







SPECIFICATIONS ISSUED FOR TENDER MAY 2021

# TRILLIUM LAKELANDS DISTRICT SCHOOL BOARD SUMMER 2021 WASHROOM RENEWALS **PROJECT MANUAL**

# 1 CONSULTANTS

The following Consultants prepared these Contract Documents:

- .1 PRIME CONSULTANT ARCHITECT: Jason Lowe Architect Inc. 77 Main Street East, Huntsville, ON P1H 2B9 T: **705 571 1465**
- .2 STRUCTURAL CONSULTANT: Tulloch Engineering Inc. 80 Main Street West Huntsville, ON P1H 1W9 T: **705 789 7851**
- .3 MECHANICAL AND ELECTRICAL CONSULTANT: HL Engineering Ltd. 14721 Woodbine Avenue Stouffville, ON L4A 2G7 T: 905 713 0003

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#### 1 SEALS and SIGNATURES

.1 The seal and signature below represents that this document issued for Building Permit so sealed was prepared in its entirety under the personal supervision and direction of a member of the Ontario Association of Architects or the Professional Engineers of Ontario for the sections indicated.

# ARCHITECTURAL SPECIFICATIONS JASON LOWE ARCHITECT Inc. Jason Lowe, B. Arch., OAA, Architect



**STRUCTURAL SPECIFICATIONS** Tulloch Engineering Inc. Frank Palmay, P.Eng

MECHANICAL and ELECTRICAL SPECIFICATIONS HL Engineering Ltd. Ming Jia Li, P.Eng.





### 1 GENERAL

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### 1 GENERAL

### 1.01 Appendix A:

.1 APPENDIX A: Details contains Architectural details are common and apply to all projects. Appendix A: Details is an 11x17 package of drawings.

### 1.02 Appendix B:

.1 APPENDIX B: Reference Booklet contains Structural details that are common and apply to all projects. Appendix B: Reference Booklet is an 11x17 package of drawings combined with Appendix A: Details

#### 1.03 Specifications:

.1 The specifications contain Architectural, Structural, Mechanical and Electrical specifications and are common and apply to all projects. The "Project Manual" containing the specifications is an 8-1/2" x 11" document.

### 1.04 PINE GLEN PUBLIC SCHOOL – 24"x36" Drawings

### Architectural

- A000 Cover Sheet
- A010 Code Compliance
- A020 DEMOLITION Keyplan and Rm 104A 105
- A021 DEMOLITION Rm 108, 109, 110 and 112
- A022 DEMOLITION Rm 113, 116A, 120, 121, 142, 143
- A023 Rm 124-125 DEMOLITION
- A100 NEW WORK GENERAL INFORMATION
- A200 Rm 104A 105 NEW WORK and FINISHES
- A201 Rm 108 NEW WORK
- A202 Rm 109-110 NEW WORK
- A203 Rm 112 NEW WORK
- A204 Rm 113 NEW WORK
- A205 Rm 142-143 NEW WORK and FINISHES
- A206 Rm 116A, 120A/B, 121 NEW WORK
- A207 Rm 124 125 NEW WORK
- A600 Rm 113 Kitchen Millwork
- A601 Rm 108 Benches
- A901A Rm 108 FINISHES
- A901B Rm 108 FINISHES
- A902A Rm 109 110 FINISHES
- A902B Rm 109 110 FINISHES

### Architectural (CON'T)

A903A Rm 112 FINISHES
A903B Rm 112 FINISHES
A904 Rm 113 FINISHES
A905A Rm 116A, 120A/B, 121 FINISHES
A905B Rm 116A, 120A/B, 121 FINISHES
A906A Rm 124, 125 FINISHES
A906B Rm 124, 125 FINISHES

### Structural

G1 STRUCTURAL UPGRADES & REPAIRS GENERAL NOTES
S1 STRUCTURAL UPGRADES & REPAIRS ROOM 108
S2 STRUCTURAL UPGRADES & REPAIRS ROOM 110 AND 112
S3 STRUCTURAL UPGRADES & REPAIRS RM 116, 121, 124, 125
APPENDIX B: REFERENCE BOOKLET

### Mechanical

M01A MECHANICAL LEGEND, DRAWING LIST, KEY PLAN AND SCHEDULE M01B PLUMBING SPECIFICATION M02 MECHANICAL PLANS - RM 104A/105 M03 MECHANICAL PLANS - RM 108/108A/108B M04 MECHANICAL PLANS - RM 109/110 M05 MECHANICAL PLANS - RM 112/112A/112B/112C/112D M06 **MECHANICAL PLANS - RM 113** M07 **MECHANICAL PLANS - RM 116A** M08 MECHANICAL PLANS - RM 120A/120B M09 MECHANICAL PLANS - RM 121 M10 MECHANICAL PLANS - RM 124/125 M11 MECHANICAL PLANS - RM 142/143

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 104A & 105
- E03 ELECTRICAL LAYOUTS ROOM 108
- E04 ELECTRICAL LAYOUTS ROOM 109 & 110
- E05 ELECTRICAL LAYOUTS ROOM 112
- E06 ELECTRICAL LAYOUTS & DETAILS ROOM 113
- E07 ELECTRICAL LAYOUTS & DETAILS ROOM 116A
- E08 "ELECTRICAL LAYOUTS ROOM 120A, 120B & 122"
- E09 ELECTRICAL LAYOUTS ROOM 124 & 125
- E10 ELECTRICAL LAYOUTS ROOM 142 & 143

### 1.05 IRWIN MEMORIAL PUBLIC SCHOOL – 24"x36" Drawings

### Architectural

A000 Cover Sheet A010 Code Compliance A020 Rm 117-119 DEMOLITION A022 Rm 129 DEMOLITION A200 Rm 117-119 NEW WORK A201 Rm 126 NEW WORK A202 Rm 129 NEW WORK A203 Rm 138-139 NEW WORK A900A Rm 117-119 FINISHES A900B Rm 117-119 FINISHES A901A Rm 126 FINISHES A901B Rm 126 FINISHES A902A Rm 129 FINISHES A902B Rm 129 FINISHES A903A Rm 138-139 FINISHES A903B Rm 138-139 FINISHES

### Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 117, 118, 119 AND 126
- S2 STRUCTURAL UPGRADES AND REPAIRS RM 138 AND 139

APPENDIX B: REFERENCE BOOKLET

### Mechanical

- M01 MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE AND PLUMBING FIXTURE SPECIFICATION
- M02 EXISTING MECHANICAL PLAN RM 117&118&119
- M03 PROPOSED MECHANICAL PLAN RM 117&118&119
- M04 EXISTING MECHANICAL PLAN RM 126&126A&126B
- M05 PROPOSED MECHANICAL PLAN RM 126&126A&126B
- M06 EXISTING MECHANICAL PLAN RM 129&129A&129B&129C
- M07 PROPOSED MECHANICAL PLAN RM 129&129A&129B&129C
- M08 EXISTING MECHANICAL PLAN RM 130&138
- M09 PROPOSED MECHANICAL PLAN RM 130&138
- M10 EXISTING AND PROPOSED MECHANICAL PLAN RM 135

### Electrical

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 117/118/119 & 126
- E03 ELECTRICAL LAYOUTS ROOM 129/138/139 & 135

# 1.06 GRAVENHURST HIGH SCHOOL – 24"x36" Drawings

# Architectural

- A000 Cover Sheet
- A010 Code Compliance
- A020 Rm 136A, 142, 143, 146 and 147 DEMOLITION
- A200 Rm 136B NEW WORK and FINISHES
- A201 Rm 142, 143, 148 and 148 NEW WORK
- A900 Rm 142-143 FINISHES
- A901 Rm 146-147-148 FINISHES

# Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 136A, 142, 143, 146,148
- APPENDIX B: REFERENCE BOOKLET

# Mechanical

- M01 MECHANICAL LEGEND, DRAWING LIST & KEY PLAN
- M02 MECHANICAL SCHEDULE, DETAIL AND PLUMBING FIXTURE SPECIFICATION
- M03 MECHANICAL PLAN RM 136A UNIVERSAL WASHROOM
- M04 MECHANICAL PLAN RM 142-143 MALE & FEMALE STAFF WASHROOM
- M05A EXISTING PLAN RM 146-148 BOY'S AND GIRL'S WASHROOM
- M05B PROPOSED PLAN RM 146-148 BOY'S AND GIRL'S WASHROOM

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS & DETAILS UNIVERSAL WASHROOM 136A
- E03 ELECTRICAL LAYOUTS WASHROOM 142 & 143
- E04 ELECTRICAL LAYOUTS WASHROOM 146 & 148

# 1.07 HALIBURTON HIGHLANDS SECONDARY SCHOOL – 24"x36" Drawings

### Architectural

- A000 Cover Sheet
- A010 Code Compliance
- A020 Rm 111-112 Demolition
- A021 DEMOLITION
- A200 Rm 111-112 NEW WORK
- A201 Rm 168 NEW WORK
- A202 Rm 128 NEW WORK
- A203 Rm 130 NEW WORK and FINISHES
- A204 Rm 159 NEW WORK and FINISHES
- A205 Rm 160 NEW WORK
- A900a Rm 111-112 FINISHES
- A900B Rm 111-112 FINISHES
- A901 Rm 168 FINISHES
- A902 Rm 128 FINISHES
- A903 Rm 160 FINISHES

### Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 111, 112, 159 AND 160
- S2 STRUCTURAL UPGRADES AND REPAIRS RM 128, 130 AND 168

APPENDIX B: REFERENCE BOOKLET

# Mechanical

- M01A MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE
- M01B PLUMBING FIXTURE SPECIFICATION
- M02 EXISTING MECHANICAL PLAN RM 111-112
- M03 PROPOSED MECHANICAL PLAN RM 111-112
- M04 EXISTING MECHANICAL PLAN RM 128-130-168
- M05 PROPOSED HVAC AND PLUMBING PLAN RM 128-130-168
- M06 PROPOSED DRAINAGE PLAN RM 128-130-168
- M07 PROPOSED MECHANICAL PLAN RM 159-160

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 111 & 112
- E03 ELECTRICAL LAYOUTS ROOM 159 & 160
- E04 ELECTRICAL LAYOUTS ROOM 128 & 168
- E05 ELECTRICAL LAYOUTS ROOM 130

### 1.08 J DOUGLAS HODGSON ELEMENTARY SCHOOL – 24"x36" Drawings

### Architectural

A000 Cover Sheet

- A010 Code Compliance
- A020A Rm 112-113 Demolition
- A021 Rm 116-117 Demolition
- A200 RM 112 NEW WORK
- A201 Rm 113 NEW WORK
- A202 Rm 116-117 NEW WORK
- A203 Rm 126-127 NEW WORK
- A900 Rm 112 FINISHES
- A901 Rm 113 FINISHES
- A902 Rm 116-117 FINISHES
- A903A Rm 126-127 FINISHES
- A903B Rm 126-127 FINISHES

# Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 112 AND 113
- S2 STRUCTURAL UPGRADES AND REPAIRS RM 116, 117, 126 AND 127

APPENDIX B: REFERENCE BOOKLET

# Mechanical

M01 MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE AND PLUMBING FIXTURE SPECIFICATION

- M02 EXISTING MECHANICAL PLAN RM 112-113
- M03 PROPOSED MECHANICAL PLAN RM 112-113
- M04 EXISTING MECHANICAL PLAN RM 116-117
- M05 PROPOSED MECHANICAL PLAN RM 116-117
- M06 EXISTING MECHANICAL PLAN RM 126-127
- M07 PROPOSED MECHANICAL PLAN RM 126-127
- M08 PROPOSED MECHANICAL PLAN DRINKING FOUNTAINS

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 EXISTING ELECTRICAL LAYOUTS ROOM 112 & 113
- E03 PROPOSED ELECTRICAL LAYOUTS ROOM 112 & 113
- E04 PROPOSED ELECTRICAL LAYOUTS ROOM 116 & 117
- E05 PROPOSED ELECTRICAL LAYOUTS ROOM 126 & 127
- E06 ELECTRICAL LAYOUT CORRIDOR

# 1.09 DUNSFORD DISTRICT ELEMENTARY SCHOOL – 24"x36" Drawings

### Architectural

A000 Cover Sheet
A010 Code Compliance
A020 Demolition
A200 Floor Plan New Work
A600 MILLWORK
A900 FINISHES
A901 FINISHES

### Structural

G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
 S1 STRUCTURAL UPGRADES AND REPAIRS RM 129-132 AND 166
 APPENDIX B: REFERENCE BOOKLET

### Mechanical

M01 MECHANICAL LEGEND, DRAWING LIST, SCHEDULE, DETAIL AND SPECIFICATION

M02 MECHANICAL PLAN - RM 129/130/131

M03 MECHANICAL PLAN - RM 166

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 129 & 129A & 130 & 131
- E03 ELECTRICAL LAYOUTS ROOM 166

# 1.10 FENELON TOWNSHIP PUBLIC SCHOOL – 24"x36" Drawings

### Architectural

- A000 Cover Sheet
- A010 Code Compliance
- A020 DEMOLITION
- A200 Rm 111 NEW WORK
- A201 Rm 125 NEW WORK
- A900 Rm 111, 112, 113, 114 FINISHES
- A901 Rm 111, 112, 113, 114 FINISHES
- A902 Rm 125 FINISHES

# Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 111, 112, 113, 114, 125
- APPENDIX B: REFERENCE BOOKLET

# Mechanical

- M01 MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE AND PLUMBING FIXTURE SPECIFICATION
- M02 MECHANICAL PLANS RM 111-113-114-115
- M03 MECHANICAL PLANS RM 125

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 111/112/113/114
- E03 ELECTRICAL LAYOUTS ROOM 154/155

### 1.11 IE WELDON SECONDARY SCHOOL – 24"x36" Drawings

### Architectural

- A000 Cover Sheet
- A010 Code Compliance
- A020 Rm 169-170 Demolition
- A200 Rm 169 NEW WORK
- A201 Rm 170 NEW WORK
- A900 Rm 169 FINISHES
- A901 Rm 170 FINISHES

# Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS ROOM 160, 161, 169, 170
- APPENDIX B: REFERENCE BOOKLET

# Mechanical

- M01 MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE AND PLUMBING FIXTURE SPECIFICATION
- M02 EXISTING MECHANICAL PLAN RM 169&170
- M03 PROPOSED MECHANICAL PLAN RM 169&170

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS WASHROOM 169&170

# 1.12 LESLIE FROST PUBLIC SCHOOL – 24"x36" Drawings

# Architectural

A000 Cover Sheet
A010 Code Compliance
A020A Rm 103-104 DEMOLITION
A200 Floor Plan NEW WORK
A900 Rm 103-104 FINISHES
A901 Rm 103-104 FINISHES

# Structural

G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES

S1 STRUCTURAL UPGRADES AND REPAIRS RM 103 AND 104

APPENDIX B: REFERENCE BOOKLET

# Mechanical

- M01 MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE AND PLUMBING FIXTURE SPECIFICATION
- M02 MECHANICAL PLANS RM 103 & 104

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 103 & 104

# 1.13 PARKVIEW PUBLIC SCHOOL – 24"x36" Drawings

### Architectural

 A000
 Cover Sheet

 A010
 Code Compliance

 A020
 Rm 120-121 DEMOLITION

 A200
 Rm 120-121 NEW WORK

 A201
 Rm 128 - 130 NEW WORK

 A900A
 Rm 120, 121 and 122 FINISHES

 A900B
 Rm 120-121 FINISHES

 A901
 Rm 128-130 FINISHES

 A902A
 Rm 128-130 FINISHES

 A902B
 Rm 128-130 FINISHES

 A902B
 Rm 128-130 FINISHES

 A902B
 Rm 128-130 FINISHES

### Structural

- G1 STRUCTURAL UPGRADES AND REPAIRS GENERAL NOTES
- S1 STRUCTURAL UPGRADES AND REPAIRS RM 120, 121, 128, 130

APPENDIX B: REFERENCE BOOKLET

### Mechanical

- M01A MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULE, DETAIL
- M01B PLUMBING FIXTURE SPECIFICATION
- M02 EXISTING MECHANICAL PLAN RM 120&121&122
- M03 PROPOSED MECHANICAL PLAN RM 120&121&122
- M04 EXISTING MECHANICAL PLAN RM 128&129a&130&133&134&135
- M05 PROPOSED MECHANICAL PLAN RM 128&129a&130&133&134&135

- E01 KEY PLAN, DRAWING LIST, LEGEND & DETAILS ELECTRICAL
- E02 ELECTRICAL LAYOUTS ROOM 120, 121 & 122
- E03 ELECTRICAL LAYOUTS ROOM 128, 130, 133, 134 & 135

- 2 PRODUCTS
- 2.01 NOT USED
  - .1 Not Used
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Divisions 2-10 of the Specifications
- .2 Supplementary Conditions to the Contract
- .3 RFT Standard Conditions of the Contract

### 1.02 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises renovations to existing spaces and to existing washrooms and rooms of various TLDSB schools, located and as described below. Refer to the specifications and drawings for complete information.

.1 Pine Glen Public School, Huntsville, Ontario – Renovation of existing Washroom 104A, Custodial Rm 105, Girl's Changeroom Rm 108 and adjacent spaces including creation of a new storage room, Girl's Washroom Rm 109, Boy's Washroom 110, Boy's Changeroom Rm 112 and related spaces including creation of a new storage room, Kitchen Rm 113, Universal Washroom Rm 116A, Staff Washrooms Rm 120A and 120B, Custodial Room Rm 121, Girl's Washroom Rm 124, Boy's Washroom Rm 125, Gym Office Rm 142 and Gym Office Washroom Rm 143 as well as corridors adjacent to these spaces.

.2 Irwin Memorial Public School, Dwight, Ontario. Renovation of existing Girl's Washroom Rm 117, Custodial Rm 118, Boy's Washroom 119, Boy's Changeroom Rm 126 and related spaces including the creation of a new storage room, Girl's Changeroom 129 and related spaces including a new storage room, Custodial Rm 135, Girl's Washroom 137, Boy's Washroom Rm 138 and corridors adjacent the renovated rooms.

.3 Gravenhurst High School, Gravenhurst, Ontario. Renovation of existing Universal Washroom Rm 136B, Staff Washrooms Rms 142 and 143, Girl's Washroom Rm 146, Boy's Washroom Rm 148 and corridors adjacent to these rooms.

.4 Haliburton Highlands Secondary School, Haliburton, Ontario. Renovation of existing Boy's Washroom Rm 111, Girl's Washroom 112, Girl's Washroom Rm 128, Gender Neutral Washroom Rm 130, conversion of two existing washrooms to gender neutral washrooms (Rms 159 and 160), Boy's Washroom Rm 168 and corridors adjacent these spaces.

.5 J Douglas Hodgson Elementary School, Haliburton, Ontario. Renovation of existing Boy's Washroom Rm 112, Girl's Washroom Rm 113, Staff Washrooms Rms 116 and 117, Girl's Washroom Rm 126, Boy's Washroom Rm 127 and corridors adjacent these rooms.

.6 Dunsford District Elementary School, Dunsford, Ontario. New millwork in Rm 136A, renovation of an existing storage room to convert it into a new Universal Washroom Rm 129, a

new storage room Rm 129A, renovation to existing washrooms 130, 131 and 166 and new shelving in Custodial Rm 132.

.7 Fenelon Township Public School, Cameron, Ontario. Renovation of existing Girl's Washroom Rm 111, Staff Washrooms 112 and 113, Custodial Rm 114, Boy's Washroom Rm 125 and corridors adjacent these rooms.

.8 IE Weldon Secondary School, Lindsay, Ontario. Renovation of existing Boy's Washroom Rm 169, Girl's Washroom Rm 170, repair of an existing service main from washrooms above and corridor finishes adjacent Rms 169/170.

.9 Leslie Frost Public School, Lindsay, Ontario. Renovation to Boy's Washroom Rm 113, Girl's Washroom Rm 104 and the corridor finishes adjacent these rooms.

.10 Parkview Public School, Lindsay, Ontario. Renovation of Girl's Washroom Rm 120, Boy's Washroom Rm 121, Custodial Rm 122, Boy's Washroom Rm 128, Girl's Washroom Rm 130, Washrooms 133 and 134, Custodial Rm 135 and corridor finishes adjacent these rooms.

# 1.03 CONTRACT METHOD

.1 Refer to Owner's RFT, Contract and Supplementary Conditions.

### 1.04 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit Project construction progress schedule in accordance with Section 01 32 16.19 -Construction Progress Schedule - Bar (GANTT) Chart.

### 1.05 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.
- .2 Co-ordinate work with other contractors. If any part of work under this Contract depends for its proper execution or result upon work of another contractor, report promptly to Consultant and Owner, in writing, any defects which may interfere with proper execution of Work.

# 1.06 WORK SEQUENCE

- .1 Construct Work continuously to completion. Time is of the essence in this Contract.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Maintain fire access/control.
- .4 Protect workers and public safety.

# 1.08 CONTRACTOR USE OF PREMISES

- .1 Refer to Owner's RFT Part II Standard Conditions of Contract, Paragraph #57 Operations Restraints.
- .2 Limit use of premises for Work, for storage, and for access to allow:
  - .1 Owner occupancy.
  - .2 Partial owner occupancy.
  - .3 Work by other contractors.
  - .4 Public usage.
- .3 Co-ordinate use of premises with the Owner's representative.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .7 Ensure that operations conditions of exiting work at completion are still the same, equal to or better than that which existed before new work started.

### 1.09 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

# 1.10 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
  - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
  - .2 Coordinate delivery to site in accordance with Progress Schedule.
  - .3 Inspect deliveries jointly with Contractor.
  - .4 Submit claims for transportation damage.
  - .5 Arrange for replacement of damaged, defective or missing items.
  - .6 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
  - .1 Designate submittals and delivery date for each product in progress schedule.

- .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to nonconformance with Contract Documents.
- .3 Receive and unload products on Site.
- .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
- .5 Handle products on Site, including uncrating and storage.
- .6 Protect products from damage, and from exposure to elements.
- .7 Assemble, install, connect, adjust, and finish products.
- .8 Provide installation inspections required by public authorities.
- .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .3 Schedule of Owner furnished items:
  - .1 Toilet paper dispensers (TP-1)
  - .2 Soap Dispensers (SD-1)
  - .3 Sanitary Napkin Disposal (SND-1)
  - .4 Sanitary Napkin Dispenser (ND-1)
  - .5 Eye wash stations (EW-1)
  - .6 Chemical Mixing Stations (CS-1)

# 1.14 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Owner to facilitate execution of work.

# 1.15 EXISTING SERVICES

- .1 Notify, Owner and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and Owner operations.
- .3 Provide alternative routes for staff, pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .5 Submit schedule for approval by Consultant and Owner for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Consultant to maintain critical building and tenant services.

- .7 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers, as required, in accordance with Section 0156 00 Temporary Barriers and Enclosures.

# 1.16 DOCUMENTS REQUIRED

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

### 2 PRODUCTS

- 2.01 NOT USED
  - .1 Not used.

# 3 EXECUTION

- 3.01 NOT USED
  - .1 Not used.

### 1 GENERAL

### 1.01 RELATED REQUIREMENTS

.1 RFT Standard Conditions of Contract.

### 1.02 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

### 1.03 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner's representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Owner's Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

### 1.04 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Owner's Representative to facilitate execution of work.

### 1.05 EXISTING SERVICES

- .1 Notify, Owner's Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner's Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 0156 00 Temporary Barriers and Enclosures.

# 1.06 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with 01 32 16.19 Construction Progress Schedule Bar (GANTT) Chart.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

# 1.07 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

### 1.08 BUILDING SMOKING ENVIRONMENT

.1 Comply with TLDSB smoking restrictions refer to RFP Standard Conditions of Contract. Smoking or vaping is not permitted anywhere on school premises or on Board property.

# 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

# 3 EXECUTION

- 3.01 NOT USED
  - .1 Not Used.

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

.1 Section 01 32 16.19 - Construction Progress Schedule - Bar (Gantt) Chart.

# 1.02 ADMINISTRATIVE

- .1 Schedule. Coordinate with the Consultant and Owner the schedule for project meetings throughout the progress of the work. Generally, project meetings will occur bi-weekly throughout the course of the project. More frequent meetings may be required to accommodate certain activities on site.
- .2 Prepare agenda items for meetings. Prepare the following items and distribute to the Consultant and Owner a minimum of 48 hrs before the scheduled meeting time:
  - .1 Latest Project Schedule with updates (if any)
  - .2 Change Order log with status updates and outstanding/in-progress Change Order documentation for review
  - .3 Request for Information (RFI) Log
  - .4 Submittals Log including status of outstanding/in progress submittals
- .3 Provide physical space and make arrangements for meetings.
- .4 Attend meetings prepared to discuss relevant agenda items and pertinent issues and resolutions to past issues on site.
- .5 The Consultant will prepare a record of the meeting in the form of a Field Report which will include significant proceedings and decisions and will identify actions by parties.
- .6 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

### 1.03 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract the Consultant and Owner will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 The Owner, the Contractor and the Consultant will be in attendance.
- .3 Coordinate and establish time and location of meeting with the Consultant and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Communications protocols for the project.
  - .3 Review of status of Construction Contract and related submittals.
  - .4 Mobilization
  - .5 Special requirements/Owner policies
  - .6 Permits and Licenses
  - .7 Testing and Inspections
  - .8 Contractor to provide at time of meeting:
    - .1 Schedule of Work: in accordance with Section 01 32 16.19 Construction Progress Schedule - Bar (GANTT) Chart.
    - .2 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 Submittal Procedures.
    - .3 Delivery schedule of specified equipment.
    - .4 List of Contractor's subcontractors.
    - .5 Close out document checklist for review by Consultant.
  - .9 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 Construction Facilities.
  - .10 Site security in accordance with Section 01 56 00 Temporary Barriers and Enclosures.
  - .11 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .12 Owner provided products.
  - .13 Record drawings in accordance with Section 01 33 00 Submittal Procedures.
  - .14 Maintenance manuals in accordance with Section 01 78 00 Closeout Submittals.
  - .15 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 -Closeout Submittals.
  - .16 Monthly progress claims, administrative procedures, photographs, hold backs.
  - .17 Appointment of inspection and testing agencies or firms.
  - .18 Insurances, transcript of policies.
  - .19 Cash allowances/contingencies and procedures.

# 1.04 PROGRESS MEETINGS

- .1 During course of Work and 2 weeks prior to project completion, schedule progress meetings monthly to coincide with progress payment applications.
- .2 Contractor, major Subcontractors involved in Work and Consultant and Owner are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Minutes of meetings will be recorded in the form of a Field Report by the Consultant.
- .5 Agenda to include the following:
  - .1 Review of minutes of previous meeting.

- .2 Review of Work progress since previous meeting.
- .3 Field observations, problems, conflicts.
- .4 Problems which impede construction schedule.
- .5 Review of off-site fabrication delivery schedules.
- .6 Corrective measures and procedures to regain projected schedule.
- .7 Revision to construction schedule.
- .8 Progress schedule, during succeeding work period 3 week look ahead.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for affect on construction schedule and on completion date.
- .12 Other business.

### 1.05 PRE-INSTALLATION MEETINGS

- .1 The Contractor is to schedule with the Consultant and the Owner the following Pre-Installation Meetings:
  - .1 TILE Pre-Installation Meeting. Meeting to include the Tradespersons, Contractor, Owner and Consultant and is to occur a minimum of 1 week prior to installation of any floor or wall tile.

### 1.06 DEMOLITION COMPLETION REVIEW

.1 The Contractor is to coordinate and schedule with the Consultant(s) a review of the work area(s) exposed after demolition is complete or at a point of progress to review the exposed condition of any areas concealed from view prior to demolition. Architectural, Structural, Mechanical and Electrical existing conditions will be reviewed at this meeting to determine if any Changes to the work are required that were not considered in the designs due to concealed/inaccessible areas during design.

# 2 PRODUCTS

# 2.01 NOT USED

- .1 Not Used.
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used.

### 1 GENERAL

### 1.01 RELATED REQUIREMENTS

.1 Section 01 31 19 – Project Meetings

### 1.02 DEFINITIONS

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

# 1.03 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.

- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

# 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit to Consultant at Pre-Construction meeting Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Consultant within 5 working days of receipt of acceptance of Master Plan.

# 1.05 **PROJECT MILESTONES**

- .1 Project milestones form interim targets for Project Schedule.
  - .1 Mobilization completed within [\_\_\_\_] working days of Award of Contract date.
  - .2 Drainage inspection and report completed within [\_\_\_\_] working days of Award of Contract date.
  - .3 Demolition completed within [\_\_\_\_] working days of Award of Contract date.
  - .4 Underslab plumbing within [\_\_\_\_] working days of Award of Contract date.
  - .5 Structural modifications/lintel installations within [\_\_\_\_] working days of Award of Contract date.
  - .6 Masonry/partition completion within [\_\_\_\_] working days of Award of Contract date.
  - .7 Rough-in completion pre-close in within [\_\_\_\_] working days of Award of Contract date.
  - .8 Interior finishing and fitting, mechanical, and electrical work completed within [\_\_\_\_] working days of Award of Contract date.
  - .9 Interim Certificate (Substantial Completion) within [\_\_\_\_] working days of Award of Contract date.

### 1.06 MASTER PLAN

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

# 1.07 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Division 01 General Requirements
    - .1 Shop Drawings, Samples.
    - .2 Mobilization.
    - .3 Drainage Inspection
  - .3 Division 02 Demolition.
    - .1 Fixtures and accessories removals
    - .2 Doors and frame removals
    - .3 Ceiling removals
    - .4 Masonry/wall demolition.
    - .5 Lintels and new Structural.
    - .5 Mechanical and Electrical Demo
    - .6 Slab cutting and excavation (Geotechnical review and recommendations)
  - .4 Division 22 Underslab drainage remediation/plumbing rough-in
  - .5 Backfill.
  - .6 Division 03 Concrete Slab on grade.
  - .7 Division 03 Lintels and Structural.
  - .8 Division 03, 04, 05, 06 Walls Masonry/Steel stud/Wood framing
  - .9 Electrical Rough-in.
  - .10 HVAC Modifications/Rough-in
  - .11 Division 9 Gypsum Board/Tilebacker.
  - .12 Division 8 Door Frames
  - .13 Controls.
  - .14 Division 9 Ceilings
  - .15 Division 9 Tile
  - .16 Plumbing Finishing
  - .17 Electrical Finishing
  - .18 Fire Systems.
  - .19 Testing and Commissioning
  - .20 Division 10 Toilet Partitions
  - .21 Division 10 Washroom Accessories
  - .22 Division 9 Painting
  - .23 Deficiency corrections
  - .24 Final Cleaning
  - .25 Substantial Completion
  - .25 Closeout procedures
  - .26 Warranty review

# 1.08 PROJECT SCHEDULE REPORTING

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

### 1.09 PROJECT MEETINGS

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

### 2 PRODUCTS

# 2.01 NOT USED

.1 Not used.

### 3 EXECUTION

- 3.01 NOT USED
  - .1 Not used.

# 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 01 31 16.19 Construction Progress Schedule.
- .2 Section 01 45 00 Quality Control
- .3 Section 01 61 00 Common Product Requirements
- .4 Section 01 78 00 Closeout Submittals

# 1.02 REFERENCE STANDARDS

.1 Not used.

# 1.03 ADMINISTRATIVE

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

### 1.04 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.10 and Supplementary Conditions.
- .2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 10 working days for Consultant's review of each submission.
- .6 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .7 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .9 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and

clearances.

- .3 Setting or erection details.
- .4 Capacities.
- .5 Performance characteristics.
- .6 Standards.
- .7 Operating weight.
- .8 Wiring diagrams.
- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .10 After Consultant's review, distribute copies.
- .11 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.

- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, electronic reviewed copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

### 1.05 SAMPLES

- .1 Submit for review as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to site office.
- .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### 1.06 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

### 1.07 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, fine resolution with progress statement and as directed by Consultant.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Frequency of photographic documentation:
  - .1 As necessary to document conditions before concealment of Work, and as directed by Consultant.

# 1.08 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status].
- .2 Submit transcription of insurance immediately after award of Contract.

### 1.09 CONTRACT SECURITY

.1 Bonds. Submit bonds as required in the Owner's RFT, Supplementary General Conditions and the Contract.

### 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

### 3 EXECUTION

# 3.01 NOT USED

.1 Not Used.
### 1.01 SUMMARY

.1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

# 1.02 RELATED REQUIREMENTS

- .1 Section 02 40 00 Demolition Minor Works
- .2 Section 02 41 19.16 Selective Interior Demolition

## 1.03 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with 2012 Ontario Building Code including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
  - .1 Meet or exceed requirements of:
    - .1 Contract documents.
    - .2 Specified standards, codes and referenced documents.

#### 1.04 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant and Owner.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant and Owner.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant and Owner.

## 1.05 BUILDING SMOKING ENVIRONMENT

.1 Comply with Owner's smoking restrictions and municipal by-laws.

# 1.06 QUALITY ASSURANCE

.1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and

pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:

- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

# 2 PRODUCTS

- 2.01 NOT USED
  - .1 Not Used.

## 2.02 PERMITS

- .1 Building Permit:
  - .1 Owner has applied for and will be paying for building permit. Contractor is responsible for obtaining or coordinating other permits required for Work and its various parts.
  - .3 Contractor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits including
  - .4 Contractor shall display building permit and other permits in a conspicuous location at Place of Work.
- .2 Occupancy Permits:
  - .1 Contractor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
  - .2 Consultant will issue appropriate instructions to Contractor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
  - .3 Contractor shall correct deficiencies in accordance with Consultant's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Contractor for costs incurred.
  - .4 Contractor shall turn occupancy permits over to Owner.

## 3 EXECUTION

- 3.01 NOT USED
  - .1 Not Used.

## 1.01 RELATED REQUIREMENTS

- .1 Section 01 32 16.19 Construction Progress Schedule. Include in the Construction Progress Schedule required tests, inspections required in the specifications.
- .2 Section 01 33 00 Submittal Procedures
- .3 Divisions 21, 22, 23 and 25: Specific test and inspection requirements for fire suppression, plumbing and HVAC systems.
- .4 Divisions 26 and 28: Specific test and inspection requirements for electrical and fire alarm systems.

### 1.02 REFERENCE STANDARDS

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

### 1.03 DEFINITIONS

- .1 Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work by the Contractor to protect against defects and deficiencies and confirming that construction is consistent with regulatory requirements, qualification statements and certification requirements listed within the Contact Documents.
- .2 Quality Control (Testing by Contractor): Tests, inspections, procedures, and related actions performed by the Contractor during and after execution of the Work using third party Inspection and Testing Agency to verify that completed construction complies with specified standards and technical requirements within the Contract Documents; these services do not include contract administration

and reporting performed by Consultant, or Quality Auditing activities performed by Owner.

- .3 Mock-ups: Full size, physical example assemblies to illustrate finishes and materials. Mock-ups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples; mock-ups establish the standard by which the Work will be judged.
- .4 Quality Audit (Testing by Owner): Tests, inspections, procedures and related actions performed by the Owner during and after execution of the Work using third party Inspection and Testing Agency to establish that work complies with Contract Documents and are additional to the Quality Control and Assurance provided by the Subcontractor, or contract administration and reporting performed by Consultant.

.5 Inspection and Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as Inspection and Testing Agency.

# 1.04 GENERAL REVIEW

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice if Work is designated for special tests, inspections or approvals by instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents Owner will pay cost of examination and replacement.

## 1.05 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Owner for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.
- .2 Allocated costs: to Section 01 21 00 Allowances
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Owner or Consultant. Pay costs for retesting and reinspection.

## 1.06 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

## 1.07 PROCEDURES

.1 Notify appropriate agency and Owner and Consultant a minimum of 5 working days in advance

of requirement for tests, in order that attendance arrangements can be made.

- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

### 1.08 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

#### 1.09 REPORTS

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

#### 1.10 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

#### 1.13 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations Consultant as specified in specific Section.
- .3 Prepare mock-ups for Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Consultant will assist in preparing schedule fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

## 1.14 MILL TESTS

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

## 1.15 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical systems.
- .2 Refer to Mechanical and Electrical drawings and specifications for definitive requirements.

## 2 PRODUCTS

- 2.01 NOT USED
  - .1 Not Used.
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used.

# 1.01 RELATED REQUIREMENTS

- .1 Section 0174 00 Cleaning
- .2 Section 01 74 19 Waste Management and Disposal
- .3 Section 02 41 00.08 Demolition Minor Works
- .4 Section 02 41 19 Selective Interior Demolition
- .5 06 08 99 Rough Carpentry for Minor Works

## 1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
  - .1 <u>CSA-0121-[M1978(R2003)]</u>, Douglas Fir Plywood.

## 1.03 INSTALLATION AND REMOVAL

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

#### 1.04 HOARDING

- .1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to <u>CSA 0121</u>.
- .2 Apply plywood panels vertically as indicated flush and butt jointed.
- .3 Provide at least one access door as directed. Equip door with locks and keys ensuring that Owner is provided with a key for access.
- .4 Provide barriers around trees and plants designated to remain where in proximity to exterior garbage bins or temporary enclosures. Protect from damage by equipment and construction procedures.

## 1.05 GUARD RAILS AND BARRICADES

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

### 1.06 DUST TIGHT SCREENS

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

#### 1.08 ACCESS TO SITE

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

#### 1.09 PUBLIC TRAFFIC FLOW

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

## 1.10 FIRE ROUTES

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

#### 1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

### 1.12 PROTECTION OF BUILDING FINISHES

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

### 2 PRODUCTS

#### 2.01 NOT USED

.1 Not Used.

# 3 EXECUTION

## 3.01 NOT USED

.1 Not Used.

### 1.00 SUMMARY

.1 This Section includes common requirements for product quality, availability, storage, handling, protection, and transportation; manufacturer's instructions; quality of the Work; and coordination and fastenings.

### 1.01 RELATED REQUIREMENTS

.1 Not used.

### 1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC) .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Within text of each specifications section, reference may be made to reference standards.
- .3 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .4 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
- .5 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

### 1.03 QUALITY

- .1 Refer to CCDC 2.
- .2 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .4 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

- .6 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .7 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .8 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

## 1.04 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

## 1.05 STORAGE, HANDLING AND PROTECTION

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

#### 1.06 TRANSPORTATION

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

#### 1.07 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

#### 1.08 QUALITY OF WORK

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

## 1.09 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

#### 1.10 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Consultant if there is interference. Install as directed by Consultant.

#### 1.11 REMEDIAL WORK

- .1 Refer to CCDC 2 and Section 0173 00 Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .4 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

#### 1.12 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

## 1.13 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

#### 1.14 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

# 1.15 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Consultant.

# 1.16 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

## 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

### 3 EXECUTION

## 3.01 NOT USED

.1 Not Used.

## 1.01 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

### 1.02 REFERENCE STANDARDS

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

## 1.03 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines within project area. Cap or otherwise seal lines at cut-off points as directed by Consultant.

#### 1.04 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

#### 1.05 RECORDS

.1 Record locations of maintained, re-routed and abandoned service lines in project as-builts.

#### 1.09 ACTION AND INFORMATIONAL SUBMITTALS

.1 Refer to 01 78 00 Closeout Submittals.

#### 1.10 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

JASON LOWE ARCHITECT

- 2 PRODUCTS
- 2.01 NOT USED
  - .1 Not Used.
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used.

## 1.01 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

### 1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

## 1.03 MATERIALS

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

#### 1.04 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

## 1.05 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing where requested by Consultant.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moistureresistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Provide firestopping in accordance with Section 07 84 00 Firestopping to maintain the integrity of fire separations, including:
  - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
  - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
- .15 Record concealed or covered work in project record documents and as otherwise required in the specifications and in accordance with Section 01 33 00 Submittal Procedures and Section 01 78 00 Closeout Submittals.

JASON LOWE ARCHITECT

- 2 PRODUCTS
- 2.01 NOT USED
  - .1 Not Used.
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used.

## 1.01 RELATED REQUIREMENTS

.1 Section 01 77 00 Closeout Procedures

### 1.02 REFERENCE STANDARDS

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

## 1.03 **PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris. Coordinate location with drawings and Owner's representative.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .11 Provide floor protection "RAM Board" over full extent of project area to protect new and existing finished floor surfaces for the full duration of construction. Tape all seams and perimeter to prevent debris from affecting finished surfaces. Reinstate damaged floor protection as required during the course of construction.

#### 1.04 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris.
- .6 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean and sweep roofs, gutters, areaways, and sunken wells where impacted by Work.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .19 Clean roofs, downspouts, and drainage systems in areas included in the scope of Work.
- .20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

JASON LOWE ARCHITECT

- 2 PRODUCTS
- 2.01 NOT USED
  - .1 Not Used.
- 3 EXECUTION
- 3.01 NOT USED
  - .1 Not Used.

# 1.01 RELATED REQUIREMENTS

.1 Section 0178 00 Closeout Submittals

# 1.02 REFERENCE STANDARDS

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

# 1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request Consultant's review.
  - .2 Consultant's Review:
    - .1 Consultant, Owner and Contractor to inspect Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
    - .4 Certificates required by Authorities Having Jurisdiction and Contract Documents: submitted.
    - .5 Operation of systems: demonstrated to Owner's personnel.
    - .6 Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks are done, request final review of Work by Consultant.
    - .2 When Work incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.
  - .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .7 Final Payment:

- .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
- .2 Refer to CCDC 2: when Work deemed incomplete by Consultant, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

# 1.04 FINAL CLEANING

- .1 Clean in accordance with Section 0174 00 Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

# 2 PRODUCTS

# 2.01 NOT USED

.1 Not Used.

# 3 EXECUTION

# 3.01 NOT USED

.1 Not Used.

## 1.01 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

### 1.02 REFERENCE STANDARDS

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

### 1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Consultant and Owner, in accordance with Section 01 31 19 Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's installation instructions and warranty requirements.
  - .2 Consultant to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

#### 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Within 30 days of award of the Contract, submit to the Consultant checklists including itemized documentation and material required at Project Closeout.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

#### 1.05 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf [219 x 279] mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Two (2) weeks prior to request for substantial completion, submit digital copies of the Project Record Documents for review to the Consultant in accordance with 01 33 00 Submittal Procedures. Contractor to arrange for Cloud based or USB stick storage for delivery to Consultant.
- .10 Provide full contents of Project Record Documents in digital format on a USB stick with the submission of the final hardcopy submission to the Consultant.

#### 1.06 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and [Contractor][Design-Builder] with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 Quality Control.

## 1.07 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Consultant and Owner one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for review by Consultant and Owner.

#### 1.08 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of red line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information. Alternately, digital means such as PDF markup are acceptable but must be hardcopy printed in colour with the hardcopy submission of the Project Record Documents.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

- .4 Field changes of dimension and detail.
- .5 Changes made by change orders.
- .6 Details not on original Contract Drawings.
- .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos on USB drive for site records.

## 1.9 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.

- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 Quality Control and where required by other sections in the Contract Documents.
- .15 Additional requirements: as specified in individual specification sections.

### 1.11 MATERIALS AND FINISHES

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

### 1.12 MAINTENANCE MATERIALS

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed by Owner; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Consultant.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed by Consultant; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to [Departmental Representative][DCC Representative][Consultant].

- .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to location as directed by Owner; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Consultant.
    - .2 Include approved listings in Maintenance Manual.

## 1.13 DELIVERY, STORAGE AND HANDLING

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

## 1.14 WARRANTIES AND BONDS

- .1 Collect and retain information relevant to Warranties during Construction.
- .2 Assemble approved information in Project Record Document binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .3 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .4 Conduct joint 12 month warranty inspection, measured from time of acceptance, by Consultant.
- .5 Respond in timely manner to oral or written notification of required construction warranty repair work.

- .6 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Owner to proceed with action against Contractor.
- 2 PRODUCTS
- 2.01 NOT USED
  - .1 Not Used.

# 3 EXECUTION

- 3.01 NOT USED
  - .1 Not Used.

### 1.01 SUMMARY

- .1 This Section includes the following:
  - .1 Demolition and removal of buildings and structures
  - .2 Abandoning in place, and or removing below grade construction

## 1.02 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

### 1.03 REFERENCE STANDARDS

- .1 CSA Group (CSA)
  - .1 <u>CSA S350-[M1980(R2003)]</u>, Code of Practice for Safety in Demolition of Structures.

## 1.04 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of hazardous materials.
- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.

## 1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Owner for the material ownership including but not limited to:
  - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- .2 Scheduling:
  - .1 Employ necessary means to meet project time lines.
  - .2 In event of unforeseen delay notify Consultant in writing.

## 1.06 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Shop Drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario as follows:
  - .2 Submit in accordance with Section 01 33 00 Submittal Procedures.
  - .3 Schedule of Demolition Activities: Coordinate with Section 01 32 16.16 Construction Progress Schedule.

### 1.07 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial and Municipal regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
- .3 Standards: Comply with Ontario Health and Safety requirements.

### 1.08 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Consultant immediately.
  - .1 Proceed only after receipt of written instructions have been received from Consultant.
- .3 Notify Owner before disrupting building access or services.

# 1.09 EXISTING CONDITIONS

- .1 Hazardous Materials: Hazardous materials may be encountered in the Work.
  - .1 Refer to Owner's requirements when hazardous materials are discovered on site.
  - .2 Hazardous materials will be removed by Owner.

#### 2 PRODUCTS

- 2.01 EQUIPMENT
  - 1. Not used.

#### 3 EXECUTION

#### 3.01 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- .2 Review Project Record Documents of existing construction provided by Owner.
- .3 Owner/Consultant does not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .4 Inventory and record the condition of items being removed and salvaged.

- .5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
- .6 Promptly submit a written report to Consultant.
- .7 Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during demolition operations.
- .8 Verify that hazardous materials have been remediated before proceeding with demolition operations.

## 3.02 PREPARATION

- .2 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .3 Demolition/Removal:
  - .1 Demolish parts of structure as indicated.
  - .2 Remove parts of existing building to permit new construction.
  - .4 Trim edges of partially demolished building elements to tolerances as defined by Consultant to suit future use.
  - .5 At end of each day's work, leave Work in safe and stable condition.
  - .6 Protect interiors of parts not to be demolished from exterior elements at all times.
  - .7 Demolish to minimize dusting.

## 3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

### 1.01 SUMMARY

- .1 This Section includes the following:
  - .1 Demolition and removal of selected portions of interior building components and finishes.
  - .2 Repair procedures for selective demolition operations.
- .2 This section does not include the following:
  - .1 Removal of hazardous materials or asbestos abatement.
  - .2 Demolition of exterior building components or structural elements.
  - .3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

#### 1.02 RELATED REQUIREMENTS

- .1 Section 02 41 00.08 Demolition Minor Works
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 30 13 Ceramic Tiling
- .4 Section 09 51 13 Acoustical Panel Ceilings

## 1.03 REFERENCE STANDARDS

- .1 CSA Group (CSA)
  - .1 <u>CSA S350</u> M1980 (R2003), Code of Practice for Safety in Demolition of Structures

#### 1.04 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not

otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.9 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

# 1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Owner for the material ownership as follows:
  - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
  - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
- .2 Pre Demolition Meeting: Convene pre-installation meeting to:
  - .1 Confirm extent of salvaged and demolished materials
  - .2 Review Contractor's demolition plan
    - .1 Verify existing site conditions adjacent to demolition work
    - .2 Coordination with other construction sub trades

## 1.06 ACTION AND INFORMATION SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Schedule of Selective Demolition Activities: Coordinate with Section 01 32 16.19 -Construction Progress Schedule – Bar (GANTT) Chart, and indicate the following:
    - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
    - .2 Coordinate with Owner's building manager ongoing site operations.
    - .3 Interruption of utility services.
    - .4 Coordination for shutoff, capping, and continuation of utility services.
    - .5 Use of building entrances, corridors and stairs.
    - .6 Locations of temporary partitions and means of egress, including for others affected by selective demolition operations.
    - .7 Coordination with Owner's continuing occupancy of portions of existing building.
  - .2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:
    - .1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations,
and proposed time frame for their operation. Consultant reserves the right to make modifications where proposed methods interfere with the Owner's ongoing operation

- .2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.
- .3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- .4 Pre and post demolition Photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.
- .2 Informational Submittals: Provide the following submittals when requested by the Consultant:
  - .1 Landfill Records
  - .2 Pre and post demolition photographs.

# 1.07 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
  - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
  - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

## 1.08 SITE CONDITIONS

- .1 Owner will occupy portions of building immediately adjacent to selective demolition area:
  - .1 Conduct selective demolition so that Owner's operations will not be disrupted.
  - .2 Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.
- .2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:
  - .1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.
- .3 Consultant and Owner assume no responsibility for condition of areas to be selectively demolished:
  - .1 Conditions existing at time of Pre Bid Site Review will be maintained by Owner as far as practical.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Consultant if materials suspected of containing hazardous substances are encountered and perform the following activities:

- .1 Refer to Section 01 41 00 Regulatory Requirements for directives associated with specific material types.
- .2 Hazardous materials will be as defined in the Hazardous Materials Act.
- .3 Hazardous materials will be removed by Owner before start of the Work.
- .4 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Consultant. Hazardous materials will be removed by Owner under a separate contract or as a change to the Work.
- .5 Hazardous Substances: Hazardous Substances are present in building to be selectively demolished. A report on the presence of Hazardous Substances is attached as an information document to this Section for review and use:
  - .1 Examine report to become aware of locations where hazardous materials are present.
  - .2 Do not disturb Hazardous Substances or items suspected of containing Hazardous Substances.

# 2 PRODUCTS

# 2.01 TEMPORARY SUPPORT STRUCTURES

.1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

# 2.02 DESCRIPTION

- .1 This section of the Work includes, but is not necessarily limited to, the following:
  - .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris
  - .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated
  - .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site
  - .4 Retain items indicated on drawings for re use in new construction

## 2.03 DEBRIS

.1 Make all arrangements for transport and disposal of all demolished materials from the site.

# 2.04 EQUIPMENT

.1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

## 2.05 REPAIR MATERIALS

.1 Use repair materials identical to existing materials:

- .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
- .2 Use a material whose installed performance equals or surpasses that of existing material.
- .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.
- .3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.
- .4 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.
- .5 Gypsum Board Patching Compounds: Joint compound to <u>ASTM C 475/C 475M</u>, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 Gypsum Board Assemblies.
- .6 Hoarding and Dust Screens: Refer to Section 01 56 00 Temporary Barriers and Enclosures for stud framing and gypsum board sheathing materials.

## 2.06 EXISTING MATERIALS

- .1 Items to be retained for re use in new construction include, but are not limited to the following:
  - .1 Ceiling components.
  - .2 Washroom accessories and other miscellaneous items identified on drawings.
  - .3 Confirm with Consultant any materials that appear to be in re usable condition prior to disposal.
  - .6 Confirm with Consultant any materials scheduled for re use that are not in re usable condition prior to installation.

## 3 EXECUTION

## 3.01 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be

removed and salvaged.

- .4 Notify the Consultant where existing mechanical, electrical, or structural elements conflict with intended function or design:
  - .1 Investigate and measure the nature and extent of conflict and submit a written report to Consultant.
  - .2 Consultant will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

#### 3.02 UTILITY SERVICES

- .1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.
- .2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - .1 Arrange to shut off affected utilities with utility companies.
  - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
  - .4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. Patch concrete using cementitious grout.
- .3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.
- .4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

#### 3.03 PREPARATION

- .1 Identify and mark all equipment and materials identified to be retained by Consultant or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.

- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re used, store in a safe place until ready for re installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.
- .8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

## 3.04 CONCRETE SLAB REINFORCING

- .1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non destructive, non ionizing radio frequency locators.
- .2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Engineer where slab features interfere with core drilling.
- .3 Notify the Engineer immediately for further instructions where coring or cutting will damage existing slab features.

## 3.05 SELECTIVE DEMOLITION

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.
- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.
- .6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.
  - .1 Provide bond beams in new openings cut into existing concrete masonry unit walls.
  - .2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.
- .7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

- .8 Demolish existing carpet, resilient flooring and adhesive remnants as follows:
  - .1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.
  - .2 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.
  - .3 Demolish existing carpet and resilient floor finishes, remove and dispose of off site.
  - .4 Remove adhesive to the greatest extent possible using scrapping tools and as follows:
    - .1 Do not use solvent based cleaners to remove adhesive remnants.
    - .2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.
    - .3 Vacuum floor ready for application of skim coating.
    - .4 Repair all slab depressions and damage with cementitious patching compound.
    - .5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.
  - .5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.
- .9 Demolish existing ceramic tile finishes. Remove setting bed or adhesive to the greatest extent possible using mechanical scraping tools and as follows:
  - .1 Saw cut edge of tile for clean and even transition joint between existing tile to remain and new flooring materials
  - .2 Lightly shot blast or grind floor to remove remnants of setting materials
  - .3 Vacuum floor ready for application of skim coating
  - .4 Repair all slab depressions and damage with cementitious patching compound. Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials
- .10 Demolish completely all ceiling panels and grid as indicated.
- .11 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.
- .12 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .13 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

## 3.06 PATCHING AND REPAIRING

- .1 Floors and Walls:
  - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
  - .2 Provide a level and smooth surface having uniform finish colour, texture, and

appearance.

- .3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
- .4 Patch with durable seams that are as invisible as possible.
- .5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
- .6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
- .7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- .2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

#### 3.07 PROTECTION

- .1 Prevent debris from blocking drainage inlets and systems and ground draining, and protect material and electrical systems and services that must remain in operation.
- .2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the Owner and users is minimized.
- .3 Maintain safe access to and egress from occupied areas adjoining.
- .4 Provide and maintain fire prevention equipment and alarms accessible during demolition.

#### 3.08 CLEANING

- .1 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .2 Maintain access to exits clean and free of obstruction during removal of debris.
- .3 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.
- .4 Dispose of materials in accordance with applicable regulations.

## END OF SECTION

PART 1 - GENERAL

<u>1.1 DESCRIPTION</u> .1 Work Included: .1 All reinforcement for cast-in-place concrete.

- .2 Related Work: Section 03 30 00 - Cast in Place Concrete Section 03 35 00 - Concrete Finishing
- 1.2 REFERENCE .1 All referenced standards shall be the current edition or edition referenced by the Ontario Building Code in force at the time of building permit application and noted on general notes of structural drawings.
- 1.3 SHOP DRAWINGS .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures. This applies to all reinforcements.
  - .2 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to the General Contractor.
  - .3 Allow a minimum of 10 working days for review of each submission of shop drawings in the Structural Engineer's office. Shop drawings received after noon will be datestamped as received the following working day.
  - .4 Submit plans, elevations, sections, and bar lists necessary to show reinforcing and to facilitate review and placing. Show location of construction joints and detail reinforcement at joints. Show concrete cover on the diagrams. Draw to scale not smaller than 1:50 (1/4'' = 1'-0'').
  - .5 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and splices with identifying code marks to permit correct placement without reference to Structural Drawings.
  - .6 Conform to CSA A23.1 and the Reinforcing Steel Manual of Standard Practice, unless the Contract Documents contain a more stringent requirement, in which case the latter



shall govern. Provide accessories as required by the Standard. Conform to ACI, SP 66 Detailing Manual whenever a detail condition is not covered by any of the above but is covered by the ACI Manual.

- .7 Design and detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated. Provide standard hooks at ends of hooked bars.
- .8 Do not release for fabrication reinforcing bars whose lengths may be affected by field conditions, such as the final elevation of footings, until the governing field dimensions have been ascertained.
- .9 Review of shop drawings by the Consultant is on a sampling basis for general conformity with contract documents. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the work accurate and in conformity with the Contract Documents.
- .10 Design for which the Contractor is responsible under the contract will not be reviewed. Design for which the Contractor is responsible under the contract will not be reviewed. Review comments are not authorization for changes to the contract price.
- .11 After review, drawings will be returned to the Contractor stamped to show one of the following: Reviewed - Released for fabrication.
  - Noted Released for fabrication after revisions noted are made. Submit revised drawings for Consultant's records.
  - Resubmit Correct and resubmit for review.
  - Conform to the requirements of each authority that has reviewed the drawings.
- .12 Keep on site at all times a set of reviewed shop drawings and use only these drawings and the Structural Drawings to place reinforcing steel. Neatly mark on the Structural Drawings changes issued during the course of construction.
- 1.4 TOLERANCE

1.5 SUBSTITUTES

- .1 Conform to CSA A23.1
  - .1 Substitute different size bars only if permitted in writing by the Consultant.



2.1 MATERIALS

PART 2 - PRODUCTS	PART	2	—	PRODUCTS
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- .1 Reinforcing steel: billet steel, grade 400R, deformed bars to CSA G30.18, unless otherwise indicated
  - .2 Welded reinforcing steel: weldable steel, grade 400W, deformed bars to CSA G30.18. Required only where welding is indicated.
  - .3 Cold-drawn annealed steel wire ties: to ASTM A 82
  - .4 Welded wire fabric: to ASTM A185. Provide in flat sheets only
  - .5 Bar supports and side form spacers: to CSA-A23.1. For exposed concrete surfaces and for floor and roof slabs with directly applied ceiling finish: use either plastic bar supports, or plastic tipped bar supports for at least the bottom 25mm; use plastic slide form spacers; and use plastic colour to match concrete.
- 2.2 FABRICATION .1 Fabricate reinforcing steel in accordance with CSA-A23.1g, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .2 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
  - .3 Where indicated, weld reinforcement in accordance with CSA W186. Use weldable reinforcing steel.
  - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.



PART 3 - EXECUTION		
3.1 QUALITY CONTROL	.1	<ul> <li>Quality control procedures and implementation are the responsibilities of the General Contractor, and submission of a quality control plan for work executed under this section is required.</li> <li>1 The plan shall include: the names of personnel responsible for execution of the plan.</li> <li>2 Means and methods for confirming material compliance with specifications, and associated documentation procedures.</li> <li>3 Program for confirming and documenting compliance of sub-trade qualifications and their individual employees, sub-contractors, and engineers.</li> <li>4 Procedures for reviewing compliance in the field with construction documents including documentation of locations reviewed, photographs taken and timing for review. The contractor's review must be completed prior to review of the Consultant.</li> <li>5 Procedures for rectifying deficiencies noted by the contractor/consultant of independent inspection agencies.</li> </ul>
3.2 FIELD BENDING	.1	Do not field bend reinforcement except were indicated or authorized by the Consultant. When field bending is authorized, bend without heat, applying a slow and steady pressure. Replace bars, which develop cracks or splits.
3.3 FIELD WELDING	.1 .2	Do not field weld reinforcement except were indicated or authorized by the Consultant. Conform to CSA A23.1 and CSA W186.
<u>3.4 REVIEW OF</u> CONSTRUCTION	.1 .2 .3 .4	Provide written notification to the Consultant and Independent Inspection and Testing Agency at least 24 hours prior to intended concrete pour to allow for a reinforcing placement review. Review of construction by Consultant and Independent Inspection and Testing Agency is to ascertain general conformity with contract documents. It does not relieve the Contractor of his contractual responsibilities. The review is based on representative samples of thee work and does not relieve the Contractor from carrying out his own quality control and making the work in conformity with the drawings and specifications. The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found. Bring to the attention of the Consultant, any defects, or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken



and will issue the necessary instructions.

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- 3.5 PITS, CURBS, .1 NOT USED. BASES
- 3.6 MECHANICAL AND.1NOT USED.ELECTICAL WORK



#### PART 1 - GENERAL

1.1 RELATED SECTIONS	.1	Work Included: .1 All work in relation to cast-in-place concrete.
	.2	Related Work: Section 03 20 00 - Concrete Reinforcing Section 03 35 00 - Concrete Finishing
1.2 MEASUREMENT PROCEDURES	.1	Cast-in-place concrete will not be measured but will paid for as a fixed price item.
	.2	Supply and installation of anchor bolts, nuts and washers and bolt grouting will be paid as a fixed price item.
1.3 REFERENCES	.1	All referenced standards shall be the current edition or edition referenced by the Ontario Building Code in force at the time of building permit application and noted on general notes of structural drawings.
	.2	<ul> <li>American Society for Testing and Materials International (ASTM)</li> <li>1 ASTM C 260-01, Standard Specification for Air-Entraining Admixtures for Concrete.</li> <li>2 ASTM C 309-03, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.</li> <li>3 ASTM C 330-04, Standard Specification for Lightweight Aggregates for Structural Concrete.</li> <li>4 ASTM C 494/C 494M-05, Standard Specification for Chemical Admixtures for Concrete.</li> <li>5 ASTM C 1017/C 1017M-03, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.</li> <li>6 ASTM D 412-98a (2002) el, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.</li> <li>7 ASTM D 624-00el, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.</li> <li>8 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).</li> <li>9 ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.</li> </ul>



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	.3	<ul> <li>Canadian General Standards Board (CGSB)</li> <li>.1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Damp proofing and Waterproofing and for Roof Coatings.</li> <li>.2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.</li> </ul>
	.4	<ul> <li>Canadian Standards Association (CSA International)</li> <li>.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.</li> <li>.2 CSA A283, Qualification Code for Concrete Testing Laboratories.</li> <li>.3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).</li> <li>.1 CSA-A3001, Cementitious Materials for Use in Concrete.</li> </ul>
<u>1.4 ACRONYMS AND</u> TYPES	.1	Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended). .1 Type GU or GUb - General use cement .2 Type MS or MSb - Moderate sulphate-resistant cement .3 Type MH or MHb - Moderate heat of hydration cement .4 Type HE or Heb - High early-strength cement .5 Type LH or LHb - Low heat of hydration cement .6 Type HS or HSb - High sulphate-resistant cement
	.2	<pre>Fly ash: .1 Type F - with CaO content less than 8% .2 Type CI - with CaO content ranging from 8 to 20. .3 Type CH - with CaO greater than 20%</pre>
	.3	GGBFS - Ground, granulated blast-furnace slag.
1.5 DESIGN REQUIREMENTS	.1	Alternative 1 - Performance in accordance with CSA- A23.1/A23.2 and as described in MIXES of PART 2 - PRODUCTS.
1.6 SUBMITTALS	.1	Submittals in accordance with Section 01 33 00 - Submittal Procedures.
	.2	Submit WHMIS MSDS - Material Safety Data Sheets.
	.3	At least 2 weeks prior to beginning Work, submit to Consultant certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.
	.4	At least 2 weeks prior to starting concrete work, submit all concrete mix designs, including pump mixes and indicate where each concrete mix is to be used. Where Class C1, C2 or F1 mix designs are required submit test data to confirm that air-void system conforms to CSA A23.1 for each mix design.



	.5	Minimum submission requirements for each concrete mix design shall include; CSA exposure class, minimum specified compressive strength at 28 days, maximum aggregate size, maximum water/cement ratio, assumed method of concrete placement, slump range, percentage and type of supplementary cementing materials, admixtures, certificate of compatibility of admixtures (unless all admixtures are supplied by same supplier), architectural requirements.
	.6	Concrete hauling time: submit for review by Consultant deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
1.7 QUALITY ASSURANCE	.1	Quality Assurance: in accordance with Section 01 45 00 - Quality Control and General Requirements.
	.2	<pre>Submit Consultant minimum 2 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete. .1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.</pre>
	.3	<pre>Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for review Consultant on following items: .1 Falsework erection .2 Hot weather concrete .3 Cold weather concrete .4 Curing .5 Finishes .6 Formwork removal .7 Joints</pre>
	.4	Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
<u>1.8 DELIVERY,</u> STORAGE AND HANDLING	.1	<pre>Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching1 Modifications to maximum time limit must be agreed to Consultant and concrete producer as described in CSA A23.1/A23.22 Deviations to be submitted for review by Consultant.</pre>

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.



- .1 Separate waste materials for reuse or recycling.
- .2 Divert unused concrete materials from landfill to local facility approved by Consultant.
- .3 Provide an appropriate area on the job site where concrete trucks can be safely washed.
- .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Consultant.
- .5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

#### PART 2 - PRODUCTS

- 2.1 SUSTAINABLE .1 Materials and resources shall be selected to be as sustainable as possible for use indicated.
- 2.2 MATERIALS
- .1 Cement: to CAN/CSA-A3001, Type GU.
  - .2 Blended hydraulic cement: Type GU to CAN/CSA-A3001.
  - .3 Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA-A3001.
  - .4 Water: to CSA-A23.1.
  - .5 Aggregates: to CAN/CSA-A23.1/A23.2. Do not use recycled concrete in aggregate.
  - .6 Admixtures:
    - .1 Air entraining admixture: to ASTM C 260.
    - .2 Chemical admixture: to ASTM C 494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.
    - .1 Compressive strength: 40 MPa at 28 days.
  - .8 Non premixed dry pack grout: composition of non metallic



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		aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 30 MPa at 28 days.
	.9	Curing compound: to CSA-A23.1/A23.2 white, Type 1- chlorinated rubber.
	.10	<pre>Pre-moulded joint fillers: .1 Bituminous impregnated fiber board: to ASTM D 1751. .2 Sponge rubber: to ASTM D 1752, Type I, firm grade.</pre>
	.11	Weep hole tubes: plastic.
	.12	Dampproof membrane: .1 Polyethylene membrane: .1 Plain: 15 mil thick polyethylene film. .2 Membrane adhesive: as recommended by membrane Manufacturer.
2.3 MIXES	.1	<ul> <li>Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria in accordance with CAN/CSA-A23.1/A23.2.</li> <li>.1 Ensure concrete supplier meets performance criteria as established below and provide verification of</li> </ul>

- compliance as described in PART 3 VERIFICATION.
  .2 Provide concrete mix to meet following hard state
  requirements:
  - .1 Durability and class of exposure as indicated on drawings.
  - .2 Minimum compressive strength at 28 days age: 30 MPa and as indicated.
  - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .3 Concrete supplier's certification.



#### PART 3 - EXECUTION

#### 3.1 PREPARATION

- .1 Obtain Consultant's approval before placing concrete. .1 Provide 48hours notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with CSA A23 and pre-agreed placing procedures.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout specified to anchor and hold dowels in positions as indicated.



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3.2 CONSTRUCTION	.1	Do cast-in-place concrete work in accordance with CSA- A23.1/A23.2.
	.2	<ul> <li>Sleeves and inserts:</li> <li>1 Do not permit penetrations, sleeves, ducts, pipes, or other openings to pass through joists, beams, column capitals or columns, except were indicated or approved Consultant.</li> <li>2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Consultant.</li> <li>3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications Consultant before placing of concrete.</li> <li>4 Check locations and sizes of sleeves and openings shown on drawings.</li> </ul>
	.3	<ul> <li>Anchor bolts:</li> <li>.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.</li> <li>.2 With approval of Consultant grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm or larger in diameter than bolts used to manufacturers' recommendations.</li> <li>.3 Protect anchor bolt holes from water accumulations, snow, and ice build-ups.</li> <li>.4 Set bolts and fill holes with epoxy grout.</li> </ul>
	. 4	<ul> <li>Drainage holes and weep holes:</li> <li>.1 Form weep holes and drainage holes in accordance with general conditions and details on drawings.</li> <li>.2 Install weep hole tubes and drains as indicated.</li> </ul>
	.5	<ul> <li>Dovetail anchor slots: in accordance with Section 04 00 00 Masonry.</li> <li>Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.</li> <li>Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.</li> </ul>
	.6	Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
	.7	<ul> <li>Finishing and curing:</li> <li>1 Finish concrete in accordance with CSA-A23.1/A23.2.</li> <li>2 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.</li> <li>.3 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.</li> </ul>



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3.3 SURFACE TOLERANCE	.1	Concrete tolerance in accordance with CSA straightedge method to tolerance schedule floor finishes.	A-A23.1/A23.2 e as required for
3.4 FIELD QUALITY CONTROL	.1	Site tests: conduct following tests in ad Section 01 45 00 - Quality Control and CS report as described in PART 1 - SUBMITTAN	ccordance with SA A23 and submit LS.
	.2	Inspection and testing of concrete and co will be carried out by testing laboratory Consultant for review in accordance with .1 Ensure testing laboratory is certifi with CSA A283.	oncrete materials y designated by CSA-A23.1/A23.2. ed in accordance
	.3	Ensure test results are distributed for of pouring concrete meeting between testing Consultant.	discussion at pre- laboratory and
	.4	Contractor will pay for costs of tests.	
	.5	Consultant will require additional test of cold weather concreting. Cure cylinders of same conditions as concrete which they re	cylinders during on job site under epresent.
	.6	Inspection or testing by Consultant will replace Contractor quality control nor re of his contractual responsibility.	not augment or elieve Contractor



CONCRETE FINISHING

<u> PART 1 - GENERAL</u>		
1.1 DESCRIPTION	.1	Work Included: .1 All reinforcement for cast-in-place concrete.
	.2	Related Work: Section 03 20 00 - Concrete Finishing Section 03 30 00 - Cast in Place Concrete
1.2 REFERENCE	.1	Canadian General Standards Board (CGSB) .1 CAN/CGSB-25.20-[95], Surface Sealer for Floors.
	.2	<pre>CSA International .1 CAN/CSA-A23.1-[09]/A23.2-[09], Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.</pre>
1.3 ACTION AND INFORMATIONAL	.1	Submit submittals in accordance with Section [01 33 00 - Submittal Procedures].
SUBMITTALS	.2	<ul> <li>Product Data:</li> <li>1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish, and limitations.</li> <li>2 Provide two copies of WHMIS MSDS in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures].</li> </ul>
1.4 ENVIRONMENTAL REQUIREMENTS	.1	<pre>Temporary lighting: .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.</pre>
	.2	Electrical power: .1 Provide sufficient electrical power to operate equipment normally used during construction.
	.3	Work area: .1 Make work area watertight protected against rain and detrimental weather conditions.
	. 4	Temperature: .1 Maintain ambient temperature of not less than [10] degrees C from [7] days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.



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	.5	Safety: .1 Comply with requirements of Workpla Materials Information System (WHMI: handling, storage, and disposal of materials.	ace Hazardous S) regarding use, hazardous
<u>1.5 DELIVERY,</u> STORAGE AND HANDLING	.1	Deliver, store and handle materials in Section [01 61 00 - Common Product Requ [with manufacturer's written instructio	accordance with irements] [and] ns].
	.2	Delivery and Acceptance Requirements: .1 Deliver materials to site in origin packaging, labelled with manufactu: address.	nal factory rer's name,
	.3	Packaging Waste Management: remove for [by manufacturer] of [pallets,] [crates [and] [packaging materials] in accordan [01 74 21 - Construction/Demolition Was Disposal].	reuse [and return] ,] [padding,] ce with Section te Management and
PART 2 - PRODUCTS			
2.1 SUSTAINABLE REQUIREMENTS	.1	Materials and products in accordance wi [01 47 15 - Sustainable Requirements: C [01 35 21 - LEED Requirements].	th Section onstruction]
2.2 PREFORMANCE REQUIREMENTS	.1	Product quality and quality of work in Section [01 61 00 - Common Product Requ	accordance with irements].
	.2	Submit written declaration that compone compatible and will not adversely affec flooring products and their installatio	nts used are t finished n adhesives.
2.3 CHEMICAL HARDENERS	.1	[Type 1 - Sodium silicate] [Type 2 - Mag fluosilicate] [Type 2 - Zinc fluosilicat	nesium e blend].
	.2	Water: potable.	
2.4 SEALING COMPOUNDS	.1	Surface sealer: to CAN/CGSB-25.20, [Type ] [Type 2 - water based], [clear] [colour [	1 - solvent-based] ]].
	.2	Sealants: maximum VOC limit [250] g/L [to 1168].	SCAQMD Rule
	.3	Surface sealer: acrylic carnuba wax, [cold	our []].
	.4	Surface sealers are not manufactured or for [aromatic solvents] [formaldehyde] [halogo [mercury] [lead] [cadmium] hexavalent chro compounds [].	ormulated with enated solvents] omium and their



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2.5 CURING COMPOUNDS	.1	Select [low VOC,] [water-based], [organic-solvent free] curing compounds.
2.6 CONCRETE STAINS	.1	Select [low VOC], [water-based] concrete stains.
2.7 MIXES	.1	Mixing ratios in accordance with manufacture's written instructions.
PART 3 - EXECUTION		
3.1 EXAMINATION	.1	Verify that [slab] [substrate] [site conditions] surfaces are ready to receive work and elevations are as [indicated on [shop] drawings] [recommended by manufacturer's written instructions].
3.2 PREPARATION OF EXISTING SLAB	.1	Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges [unless otherwise indicated].
	.2	Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.
	.3	Use [strong solvent] [mechanical stripping] to remove chlorinated rubber or existing surface coatings.
	.4	Use [protective clothing] [eye protection] [respiratory equipment] during stripping of chlorinated rubber or existing surface coatings.
3.3 APPLICATION	.1	Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.
	.2	After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
	.3	Apply floor treatment in accordance with Sealer manufacturer's written instructions.
	.4	Clean over spray. Clean sealant from adjacent surfaces.
3.4 CLEANING	.1	Progress Cleaning: clean in accordance with Section [01 74 11 - Cleaning]. .1 Leave Work area clean at end of each day.
	.2	Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section [01 74 11 - Cleaning].
	3	Waste Management, separate waste materials for [rouse]

.3 Waste Management: separate waste materials for [reuse] [and] [recycling] in accordance with Section [01 74 21 -Construction/Demolition Waste Management and Disposal]



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		[01 35 21 - LEED Requirements].	
3.5 PROTECTION	.1	Protect finished installation in accordance manufacturer's instructions.	e with
3.6 PROTECTION	.1	Table: <u>Surface Sealer Location</u> [CAN/CGSB-25.20, Type [Kitchen A1402]	

i. <u>1 - water based</u>



## PART 1 - GENERAL

1.1 RELATED REQUIREMENTS	.1	Related Works Section 04 04 99 - Masonry for Minor Works Section 04 05 19 - Masonry Anchorage and Reinforcing Section 04 05 23 - Masonry Accessories Section 04 22 00 - Concrete Unit Masonry
<u>1.2 REFERENCES</u>	.1	<ul> <li>Canadian Standards Association (CSA International)</li> <li>1 CAN3 A165 SERIES-[94(R2000)], CSA Standards on Concrete Masonry Units [covers: A165.1, A165.2, A165.3].</li> <li>2 CSA A179-[94(R1999)], Mortar and Grout for Unit Masonry.</li> <li>3 CSA-A370-[94(C1999)], Connectors for Masonry.</li> <li>4 CSA-A371-[94(R1999)], Masonry Construction for Buildings.</li> <li>5 CSA-S304.1-[94(R2001)], Masonry Design for Buildings.</li> </ul>
1.3 SUBMITTALS	.1	<pre>Submit samples in accordance with Sections [01 33 00 - Submittal Procedures] [01 00 10 - General Instructions]1 Submit duplicate [full size] [] samples of       [each type] [] masonry units.</pre>
	.2	<ul> <li>Product Data: <ol> <li>Submit manufacturer's printed product literature, specifications, and data sheet in accordance with Sections [01 33 00 - Submittal Procedures] [01 00 10 - General Instructions].</li> <li>Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section [01 33 00 - Submittal Procedures] [01 00 10 - General Instructions].</li> <li>Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products.</li> <li>Indicate VOC's for mortar, grout, parging, colour additives and admixtures.</li> </ol> </li> </ul>
	.3	<ul> <li>Shop Drawings:</li> <li>.1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures] [01 00 10 - General Instructions].</li> <li>.2 Shop drawings consist of bar bending details, lists and placing drawings.</li> <li>.3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.</li> </ul>
1.4 STORAGE AND HANDLING	.1	Protect on site stored or installed material from moisture damage in accordance with manufacturer's



printed instructions.

PART 2 - PRODUCTS		
2.1 <u>MASONRY UNITS</u>	.1	Standard concrete block units: to CAN3-A165 Series (CAN3-A165.1).
		<pre>.1 Classification: [Sc] / [_15Mpa_] / [_50%_] /       [M]2 Size: modular.</pre>
		.3 Special shapes: provide [square] [bull-nosed] units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
	.2	<pre>Special fire-resistant concrete block units: to CAN3- A165 Series (CAN3-A165.1) as modified below. .1 Classification: [H/15/B/M] [_Sc_] except as modified by fire resistance requirements specified below</pre>
		<ul> <li>.2 Fire resistant characteristics: aggregate used in units and equivalent thickness of units to the Supplement to the National Building Code of Canada [1990], Chapter 2 for fire-resistance ratings indicated.</li> <li>.3 Size: modular.</li> </ul>
		.4 Special shapes: provide [square] [bull- nosed] units for exposed corners. Provide purpose-made shapes for lintels and bond beams [and provide additional shapes as indicated] [].
2.2 PEINFORCEMENTS AND CONECTORS	.1	Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade [400] [].
	.2	Wire reinforcement: to CSA-A371 and CSA G30.14, [truss]
	.3	Connectors shall be corrosion resistant: to CSA-A370 and CSA-S304.
2.3 MORTAR AND GROUT	.1	<ul> <li>Mortar: to CSA A179.</li> <li>.1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.</li> <li>.2 Colour: ground-coloured natural aggregates or metallic oxide pigments.</li> </ul>
	.2	Mortar Type: [S] [N] based on [property] [] specifications.
	.3	<pre>Following applies regardless of mortar types and uses specified above: .1 Mortar for stonework: type [N] [N] based on [property] specifications2 Mortar for grouted reinforced masonry: type [S]</pre>

[\_\_N\_] based on [property] [\_\_\_\_]



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		specifications.
	.5	Grout: to CSA A179, Table 3.
	.6	Parging mortar: type [] to CSA A179.
2.4 ACCESSORIES	.1	Weep hole vents: purpose-made [PVC] [galvanized steel] [polypropylene fibre filter, colour []].
	.2	Nailing Inserts: 0.5 mm minimum thickness, galvanized.
	.3	Bolts: 12 mm diameter x 150 mm long with ends bent 50 mm at 90 degrees.
	. 4	Flashings: copper sheet, [600] [] g/m², asphalt laminated to two layers of creped kraft paper, reinforced with [12.7 x 12.7] [] mm fibreglass scrim.
PART 3 - EXECUTION		
3.1 INSTALLATION	.1	<pre>Do masonry work in accordance with CSA-A371 except where specified otherwise. .1 Bond: [running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below] []. .2 Coursing height: 200 mm [for one block and one joint] [for three bricks and three joints]. .3 Jointing: [tool where exposed or where paint or other finish coating is specified to provide smooth compressed [concave] [] surface] [cut joints flush].</pre>
	.2	Build masonry plumb, level, and true to line, with vertical joints in alignment.
	.3	Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
3.2 CONSTRUCTION	.1	<ul> <li>Exposed masonry:</li> <li>.1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.</li> <li>.2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.</li> </ul>
	.2	<pre>Building-In: .1 Install masonry connectors and reinforcement where</pre>



	.3	Prevent displacement of built-in items during construction. Check plumb, location and alignment
	.4	frequently, as work progresses. Brace door jambs to maintain plumb. Fill spaces
	.5	between jambs and masonry with mortar. Install loose steel lintels over openings where indicated.
.3	Conc .1	rete block lintels: Install reinforced concrete block lintels over openings in masonry where steel or reinforced
	.2	concrete lintels are not indicated. End bearing: not less than [200] [] mm [as indicated on drawings] [].
.4	Supp .1	Dort of loads: Use [_15MPa_] MPa concrete to Section [03 30 00 - Cast-in-Place Concrete] [], where concrete fill is used in lieu of solid units
	.2	Use grout to CSA A179 where grout is used in lieu of solid units.
	.3	Install building paper below voids to be filled with [concrete] [grout]; keep paper 25 mm back from faces of units.
.5	Prov	rision for movement:
	.1	Leave [3] [] mm space below shelf angles.
	.2	Leave [6] [] mm space between top of non- load bearing walls and partitions and structural elements. Do not use wedges.
	.3	Built masonry to tie in with stabilizers, with provision for vertical movement.
.6	Inte	erface with other work:
	.1 .2	Cut openings in existing work as indicated. Openings in walls: approved [Departmental
	.3	Make good existing work. Use materials to match existing.
.7	Buil A371	d in flashings in masonry in accordance with CSA-
	.1	Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings
	.2	under weep hole courses and as indicated. In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and

as follows:
.1 For masonry backing embed flashing 25 mm in
 joint.



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		<ul> <li>.2 For concrete backing, insert flashing into reglets.</li> <li>.3 For wood frame backing, staple flashing to walls behind sheathing paper.</li> <li>.4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.</li> <li>.3 Lap joints 150 mm and seal with adhesive.</li> </ul>
	.8	Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.
3.3 REINFORCING AND CONNECTING	.1	Install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371 and CSA-S304.1 unless indicated otherwise.
	.2	Prior to placing [concrete] [mortar] [grout], obtain [Departmental Representative's] [Engineer's] [Consultant's] [] approval of placement of reinforcement and connectors.
3.4 BONDING AND TYING	.1	Bond walls of two or more wythes using [metal] [] connectors in accordance with CSA-S304, CSA-A371 and as indicated.
	.2	Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.
3.5 REINFORCED LINTELS AND BOND BEAMS	.1	Reinforce masonry lintels and bond beams as indicated.
	.2	Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.
3.6 GROUTING	.1	Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.
3.7 ANCHORS	.1	Supply and install metal anchors as indicated.
3.8 LATERAL SUPPORT AND ANCHORAGE	.1	Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.
3.9 SITE TOLERANCES	.1	Tolerances in notes to Clause 5.3 of CSA-A371 apply.
3.10 FIELD QUALITY CONTROL	.1	Inspection and testing will be carried out by Testing Laboratory designated by [Departmental Representative] [Engineer] [Consultant] [].
3.11 CLEANING	.1	Perform cleaning after installation to remove construction and accumulated environmental dirt.



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	.2	Upon completion of insta materials, rubbish, too	allation, remove surplus Ls, and equipment barriers.

<u>3.12 PROTECTION</u> .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings.



1.1 RELATED REQUIREMENTS	.1	Related Works Section 04 04 99 - Masonry for Minor Works Section 04 05 19 - Masonry Anchorage and Reinforcing Section 04 05 23 - Masonry Accessories Section 04 22 00 - Concrete Unit Masonry
<u>1.2 REFERENCES</u>	.1	<ul> <li>Canadian Standards Association (CSA International)</li> <li>.1 CAN/CSA-A23.1/A23.2- [04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete</li> <li>.2 CAN/CSA A179- [04], Mortar and Grout for Unit Masonry.</li> <li>.3 CAN/CSA A371- [04], Masonry Construction for Buildings.</li> <li>.4 CAN/CSA-A3000- [03], Cementitious Materials Compendium; CAN/CSA-A3002- [03], Masonry and Mortar Cement.</li> </ul>
1.3 ACTION AND INFORMATIONAL	.1	<ul> <li>Product Data: <ol> <li>Provide submittals in accordance with Section <ul> <li>[01 33 00 - Submittal Procedures].</li> </ul> </li> <li>Provide manufacturer's printed product literature, specifications, and datasheets. Include product characteristics, performance criteria, and limitations.</li> <li>Provide two Paper and one PDF copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures]. Indicate VOC's mortar, grout, parging, colour additives and admixtures. Expressed as grams per litre (g/L).</li> </ol></li></ul> Manufacturer's Instructions: <ul> <li>Provide manufacturer's installation instructions.</li> </ul>
<u>1.4 QUALITY ASSURANCE</u>	.1	Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
1.5 DELIVERY, STORAGE, AND HANDLING	.1	<pre>Deliver, store and handles masonry mortar and grout materials in accordance with Section [01 61 00 - Common Product Requirements]. Supplemented as follows: .1 Deliver prepackaged, dry-blended mortar mix to project site in labelled plastic-lined bags each bearing name and address of manufacturer,</pre>



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		<pre>production codes or batch numbers, and colour or formula numbers. .2 Maintain mortar, grout and packaged materials clean, dry, and protected against dampness, freezing, traffic and contamination by foreign materials</pre>
	.2	Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets] [crates] [paddling] [and] [packaging materials] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal].
1.6 SITE CONDITIONS	.1	<pre>Ambient Conditions: maintain materials and surrounding air temperature to .1 Minimum 18 degrees C prior to, during, and 48 hours after completion of masonry work. .2 Maximum 32 degrees C prior to, during, and 48</pre>
	.2	hours after completion of masonry work. Weather Requirements: [CAN/CSA A371] [International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Hot and Cold Weather Masonry Construction].
PART 2 - PRODUCTS		
2.1 MATERIALS	.1 .2 .3	Use same brands of materials and source of aggregate for entire project. Cement: Cement: to CAN/CSA-A3001, Type GU.
	.4 .5	blended hydraulic cement: Type GU to CAN/CSA-A3001. Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA-A3001.
	.6 .7	Water: to CSA-A23.1. Aggregates: to CAN/CSA-A23.1/A23.2. Do not use recycled concrete in aggregate.
	.9	Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA- A23.1/A23.2. .1 Compressive strength: 40 MPa at 28 days.
	.10	Non premixed dry pack grout: composition of non- metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 30 MPa at 28 days.
	.11	Curing compound: to CSA-A23.1/A23.2 white, Type 1- chlorinated rubber.
	.12	Pre-moulded joint fillers: .1 Bituminous impregnated fiber board: to ASTM D 1751.
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2.2 COLOUR ADDITIVES	<ul> <li>.2 Sponge rubber: to ASTM D 1752, Type I, firm grade.</li> <li>.1 Use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.</li> <li>Admixtures to be approved prior to use. Use in accordance with the specific manufacturer's recommendations</li> </ul>				
2.3 ADMIXTURES	<ul> <li>Admixtures:</li> <li>.1 Air entraining admixture: to ASTM C 260.</li> <li>.2 Chemical admixture: to ASTM C 494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.</li> </ul>				
2.4 MORTAR MIXES	<pre>.1 Mortar for interior masonry: .1 Loadbearing: type [N] [S] [M] [] based on [property] [proportion] specifications. .2 Non-Loadbearing: [O] [N] [] based on [property] [proportion] specifications.</pre>				
	.1 Following applies regardless of mortar types and uses specified above:				
	<ul> <li>.2 Mortar for calcium silicate brick and concrete brick: type O based on proportion specifications.</li> <li>.1 Mortar for stonework: type [N] [] based on [proportion] [property] specifications.</li> <li>.2 Mortar for grouted reinforced masonry: type [S] [M] based on [property] [proportion] specifications.</li> </ul>				
2.5 MORTAR MIXING	Use pre-blended, pre-coloured mortar prepackaged under controlled factory conditions. Ingredients batching limitations to be within 1% accuracy.				
	Mix mortar ingredients in accordance with CAN/CSA A179 in quantities needed for immediate use.				
	Maintain sand uniformly damp immediately before mixing process.				
	Add [mortar colour] [and] [admixtures] in accordance with manufacturer's instructions. Provide uniformity of mix and colouration.				
	Do not use anti-freeze compounds including calcium chloride or chloride-based compounds.				
	Do not add air entraining admixture to mortar mix.				
	Use a batch type mixer in accordance with CAN/CSA A179.				
	Pointing mortar: pre-hydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when				



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	pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.	
	Re-temper mortar only within two hours of mixing, when water is lost by evaporation.	
	Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under [5] [10] [] degrees C.	
2.6 GROUT MIXES	<ul> <li>.1 Lintels: grout mix 10 to 12.5 MPa strength at 28 days; [200-250] mm slump; [premixed type in accordance with CAN/CSA-A23.1] [mixed in accordance with CAN/CSA A179 [fine] [coarse] grout.</li> <li>.2 Grout: Minimum compressive strength of [12.5] MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA A179.</li> </ul>	
2.7 GROUT MIXING	.1 Mix batched and delivered grout in accordance with CAN/CSA-A23.1 transit mixed.	
	.2 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA A179 [fine] [coarse] grout.	
	.3 Add admixtures in accordance with manufacturer's instructions; mix uniformly.	
	.4 Do not use calcium chloride or chloride-based admixtures.	
2.8 <u>MIX TESTS</u>	<ul> <li>.1 Testing Mortar Mix: <ul> <li>.1 Test mortar to requirements of Section [01 45 00 - Quality Control], and in accordance with CAN/CSA A179, for [mortar based on property specification] [proportion specification]. Test [prior to construction] [and] [during construction] for: <ul> <li>.1 Compressive strength.</li> <li>.2 Consistency.</li> <li>.3 Mortar aggregate ratio.</li> </ul> </li> </ul></li></ul>	
	.4 Sand/cement ratio. .5 Water content and water/cement ratio. .6 Air content. .7 Splitting tensile strength. .2 Testing Grout Mix: .1 Test grout to requirements of Section [01 45 00 - Quality Control] [], and in accordance with CAN/CSA A179, for [grout based on property specification] [proportion specification]. Test [prior to construction] [and] [during construction] for: .1 Compressive strength.	



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PART 3 - EXECUTION		<ul><li>.2 Sand/cement ratio.</li><li>.3 Water content and water/cement ratio.</li><li>.4 Slump.</li></ul>
3.1 EXAMINATION	.1	Request inspection of spaces to be grouted.
3.2 <u>PREPARATION</u>	.1	Apply bonding agent to existing [concrete] [] surfaces.
	.2	Plug clean-out holes with [[brick] [block] masonry units] []. Brace masonry for wet grout pressure.
3.3 MANUFACTURER'S INSTRUCTIONS	.1	Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
3.4 CONSTRUCTION	.1	Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.
<u>3.5 MIXING</u>	.2	Apply parging in uniform coating not less than [total] [10] mm thick [, where indicated]. All pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes, [Mixing by hand must be pre-approved by the [Departmental Representative] [Engineer] [Consultant].
	.2	Clean all mixing boards and mechanical mixing machine between batches.
	.3	Mortar must be weaker than the units it is binding.
<u>3.6 MORTAR PLACEMENT</u>	.4	Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.
	.1	Install [mortar] [premix mortar] to manufacturer's instructions.
	.2	Install mortar to requirements of CAN/CSA A179.
3.7 GROUT PLACEMENT	.3	Install mortar [and grout] to requirements of Section [].
	.4 .1	Remove excess mortar from grout spaces. Install grout in accordance with manufacturer's instructions.
	.2	Install grout in accordance with CAN/CSA A179.
	.3	Work grout into masonry cores and cavities to eliminate voids.



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	.4	Do not install grout in lifts greater than [400] mm, without consolidating grout by rodding.
	.5	Do not displace reinforcement while placing grout.
3.8 FIELD QUALITY CONTROL	.1	<pre>Site Tests, Inspection: in accordance with Section [04 05 00 - Common Work Results for Masonry] [] supplemented as follows: .1 Test and evaluate mortar [prior to construction]   [and] [during construction] in accordance with   CAN/CSA A1792 Test and evaluate grout [prior to construction]   [and] [during construction] to CAN/CSA A179; test   in conjunction with masonry unit sections   specified.</pre>
	.2	Manufacturer's Field Services: in accordance with Section [04 05 00 - Common Work Results for Masonry] [].
3.9 CLEANING	.1	Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.
	.2	Remove droppings and splashing's using clean sponge and water.
	.3	Clean masonry with low pressure clean water and soft natural bristle brush.
	.4	Waste Management: separate waste materials for [reuse] [and] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements] [].
3.10 PROTECTION OF COMPLETED WORK	.1	Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each workday. Anchor securely in position. .1 Mortar:

- .1 Concrete Masonry Units: [\_\_\_\_]. .2 White Mortar: [\_\_\_\_].


PART 1 -	GENERAL
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1.1 RELATED REQUIREMENTS	.1	Related Works Section 04 04 99 - Masonry for Minor Works Section 04 05 12 - Masonry Mortar and Grout Section 04 05 23 - Masonry Accessories Section 04 22 00 - Concrete Unit Masonry
1.2 <u>REFERENCES</u>	.1	<ul> <li>ASTM International Inc.</li> <li>.1 ASTM A 36/A 36M- [05], Standard Specification for Carbon Structural Steel.</li> <li>.2 ASTM A 82/A 82M-[05a], Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.</li> <li>.3 ASTM A 167-[99(R2004)], Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.</li> <li>.4 ASTM A 307- [04], Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.</li> <li>.5 ASTM A 580/A 580M- [06], Standard Specification for Stainless Steel Wire.</li> <li>.6 ASTM A 641/A 641M- [03], Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.</li> <li>.7 ASTM-A666- [03], Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.</li> </ul>
	.2	<ul> <li>Canadian Standards Association (CSA International) <ol> <li>CAN/CSA-A23.1/A23.2- [04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.</li> <li>CAN/CSA A179- [04], Mortar and Grout for Unit Masonry.</li> <li>CAN/CSA A370- [04], Connectors for Masonry.</li> <li>CAN/CSA A371- [04], Masonry Construction for Buildings.</li> <li>CAN/CSA G30.18-[M92(R2007)], Billet-Steel Bars for Concrete Reinforcement.</li> <li>CSA W186-[M1990(R2007)], Welding of Reinforcing Bars in Reinforced Concrete Construction.</li> </ol> </li> </ul>
1.3 ACTION AND INFORMATIONAL SUBITTALS	.1	Provide submittals in accordance with Section [01 33 00 - Submittal Procedures] [].
	.2	Product Data: .1 Provide manufacturer's printed product literature, specifications and datasheets illustrating products to be incorporated into project for

specified products. .2 Provide [two] [\_hard\_] copies of Workplace Hazardous Materials Information System (WHMIS) -



Material Safety Data Sheets (MSDS) in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures]. .3 Shop Drawings: Provide shop drawings in accordance with Section .1 [01 33 00 - Submittal Procedures] [\_\_\_ ]. .1 Provide drawings stamped and signed by professional engineer registered or licensed in [Province [s]] [Territory [ies]] [ ] of [Ontario], Canada. Provide shop drawings detailing bar bending .2 details, [anchorage details] [ ] lists and placing drawings. On placing drawings, indicate sizes, spacing, .3 location and quantities of reinforcement and connectors. .4 Samples: Provide samples in accordance with Section .1 [01 33 00 - Submittal Procedures] [ ], supplemented as follows: Samples: submit [two] [ ] of: .1 Manufacturer's Instructions: .5 .1 Provide manufacturer's installation instructions. Sustainable Design Submittals: .6 LEED Submittals: in accordance with [Section .1 01 35 21 - LEED Requirements] [\_\_\_\_]. Test Reports: certified test reports showing compliance 1.4 QUALITY ASSURANCE .1 with specified performance characteristics and physical properties. .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Pre-Installation Meetings: conduct pre-installation .3 meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section [04 05 00 - Common Work Results for Masonry] [ ]. .4 Mock-ups: Construct mock-ups in accordance with Section . 1 [01 45 00 - Quality Control] [ ] and requirements of Section [04 05 00 - Common Work Results for Masonry] [\_\_\_\_] supplemented as follows:

.1 Construct mock-ups panel of [anchorage



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	<pre>installation] [reinforcement installation]2 Sample panel: [3000 mm x 3000 mm] [] using proposed procedures, anchorage material, connectors, reinforcement material, and workmanship.</pre>
1.5 FIELD MEASUREMENTS	.1 Make field measurements necessary to ensure proper fit of members.
1.6 DELIVERY, STORAGE, AND HANDLING	<ul> <li>Deliver, store and handle masonry anchorage and reinforcing materials in accordance with Section [01 61 00 - Common Product Requirements] [], supplemented as follows: <ul> <li>Deliver reinforcement and connectors, identified in shop and placement drawings.</li> </ul> </li> </ul>
	<ul> <li>Packaging Waste Management:         <ul> <li>Separate and recycle waste materials in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [].</li> </ul> </li> </ul>
PART 2 - PRODUCTS	
2.1 MATERIALS	.1 Bar reinforcement: [Steel to CAN/CSA A371 and CAN/CSA G30.18, Grade [] [stainless steel to ASTM A 167] []] [].
	.2 Connectors: to CAN/CSA A370 and CSA-S304.1.
	.3 Corrosion protection: to CSA-S304.1, [galvanized] [] to CSA-S304.1 and CAN/CSA A370.
	<ul> <li>.4 Fasteners: installed post-construction: <ol> <li>Screw Shields and Plugs: [plastic] [fibre]</li> <li>[rubber] [nylon] [lead] [], [vibration-resistant] [chemical-resistant] [water-resistant]</li> <li>[install in mortar joints] [placed directly into solid masonry units] [].</li> <li>2 Bolts and Screws: size and type to suit application, locate where indicated.</li> <li>.3 Nails: case-hardened cut or spiral nails, size, and type to suit fastening application.</li> <li>.4 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with manufacturers use, load, and hold recommendations.</li> <li>.5 Adhesives: epoxies, mastics and contact cements for fastening applications, use in accordance with manufacturers' recommendations.</li> </ol> </li> </ul>
	.5 Ties: [hot dip galvanized to CAN/CSA A370 Table 5.2] [uncoated] [] steel finish.
	.1 Corrugated to CAN/CSA A370.



.2	Unit ties, to CAN/CSA A370: [rectangular] [Z
	style] [], fabricated form [cold-drawn
	steel] [wire stainless steel] [], size to
З	Suit application. Adjustable Unit Ties: to CAN/CSA A370.
• 5	proprietary type ties, type, style, and size to
	suit application in accordance with
	manufacturer's recommendations.
.4	Joint Reinforcement Ties: to CAN/CSA A370:
	.1 Single Wythe Joint Reinforcement: [ladder]
	[truss] [] type:
	.1 Steel wire, hot dip galvanized: to
	ASTM A 641, Class [3] [1] after
	fabrication.
	.2 Cold drawn steel wire conforming to
	Stainless steel conforming to
	ASTM A 580, Type 304, [4.8] [ ]
	mm side rods with [ ] mm cross
	ties.
	.2 Multiple Wythe Joint Reinforcement: [ladder]
	[truss] type: without moisture drip;
	[adjustable] [non-adjustable]:
	.1 Steel wire, hot dip galvanized: to
	ASIM A 041 CLASS [3] [1] alter
	.2 Cold drawn steel wire conforming to
	[ASTM A 82] [ ].
	.3 Stainless steel conforming to
	ASTM A 580 Type 304, [4.8] [] mm
	side rods with [] mm cross rods.
Ancho	prs: to CAN/CSA A370:
• ⊥	Conventional Anchors: type [steel bolts with bent
	bar anchors [prace anchors] [chrough borts]
	application.
.2	Wedge Anchors: expansion anchors type [wedge and
	bolt] [ ], sized to suit application.
.3	Sleeve Anchors: type [sleeve and bolt] [],
	sized to suit application.
.4	Self-Contained Anchors: type [double glass/plastic
	vial system, with epoxy resin and hardener]
-	[].
. 5	Dovetall Anchors: Dent Steel Strap, [X] mm Size X
	Table 5 2 [coated] [uncoated] finish
. 6	Spiral Anchors: [8 mm] [ ] stainless steel
• •	spiral anchors to Grade 304.
.7	Stone Anchors: series 300 stainless steel
	conforming to ASTM A 666. Anchors to be
	<pre>manufactured [as per drawings] [].</pre>
.8	Anchor Bolts: [conventional (unpatented) anchors]
	[proprietary (patented) anchors] [], [steel]
	[stainless steel] [], [galvanized to CAN/CSA
	AS/U TADLE 5.2] [UNCOATED] IINISN.
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MASONRY ANCHORAGE AND REINFORCING

•	7 Cc	nventional Bolts:
	.1	Bolts: to ASTM A 36, bar stock [shop threaded] [], [straight bolts with square or hex- headed nuts] [bent bar anchors, [J] [L] [] shaped].
	.2	Plate anchors: steel to ASTM A 36, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end.
	• •	threaded ASTM A 36 bar stock.
_ {	8 Ad se cc ag ma wi	thesive Anchors: proprietary systems, [pre-mixed, lf-contained system with double glass vial system to ntain epoxy, consisting of resin, hardener and gregate] [measure and mix system where epoxy terials are hand-measured and mixed in accordance th manufacturers' written instructions] [].
2.2 FABRICATION	1 Fa an th	bricate reinforcing in accordance with CAN/CSA-A23.1 d [Reinforcing Steel Manual of Standard Practice by e Reinforcing Steel Institute of Canada] [].
	2 Fa	bricate connectors in accordance with CAN/CSA A370.
	3 Ob [C re dr	tain [Departmental Representative's] [Engineer's] consultant's] [] approval for locations of inforcement splices other than shown on placing awings.
. '	4 Up [E ac	on approval of [Departmental Representative] ngineer] [Consultant] [], weld reinforcement in cordance with CSA W186.
.!	5 Sh ac	ip reinforcement and connectors clearly identified in cordance with drawings.
2.3 SOURCE QUALITY CONTROL	1 [U Re ce st an cc	pon request,] [] provide [Departmental presentative] [Engineer] [Consultant] [] with rtified copy of mill test report of reinforcement eel and connectors, showing physical and chemical alysis, [minimum [5] [] weeks prior to mmencing reinforcement work] [].
	2 [U Re pr	pon request] [] inform [Departmental presentative] [Engineer] [Consultant] [] of oposed source of material to be supplied.
PART 3 - EXECUTION		
<u>3.1 MANUFACTRER'S</u>	1 Cc in st	mply with manufacturer's written recommendations, cluding product technical bulletins, handling, orage and installation instructions, and datasheets.
3.2 PREPARATION	1 Di [m	rect and coordinate placement of metal anchors for asonry] [] supplied to other Sections.



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3.3 INSTALLATION	.1	Supply and install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371, CAN/CSA- A23.1 and CSA-S304.1 unless indicated otherwise.
	.2	Prior to placing [concrete] [mortar] [grout], obtain [Departmental Representative's] [Engineer's] [Consultant's] [] approval of placement of reinforcement and connectors.
	.3	Supply and install additional reinforcement to masonry as indicated.
3.4 BONDING AND TYING	.1	Bond walls of two or more wythes using [metal] [] connectors in accordance with CSA-S304.1, CAN/CSA A371 and as indicated.
	.2	Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CAN/CSA A371 and as indicated.
	.3	<pre>Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with [CAN/CSA A370 and CAN/CSA A371] [manufacturer's instructions]1 Bond walls of two or more wythes using [metal]       [] connectors in accordance with CAN/CSA A371 and as indicated.</pre>
		<ul> <li>.2 Install horizontal joint reinforcement [400] <ul> <li>[] mm on centre.</li> </ul> </li> <li>.3 Place masonry joint reinforcement in first [and second] [] horizontal joints above and below openings. Extend minimum [400] [] mm each side of opening.</li> <li>.4 Place joint reinforcement continuous in first [and second] [] joint below top of walls.</li> <li>.5 Lap joint reinforcement ends minimum [150] <ul> <li>[] mm.</li> </ul> </li> <li>.6 Connect [stack bonded unit] [] joint corners and intersections with strap anchors [400] <ul> <li>[] mm on centre.</li> </ul> </li> </ul>
3.5 REINFORCED LINTELS AND BOND BEAMS	.1	Reinforce masonry beams, masonry lintels and bond beams as indicated.
	.2	Place and grout reinforcement in accordance with CSA- S304.1, CAN/CSA A371, and CAN/CSA A179.
	.3	Support and position reinforcing bars in accordance with CAN/CSA A371.
3.6 GROUTING	.1	Grout masonry in accordance with CSA-S304.1, CAN/CSA A371 and CAN/CSA A179 and as indicated.



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3.7 ANCHORS	.1	Supply and install metal anchors [in accordance with CAN/CSA A370 and CAN/CSA A371] [as indicated].
3.8 LATERAL SUPPORT AND ANCHORAGE	.1	Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.
3.9 MOVEMENT JOINTS	.1	Reinforcement will not be continuous across movement joints unless otherwise indicated.
3.10 FIELD BENDING	.1	Do not field bend reinforcement and connectors except where indicated or authorized by [Departmental Representative] [Engineer] [Consultant] [].
	.2	When field bending is authorized, bend without heat, applying a slow and steady pressure.
	.3	Replace bars and connectors which develop cracks or splits.
3.11 FIELD QUALITY CONTROL	.1	Site inspections in accordance with Section [04 05 00 - Common Work Results for Masonry] [].
	.2	Obtain [Departmental Representative] [Engineer] [Consultant] [] approval of placement of reinforcement and connectors, prior to placing [mortar] [grout] [].
3.12 FIELD TOUCH-UP	.1	Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with
3.13 CLEANING	.1	<pre>compatible finish to provide continuous coating. Clean in accordance with Section [01 74 11 - Cleaning] []. .1 Remove surplus materials, excess materials, rubbish, tools, and equipment.</pre>
	.2	Waste Management: separate waste materials for [reuse] [and] [recycling] [] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements] [].



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#### PART 1 - GENERAL

1.1 RELATED REQUIREMENTS	.1	Related Works Section 04 04 99 - Masonry for Minor Works Section 04 05 12 - Masonry Mortar and Grout Section 04 05 19 - Masonry Anchorage Reinforcing Section 04 22 00 - Concrete Unit Masonry
1.2 <u>REFERENCES</u>	.1	ASTM International Inc. .1 ASTM D 2240- [05], Standard Test Method for Rubber Property - Durometer Hardness.
	.2	<ul> <li>Canadian Standards Association (CSA International)</li> <li>.1 CAN/CSA A371- [04], Masonry Construction for Buildings.</li> <li>.2 CAN/CSA-ISO 14021-[00(R2204)], Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).</li> </ul>
1.3 ACTION AND INFORMATIONAL SUBMITTALS	.1	Provide submittals in accordance with Section [01 33 00 - Submittal Procedures] [].
	.2	Product Data:
		.1 Provide manufacturer's printed product literature, specifications, and datasheets. Include product characteristics, performance criteria, and limitations.
	.3	<pre>Shop Drawings: .1 Provide shop drawings in accordance with Section [01 33 00 - Submittal Procedures] []. .1 Provide drawings stamped and signed by professional engineer registered or licensed in [Province [s]] [Territory [ies]] [] of [].</pre>
		.2 Shop drawings consist of flashing and installation details. Indicate sizes, spacing, location and quantities of fasteners.
	.4	<pre>Samples: .1 Provide masonry accessory samples in accordance with Section [01 33 00 - Submittal Procedures] [], supplemented as follows:</pre>
		<pre>.1 Materials: [two] [], [cured], [and] [coloured] samples, illustrating colour and colour range. Include: .1 Movement joint filler. .2 Lap adhesive. .3 Mechanical fasteners. 4 Reglets</pre>

.4 Reglets. .5 Brick vents.



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		<ul> <li>.2 [Two] [] moisture control material samples, illustrating colour and colour range, size, and shape. Include: <ul> <li>.1 Weep hole vents.</li> <li>.2 Mortar diverters.</li> <li>.3 Grout screens.</li> </ul> </li> <li>.3 [Two] [] flashing material samples, illustrating colour and colour range, size, shape, and profile. Include as specified: <ul> <li>.1 Sheet metal flashings.</li> <li>.2 Composite flashings.</li> <li>.3 Plastic and rubber flashings.</li> </ul> </li> </ul>
	.5	<pre>Quality Assurance Submittals: .1 Test reports: submit certified test reports in accordance with Section [04 05 00 - Common Work Results for Masonry] [], supplemented as follows: .1 []. .2 Certificates: submit in accordance with Section [04 05 00 - Common Work Results for Masonry] [].</pre>
		<ul> <li>.3 Manufacturer's Instructions: submit in accordance with Section [04 05 00 - Common Work Results for Masonry] [], supplemented as follows:</li> <li>.1 Submit installation instructions for [fillers] [adhesives] [reglets] [brick vents] [weeps] [vents] [diverters] [screens] [flashings] [].</li> </ul>
	.6	Sustainable Design Submittals: .1 LEED Submittals: in accordance with [Section 01 35 21 - LEED Requirements] [].
	.7	Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
	.8	Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.9 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section [04 05 00 - Common Work Results for Masonry] [\_\_\_\_].

# <u>1.4 FIELD MEASUREMENTS</u> .1 Make field measurements necessary to ensure proper fit of members.



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1.5 DELIVERY, STORAGE, AND HANDLING	.1	<ul> <li>Deliver, store and handle masonry accessories in accordance with, Section [01 61 00 - Common Product Requirements] [] supplemented as follows:</li> <li>.1 Keep fillers and adhesives dry, protected against dampness, and freezing.</li> <li>.2 Store packaged materials off ground and in accordance with manufacturer's written instructions.</li> </ul>
	.2	Packaging Waste Management: .1 Separate waste materials for [reuse] [and] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [].
PART 2 - PRODUCTS		
2.1 <u>MATERIALS</u>	.1	<pre>Movement joint filler: purpose-made elastomer [] durometer hardness to ASTM D 2240 of size and shape indicated. .1 Use low VOC products [in compliance with the SCAQMD Rule 1168] []. .2 Material type: [fibre board] [expanded polyethylene] [rubber] [cork] [self-expanding cork] [closed cell neoprene] []. Lap adhesive: recommended by masonry flashing</pre>
	• 2	manufacturer. Use low VOC products [in compliance with the SCAQMD Rule 1168] [and] [in compliance with Section []].
	.3	Weep hole vents: purpose-made [PVC] [galvanized steel] [polypropylene fibre filter, colour []].
	.4	Mechanical fasteners: recommended by flashing manufacturer to suit project requirements [].
	.5	<pre>Brick vents: .1 Material: [aluminum] [], [100], [38] [] mm deep frame. .2 Blades: [aluminum] [], [overlapping, 45 degree angle] [opposed blade damper] with maximum free area [39] [] %. .3 Size: [] x [] mm. .4 Provide 458 x 356 mm mesh aluminum insect screen, [single blade flap damper] [straight duct connection] [exterior operator] []. .5 Finish frame [and] [blades]: [204-R1 clear anodize] [integral colour anodize, colour [medium] [dark bronze] []] [baked enamel, colour</pre>



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[]].
.1 Weep Hole Vents: [PVC] [galvanized steel] [polypropylene fibre filter, colour []] [].
.2 Cell vents: polypropylene plastic, honeycomb design. .1 Size: [9.5 mm x 63.5 mm x 85.7 mm] [9.5 mm x 85.7 mm x 101.6 mm] [].
.3 Colour: [clear] [gray] [brown] [].
<ul> <li>.4 Mortar diverters: shaped and sized to suit cavity spaces.</li> <li>.1 Cavity space size: [] mm.</li> <li>.2 Manufactures from [recycled material] [].</li> </ul>
<ul> <li>.5 Grout Screens: 6 mm square monofilament screen is fabricated form high-strength, non-corrosive polypropylene polymers to isolate flow of grout in designated areas.</li> <li>.1 Size: [100] [150] [200] [250] [] mm wide x 30 m.</li> </ul>
<pre>.1 Sheet metal: [galvanized steel] [stainless steel]  [copper] [aluminum].    .1 Thickness: [] mm.    .2 Finish: [].</pre>
<ul> <li>.2 Composite Flashings: <ul> <li>.1 Copper: with minimum 0.36 mm thickness of copper and minimum density of 619 g/m<sup>2</sup>, laminated to two layers of creped kraft or felt paper, reinforced with [12.7 x 12.7] [] mm fiberglass scrim.</li> <li>.2 Aluminum flashings: aluminum foil, [0.004] [] mm thick, asphalt laminated between two sheets of creped kraft paper with one exposed paper surface coated with asphalt-wax treatment.</li> </ul> </li> </ul>
<ul> <li>.3 Plastic and Rubber Flashings: <ol> <li>Plastic: UV protected, [] mm thick, [self-adhering] [].</li> <li>Polyvinylchloride (PVC): to CAN/CSA A371, UV protected, minimum 0.5 mm thick or minimum thickness for PVC coated metal of 1.4 mm, with welded joints [and] [with integral metal drip deflector] [] [self-adhering] [].</li> <li>S Ethylene Propylene Diene Monomer (EPDM): to CAN/CSA A371, UV protected, minimum 1.2 mm thick for wall flashing, [self-adhering] [].</li> <li>Rubberized asphalt: [] mm thick, [self-adhering] [].</li> <li>Polyethylene Flashings: <ol> <li>Polyethylene Flashings:</li> </ol> </li> </ol></li></ul>

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		<pre>polyethylene film bonded to asphalt treated creped kraft. .2 Reinforced: two [0.05] [0.10] [0.75] mm thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with [12.7 x 12.7] [] mm fiberglass scrim.</pre>
PART 3 - APPLICATION		
3.1 APPLICATION	.1	Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
3.2 INSTALLATION: MATERIALS	.1	Install continuous movement joint fillers in movement joints at locations indicated on drawings.
	.2	Lap adhesive: apply adhesive to flashing lap joints.
	.3	Mechanical fasteners: install fasteners to suit application and in accordance with manufacturer's written installation instructions.
	.4	Reglets: install reglets at locations indicated on drawings.
	.5	Brick vents: install brick vents at locations indicated on drawings.
3.3 INSTALLATION: MOISTURE CONTROL	.1	Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.
	.2	Mortar diverters: install purpose made diverters in cavities where indicated and as directed, size and shape to suit purpose and function.
	.3	Grout screens: install purpose made diverters in cavities where indicated and as directed, size and shape to suit purpose and function.
3.4 INSTALLATION: FLASHINGS	.1	<ul> <li>Build in flashings in masonry in accordance with CAN/CSA A371.</li> <li>.1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings, and at base of cavity wall and where cavity is interrupted by horizontal members or supports and as shown on drawings.</li> </ul>

members or supports and as shown on drawings. Install flashings under weep hole courses and as indicated.

.2 In cavity walls and veneered walls, carry



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	.2	<pre>flashings from front edge of exte under outer wythe, then up backin 150 mm, and as follows: .1 For masonry backing embed or mm in joint. .2 For concrete backing, insert into reglets. .3 For wood frame backing, stap walls behind water resistive joints. .4 For gypsum board and glass fi sheathing backing, bond to wa manufacturer's recommended ad .3 Lap joints 150 mm and seal with a Form flashing (end dams) at lintels, s</pre>	rior masonry, g not less than bond flashing 25 or bond flashing le flashing to paper, and lap ibre faced all using dhesive. dhesive. ills and wall
	• 2	ends to prevent water from travelling flashing ends.	horizontally past
	.3	Install vertical flashing where outer window or door jambs, to prevent conta inner wall.	veneer returns at ct of veneer with
3.5 CLEANING	.1	Clean in accordance with Section [01 7 []. .1 Remove surplus materials, excess	4 11 - Cleaning] materials,

.2 Waste Management: separate waste materials for [reuse] [and] [recycling] [\_\_\_\_] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements] [\_\_\_\_\_].

rubbish, tools, and equipment.



PART 1 - GENERAL		
1.1 RELATED REQUIREMENTS	.1	Related Works Section 05 50 00 - Metal Fabrications
<u>1.2 references</u>	.1	<ul> <li>ASTM International Inc.</li> <li>1 ASTM A 36/A 36M- [08], Standard Specification for Carbon Structural Steel.</li> <li>2 ASTM A 193/A 193M- [08], Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.</li> <li>3 ASTM A 307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.</li> <li>4 ASTM A 325-[07a], Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.</li> <li>5 ASTM A 325M- [08], Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength [Metric].</li> <li>6 ASTM A 490M-[04ae], Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric].</li> </ul>
	.2	Canadian General Standards Board (CGSB) .1 CAN/CGSB-85.10- [99], Protective Coatings for Metals.
	.3	<ul> <li>Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).</li> <li>.1 Handbook of the Canadian Institute of Steel Construction.</li> <li>.2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.</li> </ul>
	.4	<ul> <li>Canadian Standards Association (CSA International)</li> <li>.1 CSA G40.20/G40.21- [04], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.</li> <li>.2 CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.</li> <li>.3 CAN/CSA-S16-[01(R2007)], Limit States Design of Steel Structures.</li> <li>.4 CAN/CSA-S136- [07], North American Specifications for the Design of Cold Formed Steel Structural Members.</li> <li>.5 CSA W47.1- [03], Certification of Companies for Fusion Welding of Steel.</li> <li>.6 CSA W48- [06], Filler Metals and Allied Materials for Metal Arc Welding.</li> <li>.7 CSA W55.3-[1965(R2003)], Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.</li> </ul>



STRUCTURAL STEEL FOR BUILDINGS

- .8 CSA W59- [03], Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
  - .1 MPI-INT 5.1- [08], Structural Steel and Metal Fabrications.
  - .2 MPI-EXT 5.1- [08], Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International .1 NACE No. 3/SSPC SP-6- [06], Commercial Blast Cleaning.
- 1.3 ACTION AND

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

- INFORMATIONAL SUBMITTALS
- .2 Shop Drawings:
  - .1 Provide drawings stamped and signed by professional engineer registered or licensed in [Province [s]] [Territory [ies]] [Ontario], Canada.
- .3 Erection drawings:
  - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Description of methods.
    - .2 Sequence of erection.
    - .3 Type of equipment used in erection.
    - .4 Temporary bracings.
- .4 Fabrication drawings:
  - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the [Province [s]] [Territory [ies]] of [Ontario], Canada.
- .5 Samples:
  - .1 Prepare sample of typical exposed structural connections in accordance with [AISC Specifications of Architecturally exposed structural steel] [\_\_\_\_] for approval of [Departmental Representative] [Engineer] [Consultant] [\_\_\_\_]. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness, and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance, and material acceptable for entire project.
- .6 Source Quality Control Submittals: .1 Submit [Two] copies of mill test reports [4]



		<pre>[] weeks prior to fabrication of structural steel. .1 Mill test reports to show chemical and</pre>
		physical properties and other details of steel to be incorporated in project.
		.2 Provide mill test reports certified by metallurgists qualified to practice in [Province [s]] [Territory [ies]] of [Ontario], Canada.
	.7	Fabricator Reports:
		.1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.
1.4 DELIVERY, STORAGE, AND HANDLING	.1	Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [].
	.2	Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
	.3	Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets] [crates] [paddling] [and] [packaging materials] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [].
PART 2 - PRODUCTS		
2.1 <u>DESIGN REQUIREMENTS</u>	.1	Design details and connections in accordance with requirements of [CAN/CSA-S16] [and CAN/CSA-S136] [with CSA-S136.1] to resist forces, moments, shears and allow

Shear connections: .2

for movements indicated.

- Select framed beam shear connections from an .1 industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
- .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
- .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.



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		.4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in [Province [s]] [Territory [ies]] of [Ontario], Canada for non-standard connections.
2.2	MATERIALS	<pre>.1 Structural steel: to [[CSA-G40.20/G40.21] [] Grade [as indicated] [300W]] [and/or] [CAN/CSA-S136]. .2 Anchor bolts: to [CSA-G40.20/G40.21, Grade 300W]</pre>
		[ASTM A 36/A 36M]. .3 High strength anchor bolts: to ASTM A 193/A 193M, Grade
		L]. .4 Bolts, nuts, and washers: to [ASTM A 307] [ASTM A 325]
		[ASTM A 325M] [ASTM A 490/A 490M]. .5 Welding materials: to [CSA W48 Series] [CSA W59] and
		.6 Shop paint primer: to [CISC/CPMA 2-75] solvent
		.7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of [600] []
		.8 Shear studs: to CSA W59, Appendix H.
		.9 [].
2.3	FABRICATION	.1 Fabricate structural steel in accordance with [CAN/CSA- S16] [CAN/CSA-S136] [and in accordance with [approved] [reviewed] shop drawings].
		.2 [Install shear studs in accordance with CSA W59] [].
		.3 Continuously seal members by [continuous welds] [intermittent welds and plastic filler] [where indicated]. [Grind smooth] [].
		.4 [Provide holes in [top] [bottom] flanges] []. [Weld threaded studs to [top] [bottom] flanges for attachment of wood nailers] [].
2.4	SHOP PAINTING	.1 Clean, prepare surfaces and shop prime structural steel in accordance with [CAN/CSA-S16] [CAN/CSA-S136] [MPI [INT 5.1] [EXT 5.1]] [except where members to be encased in concrete].
		.2 Clean members remove loose mill scale, rust, oil, dirt, and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
		<pre>.3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of [] to [] mils, except: .1 Surfaces to be encased in concrete.</pre>



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Specification	<ul> <li>.2 Surfaces to receive field installed stud shear connections.</li> <li>.3 Surfaces and edges to be field welded.</li> <li>.4 Faying surfaces of slip-critical connections.</li> <li>.5 Below grade surfaces in contact with soil.</li> </ul>
	<ul> <li>.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.</li> <li>.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.</li> <li>.6 Strip paint from bolts, nuts, sharp edges, and corners before prime coat is dry.</li> </ul>
PART 3 - EXECUTION	
3.1 APPLICATION	.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
3.2 <u>GENERAL</u>	.1 Structural steel work: in accordance with [CAN/CSA-S16] [CAN/CSA-S136].
	.2 Welding: in accordance with CSA W59.
	.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.
3.3 CONNECTION TO EXISTING WORK	.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to [Departmental Representative] [Engineer] [Consultant] [] for direction before commencing fabrication.
3.4 <u>MARKING</u>	.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
	.2 Match marking: shop mark [bearing assemblies and splices] [] for fit and match.
3.5 ERECTION	.1 Erect structural steel, as indicated and in accordance with [CAN/CSA-S16] [CAN/CSA-S136] [and in accordance with [approved] [reviewed] erection drawings].
	.2 Field cutting or altering structural members: to approval of [Departmental Representative] [Engineer] [Consultant] [].
	.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.



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	• 4	Continuously seal members by continuous indicated. Grind smooth.	welds where
3.6 <u>FIELD QUALITY</u> <u>CONTROL</u>	.1	Inspection and testing of [materials and [] will be carried out by testing designated by [Departmental Representati [Consultant] [].	Workmanship] laboratory .ve] [Engineer]
	.2	Provide safe access and working areas for site, as required by testing agency and by [Departmental Representative] [Engine [Consultant] [].	or testing on as authorized eer]
	.3	Submit test reports to [Departmental Rep [Engineer] [Consultant] [] within of completion of inspection.	presentative] [] weeks
	.4	[Departmental Representative] [Engineer] [Owner] [] will pay costs of tests in Section [01 29 83 - Payment Procedure Laboratory Services] [].	[Consultant] as specified as for Testing
	.5	Test shear studs in accordance with CSA	W59.
3.7 FIELD PAINTING	.1	<pre>Paint in accordance with Section [09 91 Painting] []1 Touch up damaged surfaces and surfa shop coat with primer to NACE No.3/ except as specified otherwise. Appl accordance: MPI Architectural Paint Specification Manual.</pre>	23 - Interior ces without SSPC-SP-6 y in ing
3.8 CLEANING	.1	Clean in accordance with Section [01 74 [].	11 - Cleaning]
	.2	Waste Management: separate waste materia [and] [recycling] [] in accordance [01 74 21 - Construction/Demolition Wast	als for [reuse] e with Section ce Management



and Disposal] [01 35 21 - LEED Requirements] [\_\_\_\_].

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METAL FABRICATIONS

PART 1 - GENERAL		
1.1 RELATED REQUIREMENTS	.1	Related Works Section 05 12 23 - Structural Steel For Buildings
1.2 REFERENCES	.1	<ul> <li>Canadian General Standards Board (CGSB)</li> <li>.1 CAN/CGSB-1.40- [97], Anti-corrosive Structural Steel Alkyd Primer.</li> <li>.2 CAN/CGSB-1.181- [92], Ready-Mixed, Organic Zinc- Rich Coating.</li> </ul>
	.2	<ul> <li>Canadian Standards Association (CSA International)</li> <li>CAN/CSA-G40.20/G40.21- [98], General Requirements for Rolled or Welded Structural Quality Steel.</li> <li>CAN/CSA-G164-[M92(R1998)], Hot Dip Galvanizing of Irregularly Shaped Articles.</li> <li>CAN/CSA-S16.1- [01], Limit States Design of Steel Structures.</li> <li>CSA W48- [01], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).</li> <li>CSA W59-[1989(R2001)], Welded Steel Construction (Metal Arc Welding) (Imperial Version).</li> </ul>
	.3	<pre>The Environmental Choice Program .1 CCD-047a- [98], Paints, Surface Coatings2 CCD-048- [98], Surface Coatings - Recycled Water- borne.</pre>
<u>1.3 SUBMITTALS</u>	.1	<pre>Product Data: .1 Submit manufacturer's printed product literature, specifications, and data sheet in accordance with Section [01 33 00 - Submittal Procedures] []. .2 Submit [two] [] copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section [01 33 00 - Submittal Procedures] []. Indicate VOC's: .1 For finishes, coatings, primers, and paints. .2 Shop Drawings .1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures] []. .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.</pre>
1.4 QUALITY ASSURANCE	.1	Test Reports: Certified test reports showing compliance with specified performance characteristics and physical

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified



properties.

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		performance characteristics and criteria and physical requirements.
	.3	Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section [].
1.5 DELIVERY, STORAGE, AND HANDLING	.1	Packing, Shipping, Handling and Unloading: .1 Deliver, store, handle and protect materials in accordance with Section [01 61 00 - Common Product
	.2	<ul> <li>Storage and Protection:</li> <li>.1 Cover exposed stainless-steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.</li> <li>.2 Leave protective covering in place until final cleaning of building. Provide instructions for</li> </ul>
		removal of protective covering.
1.6 WASTE MANAGEMENT AND DISPOSAL	.1	Separate and recycle waste materials in accordance with Section [01 74 19 - Construction/Demolition Waste Management and Disposal] [].
	.2	Remove from site and dispose of packaging materials at appropriate recycling facilities.
	.3	Collect and separate for disposal [paper] [plastic] [polystyrene] [corrugated cardboard] [] packaging material [in appropriate on-site] [] for recycling in accordance with Waste Management Plan.
	.4	Divert unused metal materials from landfill to metal recycling facility approved by [Departmental Representative] [Consultant] [].
PART 2 - PRODUCTS		
2.1 <u>MATERIALS</u>	.1	Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade [300W] [350W] [].
	.2	Steel pipe: to ASTM A 53/A 53M [standard weight] [extra strong] [double extra strong], [black] [galvanized] [] finish.
	.3	Welding materials: to [CSA W59] [].
	.4	Welding electrodes: to CSA W48 Series.
	.5	Bolts and anchor bolts: to ASTM A 307.
	.6	Aluminum sheet: [proprietary utility sheet] [plain] [embossed] [] pattern, [] mm minimum
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			thickness, finish [], colour [	].
		.7	Stainless steel tubing: to ASTM A 269, T [Commercial grade] [Seamless welded with finish] []. Grout: non-shrink, non flowable, 15 MPa at 24 hours.	ype [302] AISI No. [4] -metallic,
2.2	FABRICATION	.1	Fabricate work square, true, straight, a required size, with joints closely fitte secured.	nd accurate to d and properly
		.2	Use self-tapping shake-proof [flat] [rou [] headed screws on items requirin screws or as indicated.	nd] [oval] g assembly by
		.3	Where possible, fit and shop assemble wo erection.	rk, ready for
		.4	Ensure exposed welds are continuous for joint. File or grind exposed welds smoot	length of each h and flush.
2.3	FINISHES	.1	Galvanizing: hot dipped galvanizing with [600] [] g/m <sup>2</sup> to CAN/CSA-G164.	zinc coating
		.2	Chromium plating: chrome on steel with p of [0.009] [] mm thickness of copp [] mm thickness of nickel and [0.0 mm thickness of chromium.	lating sequence er [0.010] 025] []
		.3	Shop coat primer: to CAN/CGSB-1.40.	
		.4	Zinc primer: zinc rich, ready mix to CAN	/CGSB-1.181.
<u>2.4</u> I	SOLATION COATING	.1	<pre>Isolate aluminum from following componen bituminous paint: .1 Dissimilar metals except stainless white bronze of small area. .2 Concrete, mortar, and masonry. .3 Wood.</pre>	ts, by means of steel, zinc, or
2.5	SHOP PAINTING	.1	Apply one shop coat of primer to metal i exception of galvanized or concrete enca	tems, with sed items.
		.2	Use primer unadulterated, as prepared by Paint on dry surfaces, free from rust, s Do not paint when temperature is lower t C.	manufacturer. cale, grease. han 7 degrees
		.3	Clean surfaces to be field welded; do no	t paint.
2.6	ANGLE LINTELS	.1	Steel angles: [galvanized] [prime painte sizes indicated for openings. Provide [1 minimum bearing at ends.	d] [], 50] [] mm



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	.2	Weld or bolt back-to-back angles to profiles as indicated.
	.3	Finish: [shop painted] [].
2.7 <u>PIPE RAILINGS</u>	.1	[Steel] [] pipe: [] mm nominal outside diameter, formed to shapes and sizes as indicated.
	.2	Galvanize [exterior] [interior] [] pipe railings after fabrication. [Shop coat prime interior railings after fabrication] [].
2.8 <u>CORNER GUARDS</u>	.1	[Steel] [] angle: [] x [] x [] mm thick x [] mm high, with [3] [] anchors each guard.
	.2	[Galvanized finish] [] for exterior, prime paint for interior.
2.9 <u>ACCESS LADDERS</u>	.1	Stringers: [] x [] x [] mm thick, [steel] [angle] [].
	.2	[Steel] [] Rungs: [[20] mm diameter] [[] x [] x [] mm thick, [angle]], welded to stringers at [] mm on centre.
	.3	Brackets: sizes and shapes as indicated, weld to stringers at [] mm on centre, complete with fixing anchors. [Galvanize finish for exterior, prime paint for interior] [].
	.4	[Galvanize exterior ladders after fabrication] []
2.10 TRENCH COVERS AND FRAMES	.1	[Steel] [] fabricate from [6] [] mm thick [raised pattern] [] plate set in L [55 x 55 x 6] [] frame. Include anchors at [1200] [] mm on centre for embedding in concrete. Supply trench covers in [1200] [] mm removable lengths.
	.2	Finish: [galvanized] [prime coat painted] [].
2.11 <u>HANNEL FRAMES</u>	.1	Fabricate frames from [steel] [], sizes of channel and opening as indicated.
	.2	Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
	.3	Weld [] x [] x [] mm thick [steel] [] strap anchors to channel jamb frame at [] mm on centre. Finish: [galvanized] [prime coat painted] [].

PART 3 - EXECUTION



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3.1 ERECTION	.1	Do welding work in accordance with CSA W59 unless specified otherwise.
	.2	Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
	.3	Provide suitable means of anchorage acceptable to [Departmental Representative] [Consultant] [] such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
	.4	Exposed fastening devices to match finish and be compatible with material through which they pass.
	.5	Provide components for building by other sections in accordance with shop drawings and schedule.
	.6	Make field connections with bolts to CAN/CSA-S16.1, or weld.
	.7	Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
	.8	Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with
	.9	primer. Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
3.2 PIPE RAILINGS		NOT USED
3.3 CORNER GUARDS	.1	Install corner guards in locations as indicated.
3.4 ACCESS LADDERS	.1	Install access ladders in locations as indicated.
	.2	Erect ladders [] mm clear of wall on bracket supports.
3.5 TRENCH COVERS	.1	Install trench covers in locations as indicated
3.6 CHANNEL FRAMES	.1	Install steel channel frames to openings as indicated.
3.7 <u>CLEANING</u>	.1	Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.



#### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 07 21 16 Blanket Insulation: Insulation for wood framed cavities.
- .3 Section 07 26 00 Vapour Retarders: Vapour retarder installation in wood framed assemblies.
- .4 Section 09 21 16 Gypsum Board Assemblies.

#### 1.02 REFERENCE STANDARDS

- .1 Canadian Wood Council
  - .1 Wood Design Manual [2010 (R2014)] Edition
  - .2 Engineering Guide for Wood Frame Construction [2014]
- .5 CSA Group (CSA)
  - .1 <u>CSA B111-[1974 (R2003)]</u>, Wire Nails, Spikes and Staples.
  - .2 <u>CSA 086-[14]</u> Engineered Design in Wood
  - .3 <u>CSA 0121-[08(R2013)]</u>, Douglas Fir Plywood.
  - .4 <u>CSA 0141-[05(R2014)]</u>, Softwood Lumber.
  - .5 <u>CSA 0151-[09(R2014)]</u>, Canadian Softwood Plywood.
  - .6 <u>CSA 0153-[13]</u>, Poplar Plywood.
  - .7 <u>CSA 0325-[07(R2012)]</u>, Construction Sheathing.
- .7 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber [2010].
- .8 Ontario Building Code (OBC) 2012

#### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for[wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit manufacturer's installation instructions.
- .3 Shop Drawings:
  - .1 For structural applications submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
  - .2 Include on drawings:
    - .1 Design data in accordance with <u>CAN/CSA-086</u> and CWC Engineering Guide for Wood Frame Construction.

- .2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.
- .3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.
- .4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

# 1.05 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground or indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
  - .3 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.
  - .5 Store and protect from[nicks, scratches, and blemishes.
  - .6 Replace defective or damaged materials with new.

# 2 PRODUCTS

# 2.01 STRUCTURAL FRAMING

- .1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
  - .1 <u>CSA 0141</u>.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Structural Composite Lumber (SCL) in accordance with <u>ASTM D 5456</u>, for following uses:
  - .1 Laminated veneer lumber (LVL): beams as indicated.

# 2.03 FURRING AND BLOCKING

- .1 Furring, blocking, nailing strips, grounds, rough bucks:
  - .1 Board sizes: "Standard" or better grade.
  - .3 Dimension sizes: "Standard" light framing or better grade.
  - .4 Post and timbers sizes: "Standard" or better grade.

#### 2.06 ACCESSORIES

- .1 General purpose adhesive: to <u>CSA 0112.9</u>.
- .2 Nails, spikes and staples: to <u>ASTM F 1667</u>.
- .3 Bolts: [12.5] mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, [explosive actuated fastening devices], recommended for purpose by manufacturer.
- .5 Joist hangers, connectors and fasteners: in accordance with accepted shop drawings, minimum 1 mm thick sheet steel, galvanized to minimum ZF001 coating designation.
- .6 Fastener Finishes:
  - .1 Plated finish: use cadmium plated fasteners for interior work.
- .7 Sill Plate Gasket: Closed cell polyethylene foam gasket in width to match sill plate width, 6 mm thick.

## 3 EXECUTION

# 3.01 EXAMINATION

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

# 3.02 SYSTEMS INTEGRATION

- .1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets where encountered in the renovation work at exterior envelope conditions.
- .2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.
- .3 Install sill plate gasket in continuous lengths between concrete surfaces and wood framing.

#### 3.03 FRAMING INSTALLATION

- .1 Install engineered framing and plant fabricated structural wood components, including all hangers, connectors and fasteners, in accordance with accepted shop drawings and manufacturers' instructions.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.

- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .7 Countersink bolts where necessary to provide clearance for other work.
- .8 Install specified panel product for each application.
- .9 Install plywood wall sheathing in accordance with manufacturer's printed instructions [and accepted shop drawings.
- .10 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

## 3.05 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support wall and ceiling mounted work as required.

#### 3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning. .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

#### 3.07 WASTE MANAGEMENT

- .1 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.
- .2 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

#### 3.08 PROTECTION

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

#### END OF SECTION

#### 1 GENERAL

# 1.01 SYSTEMS DESCRIPTION

.1 This Section specifies fire stop systems and/or fire stop materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.

# .2 This Section includes requirements for:

- .1 Through-penetration fire stops:
  - .1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing or structural components to pass completely through a fire separation or fire-resistance rated assembly.
- .2 Membrane penetration fire stops:
  - .1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g.: panels, electric boxes, devices) or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.
- .3 Blank opening fire stops:
  - .1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.
- .4 Construction joint fire stops:
  - .1 For locations where adjacent fire separations or components of fire separations meet. These locations include: ceiling/wall and roof/wall joints, wall/wall joints at corners or in the same plane, wall/floor joints, floor/floor joints and ceiling/ceiling joints, and perimeters of rated door frames.
  - .2 Includes fire stops for seismic joints, vertical control joints, expansion joints, and joints which occur at the tops and bottoms of fire separation walls.
  - .3 Includes fire stops for head of wall to non-rated roof or floor assemblies.
- .3 This Section includes fire stopping work for entire Project including.

# 1.02 RELATED REQUIREMENTS

- .1 Section 04 22 00 Concrete Unit Masonry
- .2 Section 07 92 00 Joint Sealants
- .3 Section 09 21 16 Gypsum Board Assemblies
- .4 Section 09 91 23 Interior Painting

## 1.03 REFERENCE STANDARDS

- .1 Underwriter's Laboratories of Canada (ULC)
  - .1 <u>CAN/ULC-S115-[11(R2016)]</u>, Standard Method of Fire Tests of Firestop Systems.
  - .2 ULC Qualified Firestop Contractor Program.

#### 1.04 DEFINITIONS

- .1 Fire Blocking: materials, components or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.
- .2 Fire Stop: a material, component or system, and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.
- .3 Fire Stop System: the combination of specific materials and/or devices required with the penetrating item(s), the assembly and the opening to assemble the fire stop.
- .4 Intumescent: materials that expand with heat to prevent fire spread through fire separations.
- .5 Listed Fire Stop System: a specific field erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH and/or L rating when tested in a fire-resistance rated assembly in accordance with <u>CAN/ULC-S115</u> Standard Method of Fire Tests of Firestop Systems.
  - .1 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.
  - .2 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.
  - .3 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resists the force of a hose stream without developing openings for a prescribed period.
  - .4 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passed the hose stream test for a prescribed period.
  - .5 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test of <u>CAN/ULC-S115</u>.
- .6 Multi-penetration: two or more service penetrations through an opening in the fire separation.
- .7 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

- .8 Single-penetration: single service penetration through an opening in the fire separation.
- .9 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

# 1.05 PRE-INSTALLATION MEETINGS

- .1 Convene pre-installation meeting two weeks prior to beginning work of this Section, with Contractor's representative Consultant to:
  - .1 Verify Project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Coordinate with other building trades.
  - .4 Review system design listings, manufacturer's installation instructions and warranty requirements.
- .2 Convene pre-installation meetings with other trades to review:
  - .1 Installation procedures and precautions.
  - .2 Location, scheduling and sequencing of other work around fire stops that can affect the outcome of the installation.
  - .3 Requirements for annular opening sizes.
  - .4 Requirements and preparations for wall/floor single and multi-penetrations.
  - .5 Requirements for construction and perimeter joints.
  - .6 Mock-up requirements.
- .3 Submit copies of applicable listed fire stop system details to each trade for opening preparation. Include installation details required for the listed system.
- .4 Meeting minutes: Contractor to take minutes of pre-installation meetings and distribute to Consultant and each affected trades.

#### 1.06 SEQUENCING

- .1 Proceed with installation only when submittals have been reviewed by Consultant.
- .2 Fire stops located in floor assemblies: install before interior partition erections.
- .3 Metal deck bonding: unless noted otherwise on system design listing and manufacturer's installation instructions, fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Pipe and duct insulation: certified fire stop system component.
  - .1 Ensure pipe and duct insulation installation precedes fire stopping.

## 1.07 ACTION AND INFORMATIONAL SUBMITTALS

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

# .2 Qualification Statement

- .1 Submit contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1 - QUALITY ASSURANCE, within 10 working days after award of contract and before starting Work.
- .3 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet. Submit complete product data for each individual component and include:
    - .1 Product name and product number.
    - .2 Product characteristics and performance criteria.
    - .3 Physical size, finish and limitations.
    - .4 Technical data on out-gassing, off-gassing and age testing.
    - .5 Curing time.
    - .6 Chemical compatibility to other construction materials.
    - .7 Shelf life.
    - .8 Life expectancy.
    - .9 Temperature range for installation.
    - .10 Humidity range for installation.
    - .11 Sound attenuation STC-Rating.
  - .2 Manufacture Product Certification:
    - .1 Submit certification by the manufacturer that products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC's) and are non-toxic to building occupants.
    - .2 Submit test reports showing compliance to <u>ASTM E 595</u>.
  - .3 For each individual component, Submit copies of WHMIS Safety Data Sheets (SDS)
  - .4 Submit a comprehensive list of all products and components included in submittal.
- .4 Shop Drawings:

.4

- .1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings and method of installation.
- .2 Construction details to accurately reflect actual job conditions for each product and assembly.
- .3 Submit details for materials and prefabricated devices.
  - Submit electronic copy of shop drawings and include:
    - .1 Title page, labelled "Fire and Smoke Stop System Listings". Include project name, date and the names of the installation company and the manufacturer of proposed products.
    - .2 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.
    - .3 Location of penetrations:
      - .1 Drawings showing the location of each penetration with a unique

penetration identification number.

- .2 Schedules listing each penetration with a unique identification number, their associated listing number, organized by floor, wall and ceiling area and indicating each room number.
- .5 System Design Listings:
  - .1 Submit <u>CAN/ULC-S115</u> design listings for each listed fire stop system and each application identified.
  - .2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.
- .6 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
- .6 Engineering Judgments:
  - .1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.
  - .2 Submit an Engineering Judgment (EJ) from the system manufacturer if there are no listed systems available from other manufacturers.
  - .3 Prepare and submit an EJ in accordance with best practices established in the following documents:
    - .1 IFC Guidelines for Evaluating Engineering Judgments.
    - .2 IFC Guidelines for Evaluating Engineering Judgments Perimeter Fire Barrier Systems.
  - .4 For each EJ submitted, include:
    - .1 Project name, number and location.
    - .2 A description of the proposed system with detailed drawing.
    - .3 Installation instructions.
    - .4 Complete descriptions of critical elements for the fire stop configuration.
    - .5 Copies of all referenced system design listings on which the EJ is based on.
    - .6 EJ issuer name and contact information.
    - .7 Date of issue of EJ with authorization signature of issuer.
    - .8 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system were it to be subjected to the appropriate standard fire test method for the required fire rating duration.
- .8 Once the EJ has been reviewed, submit the EJ to the authority having jurisdiction for final approval.
- .9 EJ shall be issued only by fire stop manufacturer's qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection

Engineer or an independent testing agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

- .10 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the Engineering Judgment is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g.: <u>ASTM E 2032</u>) may also be used as further support data.
- .11 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.
- .12 EJ shall be limited to the specific conditions and configurations upon which EJ was rendered and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.
- .13 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances.
- .14 Manufacturer's Field Reports: submit manufacturer's written reports within [3] days of review, verifying compliance of Work, as described in PART 3 FIELD QUALITY CONTROL.

# 1.08 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 0178 00 Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Include:
  - .1 WHMIS Safety Data Sheets (SDS).
  - .2 Product data and manufacturer's installation and maintenance instructions for each product/system used on this project.
  - .3 Approved system design listings and Engineering Judgments.
  - .4 Matrix schedule listing all system design listings and Engineering Judgments with a description of their penetration or joint type.
  - .5 Certifications:
    - .1 Proof of training for each worker that performed installation on the Project.
    - .2 Proof of company as a FCIA Member in Good Standing.
    - .3 Certification of company as a ULC Qualified [or FM 4991 Approved] Firestop Contractor, including the Designated Responsible Individual (DRI) certificate.
    - .4 Accreditation of third-party inspection firm.
  - .6 Manufacturer's field reports.
  - .7 Warranty information on fire stop installations.
  - .8 Life expectancy of each product installed as part of Project. For each system, list the

installation date of products and the expected expiration date (month/year).

- .3 Record Documentation:
  - .1 Maintain a daily log of all activities on site during the course of construction. Submit a copy of all daily logs after completion of fire stopping work.
  - .2 As-built Drawings:
    - .1 Submit marked-up set of drawings to provide referencing system identifying the location of each fire stop.
    - .2 Identify each penetration type fire stop with their penetration identification number.
    - .3 Provide detailed drawings of system design listings for each type of fire stop (i.e.: through-penetration, membrane penetration, blank opening, construction joint, building perimeter).
  - .3 Fire Stop Schedules:
    - .1 Submit complete fire stop schedules for floors, walls and ceilings.
    - .2 Indicate all penetration fire stops and joint fire stops through each reference wall, floor and ceiling in the schedules.
    - .3 Cross-reference fire stop schedules with as-built drawings and indicate design listing numbers associated to each penetration fire stop and joint fire stop.

#### 1.09 QUALITY ASSURANCE

- .1 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:
  - .1 FCIA Firestop Manual of Practice (MOP).
- .2 Qualifications:
  - .1 Certified Firestop Contractor: company certified with:
    - .1 ULC Qualified Firestop Contractor Program. Submit signed copy of ULC Qualified Firestop Contractor Program certificate.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, shelf life expiry date.
- .2 Storage and Protection:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Replace defective, expired or damaged materials with new.
- .3 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.
- .4 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

# 1.11 FIELD CONDITIONS

- .1 Ambient Conditions:
  - .1 Install fire stops when ambient and substrate temperatures are within the limits prescribed by the manufacturer and when the substrate is dry and without risk of condensation.
  - .2 Maintain manufacturer's recommended ambient and substrate temperatures for 48 hours before and 72 hours after installation.
- .2 Ventilate fire stops in accordance with manufacturers' instructions by natural means or where this is inadequate using forced air circulation.

# 1.12 WARRANTY

- .1 For the Work of this Section 07 84 00 Fire Stopping, the 12 month warranty period is extended to 24 months.
- .2 Manufacturers shall warrant work of this section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies, which become apparent within warranty period at no expense.
- .3 Contractor shall warrant workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

# 2 PRODUCTS

# 2.01 MANUFACTURERS

- .1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without written authorization from Consultant.
- .2 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application, provide a listed system from an alternative manufacturer to avoid providing an Engineering Judgment.

# 2.02 DESIGN/PERFORMANCE CRITERIA

.1 Fire stop and smoke stop systems and systems providing a barrier to smoke spread consisting
of a material or combination of materials installed to maintain the integrity of the fire resistance rating of a fire separation in accordance with the requirements of OBC 2012.

- .2 Non-rated fire separations: provide L-Rated smoke protection fire stop system for application on both sides of separation.
- .3 Dynamic joints: where required, fire and smoke stop systems to be designed to accommodate a defined amount of movement to account for expansion or contraction in construction joints and mechanical piping, for movement in structural elements and to accommodate for movement and sound and vibration control in mechanical installations.
- .4 Insulated pipes and ducts: listed fire stop system designed and tested with actual insulation materials penetrating the fire separation, as indicated on the system design listing.
- .5 Use in wet areas: water based products are unacceptable in wet areas or areas that may be subject to occasional water exposure or flooding during and after construction.
- .6 Architectural considerations: when exposed to view, fire stop system to consider architectural finish, potential traffic, and exposure to moisture and heat.

# 2.04 MATERIALS

- .1 Fire stop and smoke stop systems: in accordance with CAN-ULC-S115.
  - .1 Asbestos-free materials and systems capable of maintaining effective barrier against the passage of flame, smoke and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.
  - .2 Fire stop system rating: to match fire resistance rating of fire separation as indicated on drawings.
  - .3 Service penetration assemblies and fire stop components: certified by test laboratory to <u>CAN/ULC-S115</u>.
- .2 Fire and smoke stop systems at openings intended for re-entry such as cables: provide elastomeric seal or non-shrink foam cement mortar.
- .3 Fire and smoke stop systems at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: provide elastomeric protection.
- .4 Fire and smoke stops behind and around mechanical and electrical boxes within wall, floor and ceiling assemblies: provide elastomeric seal.
- .5 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .6 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .7 Packing/damming materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to

authorities having jurisdiction.

- .8 Fire stop insulation: pre-formed, semi rigid, non-combustible mineral wool.
- .9 Junction box / outlet sealing putty: intumescent putty, pre-formed in pads.
- .10 Sealants: good adhesion without use of primer, high visibility safety colours.
  - .1 Flame spread rating: maximum [25].
  - .2 Smoke development classification: maximum [50].
  - .3 For vertical joints: non-sagging.
  - .4 For horizontal joints: single component, self-levelling.

# 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

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

#### 3.02 EXAMINATION

- .1 Verify substrate conditions are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.
- .2 Verify each opening/annular space to ensure it does not exceed the maximum and minimum dimensions indicated on the approved system design listing.
- .3 Verify that all joints, service penetrating elements and supporting devices/hangers have been properly installed as indicated on approved system design listings. All temporary lines and markings have been removed to meet the approved system design listings.
- .4 Verify that the proposed fire stop system is composed of components that are compatible with each other, the substrates forming the openings, and the items, if any, penetrating the fire stop under conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and field experience.
- .5 Pipe and duct insulation: confirm that the proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.
- .6 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.
- .7 Ensure areas that are to be fire stopped are accessible for proper application and conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.

- .8 Report in writing to Consultant any defective surfaces or conditions affecting the fire stop system installation, immediately and prior to commencing any installations.
- .9 Proceed only once defected surfaces or conditions have been corrected.
- .10 Beginning of installation means acceptance of site conditions.

### 3.03 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
  - .1 Ensure that substrates and surfaces are clean, dry and frost free.
  - .2 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
- .2 Prepare surfaces in contact with fire stop and smoke stop 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.
- .5 Protect adjacent work areas and finish surfaces from damage during product installation.
- .6 Ensure multi-penetration openings have been framed and boarded out, all around the annular opening as indicated in the system design listing prior to prepping the opening.

# 3.04 INSTALLATION

- .1 Install fire stop and smoke stop materials and components in accordance with manufacturer's certified tested system listing.
- .2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.
- .3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke stop systems
- .4 Protect holes or gaps made by through penetrations, poke through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are maintained.
- .5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing per manufacturer's instructions.

- .6 Tool or trowel exposed surfaces to neat finish.
- .7 Remove excess compound promptly as work progresses and upon completion.
- .8 Protect gaps around recessed components (e.g.: panels, electrical boxes, outlets) with sealing putty in accordance with manufacturer's instructions.
- .9 Do not use damaged or expired material.
- .10 Joint Fire Stops:
  - .1 For sealant applications, install joint fillers to support fire stop materials during application. Position joint fillers to ensure fire stop material cross-sectional shape and thickness relative to the joint width allows for optimum sealant movement, while developing the required fire-resistance rating.
  - .2 Install fire stops using techniques recommended by the manufacturer:
    - .1 Fully wetting joint substrates to optimize adhesion.
    - .2 Completely filling recesses provided for each joint configuration.
    - .3 Providing uniform, cross-sectional shapes and thickness relative to joint width that optimize movement capability.
    - .4 Tooling non-sag fire stop materials immediately after their application and prior to the time skinning begins. Form smooth, uniform beads of configuration indicated or required to:
      - .1 Provide required fire-resistance rating.
      - .2 Eliminate air pockets
      - .3 Ensure contact and adhesion with sides of joint..
  - .3 Joint Systems and Perimeter Fire Containment Systems:
    - .1 For systems with dynamic joints, ensure movement capabilities of the installation meet or exceed the movement expectations of the system design listing and manufacturer's installation instructions.

#### 3.05 REPAIRS AND MODIFICATIONS

- .1 Identify damaged or re-entered seals requiring repair or modification.
- .2 Remove loose or damaged materials. If penetrating items are to be added, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.
- .3 Ensure that surfaces to be sealed are clean and dry.
- .4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.
- .5 Repair all damage resulting from fire stop destructive testing.

### 3.06 FIELD QUALITY CONTROL

.1 Review: notify Consultant when ready for review and prior to concealing or enclosing fire stop

materials and service penetration assemblies.

#### 3.09 FIRE STOPPING LOCATIONS

- .1 Provide fire stop and L-Rated smoke-resistant fire stop systems at:
  - .1 Penetrations through fire-resistance and smoke-resistance rated masonry, concrete, and gypsum board partitions and walls.
  - .2 Penetrations through fire-resistance rated floor slabs/systems, ceilings and roof.
  - .3 Edge of floor slabs at curtain wall and precast concrete panels.
  - .4 Edge of fire-resistant floor or roof assemblies and exterior wall assemblies.
  - .5 Joints at top and bottom of fire-resistance rated masonry and gypsum board partitions. Joints to allow for independent movement.
  - .6 Joints at top and bottom of fire-resistance rated walls where they meet non-rated fire separation assemblies.
  - .7 Intersection of fire-resistance rated masonry, concrete and gypsum board partitions.
  - .8 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
  - .9 Expansion joints in fire-resistance rated floors, walls, ceilings and roof assemblies.
  - .10 Openings and sleeves installed for future use through fire separations.
  - .11 Around mechanical and electrical assemblies/devices penetrating fire separations.
  - .12 Mechanical and electrical recessed boxes in walls and partitions.
  - .13 Rigid ducts: fire stopping to consist of bead of fire stop material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
  - .14 Joints at the perimeter of fire rated door frames.
- .2 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on drawings and and details.

#### 3.10 CLEANING

- .1 Proceed in accordance with Section [0174 00 Cleaning].
- .2 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.
- .3 Protect fire stops during and after curing period from contact with contaminating substances. Repair all damage.
- .4 Remove temporary dams after initial set of fire stop and smoke stop materials.

#### END OF SECTION

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 07 84 00 Fire Stopping
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 91 23 Interior Painting

### 1.02 REFERENCE STANDARDS

- .3 Canadian General Standards Board (CGSB)
  - .1 <u>CGSB 19-GP-5M-[1984]</u>, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2 <u>CAN/CGSB-19.13-[M87]</u>, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3 <u>CGSB 19-GP-14M-[1984]</u>, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4 <u>CAN/CGSB-19.17-[M90]</u>, One-Component Acrylic Emulsion Base Sealing Compound.
  - .5 <u>CAN/CGSB-19.24-[M90]</u>, Multi-component, Chemical Curing Sealing Compound.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS) .1 Safety Data Sheets (SDS).

#### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's product to describe:
    - .1 Caulking compound.
    - .2 Primers.
    - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Samples:
  - .1 Submit samples of each type of material and colour if and when requested for review.
  - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

# 1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 0178 00 Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

### 1.05 DELIVERY, STORAGE AND HANDLING

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

# 1.06 SITE CONDITIONS

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
  - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

# 2 PRODUCTS

### 2.01 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

### 2.02 SEALANT MATERIAL DESIGNATIONS

- .1 Silicones one part: to <u>CAN/CGSB-19.13</u>.
- .2 Acrylic latex one part: to <u>CAN/CGSB-19.17</u>.
- .3 Acoustical sealant: to <u>ASTM C 919</u>.
- .4 Preformed compressible and non-compressible back-up materials:
  - Polyethylene, urethane, neoprene or vinyl foam:
    - .1 Extruded closed cell foam backer rod.
    - .2 Size: oversize 30%.

### 2.03 SEALANT SELECTION

.1

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): sealant type: Tremco Dymeric 240, conforming to CAN 19.24
- .2 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: Tremco 100 Latex
- .3 Exposed interior control joints in drywall: sealant type: Tremco Acoustical Sealant to ASTM D-217

#### 2.04 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

### 3 EXECUTION

#### 3.01 EXAMINATION

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

### 3.02 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

#### 3.03 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

#### 3.04 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### 3.05 MIXING

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

# 3.06 APPLICATION

.1 Sealant:

- .1 Apply sealant in accordance with manufacturer's written instructions.
- .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
- .3 Apply sealant in continuous beads.
- .4 Apply sealant using gun with proper size nozzle.
- .5 Use sufficient pressure to fill voids and joints solid.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.

### 3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [0174 00 Cleaning].
  - .1 Leave Work area clean at end of each day.
  - .2 Clean adjacent surfaces immediately.
  - .3 Remove excess and droppings, using recommended cleaners as work progresses.
  - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

# 3.08 PROTECTION

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

# END OF SECTION

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 04 05 00 Common Work Results for Masonry
- .2 Section 04 22 00 Concrete Unit Masonry
- .3 Section 05 50 00 Metal Fabrications
- .4 Section 07 84 00 Fire Stopping
- .5 Section 08 71 00 Door Hardware
- .6 09 21 16 Gypsum Board Assemblies
- .7 09 91 23 Interior Painting
- .8 Division 23 Mechanical (Door louvres) Div 26 Electrical and Div 28 Fire Alarm System

### 1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
  - .1 **CSA-G40.20-[04] /G40.21-[04]**, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 <u>CSA W59-[03]</u>, Welded Steel Construction (Metal Arc Welding).
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, [2000].
  - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, [1990].
- .3 National Fire Protection Association (NFPA)
  - .1 <u>NFPA 80-[99]</u>, Standard for Fire Doors and Fire Windows.
  - .2 <u>NFPA 252-[03]</u>, Standard Methods of Fire Tests of Door Assemblies.
- .4 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN4-S104-[M80], Standard Method for Fire Tests of Door Assemblies.
  - .2 CAN4-S105-[M85], Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

# 1.03 SYSTEM DESCRIPTION

- .1 Design Requirements:
  - .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with **CAN4-S104** for ratings specified or

indicated.

- .2 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with **CAN4-S104** and listed by nationally recognized agency having factory inspection services.
- .3 Installed door and frame assembly: Conform to NFPA 80 for fire rated class indicated or specified.

# 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 Submittal Procedures.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, louvred, arrangement of hardware and fire rating and finishes.
  - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating and finishes.
  - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
  - .5 Submit test and engineering data, and installation instructions.
- .4 Provide samples in accordance with Section 01 33 00 Submittal Procedures.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements.
- .2 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.
- .3 Store in vertical position, spaced wit blocking to permit air circulation between components.
- .4 Store materials on planks, out of water and covered to protect from damage.
- .5 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

# 2 PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURER'S

.1 Fleming Door Products, Steldor, Daley, Ambico, Macotta, Daybar Industries Ltd., Metal Door Trillium Lakelands District School Board WASHROOM RENEWALS SUMMER 2021 Ltd., or approved alternate.

### 2.01 MATERIALS

- .1 Sheet steel: Galvanized steel sheet: to <u>ASTM A 653M</u>, [ZF75], minimum base steel thickness in accordance with CSDMA Table 1 Thickness for Component Parts. Commercial grade (CS), Type B, coating designation 40A(120ZF) for interior doors and frames.
- .3 Reinforcement [channel]: to <u>CSA G40.20/G40.21</u>, Type 44W, coating designation to <u>ASTM A 653M</u>, [ZF75].

### 2.02 DOOR CORE MATERIALS

- .1 Honeycomb construction:
  - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m<sup>3</sup> minimum sanded to required thickness.

### 2.03 ADHESIVES

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

# 2.04 PRIMER

.1 Touch-up prime <u>CAN/CGSB-1.181</u>.

#### 2.05 PAINT

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

# 2.06 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Interior top and bottom caps: steel.
- .3 Metallic paste filler: to manufacturer's standard.
- .4 Fire labels: metal riveted.
- .7 Weatherstripping: Refer to 08 71 00 Door Hardware.

#### 2.07 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

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- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Interior frames: <u>1.6 mm welded type construction</u>.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Protect mortised cutouts with steel guard boxes.
- .6 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

#### 2.08 FRAME ANCHORAGE

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

#### 2.09 FRAMES: WELDED TYPE

- .1 Welding in accordance with <u>CSA W59</u>.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

#### 2.12 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for louvre openings as indicated.
- .2 Interior doors: honeycomb construction.
- .3 Fabricate doors with longitudinal edges locked seamed, epoxy-sealed. Seams: fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Reinforce doors where required, for surface mounted hardware. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with **CAN4-S104** and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .10 Manufacturer's nameplates on doors are not permitted.

#### 2.13 DOORS: HONEYCOMB CORE CONSTRUCTION

.1 Form face sheets for interior doors from 1.2mm sheet steel with honeycomb core laminated under pressure to face sheets.

#### 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

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

#### 3.02 INSTALLATION GENERAL

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

### 3.03 FRAME INSTALLATION

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

### 3.04 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 Doors Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor as follows.
  - .1 Hinge side: 1.0 mm.
  - .2 Latchside and head: 1.5 mm.
  - .3 Finished floor, 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

#### 3.05 FINISH REPAIRS

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

#### **END OF SECTION**

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 09 21 16 Gypsum Board Assemblies
- .2 Section 09 91 23 Interior Painting

### 1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for access door components and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

### 1.04 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 0178 00 - Closeout Submittals.

### 1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground or indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect access doors from[nicks, scratches, and blemishes.
  - .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
    - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
    - .2 Leave protective coating in place until final cleaning of building.
  - .4 Replace defective or damaged materials with new.

### 2 PRODUCTS

### 2.01 ACCESS DOORS

- .1 Sizes: as follows unless indicated:
  - .1 For body entry: 600 x 600 mm minimum.
  - .2 For hand entry: 300 x 300 mm minimum.
- .2 Construction: rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees.
- .3 Materials:
  - .1 Other areas: prime coated steel.

### 2.02 EXCLUSIONS

.1 Lay-in tile ceilings: use unobtrusive identification locators.

#### 3 EXECUTION

### 3.01 EXAMINATION

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

### 3.02 INSTALLATION

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
  - .2 Install masonry surfaces: in accordance with Section 04 05 00 Common Work Results for Masonry.
  - .3 Install gypsum board surfaces: in accordance with Section 09 21 16 Gypsum Board Assemblies.

#### 3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

# 3.04 PROTECTION

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

# END OF SECTION

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 08 11 00 Metal Doors and Frames
- .2 Division 26 Electrical and Division 28 Fire Alarm System

# 1.02 REFERENCE STANDARDS

- .1 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
  - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames 2009.

# 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Hardware List:
  - .1 Submit contract hardware list.
  - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

# 1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 0178 00 Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

#### 1.05 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
  - .1 Supply maintenance materials in accordance with Section 0178 00 Closeout Submittals.
  - .2 Tools:

.1 Supply [2] sets of wrenches for door closers, operators and locksets.

### 1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### 1.07 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
  - .1 Store materials off ground or indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping or strippable coating].
  - .4 Replace defective or damaged materials with new.

### 2 PRODUCTS

#### 2.01 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.
- .2 Refer to attached hardware groups 1 through 5.

### 2.02 DOOR HARDWARE

.1 Locks and latches:

Lever locksets:	Schlage
Passage set:	Schlage
Electric Strikes:	Von Duprin
Cylinders:	Best
	Lever locksets: Passage set: Electric Strikes: Cylinders:

.2	Butts and hinges: .1 Hinges: .2 Self-closing spring hinges:	lves lves
.3	Door Closers and Accessories: .1 Door controls (closers):	LCN
.5	Door Operators: .1 Power door operators:	Horton Automatics, LCN, Assa Abloy
.6	Door Actuators/Push to Lock:	Camden
.7	Kick Plate:	Canadian Builders Hardware
.8	Wall stop:	Canadian Builders Hardware
.9	Door silencers:	lves
.10	Gasketing:	KNC
.11	Interface boxes:	Von Duprin
.12	Advanced logic relays:	Camden
.13	Wire Harnesses	Schlage
.14	Door Contacts	Schlage
.15	Power Supplies	Schlage
.16	Overhead Stop:	Glynn-Johnson
.17	Emergency Call Kit:	Camden

# 2.04 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

#### 2.05 KEYING

- .1 Permanent BEST interchangeable core cylinders supplied by the Owner.
- .5 Provide colour coded temporary construction cores during construction period.

#### 3 EXECUTION

# 3.01 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
  - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores when directed by Owner.
- .1 Install permanent cores and ensure locks operate correctly. The Owner will void the operation of the construction keys.

#### 3.02 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

#### 3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 0174 00 - Cleaning.

Trillium Lakelands District School Board

WASHROOM RENEWALS SUMMER 2021

- .1 Leave Work area clean at end of each day.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

### 3.04 DEMONSTRATION

- .1 Maintenance Staff Briefing:
  - .1 Brief maintenance staff regarding:
    - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
    - .2 Description, use, handling, and storage of keys.
    - .3 Use, application and storage of wrenches for door closers, locksets and door operators.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

### 3.05 PROTECTION

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

#### 3.06 SCHEDULE

.1 See Hardware Groups as follows:

- Washroom at corridor
- Single door 965mm (38" wide)
- Barrier Free, Power Door operated doors on integral hold open typically for free passage.
- Integral hold-open to release on fire alarm signal
- Storeroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR	
3 EA	HINGE	5BB1HW 127X114MM	652	IVE	
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH	
1 EA	INTERFACE BOX	JB7	GRAY	VON	
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES	
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED			BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON	
1 EA	AUTO OPERATOR	7900 C/W INTEGRAL ON/OFF	628	HOR	
		BUTTON			
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM	
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH	
1 EA	WALL STOP	CBH 140	630	CBH	
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC	
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM	
1 EA	WIRE HARNESS	CON-6W			SCH
1 EA	DOOR CONTACT	679-05HM	BLK		SCE
1 EA	POWER SUPPLY	PS902 900-8F-FA 120/240 VAC	LGR	SCE	

NOTES:

1. ELECTRICAL CONTRACTOR TO INTERFACE AUTO OPERATOR/ INTEGRAL HOLD OPEN FUNCTION WITH F/A PANEL.

- Change room at corridor/gymnasium
- Single 965mm (38" wide)
- Barrier Free, Power Door operated high traffic
- Hold-open function not required
- Storeroom lockset function
- 45 Min Label

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	4900LE C/W INTEGRAL ON/OFF	628	HOR
		BUTTON		
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	СВН
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

- Change room interior not rated
- Single 965mm (38" wide)
- Barrier Free, Power Door operated high traffic.
- Storeroom lockset function
- No label

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	4900LE C/W INTEGRAL ON/OFF	628	HOR
		BUTTON		
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

- Universal Washroom
- Single 965mm (38" wide)
- Barrier Free, Power Door operated Universal Washroom
- Emergency Call System
- Storeroom lockset function
- 45 Min Label

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	7900 C/W INTEGRAL ON/OFF	628	HOR
		BUTTON		
1 EA	AURA PUSH TO	CM-2520/4588SE1	630	CAM
	LOCK/ACTUATOR			
1 EA	ILLUMINATED ACTUATOR	CM-45/455SE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	EMERGENCY CALL KIT	CX-WEC10K2		CAM
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

- Washroom entrance non-barrier free,
- Closer with integral hold-open to release on fire alarm signal
- Storeroom (or Classroom) lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR	
3 EA	HINGE	5BB1HW 127X114MM	652	IVE	
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH	
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES	
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED			BES
1 EA	FIRE/LIFE CLOSER	4040SE 24V AC/DC	689	LCN	
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH	
1 EA	WALL STOP	CBH 140	630	CBH	
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC	
1 EA	TRANSFORMER	4040SE-3210			LCN

NOTES:

- 1. MOUNT CLOSER ON PULL SIDE.
- 2. ELECTRICAL CONTRACTOR TO INTERFACE FIRE/LIFE CLOSER WITH F/A PANEL

### HARDWARE GROUP #3A

- Washroom entrance non-barrier free,
- Closer
- Classroom lockset function
- 45 Min Label

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	VANDL STOREROOM LOCK	ND96BD RHO	626	SCH
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	SURFACE CLOSER	4040XP SCUSH ST-3068	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

- Custodial Rooms, Storage Rooms, Kitchen
- 45 Min Label

DESCRIPTION	CATALOG NUMBER	FINISH	MFR
HINGE	5BB1HW 127X114MM	652	IVE
VANDL STOREROOM LOCK	ND96BD RHO	626	SCH
PERMANENT CORE	BEST - BY OWNER	626	BES
CONSTRUCTION CORE	BEST - COLOUR CODED		BES
SURFACE CLOSER	4040XP SCUSH ST-3068	689	LCN
KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
	DESCRIPTION HINGE VANDL STOREROOM LOCK PERMANENT CORE CONSTRUCTION CORE SURFACE CLOSER KICK PLATE GASKETING	DESCRIPTION CATALOG NUMBER HINGE 5BB1HW 127X114MM VANDL STOREROOM LOCK ND96BD RHO PERMANENT CORE BEST - BY OWNER CONSTRUCTION CORE BEST - COLOUR CODED SURFACE CLOSER 4040XP SCUSH ST-3068 KICK PLATE CBH 903 150 X SIZE TO SUIT GASKETING W-22 X 1@HD / 2@JMB	DESCRIPTIONCATALOG NUMBERFINISHHINGE5BB1HW 127X114MM652VANDL STOREROOM LOCKND96BD RHO626PERMANENT COREBEST - BY OWNER626CONSTRUCTION COREBEST - COLOUR CODED5URFACE CLOSERSURFACE CLOSER4040XP SCUSH ST-3068689KICK PLATECBH 903 150 X SIZE TO SUIT630GASKETINGW-22 X 1@HD / 2@JMBBLK

- Staff Washroom (Single)
- 45 Min Label

1 EA

1 EA

PRIVACY SET

KICK PLATE

# Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR		
3 EA 1 EA 1 EA 1 EA 1 EA 1 SET	HINGE PRIVACY SET SURFACE CLOSER KICK PLATE GASKETING	5BB1HW 127X114MM ND40S RHO 4040XP SCUSH ST-3068 CBH 903 150 X SIZE TO SUIT W-22 X 1@HD / 2@JMB	652 626 689 630 BLK	IVE SCH LCN CBH KNC		
HARDV •	VARE GROUP #5A Staff Washroom (Single) Not rated					
Provide	Provide each SGL door(s) with the following:					
QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR		
3 EA	HINGE	5BB1HW 127X114MM	652	IVE		

ND40S RHO

# **END OF SECTION**

CBH 903 150 X SIZE TO SUIT

626

630

SCH

CBH

### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 07 84 00 Fire Stopping
- .2 Section 07 92 00 Joint Sealants
- .3 Section 09 91 23 Interior Painting

### 1.02 REFERENCE STANDARDS

- .2 CAN/CSA A82.31-M91 Gypsum Board Application
- .8 Underwriters' Laboratories of Canada (ULC)
  - .1 **CAN/ULC-S102-[10]**, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

# 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for [gypsum board assemblies] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit gypsum board assembly drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Indicate components such as fastener type, dimensions, spacing and locations at gypsum board edges, ends and in field of board as well as installation methods. Components and work to confirm CAN/CSA A82.31-M91 standard specification for application and finishing of gypsum board.
  - .3 Indicate type of joint compound, and number of joint compound layers.
  - .4 Indicate number and location of electrical boxes for wall and ceiling.
- .4 Certifications:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

#### 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address and applicable standard designation.
- .3 Exercise care in unloading gypsum board materials shipment to prevent damage.
- .4 Storage and Handling Requirements in accordance with CAN/CSA A82.31-M91
  - .1 Store gypsum board assemblies materials level flat off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
  - .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
  - .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
  - .5 Protect from weather, elements and damage from construction operations.
  - .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
  - .7 Replace defective or damaged materials with new.

# 1.05 AMBIENT CONDITIONS

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

# 2 PRODUCTS

# 2.01 MATERIALS

- .1 Standard board: to CAN/CSA A82.31-M91 regular, 16mm thick and Type X, 16mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.
- .2 Glass mat water-resistant gypsum backing board: CAN/CSA A82.31-M91, 16mm thick, 1200 mm wide x maximum practical length.
- .3 Metal furring runners, hangers, tie wires, inserts, and anchors.
- .4 Drywall furring channels: [0.5] mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .5 Steel drill screws: to <u>ASTM C 1002-14</u>.
- .6 Laminating compound: as recommended by manufacturer, asbestos-free.

- .7 Casing beads, corner beads, control joints and edge trim: to <u>ASTM C 1047</u>, Zinc 0.5mm base thickness, perforated flanges, one piece length per location.
- .8 Sealants: in accordance with Section 07 92 00 Joint Sealants.
  - .1 Acoustic sealant: in accordance with Section 07 92 00 Joint Sealants.
- .9 Polyethylene: to <u>CAN/CGSB-51.34</u>, Type 2.
- .10 Joint compound: to <u>ASTM C 475</u>, asbestos-free.

# 2.02 FINISHES

- .1 Texture finish: asbestos-free [standard white] texture coating and primer-sealer, recommended by gypsum board manufacturer.
  - .1 Primer: VOC limit [50][100][200] g/L maximum to [GS-11][SCAQMD Rule 1113].

# 3 EXECUTION

# 3.01 EXAMINATION

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

# 3.02 ERECTION

- .1 Do application and finishing of gypsum board CAN/CSA A82.31-M91 except where specified otherwise.
- .2 Do application of gypsum sheathing to CAN/CSA A82.31-M91
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to CAN/CSA A82.31-M91 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 CAN/CSA A82.31-M91, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across joists between layers of gypsum board], spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with drywall screws.

### 3.03 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
  - .1 Single-Layer Application:
    - .1 Apply gypsum board on ceilings prior to application of walls to CAN/CSA A82.31-M91
    - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
  - .2 Double-Layer Application:
    - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
    - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250mm.
    - .3 Apply base layers at right angles to supports unless otherwise indicated.
    - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250mm with base layer joints.
- .3 Apply single layer gypsum board to concrete block surfaces, where indicated, using laminating adhesive.
  - .1 Comply with gypsum board manufacturer's recommendations.
  - .2 Brace or fasten gypsum board until fastening adhesive has set.
  - .3 Mechanically fasten gypsum board at top and bottom of each sheet.
- .4 Apply glass mat reinforced gypsum sheathing where wall tiles to be applied and adjacent to slop sinks. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.

- .5 Apply 10 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250mm.
- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

### 3.04 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure [at [150] mm on centre][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.
- .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 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 at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .9 Install control joints straight and true.
- .10 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .11 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .12 Install expansion joint straight and true.
- .13 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .14 Splice corners and intersections together and secure to each member with 3 screws.
- .15 Install access doors to electrical and mechanical fixtures specified in respective sections.
  - .1 Rigidly secure frames to furring or framing systems.
- .16 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
  - .1 Levels of finish:
    - .1 Level 0: no tapping, finishing or accessories required.
    - .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces free of excess joint compound; tool marks and ridges are acceptable.
    - .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
    - .4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
    - .5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
    - .6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .19 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.
- .20 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.

.21 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface Trillium Lakelands District School Board WASHROOM RENEWALS SUMMER 2021 of board.

- .22 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .23 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .24 Mix joint compound slightly thinner than for joint taping.
- .25 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .26 Allow skim coat to dry completely.
- .27 Remove ridges by light sanding or wiping with damp cloth.

### 3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 017400 Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

#### 3.06 **PROTECTION**

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

#### 3.07 SCHEDULES

.1 Construct fire rated assemblies where indicated.

# END OF SECTION

## 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 07 84 00 Fire Stopping
- .2 Section 09 21 16 Gypsum Board Assemblies

#### 1.02 REFERENCE STANDARDS

.1 CAN/CSA-S136 North American Specification for the Design of Cold Formed Steel Structural Members

### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

## 1.04 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### 1.05 DELIVERY, STORAGE AND HANDLING

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

# 2 PRODUCTS

### 2.01 MATERIALS

- .1 Non-load bearing channel stud framing: to <u>ASTM C 645</u>, various stud sizes as indicated in drawings, roll formed hot dipped zinc-coated (galvanized) steel sheet in accordance with <u>ASTM A 653</u>, Z180, for screw attachment of gypsum board.
  - .1 Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to <u>ASTM C 645</u>, in widths to suit stud sizes, and as follows:
  - .1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction.
  - .2 Base Runner: Bottom track with 33 mm upstanding legs.
- .3 Furring Channels: Commercial steel sheet in accordance with <u>ASTM A 653</u>, Z180, hot dipped zinc-coated (galvanized), as follows:
  - .1 Hat Shaped, Rigid Furring Channels: <u>ASTM C 645</u>, 0.75 mm thickness x 22 mm deep.
  - .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .4 Metal channel stiffener: thick cold rolled steel, coated with rust inhibitive coating.
- .5 Acoustical sealant: in accordance with Section 07 92 00 Joint Sealants.

## 3 EXECUTION

#### 3.01 EXAMINATION

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

# 3.02 ERECTION

- .1 Erect partitions in accordance with framing requirements of <u>ASTM C 754</u>.
- .2 Align partition tracks at floor and ceiling and secure at 610 mm on centre maximum.
- .3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

- .4 Place studs vertically at 400 mm on centre and not more than 50mm from abutting walls, and at each side of openings and corners.
  - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to bottom and ceiling track using screws.
- .7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
  - .1 Secure studs together, 50mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
  - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
  - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
  - .1 Use double track slip joint as indicated.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

# 3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning. .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

### 3.04 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by non-structural metal framing application.

# END OF SECTION

## 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 04 22 00 Concrete Unit Masonry
- .2 Section 09 21 16 Gypsum Board Assemblies

# 1.02 REFERENCE STANDARDS

- .1 Terrazzo Tile and Marble Association of Canada (TTMAC)
  - .1 Tile Specification Guide 09 30 00 [2016/2017], Tile Installation Manual.
  - .2 Hard Surface Maintenance Guide [2017-2019].
- .2 Canadian General Standards Board (CGSB)
  - .1 <u>CGSB 71-GP-22M-[78(AMEND.)]</u>, Adhesive, Organic, for Installation of Ceramic Wall Tile.
  - .2 <u>CAN/CGSB-75.1-[M88]</u>, Tile, Ceramic.
  - .3 <u>CAN/CGSB-25.20-[95]</u>, Surface Sealer for Floors.
- .3 CSA Group (CSA)
  - .1 <u>CAN/CSA-A3000-[03(R2006)]</u>, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 Submittal Procedures.
  - .1 Include manufacturer's information on:
    - .1 Ceramic tile, marked to show each type, size, and shape required.
    - .2 Chemical resistant mortar and grout (Epoxy and Furan).
    - .3 Cementitious backer unit.
    - .4 Dry-set cement mortar and grout.
    - .5 Divider strip.
    - .6 Elastomeric membrane and bond coat.
    - .7 Reinforcing tape.
    - .8 Levelling compound.
    - .9 Latex cement mortar and grout.
    - .10 Commercial cement grout.
    - .11 Organic adhesive.
    - .12 Slip resistant tile.
    - .13 Waterproofing isolation membrane.
    - .14 Fasteners.

- .3 Provide samples in accordance with Section 01 33 00 Submittal Procedures.
  - .1 Base tile: submit 1 tile sample panels of each colour, texture, size, and pattern of tile.
  - .2 Floor tile: submit, 100 x 100 mm sample panels of each colour, texture, size, and pattern of tile.
  - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.

## 1.04 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
  - .1 Manufacturer's Instructions: manufacturer's installation instructions.
  - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

## 1.06 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements.

### 1.07 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

# 1.08 MAINTENANCE

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 0178 00 Closeout Submittals.
  - .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
  - .3 Maintenance material same production run as installed material.

# 2 PRODUCTS

# 2.01 FLOOR TILE

- .1 Refer to individual project's room finish schedule and drawings for type, pattern, room location and extent of each product.
- .2 Porcelain Floor Tile (anti-slip): Rock Series by Olympia Tile
  - PT1: Grigio Grey 300 x 600mm.

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- .2 PT2: Anthracite 300 x 600mm.
- .3 PT4: White 300 x 600mm
- .4 PT5: Nero 300 x 600mm
- .3 Porcelain floor tile: Quebec Series Porcelain Dot-Mounted Mosaic by Olympia Tile .2 PT3: Black Fleck 50 x 50mm

### 2.02 WALL AND CEILING TILE

- .1 Refer to individual project's room finish schedule and drawings for type, pattern, room location and extent of each product.
- .2 Ceramic tile: Colour and Dimension Collection Glazed Wall by Olympia Tile
  - .1 CT1: Arctic White Bright 100 x 400mm.
  - .2 CT2: Bone Matte 100 x 400mm
  - .3 CT3: Taupe Bright 100 x 400mm
  - .4 CT4: Chartreuse Bright 100 x 400mm
  - .5 CT5: Olive Matte 100 x 400mm
  - .6 CT6: Citron Bright 100 x 400mm
  - .7 CT7: Papaya Bright 100 x 400mm
  - .8 CT8: Red Pepper Bright 100 x 400mm
  - .9 CT9: Turquoise Bright 100 x 400mm
  - .10 CT10: Sapphire Bright 100 x 400mm
  - .11 CT11: Silver Grey Bright 100 x 400mm
  - .12 CT12: Sterling Grey Bright 100 x 400mm
  - .13 CT13: Dark Grey Bright 100 x 400mm
  - .14 CT14: Black Bright 100 x 400mm

.3 Glass Mosaic Tile: American Olean Colour Appeal or Daltile Color Wave – Glass Mosaic

- .1 MT1: Vintage Mint 25mm x 25mm
- .1A MT1A Whisper Green 25mm x 25mm (Acceptable alternate to MT1)
- .2 MT2: Powder 25mm x 25mm
- .2A MT2A Blue Lagoon 25mm x 25mm (Acceptable alternate to MT2)
- .3 MT3: Fountain Blue 25mm x 25mm
- .4 MT4: Dusk 25mm x 25mm
- .4A MT4A Twilight Blue 25mm x 25mm (Acceptable alternate to MT4)
- .5 MT5: Vibrant Yellow 25mm x 25mm
- .5A MT5A Lemon Popsicle 25mm x 25mm (Acceptable alternate to MT5)
- .6 MT6: Orange Peel 25mm x 25mm
- .6A MT6A Russet Orange 25mm x 25mm (Acceptable alternate to MT6)
- .7 MT7: Auburn 25mm x 25mm
- .8 MT8: Hawaiian Ocean 25mm x 25mm
- .8A MT8A Capri Breeze 25mm x 25mm (Acceptable alternate to MT8)

- .9 MT9: Lime Green 25mm x 25mm.8A
- .9A MT9A Lime Glow 25mm x 25mm (Acceptable alternate to MT9)
- .10 MT10: Plum 25mm x 25mm
- .10A MT10A Purple Magic 25mm x 25mm (Acceptable alternate to MT10)
- .11 MT11: Pearl 25mm x 25mm
- .11A MT11A Ice White 25mm x 25mm (Acceptable alternate to MT11)
- .12 MT12: Powder Puff 25mm x 25mm
- .13 MT13: Charcoal Grey 25mm x 25mm
- .13A MT13A Top Hat 25mm x 25mm (Acceptable alternate to MT13)
- .14 MT14: Slate 25mm x 25mm
- .14A MT14A Midnight Black 25mm x 25mm (Acceptable alternate to MT14)
- .15 MT15: Green Parade 25mm x 25mm
- .16 MT16: Oak Moss 25mm x 25mm
- .20 MT20: Evening Mixer
- .20A MT20A: Midnight Sky (Acceptable alternate to MT20)
- .21 MT21 Silver Spring
- .22 MT22: Blue Moon
- .22A MT22A: Winter Blues (Acceptable alternate to MT22)

### 2.03 BASE TILE

- .1 Base: Porcelain Floor Tile (anti-slip): Rock Series by Olympia Tile
  - .1 PT1: Grigio Grey 100 x 600mm.
  - .2 PT2: Anthracite 100 x 600mm.
  - .3 PT4: White 300 x 600mm
- .2 Base: Porcelain Floor Tile (anti-slip): Quebec Series Porcelain Dot-Mounted Mosaic by Olympia Tile
  - .1 PT3: Black Fleck 50 x 50mm

(Two rows of 50mm = 100mm high wall base.)

# 2.04 STAIR TREADS

.1 Stair Treads: Porcelain Stair Tread Tile (anti-slip): Rock Series by Olympia Tile .2 PT2: Anthracite 300 x 600mm.

# 2.06 MORTAR AND ADHESIVE MATERIALS

.1 Latex Modified Thin Set Mortar: C-Crylic 200 with Permabond (Premium mix over concrete substrate) and/or Multicure (Modified System) by C-Cure, Kerabond mixed with Keralastic by Mapei, Laticrete 272 Mortar with Laticrete 333 Super Flexible Additive or approved alternate.

### 2.08 GROUT

- .1 Wall Tile Grout: Unsanded dry set, coloured Laticrete 600 series/1776 or equivalent by Flextile. Colours of grout to be selected by Consultant from full range of standard colours.
- .2 Floor Tile Grout: Presanded coloured latex grout: Laticrete 500 Series/1776 or equivalent by Flextile. Colours of grout to be selected by Consultant from full range of standard colours.
- .3 Shower Wall and Floor Tile Grout: 100 Flex epoxy grout by Flextile, colours selected by consultant from full range of standard colours

### 2.09 ACCESSORIES

- .1 Tile Backer Board Joint Tape: minimum 50mm wide coated fiberglass mesh tape, self adhesive.
- .2 Shower Wall and Floor waterproofing membrane: Schluter Kerdi Waterproofing membrane.
- .3 Metal lath: to <u>ASTM C 847</u> [galvanized][painted] finish, 10 mm rib at Lath weight of 2.17 kg/m<sup>2</sup>.
- .4 Corner and Edge Trim: purpose made metal extrusion; anodized aluminum type for terminating cut tile, at junction of tile and dissimilar materials. Size to suit tile thickness. Satin anodized finish. Schluter refer to drawings.
  - .1 CG1: Schluter Rondec at all outside corners
  - .2 CG2: Schluter Jolly at dissimilar material joints.
- .5 Transition Strips: purpose made metal extrusion; anodized aluminum type. Schluter refer to drawings.
  - .1 TS1: Schluter Schiene at tile to tile transitions
  - .2 TS2: Schluter Reno-U at tile to VCT transitions
  - .3 TS3: Schluter Ramp at tile to exposed concrete transitions or to maintain barrier free compliance.
  - .4 TS4: Schluter DECO-DE
- .7 Prefabricated Movement Joints: Schluter where required.
- .8 Sealant: in accordance with Section 07 92 00 Joint Sealants.
- .9 Floor sealer and protective coating: to tile and grout manufacturers recommendations.

# 2.10 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
  - .1 Compressive strength 25 MPa.
  - .2 Tensile strength 7 MPa.

- .3 Flexural strength 7 MPa.
- .4 Density [1.9] kg/m<sup>3</sup>
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.

### 2.11 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

### 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

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

#### 3.02 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Refer to drawings for working points (WP).
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Make internal angles square.
- .9 Install divider strips at junction of tile flooring and dissimilar materials.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.

.11 Clean installed tile surfaces after installation and grouting cured.

# 3.03 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

# 3.4 CLEANING

.1 Proceed in accordance with Section 0174 00 - Cleaning.

# END OF SECTION

## 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 23 37 20 Louvres, Intakes and Vents: Air inlets and outlets to be coordinated with ceiling work.
- .2 Division 26 Electrical and 28 Lighting, electrical and fire alarm devices to be coordinated with ceiling work.

### 1.02 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS) .1 Safety Data Sheets (SDS).
- .2 Underwriter's Laboratories of Canada (ULC)
  - .1 **CAN/ULC-S102-[2003]**, Surface Burning Characteristics of Building Materials and Assemblies.

#### 1.03 COORDINATION

.1 Do not begin erection of ceiling suspension system until work above ceiling has been reviewed by Consultant.

## 1.04 PRE-INSTALLATION MEETING

- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and other affected trades in accordance with Section 01 32 16.19 Construction Progress Schedule Bar (GANTT) Chart to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Coordination with work of other sections.
  - .4 Review manufacturer's installation instructions and warranty requirements.
  - .5 Review accepted shop drawings for installation requirements.

# 1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension, acoustic panels, acoustic tiles, and system accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit reflected ceiling plans for special grid patterns as indicated.

- .2 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, access door dimensions, and locations and acoustical unit support at ceiling fixture lateral bracing and accessories.
- .4 Samples:
  - .1 Submit for review and acceptance of each component specified or necessary for complete installation. Include technical descriptive data.
  - .2 Submit one sample of each component proposed for use in each type of ceiling suspension system.
  - .3 Submit 100 mm x 100 mm samples of each type of acoustical unit.

# 1.06 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 0178 00 Closeout Submittals.
- .2 Submit operation and maintenance data for acoustical suspension for incorporation into manual.

# 1.07 MAINTENANCE MATERIALS

- .1 Provide extra acoustical units in accordance with Section 01 78 00 Closeout Submittals.
- .2 Provide acoustical units amounting to 5% of gross ceiling area for each pattern and type of acoustical panel or tile, suspension system and trim required for project, minimum 1 complete factory-sealed package of each.
- .3 Ensure extra materials are from same production run as installed materials.
- .4 Deliver extra materials for each type of acoustical unit in original unopened packages clearly identified, including colour and texture.
- .5 Deliver to Owner, upon completion of the work of this section.

# 1.08 CERTIFICATIONS

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Include certification of sustainable requirements.

# 1.09 MOCK-UPS

.1 Not Used.

# 1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials flat, off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect acoustical ceiling panels, tiles suspension grid components from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
  - .4 Store extra materials required for maintenance, where directed by Owner.

### 1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15]degrees C and humidity of 20 -40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

#### 2 PRODUCTS

#### 2.01 ACOUSTICAL CEILING SUSPENSION

- .1 Acoustical Ceiling Suspension system **ACT-1**:
  - .1 Exposed tee bar grid: Main and Cross Tees and Edge moulding: double webbed, hot dipped galvanized cold rolled steel construction, prefinished white cap, "Prelude XL 15/16" Fireguard" by Armstrong.
- .2 Fire-resistance rated suspension system **ACT-2** Armstrong Ultima Fireguard
  - .1 Exposed tee bar grid: Main and Cross Tees and Edge moulding: double webbed, hot dipped galvanized cold rolled steel construction, prefinished white cap, "Prelude XL 15/16" Fireguard" by Armstrong.
- .3 Basic materials for suspension system: commercial quality zinc coated to Z265.
- .5 Hanger wire: galvanized soft annealed steel wire:
  - .1 3.6 mm diameter for access tile ceilings.
  - .2 To ULC design requirements for fire rated assemblies.
- .6 Hanger inserts: purpose made.

- .7 Carrying channels: 38mm channel, galvanized steel.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

### 2.04 ACOUSTICAL CEILING PANELS

- .1 Acoustical Panel: **ACT-1**: Armstrong Georgian 763D 24" x 24" non fire rated, made up as follows:
  - .1 Type: ACT-1.
  - .2 Fire Classification: Class [A].
    - .1 Flame spread rating of 25 or less in accordance with **CAN/ULC-S102**.
    - .2 Smoke developed 50 or less in accordance with **CAN/ULC-S102**.
  - .3 Noise Reduction Coefficient (NRC) designation of 0.55
  - .4 Ceiling Attenuation Class (CAC) rating 33 in accordance with <u>ASTM E 1414</u>.
  - .5 Light Reflectance (LR) range of 86%
  - .6 Edge type: square
  - .7 Colour: White
  - .8 Size 24" x 24" x 15.9 mm thick.
  - .9 Shape: flat.
- .1 Acoustical Panel: **ACT-2**: Armstrong Ultima 24"x 24" Fireguard, made up as follows:
  - .1 Type: ACT-2.
  - .2 Fire Classification: Class A, Fire resistive, Fire Guard
    - .1 Flame spread rating of 25 or less in accordance with **CAN/ULC-S102**.
    - .2 Smoke developed 50 or less in accordance with **CAN/ULC-S102**.
  - .3 Noise Reduction Coefficient (NRC) designation of 0.75
  - .4 Ceiling Attenuation Class (CAC) rating up to 40 in accordance with <u>ASTM E 1414</u>.
  - .5 Light Reflectance (LR) range of 88%
  - .6 Edge type: square
  - .7 Colour: White
  - .8 Size 24" x 24" x 15.9 mm thick.
  - .9 Shape: flat.

# 2.05 ACCESSORIES

.1 Hold down clips: purpose made clips to secure tile to suspension system, approved for use in fire-rated systems.

# 3 EXECUTION

# 3.01 EXAMINATION

.1 Verify conditions of substrates previously installed under other Sections or Contracts are

acceptable for acoustical ceiling tile and track installation in accordance with manufacturer's written instructions.

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

## 3.02 INTERFACE WITH OTHER WORK

- .1 Coordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.
- .2 Do not install acoustical panels and tiles until work above ceiling has been reviewed by Consultant.

## 3.03 SUSPENSION SYSTEM INSTALLATION

- .1 Comply with manufacturer's written installation instructions and recommendations, including product technical bulletins, product carton installation instructions, and data sheets.
- .2 Install suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and <u>ASTM C 636/C 636M</u> except where specified otherwise.
- .3 Lay out system according to reflected ceiling plan.
- .4 Finished ceiling system to be square with adjoining walls and level within 1:1000.
- .5 Secure hangers to overhead structure using attachment methods as indicated.
- .6 Install hangers spaced at maximum 1200mm centres and within 150 mm from ends of main tees.
- .7 Ensure suspension system is coordinated with location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between suspension system and other work above ceiling.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.
- .10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 610 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.13 Install access splines where required for full body access to above ceiling equipment.

## 3.04 ACOUSTICAL CEILING PANEL INSTALLATION

- .1 Install lay-in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.
- .2 In fire rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organizations design requirements.

#### 3.05 SITE QUALITY CONTROL

- .1 Arrange for periodic site visits by manufacturer's representative to review installed work for conformity to manufacturer's installation instructions and recommendations.
- .3 Submit written site reports by designer to Consultant within 3 days of visit.

### 3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.
  - .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

#### 3.07 PROTECTION

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

# END OF SECTION

## 1 GENERAL

# 1.01 RELATED REQUIREMENTS

.1 Section 033500 Concrete Finishing

### 1.02 REFERENCE STANDARDS

- .1 ASTM International
  - .1 <u>ASTM F 1303-[04(2014)]</u>, Standard Specification for Sheet Vinyl Floor Covering with Backing.

# 1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

# 1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
  - .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 Closeout Submittals.
  - .2 Provide 10% of each colour, pattern and type flooring material required for project for maintenance use.
  - .3 Extra materials one piece and from same production run as installed materials.
  - .4 Identify each roll of sheet flooring and each container of adhesive.
  - .5 Deliver to Owner, upon completion of the work of this section.
  - .6 Store where directed by Owner.

#### 1.05 DELIVERY, STORAGE AND HANDLING

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

recommendations in clean, dry, well-ventilated area.

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

# 1.06 SITE CONDITIONS

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

### 2 PRODUCTS

# 2.01 MATERIALS

- .1 Sheet vinyl with backing: heavy duty commercial grade.
  - .1 RF-1, Altro Reliance 25,
  - .2 Colour: "Rock" D2504
  - .3 Thickness: 2.5 mm.
  - .4 Slip Resistant.
- .2 Vinyl Composite Tile (VCT-1)
  - .1 Armstrong Excelon
  - .2 Size: 305mm x 305mm
  - .3 Thickness: 3.2mm
  - .4 Colour: "Sterling" 51904
  - .5 Adhesive: As recommended by manufacturer.
- .3 Resilient base: continuous, top set, complete with premoulded end stops and external corners:
  - .1 RB-1, rubber Johnsonite
  - .2 Style: cove.
  - .3 Thickness: 3.17 mm.
  - .4 Height: 101.6 mm.
  - .5 Lengths: cut lengths minimum 2400 mm.
  - .6 Colour: Charcoal
- .4 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.

## 3 EXECUTION

#### 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient sheet flooring installation in accordance with

manufacturer's written instructions.

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

# 3.02 SITE VERIFICATION OF CONDITIONS

.1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

#### 3.03 PREPARATION

- .1 Remove existing resilient flooring.
- .2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .5 Prime/Seal concrete slab to resilient flooring manufacturer's printed instructions.

#### 3.04 APPLICATION: FLOORING

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system.
- .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring to produce a minimum number of seams. Border widths minimum 1/3 width of full material.
- .4 Run sheets in direction of traffic. Double cut sheet joints and continuously heat weld according to manufacturer's printed instructions.
- .5 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's printed instructions.
- .6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
- .7 Cut flooring around fixed objects.

- .8 Install feature strips and floor markings where indicated. Fit joints tightly.
- .9 Install flooring in pan type floor access covers. Maintain floor pattern.
- .10 Continue flooring over areas which will be under built-in furniture.
- .11 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .13 Install metal edge strips at unprotected or exposed edges where flooring terminates.

# 3.05 APPLICATION: 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 Use toeless type base where floor finish will be carpet, coved type elsewhere.
- .9 Install toeless type base before installation of carpet on floors.
- .10 Heat weld base in accordance with manufacturer's printed instructions.

## 3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.
  - .1 Clean flooring and base surfaces to flooring manufacturer's printed instructions.

# 3.08 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.
- .3 Use only water-based coating for linoleum.

# END OF SECTION

## 1 GENERAL

## 1.01 RELATED REQUIREMENTS

.1 Section 033500 Concrete Finishing

## 1.02 REFERENCE STANDARDS

### .1 ASTM International

- .1 <u>ASTM C 241/C 241M-[13]</u>, Standard Test Method for Abrasion Resistance of Stone Subject to Foot Traffic.
- .2 <u>ASTM D 2370-[98(R2010)]</u>, Standard Test Method for Tensile Properties of Organic Coatings.
- .2 Canadian General Standards Board (CGSB)
  - .1 <u>CAN/CGSB-51.34-[M86(R1988)]</u>, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .2 <u>CAN/CGSB-25.20-[95]</u>, Surface Sealer for Floors.

## .3 CSA Group (CSA)

- .1 <u>CSA A23.1/A23.2-[09(R2014)]</u>, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 <u>CSA A3000-[13]</u>, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Safety Data Sheets (SDS).
- .5 Terrazzo, Tile and Marble Association of Canada (TTMAC)
  - .1 Maintenance Guide.
  - .2 TTMAC/CSCTEK-AID 09 40 00, Portland Cement Terrazzo Digest.
  - .3 TTMAC 2012/2014 Specification Guide 09 30 00 Tile Installation Manual.
  - .4 TTMAC 09 66 00 Terrazzo Installation Manual.

## 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for Portland cement terrazzo flooring and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of TTMAC Maintenance Guide for inclusion in operations and

maintenance manual prepared and submitted in Section 017800. Provide specific warning of maintenance practices or materials that may damage or disfigure finished work.

- .3 Submit WHMIS SDS sheets for floor sealer products.
- .3 Samples:
  - .1 Submit digital photo samples of terrazzo.

# 1.04 CLOSEOUT SUBMITTALS

.1 Provide maintenance data as set out in TTMAC publication for terrazzo work for incorporation into manual specified in Section 0178 00 - Closeout Submittals.

# 1.05 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Installer: trained and experienced in tile work. Company must be registered as members in good standing with Terrazzo, Tile and Marble Association of Canada. If requested by, Consultant submit listing of at least three previously completed projects of similar size and scope.
- .2 Supplier: a member in good standing with Terrazzo, Tile and Marble Association of Canada, providing materials meeting the minimum standards of TTMAC.
- .3 Mock-ups:
  - .1 Construct mock-up in accordance with Section 01 45 00 Quality Control.
  - .2 Provide mock-up for evaluation of surface finishes and quality of work.
  - .3 Construct mock-up where directed.
  - .4 Allow 48 hours for inspection of mock-up Consultant before proceeding with work.
  - .6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

# 1.06 DELIVERY, STORAGE AND HANDLING

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

## 1.07 SITE CONDITIONS

- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.
- .2 Ventilation:
  - .1 Provide continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.
- .3 Ambient Conditions:
  - .1 Maintain air temperature and structural base temperature at terrazzo installation area above 12 degrees C for 24 hours prior to, during, and for 24 hours following installation.

# 2 PRODUCTS

### 2.01 MATERIALS

- .1 To match existing adjacent terrazzo finish.
- .2 Cement:
  - .1 To <u>CSA A3000</u>.
  - .2 Type 10, grey for underbed.
  - .3 White for topping.
  - .4 6% air-entrainment.
- .3 Sand, fine and coarse aggregates:
  - .1 To <u>CSA A23.1/A23.2</u>.
  - .2 Clean, washed, locally available.
  - .3 Oval aggregate.
- .4 Water: potable.
- .5 Marble chips:
  - .1 Graded in accordance with TTMAC standard.
  - .2 Abrasion resistance to <u>ASTM C 241/C 241M</u>.
  - .3 No deleterious or foreign matter.
- .6 Pigments:
  - .1 Compatible with Portland cement.
  - .2 Alkali-resistant, colour-stable.
  - .3 Lime-proof mineral.
- .7 Epoxy bonding agent: two components, epoxy resin and epoxy hardener conforming to following performance properties after cure schedule of 28 days at 25 degrees C.
  - .1 Viscosity: mixed viscosity not less than 0.04 Pa.s or more than 0.5 Pa.s.

- .2 Gel time: not less than half hour at 20 degrees C.
- .3 Flexibility: Gardiner flexibility test, passes bending over 12 mm mandrel, without cracking.
- .4 Elongation: <u>ASTM D 2370</u>, minimum 10%.
- .5 Bond strength: 2 MPa, with 100% concrete failure at minimum coverage, test concrete specimen minimum compressive strength 20 MPa.
- .6 Coverage: 0.3 L/m<sup>2</sup> minimum, dry film thickness not less than 0.2 mm.
- .8 Divider strips: 3mm mm thick zinc with depth of 16 mm.
- .9 Accessories: base caps and base divider strips, separator strips, purpose made and of same material to match divider strips.
- .10 Reinforcing steel: billet steel, grade 300 deformed bars.
- .11 Welded steel wire fabric: to 50 x 50 x 1.6 x 1.6 mm wire, galvanized, in flat sheets only.
- .12 Slip sheet: polyethylene sheet to <u>CAN/CGSB-51.34</u>, Type 2, 0.05 mm thick.
- .13 Non-slip aggregate: aluminum oxide of size and colour to match marble chips.
- .14 Non-slip inserts: zinc 10 x 10 x 0.8 mm thick, dove-tail shaped channels, with anchors.
- .15 Non-slip material for inserts: fine aluminum oxide and cement mixture in selected colours.
- .16 Curing compound: to manufacturer's standard.
- .17 Cleaning compound: to TTMAC standard

### .18 Sealants:

- .1 To <u>CAN/CGSB-25.20</u>.
- .2 Sealants:
  - .1 Maximum VOC limit 50 g/L
- .19 Finishing compound: to TTMAC standard 3001.
  - .1 Sealant.

## 2.02 MIXES

- .1 Slurry coat: cement and water mixed to creamy paste.
- .2 Underbed: 1 part cement to 4 parts sand by volume.
- .3 Terrazzo topping: to match existing

### 3 EXECUTION

#### 3.01 EXAMINATION

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

### 3.02 INSPECTION

- .1 Examine area to receive terrazzo for defects in existing work which will affect proper execution of terrazzo work.
- .2 Ensure tolerances of concrete slab work do not deviate from tolerance set for finished terrazzo floor.
- .3 Terrazzo contractor to start work only when all defects are corrected.

#### 3.03 INSTALLATION

- .1 Do terrazzo work in accordance with TTMAC 09 66 00 Terrazzo Installation Manual.
- .2 Install terrazzo after concrete slabs have cured 28 days.
- .3 Install divider strips true and level to detailed pattern.
- .4 Install non-slip channel on ramps and stairs where indicated.
- .5 Apply non-slip aggregate at rate of 1.25 kg/m<sup>2</sup> to designated surfaces.
- .6 Install covers at building expansion joints.
- .7 Install control joints above control joints in subfloor.
- .8 Provide mat recesses with frames made up using divider strips.
- .9 Slope finished terrazzo floors to drains.
- .10 Produce terrazzo finished surfaces to match samples.
- .11 Floors:
  - .1 Monolithic terrazzo: provide 16 mm minimum terrazzo topping bonded to concrete base slab.
  - .2 Bonded terrazzo: to TTMAC detail No. 1.
  - .3 Floating standard terrazzo: to TTMAC detail No. 2.

- .4 Venetian terrazzo: to TTMAC detail No. 2V.
- .5 Epoxy bonded terrazzo: provide 16 mm maximum topping and epoxy concrete adhesive underbed bonded to concrete base slab.
- .12 Bases:
  - .1 Terrazzo bases: as indicated.

# 3.04 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

# 3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 Cleaning.
  - .1 Clean flooring [and][base] surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.

# END OF SECTION

#### 1 GENERAL

# 1.01 RELATED REQUIREMENTS

- .1 Section 04 22 00 Concrete Masonry Units
- .2 Section 05 50 00 Metal Fabrications
- .3 Section 07 92 00 Joint Sealants
- .4 Section 08 11 00 Metal Doors and Frames
- .5 Section 09 21 16 Gypsum Board Assemblies

## 1.02 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Safety Data Sheets (SDS).
- .2 Master Painters Institute (MPI)
  - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.

## 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Confirm products to be used are in MPI's approved product list.
- .3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour number[s].
  - .4 Manufacturer's Safety Data Sheets (SDS).
- .4 Samples:
  - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
- .5 Test reports: Provide certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance

characteristics and physical properties.

- .1 Lead, cadmium and chromium: presence of and amounts.
- .2 Mercury: presence of and amounts.
- .3 Organochlorines and PCBs: presence of and amounts.
- .6 Certificates: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.
- .7 Manufacturer's Instructions:
  - .1 Provide manufacturer's installation and application instructions.

# 1.05 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 0178 00 Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.
- .3 Include:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour number[s].

# 1.06 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
  - .1 Provide maintenance materials in accordance with Section 0178 00 Closeout Submittals.
  - .2 Submit 1 one four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

# 1.07 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.
  - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
  - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
  - .5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
  - .6 Retain purchase orders, invoices and 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 Soffits: 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.

### 1.08 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .1 Labels: to indicate:
    - .1 Type of paint or coating.
    - .2 Compliance with applicable standard.
    - .3 Colour number in accordance with established colour schedule.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Observe manufacturer's recommendations for storage and handling.
  - .3 Store materials and supplies away from heat generating devices.
  - .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
  - .5 Keep areas used for storage, cleaning and preparation, clean and orderly. After completion of operations, return areas to clean condition to approval of Consultant.
  - .6 Remove paint materials from storage only in quantities required for same day use.
  - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
  - .8 Fire Safety Requirements:
    - .1 Provide 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 (NFC).

#### 1.09 SITE CONDITIONS

.1 Ambient Conditions:

.1

- Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces.
  - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

- .3 Provide continuous ventilation for 7 days after completion of application of paint.
- .4 Co-ordinate use of existing ventilation system Owner 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 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .7 Temperature, Humidity and Substrate Moisture Content Levels:

.1

- Unless pre-approved written approval by product manufacturer, perform no painting when:
  - .1 Ambient air and substrate temperatures are below 10 degrees C.
  - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
  - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
  - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
  - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
  - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
- .2 Perform painting work when maximum moisture content of the substrate is below:
  - .1 12% for concrete and masonry (clay and concrete brick/block). Allow new concrete and masonry to cure minimum of 28 days.
  - .2 15% for hard wood.
  - .3 17% for soft wood.
  - .4 12% for plaster and gypsum board.
- .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .8 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation

conditions are such that airborne particles will not affect quality of finished surface.

- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
- .3 Apply paint when previous coat of paint is dry or adequately cured.
- .9 Additional interior application requirements:
  - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

# 2 PRODUCTS

### 2.01 MATERIALS

- .1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .7 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:
  - .1 Be Water-based, Water soluble, Water clean-up.
  - .2 Be non-flammable.
  - .3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
  - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
  - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

# 2.03 COLOURS

.1 Consultant will provide Colour Schedule after Contract award.

#### 2.04 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

# 2.05 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	<u>Gloss @ 60 degrees</u>	<u>Sheen @ 85 degrees</u>	
Gloss Level 1 - Matte	Max. 5	Max. 10	Finish (flat)
Gloss Level 2 -	Max.10	10 to 35	Velvet-Like Finish
Gloss Level 3 -	10 to 25	10 to 35	Eggshell Finish
Gloss Level 4 -	20 to 35	min. 35	Satin-Like Finish
Gloss Level 5 -	35 to 70		Semi-Gloss Finish
Gloss Level 6 -	70 to 85		Traditional Gloss
Gloss Level 7 - High	More than 85		Gloss Finish

.2 Gloss level ratings of painted surfaces as indicated.

#### 2.06 INTERIOR PAINTING SYSTEMS

- .1 Plaster and gypsum board: gypsum wallboard. Institutional Low Odour//Low VOC MPI Interior Finish System #9.2M – G3
- .2 Clay masonry units: pressed and extruded brick: Institutional Low Odour//Low VOC MPI Interior Finish System #4.1 – G4
- .3 Concrete masonry units: smooth and split face block and brick: Institutional Low Odour//Low VOC MPI Interior Finish System #4.2E – G5
- .4 Structural steel and metal fabrications: columns, beams, joists: Institutional Low Odour//Low VOC MPI Interior Finish System #5.1S – G5
- .5 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts. Institutional Low Odour//Low VOC MPI Interior Finish System #5.3N – G5

# 3 EXECUTION

# 3.01 MANUFACTURER'S INSTRUCTIONS

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

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

## 3.03 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Interior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.
- .3 Interior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Consultant in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .4 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

#### .5 Maximum moisture content as follows:

- .1 Stucco, plaster and gypsum board: 12%.
- .2 Concrete: 12%.
- .3 Clay and Concrete Block/Brick: 12%.
- .4 Hard Wood: 15%.
- .5 Soft Wood: 17%.

#### 3.04 **PREPARATION**

- .1 Protection (not applicable to new painting work):
  - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
  - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .3 Protect factory finished products and equipment.
  - .4 Protect building occupants and general public in and about the building.

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- .2 Surface Preparation (not applicable to new painting work):
  - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .3 Place "WET PAINT" signs in occupied areas as painting operations progress.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by [vacuuming,] wiping with dry, clean cloths [or compressed air].
  - .2 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. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Carried out during shop priming: 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.
- .9 Touch up of shop primers with primer as specified.

## 3.05 EXISTING CONDITIONS

- .1 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to [Departmental Representative][DCC Representative][Consultant]. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .2 Maximum moisture content as follows:
  - .1 Stucco: 12%.
  - .2 Concrete: 12].
  - .3 Clay and Concrete Block/Brick: 12%.
  - .4 Hard Wood: 15%.
  - .5 Soft Wood: 17%.

## 3.06 APPLICATION

- .1 Method of application to be as approved by Consultant. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
  - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
  - .4 Brush out immediately all runs and sags.
  - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

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- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

#### 3.07 MECHANICAL/ ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .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 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint fire protection piping red.
- .8 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .9 Paint natural gas piping yellow.
- .10 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.

.11 Do not paint interior transformers and substation equipment.

## 3.08 SITE TOLERANCES

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

## 3.09 FIELD QUALITY CONTROL

- .1 Interior painting and decorating work to be inspected by a MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor will notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 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 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .3 Advise Consultant when surfaces and applied coating is ready for review. Provide adequate lighting at time of review.

## 3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

## END OF SECTION

## 1 GENERAL

## 1.01 RELATED REQUIREMENTS

- .1 Section 09 30 13 Ceramic Tiling
- .2 Section 10 28 00 Toilet and Bath Accessories

## 1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
  - .1 <u>CSA B651-[12]</u>, Accessible Design for the Built Environment.
- .2 ASTM A 666 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- .3 ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .4 National Fire Protection Association (NFPA) 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
- .5 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies"
- .7 CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"

#### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plastic toilet compartments and include preparation instructions and recommendations, product characteristics, performance criteria, physical size, finish, limitations and installation methods.
- .3 Shop Drawings:
  - .1 Submit drawings to indicate fabrication details, plans, elevations with location and type of hardware, and installation details.
- .6 Samples:
  - .1 Submit 100 x 100 mm samples of panel showing finish on both sides, two finished

Trillium Lakelands District School Board WASHROOM RENEWALS SUMMER 2021 edges and core construction representing actual product, colour and patterns.

#### 1.04 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- .2 Installer Qualifications: A company regularly engaged in installation of products specified in this section, with a minimum of 5 years of experience.
- .3 Materials: Doors, panels and pilasters constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.
- .4 Performance Requirements:
  - .1 Fire Resistance. Partition materials shall comply with the following requirements when tested in conformance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies"
  - .2 CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"
  - .3 Material Fire Ratings: National Fire Protection Association (NFPA) 286: Pass.

## 1.04 DELIVERY, STORAGE AND HANDLING

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

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## 1.05 **PROJECT CONDITIONS**

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.06 WARRANTY

.1 Provide manufacturer's written warranty covering all plastic components and hardware against breakage, corrosion, and delamination for 25 years from Substantial Performance.

## 2 PRODUCTS

## 2.01 PRODUCT AND MANUFACTURER

- .1 Solid plastic (HDPE) toilet partitions.
  - .1 Acceptable Product: Hiny Hiders as manufactured and supplied by Scranton Products.
  - .2 Style: Floor mounted, overhead-braced toilet compartments.

## 2.02 MATERIALS

- .1 Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.
- .2 Stainless Steel Castings: ASTM A167, Type 304
- .3 Aluminum: ASTM 6463-T5 Alloy

#### 2.03 SOLID PLASTIC TOILET COMPARTMENTS

- .1 Doors, Panels and Pilasters: 1 inch (25.4 mm) thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
  - .1 Door and panel height: 55 inches (1397mm)
  - .2 Pilaster height: 82 inches (2083mm) high.
- .2 Panel Colour: Traditional Series
  - .1 Pine Glen Public School: Glacier Grey - Orange Peel .2 Irwin Memorial Public School: Glacier Grey - Orange Peel .3 Gravenhurst High School: Glacier Grey - Orange Peel .4 Haliburton Highlands Secondary School: Glacier Grey - Orange Peel .5 J Douglas Hodgson Elementary School: Glacier Grey – Orange Peel .6 Fenelon Township Public School: Glacier Grey - Orange Peel .7 IE Weldon Secondary School: Glacier Grey - Orange Peel .8 Leslie Frost Public School: Glacier Grey - Orange Peel .9 Parkview Public School: Glacier Grey - Orange Peel

- .3 Headrails: clear anodized, heavy duty extruded 6463-T5 alloy aluminum, anti grip design. Fastened to headrail brackets with stainless steel tamper resistanct Torx head sleeve bolt and nut, fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
- .4 Pilaster shoe: 3 inches (76mm) high type 304, 20 guage stainless steel. Secured to pilasters with stainless steel tamper resistant Torx head sleeve bolt and nut.
- .4 Attachment: stainless steel tamper proof type screws and bolts.

# 2.02 COMPONENTS

- .1 Hinges:
  - .1 Continuous Stainless Steel Helix Hinge:
    - a. Length: 54 inches (1372 mm).
  - .2 Material/finish: stainless steel or anodized aluminum.
  - .3 Swing: as indicated in drawings and reviewed submittal.
  - .4 Return movement: adjustable self closing.
  - .5 Emergency access feature.
- .2 Latch set: surface mounted anodized aluminum, emergency access feature.
- .3 Wall and connecting brackets: Heavy duty 6463-T5 anodized aluminum extrusion.
  - .1 Fastener locations relative to glass tile mosaic installation: No fasteners acceptable in glass tile.
- .4 Coat hook: Refer to Section 10 28 00.
- .5 Door pull: Barrier-free type suited for in-swinging or out-swinging doors, anodized aluminum or stainless steel both sides of barrier free stall doors.
- .6 Door Bumper. Provide where door swings against tile wall finish.

## 2.03 FABRICATION

- .1 Doors, panels and screens: 25 mm thick, solid HDPE panels
- .2 Pilasters: 25 mm thick, constructed same as door.

## 3 EXECUTION

## 3.01 EXAMINATION

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

Trillium Lakelands District School Board WASHROOM RENEWALS SUMMER 2021 .3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

# 3.02 INSTALLATION

- .1 Ensure supplementary anchorage, if required, is in place.
- .2 Do work in accordance with <u>CSA B651</u>.

# 3.03 ERECTION

- .1 Partition erection:
  - .1 Install partitions secure, plumb and square.
  - .2 Leave 12 mm space between wall and panel or end pilaster.
  - .3 Anchor mounting brackets to masonry or concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors.
  - .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
  - .5 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings with stainless steel shoes.
  - .6 All accessories indicated as mounted to work of this section to be performed by installer of toilet partitions for purposes of warranty.
  - .7 Equip each door with hinges, latch set, and each stall with coat hook. Adjust and align hardware for proper function. Set door open position at 30 degrees to front. Install door bumper wall door mounted. Refer to Section 10 28 00
  - .8 Equip outswinging doors with door pulls on inside and outside of door [in accordance with <u>CSA B651</u>].
  - .9 Install hardware grab bars where indicated attached to toilet partitions.
- .3 Floor supported and overhead braced partition erection:
  - .1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.
  - .2 Secure pilaster shoes in position.
  - .3 Secure headrail to pilaster face with not less than two fasteners per face.
  - .4 Set tops of doors parallel with overhead brace when doors are in closed position.

# 3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

# END OF SECTION

## 1 GENERAL

## 1.01 REFERENCE STANDARDS

- .4 CSA Group (CSA)
  - .1 <u>CAN/CSA-B651-[04]</u>, Accessible Design for the Built Environment.

# 1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

## 1.04 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 0178 00 - Closeout Submittals.

#### 1.05 MAINTENANCE MATERIAL SUBMITTALS

- .1 Tools:
  - .1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 Closeout Submittals.
  - .2 Deliver special tools to Owner.

## 1.06 DELIVERY, STORAGE AND HANDLING

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

Trillium Lakelands District School Board WASHROOM RENEWALS SUMMER 2021 .3 Replace defective or damaged materials with new.

## 2 PRODUCTS

## 2.01 MATERIALS

.1 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

## 2.02 COMPONENTS

- .1 Supply and install unless otherwise noted.
- .2 Toilet tissue dispenser: TP-1: Supplied by Owner, Installed by Contractor. Torx
- .3 Soap dispenser: SD-1: Supplied by Owner, Installed by Contractor
- .4 Feminine napkin disposal bin: SND-1: Supplied by Owner, Installed by Contractor: Bobrick
- .5 Hand dryer: HD-1: listed under re-examination service of ULC and CSA approved.
  - .1 Mounting: surface.
  - .2 Dysan V, stainless steel finish Refer also to Electrical
- .6 Shower curtain: SC-1: (Not used)
- .7 Shower rods: SR-1: (Not used)
- .8 Shower seat: SS-1: (Not used)
- .9 Grab bars: 38mm outside diameter x 1.6mm wall tubing, Type 304 stainless steel with No. 4 finish, wall flanges secured to wall with stainless steel set screws, concealed screw attachment, flanges welded to tubular bar. Peened hand grips. Grab bar material and anchorage to withstand downward pull of 2.2kN.

.1	GB-1:	90 Degree 760mm x 760mm x 38mm:	Bobrick B-6898.99
.2	GB-2:	Straight 610mm x 38mm:	Bobrick B-6806.99
.3	GB-3:	Striaght 305mm x 38mm:	Bobrick B-6806.99
.4	GB-4:	Swing-up Grab-bar:	Bobrick B-4998.99
.4	GB-4:	Swing-up Grab-bar:	Bobrick B-4998.9

- .10 Robe hook: CH-1: Frost 1150-SS safety release coat hook. Stainless.
- .11 Tilt mirror: MI-1: Bobrick B-293 2436, wall mounted unit, 610mm wide x 915mm high with 6mm tempered glass mirror, No. 4 stainless steel frame.
- .12 Fixed mirror: MI-2: Bobrick B-1658 2436, wall mounted unit, 610mm wide x 915mm high with 6mm tempered glass mirror, No. 4 stainless steel frame.

- .13 Shelf: SH-1 surface mounted, 100mm deep, 460 wide, stainless steel. Gamco/Bobrick MS-18
- .14 Hand towel dispenser: PTD-1: Supplied by Owner, Installed by Contractor
- .15 Nursing Bench/Change Table: CT-1: Pressalit 2000. Note: Structural and electrical requirements refer to related disciplines drawings and specifications and architectural details.
- .16 Washroom signage: Refer to Appendix A Details
  - .1 SN-1: Girl's Washroom with Barrier Free Symbol and Tactile Braille
  - .1a SN-1A: Girl's Washroom
  - .2 SN-2: Boy's Washroom with Barrier Free Symbol and Tactile Braille
  - .2a SN-2A: Boy's Washroom
  - .3 SN-3: Universal Washroom with Barrier Free Symbol and Tactile Braille
  - .4 SN-4 Female Staff Washroom with Barrier Free Symbol and Tactile Braille
  - .4a SN-4A Female Staff Washroom
  - .5 SN-5 Male Staff Washroom with Barrier Free Symbol and Tactile Braille
  - .5a SN-5A Male Staff Washroom
  - 6. SN-6 Gender Neutral Staff Washroom
  - 7. SN-7 Gender Neutral Washroom with Barrier Free Symbol and Tactile Braille
  - 7a. SN-7A Gender Neutral Washroom
- .17 Door Stop: DS-1: Canadian Builders Hardware CBH 140
- .18 Backrest: BR-1: Frost 1028 32mm stainless steel tube with 1.6mm wall, concealed fastening, backrest 16mm solid plastic laminate (white). Coordinate with flush valve installation.
- .19 Sanitary Napkin Vending Machine (SNV-1): Supplied by Owner, Installed by Contractor.

## 3 EXECUTION

#### 3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

#### 3.02 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
  - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
  - .2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.
  - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
  - .4 Toilet and shower compartments: use male to female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.
- .5 Install mirrors in accordance with manufacturer's instructions.

#### 3.03 ADJUSTING

- .1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.
- .2 Lubricate moving parts to operate smoothly and fit accurately.

#### 3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 0174 00 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 0174 00 Cleaning.

## 3.05 PROTECTION

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

## END OF SECTION

HL ENGINEERING

# MECHANICAL SPECIFICATIONS

FOR PROJECT:

**TLDSB SUMMER 2021** 

HL PROJECT NO.: 20065 ISSUED FOR TENDER MAY, 2021

**HL ENGINEERING LTD** 

14721 WOODBINE AVE., STOUFFVILLE, ON L4A 2G7 TEL: 905-713-0003



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# Part 1 General

# 1.1 **RELATED INSTRUCTIONS**

- .1 Division 00, General Requirements is part of this Section and shall apply as if repeated here.
- .2 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25. The Mechanical Contractor's scope shall include Divisions 21, 22, 23, & 25.
- .3 Conform to the conditions stated in the Contract Documents.
- .4 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.

# **1.2 INTENT AND SCOPE OF WORK**

- .1 The Work shall include all labour, materials, tools, equipment, services and incidentals, etc., necessary to provide the complete systems.
- .2 The intent of these specifications is to provide complete systems that are ready for operation, and while no attempt has been made to detail or list each individual part required.
- .3 Sections of these Specifications are not intended to delegate functions nor to delegate Work and supply to any specific trade.
- .4 The Specifications are integral with the Drawings which accompany them. Neither is to be used alone. Any item or subject omitted from one, but included in the other is properly specified.
- .5 Wherever differences occur in the Contract Documents, the maximum conditions will govern and be allowed for in the Contract Price. The item to be incorporated will be at the option of the Consultant.

## 1.3 **DEFINITIONS**

- .1 Where used, words "Mechanical" or "Mechanical Work", "Mechanical Divisions", "Mechanical Systems" shall include all Work in Divisions of 21, 22, 23 and 25.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on Site to perform work to make the building and Site complete in all respects.
- .3 Where used, the word "Product" shall mean the material, equipment, component, machinery, or fixture forming the completed Work.
- .4 Where used, the word "supply" shall mean to include all labour, materials and services to furnish to the Site in the location required or directed complete with accessory parts, but is not intended to include installation.
- .5 Where used, the word "install" shall mean to include all labour, materials and services to secure in place Products, including receiving, unloading, transporting, storage, uncrating,

installing, connecting and performance of such testing and finish Work as is compatible with the degree of installation specified complete ready for use.

- .6 Where used, the word "provide" shall mean to supply and install as each is described above.
- .7 Where used, the word "commission" shall mean to start-up and initial operation of Products as required to demonstrate satisfactory operation of Products and the entire system including calibration of any instrumentation.
- .8 Where used, the word "Work" shall mean the total construction required by the Contract Documents and includes all labour, Products and services.
- .9 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance, report to", shall mean "approved, directed, permitted, accepted, report to", by the Consultant.

## 1.4 STANDARDS AND REGULATIONS

- .1 Conform to latest version of the applicable standards and regulations, including Federal, Provincial and Municipal laws, By-laws, regulations, Codes and Standards and the requirements of other authorities having jurisdiction in the area where the Work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract Price. Standards established by the Drawings and Specifications shall not be reduced by applicable codes or regulations.
- .2 Comply with the latest editions and all amendments of the following standards and regulations. Where conflicts in requirements occur, the higher standards shall apply.
  - .1 Canadian Standards Association (CSA) Standards
  - .2 Underwriter's Laboratories of Canada (ULC) Standards
  - .3 Canadian Underwriters Association (CUA) Standards
  - .4 Ontario Building Code (OBC)
  - .5 Ontario Fire Code (OFC)
  - .6 National Building Code of Canada (NBCC)
  - .7 National Fire Code of Canada (NFCC)
  - .8 National Fire Protection Association (NFPA) Standards
  - .9 American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE) Handbook
  - .10 American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE) Standards
  - .11 Air Conditioning, Heating and Refrigeration Institute (AHRI) Standards
  - .12 Sheet Meal & Air Conditioning Contractors National Association (SMACNA) Standards
  - .13 Air Movement and Control Association (AMCA) Standards
  - .14 Canadian Heating, Ventilating and Air Conditioning Code
  - .15 National Plumbing Code of Canada (NBCC)
  - .16 Ontario Plumbing Code Part 7
  - .17 Sections 41 and 42 regarding provision of sewers and water mains, Ontario Regulation 54/76 of the Ontario Water Resources Act

.18 All standards and regulations mentioned in other Sections of this Division

## 1.5 TENDERS AND FORMS

- .1 State separate prices in the Bid Form for the Work indicated in the Contract Documents. Prices shall include the complete cost of the Work, i.e. all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. It shall be the Owner's option to delete from the Contract any of the Work indicated at the prices stated.
- .2 Cash allowances shall be carried in the Contract for the Work indicated, including all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. If the actual cost is less than the Cash Allowance, the remainder shall be reverted to the Owner. If the actual cost exceeds the Cash Allowances, the Owner will reimburse the extra amount.

## **1.6 PERMITS AND FEES**

- .1 Apply for, obtain, and pay for permits, licenses, certificates, connection charges, tests and inspections required for the work and/or by authorities having jurisdiction. Include any premiums applicable due to requirements for after office hour inspections.
- .2 Submit all required documentation to the authorities for their approval and comments before starting any Work. Provide all additional drawings, details or information as may be required. Comply with any changes requested by Authorities as part of the Contract, but notify the Consultant immediately of such changes.

# 1.7 EXAMINATION OF SITE AND CONDITIONS

- .1 Examine the Site and local conditions prior to tender submission.
- .2 Examine carefully all Drawings and complete Specifications to ensure that Work and equipment will satisfy Site conditions and performance requirements as shown. The Drawings do not show all Site conditions and existing equipment. The Contract Price shall cover all existing Site conditions.
- .3 No allowance will be made later for any expense incurred through failure to make these examinations or to report any such discrepancies and omissions in writing, five Working Days prior to tender closing.
- .4 Examine the work of Other Contractors and report at once any defect or interference affecting the work, its completion or warranty.
- .5 Submission of a tender confirms that the Contract Documents and Site conditions are completely understood and accepted without qualifications unless exceptions are specifically indicated in the Bid Form.

# **1.8 CONTRACT DOCUMENTS**

- .1 The Contract Drawings of this Division are performance drawings and indicate the scope and general arrangement of the Work. They are diagrammatic except where specific details are given.
- .2 They shall be read in conjunction with Architectural, Structural, Electrical and all other Division Drawings of the Contract.

- .3 Obtain accurate dimensions from the architectural and structural Drawings, or by Site measurement. Locations and elevations of services are approximate and must be verified before construction is undertaken.
- .4 Equipment dimensions are based on the first or top named manufacturer. Dimensions of items by other listed manufacturers shall not exceed variable space with necessary allowance for service and maintenance.
- .5 Make necessary change to runs of piping, ductwork and raceways to accommodate structural conditions. Location of pipes, ductwork, raceways and equipment may be altered without additional charge or expense to Owner providing such change is made before installation of items involved. Such changes will be authorized by ratified site instructions and shall be recorded on Record Set of Drawings.
- .6 The general location and route to be followed by pipes and ductwork is indicated on Drawings. Install these items to conserve headroom and interfere as little as possible with the free use of space through which they pass.

# **1.9 SHOP DRAWINGS**

- .1 Prepare and submit shop drawings of all Products in accordance with Division 1-General Requirements as specified herein and in each Section of this Division.
- .2 PDF files are acceptable.
- .3 Shop drawings shall have a minimum 210 mm x 285 mm (8-1/2" x 11") clear space on the front sheet, suitable for stamping. The cover sheet shall include the project name, Contractor's name and Product description. Where multiple Products are submitted in one binding, include an index of all equipment as the front sheet.
- .4 Assume full responsibility for submission of shop drawings. Allow a minimum of 10 Working Days for the Consultant review.
- .5 The Consultant will only review shop drawings bearing the Mechanical Division and Contractor's stamps of approval.
- .6 Submit shop drawings showing the following:
  - .1 Contract name
  - .2 Contract number
  - .3 Manufacturer's name and model number
  - .4 Supplier's name
  - .5 Approval agencies
  - .6 Shipping and working weight
  - .7 Performance characteristics
  - .8 Dimensions, including required clearances
  - .9 Power characteristics
  - .10 Bill of materials and finishes
  - .11 Time required to fabricate and deliver
  - .12 All variations from Contract Documents

- .13 Construction and field connection details
- .14 Installation requirements
- .7 The review shall not relieve the Contractor of its responsibility to provide Products in accordance with the design intent and Contract Documents.
- .8 Manufacturer's printed data sheets for standard items are acceptable providing pertinent characteristics are identified and relate to specified items.
- .9 Each shop drawing shall be checked and stamped as being correct, by trade purchasing item, and by the Contractor, before drawing is submitted.
- .10 Verify and check dimensions to ensure proper installation of equipment in available space and without interference to the Work of other Divisions.
- .11 Where requested, submit samples of Products for review and approval.
- .12 Do not have equipment delivered to the Site until a shop drawing for the item has been reviewed.

## 1.10 EXISTING, INTERFERENCE AND DETAIL DRAWINGS

- .1 Submit complete existing mechanical system drawings prior to construction work.
- .2 Existing drawings shall show complete and accurate existing system conditions, location of all devices and equipment, piping, ductwork and raceways.
- .3 Prepare Existing, Interference and Details Drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of piping, ductwork and raceways through building structure.
- .4 Prepare fully dimensioned detail drawings of Products and services in service and ceiling spaces, and all other critical locations. Coordinate the Work with all other Divisions. Base drawings on reviewed shop drawings and indicate all details pertaining to access, clearances, sleeves, inserts, curbs, equipment bases, anchors, special hangers, weights on all load points, electrical connections, and elevations of pipes, ducts and conduits. Include location of access doors provided under this Division.
- .5 Ensure that clearances required by jurisdictional authorities are indicated on the interference drawings.
- .6 The Owner will not consider any extra cost as a result of the Contractor's failure to prepare proper drawings. Submit drawings two (2) weeks after receipt of the Notice to Commence the Work.

## 1.11 RECORD DRAWINGS

.1 Maintain at least 2 sets of documents at the start of Contract Work and clearly mark on same as the Work progresses, changes and deviations from Work shown so that on completion the Owner will have records of the exact location (dimensioned) of ducts, piping, services and equipment and a record of material and equipment changes.

- .2 The Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed at each Site meeting.
- .3 Prepare record drawings showing the following:
  - .1 All buried piping runs are to be shown complete with dimension from building lines.
  - .2 Inverts of all services entering and leaving the building and at property lines
  - .3 Dimensions of underground services in relation to property lines at key points of every run
  - .4 Elevations of underground services in relation to ground floor level of the building
  - .5 Location of all services embedding in the structure, utilizing grid line references
  - .6 Dimensioned locations of all services left for future work
  - .7 All changes to the Work due to Change Orders and Site Instructions
  - .8 All changes to the Work during construction
  - .9 All changes to structural and architectural elements that affect the backgrounds of this record set
  - .10 Location and designation of all electrically supervised valves, flow switches and pressure switches
  - .11 Location and designation of all items requiring access or service in a hidden location
  - .12 Location of all access doors provided
  - .13 All changes and revisions to Specifications, details and equipment schedules
  - .14 All homerun conduits, junction boxes for complete electrical systems
- .4 Upon completion of the Work, prior to the Substantial Performance inspection, the Contractor shall neatly transfer recorded information and make a final As-Built submission for review in the following form:
  - .1 One (1) copy of clean, legible prints
  - .2 One (1) copy of ACAD2010 format drawings, files shall retain all setting (layers, line types, scales colors, etc) used in the Contract drawing
- .5 After Record Drawings have been reviewed, revise if necessary. Deliver drawings in the form of Autocad disk and three (3) sets of prints taken from those disks to the Owner. Where original design ACAD files to be obtained from HL, a cost of \$500.00 plus HST will apply.

# 1.12 OPERATION AND MAINTENANCE MANUAL

- .1 The Contractor will be responsible for collecting and organizing three (3) copies of all data, operating instructions, maintenance and trouble-shooting instructions, parts lists, parts diagrams, evidence of all tests and certifications, complete reviewed shop drawings, etc. and assembling them in neat manuals in hard cover. Identify cover "Operation and Maintenance Manual for NAME OF THE PROJECT". Manuals shall be separated with dividers in logical sections and volumes.
- .2 The Contractor shall also collect from Subcontractors and Suppliers all Guarantees/Warranties specified in the Contract Documents. Check that starting date (date of Total Performance of the Work) and extent of each guarantee/warranty are clearly indicated. Check also that all guarantees/warranties indicate the Supplier's Name or

Subcontractor's Name as appropriate together with contact phone number. Assemble neatly in labelled section of each manual.

- .3 Prior to requesting the Substantial Performing inspection, submit one (1) copy for review. Make all corrections as requested and forward the corrected two (2) copies to the Owner.
- .4 Each book shall contain the following as minimum:
  - .1 Manufacturer's literature, parts list, approved shop drawing, and name and address of closest service organization and spare parts source, for each item of equipment
  - .2 Voltage and ampere rating for each item of electrical equipment, Note: Suitably fold shop drawings larger than 8 1/2" x 11" and place in a manila envelope, 3-hole punched, for inclusion in book
  - .3 Description of system
  - .4 Schematic drawings for electrical, ventilating, heating and plumbing systems
  - .5 Mount one set of schematic drawings in a glazed frame in the mechanical room
  - .6 Description of summer operations
  - .7 Description of winter operations
  - .8 Controls including diagrams
  - .9 Maintenance and oil schedule
  - .10 Type of oil and grease to be used on each piece of equipment
  - .11 Method of operation for each piece of equipment, and list of equipment with replacement parts, part number, suppliers, addresses etc
  - .12 Valve Charts
  - .13 Air and Water Balancing Reports
  - .14 Contractor warranty and equipment extended warranties

# 1.13 SCHEDULING

- .1 Comply with the construction schedule. Conform to phasing of Work if applicable. Conform to interim and final completion dates.
- .2 Coordinate with general construction schedule.
- .3 Submit a bar chart schedule showing the start and completion dates for each activity based on a critical path analysis of the Work.
- .4 Include in the schedule for Mechanical Work done by others.

# 1.14 ALTERNATES AND SUBSTITUTIONS

- .1 Substitute Products will only be considered when tendered Products become unobtainable. State in the tender the proposed substitute and amount added or deducted.
- .2 It is the responsibility of the Contractor to ensure "Substitute Products" fit the space allotted and provides the performance specified in the Contract Documents.
- .3 If Products manufactured and/or specified by a manufacturer named as equivalent are used in lieu of the manufacturer specified, the Contractor shall be responsible for ensuring that the substituted Product is equivalent in performance and operating characteristics to the

specified Product, and, it shall be understood that all costs for additional space, larger power feeders and changes to associated or adjacent Work will be borne by the Contractor offering the substitution. In addition, in Equipment Rooms where Products named as equivalent is used in lieu of specified Products and the dimensions of such Products differs from the specified Products, prepare and submit for approval, accurately dimensioned layouts of rooms affected.

# 1.15 VALUATION OF CHANGES

- .1 For each change submit a complete itemized breakdown of labour and material.
- .2 Only the net difference between an extra and a credit will be subject to overhead and profit mark up.
- .3 Material shall be valued at current trade prices incorporating all discounts and labour rates. Overhead and profit shall be as shown in the Tender Form.

# 1.16 WORKMANSHIP

.1 Workmanship and method of installation shall conform to best standards and practice and be performed to approval. Work shall be done by tradesmen skilled in the type of work to be performed. Where required by local or other By-laws and Regulations, tradesmen shall be licensed in their trade. Install all Work and equipment according to the manufacturer's printed directions.

## 1.17 INSTALLATION REQUIREMENTS

- .1 Coordinate the Work of this Division with the Work of all other Divisions. Inform the Subcontractors for the Work of other Divisions of the locations of openings, chases, sleeves, supports, services, connections, etc., to be incorporated into the Work.
- .2 Check the locations of all expansion/building joints and ensure that all electrical installations, are at or crossing these locations, are as detailed and as required to compensate for the possible movement at the joint.
- .3 Confirm the exact location of outlets, fixtures and connections. Check architectural details and elevations for more requirements. Confirm location of connection points for equipment supplied under other Divisions or by the Owner.
- .4 Install neatly all equipment and apparatus to allow free access for maintenance, adjustment and eventual replacement.
- .5 Install metering and/or sensing devices to provide accurate and reliable sampling of quantities being measured. Install instruments to permit easy observation.
- .6 Provide suitable shielding and physical protection for devices.
- .7 Install all Products and services in accordance with the manufacturer's requirements and/or recommendations.
- .8 Provide all supports, hangers and fasteners. Secure all Products and services so as not to impose undue stresses on the structure and systems.

- .9 Ensure that the load onto structures does not exceed the maximum loading per square meter (foot) as shown on structural Drawings or as directed.
- .10 Do not use explosive activated tools.
- .11 Install services and equipment which are to be concealed, as close as possible to building structure so that necessary furring can be kept to minimum dimensions.
- .12 Locate wall and ceiling diffusers in exact accordance with dimensions furnished by the ceiling installer, wall finish installer, masonry installer and Consultant. Make any necessary adjustments in duct branches to allow diffusers to coincide with ceiling and wall patterns.

## 1.18 FIELD REVIEW

- .1 The Owner and Consultant shall have access to the Site at all times for review of the Work during construction.
- .2 Arrange for review of Products during manufacturing.
- .3 Provide all gauges, instruments and other necessary measuring equipment required for review of the Work.
- .4 Maintain a complete set of Contract Documents at all times for field reference.
- .5 Correct any deficiencies as they are reported during the performance of the Work.

## **1.19 TEMPORARY SERVICES**

- .1 Provide temporary office, workshop and tools and material storage space for the Work and assume responsibility for any loss or damage thereto. Buildings erected for this purpose shall conform in appearance to those erected for similar purposes under other Divisions of the Specifications.
- .2 Provide scaffolding and shoring necessary for the Work of this Division. Scaffolding and shoring shall be adequate to protect the workmen according to Provincial and Local Regulations.
- .3 Provide rigging and mill-wrighting, labour and equipment necessary for the Work of this Division. Employ only workmen well experienced and skilled in such trades for this portion of the Work.
- .4 Provide hoisting machinery, operators, labour and materials necessary to lift and place equipment supplied under this Division.
- .5 The permanent systems or any part thereof shall not be used during construction for construction purposes, unless so permitted in advance by the Owner, in writing.

## **1.20 PROTECTION AND CLEANING**

.1 Securely plug or cap open ends of piping, ductwork, raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice.

- .2 Equipment stored on Site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.
- .3 Protect all finished and unfinished Work of this and other Divisions from damage due to carrying out of this Work.
- .4 Make good any damage caused directly or indirectly to walls, floors, ceilings, woodwork, brickwork, finishes, etc.
- .5 Clean all polished, painted and plated Work. Remove all debris, surplus material and tools.
- .6 Carry out additional cleaning operations of systems as specified in other Sections of this Division and as Division 1 requires.

## 1.21 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling.
- .3 Divert unused wiring and metal materials to a metal recycling facility, or place in appropriate on-site bins for recycling.

## 1.22 MOCK-UPS AND TRIAL USAGE

- .1 Provide mock-ups in accordance with the conditions stated in the Contract Documents and Division 1 of the Specifications.
- .2 Trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to, or breaking of, any part of such Work which may be so used.

## 1.23 COMMISSIONING, TESTING AND DEMONSTRATION

- .1 Be responsible for commissioning of all Work provided under this Division.
- .2 Operating equipment and systems shall be tested in presence of Owner or Owner's commissioning group (and the sub-consultant at their option) to demonstrate compliance with specified requirements in the Contract Documents.
- .3 Contractor shall notify the Consultant, in writing, fourteen (14) days prior to tests scheduled under requirement of this Section.
- .4 Testing shall be conducted under specified design operating conditions as required in the Contract Documents or other conditions as accepted by the sub-consultant.
- .5 All elements of the systems shall be tested to demonstrate that total systems satisfy all requirements of the Contract Documents. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by inter-connections of other major systems.

- .6 All Special testing materials and equipment shall be provided by the appropriate Subcontractor, as determined by the Contractor.
- .7 The Contractor shall be responsible for completing and submitting start-up and pre-functional performance testing reports.
- .8 If acceptable performance cannot be achieved, the necessary corrective measures shall be carried out promptly.
- .9 Demonstrate to the Owner and Consultant the operation of all systems when commissioning has been completed. Demonstration will include the following:
  - .1 Operation of all equipment and systems under each mode of operation
  - .2 Operation of all automatic control
  - .3 Location of and operation of all access panels
  - .4 Noise levels of all mechanical equipment and terminal devices under maximum operating conditions
- .10 At the completion of commissioning, testing, balancing and demonstration submit the following to the Consultant:
  - .1 Letter certifying that all work specified is complete, clean and operational in accordance with the Contract Documents
  - .2 As-built documents
  - .3 All inspection authorities approvals
- .11 Provide a sequence of operation for seasonal switch-over (heating/cooling) of systems indicating valves to be normally open or closed.
- .12 If field tests show deficient equipment, independent test of the equipment may be requested by Consultant. If the equipment does not conform to Specifications be responsible for all tests, corrective action and retesting and balancing.

# 1.24 INSPECTION

- .1 Arrange for inspection of all Work by the authorities having jurisdiction. Upon completion of the Work furnish final unconditional certificates of approval by the inspection authorities.
- .2 Application for final review will be considered when the Work has been completed and written declarations submitted that all commissioning, testing adjustment, set up and documentation is complete. Final review shall be done when:
  - .1 All reported deficiencies have been corrected.
  - .2 All systems have been balanced, tested, commissioned and are operational.
  - .3 The Owner has been instructed in the operation and maintenance of all equipment.
  - .4 All reports have been submitted and reviewed.
  - .5 All maintenance manuals have been submitted and reviewed.
  - .6 All tags and nameplates are in place and all data submitted and reviewed.
  - .7 Cleaning up is finished in all respects.

- .8 All certificates are furnished.
- .9 All spare parts and replacement parts specified have been provided.
- .10 All record drawings have been submitted and reviewed.

## 1.25 WARRANTY

- .1 Provide a written guarantee stating that systems, equipment, components, etc. have been installed to manufacturer's instructions, that systems meet the Contract requirements and that all deficiencies in material and labour occurring within two (2) years after Substantial Performance of the work, will be corrected at no charge to the Owner.
- .2 Obtain Product warranties in excess of two (2) years from the manufacturer on behalf of the Owner. These Product warranties shall be issued by the manufacturer to the benefit of the Owner.
- .3 Instruct all manufacturers and suppliers that warranties on Products will commence upon the date of Total Performance of the Work and not from the date the Products are put into operation.
- .4 All corrections to deficiencies listed in field review reports and other correspondence, as well as but not limited to those indicated in testing, adjusting, balancing and commissioning, shall be completed prior to turn over.

## **END OF SECTION**

## Part 1 General

## 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25.
- .4 Work to be done under this Section shall include furnishings of labour, materials, and equipment required for installation, testing and putting into proper operation complete Mechanical systems as specified in the Contract Documents, as shown on the Drawings and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

## 1.2 SUBMITTALS

.1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.

# 1.3 QUALITY ASSURANCE

.1 Mechanical Work shall be carried out by qualified, licensed Technicians.

## Part 2 Products

## 2.1 **PRODUCTS**

- .1 Products shall be new, of Canadian manufacture where available, first quality and uniform throughout. The Contractor shall submit in tender based on the use of Products specified in the Contract Documents, or on the listed acceptable alternate Products as further noted.
- .2 Products shall be CSA or ULC approved and be so labelled. Products not CSA/ULC approved shall receive acceptance by the Owner for installation, and modifications and charges required for such acceptance shall be included in the Work of this Section.
- .3 Where a manufacturer is not specified, provide Products of high commercial standard and quality consistent with the standards of these Specifications. Provide Products of the same manufacture for like applications unless noted otherwise in the Contract Documents.
- .4 Products shall be designed and manufactured in accordance with latest issue of applicable Standards or authorities when such are either mentioned herein, or have jurisdiction over such materials or items of equipment.
- .5 Acceptance of Products installed presumes that Products have not been damaged or exposed to conditions that would adversely affect performance and life expectancy. If in the opinion of the consultant, Products have sustained damage, or have been exposed to abnormal

conditions it shall be the responsibility of the Contractor to have such tests performed as are deemed necessary by the Consultant to establish the condition and therefore, acceptability of installed Products.

# 2.2 EQUIPMENT IDENTIFICATION AND DIRECTORIES

- .1 Provide every valve on job (except where located on radiation, unit heaters and fixture stops or located within plain site of equipment or apparatus which they control) with an identifying tag, attached to valve system or wheel handle with a brass chain.
- .2 Tag shall be brass with stamped numbers filled in with black enamel and shall be approximately 38 mm diameter.
- .3 Submit one (1) copy of valve chart mounted in a glazed frame to Owner on completion of work.
- .4 All equipment, control panels, starter panels, zone dampers etc., shall be name tagged using 3.8 mm (1.5") high lamacoid plates, Large equipment e.g.: air handling units, condensing units, expansion tanks, air compressors, etc., shall be name labelled using stencils with 63 mm (2.5") high (minimum) lettering.
- .5 All services, i.e. water, gas, heating lines etc., shall be identified using stencils with two inch letterings. Identification shall be placed at minimum ten feet intervals and shall also show direction of flow. Minimum lettering size 50 mm (2") or maximum possible.
- .6 All ductwork shall be identified using stencils with minimum 63 mm (2.5") high lettering. Direction of flow shall be marked.

Type of Piping	Colour Coding and Labelling	
Vent	Brown (Vent)	
Storm	Dark green-brown-dark green (S)	
Sanitary	Dark green-brown (SAN)	
Domestic Cold	Dark green-brown (DCW)	
Water		
Domestic Hot Water	Yellow-dark green (DHW)	
Domestic	Yellow-dark green-yellow (DHWR)	
Circulating Hot		
Water		
Sprinkler	Red-white (SPKR)	
Hot Water Supply	Yellow-black (HWS)	
Hot Water Return	Yellow-black-yellow (HWR)	
Gas	Yellow - paint complete pipe yellow	
Uas	(Nat. Gas)	

.7 The following colour coding shall be used for the various services:

- .8 All system tagging and identifications shall follow existing colour coding, and the numbering sequence extended to the new additions.
- .9 Provide nameplates on each piece of mechanical equipment, such as pumps, fans motors, and motor starters, showing name of system or service performed following wording and numbers used in Schedule on Drawings. Do not cover or paint nameplates and where equipment is insulated, locate nameplate on outside of insulation. Nameplate shall be

black-white-black lamacoid with bevelled edges, and 10 mm minimum white engraved letters. Rivet or fasten with self tapping screws nameplates to equipment in conspicuous location.

- .10 Location of Identification on Piping and Ductwork Systems
  - .1 On long straight runs in open areas in equipment rooms. At not more than 5 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
  - .2 Adjacent to each change in direction.
  - .3 At least once in each small room through which piping or ductwork passes.
  - .4 On both sides of visual obstruction or where run is difficult to follow.
  - .5 On both sides of separations such as walls, floors, partitions.
  - .6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
  - .7 At beginning and end points of each run and at each piece of equipment in run.
  - .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
  - .9 Identification to be easily and accurately readable from usual operating areas and from access points.
  - .10 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

## 2.3 SLEEVES AND FLOOR PLATES

- .1 Pipes, ducts and conduits shall be sleeved, as they pass through walls, floors, ceilings and partitions.
- .2 Clearance within sleeves shall be 12 mm. Sleeves shall be sized to clear insulated pipes and ducts which have a vapour barrier.
- .3 Sleeves, except those extended above floors shall be flush with finished surfaces.
- .4 Sleeves through walls, partitions and floors, other than waterproofed, shall be as follows:
  - .1 For pipes, conduits and ducts smaller than 0.4 square meters, solid walls, use Schedule 40 steel pipe or 20 gauge (minimum) sheet metal, lapped and spot welded.
  - .2 For pipes, conduits and ducts smaller than 0.4 square meters through dry wall partitions, use 20 gauge, minimum, sheet metal, lapped and spot welded with lip flange at one end.
  - .3 For ducts 0.4 square meters and larger, sleeves shall be sheet metal as above, of 16 gauge minimum.
- .5 Fire dampers shall be installed in accordance with the conditions of their approval given in the manufacturer's instructions. Provide angle steel frames and collars.
- .6 Place and secure sleeves in concrete formwork. Pack within such sleeves with sand to prevent deformation during pouring of concrete.

- .7 Provide and locate sleeves for setting in walls and partitions by the appropriate general trade.
- .8 Pack and seal the void between the sleeve and the pipe, conduit, duct or insulation, for the full depth of the sleeve with ULC approved methods to maintain the same integrity as the slab, wall and partitions. Submit shop drawing of selected ULC approved installation for review. To maintain fire rating, use 3M<sup>TM</sup> Fire Barrier Sealant CP 25WB+, Dow-Corning #3-6548 `Silicone RTV' foam, Thomas & Betts `Flamesafe' firestop system, installed in accordance with the manufacturer's specifications and recommendations.
- .9 Material to be provided by M.W. McGill & Associates (416-291-8393) Fire-Bloc systems or Double A/D Distributors (416-292-2361) "Firebarrier Firestopping".
- .10 Seal the exposed ends of the sleeve packing with approved silicone compound.
- .11 Seal the void between sleeve and bare pipe passing through outside foundation walls or floors on grade with "Thunderline Linkseal" as distributed by:
  - .1 Corrosion Services Co. Limited
- .12 Provide chrome plated split type floor plates where exposed pipes pass through finished floors. Floor plates shall be as manufactured by:
  - .1 Crane Canada Ltd. No. 1-BC or 10-BC
- .13 Provide similar plates where exposed pipes pass through walls or ceilings, but with set screw to hold them in position. Terminate pipe sleeves at these locations so that ends of sleeves are covered by the plates. Plates shall be secured tight against finished surface.

## 2.4 SUPPORTS AND BASES

- .1 Supply and erect special structural required for the installation of mechanical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.
- .2 Concrete bases and housekeeping pads for mechanical and electrical equipment, which are in direct contact with the floor slab, will be provided under Concrete Division No. 3. Submit drawings to Concrete Division giving dimensions and requirements.
- .3 Concrete pads shall be set on the slab and shall be 100 mm high above the slab. Edges of pads are to be chamfered (25 mm). Generally pads shall be 160 mm larger than base of the equipment being supported.
- .4 Provide concrete bases for all mechanical equipment unless otherwise shown. Provide a 100mm raised curb around all ductwork and piping penetrating the floor of Mechanical Rooms.
- .5 Support hangers, in general, form inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting pipes and conduits.

.6 Do not use explosive drive pins in any section of Work.

## 2.5 EXPANSION JOINTS AND ANCHORS

- .1 Provide for expansion and contraction of pipe being installed.
- .2 Erect piping so that strain and weight does not bear on cast connections or apparatus.
- .3 Provide bends, expansion loops or swing joints complete with anchors and pipe guides as required to adequately handle pipe expansion and contraction except where expansion joints are specified or shown.
- .4 Expansion joints, in domestic hot water and recirculation water piping up to and including 75 mm size and heating system piping up to 65 mm size, shall be expansion compensators with pressure external to bellows and complete with anti-torque device, limit stops and internal guides. Compensators shall be of bronze construction with female solder type ends for copper pipe and shall be suitable for 1033 KPa (150 psig) working pressure. For steel pipe, compensators shall be of steel construction with stainless steel bellows and screwed ends and shall be suitable for 1033 KPa (150 psig) working pressure. Compensators shall be as manufactured by:
  - .1 Flexonics Corporation of Canada Limited
  - .2 United Flexible Metallic Tubing (Canada) Limited
  - .3 Hyddro -Flex. Inc.
- .5 Expansion joints shall be suitable for the type of pipe and service for which they are installed and shall be capable of handling the expansion between anchors in the pipe plus not less than 50% safety factor with (-18 C) 00F ambient and corresponding fluid temperature. Expansion joints for heating system service shall be suitable for a minimum working pressure of (1379 kPa) 200 psig.
- .6 Provide pipe guides for each expansion joint using two guides on each side of and adjacent to the joint. Guides shall be pipe rolls or structural steel shapes secured to building structure in an approved manner. Guides may be omitted where an anchor is located within 36" of expansion joint.
- .7 Locate anchors where shown or required. Anchors shall consist of structural steel angles, channels or plates secured in an approved manner.

## 2.6 INSERTS AND FASTENINGS

- .1 Supply and install all inserts and fastenings required for support of equipment and hangers provided under this Division. Use beam clamps attached onto structural steel and/or inserts set in concrete.
- .2 Inserts shall be of the Midwest, Truscon manufacture and shall be firmly secured to the forms before the concrete is poured. Be responsible for correct location of inserts.
- .3 Where supports are required under the roof slab and in other areas where structural bearings of sufficient strength do not exist, provide angle or channel iron supports, properly sized to support the load from the structural framework using beam clamps. Where the wall, partition, floor or roof does not permit the support of heavy equipment, carry suitable support to building structure.

- .4 Percussion type fastenings of any kind will not be permitted unless prior approval in writing is obtained from the Architect Consultant.
- .5 Bolts and anchors at metallic waterproofed surfaces shall be supplied under this Section but installed under the Waterproofing Section. Refer to architectural drawings for such areas.
- .6 Brackets may be attached to masonry walls using expansion shields in shear, but walls must not be punched through and before drilling is started, approval must be obtained from the Architect Consultant.

## 2.7 FIRE STOPPING & SMOKE SEALS

- .1 Sealants for vertical joints to be non-sagging.
- .2 Firestop and smoke seal around mechanical and electrical assemblies penetrating non-rated fire separations.
- .3 Rigid ducts with dimensions greater than 1300 mm to be fire stopped by bead of fire stopping material between retaining angle and fire separation, and between retaining angle and duct, on each side of fire separation.
- .4 Remove excess materials and debris and clean adjacent surfaces immediately after application.
- .5 Remove temporary dams after initial set of fire stopping and smoke seal materials.

# 2.8 PIPE HANGERS

- .1 Provide pipe hangers, and their supports, for piping. Install hanger rods vertically, without bends or offsets, and so that finished piping is true with respect to both line and grade.
- .2 Hang or support horizontal cast iron drainage piping at every hub. Hangers shall properly fit outside diameter of pipe. Hangers shall be Clevis type and shall be as manufactured by:
  - .1 E. Myat & Co. Ltd. Fig. 126
  - .2 Grinnell Co. of Canada Ltd.
    - Fig. 260 for soil pipe
    - Fig. 590 for C.I. pressure pipe
- .3 Hang or support horizontal plumbing piping, other than cast iron drainage, as follows:
  - .1 Up to and including 19 mm size
    - --1.8 m maximum intervals
  - .2 Size 25 mm and above
    - --2.4 m maximum intervals
- .4 Horizontal piping, for service other than plumbing shall have maximum support space as follows:

NOM. PIPE	MAX. SPAN	NOM. PIPE	MAX. SPAN
SIZE (MM)	M	SIZE (MM)	<u>M</u>
12	1.5	75	3.6
19	1.8	89	4.0
25	2.1	100	4.3
38	2.7	125	4.9
50	3.0	150	5.2
65	3.3	200	5.8

- .5 Spacing where pipes are grouped shall satisfy the smallest size pipe.
- .6 Hangers, for piping, other than cast iron drainage unless otherwise specified, shall be Clevis type as manufactured by:
  - .1 E. Myatt & Co. Ltd.
    - --Fig. 124 for uninsulated piping
    - --Fig. 124L for insulated hot piping
    - --Fig. 125 for heavy duty uninsulated piping
    - --Fig. 125L for heavy duty insulated hot piping
    - --Fig. 125 or 125 for hangers sized to suit O.D. of insulation for cold piping.
  - .2 Grinnell Co. of Canada Ltd.
    - --Fig. 260 for uninsulated piping
    - --Fig. 300 for insulated hot piping
    - --Fig. 260 for hangers sized to suit O.D. of insulation for cold piping.
- .7 Hangers, for copper or brass piping not being used for domestic cold water service, shall be copper plated or plastic coated, as manufactured by:
  - .1 E. Myatt & Co. Fig. 152CT
  - .2 Grinnell Co. of Canada Ltd. Fig. 97-C
- .8 Support vertical cast iron drainage piping, including soil, waste, vent stacks, and rainwater leaders at hubs by a riser clamp located at every other floor slab. Bolt riser clamps around pipe and anchor to concrete slab. Riser clamps shall be as manufactured by:
  - .1 E. Myatt & Co. Fig. 182
  - .2 Grinnell Co. of Canada Ltd. Fig. 261
- .9 Hangers, installed under domestic cold water piping shall be large enough to go completely around covering.

## 2.9 ACCESS DOORS

- .1 Provide access doors for locations where equipment requiring maintenance or adjustment such as expansion joints, dampers, fire dampers, valves and pressure reducing valves, are "built-in". These access doors will be coordinate with general contractor.
- .2 Access doors, unless otherwise specified or shown, shall be at least 12 gauge steel, finished prime coat and 2 finish coats to match wall/ceiling finish, with concealed hinges, anchor

straps, plaster lock, without screws. Access doors in ceilings, where acoustic tile is applied to plaster or gypsum board, shall be dish type designed to receive tile insert.

- .3 Access doors in fire rated ceilings or walls shall be ULC labelled to match the rating.
- .4 Inside frame dimensions shall be approximately 300 x 300 mm. However, if it is necessary for personnel to enter through doors, they shall be at least 600 x 450 mm.
- .5 Access doors shall be as manufactured by:

1	Ancon Labara	I 1000
.1	Ancon-Lenage	- L1000

- .2 Zurn Industries Canada Ltd. Inspectors
- .3 LeHage Industries Ltd.
- .4 A.G. Baird Limited ABCO
- .5 Stelpro Limited Type 700
- .6 Submit list of proposed door locations and obtain approval thereof before commencing access door installation.
- .7 Submit access door shop drawings for approval as soon as possible after Award of Contract, showing size, type and exact location of access doors.
- .8 Access doors are not required in removable acoustic panel type ceilings. Provide approved coloured marking devises after completion of such ceilings, at four corners of each panel below point requiring access.

## 2.10 MAINTENANCE OF BEARINGS

- .1 "Run-in" sleeve type bearing in accordance with manufacturers written recommendations. After they are "run-in", drain, flush out and refill with a new charge of oil or grease as required.
- .2 Protect bearings and shafts during installation. Grease shafts and sheaves, to prevent corrosion and dust or dirt accumulation during building construction. Provide extended nipples as required for lubrication purposes. Provide galvanized metal drip pans under oil lubricated fan bearings. "Turn over" rotating equipment at least once a month after delivery to site until building has been accepted by Owner.
- .3 Bearings which are found to have been damaged due to the lack of suitable protection shall be replaced.

#### 2.11 PIPE STRAINERS

- .1 Pipe strainers shall be Y-type and basket type strainers as shown and shall be selected for 100% of pump capacity.
- .2 Screen perforations and working pressure shall be suitable for the systems in which they are installed.
- .3 Strainers shall have monel screens and shall be reinforced when installed on pump sections.
- .4 Y-type strainers shall be self cleaning and installed with 25mm (1") hose end valve on blow-off connection.
- .5 Strainers up to 50mm (2") shall be screwed and for sizes 60mm (2 1/4") and over shall be flanged.
- .6 All strainers connected to steel pipe and to copper pipe 60mm (2 1/4") and larger shall have cast iron bodies. All strainers connected to copper pipe 50mm (2") and smaller shall have bronze bodies.
- .7 Strainers shall be Sarco, Armstrong, Bell & Gossett, Taco or Atlas.
- .8 Provide strainers where shown on the Drawings and in the following locations whether shown or not:
  - .1 Suction sides of all pumps
  - .2 Ahead of all steam traps
  - .3 Ahead of all steam control valves
  - .4 Ahead of all pressure reducing valves
  - .5 Ahead of water meter
  - .6 In addition supply and install around the by-pass for circulating pump as shown an approved fine mesh strainer to handle approximately 10% of the pump capacity.

### 2.12 CONTROLS

.1 The Mechanical Contractor, (Mechanical Division), shall install the control valves, valve actuators and dampers for all mechanical systems.

### 2.13 TIMERS/TIME SWITCHES

- .1 The timer (time switch) shall be complete with the below features:
  - .1 Digital programmable, with large LCD screen
  - .2 Power outage back-up, built-in re-chargeable battery
  - .3 Manual override On-Off
  - .4 Time switch contact operation shall be 120 VAC, 60Hz, single pole, 15A, 1/2HP, and 1200VA.
  - .5 7-day, 24-hour, 18 ON and 18 OFF set point per week, minimum setting is one minute.
  - .6 Mount in standard single gang box, recessed with white cover plate
  - .7 Enerlites #HET or equal

### 2.14 ELECTRIC MOTORS - HIGH EFFICIENCY

- .1 Supply electric driven equipment specified under Mechanical Division complete with motors. Comply with SB-10 minimum motor efficiency requirements.
- .2 Nameplate rating of motor shall be not less than the input brake horsepower rating of the driven equipment at the specified operating condition not less than the minimum horsepower specified or shown. Motors shall be sized to come up to rated RPM under load within 15 seconds.

- .3 Motors up to and including (1/2 hp) 373 Watts shall be 115 volt, 60 Hz, single phase. Motors larger than (1/2 hp) 373 Watts shall be 575 volts, 60 Hz, three phase.
- .4 Motors unless otherwise specified shall be 1750 RPM, drip proof with ball bearings and three phase motors shall be CEMA deign "B" with Class "B" insulation.
- .5 All motors, 1. H.P. up to and over, unless specified differently, shall be T-Frame, AC Three Phase and equal to or exceeding the Ontario Hydro EnerMark Motor Efficiency Level as tested to either CSA 390 M 1985, or IEEE 112B, and be approved under the Canadian Electrical Safety Code.
- .6 Motors that are to operate with a variable frequency drive (VFD) shall be compatible with a VFD.

### 2.15 FUSES FOR MOTOR PROTECTION

- .1 Fuses shall be CSA certified, time delay, energy limiting, 200,000 ampere interrupting capacity to CSA # C22.2 No. 248.
- .2 Supply a list of motors, with their starting and operating characteristics, and the type of equipment associated with the motors, to the Fuse Manufacturer for verification of fuse sizes.
- .3 Size fuses in accordance with Fuse Manufacturer's recommendations. Note that fan motors are to be sized for 15 second maximum start-up time as specified in Article "Electric Motors".
- .4 Where fuses supplied cause unnecessary outages or do not provide adequate protection, retain the Fuse Manufacturer's representative to determine the cause. Replace such blown fuses at no cost to Owner.
- .5 Provide one spare set of fuses for each rating and type of fuse used in this Contract, and hand over to Owner at completion of Work.
- .6 Fuses shall be class J and class L, as manufactured by:
  - .1 Ferraz Shawmut
  - .2 Bussman
- .7 Size fuses installed in combination magnetic starters used in conjunction with magnetic starters, for a branch circuit and motor protection for over-current protection in accordance with Fuse Manufacturer's recommendations.

#### 2.16 ELECTRICAL WIRING FOR MECHANICAL

- .1 The locations of starters, motors and associated equipment indicated on the Drawings are approximate and diagrammatic only. Coordinate with the Work of the Electrical Division to ensure the proper location of all the equipment.
- .2 Conduit and wiring to line side of remotely located starters or to line terminals of Motor Control Centres and from these points to a disconnect and/or motor will be provided under Electrical Division.

- .3 Electrical Division shall provide safety disconnect switches required at motors by CESC.
- .4 All the motor starters/controllers, and/or line voltage thermostats shall be supplied under Mechanical Division and installed under Electrical Division.
- .5 All control wiring, control devices and low voltage thermostats shall be provided under Mechanical Division.
- .6 All electric baseboard heaters, cabinet heaters, force flow unit heaters and heating cables shall be provided under Electrical Division. Electric duct heaters shall be provided under Mechanical Division.
- .7 Wiring to water unit heaters and cabinet unit heaters will be under Electrical Division. Wiring and conduit required for a low voltage thermostat will be provided by Mechanical Division.
- .8 Where individual starters and controls are grouped together, a panel for mounting this equipment shall be provided by Contractor under Electrical Division.
- .9 Wiring, motors, control devices and electrical equipment provided under Mechanical Division shall conform to the Canadian Electrical Code as amended to date.
- .10 Wiring methods and standards shall conform to those specified in Electrical Division for the area of the building in which the installation is to be made.
- .11 Install wiring in conduit unless otherwise noted.
- .12 Use thin wall conduit up to and including 32 mm size for wiring in ceilings, furred spaces, in hollow walls and partitions and where not exposed to mechanical injury. Use rigid galvanized steel conduit for wiring in poured concrete, where exposed and for conduit 38 mm size and larger. Plastic conduit is not acceptable above ground.
- .13 Run conduit and cables in finished areas concealed above ceilings and in partitions. Run conduit and cable exposed in any unfinished areas such as mechanical rooms, rooms with no suspended ceilings, service tunnels and penthouses and install at right angles or parallel to building lines. Boxes shall be cast type.
- .14 Wiring shall be RW-90 X-Link type sized to carry 125% of the full load running current in accordance with the Electrical Code. Wiring shall be minimum No. 12 gauge, except for control wiring which shall be colour coded No. 14 gauge.

### 2.17 SPARE PARTS AND TOOLS

- .1 Furnish spare parts as follows:
  - .1 One set of v-belts for each piece of machinery. (i.e. fans, exhaust fans).
  - .2 One set of filters for each filter bank installed. (i.e. handling units, force flow units).
- .2 Identify spare parts containers as to contents and replacement part numbers.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturer.

- .4 Furnish one grease gun and adaptors to suit different types of grease and grease fittings.
- .5 Upon completion of project and immediately before hand-over, replace all filters.

#### Part 3 Execution

#### 3.1 CUTTING AND PATCHING

- .1 Provide all cutting and patching required for the Work of Mechanical Division. Work shall be carried out in conformance with the requirements of Concrete Division. Include any radiography required to locate concealed services before penetrating into inaccessible locations.
- .2 Any modifications to building shall be done so as not to diminish structural, fire resistance, or smoke barrier integrity.
- .3 Proposed modifications to the structure shall require acceptance by the Structural Engineer.
- .4 The Consultant shall be afforded the opportunity to review the intent prior to any major cutting.

#### 3.2 PAINTING

- .1 Provide all exposed ferrous metal Work, and Products, except conduit, with at least one (1) factory prime coat or paint one prime coat on Site and 2 finish coats to match wall/ceiling finish. Clean up or wire brush all equipment before painting. The primer shall be rust inhibiting primer in accordance with CGSB-GB-40d.
- .2 Do not paint galvanized supports and hangers.
- .3 Repaint or refinish all damaged factory applied finishes.
- .4 Paint all visible portions of ductwork with one coat flat black paint, unless otherwise noted.
- .5 Refer to painting specifications for more information.

#### 3.3 CONCRETE

- .1 Concrete Work shown on the structural Drawings will be done as part of Concrete Division of these Specifications.
- .2 Provide all other concrete Work necessary for Mechanical Work. Have such Work carried out in accordance with the Concrete Division of these Specifications.

### 3.4 EXCAVATION AND BACKFILLING

.1 Before commencement of excavation of the Work, determine with the Consultant, the municipalities and utilities, the presence of existing underground services at the site and verify satisfactory condition. Locate such services and mark out same. Ensure that all trades concerned are aware of their presence.

- .2 Do all excavation and backfilling up to grade required for Mechanical Work inside and outside of building. Check available soil test reports. Obtain instructions of the Consultant regarding the type of soils and their extent.
- .3 Carry out all trench excavation in strict conformity with all applicable acts and bylaws.
- .4 Excavate to the required depth and width. Backfill excess excavation.
- .5 Provide additional protect ducts under roads and paved areas.
- .6 Refer to details and to Utility Company requirements for concrete encased duct installations.
- .7 Where excavation is necessary in proximity to and below the level of any footing, provide a sleeve at the proximity and backfill with 14,000 kPa (2,000 psi) concrete to the level of the highest adjacent footing. Proximity is determined by the angle of repose as established by the Consultant.
- .8 Protect the bottom of excavations against flooding and freezing. Use pumping or other means to keep bottom dry. Do not open more than weather will permit. Have excavations inspected at least once a week by authorities. Break up rocks and boulders and remove these by drilling and wedging. Do not use blasting unless approved in writing by the Consultant.
- .9 Compact all backfill to a density of 95% Modified Proctor. Before backfilling, obtain approval. Remove all shoring during backfilling. Obtain approval for all compaction machines used.
- .10 Backfill trenches within building, with clean sharp sand in individual layers of maximum 150 mm (6") thickness. Manually compact the first layers up to a compacted level of 300 mm (12"). Machine compact the balance up to grade, using approved equipment.
- .11 Backfill trenches outside buildings, not under roads, parking lots, or traffic areas, manually compact up to a compacted level of 450 mm (18") above the cable or duct bank with individual layers of material up to 150 mm (6") thick, using sand or granular 'A' gravel. Machine compact the balance up to grade with 150 mm (6") layers of approved excavated material.
- .12 Backfill all other trenches outside buildings with granular 'A' gravel in layers not exceeding 150 mm (6") thickness, up to grade level; manually compact up to 450 mm (18"), machine compact the balance.
- .13 Do not use water for consolidation or during compaction of backfill, unless approved in writing by the Consultant.
- .14 After a period has passed adequate to reveal any settlement fill all depressions to correct grade level with appropriate material, machine compacted. Pay all costs required to make good all damage caused by settlement.
- .15 Store and dispose of excavated materials as follows:
  - .1 During the progress of the contract place the material as directed in such a manner that a minimum of damage or disfigurement of the existing ground will result and

the material will not in any way impede the progress of the work. Dispose of surplus material as directed by the Consultant.

- .2 Place surplus topsoil separately from subsoil. Leave the site clear and unencumbered.
- .3 Protect, brace, support as required existing pipes, ducts, cables, etc. encountered in the work. Do not disturb or interrupt the operation of any services without written approval from the Consultant.

# 3.5 WORK IN EXISTING BUILDING AND SITE

- .1 Maintain the existing life safety systems in existing building in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .2 Maintain all existing systems in full operation during normal occupancy and operation hours, unless otherwise noted in the Contract Documents.
- .3 Maintain all systems adjacent to the construction area in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .4 All noise generating works that disrupt the building operations shall be carried out before/after normal occupancy hours and shall be coordinated with Owner.
- .5 Co-ordinate with the Owner for scheduling of Works required to be done before/after normal occupancy hours, including but not limit to: drilling through slab; power shutdown; interference to life safety system. All costs involved with this Work shall be included in Contract Price.
- .6 The Contractor shall assume responsibility for any disruption caused by its forces to operational building services. Repair any system damaged during the execution of the Work.
- .7 Scan (X-ray or ultrasound) for unknown existing concealed conduits, pipes, cables/wires, before excavating ground and drilling slabs.
- .8 Remove materials and equipment as shown and as specified in the Contract Documents.
- .9 Maintain continuity of existing services serving areas outside the construction area.
- .10 Check and inspect existing systems and equipment to be re-used.

# END OF SECTION

### Part 1 General

# 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25.

# 1.2 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Provide shop drawings to the General Contractor for setting anchor bolts and other appurtenances necessary for the proper installation of this equipment. Submit drawings for approval showing complete details of foundations including necessary concrete and steel work, vibration isolation devices and reinforcing steel. Contractor under Division of Mechanical shall supply necessary information to the Vibration Isolation Manufacturer regarding equipment to be isolated.

# Part 2 Products

### 2.1 GENERAL

- .1 Mount equipment, apparatus and piping on approved foundations or suspend from approved supports, as specified herein, shown, or as required.
- .2 Erect floor mounted equipment, complete with vibration devices as required, on 100 mm high concrete housekeeping pads unless otherwise specified.
- .3 Equipment shall be adequately isolated or acoustically treated to maintain an acceptable noise level in occupied areas of the building. Drawings and Specifications shall be referred to for areas in which a lower or higher noise level is acceptable. Approved, qualified personnel shall take noise measurements over complete audible frequency range in occupied zones adjacent to mechanical equipment rooms and main duct shafts, and in other locations as requested. Maximum Levels:

	AREAS	N.C. LEVELS
.1	General Offices	35
.2	Meeting Rooms	30
.3	Corridors and Lobbies	40
.4	Storage Rooms	40
.5	Entrance Halls	40
.6	Outdoors	45 dBA

.4 Vibration and sound control materials shall be manufactured by:

- .1 BVA Systems
- .2 Vibron Limited
- .3 E.H Price
- .4 IAC

### 2.2 SPRING MOUNTS

- .1 Spring mounts shall be complete with levelling devices, 6 mm thick ribbed neoprene sound pads and completely colour coded stable springs. Type FS shall be open spring type with horizontal to vertical stiffness equal to or greater than 1.0. Type CSR shall be similar to FS with built in vertical limit stops. Type CM shall be closed mount springs with built in stabilizers.
- .2 Springs shall be selected to operate at no greater than 2/3 solid deflection. Fasteners shall be zinc chromate plated or approved equivalent. Mounts installed outdoors or exposed to high humidity conditions shall have two coats of rust resisting paint or shall be galvanized or cadmium plated and shall have neoprene coated springs.

# 2.3 SPRING HANGERS

.1 Spring hangers shall be Type SH or SHR with completely colour coded stable springs. SHR hangers shall have a 25 mm thick acoustic isolation pad in series with the spring. Hanger frames for loads over 680 Kg shall be heavy-duty welded channel construction.

### 2.4 PAD TYPE ISOLATION

- .1 Type R rubber waffle or ribbed pads shall be of high quality neoprene 60 durometer and a minimum of 12 mm thick, selected for a maximum loading of 345 kPa Pads built into spring mounts or hangers shall be 60 durometer neoprene.
- .2 Rubber-steel-rubber pads, type RSR, shall be 12 mm thick rubber pads, as specified above, bonded to 6 mm steel plates.
- .3 Type CC pads shall be kinetic neoprene jacketed pre-compressed moulded fibreglass.
- .4 Type R.L.S. neoprene-in-shear mounts shall be moulded in various colour coded durometers and sizes. Top plates shall have tapped holes, and bottom plates shall be completely imbedded in neoprene.
- .5 Pad type isolation shall be provided for all roof mounted equipment, and floor mounted equipment.

### Part 3 Execution

### 3.1 INSTALLATION

- .1 Isolate motor driven mechanical equipment over 1/2 hp unless other shown (except propeller fans).
- .2 Pad type isolation shall be provided for all roof mounted equipment.

# 3.2 INSTALLATION OF SPRING HANGERS

- .1 All piping over 50mm diameter connected to spring isolated equipment shall be supported with minimum 25mm static deflection spring mounts or hangers as follows:
  - .1 Up to 25mm diameter: first 3 points of support
  - .2 125 to 200mm diameter: first 4 points of support
  - .3 250mm diameter and over: first 6 points of support
- .2 The first point of support shall have a static deflection of twice the deflection of the isolated equipment, but not more than 50mm.
- .3 Any piping supported from the mechanical penthouse floor shall be isolated on type CM or SL mounts with the deflection being equal to that of the isolated equipment.

# 3.3 PENETRATION OF WALLS AND SLABS

# .1 DUCT PENETRATIONS

- .1 Contractor shall make sure that all openings around pipes and ducts in the structure surrounding the mechanical equipment rooms shall be sealed airtight as described herein and on the drawings.
- .2 Where each duct passes through a wall, floor or ceiling, there shall be a clear annular space of 25 mm between the duct and structure. After all of the ductwork is installed the Contractor shall check the clearance, pack the voids full depth with glass fibre, and caulk both ends with a non-aging, non-hardening approved fireproof sealant (Firestop). Where there is not sufficient access space to pack around all sides of a duct (for example, at the underside of a slab), place a short stub duct in the wall, pack and caulk around it and then attach the inlet and outlet ducts to each end.

# .2 PIPE PENETRATIONS

- .1 HVAC and Domestic Water Piping
  - .1 Where a pipe passes through a wall or floor slab, a steel sleeve shall be cast or grouted into the structure. The internal diameter of the sleeve shall be 50 mm larger than the external diameter of the pipe passing through it. After all of the piping is installed in that area, the Contractor shall check the clearance and correct it, if necessary, to within 12 mm. Then the void shall be packed full depth with a ULC approved glass fibre and sealed at both ends, 25 mm deep, with a non-aging, non-hardening, approved fireproof sealant (Firestop).
- .2 Vent Pipes
  - .1 Pipes shall be grouted and caulked into the structure as follows: Before grout has set, rake a groove around the pipe on each side of the wall or slab; groove shall be 12 mm wide and 12 mm deep. After grout has set, fill groove full depth with sealant.

### **END OF SECTION**

# Part 1 General

#### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25.
- .4 Work to be done under this Section shall include furnishing of labour, materials and equipment required for installation of Insulation as specified.

### 1.2 **REFERENCES**

.1 Comply with the requirements of the ASHRAE/IES Standard 90.1 latest edition

# 1.3 SUBMITTALS

.1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.

### 1.4 **REGULATIONS**

.1 The type, manufacture and application of pipe covering materials including application of sealer coat, shall be in strict accordance with requirements and final approval of local authorities having jurisdiction.

### Part 2 Products

### 2.1 APPLICATOR AND MATERIAL LIST

- .1 Pipe covering, equipment and duct insulation shall be provided by a recognized specialist insulation applicator with and established reputation for this type of work.
- .2 The following manufacturers are acceptable:
  - .1 Insulation Materials:
    - .1 Mineral Fibre for Low and Medium Temperature (with or without integral vapour retarder jacket)
      - .1 Knauf Fiber Glass
      - .2 Manson Insulation Inc.
      - .3 Johns- Manville Canada
    - .2 Calcium Silicate for High Temperature
      - .1 Calsilite
      - .2 Pabco
      - .3 Johns- Manville Canada

- .3 Mineral Fibre for High Temperature
  - .1 Fibrex Inc.
  - .2 Partek Insulations Inc.
  - .3 Roxul Inc.
- .4 Perlite for High Temperature
  - .1 Sproule
  - .2 Temperlite
- .5 Cellular Glass
  - .1 Pittsburgh Corning Inc. (Foamglas)
- .6 Flexible Elastomeric
  - .1 Armstrong World Industries
  - .2 Rubatex Corp.
- .7 Coatings, Sealers and Adhesives
  - .1 Bakor
  - .2 Childers
  - .3 Foster
- .8 Finishing Cement
  - .1 Ryder Industries Inc.
  - .2 Johns- Manville Canada
- .9 PVC Fitting Covers and Jacketing
  - .1 Proto Corp.
  - .2 Ceel-Co
  - .3 Zeston (Johns- Manville)
- .10 Foil Faced Vapour Retarder Tape
  - .1 Avery Dennison
  - .2 Compac
  - .3 Mactac
- .11 Glass Fabric Reinforcing Cloth
  - .1 Alpha Associates
  - .2 Clairmont Corp.
  - .3 Compac
- .12 Aluminum and Stainless Steel Sheeting with Integral Moisture Barrier
  - .1 Childers
  - .2 Pabco
  - .3 Permaclad
- .13 Caulking Compounds
  - .1 Dow-Corning
  - .2 Foster
  - .3 Tremco Manufacturing
- .14 Bands
  - .1 Childers
  - .2 Permaclad

# 2.2 MATERIALS

- .1 Fibreglass insulation:
  - .1 Duct insulation shall be rigid board vapour seal 48 kg/cu.m. (3 lbs/cu.ft.) density duct insulation with factory applied vapour barrier. Flexible duct insulation shall be 24 kg/cu.m. (1-1/2 lbs/cu.ft.) type with vapour barrier.
  - .2 Pipe insulation shall be preformed sectional fibreglass or mineral fibre insulation with factory applied all service jacket.
  - .3 Insulation for linear radiant heating panels shall be 12 kg/cu.m. (3/4 lb.cu.ft.) density fibreglass batt insulation with foil back.
- .2 Exterior to the building shall be 125 kg/cu.m. (8 lbs/cu.ft.) density board insulation with factory applied reinforced foil vapour barrier.
- .3 Flexible elastomeric insulation shall be complete with adhesive applied to both surfaces to be joined. Flexible elastomeric insulation shall not be used on pipes that are electrically traced.
- .4 Insulation jacket for services and ductwork exterior to the building, and for indoor components such as valves, pump, meters, etc. shall be field applied U.V. protected mesh reinforced mastic.
- .5 High temperature insulation shall be 232 kg/ cu.m. (14.5 lbs/cu.ft.) asbestos free, non-combustible, abuse-resistant pipe and block insulation composed of hydrous calcium silicate meeting ASTM C533, Type I for operating temperatures up to 649 Deg. C. (1200 Deg. F.).
  - .1 Tie Wire shall be 16 gauge (0.045mm) stainless steel with twisted endons on maximum 300mm (12 in.) centres.
- .6 High temperature insulation shall be non-combustable, mineral wool fibre pipe insulation.
- .7 Corner beads and channels at floor line shall be 0.4 mm (28 ga.) galvanized sheet metal.
- .8 All cements and adhesives shall be as recommended by the manufacturer of the insulation. Insulation, insulation jacket, canvas and adhesive shall be fire retardant with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50 when tested in accordance with CAN/ULC-S102-M.
- .9 P.V.C. fitted jackets and covers shall have a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50 when tested in accordance with CAN/ULC-S102-M.
- .10 Aluminum Jacket shall be 0.51mm (24 B&S Guage 0.0201 in) this sheet, embossed finish, with longitudinal slip joints and 50mm (2 in.) laps, die shaped fitting covers with factory applied moisture barrier.
- .11 Fire resistant duct insulation shall meet the requirements of NFPA 96. Product shall meet flame spread rating of 25 and smoke developed rating of 50. Insulation product shall be complete with all manufacturers standard fastenings, including (where applicable) aluminum foil tape, filament tape, banding materials, pins, cup-head weld pins, and speed clips for a ULC listed installation.

#### Part 3 Execution

#### 3.1 INSTALLATION - GENERAL

- .1 Ensure that pipe, fittings, sheet metal and equipment on which insulation is to be applied is free from moisture, dirt, and rust, before applying insulation.
- .2 Do not apply insulation until the item to be covered has been leak tested.
- .3 Apply insulation in a neat workmanlike manner so that finished job is uniform in diameter and smooth in finish. Locate longitudinal seams so as to be invisible.
- .4 Insulation finish shall be designated "CONCEALED" where mechanical services (ie: pipe, ducts, etc.) are installed in trenches, chases, furred spaces, pipe and ducts shafts, hung ceilings or raised floors.
- .5 Insulation finish designated "EXPOSED" will mean "NOT CONCEALED" as defined herein.
- .6 Mitre insulation at pipe elbow and wrap joint with adhesive tape. Where pipe is not to be recovered, cover joints with glass fabric reinforcing cloth pasted on and extending each side of joint throat for a distance equal to one covering diameter.
- .7 Insulation having a vapour barrier jacket shall be continuous where it passes through walls or floors. Protect exposed pipe insulation at floor line with 18 ga galvanized steel jacket approximately 100 mm high, secured to floor slab.
- .8 Tightly pack annular space between sleeve and pipe covering with insulation and fireproof vapour barrier where insulated pipes pass through sleeved openings in walls or floors. Packing shall extend full length of sleeve, and be finished flush at each end with caulking compound, aluminum colour.
- .9 Smooth aluminum sheeting used for re-covering shall be not less than 18 ga. thick on piping, ducts or equipment, and not less than 0.4 mm thick on pipework. The sheeting and insulation shall be detachable at valves, flanges and other bolted connections. Bends shall be custom made swaged ring or lobster back. Sheeting shall be neatly shaped over fittings, valves and strainers. Seal joints with mastic caulk corners. Secure sheeting with bands 450 mm apart.
- .10 Bands shall be 12 mm wide stainless steel or aluminum alloy straps with cadmium plated mechanical fasteners.
- .11 Where applicator proposes to use material other than those specified as acceptable, submit to the Consultant a complete list of such materials, indicating thickness of material for each individual service and the finishing procedures and materials proposed before installation.
- .12 Rigid insulation shall be applied with edges tightly butted. Secure insulation to flat sheet metal surface by means of welded pins or perforated base metal fasteners and speed washers. Locate on not more than 450 mm centres throughout the sheet metal surface with a minimum of two rows per duct side, and adhere with a fire resistant cement. Attach speed washers, when insulation has been placed on the metal spikes and cut off the excess spike flush with washer and re-cover washer with foil faced vapour barrier tape. Cover angles or standing seams on the outside of plenums, casings and ducts which extend beyond face of

applied rigid insulation with 12 mm layer of flexible insulation. Extend this insulation 75 mm on each side of the angles and place tight around the projecting leg of the angle. Apply rigid insulation overlapping edge of flexible insulation on angle so that vertical part of insulated angle projects through work.

- .13 Flexible insulation shall be wrapped tightly on to the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 50 mm. Insulation shall be adhered to duct surface with mechanical fasteners at 300 mm on centre.
- .14 On circumferential joints, the 300 mm flange on the facing, and on longitudinal joints, the overlap shall be stapled with 14 mm flare-door staples 150 mm apart.
- .15 After insulation is applied, seal holes, speed washers, corners and joints with 75 mm wide foil faced vapour barrier tape.
- .16 Do not insulate over equipment nameplates and identification tags. Locate field applied nameplates and identification tags on outside surface of insulation. Where nameplates are permanently fixed to equipment ensure insulation is applied around nameplate allowing for clearly legible nameplates.

Nominal Pipe Diameter	Hot Water and Glycol heating Systems (mm) (see note 1, 5)	Domestic Hot Water (mm) (see note 2, 5)	Refrigerant (mm) (see note 3)	Chilled Water(mm) (see note 4)	
Less than 25 mm	38	25	13	13	
25 mm – less than 38 mm	38	25	25	13	
38 mm – less than 100 mm	50	38	25	25	
100 mm – less than	50	38	25	25	
200mm 200 mm and greater	50	38	40	25	
Note: 1. 2. 3. 4.	<ol> <li>Conductivity Range is 0.25 - 0.29 Btu-in/h sq.ft. °F.</li> <li>Conductivity Range is 0.22 - 0.28 Btu-in/h sq.ft. °F</li> <li>Conductivity Range is 0.20 - 0.26 Btu-in/h sq.ft. °F</li> <li>Conductivity Range is 0.21 - 0.27 Btu-in/h sq.ft. °F</li> <li>Eor piping smaller than 32mm and located in participal witin conditioned</li> </ol>				

.17 Insulation thicknesses shall be in accordance with ASHRAE 90.1 minimum requirements as listed in the following table:

spaces, reduction of these thicknesses by 25mm shall be permitted but not to thicknesses below 25mm.

# 3.2 HOT FLUID PIPING

- .1 Cover domestic hot water piping, domestic tempered water piping, domestic water recirculation piping, hot water heating system piping and glycol heating system piping safety valve vent lines, (except safety valve vents from boilers), boilerfeed piping, exposed portions of surface and intermittent blowdown piping, boilerfeed and condensate bleed-off piping, with insulation in accordance with ASHRAE 90.1.
- .2 Insulation shall be fibreglass insulation with factory applied fire resistive all service jacket, reinforced white kraft paper jacket bonded to aluminum foil vapour barrier with self-sealed lap. Hold insulation in place with flare type staples. Recover pipe in exposed areas with canvas or PVC jacket.
- .3 Cover fittings, valves, flanges and strainers with insulating cement of a thickness equal to that of the adjacent insulation, regardless of whether the adjacent pipe covering is recanvassed or not.

# 3.3 COLD FLUID PIPING

- .1 Cover domestic cold water piping, sanitary and condensate drain piping, storm drain piping, (including roof hoppers and fittings), with 25mm (1") insulation.
  - .1 Vertical runs of sanitary, condensate and storm drain piping may be left uninsulated where installed in airtight pipe shafts without ducts, but only if not subject to freezing (not close to outside walls) and not subject to sweating due to free air motion.
- .2 Insulation shall be with factory applied fire resistive fibreglass reinforced vapour barrier jacket and aluminum foil vapour barrier with self-sealed lap. Recover pipe in exposed areas with canvas or PVC jacket
- .3 Domestic water piping, sanitary and condensate drains, storm drains, fire protection piping, wet sprinkler system piping, drum drips of dry sprinkler system, storm sump pump discharge piping, sanitary sump pump discharge piping, piping installed in the unheated garage and other unheated areas shall be electrically traced with 50mm (2") insulation, finished with aluminium jacket banded with aluminium bands. Co-operate with Section which will install electrical tracing wiring between the pipe and insulation. Cover all insulated electrically traced piping and equipment exposed to the outside, with weatherproof aluminum jacket
- .4 Cover fittings and valves with a layer of glass fibre insulation with vapour barrier. Recover with insulating cement to insulation on adjacent piping and canvas neatly pasted on with adhesive regardless of whether the adjacent pipe covering is recanvassed or not.

### 3.4 DUCTWORK AND AIR HANDLING EQUIPMENT

- .1 Externally insulate:
  - .1 Exhaust ducts and relief air ducts min. 1.5m back from outdoor connection
  - .2 Combustion air ducts and plenums

- .3 Blank-offs behind unused sections of louvres
- .4 Return air ductwork located in unconditioned space
- .5 All supply air ductwork except exposed in conditioned space.
- .2 Unless otherwise noted, insulate round supply ducts up to 750mm (30") diameter and rectangular supply ducts up to 750mm (30") width with 25mm (1") thick fiberglass reinforced foil faced 19kg/m<sup>3</sup> (1.15lbs/ft<sup>3</sup>) density flame resistant flexible duct insulation. Adhere insulation to duct surface with adhesive applied in strips 150mm (6") wide on 300mm (12") centres. Use fiberglass tying cord or 16 gauge annealed wire until the adhesive sets. Butt edges of insulation tightly together, and seal all breaks and joints with self-adhering aluminum tape.
- .3 Unless otherwise noted, insulate round supply ducts over 750mm (30") diameter and rectangular supply ducts over 750mm (30") width with 25mm (1") thick fiberglass reinforced foil faced 48kg/m<sup>3</sup> (3.0lbs/ft<sup>3</sup>) density flame resistant rigid duct insulation board. Fasten the insulation with welded pins and speed washers on maximum 300mm (12") centres. Use a minimum of two (2) rows of fasteners per side. Butt edges of insulation tightly together, and seal all breaks and joints with self-adhering aluminum tape.
- .4 Where interior acoustic insulation is required, decrease the exterior insulation by equal thickness. Overlap the exterior insulation by at least 300mm (12"), upstream and downstream
- .5 Cover plenums, casings, and ductwork which are to be thermally insulated with 25mm thick rigid preformed flexible foil faced duct insulation with factory applied fire retardant vapour barrier, or field applied Kraft laminate attached with adhesive.
- .6 Combustion air and fresh air intake ductwork, and plenums shall be insulated with 25mm thick rigid foil faced FF Fibreglass vapour seal insulation. Vapour seal all insulation joints.
- .7 Insulate all ductwork exposed to the outside with 75mm (3") insulation and weatherproof aluminum jacket.
- .8 Insulate all ductwork exposed to unheated space with 75mm (3") insulation.
- .9 After insulation is applied, seal holes, corners and joints the same day with 75mm wide Mac-Tac scrim foil tape.
- .10 Cover angles or standing seams on the outside of plenums, casings and ducts, which extend beyond face of applied rigid insulation with a 12mm layer of flexible fire resistant fibreglass, 16 kg per cu m density, with facing. Extend this insulation 75mm on each side of the angle and place tight around the projecting leg of the angle. Apply rigid insulation, overlapping edge of flexible fiberglass on angle, so that vertical part of insulated angle projects through work. Vapour seal joints with an approved sealer.

#### 3.5 RECOVERING AND FINISHING

.1 Recover exposed pipe insulation in finished rooms, fan rooms, mechanical equipment rooms, duct and pipe shafts where access is available, pipe spaces, penthouses, with canvas jacket neatly applied.

- .2 Finish externally insulated ducts in fan rooms, penthouses, duct shafts where access is available and equipment rooms, with canvas and lap adhesive after joints and holes have been sealed with 75mm wide Mac-Tac scrim foil tape.
- .3 Cement recovering laps with lapping adhesive. After canvas has been applied, give the entire surface a heavy brush coat of the same adhesive applied undiluted.
- .4 Canvas for recovering shall be as previously specified with close weave and smooth finish. Submit sample of canvas for approval before installation.
- .5 For recovering and finishing of exposed pipe insulation PVC Jacketing may be used instead of canvas. Apply Jacketing and Pipefitting Covers in accordance with manufacturer's recommendations.
- .6 Securely fasten a layer of 25mm hexagonal wire mesh over externally insulated exposed fresh air intakes, exhausts, return and supply plenums, (excluding those formed by masonry walls or those acoustically lined), sheet metal blank-offs, and units and casings which are susceptible to damage (i.e. mounted at floor level). Securely apply a corner bead on corners. Apply a 12mm coat of insulating cement in two 6mm layers. Temper final coat with Portland cement. Recover finish coat with canvas as previously described.
- .7 Cover insulated circular ducts in exposed locations with backing paper prior to applying canvas.
- .8 Hot and cold water piping and also steam and condensate return piping in the kitchen area and the sterilizer areas where above the floor and exposed in finished areas, shall be covered with Johns-Manville Metal-on jacket insulation.
- .9 Insulation exposed to outdoors shall be finished not with canvas, but a layer of 880 kg per cu m roofing felt, lapped at all joints, sealed with lap cement and held in place with metal bands on not more than 300mm centres.

# **END OF SECTION**

### Part 1 General

# 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

# 1.2 **REFERENCES**

- .1 Comply with the requirements of the latest editions of the following:
  - .1 Federal, Provincial and Municipal Building Codes and fire regulations
  - .2 NFPA 10: Portable Fire Extinguishers
  - .3 NFPA 13: Installation of Sprinkler Systems
  - .4 NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

# **1.3** SCOPE OF WORK

- .1 These specifications for the Fire Protection Systems are "Performance" specifications and are intended to establish design criteria and basic guidelines for the work. This contractor shall assume full responsibility for the layout and details of all fire protection work to meet the requirements of local governing Codes or regulations; and to the approval of The Ontario Fire Marshall. All sprinkler systems to be hydraulically designed.
- .2 As minimum requirements, all fire protection work shall comply with the applicable provisions for the National Fire Codes published by the National Fire Protection Association (NFPA), the local Fire Department and the Owners' Insurance Underwriter.
- .3 The scope of work shall include all labour, materials, equipment and accessories necessary for the complete fire protection systems including, but not limited to the following major items:
  - .1 Modify existing sprinkler and standpipe system as noted.
  - .2 Provide new fire extinguishers.
  - .3 Prepare and submit detailed shop drawings.
  - .4 Payment of all costs relating to fees, permits, inspections, tests, and plan reviews for the fire protection work and systems
  - .5 All signs and labels required by the insurance rating agency and/or local authorities.
  - .6 Hangers and supports, drains, test connections, sleeves, escutcheons, spare sprinkler heads with cabinet, and other necessary appurtenances.
  - .7 Perform all testing and submit completed contractor's test certificate for each sprinkler system.
- .4 Identify all changes to the fire alarm system resulting from sprinkler shop drawings. All cost related to changes initiated by the Sprinkler Designer shall be the responsibility of Mechanical Division.

# 1.4 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Where required, hydraulic calculations for the fire protection systems to meet the approval of local authorities having jurisdiction on this project, Owners' Insurance Underwriter and Engineer requirements.
- .3 Including:
  - .1 Sprinkler System Components
  - .2 Fire Extinguishers
  - .3 Sprinkler Layouts, including pipe sizes and locations, where required
  - .4 Hydraulic load calculations, where required

### **1.5 INTERFERENCE DRAWINGS**

- .1 Assist in the coordination of services by providing the necessary input with regard to Fabrication Drawings described in Section of Mechanical General Requirements.
- .2 Sprinkler system layouts, where shown, are diagrammatic, the piping is to be coordinated with other services in addition to the structure, suspended ceilings, and other building components affecting the layouts. Off-sets, drains, etc., are to be provided as required in order to integrate the sprinkler layouts with other systems and components.
- .3 Where sprinkler piping distribution is not shown on the drawings, the system is to be hydraulically designed for the most economical layout. Distribution piping must be coordinated with other services in addition to the structure, suspended ceilings and other building components.

### Part 2 Products

### 2.1 VALVES

- .1 All valves to be ULC listed for fire protection service.
- .2 Gate valves on fire lines and standpipes are to be ULC listed for fire protection services and to be OS&Y pattern with Potter OSYS-B monitor switch or approved alternative, necessary for operation of ULC listed supervisory system specified under Electrical Division. Monitor switches to have four wires per normally-open concept.

### 2.2 **PORTABLE FIRE EXTINGUISHERS**

- .1 portable extinguishers shall be selected and installed in accordance with NFPA 10, "Portable Fire Extinguishers."
- .2 Portable fire extinguishers shall be rated and identified in accordance with CAN/ULC-S508 "Rating and Fire Testing of Fire Extinguishers". All ratings identified below shall be considered as a minimum.

- .3 Portable extinguishers shall comply with Fire Code and conform to the following performance standards
  - .1 CAN/ULC-S503, "Carbon-Dioxide Fire Extinguishers,"
  - .2 CAN/ULC-5504, "Dry Chemical Fire Extinguishers,"
  - .3 CAN/ULC-S507, "Water Fire Extinguishers,"
  - .4 CAN/ULC-S512, "Halogenated Agent Hand and wheeled Fire Extinguishers,"
  - .5 CAN/ULC-S554, "Water Based Agent Fire Extinguishers," and
  - .6 CAN/ULC-S566, "Halocarbon Clean Agent Fire Extinguishers."
- .4 Portable fire extinguishers in Mechanical and Electrical Rooms shall be 6A80BC rating, 4.53 kg (10 lbs.) multi-purpose dry chemical powder type and ULC labelled
- .5 Portable fire extinguishers in kitchens shall be K rating, 6 L (1.59 USgal.) wet chemical type, stainless steel, and ULC labelled
- .6 Portable fire extinguishers in general areas shall be minimum 3A40BC rating, 2.26 kg (5 lbs.) multi-purpose dry chemical powder type and ULC labelled (ammonium phosphate)
- .7 Extinguishers shall be mounted on wall brackets.
- .8 Portable fire extinguisher cabinets in finished areas shall be recessed type with 6mm (1/4 in.) return frame, 0.76 mm (0.0299 in. 22 M.S.G.) thick steel tub with enamel interior and maximum inside dimensions of 229 mm x 610 mm x 152 mm (9 in. x 24 in. x 6 in.) deep. Front shall be adjustable, 1.57 mm (0.0618 in. 16 M.S.G.) thick steel door. Glass shall be 5mm (3/16 in.) clear. Hinge shall be full length semi-concealed piano type. Door latch shall be flush stainless steel type with no visible mounting screws. All exterior metal shall be prime coated with the exception of the door latch. National Fire Equipment Model CE-950-3
- .9 Installation Height.
  - .1 Fire extinguishers having a gross weight not exceeding 40 lb (18.14 kg) shall be installed so that the top of the fire extinguisher is not more than 5 ft (1.53 m) above the floor.
  - .2 Fire extinguishers having a gross weight greater than 40 lb (18.14 kg) (except wheeled types) shall be installed so that the top of the fire extinguisher is not more than  $3\frac{1}{2}$  ft (1.07 m) above the floor.
  - .3 In no case shall the clearance between the bottom of the fire extinguisher and the floor be less than 4 in. (102 mm).
- .10 Provide fire extinguishers as shown on the drawings and at minimum in the following locations:
  - .1 Mechanical and Electrical Rooms
  - .2 Kitchens
  - .3 Maximum travel distance to FE: 75 ft.

### 2.3 SPRINKLER HEADS

.1 Provide sprinkler systems in areas indicated. Occupancy hazard shall meet ANSI/NFPA 13 requirements.

- .2 Head Types:
  - .1 Type A: Standard, upright or pendant for unfinished areas.
    - .1 Bronze finish.
  - .2 Type B: Standard, exposed, pendant for suspended ceilings:
    - .1 Bright chrome finish (satin option)
    - .2 3" (75 mm) dia. escutcheon plate, bright chrome finish (satin/white options).
  - .3 Type C: Semi/fully recessed pendant for drywall or suspended ceilings.
    - .1 Bright chrome finish (satin option).
    - .2 Sprinkler cup assembly.
  - .4 Type D: Concealed pendant for drywall or suspended ceiling:
    - .1 Bronze finish.
    - .2 Sprinkler cup assembly.
    - .3 Coverplate to suit Architectural finishes. Submit sample to Consultant for approval prior to installation.
  - .5 Type E: Sidewall Sprinklers horizontal:
    - .1 Bronze finish for unfinished areas.
    - .2 Bright chrome finish (satin option) for finished areas.
    - .3 3" (75 mm) dia. escutcheon plates for finished areas. Bright chrome finish (satin or white options).
  - .6 Provide red protective baskets for sprinkler heads in mechanical and electrical rooms and in areas indicated.
  - .7 Sprinkler heads to be listed with and bear certification marking of nationally recognized testing agency.
  - .8 Coverplates for concealed sprinkler heads to have a release temperature of 135°F (57°C) unless otherwise noted on the drawings.
  - .9 Minimum 1/2" (12 mm) discharge orifice.

# 2.4 WET PIPE SYSTEM

.1 A gridded wet pipe system shall be provided with a relief valve not less than 1/4 in. (6.4 mm) in size set to operate at 175 psi (12.1 bar) or 10 psi (0.7 bar) in excess of the maximum system pressure, whichever is greater.

### Part 3 Execution

### 3.1 INSPECTION

.1 Do not recess, paint or conceal piping, accessories or work prior to inspection and approval by authorities having jurisdiction.

### 3.2 INSTALLATION

.1 The entire installation shall apply with NFPA 13 as minimum requirements.

- .2 All fire protection piping shall be standard weight schedule 40, black steel pipe with 2100kPa heavyweight malleable iron screwed fittings. All isolation valves shall be fully supervised using Potter Model PIVSU A1 switches for butterfly valves or OSYSU A1 for OS&Y valves.
- .3 Grooved couplings may be used in lieu of welded or screwed pipe.
- .4 Coordinate the installation of all fire protection systems with the work of all other trades. Provide all necessary offsets in piping to avoid interference with other equipment and systems and provide additional sprinkler heads due to offsets and/or interference as required to achieve design coverage at no additional cost.
- .5 All horizontal piping shall be installed as high above finished floor as possible with due allowance for clearances for sprinklers as required by NFPA 13. Refer to notes on the drawings for additional requirements, if any, regarding clear heights for piping.
- .6 All piping shall be concealed above ceiling in all areas. Drains and/or test connections shall not be terminated exposed in finished rooms, areas or toilet rooms.
- .7 All piping through interior walls and partitions shall be sleeved and closed off with escutcheons where visible. Penetrations through fire rated walls shall be sleeved, packed, and grouted as required to maintain the fire rating of the wall. Piping through floors and exterior walls, including foundation walls, shall be sleeved, packed and grouted with non-shrinking cement as required to make watertight.
- .8 Install signs required by local fire protection department.

# **3.3 PORTABLE FIRE EXTINGUISHERS**

.1 Spacing of extinguishers shall conform to the authority having jurisdiction. Maximum spacing for ordinary hazard shall be 9 m (30 ft.) for 10 BC and K extinguisher and 15 m (50 ft.) for 20 BC extinguishers, but in no case shall there be less than one extinguisher in each electrical room, kitchen or mechanical room. Maximum spacing for Type A extinguishers in general offices shall be 25 m (75 ft).

# 3.4 FIELD QUALITY CONTROL

- .1 Subject systems and equipment to operational test
- .2 Hydrostatically test fire protection systems in accordance with NFPA-13, latest edition. Provide labour and equipment necessary to carry out testing required by Regulating Agencies.
- .3 Upon complete installation of piping and apparatus for sprinkler systems, test joints for tightness and good condition of piping. If impossible to test whole installation in single operation, subdivide into several zones and test each zone in manner described.
- .4 During tests, stop any leaks and remove and repair any defective part. Perform test over again until satisfactory results are obtained.
- .5 Provide hydraulic pump, temporary connections and labour required for tests.

# 3.5 PROTECTION OF COMPLETED WORK

.1 Assume responsibility for protecting of Completed Work sprinkler heads during painting. Replace damaged and painted components.

# **END OF SECTION**

#### Part 1 General

### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

# **1.2 SCOPE OF WORK**

- .1 Provide all labour, materials, plant, tools, transportation, testing and put into proper operation a complete plumbing and drainage system to the full intent of the drawings and/or specifications.
- .2 In general, the major divisions of the work are as follows:
  - .1 Plumbing fixtures, floor drains and other plumbing fittings and equipment
  - .2 Storm and sanitary drainage piping inside the building, except where shown to be provided by base building
  - .3 Domestic hot, cold, and recirculation piping inside the building downstream of building water meter
  - .4 Miscellaneous Plumbing Work as shown on drawings and/or as specified herein

# 1.3 STANDARDS

.1 All work shall conform to the National Building Code; the Ontario Building Code; and all regulations of City, Local, Provincial or Territorial Authorities having jurisdiction. In case of confliction of codes with Specifications and Drawings, the most severe requirements shall apply. Where Drawings call for pipe sizes larger than minimum of the codes, Drawings shall be followed. The codes, however, shall not be violated under any circumstances.

### 1.4 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Submit Shop Drawings for the following:
  - .1 Valves
  - .2 Plumbing specialties, including cleanouts, floor drains, backwater valves, scupper drains, area drains, trap primers, etc.
  - .3 Plumbing fixtures, including water closets, lavatories, sinks, showers, faucets, traps, stops, etc

### Part 2 Products

### 2.1 PLUMBING PIPE AND FITTINGS

.1 Buried storm and sanitary drainage piping and fittings shall be plastic SDR 35 type.

- .2 Above ground sanitary and storm drains, 75mm (3") dia. and under shall be copper drainage tube (DWV), cast brass fittings and 50/50 solder joints. Drains 100mm (4") dia. and over shall be standard weight cast iron pipe and fittings with mechanical joints.
- .3 Above ground sump and sewage pump discharge piping from pump to gravity drain shall be Schedule 40 galvanized steel pipe; stretch reduced continuous weld, ASTM A53, with screwed fittings.
- .4 Vents 50mm (2") dia. and less shall be type DWV copper, 65mm  $(2^{-1}/_{2}")$  and over shall be galvanized steel.
- .5 Branch vents shall be type "DWV" hard drawn copper with cast bronze or wrought copper solder type fittings. Buried vents may be plastic ABS DWV type piping.
- .6 Domestic water piping installed above the floor, including hot and cold and recirculating piping shall be Type "L" hard drawn copper tubing with cast bronze or wrought copper solder type fittings. No copper piping shall be in contact with ferrous materials. Unions or flange connections similar to Epco "Di-Electric" pipe fittings shall be used when making such connections. Copper pipe and fittings shall be in accordance with the latest issue of C.S.A. Standard Specification. ASTM Standard B88. Copper pipe with roll groove and mechanical coupling Victaulic Style is accep607N table for 50mm (2") pipe size and larger.

### .7 **Type M copper is not acceptable.**

.8 Buried water pipe (100mm) 4" size and larger shall be Class 150 Ring-Tite PVC or cement lined ductile cast iron water pipe. Buried water pipe less than 100mm 4" size shall be soft temper copper with no joints below the floor, Type "L".

# 2.2 VALVES

- .1 Conform to requirements of ANSI, ASTM, ASME, and applicable MSS standards.
- .2 Provide valves with manufacturer's name and pressure rating clearly marked on body. Product shall carry valid CRN (Canadian Registration Number).
- .3 Provide valves of same manufacturer throughout, where possible. Provide Valves shall be Kitz, MAS, Toyo or approved equal.
- .4 All valves shall be suitable for 1.4MPa/200PSIG water working pressure and up to and including 60mm (2 1/4") size, shall be all brass or bronze. Larger sizes shall have Stainless steel, or cast iron bodies and bronze trim. All valves 100mm (4") and larger on main distribution piping shall be with rising stem and shall be flanged.
- .5 Install valves set behind access doors, except for unfinished areas, where they may be exposed.
- .6 Domestic Water Systems (Hot and Cold), portable water, lead free valves Up to 200 PSIG
  - .1 Check Valves Back Flow Prevention. For sizes 50 mm (2") and under, Screwed Ends - Kitz 822T; Solder Ends - Kitz 823T

- .2 Ball Valves For Isolation and Balancing Service. For sizes 50 mm (2") and under, Screwed Ends - Kitz 858; Solder Ends - Kitz 859. For sizes 65 mm (2-1/2") and over: Kitz 150UTDZM-N
- .3 Shutoff valves at plumbing fixture connection Boshart, 08SV series, brass chrome plated.
- .7 Check valves 50mm (2") size and smaller shall be 15 degree swing type, Kitz #23. Check valves larger than 50mm (2") shall be Kitz#78.
- .8 Gate valves up to and including 50mm (2") size shall be Kitz #44. 65mm (2 1/2") size and over shall be Kitz#72.
- .9 Globe valves up to and including 50mm (2") size shall be Kitz #12. 65mm (2 1/2") size and over shall be Kitz #76.
- .10 Ball valves size 50mm (2") and less may be used in lieu of globe and gate valves, Kitz #59.
- .11 Butterfly valves may be used in lieu of globe and gate valves size 60mm (2 1/4") and over, Kitz #6122El.

# 2.3 PLUMBING FIXTURES

- .1 Plumbing fixtures shall be as described on the drawings.
- .2 Fixtures shall be complete with necessary trim, including traps, faucets, supplies, stops, strainers, escutcheons, spuds, wastes, tail pieces, gaskets, brass bolts and carriers of type capable of being secured to floor slab.
- .3 Provide wheel handle or screwdriver stop valve on the hot and cold water supply to every fixture on the job, in addition to the valve or faucet on the fixture itself.
- .4 Shop drawings for fixtures shall consist of a carefully prepared portfolio showing illustrations, dimension drawings and detail descriptions of the fixtures to be furnished.
- .5 Manufacturer: as specified on the drawings or equivalent.

# Part 3 Execution

### 3.1 PIPING INSTALLATION

- .1 All work shall be executed by plumbers holding certificates of competency. All fixtures and equipment shall be roughed-in, installed and connected exactly in conformity with respective manufacturer's details and all fitted with individual shut offs. All lines shall be laid or hung to approved falls, and all lines shall be arranged so that any or all systems may be completely drained. All roughing-in shall be concealed, save where specifically excepted by the Architect Consultant. Piping shall not touch the structure, sleeves, other piping, conduits or equipment at any point, save at the necessary connections. This shall be observed carefully to avoid transmission of noise. Allow sufficient space in sleeves, etc. for thermal expansion of piping.
- .2 Where piping is installed in filled ground, or earth that cannot support piping, piping shall be supported on a concrete pad or piers, or alternatively it shall be cast iron hung at every

joint from reinforcing rods 10mm (3/8") diameter min. asphalt coated as described in Ontario Building Code. Where piping passes through foundation walls, it shall be supported on a reinforced concrete pad as specified under "Excavation and Backfill" in Section of Basic Materials and Methods.

- .3 In all piping 75mm (3") size and over, located anywhere, provide copper or brass flanges at each valve and at apparatus.
- .4 Water pipe in boiler room and mechanical equipment rooms shall be copper as previously specified but disconnecting copper or brass flanges shall be installed at boilers, chillers, etc., using wrought copper streamlined fittings and with Silfos solder within 8m (25 ft.) of such connections.
- .5 Pipes to circular wash fountains and island fixtures shall be insulated, wrapped with polyken tape and run in individual ABS Plastic conduits.

# 3.2 JOINTS

- .1 Joints in cast iron pipes shall be Mechanical type.
- .2 Joints in screwed steel pipe shall be made up with an approved joint compound. The use of lampwick will not be permitted. Pipe threads shall be full and clean cut. Pipes shall be reamed after being cut.
- .3 Joints in copper piping shall be made using special tools of proper size. Ends shall be cut off at right angles to pipe and reamed. Inside of fitting and outside of pipe shall be thoroughly cleaned with steel wool and coated with flux. Joints shall be soldered with a blowtorch or oxyacetylene flame using single or double tip torch depending on fitting size. Use hard solder made up of 95% tin and 5% antimony for pipe sizes up to and including 78mm (3"). Use Silfos for pipe sizes 100mm (4") and above. Working parts of valves must be removed during soldering. Wrought copper streamlined fittings must be used where Silfos is specified.
- .4 Joints in plastic piping to be solvent welded.
- .5 All solders and jointing materials shall meet the current code requirements regarding the maximum allowable lead content.

# 3.3 CLEANOUT INSTALLATION

- .1 Provide cleanouts on straight horizontal pipes with maximum spacing between cleanouts as followings:
  - .1 In the case of a sink waste pipe, 6m (20 ft).
  - .2 In the case of a horizontal sanitary drainage pipe, or storm drainage pipe, other than a waste pipe from a sink, DN100 (4") and less ,15m (50 ft).
  - .3 In the case of a horizontal sanitary drainage pipe or storm drainage pipe larger than DN150 (6"), 30m (100 ft).
- .2 Provide cleanouts at changes of direction greater than 45° in a sanitary drain, at the end of all branches, at the base of all riser lines, on all exposed or accessible traps (except water closet traps), at where drains leave the building, at all points on the system where so

indicated or required by Code, or where necessary because of interruption of general line of flow.

- .3 Cleanouts shall be full size of pipe up to 100mm (4") and not less than 100mm (4") for larger pipes. Full size "Y" or "TY" branches shall be provided for cleanouts on drains and their branches.
- .4 All cleanouts shall be made accessible and wherever necessary branch connections shall extend to finished surfaces of floors with polished bronze floor plate and frame for each, set flush with floor and with vandalproof socket head screws to match the cover finish.
- .5 Care shall be taken to locate all Barrett type cleanouts above any curbs, bases, etc. Barretts shall be covered with access doors as specified.

# 3.4 PIPE HANGERS

.1 Provide pipe hangers and supports for all piping and equipment supplied and installed under this Section. Refer to Section of Basic Materials and Methods for detailed requirements.

# 3.5 FLASHING

- .1 All piping extending through the roof or other waterprooofed area shall be flashed with Thaler Roofing Specialties Products roof flashing. Flashing shall be left ready as directed by the roofers or water proofers for them to make watertight connections.
- .2 Piping other than cast iron may be flashed with 0.5mm sheet copper soldered at all joints and provided with a conical weather drip clamped to pipe.
- .3 Where pipes pass through walls, flashing shall be turned back into the wall and caulked.

### **3.6 PIPE EXPANSION AND CONTRACTION**

- .1 Provide for the expansion and contraction of pipe work. Erect all pipe in such a manner that the strain and weight does not come upon cast connections or apparatus. Provide bends or swing joints for this purpose.
- .2 Provide anchors and expansion loops where required and where shown on drawings. Anchors shall be equal in strength to the pipe being anchored, both in shear and in bending.

# **3.7 TRAP PRIMERS**

- .1 All floor drains, hub drains, funnel drains etc., shall be trapped and provided with a 10mm (3/8") water connection for trap seal.
- .2 Install insulated flush valve tanks at high level for priming and/or P.P.P. Model P1 & P2 Prime Rite automatic primer valves complete with distribution units.

# 3.8 CO-ORDINATION

.1 Coordinate the work with reference to ceiling space and heights, partitions, lighting, ductwork, etc.

.2 Where the food store merchandising layouts or commercial kitchen layouts are applicable, coordinate these layouts supplied for plumbing work prior to the rough-ins of plumbing pipes and fixtures.

# **3.9 BACKVENTS**

- .1 Every plumbing fixture shall have its own trap and these shall be vented in accordance with the Ontario Building Code or any other local rules and regulations.
- .2 Vents smaller than 75mm (3") shall be increased to 75mm (3") before passing through the roof.

### 3.10 COLD WATER DISTRIBUTION

.1 Run piping to plumbing fixtures, hose bibbs and all other miscellaneous equipments requiring cold water connections on the job.

# 3.11 HOT WATER DISTRIBUTION

- .1 Run hot water piping as indicated on the Drawings and connect to all fixtures, and all other miscellaneous equipment requiring hot water connection.
- .2 Recirculation piping shall be arranged to provide a continuous and positive circulation of hot water throughout the system at all times. Branch shut-offs in recirculation piping shall match the shut-offs in the hot water mains, so that any section of the system could be shut down and drained for maintenance. No recirculation branch shall be less than 20mm (3/4") size.
- .3 There shall be no high points or air pockets in any recirculation lines. Lines shall be so arranged and graded that air shall collect at the fixtures or at the hot water tanks. Where it is impossible to avoid high points, install automatic air eliminator traps, Sarco Type 13WN with discharge piped to nearest drain.

### 3.12 DRAINAGE AND SANITARY SEWER SYSTEM

- .1 The general arrangement of the storm and sanitary drainage piping is shown on the Drawings. Install a complete drainage system as shown.
- .2 Include connections and revisions to the existing sewers.
- .3 The area drains connecting to internal drainage system are part of the work of this Section.
- .4 Provide complete venting system per Ontario Building Code.
- .5 Connect vent lines into the soil stack above highest fixture or extend separately through roof to a height of 600mm (24") above roofline and 3.6m (12 ft) away from any opening into building and flash properly

# 3.13 FIXTURE INSTALLATION AND SUPPORTS

.1 Supply, install and connect up complete all plumbing fixtures shown on the Drawings. Protect all fixtures until the building is accepted by the Owner.

- .2 All wall hung plumbing fixtures shall be supported by wall brackets. The bolts for these brackets are to be carried through the wall and through a steel plate 150mm (6") wide, 3mm thick and full length of bracket, plus 50mm (2") or to suit studs on wall.
- .3 Water closets shall be set in mastic to prevent water on floor from entering space between floor and bowl or pipe sleeve.
- .4 Supply and install below showers, janitor's receptors, and all other waterproofed areas required for plumbing fixtures a 2.5mm sheet lead safe, soldered at all joints, flashed into the floor drain and turned up 150mm (6") into all walls and curbs. "Compotite" manufactured membrane may be used in lieu of sheet lead.
- .5 Provide shutoff vale on each branch pipe connection to each plumbing fixture.

# 3.14 THERMAL INSULATION

.1 Provide insulation as required in Section of Thermal Insulation.

# 3.15 TESTING

- .1 Make pressure tests on all piping included in this Contract. Furnish all pumps, compressors, gauges and connectors necessary for tests.
- .2 Conduct tests in presence of Consultant and all other personnel of Governing Authorities having jurisdiction. Notify all parties in ample time to permit them to be present.
- .3 Conduct tests before piping is painted, covered or concealed.
- .4 Test drains for tightness and grade as required by the Ontario Water Resources Commission Act, Regulation No. 736 and the local plumbing inspector.
- .5 Hydrostatically test domestic water piping to a pressure of at least 1050 KPa (152Psi).
- .6 All drains shall be tested for tightness and grade as required by the Ontario Building Code and Governing Authorities.
- .7 Any tests required by the Architect and/or Consultant during the progress of the work or at its completion, shall be made without cost to the Owner. Such tests shall be carried out solely for the purpose of determining if the work as actually installed meets specified requirements.
- .8 Caulking of threaded joints shall not be acceptable, faulty piping shall be replaced with new pipe and fittings.
- .9 Conduct hydrostatic tests for a minimum period of 2 hours, or longer when requested. During this time the pressure shall remain constant and the exterior surfaces of pipe or fittings shall not show any cracks or other form of leak.
- .10 Promptly correct any defects that develop through tests and re-test to complete satisfaction of Consultant and Governing Authorities.

.11 Submit records of all pressure tests, flushing and sterilization tests, and Approvals of Governing Authorities approvals to Consultant immediately on acceptance of tests and/or approvals.

# **END OF SECTION**

### Part 1 General

#### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Work to be done under this Section shall include furnishings of labour, materials, and equipment required for installation, testing and putting into proper operation complete Mechanical systems as specified in the Contract Documents, as shown on the Drawings and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.
- .4 Modify existing hydronic system as shown.

# 1.2 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements, including:
  - .1 Hydronic Heaters
- .2 Shop drawings shall indicate:
  - .1 Components, capacities, dimensions, weights and loadings, required clearances, and location and size of field connections
  - .2 Schematic layouts showing, finned tube, coil, piping, valve, access panel and accessories required for complete system
  - .3 Controls, electrical data, and wiring diagrams and noise data
  - .4 Manufacturer's installation instructions and details, support, mounting bolt hole sizes and locations and point loads.

### **1.3 FIELD MEASUREMENTS**

.1 Verify field measurements prior to fabrication.

### Part 2 Products

# 2.1 PIPE AND FITTINGS

- .1 For 860 kPa (125 psi) or lower operating pressure use Class 125 fittings. For 860 kPa to 1,172 kPa (125 psi to 170 psi) operating pressure use Class 150 fittings. For 1,172 kPa to 3,034 kPa (170 psi to 440 psi) operating pressure use Class 300 fittings.
- .2 Heating water, chilled water, condenser water, and glycol piping shall be Schedule 40 black steel pipe; stretch reduced continuous weld, ASTM A53.
- .3 Condensate drain piping shall be type DWV copper drainage tube with cast brass fittings and 50/50 solder joints. Provide screwed cleanout tees and crosses at all changes in direction.

## 2.2 FORCED FLOW HEATERS (HYDRONIC)

- .1 Units shall be complete with coil, fan, filter and motor assembly and casing.
- .2 Cabinet shall be constructed with 1.6mm (16-gauge) electro galvanized steel with removable front panel. Adequate work area for installation of control valves or electrical equipment shall be provided on both sides of the internal cabinet. The cabinet shall be provided with a baked enamel prime coat as standard. All cabinets shall be supplied with adjustable levelling legs and rear mounting brackets, which will provide adjustment to correct alignment of the unit at installation to non-square or out of true walls, joists, studs or surfaces.
- .3 Recessed units shall be supplied with a "Wall Seal" assembly. This assembly shall provide protection to the wall or ceiling construction material. The "Wall Seal" shall be supplied in an eggshell baked enamel prime coat as standard.
- .4 Filters shall be reusable aluminum media with a 69% arrestance level. Filters shall be slide-in type, which are locked into position.
- .5 Fan wheels shall be centrifugal, forward curved, double width of electro galvanized steel. Fan housing shall be of formed, galvanized sheet metal.
- .6 Motors shall have integral thermal protection and start at 78 percent of rated voltage. Motors shall be of PSC design and be capable of operating in high static conditions. Motors shall be factory run-tested and assembled in unit prior to shipping. Primary internal wiring shall be done at the factory and every unit shall be factory tested for reliability.
- .7 Provide each unit with a solid-state motor speed controller for infinite speed adjustment from high to low speed. On wall and floor mounted unit, the speed controller shall be factory mounted behind an access door. Provide a unit mounted line voltage thermostat for wall and floor units. Provide remote line voltage thermostat for ceiling hung units.
- .8 Install safety chains on ceiling hung units.
- .9 Units manufactured by Engineered Air, Rosemex, Slant, Trane are acceptable.

# 2.3 CONVECTORS (HYDRONIC)

- .1 Convector heating elements shall be non-ferrous consisting of DN18mm (5/8") diameter copper tubing and 0.25mm (30-gauge) thick aluminum plate fins with full-flanged collars. The tubes shall be expanded mechanically into fin collars to form a permanent thermal bond. Heating elements shall be tested by manufacturer at 689 kPa (100 psi) air pressure under water.
- .2 Cabinets shall be formed from cold rolled steel and shall be suitably braced and reinforced to provide stiffness and fitted to prevent air leakage. Cabinet enclosures shall be formed steel with front 1.2mm (18-gauge), back and sides of 1.0mm (20-gauge) thickness. Cabinet front shall be flanged top and bottom for added rigidity. Air louvers shall be the Venetian type. Heating element support brackets shall be spot welded to inside ends of all convector cabinets. Provide factory installed knob-operated dampers for convectors where noted.
- .3 Where noted, convectors shall be provided with hinged access doors. Access doors shall be 100mm x 100mm (4" x 4") and shall be located in the non-louvered area.

.4 Units manufactured by Engineered Air, Rosemex, Slant, Trane are acceptable.

### 2.4 WALLFIN RADIATORS (HYDRONIC)

- .1 Furnish and install where shown on the Drawings, finned-tube assemblies as described in this Specification Section. Approved IBR ratings must be submitted as required.
- .2 All copper/aluminum heating elements shall be manufactured with seamless copper tubing mechanically expanded into the diameter of the equally spaced aluminum fins. The element shall be swaged one end. Provide support for elements on 900mm (36") centers.
- .3 Perimeter custom enclosure shall be Sigma or approved equivalent as described in this Specification Section and detailed on the Drawings.
- .4 The enclosures shall be suitably reinforced to withstand a loading of 223 kgs per m (150 lbs per lin. ft). Minimum thickness shall be as shown on the Drawings, but not less than 1.6mm (16-gauge).
- .5 The enclosure shall be continuous wall to wall or as shown on the Drawings, and shall be fabricated typical to the window modules with a recessed joint at the window mullions. The top shall have a extruded aluminum grille outlet that extends the entire panel length. The grille shall have capped ends and be affixed to 1.9mm (14-gauge) gusset located on the enclosure.
- .6 Accurately form mitres, joints, etc., for a true, square and tight fit. Fill all holes and remove all burrs or welds that could mar the finished surface.
- .7 Top of enclosure shall be supported on a continuous hanging strip with hanging strip fastened to windowsill on wall mounted enclosure. Free standing enclosure shall be supported from floor mounted pedestal. Pedestals shall be centered on window mullions and allow for levelling of enclosure.
- .8 Provide internal return and/or supply pipe hangers where required.
- .9 Panels between mullion pieces shall be removable. Panels shall be made in sections to match window modules. Panels shall have a 13mm (½ inch) return edge around the perimeter to provide rigidity.
- .10 Telescopic column angles shall be factory cut to fit tight around columns. Column angles shall be designed to provide for telescopic linear adjustment to a maximum of 25mm (1 inch) per bay.
- .11 Mullion joiners shall be designed to accommodate sound barrier partitions. The Contractor shall provide and install sound barrier partition where shown on the Drawings.
- .12 Enclosures shall be coated with electrostatically applied, temperature cured primer finish.
- .13 Wallfin radiator overall dimensions shall not exceed 160mm (6-1/3") width x 254mm (10") height.
- .14 Wall fin radiation shall be locally controlled via wall mounted thermostat and 2-way control valve.
- .15 Units manufactured by Engineered Air, Rosemex, Slant, Trane are acceptable.

### Part 3 Execution

#### 3.1 INSTALLATION

- .1 Check and locate unit or equipment upon arrival. Level and make secure.
- .2 Install according to piping layout. Make provision for pipe movement during normal operation. Pipe drains and/or blow-off connections to nearest drain.
- .3 Maintain proper clearance around equipment to permit service and maintenance. Check final location with Engineer if different from that shown, prior to installation.
- .4 Should deviations beyond allowable clearance arise, request and follow Engineer's directive.
- .5 Refer to manufacturer's installation drawings. Check electrical service work with characteristics stamped on unit.
- .6 Check that all openings for appurtenances and operating weight conform to shop drawings.
- .7 Inspect openings and interiors of equipment, remove any foreign matter from, and clean.
- .8 If accessories and/or ancillaries are delivered separately, assemble to form complete assembly.
- .9 Install control valves, wells, etc. (supplied by Controls Contractor) and circuit balancing valves in pipework as indicated. Provide reducing fittings immediately upstream and downstream of control valves and circuit balancing valves where smaller than line size. Coordinate this work with Controls Contractor.

### 3.2 TERMINAL UNITS

- .1 For terminal hydronic units, install isolating valve on supply and return runouts, and globe valve for flow balancing on return. Install control valves where specified.
- .2 Provide manual air vents for up-fed radiators and convectors.
- .3 Provide automatic air vents for suspended unit heaters. (Use manual air vents only on systems charged with glycol solution with air separators.)
- .4 Clean all finned elements, and comb fins at completion of job.
- .5 Field-measure for all lengths of element and cabinets prior to manufacturing.
- .6 Provide ancillary steelwork for suspended unit heaters.
- .7 Make provisions for pipe movement due to thermal expansion during normal operation.

### **END OF SECTION**

### Part 1 General

### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

### 1.2 **REFERENCES**

- .1 Comply with the requirements of the latest edition of the following:
  - .1 Building codes and fire codes
  - .2 ASHRAE Standards
  - .3 SMACNA Standards
  - .4 AMCA Standards
  - .5 NFPA-90A
  - .6 NFPA-96
  - .7 ANSI/AHRI 430-2009: Central Station Air Handling Units
  - .8 ANSI/AHRI 1060 (I-P)-2011, Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment
  - .9 NEBB (National Environmental Balancing Bureau)
  - .10 NABC (National Air Balance Council)
  - .11 AABC Standards (Associated Air Balance Council)

### **1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Mechanical General Requirements for all equipment supplied under this Section, including:
  - .1 Fans
  - .2 Controls
  - .3 Dampers
  - .4 Louvres

# Part 2 Products

### 2.1 DUCTWORK

- .1 Ductwork shall be constructed of first class material and according to the recommended standards of ASHRAE Handbook, latest edition.
- .2 Ductwork, unless noted or specified elsewhere, shall be first grade galvanized steel lock forming quality.
- .3 Round ductwork and fittings to be spiral lock seam galvanized ductwork.
- .4 Underground ductwork shall be spiral lock seam with waterproof coating. Cover in concrete and slope to a pump out plenum.
- .5 Flexible ductwork shall be aluminium (maximum length of 3 meters (10 ft)).
- .6 Splitter dampers shall be with Durodyne bracket and adjusting rods.
- .7 Fasteners shall be rivets and bolts throughout, sheet metal screws accepted on low velocity ducts except adjacent to all fire dampers and access doors where pop rivets are required.
- .8 Turning vanes shall be S.E. Rozell manufacture. Duct turning vanes shall be reinforced where air velocity exceed 10 m/s.

#### 2.2 SEALANTS AND TAPES

- .1 Except where used in conjunction with impermeable tape sealants shall be fire resistive compounds, non-flammable (ASHRAE) in wet state. Sealants used in conjunction with impermeable tape shall consist of non-oxidizing resin compound and shall have a 1034 kPa shear strength; sealant shall not support combustion in the dry state.
- .2 Duct tapes shall be of the pressure sensitive type, at least 51 mm wide. Tape used with a sealer compound shall have polyethylene coating on 80-thread count cloth with total thickness of 18 mil, and shall be furnished by the sealant manufacturer to ensure compatibility of materials for proper curing.
- .3 Vapour seal adhesive tape, and that used without sealant, shall be vinyl plastic, flame resistant and shall have physical properties as follows: 45 g/mm width, tensile strength 23 kg/mm width. Maximum flame spread rating of sealant and tapes to be 25.
- .4 All ductwork joints for supply and return ductwork shall be provided with duct tape and sealant.

#### 2.3 FLEXIBLE DUCT CONNECTORS

- .1 Connections for conventional systems shall be fabricated from non-combustible, air-tight, moisture-proof material coated with layers of neoprene or vinyl. Provide 1.3mm (18-gauge) protective collar over flexible connections
- .2 Connection materials shall be:
  - .1 Duro-Dyne of Canada Ltd. Durolon
  - .2 Ventfabric Inc. Ventglas
  - .3 Elgen Manufacturing Corp. Neoprene
- .3 Securely anchor ductwork to building structure at the flexible connection and select length of flexible material to allow 100 mm movement of supply air equipment and 50 mm for other fans.
- 2.4 FANS
  - .1 GENERAL

- .1 Provide fans of type, size arrangement and performance as detailed in Schedules and as required herein.
- .2 Acceptable manufacturers are as follows:
  - .1 Cook
  - .2 Greenheck
  - .3 Twin City
  - .4 Carnes
  - .5 Reversomatic
  - .6 Flaktwoods
  - .7 PennBarry
- .3 Space allocation, motor sizes, base details and connection arrangements are based on equipment by manufacturers as shown in Schedules. In submitting a Tender based on installation of equipment supplied by another of the named manufacturers, include allowance for changes in ductwork, piping, electrical starters and wiring necessary to accommodate proposed equipment. After submission of shop drawings, submit details, drawn to same scale as Contract Drawings showing how layout is to be modified to accommodate approved equipment.
- .4 Fans shall be selected from manufacturer's catalogued range of standard products, shall be statically and dynamically balanced, and when operating at maximum speed for class of construction shall be running at least 20% below first critical speed.
- .5 The fan manufacturer will check that the motor horsepower specified is sufficient to accelerate the fan to operating speed without motor overload within normal time limits.
- .6 Interior and exterior surfaces of fan equipment manufactured from black steel shall be factory cleaned and primed with red oxide chromate primer.
- .7 Fans used for smoke exhaust shall be suitable for continuous operation at 205°C (400°F).
- .8 Utility sets shall be of light weight construction, Arr #10, with V belt pulley outboard of fan bearings and fan shaft and motor shaft pointing in same direction. Include motor and belt drive enclosing covers where installed outdoors.
- .9 Fan motor shall be:
  - .1 Not less than the motor horsepower, shown in the schedule.
  - .2 Sized in accordance with criteria specified under "motors"
- .10 V-belt Drives
  - .1 The V-belt drive provided with belt drive fan shall be selected with 140% safety margin over motor horsepower listed. Fan belts shall be oil and heat resistant, non-static type. Drives shall be precision-machined cast iron type, keyed and securely attached to the wheel and motor shafts.
  - .2 For belt driven fans with variable pitch motor drive, the drive must be factory set to the specified fan RPM.
  - .3 For belt driven fans with fixed drives, allow for one (1) drive change for air balancing purposes (parts only, labour by Air Balancing Contractor).
- .11 Fan Bearings

- .1 All fans shall be equipped with heavy duty pillow block type bearings. Access doors shall be provided in casings or ductwork to permit the bearings to be inspected and replaced if necessary.
- .2 Except for permanently lubricated bearings, run in all bearings and after they are run in, drain, flush out and refill with new charge of oil or grease as required.
- .3 Provide extended lubrication tubes for all bearings that require periodic lubrication. For permanently lubricated bearings provide for a future grease fitting.
- .4 Bearings shall be packed with grease at factory.
- .12 Variable frequency drives shall be Graham, AC Tech, ABB, Siemens, Emerson.
- .2 PROPELLER FANS
  - .1 Propeller fans shall be of size, type and capacity listed in schedules. Wheels shall have not less than four dieformed aluminium or steel blades rivetted to machined steel hubs and shall be statically and dynamically balanced.
  - .2 Motors shall be totally enclosed, sleeve or ball bearing type. Provide wireguard where location is exposed.
  - .3 Where automatic dampers are not required, fans shall be complete with gravity backdraft dampers with galvanized steel frames, bronze bearings, felt edged min. 26 gauge aluminium blades.
  - .4 Provide 13mm mesh birdscreen.
  - .5 Supply the following accessories unless described otherwise in the plans and schedules:
    - .1 UL safety disconnect switch
    - .2 Wiring between motor and disconnect switch
    - .3 Inlet Guard

#### .3 CEILING FANS

.1 Provide ceiling fans with integral aluminum ceiling grille or in-line type. Each fan shall be completed with a backdraft damper. Provide fans with aluminum wall outlet boxes or roof cap containing a built-in backdraft damper.

#### 2.5 ELECTRIC DUCT HEATERS

- .1 Electric baseboard heaters, forced flow and unit heaters will be provided by Electrical Division.
- .2 Mechanical Division shall provide CSA approved duct heaters.
- .3 Frame constructed from galvanized sheet steel, coils of high-grade nickel-chrome alloy insulated by floating ceramic bushings. Stainless steel terminal pins, insulated from the frame.
- .4 Coils shall be protected by fail-safe auto reset disc-type thermal cut-outs. Heaters shall be protected by fail-safe manual reset disc-type thermal cut-outs. Coil support bushings of ceramic locked in place.
- .5 Heaters shall be slip-in type or flange-mounted as indicated.

- .6 Heaters shall be tested according to CSA.
- .7 Heaters shall be complete with the following controls:
  - .1 Built-in control panel, including Line-voltage magnetic contactor, control transformer, operation indicators, etc.
  - .2 High limit cut-outs. Cut-out controls to de-energize the heater in the case of insufficient or zero airflow conditions.
  - .3 Airflow sensor, installed in air duct and wired back to control panel. Air flow sensor shall permit heater on/off (air interlock with supply fan).
  - .4 Space thermostat, installed in downstream air duct, minimum 1 meter away from heater, wired back to control panel. Thermostat shall automatically control heater on/off. Set temperature at 22°Cunless noted other wise.
  - .5 All control wires shall be by mechanical division.
- .8 Outputs, number of stages, power supply, etc., as indicated on drawing.
- .9 Acceptable Manufacturers: INDEECO, Ouellet, or approved equal.

#### 2.6 GRILLES AND DIFFUSERS

- .1 Supply and install all grilles and diffusers as required and as shown on the drawings.
- .2 Diffusers shall be of type, performance and size indicated on the drawings.
- .3 Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.
- .4 Provide door grilles as specified on drawings.
- .5 Acceptable manufacturers: E.H. Price, Titus, Nailor Industries.

#### 2.7 DAMPERS

- .1 Provide manual dampers at all duct branches, and where necessary for system balancing.
- .2 Install motorized dampers supplied under Controls and Instrumentation where shown. Motorized dampers shall be equipped with actuator types as indicated on the schedule/specifications.
- .3 Manual dampers in rectangular ductwork shall be of the opposed blade type provided with extended control shaft and locking quadrant.
- .4 Manual dampers in round ductwork shall be butterfly type with round edged 10 gauge disk set in round sheet metal housing with rubber packing glands and wing nuts. Damper blades shall fit snugly when fully closed, 10 degrees from vertical and shall have indexing device to indicate position.
- .5 Dampers shall be located so that access is available for adjusting quadrant or servicing damper motors.
- .6 Acceptable manufacturers: Ruskin Corp, Nailor Industries Inc, E.H. Price.

#### 2.8 FIRE DAMPERS

- .1 Provide fire dampers throughout supply, return and exhaust air systems as shown.
- .2 Submit drawings showing fire damper locations to authorities for approval before work is commenced.
- .3 Fusible link dampers shall be Type B or Type C (as required) with curtain blade out of air stream. Type A dampers (with the curtain blade in the air stream) shall be installed where size or location are such that Type B and Type C cannot be installed. Consultant shall approve Type A installation
- .4 Fire dampers shall meet or exceed the following criteria: Fire dampers shall be manufactured, tested and labeled in accordance with UL 555 Safety Standard for Fire Dampers Sixth Edition, June 1999, and shall have 1 1/2 hour fire resistance rating. Each fire damper shall bear a ULC label verifying fire resistance rating in addition to intended mounting position.
- .5 Fire dampers shall be suitably constructed for vertical or horizontal installation as required for each specific location and include a steel sleeve of appropriate length/gauge and retaining angles, supplied by damper manufacturer to ensure proper installation in accordance with damper manufacturer's instructions.
- .6 Contractor shall provide and install an access door at each fire damper, of appropriate size to allow for inspection, testing and fusible link replacement.
- .7 Fire dampers shall be Ruskin Corp, Nailor Industries Inc or E.H. Price to suit rating of fire separation

#### 2.9 ACCESS DOORS IN DUCTS & CASINGS

- .1 Provide access doors in ducts, casings and plenums as shown and as specified herein. Where prefabricated duct access doors are proposed, submit shop drawings for approval.
- .2 In insulated plenums and ductwork, access doors shall be installed in a metal collar flush with the face of the finished insulation. Doors shall be 22 gauge and shall be constructed with an insulated liner, not less than 25 mm thick and shall be double wall construction in plenums.
- .3 Access doors shall be fitted with neoprene gaskets.
- .4 In ductwork doors shall be secured with sash type fasteners.
- .5 Access doors in ducts shall be maximum size possible with duct sides up to and including 350 mm. With duct sides 375 mm and larger, access doors shall be 300mm x 375mm.

#### 2.10 OUTSIDE OPENINGS AND LOUVERS

- .1 Provide louvers, bird screens, ductwork, plenums and blank-offs for intakes and exhausts. Confirm and co-ordinate opening size and location with other trades concerned. Provide motorized dampers as required.
- .2 Louvers shall be:

- .1 Air performance rating and water penetration shall be in accordance with AMCA publication 511
- .2 6" deep extruded aluminum frame, with drainable head collects and removes water
- .3 Extruded aluminum drainable blades
- .4 16mmx1mm expanded, flattened aluminum bird screen
- .5 Where required, provide hinged frame, double side security bars.
- .3 Blank-offs shall be 18 gauge galvanized sheet steel suitably reinforced (including 50 mm thick insulation) and sealed with fire resistant mastic between galvanized steel and aluminum.
- .4 Acceptable products:
  - .1 Ruskin #ELF6350
  - .2 Construction Specialties
  - .3 E.H. Price

#### Part 3 Execution

#### 3.1 DUCTWORK

- .1 All ductwork shall be constructed in strict accordance with the latest ASHRAE Guide.
- .2 All ductwork unless specifically noted otherwise, shall be made of galvanized iron. Metal shall be best quality open hearth steel. The galvanizing shall be carefully done to prevent cracking.
- .3 All laps shall be in the direction of air flow. No sheet metal screws shall be used in the duct where it is possible to use rivets and bolts. All edges and slips shall be hammered down so as to leave a smooth finished surface inside the ducts.
- .4 All ducts shall be braced and stiffened so that they will not breathe, rattle, vibrate or sag.
- .5 Rectangular ducts shall be constructed by breaking the corners and grooving the longitudinal seam, using the Pittsburgh lock or approved air tight joint. Elbows and transformation sections shall be formed with Pittsburgh corner seams or double seam corners.
- .6 Ducts shall be free of obstruction, vibration and rattle. Leakage will be permitted to a maximum of 5% in the longest duct run.
- .7 All rectangular ductwork carrying air at low or medium pressure and having any side over 300mm in width or depth shall be reinforced by cross bracing.
- .8 All ducts shall be complete in themselves and no single partitions shall be permitted between ducts unless specifically shown.
- .9 All tees, elbows or bends shall be made with a centre-line radius of not less than 1-1/2 times the width of the duct. Where space conditions do not permit the specified radius, then square throat fittings may be used complete with double thickness turning vanes.

.2

- .10 In special cases only, with prior approval of the Consultant, pipes may pass through ducts. In these cases, the pipe shall be covered with a streamline deflector, the duct shall be sealed air-tight and increased in size to provide the original free area.
- .11 Where drawings indicate that the ductwork is to be insulated, make provisions for neat insulation finish around damper quadrants, access doors, etc. Mount metal collars of suitable size and width on insulated ducts to allow insulation to be neatly finished.
- .12 Provide counterflashing for roof mounted equipment and any other duct openings in the roof.
- .13 The sides of tapered fittings shall not slope at an angle exceeding 15 deg. from the line of air flow unless specifically shown or approval of the Consultant is obtained.
- .14 The transitions at the axial fan shall not exceed 10 deg.
- .15 Minimum low pressure duct gauges shall be as follows:
  - .1 Rectangular Ductwork, Galvanized Iron:

.1	Up to 300 mm (Largest side)	.55 mm thick
.2	310 to 750 mm	.70 mm thick
.3	760 to 1370 mm	.85 mm thick
.4	1380 to 2150 mm	1.01 mm thick
.5	2160 mm and up	1.31 mm thick
Rou	nd Ductwork, Galvanized Iron:	
.1	660mm or less dia.	.55mm thickness
.2	670 to 910mm dia.	.85mm thickness
.3	920 to 1270mm dia.	1.01mm thickness
.4	1280 to 1520mm dia.	1.31mm thickness

- .16 Round ductwork shall be shop or factory fabricated of helically wound galvanized iron strips with spiral lock seam. Each duct section and fitting shall have a plain and a belled or swaged end to permit a sliding fit with an overlap of not less than 100mm. Insert sheet metal screws in joints at 300mm centres around perimeter with not less than three screws per joint. Ducts over 1000mm dia. shall have flanged joints. Surface of overlap or flanges shall be cleaned and painted with duct sealing compound before sections are joined.
- .17 Ninety degree elbows shall be of five piece construction. Mitred elbows with approved turning vanes may be used where space limitations do not permit use of five piece elbows. Forty-five degree elbows shall be of three piece construction.
- .18 Flexible ducts shall be aluminum helically would spiral duct, equal to Flexmaster T/L, maximum 10 ft. length. Provide acoustic flex equal to Flexmaster model T/L-A, where ducts are to be internally insulated.
- .19 Supply and install deflectors or splitters with quadrant dampers at all points on supply systems and exhaust systems where small ducts are taken from larger ones.
- .20 Supply and install manual dampers and turning vanes where shown.

#### **3.2 DUCT SUPPORTS**

- .1 Ducts 1500mm and less in width or depth shall be supported by 25mm wide by 16 gauge or heavier galvanized bent hangers fastened to the side and bottom of the duct by bolts, rivets or metal screws. Straps shall be continuous under the duct. Speed nuts and nailed units shall not be used to fasten hangers to ducts. Hangers shall be spaced at not more than 2.5m intervals.
- .2 Ducts over 1500mm width or depth shall be supported with 10mm diameter vertical rod hangers bolted to an angle supporting the duct from below and bolted to the bottom of the duct at 600mm intervals. Space hangers at not more than 1200mm intervals.
- .3 Where vertical ducts pass through floors, they shall be supported by angles rivetted or bolted to the duct and bearing on the building structure.
- .4 Support all ducts immediately adjacent to flexible connections.
- .5 Duct hangers for ducts shall not be suspended from the steel roof deck. Hangers for such ducts shall be supported from structural bearings such as beams, top chords of steel joists, or structural concrete slabs. Where structural bearings do not exist, provide angle or channel iron from nearest structural bearings to support hangers.

#### **3.3 FLEXIBLE DUCTWORK**

- .1 At connection points between sheet metal and flexible duct use sealing compound and tape. Make a further mechanical connection using sheet metal screws.
- .2 Sharp bends of flexible duct with centreline radius less than diameter of duct will not be accepted.
- .3 Install maximum length of 3m (10') of flexible duct for each ceiling outlet.
- .4 Flexible duct shall not penetrate through masonry or metal enclosure.
- .5 Flexible ductwork may not be used on any branch ducts that have penetrated a <sup>1</sup>/<sub>2</sub> hour fire separation.

#### 3.4 FIRE DAMPERS AND FIRE STOP FLAPS

- .1 Supply and install a system of fire dampers and fire stop flaps. Dampers and flaps shall have ULC labels. Follow manufacturer's Installation Instructions.
- .2 Dampers, housings, and method of installation shall comply with NFPA Standard No. 90A - "Air Conditioning and Ventilation Systems" and shall have C.S.A. and UL (Canada) approval.
- .3 Fire dampers shall be located within the fire separation membrane which the duct is penetrating and the opening in the fire separation membrane, e.g. masonry wall or floor, shall be sleeved and fire stopped with approved fire stopping material around and within the sleeve to provide for expansion and to maintain the integrity of the fire partition.

- .4 Where ducts penetrate dry-wall (gypsum board) construction, fire dampers shall be framed with double steel studs all around the opening, tied into the steel studs of the fire rated membrane.
- .5 If the fire damper cannot be installed within the fire rated membrane, the off-set must be of the same or equivalent material as the fire rated membrane.
- .6 Fire dampers in supply air ducts shall have the blades clear of the air stream. Fire dampers shall be Ruskin, Nailor Industries or Controlled Air equal to Ruskin IBD2-Style 'B' or Style 'C'. Dampers in return and exhaust systems may have the blades in the air stream if permitted by the Consultant, and shall be equal to Ruskin IBD2-Style 'A'.
- .7 Fire dampers shall be supported by structural members and independently from the ductwork.
- .8 Ducts and fire dampers shall penetrate the fire rated membrane perpendicularly (at right angle).
- .9 For ceiling mounted grilles and diffusers, provide fire stop flap type dampers as tested and approved by Underwriters' Laboratories of Canada and listed in "List of Equipment and Materials, Volume II, Building Construction," latest revision.
- .10 Generally fire dampers shall be installed in, but not necessarily confined to, the following ducts:
  - .1 Ducts that enter or leave Mechanical Rooms and Fan rooms.
  - .2 Ducts that enter or leave fireproof shafts.
  - .3 Ducts passing through fire walls.
  - .4 Ducts passing through floors and not enclosed in fireproof shafts.
  - .5 As further required and/or indicated on the drawings.
- .11 Fire dampers in stainless steel and aluminium ductwork shall be of stainless steel construction.
- .12 Confirm all fire damper construction and location with all Authorities having jurisdiction.

#### 3.5 ACCESS DOORS

- .1 Supply and install access doors in ducts and plenums for servicing of control elements, fire dampers, balancing dampers, damper motors, coils and all other duct mounted equipment, and for oiling of bearings and removal of electric motors.
- .2 Access doors in ductwork shall be a minimum of 450mm x 300mm clear, 1.3mm thick, or as close to these dimensions as duct size permits, with edges of door folded and duct opening provided with a frame. Door shall be secured with a minimum of 4 sash fasteners, shall be provided with a gasket, and shall be air tight. Fasteners shall be equal to Duro-Dyne SL-1.
- .3 On insulated ducts access doors shall be double wall construction, with void filled with insulation equivalent to the duct insulation.

#### **3.6 FLEXIBLE CONNECTIONS**

- .1 On the suction and discharge of all fans, provide 150mm wide airtight Duralon, elastomer coated, fibreglass fabric, flexible connections to isolate the fan from the ductwork.
- .2 Length of connection:
  - .1 75 mm (3 in) for movement up 40 mm (1.5 in)
  - .2 150 mm (6 in) for movement over 40 mm (1.5 in)
- .3 Minimum distance between metal parts when system is in operation: 25 mm (1 in).
- .4 Securely anchor ductwork to building structure on building side of flexible connection.

#### 3.7 OUTSIDE OPENINGS

- .1 Openings will be left under Divisions 3, 4 and 7 in the outside wall, roof, etc., where shown and required for fresh air intakes and exhaust.
- .2 Flashing for roof curbs and ducts under Division 7. Counterflashing by this Section.
- .3 Supply and install all necessary ductwork and plenums for intakes and exhausts and patch around same to make a weathertight job.

#### 3.8 CONNECTION TO LOUVRES

.1 Extend ductwork up to weatherproof louvres and make connections to same. Fill and caulk all openings to prevent water from draining to the wall or ceiling between the louvre and ductwork.

#### 3.9 FANS

- .1 Install fans in location shown, align shafts, belt drive and motor, adjust belt tension and check motor rotation before start-up.
- .2 Protect motors and fans during construction and rotate fans, by hand if necessary, every month between delivery and acceptance of the building.
- .3 Adjust variable pitch fan/motor sheaves as required during balancing to achieve specified air quantities.
- .4 Do not operate unit until filters (temporary or permanent) are in place. Provide new permanent filters at takeover by Owner.
- .5 Provide inlet boxes (SMACNA) on all centrifugal fans.

#### **END OF SECTION**

#### Part 1 General

#### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Employ a single qualified and approved independent company to perform testing, adjusting, balancing and commissioning of all systems and products under Mechanical Divisions.

#### 1.2 QUALIFICATIONS

- .1 The company must be a member in good standing with either National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC), and will be subject to approval by the Consultant.
- .2 Perform testing, adjusting, balancing (TAB) and commissioning in accordance with most stringent conditions of selected standard:
  - .1 AABC Standards (Associated Air Balance Council)
  - .2 NEBB (National Environmental Balancing Bureau)
  - .3 NABC (National Air Balance Council)
  - .4 SMACNA Standards
  - .5 ASHRAE Standards
  - .6 AMCA Standards
  - .7 ANSI/AHRI 1060 (I-P)-2011, Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment
  - .8 NFPA-90A
  - .9 NFPA-96

#### 1.3 WORK INCLUDED

- .1 Perform all tests specified and all tests required by authorities having jurisdiction.
- .2 Review Contract Documents before project construction is started and confirm in writing the adequacy of provisions for the work.
- .3 Schedule time required for the work (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .4 Provide all equipment, labour, calibrated instruments, and pay for expenses of manufacturers representatives, incidentals, and all power and fuel required to carry out the tests.
- .5 Test equipment to the requirements of the equipment manufacturer.
- .6 Follow start-up procedures as recommended by the manufacturer.

- .7 During construction, coordinate location and installation of TAB & commissioning devices, equipment, accessories, measurement ports and fittings.
- .8 Have the person in charge visit the project site at least once a month and submit a report stating that the work is satisfactory for future balancing and testing with respect to number, location and accessibility of balancing and testing devices, openings and all other aspects pertinent to this work.
- .9 Fully record all tests including date, location, system, equipment tested, test set up, test results, etc.
- .10 Test records of all manufactured equipment shall be complete with a manufacturer's affidavit.
- .11 Have all test records signed by testing technician, and witnesses.
- .12 Do not balance systems until each system has successfully passed the initial operational test.
- .13 Where applicable, phasing of the work will require portions of the new and existing systems balanced at different times. Refer to the General Conditions on phasing.
- .14 Start final TAB & commissioning only when building is essentially completed, including:
  - .1 Installation of ceilings, doors, windows and other construction
  - .2 Application of sealing, caulking and weather-stripping
  - .3 Normal operation of mechanical systems
  - .4 Air systems:
    - .1 Filters in place, clean
    - .2 Duct systems clean
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances
    - .4 Correct fan rotation
    - .5 Fire, smoke, volume control dampers installed and open
    - .6 Coil fins combed, clean
    - .7 Access doors, installed, closed
    - .8 Outlets installed, volume control dampers open
  - .5 Liquid systems:
    - .1 Flushed, filled, vented
    - .2 Correct pump rotation
    - .3 Strainers in place, baskets clean
    - .4 Isolating and balancing valves installed, open
    - .5 Calibrated balancing valves installed, at factory settings
    - .6 Chemical treatment systems complete, operational

#### 1.4 ACCURACY

- .1 Perform TAB to within plus or minus 5% of design values.
- .2 Prior to TAB, submit list of instruments used together with serial numbers.

- .3 Calibrate in accordance with requirements of most stringent of referenced standard for the applicable systems.
- .4 Calibrate within 3 months of TAB. Provide certificate of calibration.

#### 1.5 VERIFICATION

- .1 Reported measurements shall be subject to verification by Consultant. Provide instrumentation and manpower to verify results of up to 30% of all reported measurements. Number and location of verified measurements shall be at discretion of Consultant.
- .2 Bear costs to repeat TAB, as required to satisfaction of Consultant.
- .3 After TAB is completed, replace drive guards, close access doors, lock devices in set positions, and ensure sensors are at required settings.
- .4 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.
- .5 TAB will be considered complete only when all final reports are approved by Consultant.

#### 1.6 SUBMITTALS

- .1 Prior to commencing TAB work, submit shop drawings showing:
  - .1 Details of instruments to be used
  - .2 Details of TAB procedures to be used
  - .3 Certificate of instruments calibration
  - .4 Forms and diagrams to be used
- .2 Produce "as-built" full system schematics. Use as-built drawings for reference. Show location of permanent and temporary instruments and gauges, required for testing and balancing. Show location of any work for future.
- .3 Submit PDF files of preliminary TAB reports, complete with index tabs for verification and approval of Consultant.
- .4 Submit PDF files and 6 copies of final TAB reports after approval by the Consultant.
- .5 TAB report format to be in accordance with referenced standard listed above, but using design drawing units.
- .6 In TAB report, note those records for which tests have been witnessed by Authorities having jurisdiction.
- .7 In TAB report, prepare a complete list of instruments used for each type of test and attach to each copy of the test report. Each list shall contain for each instrument:
  - .1 Name of instrument manufacturers
  - .2 Instrument number
  - .3 Scale(s) and full scale accuracy

- .8 At the completion of testing, adjusting, balancing, commissioning and demonstration submit the following to the Consultant:
  - .1 Letter certifying that all work specified is complete, clean and operational in accordance with the Contract Documents
  - .2 As-built documents, sequences of operation and all maintenance manuals
  - .3 All TAB & commissioning reports
  - .4 All inspection authorities approvals
- Part 2 Products
- 2.1 NIL

#### Part 3 Execution

#### 3.1 AIR SYSTEMS

- .1 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, Velocity pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power voltage and current, noise, vibration.
- .2 Locations of equipment and system measurements: to include as appropriate:
  - .1 Inlet and outlet of damper, filter, coil, humidifier, fan, other equipment causing changes in conditions
  - .2 Controller and controlled device
  - .3 Main duct, main branch, sub-branch, and run-out (or grille, register or diffuser)
  - .4 Provide fan curves indicating operating point with the air balancing report.
- .3 Adjust, balance and test all system components until the trial test data are within five percent (5%) of design requirements for the overall system and each component. Repeat balancing and adjusting until the requirements are met.
- .4 Adjust each outlet by anemometer, velometer, pitot tube, or anemotherm readings to provide proper air quantities. Adjust each supply outlet to provide proper throw and distribution in accordance with space and occupancy requirements.
- .5 Perform all work required within the air handling unit casings to assist in balancing the systems.
- .6 Arrange to have additional spread plates or baffles installed within the air handling unit casings where stratification or undesirable velocity patterns are evident.
- .7 Balance main duct branches using the number of pitot tube traverses required to verify that required distribution has been achieved.
- .8 Balance sub-branches to the required amounts as summated from measured quantities at all outlets.

- .9 Systems shall be balanced so that fans operate at lowest possible speed and static pressure consistent with delivery of specified air quantities.
- .10 Static pressure dampers shall be installed where static pressure must be reduced for control of either pressure or noise.
- .11 After adjustment of supply, return and related exhaust fans, adjust minimum fresh air damper position to obtain design fresh air quantity. Damper position shall be determined by measurement of outside return mixed air temperatures and confirming calculations shall be included in balance report.
- .12 Check the setting on all unit heaters, fan coil units, cabinet heaters, variable air volume fans, variable air volume boxes, and adjust as required.
- .13 Provide pressure testing of the ductwork according to SMACNA. Minimum test length shall be 15 meters and 2 takeoffs and elbows.
- .14 Mixing plenums: establish leakage at dampers, for mixing condition at minimum outside air, and at fifty percent (50%) outside air. Leakage shall not result in more than 0.6°C (1°F) differential in average mixed air temperature. Use pitot tube traverse readings. Have automatic dampers adjusted as required.
- .15 The air balancing report shall include the following information, but not limited to:
  - .1 Diffusers, grilles, registers, floor outlets: System, room no., outlet designation and required air volume as per drawings, test air volume, test air velocity.
  - .2 Air supply systems: Provide design and test information including fan number, fan make, total fan air volume, minimum outside air volume, return air volume, total pressure, total static pressure, suction static pressure, discharge static pressure, fan RPM, motor make, size, motor nameplate information, rated amperage, actual amperage.
  - .3 Exhaust systems: Provide information including fan number, size and model, motor size, motor nameplate information, rated amperage, actual amperage, fan RPM, total pressure, static pressure, suction static pressure, air volume.

#### 3.2 FLUID SYSTEMS

- .1 Run each system with the applicable pumps and all permanent equipment in the path of the fluid.
- .2 Measure the flow with fluid meters and/or utilizing pump characteristics and actual brake horsepower.
- .3 Adjust the flow to result in the required system performance.
- .4 Rough balance the flow in each system branch to achieve even distribution at equipment and systems as indicated by pressure differential readings.
- .5 Perform final balancing of operating systems based upon pressure and temperature readings commensurate with actual loads.
- .6 Submit a test report listing measured data versus design data. Include in report, schematics, reference numbers and all pertinent information relative to the particular system.

#### .7 Hot Water Heating System

- .1 Test heating water circuit by means of flow meter installed in the heating water supply line. Adjust flow as required.
- .2 Test heating water pumps. Open valves gradually to obtain design flow rate as measured by flow meter. Record pump pressures and correct for suction and discharge level difference.
- .3 Adjust flow in each heating coil, radiation, and reheat coil using flow meter.

#### 3.3 FANS

- .1 Air quantity shall be measured by taking anemometer traverses across a cooling coil, a heating coil or at a filter bank or by pitot tube traverses in the fan suction or discharge plenum.
- .2 Static pressure difference between fan inlet and discharge, motor amperage and fan rmp shall be measured and motor horsepower shall be determined from an appropriate curve showing horsepower, as a function of motor amperage for that particular motor.
- .3 The results of these measurements shall be plotted on the fan characteristic curve supplied by the manufacturer and the air volume, static pressure and rpm lines should form a triangle enclosed by a rectangle with a vertical dimension not more than 15% of rated static pressure and a horizontal width of not more than 10% of rated air volume. The horsepower (KW) taken from the fan characteristic shall be within 10% of the horsepower, KW given by the motor amperage readings.
- .4 Provide new drives and belts on equipment as required for TAB.
- .5 Start and stop each fan at least five (5) times. Ensure that each fan is free wheeling and does not produce any abnormal vibration at any speed. Allow proper time interval between starts to motor manufacturer's requirements.
- .6 Check fan starting and stopping time against time recorded on shop drawings.
- .7 Let each fan and drive run continuously for one (1) hour, and check the motor temperature rise, and check bearing temperatures.
- .8 Check the working of all motor starters, remote pushbutton stations and all motor interlocks.
- .9 Check that when the fan runs at maximum power consumption no overload occurs in its electrical circuit.
- .10 Perform these tests in conjunction with Division of Electrical, the fan manufacturer and if applicable with Controls and Instrumentation subcontractor.

#### 3.4 SUPPLY AIR UNITS

- .1 Preset the system as follows:
  - .1 Set outdoor air damper to fully open position.
  - .2 Set return air damper to fully closed position.
  - .3 Set relief air damper to fully open position.

- .4 Set air filter gauge oil level to zero.
- .5 Set main branch duct dampers to fully open position.
- .6 Set all room thermostats to minimum setting and ensure all air valves are fully open (variable volume systems).
- .7 Preload air filter pressure drop to halfway between clean and replace pressure drop
- .8 Set inlet vane control to fully open position (variable volume systems).
- .9 Set all diffusers to fully open and adjust for proper air pattern.
- .10 Start all systems serving the same area.
- .2 Record all preset conditions in balancing report.
- .3 Check fan speed, motor amperage and voltage. Compare to shop drawing data. Adjust fan speed to within five percent (5%) of shop drawing value.
- .4 Make pitot tube traverse, velocity and static pressure readings in main duct.
- .5 Check static pressure requirements at air valve inlets (variable volume systems).
- .6 Check pressure drop across silencers.
- .7 Evaluate test results. If system capacity is less than 90% of design, take static pressure readings in each section of air handling unit and establish and correct cause of air shortage.
- .8 For variable volume systems if the air flow capacity is within five percent (5%) of design quantity and the inlet pressure of air valves is within ten percent (10%) of the minimum pressure required, test and balance individual valves close to the fan. Test four (4) valves for maximum and minimum air flow rates, with two units at maximum inlet pressure. Re-calibrate air valves as required to conform to test results.
- .9 Make pitot tube traverses in the main branch ducts and adjust ducts for required capacity (or preferably ten percent (10%) higher than design at this stage) using trial and error method.
- .10 Check for correct and undue drafts and noise.
- .11 Test air handling unit components and establish air side performance. Ensure uniform air flow across components.
- .12 For variable volume systems set room thermostats to maximum. Verify that fan discharge pressure is maintained without fluctuations. Verify that damper motor can control variable inlet vanes at minimum position.
- .13 Adjust system to normal operating conditions.
- .14 Verify AK factors on site or use hood for individual outlets.
- .15 Test and record duct static pressure at sensor location for fan inlet vane control (variable volume systems).
- .16 Record all test data. Note system percentage variation from design values.

# 3.5 UNIT HEATERS, CABINET UNIT HEATERS, DUCT HEATERS AND FAN COIL HEATERS

- .1 Test units for proper performance, air pattern, and cycling under their automatic controls.
- .2 Check for proper mechanical and electrical installation.

#### 3.6 PRESSURE AND TEMPERATURE GAUGES

- .1 Check all field mounted thermometers and pressure gauges for ease of observation. Adjust these gauges so they are readily visible from the floor.
- .2 Where the installation is such that temperature and pressure gauges are not conveniently located, arrange for the relocation of such instruments.

#### **3.7 TEMPERATURE CONTROL**

- .1 Check automatic valves and dampers for correct installation, smoothness of operation, and proper stroking.
- .2 Test two way control valves for tight shut off under maximum pressure drop conditions (no flow through associated circulating pumps).
- .3 Check that sequenced control devices operate properly without overlap. Check that such sequenced devices are equipped with properly functioning pilot positioners.
- .4 Check the accuracy of all sensor-controller assemblies by comparing the results with those obtained with independent measuring instruments.
- .5 Check the accuracy of all panel mounted indicating gauges by comparing with readings obtained with independent measuring instruments.
- .6 Check reset systems for proper compliance with design reset schedules.
- .7 Monitor the adjustment of the temperature control system to ensure that the system performs as intended.
- .8 The temperature control system shall be commissioned during the applicable season, i.e., heating systems during winter and cooling system during summer.
- .9 Submit a full report including a statement that the systems perform satisfactorily and as intended over the full range of operating conditions.

#### 3.8 VIBRATION ISOLATION EQUIPMENT

- .1 Check all vibration isolators for proper deflection and freedom of movement under all operating conditions of equipment being isolated.
- .2 Check flexible connections at all equipment isolated with vibration isolators to ensure that they are free from binding under no load, full load, start up and coast down of the isolated equipment.

#### **3.9 ELECTRIC DUCT HEATERS**

- .1 Test heaters interlock with fans.
- .2 Test heater proper operation and control. Ensure heater stop and start as intended (temperature and air flow)
- .3 Test thermostat setting. Test supply air temperature.

#### 3.10 DEMONSTRATION

- .1 Arrange for demonstration and instruction of Owner's staff on all aspects of equipment and system operation.
- .2 Arrange for and pay for services of manufacturer's representatives required to provide instruction on specialized portions of the installation.
- .3 Demonstration and instruction will be provided on the following systems:
  - .1 Operation of all automatic control dampers and temperature control devices
  - .2 Response of all terminal units to thermostats and other controls
  - .3 Location of and operation of all access panels
  - .4 Location of all valves and control devices above ceilings
  - .5 Operation of building occupied/unoccupied controls
  - .6 Location and operability of fire dampers
  - .7 Noise levels of all mechanical equipment and terminal devices under maximum operating conditions
- .4 Operation of all equipment and systems under each mode of operation including:
  - .1 Hydronic heaters
  - .2 Fans
  - .3 Others specified

#### 3.11 RUNNING-IN

- .1 After completion, balancing and adjusting and prior to takeover and operation by the Owner, run each system in with automatic controls fully operational during a period of at least fourteen (14) days including weekends.
- .2 Maintain a daily log of key operating parameters.
- .3 Before handing any system over, submit certified records for review by the Consultant.
- .4 Systems without record of 14 days uninterrupted acceptable operation will not be taken over.
- .5 Systems which cannot be run in prior to occupation shall be run in after occupation. The Owner shall delay his own operation until the performance of each system proves satisfactory and has been accepted.
- .6 Adjust systems as necessary to result in acceptable operation.

# **END OF SECTION**

HL ENGINEERING

# **ELECTRICAL SPECIFICATIONS**

FOR PROJECT:

**TLDSB SUMMER 2021** 

HL PROJECT NO.: 20065 ISSUED FOR TENDER MAY, 2021

### **HL ENGINEERING LTD**

14721 WOODBINE AVE., STOUFFVILLE, ON L4A 2G7 TEL: 905-713-0003



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#### Part 1 General

#### 1.1 SUMMARY

- .1 Division 00, General Requirements is part of this Section and shall apply as if repeated here.
- .2 Unless specified otherwise, this Section shall apply to all Sections of Electrical Divisions, 26, 27, & 28. The Electrical Contractor's scope shall include Divisions 26, 27, & 27.
- .3 Conform to the conditions stated in the Contract Documents.
- .4 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.

#### **1.2 INTENT AND SCOPE OF WORK**

- .1 The Work shall include all labour, materials, tools, equipment, services and incidentals, etc., necessary to provide the complete systems.
- .2 The intent of these specifications is to provide complete systems that are ready for operation, and while no attempt has been made to detail or list each individual part required.
- .3 Sections of these Specifications are not intended to delegate functions nor to delegate Work and supply to any specific trade.
- .4 The Specifications are integral with the Drawings which accompany them. Neither is to be used alone. Any item or subject omitted from one, but included in the other is properly specified.
- .5 Wherever differences occur in the Contract Documents, the maximum conditions and higher standards will govern and be allowed for in the Contract Price. The item to be incorporated will be at the option of the Consultant.

#### 1.3 **DEFINITIONS**

- .1 Where used, words "Electrical" or "Electrical Work", "Electrical Divisions", "Electrical Systems" shall include all Work in Divisions of 26, 27 and 28.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on Site to perform work to make the building and Site complete in all respects.
- .3 Where used, the word "Product" shall mean the material, equipment, component, machinery, or fixture forming the completed Work.
- .4 Where used, the word "connect" shall mean to supply and install all wiring and raceways and make all power connections to Products.

- .5 Where used, the word "supply" shall mean to include all labour, materials and services to furnish to the Site in the location required or directed complete with accessory parts, but is not intended to include installation.
- .6 Where used, the word "install" shall mean to include all labour, materials and services to secure in place Products, including receiving, unloading, transporting, storage, uncrating, installing, connecting and performance of such testing and finish Work as is compatible with the degree of installation specified complete ready for use.
- .7 Where used, the word "provide" shall mean to supply and install as each is described above.
- .8 Where used, the word "commission" shall mean to start-up and initial operation of Products as required to demonstrate satisfactory operation of Products and the entire system including calibration of any instrumentation.
- .9 Where used, the word "Work" shall mean the total construction required by the Contract Documents and includes all labour, Products and services.
- .10 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance, report to", shall mean "approved, directed, permitted, accepted, report to", by the Consultant.

#### 1.4 STANDARDS AND REGULATIONS

- .1 Conform to latest version of the applicable standards and regulations, including Federal, Provincial and Municipal laws, By-laws, regulations, Codes and Standards and the requirements of other authorities having jurisdiction in the area where the Work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract Price. Standards established by the Drawings and Specifications shall not be reduced by applicable codes or regulations.
- .2 Comply with the latest editions and all amendments of the following standards and regulations. Where conflicts in requirements occur, the higher standards shall apply.
  - .1 Canadian Standards Association (CSA) Standards
  - .2 Underwriter's Laboratories of Canada (ULC) Standards
  - .3 Canadian Underwriters Association (CUA) Standards
  - .4 Ontario Building Code (OBC)
  - .5 Ontario Fire Code (OFC)
  - .6 National Building Code of Canada (NBCC)
  - .7 National Fire Code of Canada (NFCC)
  - .8 National Fire Protection Association (NFPA) Standards
  - .9 Ontario Electrical Safety Code (OESC) and Bulletins
  - .10 Electrical Safety Authority (ESA) Requirements
  - .11 National Electrical Manufacturers Association (NEMA) Standards
  - .12 Electrical and Electronic Manufacturers Association of Canada (EEMAC) Standards
  - .13 All standards and regulations mentioned in other Sections of this Division

#### 1.5 TENDERS AND FORMS

- .1 State separate prices in the Bid Form for the Work indicated in the Contract Documents. Prices shall include the complete cost of the Work, i.e. all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. It shall be the Owner's option to delete from the Contract any of the Work indicated at the prices stated.
- .2 Cash allowances shall be carried in the Contract for the Work indicated, including all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. If the actual cost is less than the Cash Allowance, the remainder shall be reverted to the Owner. If the actual cost exceeds the Cash Allowances, the Owner will reimburse the extra amount.

#### 1.6 PERMITS AND FEES

- .1 Apply for, obtain, and pay for permits, licenses, certificates, connection charges and inspections required by authorities having jurisdiction. Include any premiums applicable due to requirements for after office hour inspections.
- .2 Submit all required documentation to the authorities for their approval and comments before starting any Work. Provide all additional drawings, details or information as may be required. Comply with any changes requested by Authorities as part of the Contract, but notify the Consultant immediately of such changes.

#### 1.7 EXAMINATION OF SITE AND CONDITIONS

- .1 Examine the Site and local conditions prior to tender submission.
- .2 Examine carefully all Drawings and complete Specifications to ensure that Work and equipment will satisfy Site conditions and performance requirements as shown. The Drawings do not show all Site conditions and existing equipment. The Contract Price shall cover all existing Site conditions.
- .3 No allowance will be made later for any expense incurred through failure to make these examinations or to report any such discrepancies and omissions in writing, five Working Days prior to tender closing.
- .4 Examine the work of Other Contractors and report at once any defect or interference affecting the work, its completion or warranty.
- .5 Submission of a tender confirms that the Contract Documents and Site conditions are completely understood and accepted without qualifications unless exceptions are specifically indicated in the Bid Form.

#### 1.8 CONTRACT DOCUMENTS

- .1 The Contract Drawings of this Division are performance drawings and indicate the scope and general arrangement of the Work. They are diagrammatic except where specific details are given.
- .2 They shall be read in conjunction with Architectural, Structural, Mechanical and all other Division Drawings of the Contract.

- .3 The Drawings do not show all conduits and/or wiring or all structural, mechanical and architectural details.
- .4 Obtain accurate dimensions from the architectural and structural Drawings, or by Site measurement. Locations and elevations of services are approximate and must be verified before construction is undertaken.
- .5 Make changes required to accommodate structural conditions, (beams, columns caps, etc.). Obtain the Consultant's approval before proceeding.
- .6 Adjust the location of materials and/or equipment up to 3 meters in any direction as instructed without adjustment to Contract Price, provided that the instructions are given before installation and rough-in.
- .7 Plan and install conduit runs respecting all applicable conditions including structural, mechanical and architectural details.

#### **1.9 SHOP DRAWINGS**

- .1 Prepare and submit shop drawings of all Products in accordance with Division 1-General Requirements as specified herein and in each Section of this Division.
- .2 PDF files are acceptable.
- .3 Shop drawings shall have a minimum 210 mm x 285 mm (8-1/2" x 11") clear space on the front sheet, suitable for stamping. The cover sheet shall include the project name, Contractor's name and Product description. Where multiple Products are submitted in one binding, include an index of all equipment as the front sheet.
- .4 Assume full responsibility for submission of shop drawings. Allow a minimum of 10 Working Days for the Consultant review.
- .5 The Consultant will only review shop drawings bearing the Electrical Division and Contractor's stamps of approval.
- .6 Submit shop drawings showing the following:
  - .1 Contract name
  - .2 Contract number
  - .3 Manufacturer's name and model number
  - .4 Supplier's name
  - .5 Approval agencies
  - .6 Shipping and working weight
  - .7 Performance characteristics
  - .8 Dimensions, including required clearances
  - .9 Electrical characteristics
  - .10 Bill of materials and finishes
  - .11 Time required to fabricate and deliver
  - .12 All variations from Contract Documents
  - .13 Construction and field connection details

#### .14 Installation requirements

- .7 The review shall not relieve the Contractor of its responsibility to provide Products in accordance with the design intent and Contract Documents.
- .8 Manufacturer's printed data sheets for standard items are acceptable providing pertinent characteristics are identified and relate to specified items.
- .9 Each shop drawing shall be checked and stamped as being correct, by trade purchasing item, and by the Contractor, before drawing is submitted.
- .10 Where applicable, provide wiring details, schematics, single line drawings, and wiring diagrams showing interconnection with the Work of other Divisions.
- .11 Verify and check dimensions to ensure proper installation of equipment in available space and without interference to the Work of other Divisions. Ensure that electrical and all other coordination is complete prior to submission of shop drawings.
- .12 Provide data sheets and samples for all wiring devices and wall plates prior to installation. Device and plate colours/finishes to be confirmed prior to ordering.
- .13 Where requested, submit samples of Products for review and approval.
- .14 Do not have equipment delivered to the Site until a shop drawing for the item has been reviewed.

#### 1.10 EXISTING, INTERFERENCE AND DETAIL DRAWINGS

- .1 Submit complete existing electrical system drawings prior to construction work.
- .2 Existing drawings shall show complete and accurate existing electrical system conditions, location of all devices and equipment, conduits and wires, junction boxes and power suppliers to building loads.
- .3 Prepare Existing, Interference and Details Drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of piping and conduits through building structure. Drawings shall also show inserts, curbs, equipment bases, anchors, special hangers and weights on all load points.
- .4 Prepare fully dimensioned detail drawings of Products and services in electrical rooms, service and ceiling spaces, and all other critical locations. Coordinate the Work with all other Divisions. Base drawings on reviewed shop drawings and indicate all details pertaining to access, clearances, sleeves, electrical connections, and elevations of pipes, ducts and conduits. Include location of access doors provided under this Division.
- .5 Ensure that clearances required by jurisdictional authorities are indicated on the interference drawings.
- .6 The Owner will not consider any extra cost as a result of the Contractor's failure to prepare proper drawings. Submit drawings two (2) weeks after receipt of the Notice to Commence the Work.

#### 1.11 RECORD DRAWINGS

- .1 Conform to the General Requirements. Maintain at least 2 sets of documents and clearly mark on same as the Work progresses, changes and deviations from Work shown so that on completion the Owner will have records of the exact location of ducts and equipment and a record of material and equipment changes.
- .2 The Contractor shall obtain a clean set of prints at the start of Contract Work and shall keep these prints up-to-date at the Site, accurately recording all changes made on the project and locating all services, equipment, etc. which may have been shown only diagrammatically on the Contract Documents.
- .3 The Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed at each Site meeting.
- .4 Prepare record drawings showing the following:
  - .1 All buried conduit runs are to be shown complete with dimension from building lines.
  - .2 Inverts of all services entering and leaving the building and at property lines
  - .3 Dimensions of underground services in relation to property lines at key points of every run
  - .4 Elevations of underground services in relation to ground floor level of the building
  - .5 Location of all services embedding in the structure, utilizing grid line references
  - .6 Dimensioned locations of all services left for future work
  - .7 All changes to the Work due to Change Orders and Site Instructions
  - .8 All changes to the Work during construction
  - .9 All changes to structural and architectural elements that affect the backgrounds of this record set
  - .10 Location and designation of all electrically supervised valves, flow switches and pressure switches
  - .11 Location and designation of all items requiring access or service in a hidden location
  - .12 Location of all access doors provided under Electrical Division
  - .13 All changes and revisions to Specifications, details and equipment schedules
  - .14 All homerun conduits, junction boxes for complete electrical systems
- .5 Upon completion of the Work, prior to the Substantial Performance inspection and after final review with, the Contractor shall neatly transfer recorded information and make a final As-Built submission for review in the following form:
  - .1 One (1) copy of clean, legible prints
  - .2 One (1) copy of ACAD2010 format drawings, files shall retain all setting (layers, line types, scales colors, etc) used in the Contract drawing
- .6 After Record Drawings have been reviewed, revise if necessary. Deliver drawings in the form of Autocad disk and three (3) sets of prints taken from those disks to the Owner. Where original design ACAD files to be obtained from HL, a cost of \$500.00 plus HST will apply.

#### 1.12 OPERATION AND MAINTENANCE MANUAL

- .1 The Contractor will be responsible for collecting and organizing three (3) copies of all data, operating instructions, maintenance and trouble-shooting instructions, parts lists, parts diagrams, evidence of all tests and certifications, complete reviewed shop drawings, etc. and assembling them in neat manuals in hard cover. Identify cover "Operation and Maintenance Manual for NAME OF THE PROJECT". Manuals shall be separated with dividers in logical sections and volumes.
- .2 The Contractor shall also collect from Subcontractors and Suppliers all Guarantees/Warranties specified in the Contract Documents. Check that starting date (date of Total Performance of the Work) and extent of each guarantee/warranty are clearly indicated. Check also that all guarantees/warranties indicate the Supplier's Name or Subcontractor's Name as appropriate together with contact phone number. Assemble neatly in labelled section of each manual.
- .3 Prior to requesting the Substantial Performing inspection, submit one (1) copy for review. Make all corrections as requested and forward the corrected two (2) copies to the Owner.

#### 1.13 SCHEDULING

- .1 Comply with the construction schedule. Conform to phasing of Work if applicable. Conform to interim and final completion dates.
- .2 Coordinate the Electrical schedule with general construction schedule.
- .3 Submit a bar chart schedule showing the start and completion dates for each activity based on a critical path analysis of the Work.
- .4 Include in the schedule for Electrical Work done by others, e.g. Power Supply Authority connection.

#### 1.14 ALTERNATES AND SUBSTITUTIONS

- .1 Substitute Products will only be considered when tendered Products become unobtainable. State in the tender the proposed substitute and amount added or deducted.
- .2 It is the responsibility of the Contractor to ensure "Substitute Products" fit the space allotted and provides the performance specified in the Contract Documents.
- .3 If Products manufactured and/or specified by a manufacturer named as equivalent are used in lieu of the manufacturer specified, the Contractor shall be responsible for ensuring that the substituted Product is equivalent in performance and operating characteristics to the specified Product, and, it shall be understood that all costs for additional space, larger power feeders and changes to associated or adjacent Work will be borne by the Contractor offering the substitution. In addition, in Equipment Rooms where Products named as equivalent is used in lieu of specified Products and the dimensions of such Products differs from the specified Products, prepare and submit for approval, accurately dimensioned layouts of rooms affected.

#### 1.15 VALUATION OF CHANGES

.1 For each change submit a complete itemized breakdown of labour and material.

- .2 Only the net difference between an extra and a credit will be subject to overhead and profit mark up.
- .3 Material shall be valued at current trade prices incorporating all discounts and labour rates. Overhead and profit shall be as shown in the Tender Form.

#### 1.16 WORKMANSHIP

.1 Workmanship and method of installation shall conform to best standards and practice and be performed to approval. Work shall be done by tradesmen skilled in the type of work to be performed. Where required by local or other By-laws and Regulations, tradesmen shall be licensed in their trade. Install all Work and equipment according to the manufacturer's printed directions.

#### 1.17 INSTALLATION REQUIREMENTS

- .1 Coordinate the Work of this Division with the Work of all other Divisions. Inform the Subcontractors for the Work of other Divisions of the locations of openings, chases, sleeves, supports, services, connections, etc., to be incorporated into the Work.
- .2 Check the locations of all expansion/building joints and ensure that all electrical installations, are at or crossing these locations, are as detailed and as required to compensate for the possible movement at the joint.
- .3 Confirm the exact location of outlets, fixtures and connections. Check architectural details and elevations for more requirements. Confirm location of connection points for equipment supplied under other Divisions or by the Owner.
- .4 Install neatly all equipment and apparatus to allow free access for maintenance, adjustment and eventual replacement.
- .5 Install metering and/or sensing devices to provide accurate and reliable sampling of quantities being measured. Install instruments to permit easy observation.
- .6 Provide suitable shielding and physical protection for devices.
- .7 Install all Products and services in accordance with the manufacturer's requirements and/or recommendations.
- .8 Provide all supports, hangers and fasteners. Secure all Products and services so as not to impose undue stresses on the structure and systems.
- .9 Ensure that the load onto structures does not exceed the maximum loading per square meter (foot) as shown on structural Drawings or as directed.
- .10 Do not use explosive activated tools.

#### 1.18 FIELD REVIEW

- .1 The Owner and Consultant shall have access to the Site at all times for review of the Work during construction.
- .2 Arrange for review of Products during manufacturing.

- .3 Provide all gauges, instruments and other necessary measuring equipment required for review of the Work.
- .4 Maintain a complete set of Contract Documents at all times for field reference.
- .5 Correct any deficiencies as they are reported during the performance of the Work.

#### **1.19 TEMPORARY SERVICES**

- .1 Provide temporary office, workshop and tools and material storage space for the Work and assume responsibility for any loss or damage thereto. Buildings erected for this purpose shall conform in appearance to those erected for similar purposes under other Divisions of the Specifications.
- .2 Provide temporary lighting for whole construction area.
- .3 Provide scaffolding and shoring necessary for the Work of this Division. Scaffolding and shoring shall be adequate to protect the workmen according to Provincial and Local Regulations.
- .4 Provide rigging and mill-wrighting, labour and equipment necessary for the Work of this Division. Employ only workmen well experienced and skilled in such trades for this portion of the Work.
- .5 Provide hoisting machinery, operators, labour and materials necessary to lift and place equipment supplied under this Division.
- .6 The permanent systems or any part thereof shall not be used during construction for construction purposes, unless so permitted in advance by the Owner, in writing.

#### **1.20 PROTECTION AND CLEANING**

- .1 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice.
- .2 Equipment stored on Site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.
- .3 Protect all finished and unfinished Work of this and other Divisions from damage due to carrying out of this Work.
- .4 Make good any damage caused directly or indirectly to walls, floors, ceilings, woodwork, brickwork, finishes, etc.
- .5 Before energizing any systems, inspect and clean the inside of all panelboards, switchgear and cabinets to ensure that they are completely free from dust and debris.
- .6 Clean all polished, painted and plated Work. Clean all lighting fixtures. Remove all debris, surplus material and tools.
- .7 Carry out additional cleaning operations of systems as specified in other Sections of this Division and as Division 1 requires.

#### 1.21 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling.
- .3 Divert unused wiring and metal materials to a metal recycling facility, or place in appropriate on-site bins for recycling.

#### 1.22 MOCK-UPS AND TRIAL USAGE

- .1 Provide mock-ups in accordance with the conditions stated in the Contract Documents and Division 1 of the Specifications.
- .2 Trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to, or breaking of, any part of such Work which may be so used.

#### 1.23 COMMISSIONING

- .1 Be responsible for commissioning of all Work provided under this Division. The total commissioning requirements of this Division involve:
  - .1 Complete activation of all systems
  - .2 Calibration, testing and verification of all systems
- .2 Commissioning shall commence with activation and verification of all systems in accordance with requirements of the Specifications. This will include, but not be limited to, the following items to be tested, adjusted and verified:
  - .1 Lighting and power distribution
  - .2 Fire alarm system
  - .3 Emergency lighting system
  - .4 Electric heating equipment/system

#### 1.24 TESTING

- .1 Carry out all tests specified in the Contract Documents and tests required by authorities having jurisdiction. The testing and adjusting is the responsibility of the Contractor.
- .2 Provide all equipment, labour, instruments, expenses of the manufacturer's representative, and incidentals, and pay for all power and fuel required to carry out the tests.
- .3 Submit the record of all tests signed by the Contractor's Superintendent and, where applicable the manufacturer's representative. Show in schedule form a record of the systems or parts of systems tested, the date of the test, the circumstances such as current, temperatures, etc., the duration of the test and any special remarks pertaining to events during the test. Note the test has been witnessed by authorities having jurisdiction.
- .4 Submit certification letters from the manufacturers of all equipment certifying that their technical representatives have inspected and tested their equipment and are satisfied with the methods of installation and operation. Where existing systems are extended, provide letters covering both new and existing equipment and connections. These letters shall

state the names of persons present at testing, methods used and a list of functions performed with location and room numbers where applicable.

- .5 Conduct the following tests, at a minimum:
  - .1 Fire alarm system test
  - .2 Emergency lighting system test
  - .3 Power distribution, including control and switching, polarity tests, voltage-drop tests and phase balancing measurement
  - .4 General operations: energize and operate electrical circuit and item
  - .5 Circuits originating from branch distribution panels
  - .6 Lighting and lighting control
  - .7 Motors, heaters and associated control equipment, including sequenced operation
  - .8 Di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment
  - .9 Demonstrate systems operation
  - .10 Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system

#### 1.25 INSPECTION

- .1 Arrange for inspection of all Work by the authorities having jurisdiction. Upon completion of the Work furnish final unconditional certificates of approval by the inspection authorities.
- .2 Application for final review will be considered when the Work has been completed and written declarations submitted that all commissioning, testing adjustment, set up and documentation is complete. Final review shall be done when:
  - .1 All reported deficiencies have been corrected.
  - .2 All systems have been balanced, tested, commissioned and are operational.
  - .3 The Owner has been instructed in the operation and maintenance of all equipment.
  - .4 All reports have been submitted and reviewed.
  - .5 All maintenance manuals have been submitted and reviewed.
  - .6 All tags and nameplates are in place and all data submitted and reviewed.
  - .7 Cleaning up is finished in all respects.
  - .8 All certificates are furnished.
  - .9 All spare parts and replacement parts specified have been provided.
  - .10 All record drawings have been submitted and reviewed.

#### 1.26 DEMONSTRATION AND INSTRUCTION

.1 Provide personnel, equipment and tools to demonstrate and instruct the Owner's designated personnel in the operation, controlling, adjusting, trouble-shooting and servicing of all systems and equipment to satisfaction of the Owner. This Work shall take place during the Owner's regular business hours prior to acceptance.

- .2 Where specified elsewhere in this Division, manufacturers shall provide demonstration and instructions.
- .3 Where deemed necessary, the Owner's agent may record these demonstrations via video tape or other means for future reference.

#### 1.27 WARRANTY

- .1 Provide a written guarantee stating that systems, equipment, components, etc. have been installed to manufacturer's instructions, that systems meet the Contract requirements and that all deficiencies in material and labour occurring within two (2) years after Substantial Performance of the work, will be corrected at no charge to the Owner.
- .2 Obtain Product warranties in excess of two (2) years from the manufacturer on behalf of the Owner. These Product warranties shall be issued by the manufacturer to the benefit of the Owner.
- .3 Instruct all manufacturers and suppliers that warranties on Products will commence upon the date of Total Performance of the Work and not from the date the Products are put into operation.
- .4 All corrections to deficiencies listed in field review reports and other correspondence, as well as but not limited to those indicated in testing, adjusting, balancing and commissioning, shall be completed prior to turn over.

#### END OF SECTION

#### Part 1 General

#### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Electrical Divisions, 26, 27, & 28
- .4 Work to be done under this Section shall include furnishings of labour, materials, and equipment required for installation, testing and putting into proper operation complete electrical systems as specified in the Contract Documents, as shown on the Drawings and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

#### 1.2 SUBMITTALS

.1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Electrical General Requirements.

#### 1.3 QUALITY ASSURANCE

.1 Electrical Work shall be carried out by qualified, licensed electricians.

#### Part 2 Products

#### 2.1 **PRODUCTS**

- .1 Products shall be new, of Canadian manufacture where available, first quality and uniform throughout. The Contractor shall submit in tender based on the use of Products specified in the Contract Documents, or on the listed acceptable alternate Products as further noted.
- .2 Electrical Products shall be CSA or ULC approved and be so labelled. Products not CSA/ULC approved shall receive acceptance by the Owner for installation, and modifications and charges required for such acceptance shall be included in the Work of this Section.
- .3 Products shall not be installed or connected to the source of electrical power until approval is obtained.
- .4 Where a manufacturer is not specified, provide Products of high commercial standard and quality consistent with the standards of these Specifications. Provide Products of the same manufacture for like applications unless noted otherwise in the Contract Documents.
- .5 Products shall be designed and manufactured in accordance with latest issue of applicable Standards or authorities when such are either mentioned herein, or have jurisdiction over such materials or items of equipment. Confirm capacity, ratings and characteristics of

Products being provided to supply power to equipment provided under other Sections of the Work. Resolve discrepancies before such items are purchased.

.6 Acceptance of Products installed presumes that Products have not been damaged or exposed to conditions that would adversely affect performance and life expectancy. If in the opinion of the consultant, Products have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as are deemed necessary by the Consultant to establish the condition and therefore, acceptability of installed Products.

#### 2.2 ELECTRICAL IDENTIFICATION

- .1 Cable and conduit
  - .1 Identify conduits and cables for the various systems by the use of the following distinctive coloured labels. The labels shall comprise pressure sensitive plastic tape with printing labels indicating the system. Apply a small area of paint to the inside of each outlet box, pull box and panel as it is being installed. Identify junction boxes in suspended ceiling areas with colour on both inside and outside.
    - .1 Power system yellow
    - .2 Fire alarm systems red
  - .2 Locate identification labels as follows:
    - .1 Behind each access
    - .2 At each change of direction, at junction boxes, and at both ends of each run
    - .3 Not more than 15m apart in straight runs
    - .4 Where passing through a wall, partition, and floor; one on each side of the wall, partition, and floor
- .2 Cable and conduit labels
  - .1 For power and lighting system feeders, install labels at either end of the conductors where terminated inside of equipment to match wiring diagram conductor identification or panelboard circuit numbers. Typical identification Panel AA circuit 21; use "AA-21". For a three phase circuit provide identification on phase A conductor only. For a single phase circuit provide identification on the phase conductor.
  - .2 For lighting branch circuits identify circuit at panel and in outlet box connection to lighting fixture. Install label on phase conductor tap-off. Typical identification if fixture connected to Panel A, circuit 5; marker identification A-5.
  - .3 For branch circuits supplying single phase and three phase devices such as receptacles and connections to equipment identify conductors at panel and in device outlet box. Install label on phase conductor inside outlet box. Typical identification if device is connected to Panel B circuit 14, marker identification "B-14".
  - .4 For switchboards identify all control conductors at terminal strips inside equipment and where terminated at all remote devices. Identification shall match the numbering system on the Drawings and "Reviewed" shop drawings.
  - .5 For fire alarm systems, identify all conductors at terminal strips located in:
    - .1 Control panels.
- .2 Annunciators.
- .3 Printers.
- .4 Local terminal cabinets.
- .5 All remote devices.
- .6 All connections in the system.
- .7 Provide identification in accordance with the numbering system on the "Reviewed" shop drawings.
- .6 For miscellaneous systems identify all conductors at terminal strips located in:
  - .1 Control and/or monitoring panels.
  - .2 Control and/or monitoring stations.
  - .3 Local terminal cabinets.
  - .4 All remote devices.
  - .5 All connections in the system.
  - .6 Provide identification in accordance with the numbering system on the "Reviewed" shop drawings.
- .3 Equipment nameplates
  - .1 Provide lamacoid name plates, white background with black engraved letters 0.4" (10 mm) high, for electrical equipment but not limited to panels, switchboards, transformers, disconnect switches, breakers, contactors, relay panels, starters, TVSS, FACP and miscellaneous panels.
  - .2 Nameplates shall indicate voltage, capacity, upstream, and downstream equipment. Typical identification for panel: "Lighting Panel C, 230/415V, 3 phase, 4 W. Supplied from Panel BB".
  - .3 Install plates after all painting has been completed. Secure with mechanical fastening devices except on the inside of panel doors where gluing will be acceptable.
- .4 Power system colour code
  - .1 Power system phase colour code:
    - .1 Red Phase A
    - .2 Black Phase B
    - .3 Blue Phase C
    - .4 Neutral White
    - .5 Ground Green
  - .2 Identify incoming utility service lines with enamel paint conforming to the above colour code.
  - .3 Band buses in switch board and panels shall conform to the above colour code.
  - .4 Provide branch conductor conforming to the above colour code.
- .5 Manufacturer's nameplates
  - .1 Have the manufacturer's nameplates affixed to each item of all equipment showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase, horsepower, etc., and the name of the manufacturer and its address. Ensure that all stamped, etched or engraved lettering on plates is perfectly legible. Ensure that nameplates are not painted

over. Where apparatus is to be concealed, attach the nameplate in an approved location on the equipment support or frame.

- .2 Ensure that panels and other apparatus which have exposed faces in finished areas do not have any visible trade marks or other identifying symbols. Mount nameplates behind doors.
- .6 Signage
  - .1 Provide signage to the local inspection authority on all equipment and electrical rooms.
  - .2 The suitable warning signs must be installed as per the Electrical Safety Code.
  - .3 Where applicable, provide warning signs for ground fault protection circuit as required by ESC.
  - .4 Where applicable, provide warning signs and marking for the power disconnect switches for fire pumps as per NFPA-20, section 9.3.

## 2.3 WIRES AND CABLES

- .1 Comply with the requirements of the latest editions of the followings:
  - .1 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables
  - .2 CAN/CSA-C22.2 No.131 Type TECK 90 Cable
  - .3 CSA C22.2 No. 38, Thermoset Insulated Wires and Cables
  - .4 CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables
  - .5 CSA C22.2 No. 65, Wire Connectors
- .2 Use copper conductors RW90XLPE and/or RWU90XLPE, 90°C rated insulation unless otherwise noted in the Contract Documents.
- .3 All wire and cable voltage rating shall be 600V. All outdoor wire and cable shall be -40 Deg. C rated.
- .4 Direct burial cable is **not** acceptable. All wire and cable shall be run in conduit.
- .5 Solid conductors of #12AWG and smaller. Stranded conductors for #10 AWG and larger.
- .6 Except as indicated hereinafter, wire for lighting and receptacle branch circuits to be #12 AWG except that #10 minimum to be used where the home run exceeds 27m (90').
- .7 Minimum #10 for all exterior lighting circuits.
- .8 Wire for control circuits to be #12AWG minimum, and for 24 volt control circuits to be #18 AWG minimum.
- .9 Wire to ceiling outlet boxes on which a lighting fixture is or may be mounted, with conductors having insulation suitable for 90°C.
- .10 Cables located in plenum, ceiling or floor spaces shall be totally enclosed in noncombustible conduit or raceway or be armoured cable where permitted by the Ontario Building Code.

- .11 Unless specified otherwise in the Contract Documents, wire for branch circuits shall be 2#12 + Ground in 16mm conduit.
- .12 Wires and cables for outdoor locations shall be rated accordingly.
- .13 Armoured cables shall be complete with interlocked aluminum armour, approved fastening and connectors and meet the requirements of Vertical Flame Test-Cables in Cable Tray of CSA C22.2 No. 0.3. The PVC jacket cables (TECK 90 and ACWU90) shall be FT6 rated.
- .14 Install all wiring in raceways, unless indicated as armoured. Route wire and cable to meet project conditions. Use suitable cable fittings and connectors.
- .15 Use an approved lubricant to assist in pulling conductors through conduit. Neatly train and lace wiring inside boxes, equipment and panelboards.
- .16 Balance the loading on feeders so that unbalanced load is less than 10%.
- .17 Limit the voltage drop at the end of feeders and branch circuits to 2% at the rated load of the circuit.
- .18 Lighting fixture wiring in accessible ceiling spaces shall be run in conduit from the lighting panel to ceiling outlet boxes with armoured cable drops no longer than 2m permissible from the boxes to fixtures.
- .19 Protect all exposed non-armoured cables in manholes, pull pits and trenches with an approved fire protective fibreglass tape of '3M' manufacture or approved equal. Extend the protective wrapping on the cables where they leave pull pits or trenches below switchgear to the circuit breaker or fused switch terminals. Rack cables in manholes and pull pits to provide clear access for maintenance and servicing.
- .20 Splice wire, up to and including No. 6 gauge, with nylon insulated expandable spring pressure type connectors. Splice large conductors using compression type connections insulated with heat shrink sleeves.

## 2.4 RACEWAYS AND FITTING

- .1 Drawings do not show all raceways. Those shown are generally in diagrammatic form only.
- .2 Comply with the requirements of the latest editions of the following:
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
  - .4 CSA C22.2 No. 62, Surface Raceways and Lighting Fixture Raceways and Fittings
  - .5 CSA C22.2 No. 83, Electrical Metallic Tubing
  - .6 CSA C22.2 No. 126, Cable Tray System

- .7 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit
- .8 CAN/CSA C22.2 No. 227.3, Flexible Non-metallic Tubing
- .9 CSA C22 No. 18, Outlet Boxes, Conduits Boxes, Fittings and Associated Hardware
- .3 Conduits
  - .1 Steel galvanized electrical metallic tubing (EMT) installed:
    - .1 In partitions;
    - .2 In ceiling spaces;
    - .3 In service spaces.
    - .4 In masonry walls.
  - .2 Rigid steel conduit hot dip galvanized inside and outside installed:
    - .1 On the exterior of building;
    - .2 Where exposed to mechanical damage;
    - .3 Where conduits turn up or turn down out of concrete slab;
    - .4 Damp and wet locations.
  - .3 Rigid PVC (unplasticized) conduit except for exit light, emergency lighting, and fire alarm system installed:
    - .1 In slabs with rigid steel galvanized turn-up;
    - .2 Underground with rigid steel galvanized turn-up;
    - .3 In concrete walls;
    - .4 Damp and wet locations.
  - .4 Flexible armoured conduit:
    - .1 In partitions;
    - .2 For lighting fixture drops;
    - .3 From ceiling junction boxes into wall outlets;
    - .4 Flexible armoured conduits shall be limited to 10'-0" lengths where run horizontally from take-off junction boxes.
  - .5 Liquid tight flexible conduit:
    - .1 Final connection to motors.
    - .2 Any equipment which vibrates or generates noise.
  - .6 Provide green ground/bond wire in all conduits.
  - .7 Provide bushings on the ends of all conduits in enclosure, boxes, panels and cabinets, to protect the conductor installation. Except where grounding bushings are specified, use all plastic insulated bushings with a temperature rating of 150°C with double locknuts.
  - .8 For EMT use steel concrete tight set screw fittings as manufactured by T & B or equal. Die cast or pressure cast fittings are not acceptable.
  - .9 For rigid steel conduit use only insulated throat set screw type fittings. Threadless, die cast or pressure cast fittings are not acceptable.
  - .10 Use PVC conduit for all landscaping locations where conduit comes in contact with soil. Refer to the Landscape Drawings for the final elevation of planting soil. Co-ordinate and adjust electrical devices accordingly. Use epoxy glue coupling, and formed offsets. Approved manufacturers are Scepter Mfg. Co. Ltd and CGE "Cobocon".

- .11 Conceal all conduits except in service spaces, mechanical rooms, electrical rooms and ceiling spaces.
- .12 Install all locknuts and bushings to ensure a secure mechanical and electrical bond. Use Erickson couplings in lieu of running threads.
- .13 Where conduit joints occur in concrete, use silicone sealing compound to make water tight.
- .14 Lay out conduit to drain free of all moisture.
- .15 Securely hold conduits in place in concrete or masonry during pouring and construction operations; provide templates, forms and spacers as necessary.
- .16 Support multiple runs of conduit on channel or angle iron with rod hangers.
- .17 All exposed conduits shall be run parallel to building lines and to other conduits.
- .18 Secure all conduits in place with conduit clamps T & B or equal. Perforated pipe straps, wire lashings, wood screws or nails are not acceptable.
- .19 Provide conduit expansion joints where conduits cross building expansion joints, also in straight runs of conduit 30 m (100') or longer. Conduit expansion joints shall be telescoping sleeve type, with insulated bushings and ground jumper.
- .20 Make field bends and offsets uniform and symmetrical without flattening conduit. Minimum bending radius shall be ten (10) times the conduit diameter.
- .21 Ream conduit ends to remove burrs and sharp edges. Fit conduit stubs with waterproof plastic caps during installation to protect threads and to prevent entrance of moisture into conduit.
- .22 Test all conduits for clear bore using ball mandrel, brushes and snake. Clear any conduit which rejects the ball mandrel. Replace if necessary. Bear all costs involved in making all Work good, restoring all surfaces to their original pre-construction condition.
- .23 Install a continuous nylon cord 180 kg (400 lb) test in each conduit left empty.
- .24 Install a correctly sized green copper ground wire within each conduit.
- .25 Provide conduit seals in conduits which pass to the outside.
- .26 Provide pull boxes, fittings or junction boxes in conduit runs, on the basis of not more than two (2) right angle bends or their equivalent or not more than 30 m (100'), in straight runs between boxes. For outdoor direct buried conduit, up to 50m.
- .27 Size conduits to code requirements, provide larger sizes where noted in the Contract Documents.
- .28 Size conduits for low voltage wiring in accordance with the manufacturer's recommendations.
- .29 Provide conduit sealing fittings and correspond for hazardous application to Electrical Safety Code requirements.
- .30 Maximum conduit size permitted in a concrete slab shall be 35 mm. In any case verify with Structural Consultant for acceptability.
- .31 Where multi-conduits parallel run and/or crossover in concrete slab/wall, verify with Structural Consultant for acceptability.
- .4 Surface metal raceway
  - .1 The surface metal raceway systems shall consist of surface metal raceway, appropriate fittings and device brackets to complete installation.

- .2 The raceway is to be utilized in dry interior locations only in accordance with the Ontario Electrical Safety Code.
- .3 Submit drawings for approval showing the complete layout of all Products that make up the complete system for each floor prior to installation with raceway lengths, device type (power and data), locations and circuits identified, complete with data sheets and samples.
- .4 The surface raceway system specified herein for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be Hubbell HBL4750 series or Wiremold V4000 Series. The raceway shall be metal, two-piece design with a base and a snap-on cover. The raceway shall be complete with one integral barrier in the base for power/data separation. Power shall be in top; data in the bottom. Finish shall be ivory unless otherwise noted in the Contract Documents.
- .5 Complete with power receptacles and telecommunication outlets as required.
- .6 Receptacle / Data plates shall be Wiremold V4047 series, or equaled by Hubbell.
- .7 For individual devices located on surfaces where conduit cannot be recessed in finished area, provide single or double channel raceway system Products: Wiremold V500/V700/V2400, ivory finish, or equalled by Hubbell.
- .5 Install raceways system complete with appropriate fittings such as connectors, bushings, elbows, couplings, locknuts, expansion fittings, fasteners and supports and accessories supplied as integral parts of assembly, as specified in the Contract Documents. Installation shall comply with Regulatory Authorities requirements.
- .6 Neatly install exposed raceway running parallel to, and at right angles to, building lines and equally spaced in groups.
- .7 Keep raceway ends parallel and on proper spacing to suit knockouts or raceway openings in equipment or enclosure.
- .8 Keep raceways at least 150 mm clear of heating pipes, flues and hot item surfaces. Where the required clearance cannot be provided, obtain written approval alter the layout or to reduce clearance.
- .9 Provide expansion couplings, with bonding jumper and ground clamps where raceways cross building control joints.
- .10 Use only metallic, enclosed raceway on installation that require shielding of electrical cables or where installed in ceiling used as return air plenum, as specified or indicated on Drawings.
- .11 Raceways shall have established positive low resistance paths to ground and effectively isolate conductors so that any short-circuit arc is confined.
- .12 Select appropriate fittings, such as grounding bushings, bonding and grounding straps, to maintain continuity and effectiveness of grounding of raceway system.
- .13 Provide necessary fasteners and supports acceptable for type and size of raceways, to ensure a rigid, complete assembly.
- .14 Provide suitable inserts or expansion type machine bolts for fastening raceways, fittings, boxes and equipment to concrete surfaces.

- .15 Do not use wood screws, lag screws, expansion shields, rawl plugs and nylon inserts.
- .16 Secure raceway and other associated Work to structure members. Raceway shall not be supported from the ceiling suspension system.
- .17 Thoroughly clean raceway and dry clear obstructions before pulling cable or wire.
- .18 Minimum raceway size: 16mm (1/2") conduit equivalent system.

#### 2.5 OUTLET AND CONDUIT BOXES

- .1 Comply with the requirements of latest edition of the followings:
  - .1 CSA Standard C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings
  - .2 CSA Standard C22.2 No. 85, Rigid PVC Boxes and Fittings
- .2 Outlet and conduit boxes general
  - .1 Size boxes in accordance with CSA C22.1.
  - .2 102mm square or larger outlet boxes as required for special devices.
  - .3 Gang boxes where wiring devices are grouped.
  - .4 Blank cover plates for boxes without wiring devices.
  - .5 347V outlet boxes for 347V switching devices.
  - .6 Combination ganged boxes with appropriate steel removable barriers where outlets for more than one system are grouped.
  - .7 Where standard make boxes are not suitable, provide boxes of special design to fit space and other requirements.
  - .8 Where vapour proof lighting is specified, provide matching vapour proof ceiling or wall junction boxes and fittings as required.
- .3 Sheet steel outlet boxes
  - .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76mm x 50mm x 38mm or as indicated in the Contract Documents. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
  - .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102mm x 54mm x 48mm.
  - .3 102mm square or octagonal outlet boxes complete with steel fixture studs where supporting lighting fixtures. Die cast fittings are not permitted.
  - .4 102mm square outlet boxes with extension and plaster rings for lush mounting devices in finished plaster or tile walls.
- .4 Masonry boxes
  - .1 Electro-galvanized stamped steel masonry single and multi gang boxes for devices flush mounted in exposed block walls, minimum size 95mm x 50mm x 64mm standard.
- .5 Concrete boxes
  - .1 Electro-galvanized stamped steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

- .6 Recessed floor boxes and outlets
  - .1 For concrete and wood floor:
    - .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brushed aluminum cover plate. Confirm exact cover finish to suit floor finish prior to ordering devices during the shop drawings review.
    - .2 Minimum 2 compartments for both power and communication and 4-gang capability
    - .3 Device mounting plates (brackets) to accommodate power receptacles and communication outlets.
    - .4 Complete with minimum 2 duplex power receptacles and one communication single gang plate for 2 communication outlets.
    - .5 Minimum size: 254mm x 204mm x 76mm (deep)
    - .6 Wiremold Resource #RFB series or equal
  - .2 Poke-thru type boxes for floor with access from below:
    - .1 UL fire rated of 2hr, water tight, suitable for plenum space.
    - .2 Die-cast aluminum cover, confirm exact cover finish to suit floor finish prior to ordering devices during the shop drawings review.
    - .3 Minimum 2 compartments for both power and communication and 2 1/2gang capability
    - .4 Device mounting plates (brackets) to accommodate power receptacles and communication outlets.
    - .5 Complete with minimum 2 duplex power receptacles and one communication single gang plate for 2 communication outlets.
    - .6 Wiremold Evolution #6AT series or equal
  - .3 Raised Access Floor Boxes and outlets
    - .1 Die-cast aluminum housing with 2 compartments for both power and communication, 3-gang capability
    - .2 Flush in raised floor tile complete with lift-up cast aluminum recessed cover and cable lid. Confirm exact cover finish to suit floor finish prior to ordering devices during the shop drawings review.
    - .3 Device mounting plates (brackets) to accommodate power receptacles and communication outlets.
    - .4 Complete with 2 duplex power receptacles and one communication single gang plate for 2 communication outlets.
    - .5 Minimum: 203mm x 152mm x 114mm.
    - .6 Wiremold #AF series or equal
- .7 Conduit boxes
  - .1 Cast FS or FD aluminum, or feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
  - .2 PVC FS or FD boxes or PVC conduit where required in special corrosive areas as indicated on the Drawings.
- .8 Fittings general
  - .1 Bushing and connectors with nylon insulated throats.

- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits
- .4 Double locknuts and insulated bushings on sheet metal boxes
- .9 Installation
  - .1 Support boxes independently of connecting conduits. Install all boxes vertically plumb and securely fastened so associated trades will not cause the box to be misaligned.
  - .2 Where interior recessed boxes on exterior wall, a good vapour barrier continuity technique shall be employed such as Iberville or Mold Processors 1004-VB plastic backboxes.
  - .3 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of the Work.
  - .4 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
  - .5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washer is not allowed.
  - .6 Size and install appropriate boxes and enclosures in accordance with applicable section(s) of Ontario Hydro Electrical Safety Code and the manufacturer's recommended procedures.
  - .7 Co-ordinate the location and installation of boxes so as to be accessible and clear from the building system equipment.
  - .8 Install pull boxes in inconspicuous but accessible locations.
  - .9 Use pull boxes for conduits larger than 35mm. Use conduit outlet bodies for conduit 35mm.
  - .10 Provide approved hole plugs in unused conduit knockouts and openings.
  - .11 Furnish boxes and enclosures with corrosion resistant machine screws.
  - .12 Boxes and enclosures embedded in concrete for flush-mounted, shall be secured properly with connecting conduits and related Works set in place before concrete is poured. Forms, when used, shall be able to be removed without disturbing installed boxes or enclosures.
  - .13 Ensure junction and outlet boxes mounted in ceiling cavities do not interfere with removal of ceiling tiles.
  - .14 Use masonry boxes for flush mounting in exposed block walls, concrete boxes for flush mounting in concrete wall.
  - .15 Furnish conduit boxes with neoprene gaskets for outdoor area or hazardous area application.
  - .16 Install all wall boxes for door security access devices, fire alarm devices, etc., adjacent to lock side of door openings unless otherwise shown on the Drawings. Check door swing before installing any switch.
  - .17 Install all boxes in walls so that tapped holes for mounting wiring devices or fixtures will be aligned vertically or horizontally, as required. Where boxes are grouped at one location with common and varying mounting heights, align boxes horizontally and vertically from centre line unless otherwise indicated in the Contract Documents.

- .18 Offset outlet boxes in sound attenuating partitions to avoid undue transmission of sound between the partition elements. Use flexible conduit connections where wiring is required between outlet boxes on opposite sides of partition.
- .19 Offset outlet boxes where installed on either side of a fire separation.
- .20 Where steel supports are required for outlet boxes, wood supports are not acceptable.
- .21 Maintain integrity of vapour barriers along building perimeter wall where flush outlet boxes are required.

#### 2.6 ACCESS PANELS AND DOORS

- .1 All access panels and doors shall be Milcor or Bel, 12 gauge with concealed hinges.
- .2 In glazed tile walls provide #304 alloy stainless steel with #4 finish recessed frame and secured with stainless steel countersunk flush head screws.
- .3 In plaster surfaces provide dished steel door for plaster finish with welded metal lath and plastic grommet for keyhole.
- .4 In other finishes use plain steel door with lock and anchor straps, complete with factory prime coat.
- .5 In lay-in ceilings, tiles properly marked may serve as access panels.
- .6 Provide the appropriate Subcontractors for other Divisions of the Work with panels and doors, complete with frames and all pertinent information for installation. Ensure that all panels and doors are flush mounted and properly aligned with building modules and grids. Indicate locations on record drawings.
- .7 Select all access panels and doors to provide adequate access, and to suit appropriate architectural finish, minimum size 150 mm x 150 mm (6" x 6"). Where necessary for persons to enter, provide minimum 600 mm x 450 mm (24" x 18") size doors.

## 2.7 METALS

.1 Provide all other electrical Work such as, but not limited to, equipment bases, supports, catwalks, framework to support checker plates and electrical equipment above trenches and cable pits, ladders, pit and trench covers, etc. Have such Work carried out in accordance with the requirements of Division of Metals.

## 2.8 SLEEVES AND CURBS

- .1 Provide conduit sleeves of galvanized steel for conduit and cable runs passing through concrete walls, beams, slabs and floor. Cut flush with finished surface.
- .2 Extend galvanized conduit sleeves for conduit rising through slabs a minimum of 4" above finished floors.
- .3 Through exterior walls below grade waterproofed floors, and other waterproof walls use heavy weight cast iron pipes machine cut. Extend sleeves 100 mm (4") above finished floors, and cut flush with underside of floor.

- .4 For rectangular duct openings for bus ducts and cable tray use minimum 18 gauge galvanized steel sleeves or provide a removable wood box-out of the required size. Brace sleeves to retain their position and shape during the pouring of concrete and other work.
- .5 Seal sleeves and openings to maintain fire rating. Use 3M<sup>™</sup> Fire Barrier Sealant CP 25WB+, Dow-Corning #3-6548 `Silicone RTV' foam, Thomas & Betts `Flamesafe' firestop system, installed in accordance with the manufacturer's specifications and recommendations.
- .6 Seal all openings and sleeves after installation of equipment:
  - .1 With an approved material to maintain fire rating where sleeves and openings pass through fire separations and floors.
  - .2 With an approved material to maintain fire rating for sleeves and openings provided for future equipment.
- .7 Size sleeves to provide 13 mm (1/2") clearance all around.
- .8 Provide all flashing and waterproofing for sleeves through the roof and exterior walls in accordance with the requirements of Division of Thermal and Moisture Protection.
- .9 Except where furred in, provide watertight concrete curbs, 100 mm (4") high by 100 mm (4") wide with 19 mm (3/4") chamfered edges around all sleeves and openings passing through waterproof floors.

## 2.9 SUPPORTS AND BASES

- .1 Submit the proposed method of attachment of hangers and beam clamps, to cellular steel deck for approval before proceeding with Work.
- .2 Supply and erect special structural Work required for the installation of electrical equipment. Provide anchor bolts and other fastenings unless noted otherwise in the Contract Documents. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.
- .3 Electrical panels, switches or other electrical equipment shall be complete with suitable bases or mounting brackets.
- .4 Provide channel or other metal supports where necessary, to adequately support lighting fixtures. Do not use wood unless wood forms part of the building structure.
- .5 Secure supports, in general to structure, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting conduits and cables.
- .6 Provide any additional supports required from existing concrete construction for any piping or equipment, by drilling same and installing expansion bolt cinch anchors.
- .7 Do not use explosive drive pins in any section of Work without obtaining prior approval.

- .8 Hangers for electrical conduit shall be galvanized after fabrication. Conduit hangers shall be as manufactured by:
  - .1 Burndy Canada Ltd.
  - .2 Canadian Strut Products Ltd.
  - .3 E. Myatt & Co. Ltd.
  - .4 Steel City Electric Co.
  - .5 Pilgrim
  - .6 Thomas & Betts
  - .7 B-line
- .9 Do not use, perforated strapping (grappler bars).
- .10 Steel supports in wet or dry locations shall be galvanized after fabrication.
- .11 Provide concrete housekeeping pads or bases for all floor mounted equipment 100 mm (4") high with 19 mm (3/4") chamfered edges, keyed to the floor slab and extending at least 100 mm (4") on all sides of the equipment. Where draw-out truck type circuit breakers are provided extend pad to accommodate complete withdrawal of breaker. Provide and set all anchor bolts.
- .12 Use only factory made threaded or toggle type insert.
- .13 Place inserts only in structural members and not in the finishing material.
- .14 Provide bus ducts, cable trays, and wireways with fire barriers at each floor level and fire separation.
- .15 Provide locations and dimensions for all pads and curbs and provide and set all anchor bolts for all concrete Work provided under Division of Concrete.

#### 2.10 SPARE PARTS

.1 Furnish spare parts and maintenance materials as recommended by the equipment manufacturer for the warranty period.

#### 2.11 EMERGENCY CALL SYSTEM

- .1 Provide emergency call system in barrier-free washrooms, and as noted. The system shall consist of controller (power supply module), 'assistance required' signs, emergency call stations, relays transferring signal to access control releasing electric strike, power wiring in conduit and signal wiring in conduit.
- .2 System shall be Camden CX series, or approved equal.
- .3 Activating an emergency call station (pushing the button) shall automatically result in the following:
  - .1 Indication light in push button shall be illuminated at the switch.
  - .2 'Assistance Required' signs shall operate.
  - .3 Where applicable, electric strike to release.

- .4 The emergency call station shall include:
  - .1 Combination push button and lamp indicators, red color. Latching switch (push-on/push-off) rated at 1A/ 125VAC. Normally-open, single pole
  - .2 Relay (dry contact) transferring single to access control system releasing electric strike
  - .3 Stainless steel faceplate
  - .4 Mount in recessed single gang box at 1100mm AFF
- .5 'Assistance Required' signs
  - .1 Dome light, clear lexan lens, 'Assistance Required' test, 90dB sounder.
  - .2 Rating: 0.03A at 120VAC
  - .3 Wall mounted in recessed box 200mm above the door or 200mm below ceiling.

## 2.12 HAND DRYERS

- .1 Hand dryers shall be surface mounting, temper-resistant housing, vandal-resistant grille, automatic activation (hands-free operation), rating of 1,000W at 120V1Ø, air intake slot, brushless fan motor with thermal protection, sound level of 63DBA at 2 meters. 10 years warranty. Dyson #Airblade V or equal.
- .2 Provide 15A 1P GFI breaker in panels to feed each hand dryer.
- .3 Confirm exact location on site prior to rough-in. Mounting height: 1000mm AFF from top of hand dryer, unless otherwise noted. Install hand dryer to manufacturer's instructions.

#### Part 3 Execution

### 3.1 NEUTRALS AND PHASING

- .1 Provide one (1) identified grounded neutral conductor for each set of branch circuits connected to different mains of each panel.
- .2 For circuits identified as computer dedicated (D) or isolated ground (IG), provide individual neutral per identified circuit.
- .3 Install a separate neutral for each GFCI circuit when the GFCI is located at the panelboard.
- .4 Connect two or three (2 or 3) circuits sharing a common neutral to different mains or phases.
- .5 Balance the connected loads across the mains of each panel to within 15%.
- .6 Circuit numbers on the panels must correspond to the numbers on the Drawings.
- .7 Connections in all equipment to be Phase A, B and C from left to right, and front to back when viewing from the front or accessible direction.

## 3.2 MOUNTING HEIGHTS

- .1 Mounting heights are from floor level to centre line of device outlet, unless noted otherwise in the Contract Documents. Confirm all locations before installation. In all areas accessible to persons in wheelchairs, the mounting heights of all switches, thermostats, intercom switches, pull stations, etc., shall comply with the Ontario Building Code "Barrier Free" requirements.
- .2 The mounting heights of all power and lighting devices shall comply with Ontario Electrical Safety Code requirements. The mounting heights of all fire alarm devices shall comply with CSA requirements.
- .3 If mounting height of equipment is not specified or indicated in the Contract Documents, verify before proceeding with installation.
- .4 Install electrical equipment at the following heights (centre of device) unless indicated otherwise in the Contract Documents.
  - .1 Wall switches, dimmers, timers, speed controllers, speaker volume controllers, thermostat: 1100 mm.
  - .2 Wall receptacles:
    - .1 General: 350 mm.
    - .2 Above top of continuous baseboard heater: 250 mm.
    - .3 Above top of counters or counter splash backs: 250 mm.
    - .4 In mechanical rooms: 1100 mm. (gang with switch)
  - .3 Panelboards: as required by Code or as indicated in the Contract Documents.
  - .4 Wall mounted speakers: 150 mm below ceiling.
  - .5 Door bell pushbuttons and door open push buttons: 1100 mm.
  - .6 Security key switches, card readers and intercom switches: 1100mm.
  - .7 Security wall-mounted motion sensor: 2300mm, or 150mm below ceiling.
  - .8 Service receptacle for roof mounted equipment: 750mm above finished roof.

### 3.3 WIRING OF MECHANICAL EQUIPMENT

- .1 The locations of starters, motors and associated equipment indicated on the Drawings are approximate and diagrammatic only. Coordinate with the Work of the Mechanical Division to ensure the proper location of all the equipment. The exact locations of conduit terminations at mechanical units shall be determined from the equipment manufactures' approved shop drawings. Conduits must be installed to enter only in the locations designated by equipment manufactures.
- .2 All electric baseboard heaters, cabinet heaters, force flow unit heaters and heating cables shall be provided under Electrical Division. Electric duct heaters shall be provided under Mechanical Division.
- .3 Electrical Division shall provide safety disconnect switches required at motors by CESC whether shown on the Drawings or not. Provide power wires and connections to all mechanical equipment.
- .4 All the motor starters/controllers, and/or line voltage thermostats shall be supplied under Mechanical Division and installed under Electrical Division.

- .5 All control wiring, control devices and low voltage thermostats shall be provided under Mechanical Division.
- .6 Where motor starters, switches and the like, are grouped together, provide suitable plywood backboard to which all such equipment shall be secured.
- .7 Where the single-phase exhaust fan shall be controlled by manual switch, power connections to the fan, heavy-duty toggle control switch and the safety disconnect means shall be provided under Electrical Division.

## 3.4 SERVICES TO EQUIPMENT SUPPLIED BY OWNER / OTHER DIVISIONS

- .1 Provide all necessary connections required for equipment supplied by the Owner and under other Divisions. Examine all Drawings and Specifications and identify all requirements.
- .2 Verify the type, rating and location of all outlets and/or connections required for all equipment provided by the Owner and under other Divisions.
- .3 Provide isolation devices as required to the equipment for all services.

## 3.5 PROVISION FOR FUTURE EQUIPMENT AND CONSTRUCTION

- .1 Spaces designated for future equipment or building expansion shall be left clear.
- .2 Provide services for future extensions complete with Products necessary for present termination and to permit future extension.
- .3 Identify each service by a permanent marker at its termination point.

## **3.6 CUTTING AND PATCHING**

- .1 Provide all cutting and patching required for the Work of Electrical Division. Work shall be carried out in conformance with the requirements of Concrete Division. Include any radiography required to locate concealed services before penetrating into inaccessible locations.
- .2 Any modifications to building shall be done so as not to diminish structural, fire resistance, or smoke barrier integrity.
- .3 Proposed modifications to the structure shall require acceptance by the Structural Engineer.
- .4 The Consultant shall be afforded the opportunity to review the intent prior to any major cutting.

## 3.7 PAINTING

.1 Provide all exposed ferrous metal Work, and Products, except conduit, with at least one (1) factory prime coat or paint one prime coat on Site. Clean up or wire brush all equipment before painting. The primer shall be rust inhibiting primer in accordance with CGSB-GB-40d.

- .2 Unless otherwise noted in the Contract Documents, finish painting will be done under Division 9 of these Specifications.
- .3 Do not paint galvanized supports and hangers.
- .4 Repaint or refinish all damaged factory applied finishes.

#### 3.8 VIBRATION AND NOISE CONTROL

- .1 Spring type vibration isolations shall be complete with horizontal spring constant (kH) to vertical (kV) ratio between one and two to assure stability. Select springs to operate no greater than 2/3 solid deflection. For indoor mounting use springs with one (1) coat of zinc chromate primer and two (2) coats of paint. For outdoor mounting use springs of neoprene coated steel or stainless steel. All spring housings to be hot dipped galvanized. Where the spring assembly is bolted to the floor provide vibration isolation washers and pads to reduce transmission of vibration.
- .2 Pad type isolators shall be rubber for indoor application, neoprene for oil filled devices and for outdoor use. Use 30 durometer rubber and 50 durometer neoprene. Select pad type isolators which do not exceed the mid-point of their recommended operating rate with maximum deflection of 20% of thickness. Use minimum 6 mm (1/4") thick pads under spring assemblies.
- .3 Provide spring type vibration isolators for IC engine driven equipment. Raise equipment to operating height, levelled with blocks and shims so that connections can be made to a rigid system at operating level before isolator adjustments.
- .4 For power class transformers provide spring or pad type isolators in accordance with the manufacturer's recommendations. Where dry type transformers are contained within unit substation enclosures mount the core and coils to the structural framing of the unit substation. Locate isolators between core and coil frame and unit substation structural frame.
- .5 Provide pad type isolators for all floor mounted dry type distribution transformers. Locate isolators between transformer enclosure and floor.
- .6 Where transformers are platform mounted from structure above provide spring hangers with levelling devices and sound pads in all supports.
- .7 Make connections to rotating, vibrating, magnetic or other noise producing equipment such as motors, transformers, and between independent structure by means of loop flexible conduits.
- .8 If objectionable noise or vibration should be transmitted to occupied portions of the building by any part of the electrical Work, make necessary changes and/or additions, to the Commissioner's approval, at no increase to the Contract Price.

## 3.9 CONCRETE

.1 Concrete Work shown on the structural Drawings will be done as part of Division 3of these Specifications.

.2 Provide all other concrete Work necessary for the Work of this Division. Have such Work carried out in accordance with the Concrete Division 3 of these Specifications.

#### 3.10 WORK IN EXISTING BUILDING AND SITE

- .1 Maintain the existing life safety systems in existing building in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .2 Maintain all existing systems in full operation during normal occupancy and operation hours, unless otherwise noted in the Contract Documents.
- .3 Maintain all systems adjacent to the construction area in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .4 All noise generating works that disrupt the building operations shall be carried out before/after normal occupancy hours and shall be coordinated with Owner.
- .5 Co-ordinate with the Owner for scheduling of Works required to be done before/after normal occupancy hours, including but not limit to: drilling through slab; power shutdown; interference to life safety system. All costs involved with this Work shall be included in Contract Price.
- .6 The Contractor shall assume responsibility for any disruption caused by its forces to operational building services. Repair any system damaged during the execution of the Work.
- .7 Scan (X-ray or ultrasound) for unknown existing concealed conduits, pipes, cables/wires, before excavating ground and drilling slabs.
- .8 Provide temporary lights in the construction area to carry out the Work.
- .9 Provide temporary power connections to temporary services during construction.
- .10 Disconnect and remove materials and equipment as shown and as specified in the Contract Documents.
- .11 The existing electrical conduits/wiring to remain in ceiling spaces, interfering with new installation, shall be raised or re-mounted.
- .12 All new conduit installations in ceiling shall be fastened tight to the ceiling structure or rod suspended at high level to the underside of the ceiling slab.
- .13 Where circuits to be removed which are fed from panels outside of the construction area, remove feeder back to panel, make safe circuit and update panel directories.
- .14 Make safe all circuits to be cut off.
- .15 Maintain continuity of existing services for other circuits/devices serving areas outside the construction area. Provide additional wiring/conduits/boxes etc. to suit existing services to be maintained and also implement new Work as detailed in the Contract Documents.

.16 Check and inspect existing distribution equipment to be re-used (i.e., panel breakers, disconnect switches, etc.) for abnormal thermo-graphic scan under actual loads in operation and submit scan results indicating problems have been corrected.

## **END OF SECTION**

#### Part 1 General

### 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all grounding to comply with the Ontario Electrical Safety Code and the latest instructions of the Inspection Authority, with any further requirements as noted herein.

#### Part 2 Products

#### 2.1 MATERIALS

- .1 All grounding conductors shall be stranded copper, bare or insulated as required, in conduit sized to meet electrical safety requirements unless otherwise noted in the Contract Documents.
- .2 Use Cadweld process for all weld connections. Burndy and/or AMP of Canada Ltd. mechanical grounding connectors are an acceptable equivalent to welded connections.
- .3 All ground connectors shall be designed and approved for grounding purposes.

#### 2.2 Execution

#### 2.3 INSTALLATION

- .1 Bond all interior non-electrical metallic piping systems to the electrical system ground including, but not limited to, water supply, wastewater, and gas systems.
- .2 Bond all conduit, and all non-current carrying metal parts, equipment cases, frames, bases, brackets, etc.
- .3 Bond each piece of fixed equipment back to the switchboard or panel feeding that equipment, by one of the following methods:
  - .1 Where equipment is fed by a steel conduit, provided sizing is adequate, utilize conduit for the ground return conductor. At switchboard provide a grounding bushing, and strap such conduits to the ground bus (size per Code).
  - .2 Where the size of the conduit is inadequate (per Code), or if the conduit is flexible, install a separate insulated copper ground inside the conduit. At the switchboard or distribution panel, provide a grounding bushing, loop the ground conductor through the bushing, and connect to the switchboard ground bus. At the fixed equipment, connect to an internal ground bus, or connect to the inside of the metal enclosure utilizing approved screws and connectors (remove all paint).
  - .3 For branch circuits, the conduits may be used for grounding, provided seamless steel fittings are used on EMT and threaded fittings are used on rigid conduit. At each receptacle connect a stranded copper ground wire from the outlet box to the

grounding terminal on the receptacle. Install a separate grounding conductor in all PVC conduits.

- .4 Where equipment is fed by a multi-conductor power cable, provide a ground conductor in the cable. At the switchboard or panel, connect to the ground bus. Use a grounding connector on the cable for positive grounding of the metallic sheath. Loop the ground wire to the grounding connector.
- .4 Run a separate ground wire in all flexible conduits. Connect each end to ground bus or lug or connector.
- .5 Where mechanical protection is required for insulated grounding conductors install in rigid conduit. Use rigid PVC conduit in concrete or below grade slab and aluminum conduit in other locations.
- .6 Provide weld connection or mechanical grounding connectors for:
  - .1 All connections between grounding conductors
  - .2 All connections to building steel
  - .3 All connections between grounding conductors and cable lugs
- .7 Where single ground conductor is in one conduit, the conduit must be non-ferrous.
- .8 Arrange grounding to provide the minimum impedance paths for ground fault currents. Provide any additional grounding required for approval by the inspecting authorities.
- .9 Provide system grounding to all low voltage neutral 'XO' of the transformer, neutral 'XO' also shall be bonded to the transformer enclosure/frame. The minimum conductor shall be sized as per Electrical Safety Code.

# END OF SECTION

## 1.1 General

#### 1.2 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide factory assembled power distribution equipment as herein specified and as shown on the Electrical Drawings.
- .4 Refer to the Electrical Drawings for more requirements on: voltage; phase; size and type of mains; size, type and quantity of the branch devices; location; surface or flush mounting.

#### **1.3 REFERENCE**

- .1 Comply with the requirements of the latest edition of the following:
  - .1 CSA C22.2 No. 31, Switchgear Assemblies
  - .2 CSA C22.2 No. 29, Panelboards
  - .3 CSA C22.2 No. 5, Molded Case Circuit Breakers
  - .4 CAN/CSA C22.2 No.47, Air-Cooled Transformers (Dry-Type)
  - .5 CSA C9, Dry Type Transformers
  - .6 CAN/CSA-C802.2, Minimum Efficiency Values for Dry-Type Transformers
  - .7 CAN/CSA-C802.3, Maximum Losses for Power Transformers
  - .8 CSA C22.2 No. 4, Enclosed and Dead-Front Switches
  - .9 CSA C22.2 No. 39, Fuseholder Assemblies
  - .10 CSA C22.2 No. 248 (Part 1 to Part 16), Low Voltage Fuses
  - .11 CSA C22.2 No. 190, Capacitors for Power Factor Correction

## 1.4 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Shop drawings shall include electrical details, dimensions, ratings, types, and quantity.

## 1.5 APPROVED MANUFACTUERS

- .1 The manufacturer shall be the manufacturer of the major components within the assembly, including circuit breakers and fusible switches.
- .2 Use the Products of one manufacturer for the entire project. Acceptable manufacturers are:
  - .1 Cutler-Hammer
  - .2 Schneider
  - .3 Siemens

- .4 GE
- .5 Approved equal

### 1.6 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section of Basic Materials and Methods.
- .2 Identify circuits controlled by each breaker on directory cards provided with panels. Directories shall be typed and mounted in metal frame with clear plastic cover.
- .3 Modify existing power panel directory.

#### Part 2 Products

## 2.1 BREAKERS

.1 Provide new breakers to match existing in existing power panel.

## 2.2 ENCLOSURES FOR ALL PRODUCTS

- .1 Indoor dry locations: CSA type 1.
- .2 Indoor sprinkler locations: CSA type 2.
- .3 Outdoor locations: CSA type 3R.

## 2.3 PANELBOARDS

- .1 Panelboards rated 120/208 volt AC shall have short-circuit rating as shown on the Drawings, but not less than 14 kA RMS symmetrical.
- .2 Panelboards shall be labeled with the short-circuit rating.
- .3 Interiors shall be completely factory assembled devices.
- .4 Enclosure:
  - .1 Indoor dry locations: CSA type 1.
- .5 Provide doors with concealed hinges, combined locks and latches for all panelboards.
- .6 Two (2) keys for each panelboard and key all panelboards alike.
- .7 Interior trim shall be dead-front construction to shield users from energized parts.
- .8 Main bus shall be tin finished high quality copper and extend the full length of the panel. Ground bus shall be sized to accommodate branch circuit grounding conductors.
- .9 Sequence phase bussing with odd numbered sections on the left and even on the right, with each section identified by permanent number identification as to circuit number and phase.

- .10 Provide bolt-on type circuit breakers.
- .11 Means of locking off shall meet CSA requirements of elevator power supplies
- .12 Minimum circuits shall be 42, unless otherwise noted in the Contract Documents.
- .13 Trims and doors shall be painted ANSI 61 grey. Factory applied paint finish on all exterior surfaces.
- .14 All required lugs.
- .15 Connectors for future breakers and switches. Drill and tap bus work.
- .16 Circuit breakers shall be quick-make, quick-break type, for manual and automatic operation, with over centre toggle handle. The handle shall reside in a position between "ON" and "OFF".
- .17 Circuit breakers shall have thermal and magnetic trip mechanism, to provide inverse time current tripping and instantaneous tripping, trip-free and trip indicating.
- .18 Multi-pole breakers shall be common trip type and have a common handle. Tie handles are not acceptable.
- .19 Clearly marked with their rated ampacity and respective trip rating and visible without removing bolted covers.
- .20 Provide class 'A' ground fault protection with the circuit breaker, where required by the Electrical Safety Code.

#### 2.4 TRANSFORMERS

- .1 Product of one manufacturer for the entire project. Acceptable manufacturers are:
  - .1 Hammond
  - .2 Delta
  - .3 Siemens
  - .4 Cutler-Hammer
  - .5 Schneider
- .2 Type ANN, air cooled, copper windings, Class 220 insulation, **115°C rise**, 3 phase, 60 Hz, 600 Volts delta primary, 120/208 volts, 3 phase, 4 wire star secondary, with four 2-1/2% taps brought to a terminal board; two taps FCAN, two taps FCBN.
- .3 Basic Impulse Level (BIL) and Impedance values shall comply with CSA Standards.
- .4 Maximum loss and minimum efficiency values shall comply with CSA Standards C802.2 and C802.3.
- .5 EMF level, not to be higher than 10 mG top, 10 mG side and 10 mG at one meter.

#### .6 Quiet operation with 3DB lower sound level.

## .7 Electrostatic shield. Epoxy vacuum impregnated.

- .8 Enclosure: removable metal front panel.
- .9 Transformer housing of freestanding rigid self-supporting structural steel frame.
- .10 Test all transformers in accordance with applicable CSA Standards and include ratio, polarity, impedance, load loss, no load loss, existing current, induced potential and applied potential. **Submit test data for each transformer for review.**

#### 2.5 DISCONNECT SWITCHES

- .1 Provide all disconnect switches, whether an integral part of equipment or separately mounted.
- .2 Enclosure:
  - .1 Indoor dry locations: CSA Type 1.
  - .2 Indoor sprinkler locations: CSA Type 2.
  - .3 Outdoor locations: CSA Type 3R.
- .3 Provision for padlocking in off switch position by locks
- .4 Mechanically interlocked door to prevent opening when handle in ON position.
- .5 Fuses: size as indicated in the Contract Documents.
- .6 Fuse holders: suitable without adaptors, for type and size of fuse indicated.
- .7 Heavy-duty horsepower rated, quick-make, quick-break action, front operation, with integral handle mechanism and visible contacts in "OFF" position.
- .8 ON-OFF switch position indication on switch enclosure cover
- .9 Switches identified for use as service equipment are to be labeled for this application
- .10 Furnish solid neutral assembly and equipment ground bar.
- .11 Lugs suitable for copper and/or aluminum conductors
- .12 Identify name of load controlled.

#### 2.6 FUSES

- .1 Fuses up to 600 volts and over 600amps:
  - .1 Where used in motor, transformer and other circuits with an inrush: Class L time delay. Ferraz Shawmut type A4BT or approved equal by Bussman.
  - .2 All remaining fuses: Class L non-time delay. Ferraz Shawmut A4BY or approved equal by Bussman.
- .2 Fuses up to 600 volts and up to and including 600amps:

- .1 Where used in motor, transformer and other circuits with an inrush: Class J time delay. Ferraz Shawmut type AJT or approved equal by Bussman.
- .2 All remaining fuses: Class J non-time delay. Ferraz Shawmut type A4J or approved equal by Bussman.
- .3 Fuse storage cabinet: Wall-mounted sheet metal cabinet with shelves, suitable size to store spare fuses and fuse pullers, complete with hinged door.

## 2.7 CONTACTORS

- .1 Conform to the requirements of latest edition of CSA C22.2, No. 14 Industrial Control Equipment.
- .2 The contactors shall be fully rated and withstand the large initial in-rush currents of lamps without contact welding.
- .3 Contactors shall be NEMA rated, magnetic, electrically operated, electrically held, and complete with suitable type enclosure and 120V coil.
- .4 Fail open: contacts shall open upon the supply voltage drop below 75% of the rated voltage.
- .5 Accessories
  - .1 Pilot lights (ON/OFF).
  - .2 On/Off/Auto selector switch for lighting control panel.
  - .3 Auxiliary contacts (NO and NC) and relays to match control function.
  - .4 Control circuit fuse-holders and fuses.
  - .5 Control transformers in each 347/600V enclosed contactor. Transformer shall be 120V secondary and furnished with primary and secondary fuses. Bond unfused leg of secondary to enclosure.
- .6 Mount contactors in lighting control panel at 1500 mm AFF to operating handle/pushbutton.
- .7 Mount power control contactors above power panels.
  - .1 Display power factor with indication for an inductive or capacitive power factor. Indicate the insufficient KVAR to achieve target power factor. Indicate harmonic condition.
  - .2 Calculate and store in memory the KVAR of each step.
  - .3 The time delay between switching of capacitors shall be field programmable.
  - .4 Programmable target selector.
  - .5 All output contacts shall be disabled after main power interruption. The controller shall retain its programming after the restoration of supply voltage.

## Part 3 Execution

#### 3.1 GENERAL

## .1 Modify existing power panel directory.

- .2 Install disconnect switches complete with fuses if applicable.
- .3 In finished areas, where disconnecting devices are required, provide a circuit breaker in flush mounted enclosure.
- .4 Provide three spare fuses of each type and size used above 600 amp and six spare fuses of each type and size used up to and including 600amp.
- .5 Install fuses in mounting devices immediately before energizing circuit.
- .6 Ensure correct fuses fit to physically match mounting devices.

#### 3.2 PANELBOARDS

- .1 Install panelboards securely, plumb, true and square, to adjoining surface.
- .2 Provide three (3) empty 35 mm (1 <sup>1</sup>/<sub>4</sub>") conduits from all lighting and receptacle panelboards, terminated in ceiling space above.

#### 3.3 TRANSFORMERS

- .1 Provide vibration and noise control and make connections in accordance with the requirements of the Vibration and Noise Control Section in this Division.
- .2 Suspend or wall mount transformer up to 45kVA.
- .3 Ensure adequate clearance around transformer for ventilation.
- .4 Install transformers in level upright position.

## END OF SECTION

#### 1.1 General

#### 1.2 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all switches, receptacles, wiring devices and cover plates as required to complete the installation.

## **1.3 REFERENCES**

- .1 Comply with the requirements of the latest editions of the following:
  - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Wiring Devices
  - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices
  - .3 CSA-C22.2 No.55, Special Use Switches
  - .4 CSA-C22.2 No.111, General-Use Snap Switches
  - .5 CSA-C22.2 No. 144, Ground Fault Circuit Interrupters

### 1.4 SUBMITTALS

.1 Submit shop drawings and Product data in accordance with Section OF Electrical General Requirements.

#### **1.5 MANUFACTURER**

.1 Wiring devices shall be manufactured by 1) Hubbell; 2) Pass & Seymour; 3) Leviton; 4) Watt Stopper; 5) Lutron. Catalogue numbers are referred to below to indicate quality standard.

Part 2 Products

#### 2.1 SWITCHES

- .1 White premium specification grade, quite type
- .2 Terminal holes approved for No. 10 AWG wire
- .3 Silver alloy contacts
- .4 Urea or melamine moulding for parts subject to carbon tracking
- .5 Suitable for back and side wiring
- .6 Fully rated for tungsten filament and fluorescent lamps

- .7 Switches for 120 Volt lighting circuits shall be Hubbell CSB115W, CSB315W and CSB415W, 15 ampere for single pole, three-way and four-way switching as required for the application.
- .8 Switches for 347 Volt lighting circuits shall be Hubbell HBL18221, HBL18223, 20 ampere for single pole, three-way switching as required for the application. Switch handles white. Provide key operated switches where shown of the same series.
- .9 Switches for motor or other control applications shall be horsepower rated, Hubbell, HBL7832D and HBL7810D 30Ampere for double-pole and three-pole for one application.

## 2.2 RECEPTACLES

- .1 White premium specification grade, urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring
- .3 Break off links for use as split receptacles
- .4 Eight back wired entrances, four side wiring screws
- .5 Triple wipe contacts and riveted grounding contacts
- .6 Impact-resistant nylon face
- .7 U-ground
- .8 GFCI receptacles shall meet UL 943 requirements and be complete with test and reset buttons, and LED indication light
- .9 Duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHI (CSA 5-15R)
- .10 Duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR20WHI (CSA 5-20RA)
- .11 GFCI duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GFST15W (CSA 5-15R)
- .12 GFCI duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GFST20W (CSA 5-20RA)
- .13 Isolated ground receptacle, orange, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, IG5262 (CSA 5-15R)
- .14 Single 30 amp, 120 volt, 1 phases, 2 pole, 3 wire, Hubbell, HBL9308 (CSA 5-30R)
- .15 Single 30 amp, 120/208 volt, 2 phases, 3 pole, 4 wire, Hubbell, HBL9430A (CSA 14-30R)
- .16 Single 50 amp, 120/208 volt and 120/240 volt, 2 phases, 3 pole, 4 wire, Hubbell, HBL9450A (CSA 14-50R)

- .17 TVSS duplex receptacle, gray, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, HBL5262GYWSA (CSA5-15R)
- .18 Weather-resistant duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHIWR (CSA5-15R)
- .19 Temper-resistant duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHITR (CSA5-15R)
- .20 Temper-resistant duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR20WHITR (CSA5-20R)
- .21 Temper-resistant GFCI duplex receptacle, 15/20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GFTRST15W/20W (CSA5-15R/20R)

## 2.3 COVER PLATES

- .1 Stainless steel type 302, complete with matching screw or snap on type
- .2 Weatherproof covers shall be while-in-use type polycarbonate body, cover and plates, conforming to NEMA3R. Hubbell # WP826MP

#### 2.4 DIMMERS

- .1 Slide dimmers, specification grade, white finish and cover plate shall match wall lighting switch
- .2 Preset ON/OFF switches and LED indicator
- .3 Minimum 1000W rating for incandescent lamp
- .4 Minimum 10A rating for fluorescent ballast and/or low voltage transformer

#### 2.5 OCCUPANCY SENSORS

- .1 Wall sensor switches
  - .1 Adaptive technology for time delay
  - .2 No minimum load requirement
  - .3 180° coverage up to 900 square feet
  - .4 Dual technology, ultrasonic and passive infrared
  - .5 Manual override for both on and off
  - .6 Compatible with all electronic/magnetic ballast and incandescent lamp
  - .7 Built-in photocell
  - .8 120VAC or 347VAC to suit application, 800W, dual switching circuits to suit application
  - .9 Installed in recessed single gang box, white finish and cover plate shall match wall lighting switch
  - .10 Watt Stopper #DW-100 series
- .2 Ceiling Sensors

- .1 Adaptive technology for time delay
- .2 Complete with 120VAC (or 347VAC to suit application) power supply and switching relay, dual switching relay circuits to suit application
- .3 Dual technology, ultrasonic and passive infrared
- .4 360° coverage up to 2000 square feet
- .5 Compatible with all electronic/magnetic ballast and incandescent lamp
- .6 Watt Stopper #DT-300 series

#### Part 3 Execution

#### 3.1 INSTALLATION

- .1 All wiring devices to be flush mounted in finished space. Surface installation is permitted in unfinished and/or service space.
- .2 Install single throw switches with the handle in "UP" position when switch closed.
- .3 Install devices in gang type outlet box when more than one switch is required in one location. When supplied from different voltages or power sources, provide metal barriers in the ganged box.
- .4 Permanently identify '347V' on each 347V switch cover plate.
- .5 Clean debris from outlet boxes.
- .6 Install devices plumb and level. Adjust devices and wall plates to be flush and level.
- .7 Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- .8 Clean exposed surfaces to remove splatters and restore finish.
- .9 Test each receptacle device for proper polarity.
- .10 Test each GFCI receptacle device for proper operation.

## END OF SECTION

#### Part 1 General

## 1.1 SUMMARY

- .1 This Section of Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all lighting fixtures with lamps, ballasts and accessories as specified herein and as shown on the Electrical Drawings.

#### **1.2 REFERENCE**

.1 Comply with all requirements of the latest edition of CSA Standards.

#### 1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Include fixture catalogue data sheets with shop drawings. Arrange the fixture catalogue data sheets and identify in the same sequence as the specified fixture list. Fixture catalogue data sheets shall indicate the following:
  - .1 Dimensions, weight, material, finish and mounting details
  - .2 Performance: Candle power distribution curves in two planes, C.V. chart of indoor fixtures and lumen output chart of outdoor fixtures and flood lights.
  - .3 Pole wind loading, weight, dimension, anchoring details and finish
  - .4 Lamps: type and base, burning hours, CRI, CCT and lumens
  - .5 Ballasts/drivers: type, wiring diagram, watts, voltage, P.F., sound rating, starting temperature, efficiency and other required characteristics
- .3 Submit photometric IES file for all substituted fixtures. Where requested, submit an electronic lighting level calculation analysis for the area with substituted fixtures.
- .4 Where requested, submit fixture samples of each substituted fixtures.
- .5 Submit a colour/finish chart for all lighting fixtures for final selection/approval.
- .6 Where requested, submit certified heat-run test data for each type of ballast mounting.
- .7 Where requested, within four (4) weeks of Contract award, provide information on the electronic ballast operating frequency for Owner's co-ordination with Owner supplied equipment operating at high frequencies.

#### 1.4 WARRANTY

.1 Warrant LED lamps and drivers for a minimum of 5 years from the date of Substantial Completion of the Work. Include labour for replacing lamps and drivers in the warranty.

#### Part 2 Products

## 2.1 LAMPS AND DRIVERS

- .1 LED
  - .1 Minimum lamp and driver life of 50,000 burning hours
  - .2 4100°K CCT unless otherwise noted.
  - .3 Quietest electronic driver
  - .4 Dimming drivers shall dim continuously between 100% and 5% light output at a minimum.
- .2 Manufacturers
  - .1 Philips
  - .2 Osram-Sylvania
  - .3 G.E.

#### 2.2 LIGHTING FIXTURES

- .1 Fixtures shall have CSA labels and shall be complete with lamps, ballasts and necessary accessories for installation.
- .2 Unless otherwise indicated in the Contract Documents, linear lighting fixture bodies shall be minimum 20 gauge, cold rolled prime steel of rigid construction with knockout as required. Fixture rigidity shall permit any suspension method without sag. Shall be suitable for either individual or continuous mounting.
- .3 Reflecting surfaces shall be with an average reflectance of not less than 85%.
- .4 All fixture types shall be designed with adequate heat sinks to dissipate the generated heat in order to prevent ballast and lamps from overheating with the resulting decrease in their rated life expectancy and/or light output. Fixtures shall be wired with type GTF fixture wire.
- .5 All fixtures shall be complete with required safety disconnect means.
- .6 Fixtures shall be designed so that minimum time is required for lamp or ballast/driver replacement.
- .7 Plastic lenses shall be 100% virgin acrylic not less than 3 mm thick.
- .8 Include the cost of all necessary accessories for a complete installation in the Contract Price. No extras will be entertained as a result of the supplier or Contractor failing to provide such accessories.

## Part 3 Execution

#### 3.1 INSTALLATION

- .1 Install all fixtures in the standard manner for the type of fixture and in accordance with the manufacturer's instructions. Support all fixtures from building structural members. The drop ceiling supports are not acceptable.
- .2 In non-accessible ceilings, wire with not less than 1220 mm of AC90 or RW90 wire in flexible conduit to adjacent outlet boxes placed above the finished ceiling within reach of the fixture openings.
- .3 In accessible ceilings wire with 1830 mm of AC90 or RW90 wire in flexible conduit to adjacent outlet boxes.
- .4 Where fixtures are not installed in the approved ceiling system, provide steel fixture studs, brackets and hangers. Where fixtures are hung on chain hangers, provide chain of closed link type capable of supporting ten times the fixture weight. Use U-bolts for chain ends; S-hooks are not acceptable.
- .5 Provide all mounting hardware for all fixtures.
- .6 Provide suitable trim for all fixtures installed in drywall ceiling or within lay in or snap in tiles.
- .7 Provide I.C. frame/enclosure for all fixtures installed in insulated ceiling. Confirm the insulated ceiling areas.
- .8 Provide fire rated boxes for all recessed fixtures in the fire rated ceiling area.
- .9 Protect fixtures from dirt and damage during construction and clean when the installation is completed. Replace fixtures showing marks or scratches due to handling or tool marks.
- .10 Align fixtures shown in continuous rows or broken lines so that all rows appear as straight lines. Crooked lines and misplaced fixtures will not be accepted.
- .11 Where luminaries are surface mounted on inverted T-bar ceilings, they shall be supported directly from the building structure. Where this is not possible due to presence of mechanical ducts or other obstruction, supply and install galvanized steel channel, Unistrut or approved equal, above the ceiling, securely attached to the structure and not from the suspension system for the ceiling, and fasten the luminaires to the channel with clamping nut, bolt, flat washers and lock washer to the satisfaction of the Consultant. Provide bolts at least every 1.2m of the length of the fixture (i.e., 3 bolts for 2.4m fixture).
- .12 Fixtures are shown on the Electrical Drawings in approximate locations only. Install fixtures in accordance with reflected ceiling plans, details and/or field instructions.
- .13 Install lighting fixtures in service areas, underground parking areas, unfinished areas, mechanical and electrical rooms after the mechanical and electrical equipment is in place. Locate fixtures on Site to clear all obstructions to the approval of the Consultant. Provide auxiliary steel members for hanging fixtures below ducts and other equipment.

- .14 Where the ceiling height is less than 3 metres, suspend ceiling surface mounted fixtures at 3 metres AFF. Where the ceiling height is more than 3 metres, suspend ceiling surface mounted fixtures at 3 metres AFF.
- .15 Check the latest ceiling finishes in all areas where recessed fixtures are specified to ensure that fixtures are purchased with suitable ceiling trim for the particular ceiling finish. Replace fixtures which are sent to the Site with the wrong ceiling trim or flanges with fixtures having the correct trims, flanges, etc. as required, at no cost to the Owner.
- .16 Fixtures shall be installed in accordance with the reflected ceiling layouts with due consideration for mechanical diffusers, bulkheads, sprinkler heads, and other obstructions. Check the Mechanical and Architectural Drawings before roughing-in to avoid any possible conflict.
- .17 Fixtures connected to ground fault interruptor circuits shall have separate neutrals (common neutrals for 2 or 3 circuits are not acceptable).
- .18 Exterior wall mounted lighting fixtures shall be mounted on recessed boxes except where fixtures with integral outlet boxes are specified, in which case the recessed outlet box is not required. Outlet boxes shall be firmly anchored to the wall.
- .19 Unless otherwise indicated in the Contract Documents, supply and install concrete bases for lighting standards. Concrete bases shall be trowel finished with all exposed corners bevelled at 45 degrees. Junction boxes shall be carefully set and anchored to ensure flush fit of junction box cover. Concrete bases shall be constructed of 20 Mpa concrete air entrained and steel reinforced as shown on the Drawings.
- .20 Include third party functional testing of all lighting control devices and systems. Submit test report.

# **END OF SECTION**

## Part 1 General

## 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide an emergency lighting system including exit signs, remote heads, and battery units, as shown on the Drawings, as specified herein and as otherwise required.

#### **1.2 REFERENCE**

- .1 Comply with the requirements of the latest edition of the following:
  - .1 CSA-C22.2 No. 9, General Requirements for Luminaires
  - .2 CSA-C22.2 No. 141, Unit Equipment for Emergency Lighting
  - .3 CSA-C22.2 C860, Performance of Internally Lighting Exit Signs
  - .4 CSA-C282, Emergency Electrical Power Supply for Buildings

#### 1.3 SUBMITTALS

- .1 Submit shop drawings and Product data in accordance with Section of Electrical General Requirements.
- .2 Include fixture catalogue data sheets with shop drawings indicating dimensions, components, electrical characteristics and performance data for each fixture and device. Arrange the fixture catalogue data sheets and identify in the same sequence as the specified fixture list.
- .3 Submit test report and verifications following the completion of testing.

#### 1.4 WARRANTY

- .1 For the complete system, provide a 2-year, no-charge, unconditional guarantee, and 5-year pro-rated charge guarantee on workmanship and parts.
- .2 For batteries, on the second 5-year, provide a pro-rated charge guarantee on workmanship and parts.

#### 1.5 MANUFACTURERS

- .1 Emergi-Lite
- .2 Lumacell
- .3 Beghelli

### Part 2 Products

#### 2.1 STANDARD EXIT SIGNS

- .1 Pictogram exit signs meet or exceed CSA 22.2 No.141-10 standard for pictogram exit signs
- .2 The housing shall be constructed of rugged extruded aluminum
- .3 The faceplate(s) shall be constructed of extruded Aluminum and shall incorporate a protective clear poly-carbonate panel.
- .4 Each face plate shall come standard with two legend films for pictogram and directional indicators.
- .5 Lamps: Less than 2.5W, LED.
- .6 Inputs:
  - .1 DC: 12V as shown on the Drawings.
  - .2 AC: Universal: 120V/347V.
- .7 Directional arrows: universal type for field adjustment.
- .8 Mounting: universal for field selection of ceiling surface, wall surface, and/or pendent
- .9 Provide white metal wire guard in rough areas and as required.

### 2.2 STANDARD REMOTE HEADS

- .1 Single or double cast aluminum head(s), complete with mounting plates, 300 degree horizontal and 80 degree vertical minimum adjustment.
- .2 Lamps: LED Narrow beam, 6W or as shown on the Drawings.
- .3 Input: 12VDC as shown on the Drawings.
- .4 Mounting: ceiling or wall as shown on the Drawings.
- .5 Finish: white painted.
- .6 Provide white metal wire guard as required.

#### **2.3 BATTERY UNIT**

- .1 Supply voltage: as indicated on the Electrical Drawings.
- .2 Output voltage: 12V DC.
- .3 Operating time: 1/2 hour minimum.
- .4 Battery: sealed, maintenance free, long-time lead with rated life of ten (10) years.
- .5 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations capable of restoring a discharged battery to the fully-charged state within twenty-four (24) hours, and switched to a float charge when not in full charge mode.
- .6 Solid state transfer circuit
- .7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .8 Signal lights: solid state, for "AC Power ON' and 'High Charge'.
- .9 Lamp heads: integral on unit and remote, 345° horizontal and 180° vertical adjustment, white painted cast aluminum head. Lamp type: wide beam flat MR16 LED, 2-6W, unless noted otherwise in the Contract Documents.
- .10 Cabinet: suitable for direct or shelf mounting to wall and complete with knockouts for conduits. Removable or hinged front panel for easy access to batteries.
- .11 Finish: standard factory finish.
- .12 Auxiliary equipment:
  - .1 Advanced diagnostic printed circuit board with auto self test and time delay
  - .2 Test switch and LED trouble indicator
  - .3 Battery disconnect device
  - .4 AC input and DC output terminal blocks inside cabinet
  - .5 Mounting shelf
  - .6 Transient voltage surge suppressor on the supply side of power to the unit

### 2.4 WIRING

.1 Refer to Section of Basic Materials and Methods.

### Part 3 Execution

### 3.1 INSTALLATION

- .1 Pendant mount exit signs in service rooms and other areas where necessary to clear obstructions. Install suspended exit signs using pendants supported from swivel hangers.
- .2 Install all unit equipment, remote heads, exit signs, and accessories in accordance with the manufacturer's instruction.
- .3 Direct heads for illumination to meet OBC requirements.

### 3.2 TESTING AND VERIFICATION

.1 Arrange with the manufacturer to conduct a complete commission, inspection and test of all installed emergency lighting system.

- .2 The manufacturer's representative shall be responsible for properly aiming remote heads, recording the light level readings, recording battery full load operation time, issuing a verification indicating that lighting levels meet CNBC requirements, and the system has been installed properly.
- .3 Submit the report and verification to Consultant.
- .4 Correct all deficiencies.
- .5 Shall be witnessed by Consultant.
- .6 All costs involved in the testing, verification, and corrections shall be included in the Contract Price.

#### Part 1 General

#### 1.1 SUMMARY

- .1 This section of specification is an integral part of the contract documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide the following electric heating assemblies and system complete with all components/accessories and controls.
- .4 Electric duct mounted heaters are excluded.

# **1.2 REFERENCE**

- .1 Comply with the requirements of the latest editions of the following:
  - .1 CSA C22.2 No. 130, Requirements for Electrical Resistance Heating Cables and Heating Device Sets
  - .2 CSA C22.2 No. 46, Electric Air Heaters
  - .3 CSA C22.2 No. 72, Heater Elements
  - .4 CAN/CSA C273.4, Performance Requirements for Electric Heating Line-Voltage Wall Thermostats
  - .5 CAN/CSA C828, Performance Requirements for Thermostats Used with Individual Room Electric Space Heating Devices

### 1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Product Data: dimensions, mounting methods, characteristics, performance criteria, materials, accessories, mechanical and electrical data, product characteristics and limitations.
- .3 Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.
- .4 Submit color/finish chart for all lighting fixtures for final selection/approval.

# 1.4 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

### Part 2 Products

### 2.1 ELECTRIC BASEBOARD HEATERS

.1 Acceptable manufacturers:

- .1 Chromalox
- .2 Stelpro
- .3 Ouellet
- .4 Approved equal
- .2 Assembly: ULC listed and labeled with terminal boxes on both ends, covers, controls and all mounting accessories.
- .3 Heating Elements: Through-type nickel chromium element enclosed in mineral insulation in stainless steel sheath fitted with aluminum fins.
- .4 Cabinet: Slop top, pre-drilled back for securing to wall. Integral air diffusion reflector with wireway at bottom. Front inlet top outlet. Minimum 11 gauge extruded aluminum equivalent in strength with front panel, end panel, end caps, corners, and joiner pieces to snap together. Furnish full-length damper.
- .5 Finish: aluminum, unless otherwise required.
- .6 Control: easy access built-in tamper-proof heating thermostat, factory wired.
- .7 Surface wall-mounted at low level, but minimum 150mm AFF. Co-ordinate with Architect for more installation requirements.
- .8 Ouellet #ODIA or equal.

### 2.2 ELECTRIC CABINET HEATERS

- .1 Acceptable manufacturers:
  - .1 Chromalox
  - .2 Stelpro
  - .3 Ouellet.
  - .4 Approved equal
- .2 Assembly: ULC listed and labeled assembly with terminal box, covers, controls and all mounting accessories.
- .3 Heating Elements: Through-type nickel chromium element enclosed in mineral insulation in stainless steel sheath fitted with aluminum fins.
- .4 Cabinet: Pre-drilled back for securing to wall. Adapter for ceiling mounted unit. Integral air diffusion reflector with wireway at bottom. Front inlet/front outlet. Minimum 20 gauge steel or extruded aluminum equivalent in strength with front panel, end panel, end caps, corners, and joiner pieces to snap together. Furnish full-length damper.
- .5 Finish: Clear anodized aluminum or powder coated finish, almond colour, unless otherwise required.
- .6 Fan: Direct-drive, statically and dynamically balanced, with fan guard.
- .7 Motor: Permanently lubricated, totally enclosed, ball bearing type, built-in thermal overload protection, built-in safety disconnect switch or plug-in electrical connection.

Where power supply voltage is not matched with motor, provide built-in transformer for motor.

- .8 Control: Built-in tamper-proof heating thermostat, factory wired.
- .9 Applications: Wall and/or ceiling mounted as shown on drawings; recessed mounted. Verify the exact application and co-ordinate more installation requirements with Architect before ordering.
- .10 Ouellet #OAC & #OACP series or equal.

# 2.3 ELECTRIC CEILING RADIANT HEATING PANELS

- .1 Assembly: ULC listed and labeled assembly with terminal box, covers, controls and all mounting accessories.
- .2 Refer to drawings for size & wattage/voltage.
- .3 Heating Elements: encapsulated cassette element.
- .4 22 (& 24) gauge galvanized steel panel. Minimum 1 inch, 1-pound density, high temperature fiberglass insulation. Crystalline surface.
- .5 Finish: white.
- Provide line voltage wall mounted thermostat to control heating panel. Thermostat shall be programmable electronic thermostat, white finish. Temperature range: 0 30°C.
  Resolution and precision: 0.5°C. Digital display of ambient and set point temperature. temperature setting recorded permanently; 4-settings per week, and 4-setings per weekend. Switching rating: 20A, 2-pole, 240V.
- .7 Qmark #CP series or equal.

### Part 3 Execution

### 3.1 INSTALLATION OF HEATERS

- .1 For recessed units, verify recess dimensions are correct size.
- .2 Verify wall construction is ready for installation.
- .3 Verify concealed blocking and supports are in place and connections are correctly located.
- .4 Install the electric heaters in accordance with the manufacturer's instructions.
- .5 Use wire in electric heaters, which is specifically approved for electric heater use.
- .6 Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- .7 Protection: Provide finished cabinet units with protective covers during remainder of construction.

- .8 Unit Heaters: Provide at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed units.
- .9 Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.
- .10 The installation shall be inspected by the manufacturer's approval for the completed installation.
- .11 Perform the heater tests to ensure that all heaters, fans and heating controls are operating properly. Submit the test reports.

### Part 1 General

# 1.1 SUMMARY

- .1 This Section of Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Related Sections:
  - .1 Section 27 05 00 Telecommunication Raceway Systems

### 1.2 WORK INCLUDED

- .1 Retain an approved P.A. System Contractor (supplier) to upgrade existing P.A. system as specified herein and as required on drawings.
- .2 Electrical Contractor and System Contractor shall also co-operate in every respect with each other.
- .3 The System Contractor shall meet with Owner's representative(s) throughout the project to ensure that all their requirements are met.
- .4 System contractor: RJ Winters, (905) 424-8804, Attn: Bob Winters.

#### **1.3 REFERENCES**

- .1 Comply with the latest edition of the following:
  - .1 EIA/TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
  - .2 J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications
  - .3 EIA/TIA-568-B series, Commercial Building Telecommunication Cabling Standard and Subsequent Addendums and Revisions
  - .4 EIA/TIA-606-A, Administration Standard for Commercial telecommunications Infrastructure

# 1.4 SUBMITTALS

- .1 Shop drawings
  - .1 PA speakers
  - .2 Detailed data and specification cut-sheets

### Part 2 Products

### 2.1 INTERIOR CEILING SPEAKERS

- .1 8" (203mm) dual cone 10 oz with max power handling of 20 watts.
- .2 4 watt multi-tap transformer, 12.75" square baffle.
- .3 95dB (1W/m) sensitivity. 80 to 12KHz frequency response.
- .4 Built-in 25/70 volt transformer.
- .5 Speakers shall be in a white steel, acoustically treated back box with fire-resistant ABS resin baffle and Rim.
- .6 Speakers shall be flush ceiling and flush wall mounted and shall be complete with TH20 back box and white finish coated grilled baffle.
- .7 Tortech #TT81070TS series.

#### 2.2 P. A. CABLES

.1 Speaker cabling shall be Grey FT6, 1 pair twisted, 18 AWG as specified by the equipment manufacturer. All speakers shall be looped as per zones and/or locations back to central equipment rack.

### Part 3 Execution

#### 3.1 INSTALLATION

.1 All cabling shall be installed to conform to the requirements of the Canadian Electrical Code and applicable Provincial Codes. Cabling shall be sized in accordance with Class 2 requirements, but shall be protected from mechanical injury or other injurious conditions such as moisture, excessive heat or corrosive action in accordance with Class 1 requirements.

### 3.2 IDENTIFICATION

.1 All cables shall be color coded and individually labeled with the speaker location, such as room number, exterior, etc.

#### 3.3 TESTING

- .1 Test all cables for correct continuity and polarity.
- .2 All speakers must be tested. Sound level uniformity over the speakers shall be plus or minus 4dB in the 4kHz octave band throughout the entire coverage area.
- .3 The work will not be considered complete until the Owner is satisfied with the system operations, configurations, and the training of staff.

# Part 1 General

# 1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide labour, materials, and equipment for, modification, installation, testing, and commissioning of a complete existing modified operating fire alarm system as specified herein, indicated on drawings, add/or required otherwise. The system shall be left ready for continuous and efficient satisfactory operation.

### **1.2 REFERENCES**

- .1 Comply with the requirements of the latest edition of the following:
  - .1 CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems
  - .2 CAN/ULC-S525, Audible Signal Device for Fire Alarm Systems
  - .3 CAN/ULC-S526, Visual Signal Devices for Fire Alarm Systems
  - .4 CAN/ULC-S527, Control Units for Fire Alarm Systems
  - .5 CAN/ULC-S528, Manual Pull Stations for Fire Alarm Systems
  - .6 CAN/ULC-S529, Smoke Detectors for Fire Alarm Systems
  - .7 CAN/ULC-S530, Heat Actuated Fire Detectors for Fire Alarm Systems
  - .8 CAN/ULC-S531, Standard for Smoke Alarms
  - .9 CAN/ULC-S533, Egress Door Security and Releasing Devices
  - .10 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems
  - .11 CAN/ULC-S537, Standard for the Verification of Fire Alarm System Installations
  - .12 CAN/ULC-S541, Speakers for Fire Alarm Systems
  - .13 CAN/ULC-S553, Installation for Smoke Alarms

# 1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements. Shop drawing shall include:
  - .1 Details and performance specifications for system control annunciation and peripherals.
  - .2 Details for devices
- .2 Submit arrangement and wording of annunciators for fire alarm zone indications to local fire department and provide changes as requested. Submit document to local fire department to department's requirement.
- .3 Following completion of verification, and of acceptance of the installation by local fire department, submit the certification of the Fire Alarm system, together with detailed verification record sheets showing location of each device and all verification results.

- .4 Submit the operating and maintenance manual in accordance with section of Section of Electrical General Requirements., the manual shall include:
  - .1 Instructions for the maintenance of the fire alarm system
  - .2 Approved shop drawings with all the connections
  - .3 As-built drawings showing all the devices

### 1.4 QUALITY ASSURANCE

- .1 New devices shall match existing.
- .2 The existing FA Manufacturer as shown on drawings.

### Part 2 Products

### 2.1 GENERAL

- .1 Modify existing fire alarm system, upgrade existing fire alarm control panel, upgrade existing fire alarm annunciator panel, upgrading all existing wires to accommodate new floor plan.
- .2 Add more alarm, supervising, and control zones in existing fire alarm panel as shown.

# 2.2 SYSTEM DEVICES

- .1 General
  - .1 All new devices shall match existing and shall be compatible with existing fire alarm system.
- .2 Manual Pull Stations
  - .1 Manual pull stations shall be single stage, red, extruded aluminum, semi-flush or surface, red, pull activated, wall mounted in 102mm square Red box. At maglock doors, the station shall have a dual contact.
  - .2 Mount pull stations with operating lever at 1200mm AFF. Maximum lateral distance from door opening: 1500mm (600mm for mag-lock door).
  - .3 Where required, provide tamper proof, weatherproof clear shield complete with a battery operated warning horn.
- .3 Heat Detectors
  - .1 Combination fixed 57°C (135°F) and 8.3°C (15°F)/min rate-of-rise type, in all areas except where normal temperature fluctuations exceed 10°C (18°F)/min.
  - .2 Fixed temperature 91°C (195°F) type, provided in areas with normal ambient temperature between 38°C (100°F) and 66°C (150°F).
  - .3 Ceiling mounted in 102 outlet box.
  - .4 Detector in elevator shaft to be complete with auxiliary relays and wired to elevator controller.
- .4 Area Smoke Detectors
  - .1 Photoelectric type ceiling smoke detector with the following features:

- .1 Sensitivity read-out;
- .2 Snap-in base;
- .3 Visual indication of detector actuation.
- .2 Ceiling mounted in 102mm outlet box.
- .3 Smoke detectors in elevator machine rooms, elevator lobbies of  $1^{st}$  floor, P1 level and  $2^{nd}$  floor, and elsewhere indicated shall be provided with auxiliary relays, and wired to elevator controls for supplementary operation of elevators.
- .4 Smoke detectors required for door hold openers and fire automatic doors shall be provided with auxiliary relays, and wired to door hold openers.
- .5 Addressable Circuit Interface Modules
  - .1 Addressable Circuit Interface Modules: Modules shall be used for monitoring of non-addressable devices and/or circuit, and for control of evacuation indicating appliances and AHU systems.
  - .2 Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signalling line or a separate two-wire pair running from an appropriate power supply as required.
  - .3 All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.
  - .4 There shall be the following types of modules:
    - .1 Type 1: Monitor Circuit Interface Module:
      - .1 For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
      - .2 For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.
    - .2 Type 2: Line Powered Monitor Circuit Interface Module
      - .1 This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.
      - .2 This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal,

abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.

- .3 Type 3: Single Address Multi-Point Interface Modules
  - .1 This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status conditions (normal, open, current limited, and short). The input circuits and output relay operation shall be controlled independently and disabled separately.
  - .2 This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited, and short). The two-wire signaling line circuit shall supply power and communications to the module.
  - .3 This dual point module shall monitor an unsupervised normally open, dry contact with one point and control an output relay with the other point, using a single address. The two-wire signaling line circuit shall supply power and communications to the module.
- .4 Type 4: Line Powered Control Circuit Interface Module
  - .1 This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.
- .5 Type 5: 4-20 mA Analog Monitor Circuit Interface Module
  - .1 This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.
- .6 End-of-Line Devices
  - .1 Mount end of line devices in box with last device or separate box wall mounted, adjacent to last device.
- .7 Horns:
  - .1 Temporal horns rated at 98 dba to 75dba at 3m, finished in red and operated on 24V DC. Mounted in 102mm or single gang outlet box. High, medium and Low field selectable sound output level setting.
  - .2 Wall mounting height: not less than 2300mm AFF, and at least 150mm below ceiling measured to the top edge of the device.
- .8 Fire Alarm Strobe
  - .1 Provide surface wall mounted (or ceiling mounted) synchronized high strobe lights to indicate alarm condition. The strobe maybe part of audio-visual assembly.

- .2 The strobe light shall consist of a xenon tube with red lens. 75cd to 110 cd flash intensity.
- .3 Mounted in 102mm or single gang outlet box.
- .4 Wall mounting height: 2400mm AFF. Ceiling mounting height: not more than 9000mm AFF, otherwise shall be suspended.
- .9 Hold Open Devices
  - .1 24VDC Supplied by others. Refer to drawings for more installation details.

# 2.3 WIRING

- .1 Install all wiring in conduit.
- .2 Fire alarm system wiring shall be run in separate conduit.
- .3 Provide shielded wiring when recommended by the manufacturer's specifications.
- .4 Wires shall be CSA-FAS Type 105 copper conductor, 105°C rating, not less than 300V. Wiring shall be sized not less than requirement of Section 32-100 of the Electrical Safety Code, Class 1 or Class 2 circuits as required, with screw-terminal wiring connections.
- .5 Stranded conductors with more than 7 strands shall be bunched-tinned or terminated in compression connectors.
- .6 Provide watertight fittings for conduits entering the top or sides of surface mounted terminal cabinets, annunciator transponders and control panels.

### 2.4 SPECIAL ENVIRONMENT

- .1 Devices shall be moisture-proof where located in moisture area. Devices shall be weatherproof where located outside.
- .2 Provide heater and power to heater including breaker and wiring, (break may not be shown on drawing), for devices located in cold area as required by manufacturer.
- .3 Where the devices located in cold and/ or hot area, locate addressable module in warm area, and conventional devices in cold and/ or hot area.
- .4 Provide tamper proof wire guard where required.

### 2.5 SMOKE ALARMS AND CARBON MONOXIDE DETECTORS

- .1 Smoke alarms, carbon monoxide detectors and their combinations in suites shall not be connected to the fire alarm system.
- .2 Ceiling mounted ionization type smoke alarms shall be activated by the presence of combustion products. The unit shall contain dual ionization chambers (one for fire detection, one for reference), solid state "Power On" indicator, sensitivity test button, visual signaling component, alarm sound level of minimum 85 dB at 3 meters, and the unit shall operate from 120 volt ac power circuit. Where more than one (1) smoke alarm is provided in a suite, the operation of one smoke alarm shall operate the alarm of all other

smoke alarms within the suite. Each smoke alarm shall be complete with additional signal contact and wired to monitoring panel as required.

- .3 Ceiling mounted carbon monoxide detectors shall operate from a hard-wired 120 volt AC source. The detector's chemical sensor to respond to CO concentrations and when dangerous levels are reached, trigger an internal alarm rated at a minimum of 85 dB at 3 meters. Detector shall be complete with visual signaling component, LED light to indicate unit is receiving power and test button. Where more than one detector is provided in a suite, the operation of one detector shall operate the alarm of all other CO detectors within the suite. Each detector shall be complete with additional signal contact and wired to monitoring panel as required.
- .4 Ceiling mounted combination smoke alarm and carbon monoxide detectors shall be activated by the presence of combustion products and the dangerous levels of CO concentration. The unit shall contain ionization chamber and chemical CO sensor, visual signaling component, alarm sound level of minimum 85 dB at 3 meters, "POWER ON" indicator, test/reset button, and the unit shall operate from 120 VAC power circuit. Where more than one unit is provided in a suite, the operation of one unit shall operate the alarm of all other units within the suite. Each detector shall be complete with additional signal contact and wired to monitoring panel as required.

### Part 3 Execution

### 3.1 INSTALLATION

- .1 Install all equipment in accordance with CAN/ULC-S524 "Standard for the Installation of Fire Alarm Systems", the manufacturer's instructions, Ontario Building Code, Underwriter's Laboratory of Canada, Electrical Safety Code, these Documents and requirements of Local Authority Having Jurisdiction. This shall include appropriate settings for speaker transformer taps.
- .2 In the event that the information given in the Specification and/or shown on the Drawings is in conflict with the Code and/or the requirement of authorities having jurisdiction, bring this to the attention of the Consultant, and do not proceed with the work until the matter is clarified.
- .3 Connections to Other Systems
  - .1 Door Device Connections
    - .1 Provide power, wiring, conduit and connections to electrical door hardware, door hold-open devices and door control (Maglocks) devices for proper release operation. Co-ordinate installation with the hardware installer.

### 3.2 TESTING AND CERTIFICATION

.1 Arrange with the manufacturer to conduct a complete inspection and test of all installed fire alarm and voice communication equipment including all components such as manual stations, signaling devices, heat detectors, smoke detectors, speakers, fire fighters handsets, controls, etc. Test and verify connections to equipment of other Division such as sprinkler valves, elevators, etc. Coordinate with and arrange for staff of other divisions to be present where required.

- .2 Provide staff to test devices and all operational features of the system for witness by the Consultant and authority having jurisdiction. Provide 2-way radio communication at each annunciator, control point and other areas in the building as required. All testing must be witnessed by Owner's representative prior to acceptance.
- .3 Test and verify the total system to ensure satisfactory operation in conformance with latest version of CAN/ULC-S536 and CAN/ULC-S537, "Standard for the Verification of Fire Alarm System Installations".
- .4 Carry out testing, verification and certification as follow:
  - .1 System test in conjunction with the manufacturer
  - .2 Correction of all deficiencies
  - .3 Submission of test results to Consultant for review including letter of certification from the manufacturer(s)
  - .4 Witness of complete system by Consultant and/or his representatives
  - .5 Correction of any deficiencies noted
  - .6 Acceptance of the system by the Consultant
  - .7 Witness of system test by authority having jurisdiction
  - .8 Correction of any deficiencies requested by authority having jurisdiction
  - .9 Submission of manuals with final verification sheets
- .5 All costs involved in the testing and certification shall be included in the Tender Price.