the connection is terminated.

.6 Arrange that the communication cannot be terminated from within the cab.

.7 Provide twin conductor shielded wiring from the cab to the elevator machine room, from the elevator machine room to the lobby rescue station, and from the lobby rescue station to any remote handsets (if provided).

.8 Provide 110 volt power at the car station for the intercommunication station.

.3 Provide a lobby rescue station at a location determined by the Owner (likely at the lobby entrance vestibule).

.1 Provide a telephone handset and communication equipment such that calls may be placed to each individual elevator from this station.

.2 Finish the lobby rescue station in brushed stainless steel and engrave suitable signage and instructions for its use.

.4 The telephone functionality must be available for remote reprogramming.

.5 Provide and pull all wiring to interconnect the equipment including but not limited to wiring between the elevator cab and the machine room as well as between the machine room and the lobby rescue station. Conduit will be provided by another trade between the elevator hoistway at the main floor and the lobby rescue station.

.6 Provide a junction box with terminal blocks for the intercommunication equipment mounted on the side of a controller in the elevator machine room.

.7 Arrange that the intercommunication system within the car verifies operability of the telephone line automatically on a daily basis without requiring activation of the line. If the verification means determines that the line is not functional, sound and illuminate a signal (identified as "ELEVATOR COMMUNICATIONS FAILURE") at the main floor hall station. Provide a means for authorized personnel to silence the signal.

2.21 ALARM

.1 Provide an alarm bell on top of the elevator cab

.2 Arrange that the alarm bell is initiated by momentary actuation of the “PHONE” button in the car station.

.3 Provide back-up battery power for the alarm bell operation. It can be from the same source as the emergency cab lighting.

2.22 CARD READER SECURITY SYSTEM

.1 Provide equipment and labor for installation of a card reader security system.

.2 Integrate into the car station a 150 mm (6") wide by 100 mm (4") high black translucent plastic plexiglass lense.

.3 Provide six pair shielded wires connected from a terminal strip in the car station to a terminal strip in the elevator security box in the machine room. Do not use

splices.

.4 Provide appropriate elevator controller connections and circuits for the security system (including floor tracking).

.5 Install and wire the card readers provided by another trade.

.6 Provide all other required equipment and labor.

.7 Arrange that on Firefighters' Emergency Operation or independent service the card reader security system is disabled.

2.23 SECURITY CAMERA

.1 Provide for installation of a security camera in the elevator.

.2 Install and wire the security camera provided by another trade.

.3 Provide an RG 6 coaxial conductor in the travelling cable run between the car top and the controller. Leave an extra 3 m (10') at each end.

.4 Provide 110 volt power to the car top for the camera.

2.24 CAR TOP INSPECTION STATION

.1 Provide an inspection station on the car top consisting of an emergency stop button, up, down and common inspection running buttons, a light with switch and guard, a duplex receptacle, and other devices necessary for car top operation.

2.25 CAB FAN

.1 Provide a new two speed exhaust fan mounted in the cab top.

.2 Arrange that when the fan is operating there is no noticeable vibration in the cab.

2.26 IN-CAR LANTERNS

.1 Provide new flush mount in-car lanterns in one jamb of the elevator cab entrance.

.2 Arrange the lanterns such that as the car doors start to open, the lanterns illuminate (do not provide any audible signals).

2.27 CAB LIGHTING & FAN: TIMER

.1 Provide a timer for the cab lights and fan such that the lights and fan turn off when the elevator has been idle for more than 5 minutes and then turn on when demand for the elevator returns.

2.28 DOOR PROTECTIVE DEVICE

.1 Provide an infra-red multiple beam door protective device.

.2 Protect the full width and up to 1830 mm (6') from the floor of the door opening.

.3 Locate the device 25 mm (1") behind from the leading edge of the door.

.4 Arrange that if the door protective device detects a person or object while the doors are closing, it will re-open the doors.

.5 If the beams are interrupted continuously for more than 30 seconds, close the doors slowly under reduced speed and force, and actuate an audible signal as a warning.

2.29 DOOR OPERATOR: RETAIN

.1 Retain and refurbish the existing recently replaced door operator.

.2 Adjust the door closing speed to an average of 300 mm (12") per second and the door opening speed to an average of 600 mm (24") per second.

.3 Arrange the equipment for a minimum of noise.

2.30 HALL DOOR INTERLOCKS

.1 Provide new hall door interlocks as well as new pick-up and clutch assemblies. Provide equipment from GAL or Otis.

2.31 HALL DOOR EQUIPMENT

.1 Check and replace if necessary the door rollers, hangers, gibs, closers, relating cables, and all other door equipment.

.2 Replace steel door rollers with plastic insert rollers.

.3 Clean, lubricate, and re-adjust the door equipment.

2.32 HOISTWAY DOOR UNLOCKING DEVICES

.1 Provide hoistway door unlocking devices (by lunar key) on all hall doors.

2.33 HOISTWAY ACCESS SWITCH

.1 Provide, if required by code, hoistway access switches located in the entrance frame or in the hall door sight guard.

2.34 HALL PUSH BUTTON STATIONS

.1 Provide a single riser flush mounted hall stations located at the existing height.

.2 Perform any required cutting and patching.

.3 Provide in each hall station illuminating up and down push buttons (at terminal floors, provide only one button).

.4 Provide buttons of minimum 19 mm (0.75") size and located with their centerline 1070 mm ± 25 mm (42" ± 1") above the floor.

2.35 HALL POSITION INDICATOR: MAIN FLOOR

.1 Provide a flush-mounted digital (LED dot matrix or segmented) hall position indicator located above the main floor entrance with a minimum 50 mm (2") high display.

.2 Perform any required cutting and patching.

.3 Provide continuous indication of the elevator location.

2.36 ELECTRIC WIRING

.1 Provide copper wiring to connect the equipment.

.2 Run the wire in metal conduit, duct or electrical metallic tubing.

.3 Provide travelling cable between car stations and the controller in the machine room.

.4 Provide at least eight pair shielded wires and a coaxial conductor in the travelling cable.

.5 Provide at least ten percent spare wires in each travelling cable.

.6 Provide on one controller a separate junction box for non-elevator devices such as telephones, cameras, and security systems.

.7 If required by code, provide auxiliary disconnect switches and wiring.

.8 Provide wiring and conduit between the disconnect switch and the controller or drive.

3.0 EXECUTION

3.1 MICROPROCESSOR BASED CONTROL AND DISPATCHING

.1 Provide microprocessor based group dispatching of the elevator that operates in real time, continuously analysing the elevators' position, condition, and load.

.2 Provide full automatic control of the elevator by means of push buttons in the car numbered to correspond with floors served and by push buttons at each hall landing.

.3 Constantly scan the system for hall calls. When hall calls are registered, instantly calculate the estimated time of arrival, number of floors to travel from the current position, the time it takes to travel one floor at top speed, calls assigned to a car, and car reversal time to respond to a call in the opposite direction of travel. When a car's status changes or additional hall calls are registered, re-calculate the estimated time of arrival and re-assign calls if necessary.

.4 Provide flexibility to meet well defined patterns of traffic including up peak, down peak, and heavy inter-floor demands, and adjust for indeterminate variations in these patterns which occur in buildings.

.5 When car call buttons are actuated, dispatch the elevator to the designated floors in the order in which the landings are reached by the elevator, irrespective of the sequence in which the buttons are pressed. Cancel the car call when the elevator arrives at the floor.

.6 Respond to calls only in the direction that the elevator is travelling.

.7 Cancel car calls when the elevator changes direction.

3.2 INDEPENDENT SERVICE

.1 Provide independent service as follows:

.1 Remove the elevator from the group dispatching system such that it does not answer hall calls, the hall lanterns are disabled, and the door protective devices are disabled;

.2 Arrange the elevator to park with its doors open;

.3 Accept a car call and close the doors only when the door close button or any call button is actuated using constant pressure until the doors are fully closed and the interlock is closed. Re-open the doors if the button is released before the elevator starts to move;

3.3 DOOR PRE-OPENING

.1 Start opening the doors when the elevator is levelling into the floor such that the doors are one third open when the car stops.

3.4 NUDGING

.1 If the door detector is operated continuously for more than 30 seconds, close the doors slowly under reduced speed and force, and actuate an audible signal as a warning.

3.5 DOOR DWELL TIMES

.1 When an elevator stops in response to a car call, keep the doors open for 3.0 seconds.

.2 When an elevator stops in response to a hall call, keep the doors open for 5.0 seconds. Reduce this time to 1.0 second after the door detector beams are broken.

.3 Arrange that these times are separately adjustable over a range of 0.5 to 12 seconds.

.4 Close the doors immediately if a car call or door close button is actuated.

3.6 SOUND LEVELS

.1 Arrange the fan so that the sound level as measured in the cab with the elevator stopped is less than 57 decibels with the fan running.

.2 Arrange the elevator equipment so that the sound level as measured in the cab with the elevator running is less than 60 decibels.

.3 Arrange the door equipment so that the sound level as measured in the cab is less than 62 decibels during a full door open and door close operation.

.4 Arrange the machine room equipment so that the sound level as measured in the machine room with the elevator running is less than 80 decibels.

.5 Measure the sound levels using a sound level meter set to the "A" scale for a fast response.

3.7 OPERATING PERFORMANCE

.1 Levelling - Arrange that the car stops within 6 mm (¼") of the floor level.

.2 Acceleration - Arrange that the average acceleration is at least 0.6 m/s/s (2.0 f/s/s) and that the acceleration peaks are less than 1.5 m/s/s (5.0 f/s/s).

.3 Operating time - Adjust the equipment so that the operating time is 15.0 seconds or less. Measure the operating time from the time that the doors begin to close until they are three quarters open at the next floor.

.4 Ride quality - Arrange that the lateral acceleration (front to rear and side to side) measured during express runs is less than 150 mm per second per second (0.5 f/s/s) peak to peak.

.5 Ensure that the number of callbacks does not exceed 4.9 per elevator per year.

.6 Ensure that the elevator uptime is at least 99.25%. This is the amount of time the elevator is available for use divided by (the amount of time in period less scheduled maintenance and repair time in period).

3.8 FIREFIGHTERS' EMERGENCY OPERATION

.1 Provide Firefighters' Emergency Operation.

.2 Phase I emergency recall operation - Initiate Firefighters' Emergency Operation either manually by turning the three position (RESET/OFF/ON) key switch labelled 'FIRE RECALL' to the 'ON' position or automatically through the fire alarm system.

.1 When Phase I has been initiated, return the elevators non-stop to the designated level and open the doors.

.2 Provide visual and audible indication inside the elevator.

.3 Disable door protective devices that are sensitive to smoke or flame.

.4 Disable emergency stop switches.

.5 Where the designated level is not sprinklered and Phase I is initiated by a device located at the designated level, return the elevators non-stop to the alternate level (unless a ‘FIRE RECALL’ switch is already in the ‘On’ position).

.3 Phase II emergency in-car operation - After recall of the elevators, run the elevators on Firefighters’ Emergency Operation only when the three position (OFF/HOLD/ON) in-car key switch labelled ‘FIRE OPERATION’ is in the 'ON' position as follows:

.1 Allow the elevator to be controlled only from within the elevator (ie. prevent the elevator from responding to hall calls).

.2 Disable the door protective devices.

.3 Arrange that the doors can be opened only by constant pressure on the ‘door open’ button. Re-close the doors immediately if the pressure on the button is released before the doors have fully opened.

.4 Arrange that the doors can be closed only by constant pressure on the ‘door close’ button. Re-open the doors immediately if the pressure on the button is released before the doors have fully closed.

.5 When the doors are completely closed, allow the car to travel to the car call floor and stop without opening the doors.

.6 When the ‘CALL CANCEL’ button is actuated, cancel all car calls and stop the car at or before the next available landing.

.7 When the doors are fully open and the ‘FIRE OPERATION’ switch is in the ‘HOLD’ position, keep the elevator at the floor, keep the doors open, disable the ‘door close’ button, and do not allow car calls to be registered.

.8 When the car is at a landing other than the designated level with the doors

open and the ‘FIRE OPERATION’ switch in the ‘OFF’ position, close the doors automatically. The ‘door open’ button shall remain operative. If the ‘FIRE OPERATION’ switch is turned to the ‘ON’ or ‘HOLD’ position prior to the completion of door closing, re-open the doors.

.9 Remove an elevator from Phase II operation only when the ‘FIRE OPERATION’ switch is in the ‘OFF’ position and the car is at the designated level with the doors open.

.4 Arrange that upon restoration of power following a power interruption, elevators re-establish their absolute car position and are not removed from Firefighters’ Emergency Operation - Phase I or Phase II.

.5 Terminate Firefighters’ Emergency Operation once all cars are at the designated level, the fire alarm system is in its normal status, and all key switches are in the 'OFF' position (with the ‘FIRE RECALL’ switch having first been turned to the ‘RESET’ position).

3.9 FIREFIGHTERS’ EMERGENCY OPERATION PANEL

.1 Locate the “FIRE OPERATION” switch, the “CALL CANCEL” button, the “STOP” switch, the door open and close buttons, the additional visual signal, and the operating instructions grouped together at the top of the main car operating panel behind a locked cover.

.2 Engrave the front of the cover with the words “FIREFIGHTERS’ OPERATION” in red letters at least 10 mm (0.4") high.

3.10 INSTRUCTIONS: FIREFIGHTERS’ EMERGENCY OPERATION

.1 Engrave the ‘FIRE RECALL’ switch at the designed level with the following wording:

FIREFIGHTERS’ OPERATION

To recall elevators
Insert fire key and turn to “ON”

.2 Engrave the inside of the Firefighters’ Emergency Operation panel in each car with the following wording:

FIRE OPERATION

When  **Flashing, exit elevator**

To operate car	**Insert fire key and turn to "ON". Enter floor selection.**
To cancel floor selection	**Press "CALL CANCEL" button.**
To close door	**Press and hold "CLOSE" button.**
To open door	**Press and hold "OPEN" button.**
To hold car at floor	**With doors open, turn key to "HOLD".**
For emergency stop	**Use "STOP" switch.**
To automatically return to recall floor	**Turn key to "OFF".**

.3 Provide instructions in lettering not less than 3 mm (1/8") in height.

3.11 BATTERY LOWERING

.1 Provide battery operated emergency lowering.

.2 Provide enough battery power to close the elevator doors, lower the elevator to the lowest floor without stopping, and open the doors in the event of a loss of normal power.

.3 Provide a charging unit that will re-charge the battery when normal power returns and keep the battery fully charged at all times.

4.0 SEPARATE PRICES (not included in base bid)

4.1 REDUCED SCHEDULE: LONGER SHIFTS OR DOUBLE CREWS

.1 Work longer shifts or use two crews to complete the modernization in significantly less time.

.2 Identify the impact on schedule along with the price.

4.2 LIFTNET ELEVATOR MONITORING

.1 Provide a Liftnet elevator monitoring system to remotely monitor the elevator.

.2 Provide all necessary hardware and wiring.

.3 Provide web based access to Liftnet monitoring and reporting.

END OF SECTION

Standard Building Automation System (BAS) Specification

September, 2018

This document is the standard Building Automation System (BAS) Specification for use in all new construction, retrofits and upgrades in City of Toronto facilities and shall not be amended in any way without written consent from the Environment and Energy Division.

****
This section includes the central building automation system components and network protocol specifications. It may be used as section 23 09 23 or 23 09 93 depending on specification format used.

In addition to this section it will be necessary to add project specific sections for control components and sequences of operation.
The intent of this specification is to describe the minimum features required for a new installation. For renovation or refit type projects, it will be necessary to determine to what extent any existing system can be upgraded or modified within the parameters of the project budget to achieve the general intent of this specification and provide appropriate edits.
****

PART 1 - GENERAL

1.0 GENERAL REQUIREMENTS

1.1 Conform to all, “Mechanical General Provisions”.

1.2 The "provide" in this Division shall be interpreted as "supply and install".

1.3 All work shall conform to Canadian Metric Practice Guide CSA CAN3-2234.1.76

1.4 Provide all required adapters between metric and imperial components.

1.5 Metric descriptions in this Division are nominal equivalents of Imperial values.

1.6 All equipment and material to be new, CSA certified, manufactured to minimum standard quoted including additional specified requirements.

1.7 Where there is no alternative to supply equipment that is not CSA certified, submit such equipment to Inspection Authorities for special inspection and obtain approval before delivery of equipment to site.

1.8 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by the owner. Spare parts shall be available for at least five years after completion of this contract.

1.9 Use material and equipment available from a regular production by manufacturer concerned.

2.0 WORK INCLUDED

****
Add to this section any site specific qualifications that may apply to the specific project with respect to application of the specified requirements for the system.
****

2.1 The City of Toronto has standardized Building Automation Systems utilizing native BACnet area, system and application controllers. Extend the existing Framework as detailed herein.

2.2 The system shall support standard Web browser access via the City's Intranet/Internet. It shall support a minimum of 100 simultaneous users with the ability to access the graphical data and real time values simultaneously. (Refer to Section 7.16)

2.3 Provide an open protocol Building Automation System (BAS) incorporating Direct Digital Control (DDC), equipment monitoring, and control consisting of: A PC based Operator Work Station (OWS) with colour graphic data displays; Microcomputer based Building Controllers (BCs) and Microcomputer based Advanced Application Controllers (AACs) and Application Specific Controllers (ASCs) interfacing **directly** with sensors,

actuators and environmental delivery systems (i.e., HVAC units, boilers, chillers, lighting systems, etc.); electric controls and mechanical devices for all items indicated on drawings described herein including dampers, valves, panels and compressed air plant.

2.4 City of Toronto has standardized the use of Direct Digital Controllers (DDC) and End Devices. No **NEW** pneumatic control devices shall be connected or incorporated into the BAS network. It applies to new installations as well as retrofit applications.

2.5 Open Protocols by definition are to be BACnet (ASHRAE Standard 135 – Annex J) only.

2.6 Provide BAS controllers (BCs, AACs and ASCs) based on native BACnet (ASHRAE Standard 135 – Annex J) protocols.

2.7 Provide submittals, data entry, electrical installation, programming, startup, test and validation acceptance documentation, and system warranty.

3.0 WORK BY OTHERS

3.1 Access doors and setting in place of valves, flow meters, water pressure and differential taps, flow switches, thermal wells, dampers, air flow stations, and current transformers shall be by others.

4.0 QUALITY ASSURANCE

4.1 Codes and Approvals:

4.1.1 Work, materials, and equipment shall comply with the Ontario Building Code, Ontario Electrical Code, ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACnet) and Authorities having jurisdiction over this work. All devices shall be ULC, UL or FM listed and labeled for the specific use, application and environment to which they are applied.

4.1.2 The BAS shall comply with NFPA 90A Air Conditioning and 90B Warm Air Heating, Air Conditioning.

4.1.3 All electronic equipment shall conform to the requirements of CSA for electromagnetic emissions standards and placed in approved locations such that it does not interfere with building equipment or computers.

4.2 Provide satisfactory operation without damage at 110% above and 85% below rated voltage and at 3 hertz variation in line frequency. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interference. Bus connected devices shall be AC coupled, or equivalent so that any single device failure will not disrupt or halt bus communication.

5.0 ABBREVIATIONS AND SYMBOLS

5.1 All letter symbols and engineering unit abbreviations utilized in information displays ANSI/ISA S5.5 and printouts shall conform to ANSI 710.19/IEEE 260-letter symbols for SI and certain other units of measurement.

5.2 Specification Nomenclature - Acronyms used in this specification are as follows:

AAC Advanced Application Controller
ASC Application Specific Controller
BAS Building Automation System
BC Building Controller

BIBB BACnet Interoperability Building Blocks
DDC Direct Digital Controls
GUI Graphical User Interface
HTTP Hyper Text Transfer Protocol
LAN Local Area Network
ODBC Open Database Connectivity protocol
OOT Object Oriented Technology
OPC Object linking and embedding for Process Control
OWS Operator Workstation
PDA Personnel Data Assistant device
PICS Protocol Implementation Conformance Statement
PWS Portable Workstation
SNVTS Standard Network Variables Types
SQL Standard Query Language
TCP/IP Transmission Control Protocol / Internet Protocol
TCU Terminal Control Unit
WAN Wide Area Network
WAP Wireless Application Protocol device
WBI Web Browser Interface
XML Extensible Markup Language
XIF External Interface Files

6.0 APPROVED CONTROL SYSTEMS

****
Applicable to new construction projects, new installations within existing buildings and major retrofit/overhaul of existing BAS systems.
****

6.1 Any vendors that are authorized dealers or distributors of the following control systems are acceptable.

6.1.1 DELTA CONTROLS
6.1.2 RELIABLE CONTROLS
6.1.3 SCHNEIDER ELECTRIC (MNB SERIES)
6.1.4 DISTECH
6.1.5 FACILITY EXPLORER

6.2 BAS Systems Integration:

6.2.1 TRIDIUM NIAGARA FRAMEWORK OR

6.2.2 DELTA CONTROLS- ENTELIWEB (City of Toronto has already purchased EnteliWEB Software Package) OR

6.2.3 Installer must be licensed TRIDIUM system integrator.

6.2.4 For TRIDIUM NIAGARA FRAMEWORK, Soft JACE is NOT accepted.

6.2.5 For ENTELIWEB applications, installer must be licensed and authorized vendor of DELTA Controls.

6.3 Licensing Requirements

6.3.1 Licenses shall be provided to and in the name of the City of Toronto
6.3.2 Licenses shall be perpetual, transferrable, assignable and royalty-free
6.3.3 Tridium licenses shall allow all Workbench/Supervisor brands complete system access and functionality.

6.4 Installer and Manufacturer Qualifications

6.4.1 Installer shall have an established working relationship with Control System Manufacturer.

6.4.2 Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

6.4.3 It is the intent of this specification to define an open protocol state-of-the-art distributed computerized Building Management and Control System which is user friendly, has known reliability, is extremely responsive, and which is to be designed, installed, implemented, and supported by a local office of approved bidders.

6.4.4 BAS contractor shall provide three locations of successful installations of similar open protocol computer based systems. Sites provided must consist of more than 150 hardware inputs/outputs. Project sites must be local to the location of this project.

7.0 SYSTEM DESIGN

****
For retrofit projects where a gateway might be considered the most appropriate economic decision for interface to an existing automation system, remove article 7.2.
****

7.1 The system shall consist of a network of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), and Smart Actuators (SA). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

7.2 Systems utilizing gateways will not be considered. A gateway device is considered to be a device where only mapping of system points from one protocol to another occurs. A gateway device cannot perform higher-level energy management functions such as Outdoor Air Optimization, Electrical Demand Limiting and the like.

7.3 The Building Automation System software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a BAS server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

7.4 A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a flat single tiered architecture shall not be acceptable. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

8.0 BACnet.

8.1 Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

8.2 Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

8.3 Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

8.4 Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

8.5 Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

8.6 BACnet Communication.

8.6.1 Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

8.6.2 BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

8.6.3 Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.4 Each ASC shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.5 Each SA shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.6 Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

8.6.7 The maximum number of controllers on an MS/TP network/subnet shall be no more than 64 or the manufacturer recommended limit, whichever is less.

8.6.8 An approved addressing scheme must be obtained from the Environment and Energy Division and be included on project shop drawings (specifically the BAS network architecture diagrams) prior to installation. Buildings without approved schemes shall not exist on the City WAN.

8.6.9 BAS shall transfer data between controllers on a stand-alone BAS network. No more than one (1) data drop per building will be provided to establish connection to central server.

8.6.10 Non-City staff will not have access to the central server during construction. Database and graphics are merged with central server after project deficiency lists have been cleared (including graphics deficiencies). This merging must be coordinated with the application administrators (Environment and Energy Division).

9.0 COMMUNICATION

9.1 Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

9.2 Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

9.3 Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

9.4 Stand-Alone Operation. Each piece of equipment specified in the sequence of operation shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

10.0 ENVIRONMENT

Controller hardware shall be suitable for anticipated ambient conditions.

10.1 Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

10.2 Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

11.0 REAL-TIME CLOCK

11.1 Controllers that perform scheduling shall have a real-time clock.

12.0 SERVICEABILITY

12.1 Controllers shall have diagnostic LEDs for power, communication, and processor.

12.2 Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

12.3 Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

13.0 MEMORY

13.1 Controller memory shall support operating system, database, and programming requirements.

13.2 Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

13.3 Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

14.0 IMMUNITY TO POWER AND NOISE

14.1 Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

15.0 POWERFAIL RESTART

15.1 In the event of the loss of normal power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

15.2 Upon restoration of normal power, the controller shall automatically resume full operation without manual intervention. The controllers shall incorporate random start sequences to ensure a power spike does not result.

15.3 Controller memory shall not be lost during a power failure.

15.4 The user shall have the capability of loading or re-loading all software via the OWS or the local terminal port.

16.0 DYNAMIC DATA ACCESS

16.1 All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment.

17.0 INPUT AND OUTPUT INTERFACE

17.1 General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

17.2 Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

17.3 Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

17.4 Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

17.5 Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

17.6 Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

17.7 Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

17.8 Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

17.9 Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

18.0 POWER SUPPLIES AND LINE FILTERING

18.1 Power Supplies: Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with CEC requirements. Limit connected loads to 80% of rated capacity.

18.1.1 DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes.

Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

18.1.2 Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

18.1.3 Line voltage units shall be UL recognized and CSA listed.

18.2 Power Line Filtering.

18.2.1 Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

18.2.1.1 Dielectric strength of 1000 V minimum

18.2.1.2 Response time of 10 nanoseconds or less

18.2.1.3 Transverse mode noise attenuation of 65 dB or greater

18.2.1.4 Common mode noise attenuation of 150 dB or greater at 40-100 Hz

19.0 AUXILIARY CONTROL DEVICES

19.1 Electric Damper and Valve Actuators.

19.1.1 Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.

19.1.2 Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).

19.1.3 Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 16.8)

19.1.4 Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.

19.1.5 Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

19.2 Binary Temperature Devices.

19.2.1 Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

19.2.2 Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

19.2.3 Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

19.3 Temperature Sensors

19.3.1 Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor (10K).

19.3.2 Duct Sensors. Duct sensors shall be single point or averaging. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m^2 (10 ft^2) of duct cross-section.

19.3.3 Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.

19.3.4 Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port.

19.3.5 Differential Sensors. Provide matched sensors for differential temperature measurement.

19.4 Humidity Sensors.

19.4.1 Differential Sensors. Provide matched sensors for differential temperature measurement.

19.4.2 Duct and room sensors shall have a sensing range of 20%-80%.

19.4.3 Duct sensors shall have a sampling chamber.

19.4.4 Outdoor air humidity sensors shall have a sensing range of 20%-95% RH and shall be suitable for ambient conditions of 40°C-75°C (40°F-170°F).

19.4.5 Humidity sensors shall not drift more than 1% of full scale annually.

19.5 Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service). Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

19.5.1 Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

19.5.2 Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

19.6 Relays.

19.6.1 Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

19.6.2 Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

19.7 Override Timers.

19.7.1 Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

19.8 Current Transmitters.

19.8.1 AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

19.8.2 Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

19.8.3 Unit shall be split-core type for clamp-on installation on existing wiring.

19.9 Current Transformers.

19.9.1 AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

19.9.2 Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

19.9.3 Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

19.10 Voltage Transmitters.

19.10.1 AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

19.10.2 Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

19.10.3 Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

19.11 Voltage Transformers.

19.11.1 AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

19.11.2 Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

19.11.3 Windings (except for terminals) shall be completely enclosed with metal or plastic.

19.12 Power Monitors.

19.12.1 Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

19.12.2 Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

19.13 Current Switches.

19.13.1 Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

19.14 Pressure Transducers.

19.14.1 Transducers shall have linear output signal and field-adjustable zero and span.

19.14.2 Continuous operating conditions of positive or negative pressure 50% greater than calibrated span shall not damage transducer sensing elements.

19.14.3 Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.

19.14.4 Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.

19.15 Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

20.0 NETWORKS

20.1 BAS contractor to coordinate with the City's IT department for the connections to the City's Network.

20.2 Design for the Network LAN (BC LAN) shall include the following provisions:

20.2.1 Provide access to the BC LAN from a remote location, via the Intranet.

20.2.2 The network LAN shall utilize BACnet/IP (ASHRAE standard SPC-135A-2004 - Annex L) for communication between BCs. Manufacturer specific proprietary protocols, gateways, or protocol converters are not acceptable for this project. The OWS shall communicate to the BCs utilizing standard Ethernet to IEEE 802.3 Standards.

20.2.3 High-speed data transfer rates for alarm reporting, quick report generation form multiple controllers and upload/download efficiency between network devices.

20.2.4 Detection and accommodation of single or multiple failures of workstations, controller panels and the network media. The network shall include provisions for automatically reconfiguring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

20.2.5 Message and alarm buffering to prevent information from being lost.

20.2.6 Error detection, correction, and retransmission to guarantee data integrity.

20.2.7 Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

20.2.8 Commonly available, multiple sourced, networking components shall be used to allow the system to coexist with other networking applications such as office automation. ETHERNET is the only acceptable technology.

20.2.9 Synchronization of the real-time clocks in all BC panels shall be provided.

20.2.10 The BC LAN shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Building Controllers (BCs), user workstations and where specified, a local server. Local area network minimum physical and media access requirements:
20.2.10.1 Ethernet; IEEE standard 802.3

20.2.10.2 Cable; 100 Base-T, UTP-8 wire, category 5
20.2.10.3 Minimum throughput; 10 Mbps, with ability to increase to 100 Mbps

20.2.11 Provide access to the BC LAN via a Wireless Application Protocol (WAP) device as well. Through this connection the BC LAN will provide authorized staff with the ability to monitor and control the BAS from any location within the City network through a web browser, cellular phone, pager, WebPads, or PDA. (Pocket Computer).

21.0 SERVER FUNCTION

21.1 Local connections shall be via an Ethernet LAN.

21.2 It shall be possible to provide access to all Building Control Units (BC) via a single connection to the server. In this configuration, each Building Control Unit (BC) can be accessed from an Operator Workstation (OWS) using a standard Web browser by connecting to the BAS LAN. The server shall provide the following functions, as a minimum:

21.2.1 Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
21.2.2 Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any Building Control Unit (BC) in the network, local or remote.
21.2.3 The server shall include a master clock service for its subsystems and provide time synchronization for all Building Control Units (BC).
21.2.4 The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
21.2.5 The server shall provide scheduling for all Building Control Units and their underlying field control devices.
21.2.6 The server shall provide demand limiting that operates across all Building Control Units. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shedding lists for effective demand control.
21.2.7 The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Building Control Units. Systems not employing this prioritization shall not be accepted.
21.2.8 Each Building Control Unit supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
21.2.9 The server shall provide central alarm management for all Building Control Units supported by the server. Alarm management shall include:
21.2.10 Routing of alarms to display, printer, email and pagers
21.2.11 View and acknowledge alarms
21.2.12 Query alarm logs based on user-defined parameters
21.2.13 The server shall provide central management of log data for all Network Control Units supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
21.2.14 Viewing and printing log data
21.2.15 Exporting log data to other software applications
21.2.16 Query log data based on user-defined parameters
21.2.17 Minimum BACnet features supported are
-Standard BACnet Objects (Analog In/Out/Value, BinaryInput/Output/Value, Multi-State -- Input/Output/Value, Schedule(export), Calendar(export), Trend(Export), Device).
-Segmented Capability (Segmented Request-Segmented Response).
-Application Services (Read Property, Read Property Multiple, Write Property, Write Property Multiple, Confirmed Event, Notification, Acknowledge Alarm, Get Alarm Summary Who-has, I-have, Who-is, I-am, Subscribe COV, Confirmed COV notification, Unconfirmed COV notification).

-BACnet Broadcast Management

22.0 SCOPE OF WORK

22.1 The work covered by this specification and related sections consists of providing shop drawings, equipment, labour, materials, engineering, technical supervision, and transportation as required to furnish and install a fully operational BAS to monitor and control the facilities listed herein, and as required to provide the operation specified in strict accordance with these documents, and subject to the terms and conditions of the contract. The work in general consists of but is not limited to, the following:

22.1.1 The preparation of submittals and provision of all related services.

22.1.2 Operator workstations located as listed in the specifications **(OWS will be provided by the City's IT, SEE PART 2, SECTION 1.1.4).**

22.1.3 Furnish and install all controllers to achieve system operation, any control devices, conduit and wiring, in the facility as required to provide the operation specified.

22.1.4 Furnish and load all software required to implement a complete and operational BAS.

22.1.5 Furnish complete operating and maintenance manuals and field training of operators, programmers, and maintenance personnel.

22.1.6 Perform acceptance tests, commissioning or re-commissioning as indicated.

22.1.7 Provide full documentation for all application software and equipment.

22.1.8 Miscellaneous work as indicated in these specifications.

23.0 PERMITS, FEES AND CODES

23.1 Apply for, obtain and pay for all permits, licenses, inspections, examinations and fees required. Also submit, if required, information and other data that may be obtained from the Engineer. Should the authorities require the information on specific forms, fill in these forms by transcribing the information provided by the Engineer.

23.2 BAS contractor shall obtain and pay for the police clearance certificates if required for the project.

23.3 Arrange for inspection of all work by the authorities having jurisdiction over the Work. On completion of the Work, present to the Engineer the final unconditional certificate of approval of the inspecting authorities.

23.4 Comply with the requirements of the latest edition of the applicable ULC or CSA standards, the requirements of the Authorities, Federal, Provincial/Territorial and Municipal Codes, the applicable standards of ULC and all other authorities having jurisdiction. These Codes and Regulations constitute an integral part of these Specifications.

23.5 Where there is no alternative to supply equipment which is CSA certified, submit such equipment to the local electrical authority for special inspection and obtain approval before delivery of equipment to site.

23.6 In case of conflict, applicable Codes take precedence over the Contract Documents. In no instance reduce the standard or Scope of Work or intent established by the Drawings and Specifications by applying any of the Codes referred to herein.

23.7 Before starting any work, submit the required number of copies of documentation to the authorities for their approval and comments. Comply with any changes requested as part of the Contract, but notify the

Engineer immediately of such changes, for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

24.0 COORDINATION

24.1 All work shall be performed at times acceptable to the Engineer/Construction Manager. Provide work schedule at the start of the job for the approval of the Engineer/Construction Manager. Schedule shall show when all staff and sub-contractors shall be on-site.

24.2 Organize all sub-contractors and ensure that they maintain the schedule.

24.3 Full cooperation shall be shown with other sub-contractors to facilitate installations and to avoid delays in carrying out the work.

24.4 Notify Engineer/Construction Manager of any changes to the schedule. Send any schedule changes and weekly progress reports via fax to Engineer/Construction Manager.

24.5 Where, in the judgment of the Engineer/Construction Manager, the work could disrupt the normal operations in or around the building, contractor shall schedule work to eliminate or minimize interference, subject to owner's approval.

24.6 When connecting to the existing systems, advise the Engineer/Construction Manager and obtain permission to so. Perform work at a time acceptable to the Engineer/Construction Manager and Owner.

24.0 SUPERVISION OF PERSONNEL

24.1 Maintain at this building qualified personnel and supporting staff with proven experience in erecting, supervising, testing, and adjusting projects of comparable nature and complexity.

24.2 Supervisory personnel and their qualifications are subject to the approval of the Owner.

24.3 All personnel working on-site shall sign in as required by the Owner and shall wear company identification.

24.4 When requested and for whatever reason, remove personnel and/or support staff from project. Take immediate action. Contractors and subcontractors may require police clearance.

25.0 ELECTRICAL WORK AND SAFETY REQUIREMENTS

25.1 Control and interlock wiring and installation shall comply with national and local electrical codes, and manufacturer's recommendations.

25.2 CEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by CEC.

25.3 Low-voltage wiring shall meet CEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

25.4 CEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

25.5 Install wiring in raceway where subject to mechanical damage and at levels below 3 m (10ft) in mechanical, electrical, or service rooms.

25.6 Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

25.7 Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

25.8 Do not install wiring in raceway containing tubing.

25.9 Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.

25.10 Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

25.11 Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

25.12 Size raceway and select wire size and type in accordance with manufacturer's recommendations and CEC requirements.

25.13 Include one pull string in each raceway 2.5 cm (1 in.) or larger.

25.14 Use color-coded conductors throughout.

25.15 Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

25.16 Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.

25.17 Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

25.18 Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

25.19 Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

25.20 Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

25.21 All equipment and systems installed under this Contract shall be grounded, isolated, or conditioned as required to permit equipment to continue to function normally, without interruption, in the event of radio frequency interference (RFI), electromagnetic interference (EMI), power surges/dips or other electrical anomalies.

25.22 It shall be the responsibility of the Contractor or his Sub-contractor to ensure that any coring of holes through the walls or floors will not penetrate existing conduits, cables or mechanical equipment in or under the floor slabs or walls. He shall be responsible to take any and all action as deemed necessary by the Project Manager to correct any such penetrations at his cost. No coring shall be undertaken unless the Project Manager gives permission. Scan walls and floors prior to core drilling to identify hidden piping. Ensure that water does not flow into equipment and below floors. Waterproof and fire stop all penetrations.

26.0 COMMUNICATION WIRING

26.1 Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 25 (Electrical Work).

26.2 Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

26.3 During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

26.4 Verify entire network's integrity following cable installation using appropriate tests for each cable.

26.5 Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

26.6 Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

26.7 Label communication wiring to indicate origination and destination.

26.8 Ground coaxial cable according to OEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

27.0 LOCKABLE PANELS

27.1 Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

27.2 Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

27.3 Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

28.0 WARNING LABELS

28.1 All Controller panelsAffix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

29.0 IDENTIFICATION OF HARDWARE AND WIRING

29.1 Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.

29.2 Permanently label or code each point of field terminal strips to show instrument or item served.

29.3 Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

29.4 Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement (lamacoids).

29.5 Label room sensors related to terminal boxes or valves with nameplates (lamacoids).

29.6 Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

29.7 Label identifiers shall match record documents.

29.8 Insert laminated points list in the control panel

30.0 PRELIMINARY DESIGN REVIEW

30.1 The BAS contractor shall submit a preliminary design document for review. This document shall contain the following information:

30.1.1 Provide a description of the proposed system along with a system architecture diagram with the intention of showing the contractors solution to meet this specification.

30.1.2 Provide product data sheets and a technical description of BC, AAC, ASC hardware required to meet specifications listed herein.

30.1.3 Provide product brochures and a technical description of the Server, Operator Workstation, and Building Control Unit (BC) software required to meet this specification. Provide a description of software programs included.

30.1.4 Open Protocols - For all hardware Building Controllers, Advanced Application Controllers (AAC) and Advanced Specific Controllers (ASC), provide BACnet Interoperability Building Blocks BIBBs certification. Provide complete description and documentation of any proprietary services and/or objects where used in the system.

30.1.5 Provide a description and samples of Operator Workstation graphics and reports.

30.1.6 Provide an overview of the BAS contractor’s local/branch organization, local staff, recent related project experience with references, and local service capabilities.

30.1.7 Provide information on the BAS contractors project team including project organization, project manager, project engineer, programmers, project team resumes, and location of staff.

31.0 DRAWING REQUIREMENTS

31.1.1 Within 45 days of award of contract and before start of construction, submit 3 hard copies and 1 soft copy of manufacturers information and shop drawings. Soft copy to be in AutoCAD or VISIO and WordPerfect or Word formats (latest versions) structured using menu format for easy loading and retrieval on the OWS.

31.1.2 Manufacturer's Data: Provide in completely coordinated and indexed package to assure full compliance with the contract requirements. Piecemeal submittal of data is not acceptable and such submittals will be returned without review. Information shall be submitted for all material and equipment the contractor proposes to furnish under terms of this contract work. Arrange the

submittals in the same sequence as these specifications and reference at the upper right-hand corner the particular specification provision for which each submittal is intended. Submittals for each manufactured item shall be manufacturer's descriptive literature (equipment specification), equipment drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size layout dimension, capacity, specification reference, applicable specification references, and all other information necessary to establish contract compliance.

31.1.3 Shop drawings: Provide in completely coordinated and indexed package:

31.1.3.1 Wiring and piping diagrams.

31.1.3.2 Control schematics with narrative description and control descriptive logic fully showing and describing operation and/or manual procedures available to operating personnel to achieve proper operation of the building, including under complete failure of the BAS.

31.1.3.3 Shop drawings for each input/output point showing all information associated with each particular point including sensing element type and location; details of associated field wiring schematics and schedules; point address; software and programming details (CDL's) associated with each point; and manufacturer's recommended installation instructions and procedures for each type of sensor and/or transmitter.

31.1.3.4 Detailed system architecture showing all points associated with each controller, controller locations, and describing the **spare points capacity** at each controller and BAS LAN.

31.1.3.5 Each BC shall contain a minimum of 20% spare resource capacity. The BC shall provide a throughput capable of transmitting all BAS LAN data connected to it within 10 seconds.

31.1.3.6 Each AAC and ASC shall have a minimum of 10% spare capacity for each point type for future point connection. Provide all processors, power supplies and communication controllers complete so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring. As a minimum, provide one of each type of point available on the controller.

31.1.3.7 Specification sheets for each item including manufacturers descriptive literature, drawings, diagrams, performance and characteristic curves, manufacturer and model number, size, layout, dimensions, capacity, etc

31.1.3.8 Colour graphic displays detailing hierarchical structure of facility, including floor plans, with multi-level penetration to equipment level.

32.0 START-UP AND CHECKOUT

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City's BAS Project Manager shall be present during the Start-Up and Checkout- FOR FACILITIES MANAGEMENT PROJECTS ONLY, FOR OTHER DIVISIONS THIS IS OPTIONAL

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32.1 This work shall include field testing and adjustment of the complete BAS, and on-site final operational acceptance test of the complete operational BAS. The Engineer shall be advised at least 14 days in advance of the dates of all tests and may attend at his discretion. If the Engineer witnesses the test, such tests shall be subject to his approval prior to the release of equipment. If the Engineer elects not to witness the tests, the contractor shall provide performance certification. Acceptance of tests by the Engineer and Project Manager shall not relieve the contractor of responsibility for the complete system meeting the requirements of these specifications after installation.

32.2 Static testing:

32.2.1 Static testing shall include point-by-point testing of the entire system and completion of Component Test Sheets. The contractor shall forward proposed Test Sheets at the shop drawing review stage. These Component Test Sheets shall be completed during the contractor's own testing and verification procedure that is done prior to the request for a final inspection. The completed Component Test Sheets shall then be returned to the Engineer for review and approval. The Engineer may repeat a random sampling of at least 50% of the tests during the Engineers commissioning procedure to corroborate their accuracy. The Contractor shall be on site with test equipment during this verification process. The test procedures shall include the following.

32.2.1.1 Digital input component test sheet:

32.2.1.1.1 DI status shall be verified at the POT and OWS for ON and OFF status.

32.2.1.1.2 All digital alarm inputs shall be proven using actual field conditions where possible or be jumpered at the field device for testing with the approval of the Engineer.

32.2.1.2 Digital output component test sheet:

32.2.1.2.1 Status to be verified at the equipment location. Verification at the OWS shall be completed for ON and OFF status, software DISABLE indicator and OVERRIDEN indicator

32.2.1.3 Analog input component test sheet:

32.2.1.3.1 All temperature sensors shall be calibrated using a hand held meter with equal or better accuracy.

32.2.1.3.2 Selected temperature sensors chosen by the Engineer shall be verified by spraying with a cold spray or other means to ensure response and to test the low temperature alarm condition.

32.2.1.3.3 All pressure sensing devices and analog output feedback shall be verified using a device with equal or better accuracy to ensure correct calibration.

32.2.1.3.4 All humidity sensing devices must be verified using a recently calibrated device with equal or better accuracy

32.2.1.3.5 All CTs shall be set to accurately reflect motor status, including removing belts on belt driven equipment

32.2.1.3.6 All other devices shall be verified using appropriate devices of equal or better accuracy

32.2.1.3.7 Adjust span on feedback devices so that input matches the end device

32.2.2 Analog output component test sheet:

32.2.2.1 AI points shall be tested by sending a command from the PWS or OWS to incrementally stroke the field device from full CLOSED to full OPEN and measuring the signal at the field device. The increments of the test shall be no larger than 10% of the output span.

32.2.2.2 The AO feedback requirement shall also be tested by failing the field device and verifying that the alarm registers

32.2.2.3 Each output shall be exercised over the full output capability of the panel

32.2.2.4 Field device hysteresis shall be measured at a minimum of three output levels for each direction of travel. Output increments shall not exceed 2% of span for this test

33.0 STANDARDS COMPLIANCE

33.1 Where materials or equipment are specified to conform to requirements of the standards of organizations, such as the Canadian Standards Association (CSA) that use a label or listing as method of indicating compliance, proof of such conformance shall be submitted and approved, indexed and cross-referenced with the specification. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the contractor shall submit a certificate from a testing organization adequately equipped and competent to perform such services, and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code. For materials whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate from the manufacturer shall be furnished to the Engineer stating that the material complies with the applicable referenced standard or specification.

34.0 FINAL ACCEPTANCE

34.1 Final acceptance shall commence only after satisfactory completion of start-up, verification of performance and the 30-day test period described earlier. When the Contractor has satisfied himself as to proper system operation he shall advise the BAS Commissioning Engineer/Consultant to establish a date for Final Acceptance. This will involve a point-by-point check of all hardware and software items including graphics and displayed data, as well as performing tasks as directed.

34.2 Supply 2-way radios and all test equipment as previously specified. Have on-site technical personnel capable of re-calibrating all field hardware and modifying software.

34.3 Test each system independently and then in unison with other related systems. Test weather sensitive systems twice- once near winter design conditions and again near summer design conditions.

34.4 Optimize operation and performance of each system. Test full-scale emergency operation and integrity of smoke management and other life safety systems.

34.5 Demonstrate to the Engineer the operation of each system including sequence of operations in regular and emergency modes, under all normal and emergency conditions, start-up, shut-down, interlocks, and lock-outs.

34.6 Upon completion of the testing submit a report to the Engineer to summarize all testing.

35.0 DOCUMENTATION

35.1 Documentation shall consist of 4 hard copies and one soft copy for all information described below

35.2 The final documentation package shall include:

35.2.1 Hard and soft copies of all control drawings (As-Builts).

35.2.2 Manufacturer’s technical data sheets for all hardware and software

35.2.3 Factory operating and maintenance manuals with any customization required

35.2.4 Soft copies of programming and front-end software and each controller’s database. Hard copy output of programming is not necessary

35.2.5 Provide clear, concise, typewritten and soft copy descriptions of all control sequences in the working language.

35.2.6 Soft copy text files shall be in MS-Word.

35.3 Each instruction and reference manual shall be bound in hardback, 3 ring, binders or an approved equivalent shall be provided to the Engineer. Binders to be no more than 2/3 full. Each binder to contain index to full volume. One complete set of manuals shall be furnished prior to the time that the system or equipment tests are performed, and the remaining manuals shall be furnished at acceptance. The identification of each manual's contents shall be inscribed on the cover and spine. The manuals shall include the names, addresses and telephone numbers of each subcontractor installing equipment systems and of the local representatives for each item of equipment and each system. The manuals shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. Additionally, each manual shall contain a comprehensive index of all manuals submitted in accordance with this paragraph. Manuals and specifications shall be furnished which provide full and complete coverage of the following subjects:

35.4 Operational Requirements: This document shall describe in concise terms, all the functional and operational requirements for the system and its functions that have been implemented. It shall be written using common terminology for building operation staff and shall not presume knowledge of digital computers, electronics or in-depth control theory.

35.5 System Operation: Complete step by step procedures for operation of the system, including required actions at each operator station; operation of computer peripherals; input and output formats; and emergency, alarm and failure recovery. Step-by-step instructions for system startup, back-up equipment operation, and execution of all system functions and operating modes shall be provided.

35.6 Maintenance: Documentation of all maintenance procedures for all system components including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective module. This shall include calibration, maintenance, and repair or replacement of all system hardware.

35.7 Test Procedures and Reports: The test implementation shall be recorded with a description of the test exercise script of events and documented as test procedures. A provision for the measurement or observation of results, based on the previously published test specification, forms the test reports. The procedures record and the results of these exercises shall be conveniently bound and documented together.

35.8 Configuration Control: Documentation of the basic system design and configuration with provisions and procedures for planning, implementing, and recording any hardware or software modifications required during the installation, test, and operating lifetime of the system. This shall include all information required to ensure necessary coordination of hardware and software changes, data link or message format/content changes, and sensor or control changes in the event system modification are required, and to fully document such new system configurations.

36.0 TRAINING

36.1 The Contractor shall provide the services of competent instructors who will provide instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. The training shall be oriented towards the system installed rather than being a general "canned" training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The number of person-days (eight hours) of instruction furnished shall be as specified below as a minimum. A training manual shall be provided for each trainee that describes in detail the data included in each training program.

36.2 All equipment and material required for classroom training shall be provided by the contractor. A person-week shall be considered as 37.5 hours, 8:00 am to 12:00 noon, and 12:30 pm to 4:30 pm Monday through Friday. Provide 5 days of training as specified herein.

36.3 Training shall enable operators to accomplish the following objectives:

36.3.1 Proficiently operate system

36.3.2 Understand control system design and configuration

36.3.3 Create and change system graphics

36.3.4 Create, delete, and modify alarms, including configuring alarm reactions

36.3.5 Configure and run reports

36.3.6 Add, remove, and modify system's physical points

36.3.7 Create, modify, and delete application programming

36.3.8 Add a new controller to system

36.3.9 Download firmware and advanced applications programming to a controller

36.3.10 Configure and calibrate I/O points

36.3.11 Maintain software and prepare backups

36.3.12 Understand DDC system components

36.3.13 Understand system operation, including DDC system control and optimizing routines (algorithms)

36.3.14 Operate workstation and peripherals

36.3.15 Log on and off system

36.3.16 Access graphics, point reports, and logs

36.3.17 Adjust and change system setpoints, time schedules, and holiday schedules

36.3.18 Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools

36.3.19 Access data from DDC controllers

36.3.20 Add new users and understand password security procedures

37.0 WARRANTY

37.1 Provide warranty certificates showing the name of the firm giving the warranty, dated from the issuance of the Certificate of Substantial Performance and acknowledged on specific equipment and systems.

37.2 Include these certificates with the Operation and Maintenance Manual in the appropriate sections.

37.3 Contractor shall give a minimum two-year warranty for parts and labor on all equipment and materials installed and shall select materials and equipment where the Manufacturer gives the same warranty arrangements. Warranty shall commence on the date of the Engineers issuance of the Certificate of Substantial Completion.

37.4 Provide a warranty as indicated in 38.0 - Maintenance/Service.

37.5 The Contractor shall agree to make good at his own expense any equipment that fails to operate due to poor workmanship, manufacturing defect or improper installation. Any repairs shall be made at the convenience of the Engineer during normal working hours, unless deemed an emergency.

37.6 Provide upgrades to all software or all panel firmware issued during the warranty period at no charge to Owner.

38.0 MAINTENANCE/SERVICE

****
BAS contractor to show the price of service contract as separate line item.
Applicable to New System Installations OR Major overhaul of existing BAS system/s
****

38.1 Provide warranty in accordance with the warranty section of this specification. In addition provide scheduled maintenance and service during the warranty period on all control system apparatus including but not limited to valves, dampers, linkages, control panels, interfaces, direct digital control systems, OWS, Server, BC, AAC, ASC, Software and application programs.

38.2 Scheduled preventive maintenance inspections will provide those services required to maintain the system at maximum performance and reliability levels and may include the following:

38.3 Analyze, adjust, calibrate the applicable temperature sensors, humidity sensors, diagnostic LEDs, printers, power supplies, work stations, controllers, modems, input/output points, communication cabling, transmitters, transducers, UPS for the BAS system.

38.4 Conduct inspections and thorough preventive maintenance routine on each piece of covered equipment. In addition, make tests and adjustments to ensure efficient and reliable operation of other major components.

38.5 Examine, clean and calibrate as required sensors, thermostats, humidity controls, temperature controls, pressure controls, relays, damper actuators, instrumentation and accessories directly pertaining to the Building Automation System.

38.6 Check and confirm control system sequence of operation to insure optimum system efficiency and economy.

38.7 A log of each loop tested and each control sequence verified shall be reviewed with the owner.

38.8 All components of the Pneumatics Control System will be serviced according to manufacturer's recommendations during each year of the contract. This will include (but not be limited to) all lubricant changes, filter changes, adjustments, calibrations and cleaning.

38.9 The system includes, but is not limited to, the air compressor, air receiver, pressure reducing valves, air dryers and all sensors, controllers, transducers, damper and valve operators, thermostats, pilot positioners, electro-pneumatic switches, linkages and any other pneumatic and electronic devices used to maintain the environmental comfort in the building.

38.10 The Contractor will provide preventative maintenance and diagnostic inspections to all electronic system components on a frequency established by manufacturer's recommendations, component age and condition and discussion with the Supervisor of Operations responsible for the site.

38.11 Provide a fully trained BAS service technician and a Pneumatic fitter (Required for Pneumatic/DDC system) a minimum of one day per month (8 hours for DDC technician and 8 hours for pneumatic fitter) during the warranty period to provide the preventive maintenance and service described above. Provide

written reports to the owner outlining the work performed. Allow for 12 annual visits of one day each (24 days total for 2 years) during the warranty period to provide required service. *(This may change in accordance with the size of the project).*

38.12 Provide emergency service for parts and labor on an as needed basis. Response to an emergency call shall be 2 hours maximum on Mon.-Fri. including on holidays and weekends.

38.13 Provide remote service diagnostic monitoring from the local office. At the request of the owner, a service diagnostic call will be made to troubleshoot and resolve (if possible) any reported system complaints.

38.14 Provide a price for a three-year service agreement based on the above requirements to come in to effect upon the completion of the warranty period. Show this price as OPTION: Service Agreement.

PART 2 – OPERATOR WORKSTATION (OWS) AND SOFTWARE

1.0 GENERAL

1.1 General Requirements: Section 23 09 23 BUILDING AUTOMATION SYSTEM (BAS)

1.2 Performance requirements of the Operator WorkStation (OWS) and the Graphical Users Interface are specified in this section.

1.3 Environmental Conditions: The OWS and its immediate associated devices shall be able to operate properly under environmental conditions of 10 deg.C to 32 deg.C and a relative humidity of 20 to 90% non-condensing.

1.4 **OWS shall be provided by the City's IT department.** BAS contractor shall **NOT** include the cost of the computer for the pricing of the project. The OWS shall be provided for centralized system control, information management, alarm management and data base management functions. All real time control functions shall be resident in the standalone Building Control Unit (BC) and local controllers (AACs and ASCs).

1.5 Provide two copies of all Programming Software; one each for OWS and a laptop; **if requirement of a laptop is deemed necessary otherwise provide only one copy. Requirement of a laptop is site specific and shall be provided by the City's IT department. City's project manager shall consult with the district operation manager/supervisor to determine if a laptop is required for the project.**

1.6 Any computer on the BAS LAN shall be capable of displaying the systems in a graphical and dynamic format utilizing a standard web browser. Screen refresh shall be automatic. Manual refresh is not acceptable.

2.0 WORKSTATION HARDWARE REQUIREMENTS

2.1 Reference 1.1.5

2.2 BAS contractor shall coordinate with the City's IT department through the project manager to discuss minimum requirement of the workstation's (computer) hardware, software (operating system) to ensure BAS system will meet or exceed the performance requirement of this specifications.

2.3 Connection to the BAS LAN network shall be via an Ethernet network interface card, 100 Mbps.

2.4 Provide____Workstations. The Workstation(s) will be located as directed by the engineer.

2.5 **This Item is for guidance only.** Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified by the conusltant's sequence of operation and the points list. Workstations shall be with a minimum of:

2.5.1 Intel Pentium 2.66 GHz processor (Pentium IV- Duo Core)

2.5.2 8 GB RAM

2.5.3 100 GB hard disk providing data at 100 MB/sec

2.5.4 48x CD-ROM drive

2.5.5 Keyboard

2.5.6 Mouse

2.5.7 24-inch 24-bit color monitor with at least 1024 x 768 resolution

2.5.8 Serial, parallel, and network communication ports and cables as required for proper system operation

2.5.9 Two (2) USB 2.0 or 3.0 ports

3.0 PRINTERS

3.1 BAS contractor to coordinate with the City's IT department through the project manager to ensure a network printer is connected to the Operator Workstation that is provided by the City's IT department.

3.2 If the site doesn't have a printer available then City's IT department shall provide a desktop printer.

3.3 **Printer Specifications- For Guidance only:** The printer shall be a bubble jet or inkjet printer, 1440 x1440 dpi resolution, internal 1MB buffer memory, minimum 8 ppm in black. No colour printer is required.

4.0 UNINTERRUPTABLE POWER SUPPLIES

4.1 Provide the OWS, Server (if applicable), and each BC with individual UPS to provide clean, reliable, noise-filtered power at all times and to protect and maintain systems operation throughout short term power interruptions of at least 15 minutes duration. (site specific)

5.0 PROGRAMMING SOFTWARE

5.1 Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

5.1.1 Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."

5.1.2 Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

5.1.3 Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

5.1.4 Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate

actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

5.1.5 Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

5.1.6 Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

5.1.7 Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

5.1.7.1 Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

5.1.7.2 System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

5.2 The software shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the software shall be through password access as assigned by the system administrator.

5.3 Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

5.4 Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building’s flywheel effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day’s performance.

FOR TRIDIUM INTEGRATION (IF APPLICABLE) BAS CONTRACTOR SHALL CONFORM TO ITEMS 5.1, 5.2, 5.3, 5.4 PLUS ITEM 5.5

5.5 A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide real-time data updates. Any real-time data value or object property may be connected to display its current value on a user display.

Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

5.5.1 Programming Methods

5.5.1.1 Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in colour depending on the type of link; i.e., internal, external, hardware, etc.

5.5.1.2 Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.

5.5.1.3 The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.

5.5.1.4 All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.

5.5.1.5 The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

5.5.1.6 The user shall be able to pick a graphical function block from the menu and place on the screen. Programming tools shall place lines connecting appropriate function blocks together automatically. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

5.5.1.7 The programming tools shall include a test mode. Test mode shall show user real-time data on top of graphical display of selected function blocks. Data shall be updated real-time with no interaction by the user. Function blocks shall be animated to show status of data inputs and outputs. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

5.5.1.8 Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the contained application that are represented on the graphical shell of this container.

5.6 OPERATOR WORKSTATION SOFTWARE

5.6.1 Operating System: City's IT department will provide OWS including operating system.

5.6.2 The BAS software shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to,

forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

5.6.3 Real-Time Displays. The OWS, shall at a minimum, support the following graphical features and functions:

5.6.3.1 Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.

5.6.3.2 Graphic screens shall have the capability to contain objects for text, real-time values, animation, colour spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URLs, and links to other graphic screens.

5.6.3.3 Graphics shall support layering and each graphic object shall be configurable for assignment to one a layer. A minimum of six layers shall be supported.

5.6.4 Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

5.6.5 Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

5.6.6 Right-clicking the selected object and using a graphical slider to adjust the value shall make adjustments to analog objects, such as set points. No entry of text shall be required.

5.6.7 System Configuration. At a minimum, the OWS shall permit the operator to perform the following tasks, with proper password access:

5.6.7.1 Create, delete or modify control strategies.

5.6.7.2 Add/delete objects to the system.

5.6.7.3 Tune control loops through the adjustment of control loop parameters.

5.6.7.4 Enable or disable control strategies.

5.6.7.5 Generate hard copy records or control strategies on a printer.

5.6.7.6 Select points to be alarm-able and define the alarm state.

5.6.7.7 Select points to be trended over a period of time and initiate the recording of values automatically.

5.6.8 On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

5.6.9 Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This

auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

5.6.10 System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

5.6.11 Alarm Console. The system shall be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

5.6.12 Operator's workstation software shall contain an easy-to-operate system; allowing configuration of system-wide controllers, including management and display of the controller programming. This system shall provide the capability to configure controller binary and analog inputs/outputs.

5.6.13 The system shall be capable of utilizing third-party Windows-based programs for such things as spreadsheet analysis, graphing, charting, custom report generation, and graphics design packages. Graphics generation shall be done using standard Windows packages. No proprietary graphics generation software shall be needed.

5.6.14 Provide software, which enables the non-programmer operator to easily perform, tasks which are likely to be part of his daily routine.

5.6.15 The operator's console shall provide facilities for manual entries and visual displays enabling an operator to enter information into the system and obtain displays and logs of system information. All requests for status, analog, graphic displays, logs, and control shall be selected from the operator's console. The operator interface shall minimize the use of typewriter style keyboard by implementing a mouse or similar pointing device and "point and click" approach to command selection. The facility shall be provided to permit the operator to perform the following tasks:
5.6.15.1 Automatic logging of digital alarms and change of status message.

5.6.15.2 Automatic logging of all analog alarms.

5.6.15.3 System changes (alarm limits, set-points, alarm lock-outs, etc.).

5.6.15.4 Display specific points as requested by the operator.

5.6.15.5 Provide reports as requested by the operator and on Scheduled basis where so required.

5.6.15.6 Display graphics as requested by the operator.

5.6.15.7 Display help information.

5.6.15.8 Provide trend logs as required by the operator.

5.6.15.9 Provide manual control of digital and analog outputs as required by the operator.

5.6.15.10 Direct the hard copy output of information to the device selected by the operator.

5.6.15.11 Data displayed on monitor to cyclic update as appropriate.

5.6.16 Online changes:
5.6.16.1 Alarm limits

5.6.16.2 Setpoints

5.6.16.3 Deadbands

5.6.16.4 Changes/deletions/additions ofpoints.

5.6.16.5 Control and change of statechanges.

5.6.16.6 Time of day, day, month, year.

5.6.16.7 Control loop control description changes for NCU based CDM's.

5.6.16.8 Control loop tuningchanges

5.6.16.9 Schedule changes

5.6.16.10 Changes/additions/deletions to system graphics

5.6.16.11 Changes/additions/deletions to total systems

5.6.17 It shall be possible for the OWS operator to initiate analog and digital output commands. Where the BAS software normally originates these outputs, the provision shall exist for the operator to terminate automatic BAS control of any particular output and to originate a manual analog or digital output command. The provision shall exist for the operator to return analog or digital output command functions to automatic BAS software control.

5.6.18 It shall be possible for the OWS operator to place any computed system setpoint to a computed basis or manual value as and when required.

5.6.19 All above functions shall operate under the password protection system.

5.6.20 A vocabulary of at least 25 different descriptions using at least six alphanumeric characters to identify engineering units for analog input and output points. Typical description is as follows: %, Deg.C, KPA, KW, KWH, L/S, CFM, Deg.F, PSI. The descriptions shall be alterable from the OWSconsole with the system on-line.

5.6.21 Upon operator's request, the system shall present the condition of any single point, any system, and area or the whole system on printer or CRT. The output device shall be by operator's choice. Analog values and status displayed on the CRT shall be updated whenever new values are received. Points in alarm shall be flagged by blinking, inverse video different colour, bracketed, or by some other means to differentiate them from points not in alarm. Overridden (not in auto) points/values shall similarly be identified.

5.7 REPORTING ACCURACY

5.7.1 System shall report values with minimum end-to-end accuracy listed in Table 1.

5.8 CONTROL STABILITY AND ACCURACY

5.8.1 Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1
Reporting Accuracy

Measured Variable	**Reported Accuracy**
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)

Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15ºC (±0.25ºF)
Relative Humidity	±5% RH for monitor only, ±3% RH for control
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm
Note 1: 10% - 100% of scale	
Note 2: For both absolute and differential pressure	
Note 3: Not including utility-supplied meters	

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

5.9 ERROR MESSAGES

5.9.1 Inform operator of all errors in data, errors in entry instructions, failure of equipment to respond to requests or commands, or failure of communications between components of EMCS.

5.9.2 Error messages to be comprehensive and communicate clearly to operator precise nature of problem.

5.10 PASSWORD PROTECTION

5.10.1 Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's terminal functions unless user is logged on. This includes displays as outlined above.

5.10.2 Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 8 characters, User Name shall be 29 characters, and Password shall be 8 characters long. Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

5.11 AUDIT LOGS

5.11.1 Provide and maintain an Audit Log that tracks all activities performed on the NCU. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it=s user-defined buffer size. Provide the ability to archive the log locally (to the NCU), to another NCU on the network, or to a server. For each log entry, provide the following data:

5.11.2 Time and date

5.11.3 User ID

5.11.4 Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

5.12 TREND DATA

5.12.1 System shall periodically gather historically recorded selected samples of object data stored in the field equipment (global controllers, field controllers) and archive the information on the operator's workstation (server) hard disk. Archived files shall be appended with new sample data, allowing samples to be accumulated over several years. Systems that write over archived data shall not be allowed, unless limited file size is specified. Samples may be viewed at the operator's terminal in a trendlog. Logged data shall be stored in spreadsheet format. Operator shall be able to scroll through all trendlog data. System shall automatically open archive files as needed to display archived data when operator scrolls through the data vertically. All trendlog information shall be displayed in standard engineering units.

5.12.2 Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to six object types at the same time in different colours. Graphs shall show object type value relative to time.

5.12.3 Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

5.12.4 System shall be capable of periodically gathering energy log data stored in the field equipment and archive the information on the operator workstation's hard disk. Log data shall include both instantaneous and accumulated values. Archive files shall be appended with the new data, allowing data to be accumulated over several years. Systems that write over archived data shall not be allowed unless limited file size is specified. System shall automatically open archive files as needed to display archived data when operator scrolls through the data. Display all energy log information in standard engineering units.

5.12.5 System software shall be provided that is capable of graphing the energy log data. Software shall be capable of creating two-axis (x,y) graph that show recorded data, relative to time. All data shall be stored in comma-delimited file format for direct use by third-party spreadsheet or other database programs. Operation of system shall not be affected by this operation. In other words, it shall stay completely online.

5.12.6 Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. All operations shall be password protected.

5.13 GRAPHICS

5.13.1 The operator's workstation shall display all data associated with the project. The operator's terminal software shall accept Windows BITMAP (*.bmp) format graphic files for display purposes. Graphic files shall be created using scanned, full colour photographs of system

installation, AutoCAD drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's terminal shall display all data using 3-D graphic representations of all mechanical equipment.

5.13.2 Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 seconds.

5.13.3 Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 seconds and shall automatically refresh every 15 seconds

5.13.4 Colour graphic displays detailing hierarchical structure of facility, including floor plans, with multi-level penetration to equipment level.

5.13.5 System shall be capable of displaying graphic file, text, and dynamic object data together on each display. Information shall be labelled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Terminal shall allow user to change all field-resident BAS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

5.13.6 All displays shall be generated and customized in such a manner that they fit the project as specified. Canned displays shall not be acceptable. Displays shall use standard English for labelling and readout. Systems requiring factory programming for graphics or DDC logic are specifically prohibited. The installing contractor without factory dependency or assistance shall support all graphics and DDC programming locally.

5.13.7 Binary objects shall be displayed as ON/OFF/NULL or with customized text. Text shall be justified left, right or centre as selected by the user. Also, allow binary objects to be displayed as individual change-of-state bitmap objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three bitmap files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the objects commanded status when the bitmap is selected with the system digitizer (mouse). Similarly, allow the terminal operator to toggle the object's status by selecting (with the mouse) a picture of a switch or light, for example, which then displays a different picture (such as an ON switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic.

5.13.8 Animated graphic objects shall be displayed as a sequence of multiple bitmaps to simulate motion. For example: when a pump is in the OFF condition, display a stationary picture of the pump. When the operator selects the pump picture with the mouse, the represented objects status is toggled and the picture of the pumps impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change bitmap file assignment and also create new and original bitmaps online. System shall be supplied with a library of standard bitmaps, which may be used unaltered or modified by the operator. Systems that do not allow customisation or creation of new bitmap objects by the operator (or with third-party software) shall not be allowed.

5.13.9 Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual bitmap items on the display screen as an overlay to the system graphic. Each analog input object may be assigned to a minimum of five bitmap files, each with high/low limits for automatic selection and display of the bitmaps. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the increase or decrease arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.

5.13.10 Analog objects may also be assigned to an area of a system graphic, where the colour of the defined area would change based on the analog objects value. For example, an area of a floor-plan graphic served by a single control zone would change colour with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.

5.13.11 A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A separate security level may be assigned to each display and system object.

5.13.12 A mouse, or other form of digitizer, shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.

5.13.13 Displays may be modified on site or via remote communications.

5.13.14 Entire system shall operate without dependency on the operator's terminal. Provide graphic generation software at each workstation.

5.14 ALARMS

5.14.1 Operator’s terminal shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running (such as a word processor). Printout of alarms shall be sent to the assigned terminal and port.

5.14.2 System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator’s terminal. Each entry shall include a description of the event-initiating object generating the alarm, time and date of alarm occurrence, time and date of object state return to normal, and time and date of alarm acknowledgement.

5.14.3 Alarm messages shall be in user-definable text English (or other specified language) and shall be entered either at the operator’s terminal or via remote communication.

5.15 SCHEDULING

5.15.1 Operator’s terminal display of weekly schedules shall show all information in easy-to-read 7-day (weekly) format for each schedule. This includes all ON/OFF times (to the minute) for each days events.

5.15.2 Exception schedules (non-normal schedules, such as holidays or special events) shall display all dates that are an exception to the weekly schedules. These speciality schedules shall be displayed at the operator’s terminal in a format similar to the weekly schedules, again allowing easy data entry. Exception schedule data is entered by the following methods: date entries (one day entries), date-to-date (a range or span of days), and by weekday (for example, a given day of a given week each month). User shall be able to scroll easily through the months for each year as a minimum.

5.15.3 At the operator’s terminal, the system user shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.

5.16 ARCHIVING

5.16.1 Store back-up copies of all controllers databases in at least one OWS and/or the server(if applicable).

5.16.2 Provide continuous supervision of integrity of all controller databases. If controller loses database, system to automatically download new copy of database to restore proper operation.

5.16.3 Data base back up and downloading to occur over LAN without operator intervention. Operator to be able to manually download entire controller database or parts thereof.

5.17 REPORTS

5.17.1 Provide a report facility to generate and format for display, printing, or permanent storage, as selected by the operator, the reports as specified in this section. If display output (CRT) is requested, it shall be scrollable; scroll bars will be used to allow easy and flexible movement within the report. Output to be sorted by area, system, point.

5.17.2 Periodic/Automatic Report: Provide the software to automatically generate any report specified, the user will be able to specify the type of report, start time and date, interval between reports (hourly, daily, weekly, monthly) and output device. The software will allow the operator to modify the periodic/automatic reporting profile at any time.

5.17.3 As a minimum, the following reports shall be configured on the system:

5.17.3.1 Dynamic Reports: To allow operator to request a display of the dynamic value for the user specified points which shall indicate the status at the time the request was entered and updated at an operator modifiable scan frequency. It shall be possible to select points on the following basis:

5.17.3.1.1 All points in all areas
5.17.3.1.2 Area (all points in area)
5.17.3.1.3 Area system (all points in system)
5.17.3.1.4 Area system point (individual point)
5.17.3.1.5 System (all points by system and point type)
5.17.3.1.6 System point (all points by system and point type)
5.17.3.1.7 Area point (all points by area and point type).

5.17.3.2 Summary Report: To permit the display or printing the dynamic value for the user specified points which shall indicate the status at the time the CLM was entered. Reports to be available on same basis as dynamic reports. Output will be to the user selected output device.

5.17.3.3 Trend Reports: To permit the trending of points selected by the operator, including as a minimum digital input and output, analog input and output, set points, and calculated values.

5.17.3.4 Historical Data Collection: Provision shall be made to ensure historical data is not lost. The ability to off-load historical data to removable media, and to later load data previously backed-up, will be provided. Historical data values, for an operator specified time range and for operator specified points, may be output the same as for trend data.

5.17.3.5 Critical Alarm Summary: Provide a summary of those points in the critical alarm state and include as a minimum; point acronym, point description, alarm type, limit exceed, current value, alarm type, time and date of occurrence.

5.17.3.6 Maintenance Alarm Summary: Provide a summary of those points in maintenance alarm and include as a minimum; point acronym, point description, current value, alarm type, limit exceed, time and date of occurrence.

5.17.3.7 Alarm Summary: Provide a summary of all points in alarm and include as a minimum; point acronym, point description, current value, alarm type, limit exceeded, and time and date of occurrence.

5.17.3.8 Disable Point Summary: Provide a summary of all points in the disabled state and include as a minimum point acronym and point description.

5.17.3.9 Run Time Summary: Provide a summary of the accumulated running time of selected pieces of equipment with point acronym and description, run time to date, alarm limit setting. The run time shall continue to accumulate until reset individually by means of suitable operator selection.

5.17.3.10 Schedule Summary: Provide a summary of all schedules and indicate as a minimum, which days are holidays and, for each section, the day of the week, the schedule times and associated values; for digital schedules value will be on or off; for analog schedules value will be an analog value.

5.17.3.11 User Record Summary: Provide a summary of all user records to include as a minimum; user name, password, initials, command access level and point groups assigned.

5.18 UTILITY SOFTWARE

5.18.1 Supply and install software products to allow the owner to access and manipulate the control schematic diagrams, and to access product data sheets in an electronic format.

5.18.2 Enter all soft copy submissions; including "Record" drawings as specified herein [Shop Drawings, Product Data, etc.] in OWS.

5.19 WEB BROWSER CLIENTS

5.19.1 The system shall be capable of supporting at least 100 simultaneous users using a standard Web browser such as Internet Explorer. Systems requiring additional software to be resident on the client machine to enable a standard Web browser, or manufacturer-specific browsers shall not be acceptable.

5.19.2 The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall not be acceptable.

5.19.3 The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

5.19.4 The Web browser client shall support as a minimum, the following functions:

5.19.4.1 User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

5.19.4.2 Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the Software shall be supported by the Web browser interface.

5.19.4.3 HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

5.19.4.4 Storage of the graphical screens shall be in the Network Control Unit (NCU), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5.19.4.5 Real-time values displayed on a Web page shall update automatically without requiring a manual refresh of the Web page.

5.19.5 User's shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

5.19.5.1 Modify common application objects, such as schedules, calendars, and set points in a graphical manner. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

5.19.5.1.1 Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

5.19.5.1.2 View logs and charts

5.19.5.1.3 View and acknowledge alarms

5.19.5.1.4 Setup and execute SQL queries on log and archive information

5.19.6 The system shall provide the capability to specify a user's home page (as determined by the log-on user identification). Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

5.19.7 Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.