HWDSB

2024-134-P01941
RFT Glendale Secondary School HVAC and Boiler Project

Addendum #2

Issued February 29, 2024

The following information changes the competitive process documents issued on February 14, 2024.

CLOSING DATE CHANGE

Change of closing date to Tuesday, March 12, 2024 on or before 2:00:00 PM local time.

GENERAL INFORMATION

Item 1: Refer to RFT Document, Introduction and Project Details section.
REMOVE and REPLACE Section 1.5 Project Schedule with below:

4. PROJECT SCHEDULE

4. The following are Project milestone dates:

a)	Tender Issued	Wednesday, February 14, 2024
b)	Site Walkthrough at 3:15 PM	Wednesday, February 21, 2024
c)	Closing for Questions	Wednesday, February 28, 2024
d)	***Tender Closing on or before 2:00 PM***	***Tuesday, March 12, 2024***
e)	Anticipated Construction Commencement	Monday, June 3, 2024
f)	Substantial Performance	Friday, October 3, 2024
g)	Total Completion/Occupancy	October 2025

Item 2: See 'Structural Mechanical Electrical Addendum No. 01' dated February 29, 2024 issued by EXP Services Inc. (11 pages)

QUESTIONS AND RESPONSES

Q1 To provide more time for subtrades, could the tender closing be made for the following week. For March 13 at 2 pm ?

R1 Refer to General Information, Item 1 above.

Q2 As per the supplementary conditions please confirm that Builder's Risk is not required?

R2 Correct. Builder's Risk Insurance is not required for this project.

Q3 Can you please confirm that the pollution coverage is to be carried by the prequalified abatement contractor?

R3 Refer to the RFT Document, Supplementary Conditions, Part 11 Insurance. All insurance must be connected to the Successful Bidder. Business decisions to delegate are at the discretion of the Successful Bidder.

Q4 What is the extent of asbestos wrap on the duct work and piping? The DSS report indicates that some elbows have been renewed with fibreglass and vinyl, and that some piping and duct work does contain ACM and some does not? Our abatement contractor is looking to quantify for take-off purposes.

R4 Please refer to Hazardous Materials Abatement Scope and Details for location specific information of asbestos-containing materials.

Q5 The large duct above the boiler boxes in the mechanical room 1072 appears to be parged in ACM. Can we please have confirmation?

R5 Assuming the location referenced is Mechanical Room 1027, large duct was determined to be insulated with fibreglass.

Q6 Does boiler room ceiling contain asbestos materials? Will we be able to penetrate the sheeting for installation of new pipe hangers?

R6 There is no ceiling in the Mechanical Room (Boiler Room) Loc. 1027. Deck is composed of concrete or Siporex panels. There is plaster present on beam enclosures that is asbestos-containing. Removal of plaster or drilling of shots will require the appropriate asbestos procedures.

End of Addendum #2

Structural Mechanical Electrical Addendum No. 01

EXP Project: ALL-23010629-A0 HWDSB Glendale

Date: February 29, 2024

Prepared By: EXP Services Inc.

Requirements:

The addendum forms part of the Contract Documents and amends the original Specifications and Drawings, as noted below.

Ensure that all parties submitting bids are aware of all items included in this Addendum.

This Addendum consists of 10 pages.

Amendments to Drawings

1. **Drawing S1.1**
   - .1 **R-001 – Detail for cutting a new opening through existing concrete slab – added**
   - .2 **R-003 – Structural guidelines for drilling, cutting and coring through existing concrete structure – added**
   - .3 **GN-012CS – concrete anchors, inserts, bolts – typical notes added**
   - .4 **Typical detail – new slab on grade and mechanical pad at boiler room**
     - .1 **Revised note 1 – if existing mechanical pads are connected to existing slab on grade, contractor shall confirm approach with structural consultant**
     - .2 **Note 7 deleted – existing mechanical pads are not connected directly to slab per correspondence from contractor**
     - .3 **New slab on grade removed – detail revised to show connection to existing slab on grade only**
     - .4 **Sawcut location revised**
2. **Drawing M0.2**
   - .1 **Mechanical general specifications training scope of work item 1.2.N revised to clarify training hours:**
     - .1 **4 hour training session for boilers & pumps**
     - .2 **4 hours training session for rooftop equipment & unit ventilators.**
3. **Drawing M0.9**
   - .1 **Controls BAS training scope of work item 19.A revised to clarify training hours:**
     - .1 **Two (2) 4 hour training sessions totalling 8 hours are required under contract for BAS.**
4. **Drawing M1.1**
   - .1 **Existing grille dimensions added to drawing note 11 and 12. Note 11 indicates openings to be modified to suit new work. Note 12 indicates openings to be infilled. Refer to architectural drawings for details.**

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Question and Answer

Question 1:

Please provide name plates/photos of existing panels ‘LP – L’, ‘DP – A’, ‘HVD – A’, ‘PNL – U’, ‘PNL – V’, ‘HVD – B’.

Answer 1:

‘LP-L’

‘DP-A’

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'HVD-A'

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'PNL-U'

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'PNL-V'


DOMINION ELECTRIC MFG. CO. LTD.
TORONTO
CANADA
CIRCUIT BREAKER PANELBOARD
CAT. NO.
VOLTS
PHASE
AMPS
OFF
OFF
OFF
AVC
Supply
FAN

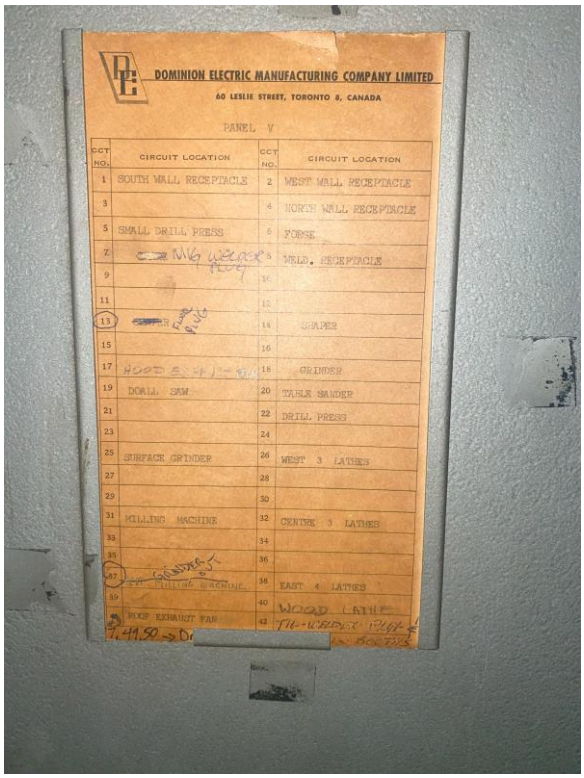
'HVD-B'


MENS
SIEMENS
O.K.

Question 2:
Note #5 on the drawing E2.1 says to provide separate price for upgrading panels 'PNL – U', 'PNL – V' and 'DP – Q'. Please provide more information like panel schedules, feeder sizes if we have to change the feeders.

Answer 2:
PNL-U' Refer to Answer 1.

'PNL-V'



DOMINION ELECTRIC MANUFACTURING COMPANY LIMITED
60 LESLIE STREET, TORONTO 8, CANADA

PANEL V

CCT NO.	CIRCUIT LOCATION	CCT NO.	CIRCUIT LOCATION
1	SOUTH WALL RECEPTACLE	2	WEST WALL RECEPTACLE
3		4	NORTH WALL RECEPTACLE
5	SMALL DRILL PRESS	6	FORGE
7	MIG WELDER	8	WELD. RECEPTACLE
9		10	
11		12	
13		14	GRADER
15		16	
17	HOOD	18	GRINDER
19	DOALL SAW	20	TABLE SANDER
21		22	DRILL PRESS
23		24	
25	SURFACE GRINDER	26	WEST 3 LATHES
27		28	
29		30	
31	MILLING MACHINE	32	CENTER 3 LATHES
33		34	
35		36	
37	GRINDER		
39		38	EAST 4 LATHES
	ROOF EXHAUST FAN	40	WOOD LATHE
		42	TH-WELDER PLUG

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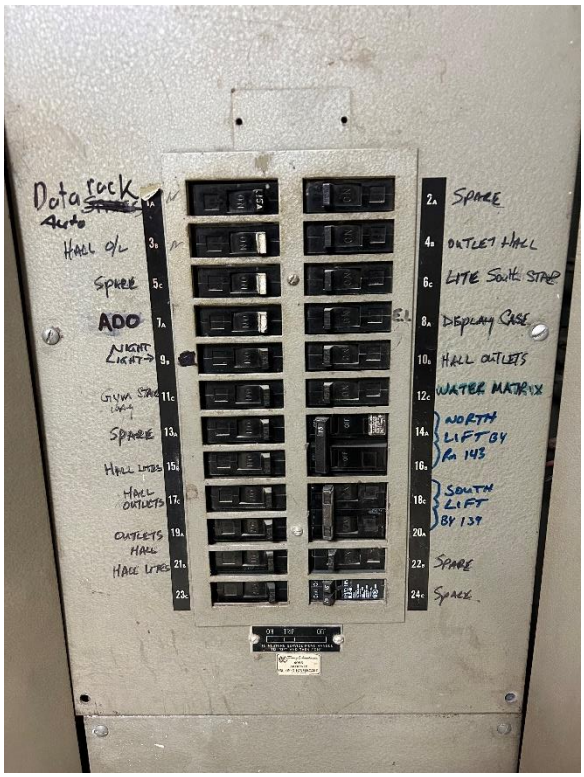
'DP-Q'



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Question 3:
Can you please confirm the size of grills in which need infilled with concrete block? Keying note 8.

Answer 3:
Refer to amended drawing M1.1 note 12 which indicates size of existing grilles to be demolished.

Question 4:
Refer to drawing M0.8, Item 9 - Intelligent Services Analytics. This section describes a cloud based analytics platform. Please confirm that this is required for this project.

Answer 4:
A cloud based platform is not required for this project.

Question 5:
Refer to drawing M0.8, Item 10 - Operator Interface. Please confirm that use of the Owner's existing BAS server is acceptable and no additional operator interfaces are required.

Answer 5:
Use of the owner's existing BAS server is acceptable. BAS Contractor to expand and upgrade system if required to facilitate installation.

Question 6:
To be able to quote project we would require Panel Information Serial # off of Seimens Panel DP-A, a full front picture of Distribution Panel, and current Pump Breakers I believe are fed out of this Panel .
- new panel PP-R is shown as fed out of Main Service Panel HVD-A, we require serial # off of panel, and a full front picture please.
- or if able to, could we have a quick site visit to gather all this information?

Answer 6:
Refer to Answer 1.

Question 7:
Electrical Rooms 1027C and 1027D – Could you provide pictures of the inside of both these rooms, including the existing electrical equipment c/w manufacturer data plates.

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Answer 7:
1027D

Question 8:
HWDSB mentioned that they had purchased some of the mechanical equipment for the project already during the walk thru. Is HWDSB also supplying the New Boiler Control Panel? Can you provide a cut sheet for this panel?

Answer 8:
No, HWDSB has not purchased the new boiler control panel. Control panel is to be carried by the mechanical contractor. Contractor to carry recommended panel from boiler manufacturer.

Question 9:
EPO switch location for new boilers – provide preferred location and mounting heights.

Answer 9:
Preferred location is mounted by boiler control panel in mechanical room. Exact height and location to be coordinated on site and confirmed with owner.

Question 10:
Existing breaker panels in Rooms 1055 (PNL-U) and 1056(PNL-V) – Could you provide pictures of these panels and manufacturer data plate.

Answer 10:
Refer to Answer 2.

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Question 11:
Switch board HVD-B in Room 1040 – Could you provide pictures and manufacturer data plate

Answer 11:
Refer to Answer 1.

Question 12:
Maintenance receptacles that are to be added to rooftop – 15 or 20 GFCI?

Answer 12:
CSA configuration 5-20R

Question 13:
Fire Alarm control panel/Annunciator panel – Could you provide pictures or these including manufacturer data plates

Answer 13:
No Pictures available at this time.

Question 14:
Spec on hydronic piping reads 2" and smaller sizes to be BMI screwed, 2-1/2" and larger sizes to be buttweld. Is grooved joint acceptable for 2-1/2" and larger sizes?

Answer 14:
Grooved joint is not acceptable. Hydronic piping is to be butt welded at 2-1/2" and larger.

Question 15:
For chemical/water treatment and/or cleaning of the hydronic system we cannot locate a spec, instructions, or named supplier?

Answer 15:
Existing hydronic system is to be flushed and contractor is to coordinate with aquarian chemicals for water treatment scope. Named supplier is listed on sheet M2.0, note 24. Company is Aquarian Chemicals Inc, contact: mcesa@aquarianchemicals.com, 416-540-1883.

Question 16:
Please confirm if there is communication cabling on this project as there does not appear to be any required on this project.

Answer 16:
No new communication cabling on this project. Allow for temporarily removing any existing ceiling mounted devices as noted on the drawings.

Question 17:
I don't see any mention of the DHW. Is that included in this renovation?

Answer 17:
DHW is not within scope.

Question 18:
Is BAS responsible for supplying the smoke detectors for ERV-1, AHU-9 and AHU-12?

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Answer 18:
Electrical to provide.

Question 19:
Can you please provide pictures of the labels on the existing panels in order for us to quote the correct breakers?

Answer 19:
Refer to answer 1 and 2.

Question 20:
For 2-1/2" and larger pipe sizes on the hydronic system, are butterfly valves acceptable for isolation valves, as spec reads only as flanged gate valves.

Answer 20:
Butterfly valves are acceptable.

Question 21:
Please supply shop drawings or details of the "packaged pump skid" ie what does the package include and how much is pre-assembled.

Answer 21:
Refer to P-1,P-2 sample shop drawing attachment. Contact Grundfos sales for additional detail: hjambocus@grundfos.com, 905-491-6674.

Question 22:
Is the existing gas service already 2 psig supply, or does the gas pressure need to be increased at the main service?

Answer 22:
Existing gas service is 2 PSI from the main service.

Question 23:
Has a study taken place to ensure the incoming gas main can supply the renovated system?

Answer 23:
Contractor to coordinate with the utility for any service upgrade. A gas service upgrade is not included within the base scope of work.

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LINTEL SCHEDULE AND NOTES — M-002

NON-LOAD BEARING PARTITIONS

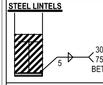
BLOCK LINTELS

MAX CLEAR SPAN	140 BLOCK				190 BLOCK				240 BLOCK				290 BLOCK			
	b	d	REBAR	STIRRUPS	b	d	REBAR	STIRRUPS	b	d	REBAR	STIRRUPS	b	d	REBAR	STIRRUPS
UP TO 1200	140	190	1-10 T&B	⁄	190	190	1-10 T&B	⁄	240	190	1-10 T&B	⁄	240	190	1-10 T&B	⁄
1201 TO 1800	140	390	1-10 T&B	⁄	190	390	1-15 T&B	⁄	240	390	1-15 T&B	⁄	240	390	1-15 T&B	⁄
1801 TO 2300	140	390	1-15 T&B	⁄	190	390	1-20 T&B	10@200	240	390	1-20 T&B	10@200	240	390	1-25 T&B	10@200
> 2300 USE STEEL LINTEL																

NOTES:

1. CONCRETE FILL: 20 MPa MIN. STRENGTH WITH 150 SLUMP
2. BEARING LENGTH: 200 MIN. AT EACH END.

STEEL LINTELS



MAX CLEAR SPAN	140 BLOCK		190 BLOCK		240 BLOCK		290 BLOCK	
	BEAM	PLATE	BEAM	PLATE	BEAM	PLATE	BEAM	PLATE
2300 TO 2600	S200x27	130x10	S200x27	180x10	S200x27	230x10	S200x27	280x10

NOTES:

1. BEARING LENGTH: 150 MIN. EACH END. BEAR PLATE ON BUTTER COAT OF CEMENT MORTAR EACH END.

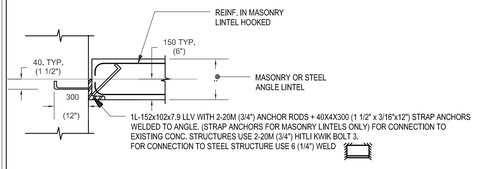
BRICK AND BLOCK WYTHES

MAX CLEAR SPAN	1-100 THICK WYTH	2-100 THICK WYTH	3-100 THICK WYTH	4-100 THICK WYTH	5-100 THICK WYTH
UP TO 1500	L L89x89x7.9	L L89x89x7.9	L L89x89x7.9	L L89x89x7.9	L L89x89x7.9
1501 TO 2300	L L127x89x7.9	L L127x89x7.9	L L127x89x7.9	L L127x89x7.9	L L127x89x7.9
2301 TO 2600	L L152x89x7.9	L L152x89x7.9	L L152x89x7.9	L L152x89x7.9	L L152x89x7.9

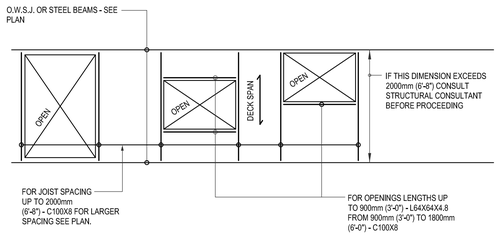
NOTES:

1. LONG LEGS VERTICAL
2. BEARING LENGTH 150 MIN. EACH END. SET STEEL ANGLE LINTELS WITH ENDS WRAPPED WITH 6mm POLYETHYLENE SHEET ON 10GA. GALV. STEEL PLATES ON MASONRY EA. END.
3. CONNECT ANGLES BACK TO BACK AT 600 o/c BY WELDING OR BOLTING ANGLES GREATER THAN 1800 LONG. USE 16 DIA. BOLTS.
4. FOR LOCATIONS & SIZES OF OPENINGS, SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.

LINTEL CONNECTION TO CONCRETE OR STEEL STRUCTURE

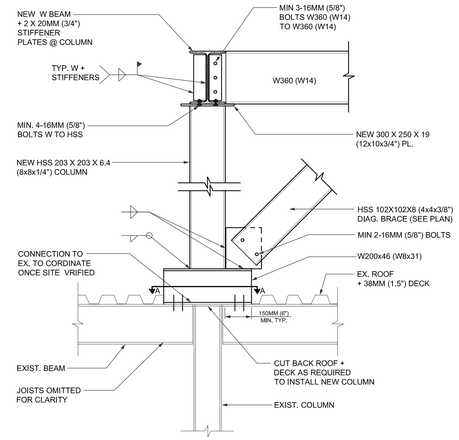


TRIMMING AT OPENINGS IN DECK — S-008



NOTES:

1. TOP OF ALL TRIMMING AT UNDERSIDE OF STEEL DECK UNLESS OTHERWISE NOTED
2. LOCATION OF MECHANICAL UNITS AND OPENINGS THROUGH ROOF IS BASED ON INFORMATION SHOWN ON MECHANICAL DRAWINGS. THE STRUCTURAL STEEL SUB-CONTRACTOR MUST CONFIRM ALL THESE DIMENSIONS AND SIZES WITH THE MECHANICAL CONTRACTOR
3. O.W.S.J. MUST BE DESIGNED FOR ADDITIONAL LOADS FOR MECHANICAL UNITS.
4. IF ACTUAL LOCATIONS OR DETAILS VARY FROM THOSE SHOWN, THE STRUCTURAL CONSULTANT MUST BE INFORMED AND INSTRUCTIONS RECEIVED BEFORE PROCEEDING WITH THE WORK.
5. THE STRUCTURAL STEEL SUB-CONTRACTOR IS TO SUBMIT ERECTION DRAWINGS TO THE MECHANICAL ENGINEER AND/OR CONTRACTOR FOR APPROVAL OF SIZE AND LOCATION OF OPENINGS FOR MECHANICAL UNITS.



TYP. SUPPORT DETAIL NEW ERV

SCALE: 3/4" = 1'-0"

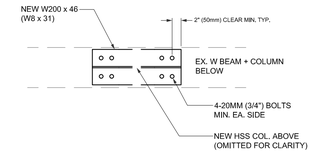
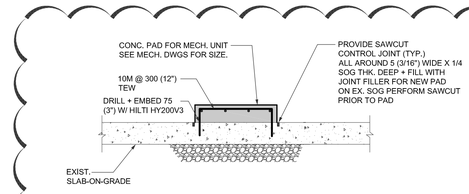


PLATE INSTALLATION DETAIL A-A

SCALE: 3/4" = 1'-0"

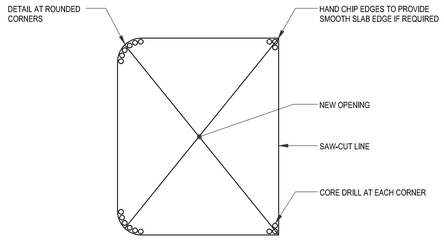


TYP. DETAIL - NEW SLAB ON GRADE AND MECHANICAL PAD AT BOILER ROOM

SCALE: 3/4" = 1'-0"

1. IF EXISTING MECHANICAL PADS ARE CONNECTED TO EXISTING SLAB ON GRADE: CONFIRM WITH STRUCTURAL CONSULTANT.
2. IF EXISTING MECHANICAL PADS ARE NOT CONNECTED TO EXISTING SLAB ON GRADE:
   i) DEMOLISH EXISTING MECHANICAL PADS AS REQUIRED
   ii) INSTALL NEW MECHANICAL PAD ON EXISTING SLAB ON GRADE. DOWEL TYPICAL PAD REINFORCEMENT MIN 100 mm (4") INTO EX. SLAB ON GRADE + HILTI HY 200 V3 EPOXY.
3. ALL NEW CONCRETE TO BE MINIMUM 25 MPa CLASS N TO A23.1/2
4. REBAR TO BE 400W, TO CSA G30.18
5. CONCRETE CLEAR COVER: 50MM (2") UNO
6. NEW SOG THICKNESS TO MATCH EXISTING EXCEPT MIN. 150 (6") THICK.

DETAIL FOR CUTTING A NEW OPENING THROUGH EXISTING CONCRETE SLAB — R-001



NOTES:

1. MARK OUTLINE OF NEW OPENING ON EXISTING SLAB.
2. CORE DRILL HOLES AT EACH CORNER.
3. SAW-CUT BETWEEN CORE-DRILLED HOLES, OR CORE DRILL ENTIRE PERIMETER. DO NOT DRILL OR CUT BEYOND LIMITS OF THE OPENING DIMENSIONS.

STRUCTURAL GUIDELINES FOR DRILLING, CUTTING & CORING THROUGH EXISTING CONCRETE STRUCTURE — R-003

1. GENERAL
   - 1.1 ALL OPENINGS THROUGH EXISTING STRUCTURE REQUIRED FOR MECHANICAL AND ELECTRICAL SERVICES ARE TO BE LOCATED AND CUT IN ACCORDANCE WITH THE REQUIREMENTS STIPULATED HEREIN. ALL PROPOSED NEW CORES AND OPENINGS THROUGH EXISTING STRUCTURE MUST BE REVIEWED ON SITE BY THE STRUCTURAL CONSULTANT PRIOR TO PROCEEDING WITH CUTTING OR CORING.
   - 1.2 GENERAL CONTRACTOR IS RESPONSIBLE FOR SUBMITTING COORDINATED SLEEVING AND CORING DRAWINGS SHOWING LOCATION, SIZE AND SPACING FOR PROPOSED NEW OPENINGS FOR ALL MECHANICAL AND ELECTRICAL SERVICES AND ALL EXISTING OPENINGS WITHIN THREE FEET OF NEW ONES. THE COORDINATED DRAWINGS SHALL BE PREPARED ON STRUCTURAL FRAMING PLAN BACKGROUNDS. ALL OPENINGS TO BE REFERENCED TO GRID LINES. INDIVIDUAL SUBMISSIONS OF DRAWINGS SHOWING MECHANICAL CORES ONLY OR ELECTRICAL CORES ONLY WILL NOT BE ACCEPTED. DO NOT DRILL OR CUT HOLES THROUGH EXISTING STRUCTURE PRIOR TO SUBMISSION OF SLEEVING DRAWINGS AND FINAL REVIEW BY STRUCTURAL CONSULTANT.
   - 1.3 PRIOR TO DRILLING FOR ANCHOR BOLTS OR CUTTING HOLES IN EXISTING REINFORCED CONCRETE STRUCTURES LOCATE ALL TOP AND BOTTOM EXISTING REINFORCING STEEL USING 'HILTI FERROSCAN' OR 'GRAFSCAN RADAR' RADAR DETECTION SYSTEMS. RESULTS OBTAINED BY X-RAY WILL NOT BE ACCEPTED. ALLOW CONSULTANT TO REVIEW ALL RESULTS BEFORE PROCEEDING.
   - 1.4 CUTTING NEW RECTANGULAR OPENINGS THROUGH EXISTING STRUCTURE: CORE DRILL AT CORNERS OF OPENING AND SAW CUT OR CORE DRILL AROUND PERIMETER. DO NOT OVER CUT BEYOND MINIMUM DIMENSION REQUIRED.
   - 1.5 WHERE HOLES ARE IN A GROUP, SPACE AT LEAST 3 TIMES THE DIAMETER OF THE LARGER ADJACENT HOLE, CENTER TO CENTER.
   - 1.6 DO NOT CUT ANY EXISTING REINFORCING STEEL WITHOUT WRITTEN AUTHORIZATION BY STRUCTURAL CONSULTANT.
2. PROCEDURE FOR REVIEW OF NEW OPENINGS THROUGH EXISTING STRUCTURE
   - 2.1 GENERAL CONTRACTOR TO SUBMIT COORDINATED CORING DRAWINGS TO ALL CONSULTANTS FOR REVIEW.
   - 2.2 MARK PROPOSED CORE LOCATION ON EXISTING STRUCTURE.
   - 2.3 SCAN EXISTING STRUCTURE TO IDENTIFY ALL REINFORCING STEEL IN AREA OF PROPOSED CORES. SCANNING CONTRACTOR SHALL CLEARLY MARK AND DISTINGUISH BETWEEN ALL TOP AND BOTTOM BARS.
   - 2.4 ALLOW STRUCTURAL CONSULTANT TO REVIEW EACH PROPOSED CORE LOCATION AND REINFORCING STEEL SCAN RESULTS ON SITE. ADJUSTMENTS TO FINAL POSITION OF CORE MAY BE NECESSARY TO MINIMIZE EFFECTS TO EXISTING REINFORCING STEEL.

CONCRETE ANCHORS, INSERTS, BOLTS — GN-012CS

1 GENERAL

1.1 THE FOLLOWING REFERENCE STANDARDS SHALL GOVERN THE WORK OF THIS SECTION:
1.1.1 CSA A23.3-04, DESIGN OF CONCRETE STRUCTURES

2 PRODUCTS

2.1 TORQUE CONTROLLED EXPANSION ANCHORS
2.1.1 EXPANSION ANCHOR: PROVIDE EXPANSION ANCHORS OF SIZE SHOWN ON DRAWINGS, INCLUDING MATCHING NUTS AND WASHERS;
.1 FOR DRY LOCATIONS: :KWIK BOLT 3 CARBON STEEL ZINC PLATED, BY HILTI (CANADA) CORPORATION, MISSISSAUGA, ONTARIO
.2 FOR WET OR HIGH HUMIDITY LOCATIONS OR LOCATIONS EXTERIOR TO THE CONDITIONED BUILDING ENVELOPE: :KWIK BOLT 3 TYPE 304 STAINLESS STEEL, BY HILTI (CANADA) CORPORATION, MISSISSAUGA, ONTARIO
.3 FOR LOCATIONS EXPOSED TO CHLORIDES OR OTHER CORROSIVE MATERIALS: :KWIK BOLT 3 TYPE 316 STAINLESS STEEL, BY HILTI (CANADA) CORPORATION, MISSISSAUGA, ONTARIO
2.1.2 SLEEVE ANCHOR: *PROVIDE* SLEEVE ANCHORS OF SIZE SHOWN ON DRAWINGS, INCLUDING MATCHING NUTS AND WASHERS:
.1 FOR DRY LOCATIONS: :HSL3 CARBON STEEL BY HILTI (CANADA) CORPORATION, MISSISSAUGA, ONTARIO
.2 FOR WET OR HIGH HUMIDITY LOCATIONS OR LOCATIONS EXTERIOR TO THE CONDITIONED BUILDING ENVELOPE: :HSL3 STAINLESS STEEL BY HILTI (CANADA) CORPORATION, MISSISSAUGA, ONTARIO
2.2 ADHESIVE ANCHORS IN DRILLED HOLE:
2.2.1 ANCHOR ROD: *PROVIDE* ANCHOR RODS OF SIZE, TYPE AND EMBEDMENT LENGTH SHOWN ON DRAWINGS INCLUDING MATCHING NUTS AND MATCHING WASHERS.
2.2.2 REINFORCING BAR: *PROVIDE* REINFORCING BAR AS ANCHOR ROD WHERE SPECIFIED ON DRAWING.
2.2.3 CORROSION PROTECTION: *PROVIDE* CORROSION PROTECTION SPECIFIED ON DRAWINGS
2.2.4 ADHESIVE: *PROVIDE* THE ADHESIVE SPECIFIED ON THE DRAWINGS.

3 EXECUTION

3.1 DRILLED-IN ANCHORS
3.1.1 ARRANGE FOR MANUFACTURER'S TECHNICAL REPRESENTATIVE TO BE PRESENT DURING INSTALLATION OF FIRST FEW ANCHORS OF EACH TYPE. SUBMIT SITE REPORTS BY MANUFACTURER TO *CONSULTANT* WITHIN ONE WEEK OF EACH VISIT, INDICATE IN REPORTS ANCHOR SIZES AND TYPES INSTALLED, LOCATIONS, AND WHETHER INSTALLATION PROCEDURES WERE IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS.
3.1.2 INSTALL ANCHORS IN STRICT ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS.
3.1.3 INSTALLERS SHALL BE TRAINED BY THE MANUFACTURER.
3.1.4 DO NOT DRILL HOLES LARGER IN DIAMETER THAN INDICATED IN MANUFACTURER'S PRINTED INSTRUCTIONS.
3.1.5 *PROVIDE* MANUFACTURER'S STANDARD EMBEDMENT LENGTH INTO SOLID CONCRETE, UNLESS OTHERWISE NOTED ON DRAWINGS.
3.1.6 DO NOT CUT REINFORCEMENT TO ACCOMMODATE ANCHORS.
3.1.7 RELOCATE ANCHORS, AT NO ADDITIONAL COST TO *CONTRACT*, WHEN OBSTRUCTIONS PREVENT DRILLING HOLES TO REQUIRED DEPTH IN LOCATIONS INDICATED ON *DRAWINGS*.
3.1.8 OBTAIN *CONSULTANT'S* APPROVAL OF NEW LOCATION BEFORE DRILLING HOLE. FILL ABANDONED HOLES WITH SPECIFIED GROUT.
3.1.9 TIGHTEN EXPANSION ANCHORS USING TORQUE WRENCH UNLESS FINGER-TIGHT IS INDICATED ON DRAWINGS.

4 FIELD QUALITY CONTROL

4.1 ARRANGE FOR INSPECTION AND TESTING COMPANY TO RANDOMLY SELECT AND PULL TEST ANCHORS AS FOLLOWS:
4.1.1 5% OF EACH TYPE AND SIZE OF ANCHOR INSTALLED ON A WEEKLY BASIS, BUT NOT LESS THAN ONE ANCHOR OF EACH TYPE AND SIZE.
4.1.2 PULL TEST TO TWICE THE ALLOWABLE DESIGN TENSION CAPACITY OF THE ANCHOR GIVEN BY THE MANUFACTURER.
4.1.3 SUBMIT REPORTS OF PULL TESTS TO *CONSULTANT* ON WEEKLY BASIS. INDICATE ON REPORT EACH ANCHOR LOCATION, TEST LOAD AND MODE OF FAILURE, IF APPLICABLE, NOTIFY *CONSULTANT* IMMEDIATELY IF ANCHOR FAILS PULL TEST.

1	ISSUED FOR PERMIT	2023–11–14
2	ISSUED FOR TENDER	2023–11–21
3	ISSUED FOR TENDER	2024–01–31
4	ISSUED FOR ADDENDUM	2024–02–28

PROJECT:
HVAC Renovations

Glendale Secondary School

145 Rainbow Dr, Hamilton, ON
For the HWDSB

SEAL:

REGISTERED PROFESSIONAL ENGINEER
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TRUE NORTH:

DRAWING TITLE:

TYP. DETAILS

SCALE: AS NOTED
DRAWN: TT
DATE: NOVEMBER, 2023
PROJECT #: ALL–23010629–A0
DRAWING #: S1.1

MECHANICAL SPECIFICATIONS – GENERAL

1. GENERAL

1.1 GENERAL REQUIREMENTS

A. READ AND CONFORM TO:
 .1 THE CONTRACT CCDC 2, STIPULATED PRICE CONTRACT AS AMENDED.
 .2 DIVISION 1 REQUIREMENTS AND DOCUMENTS REFERRED TO THEREIN.

B. THE SPECIFICATIONS ARE INTEGRAL WITH THE DRAWINGS WHICH ACCOMPANY THEM. NEITHER IS TO BE USED ALONE. ANY ITEM OR SUBJECT OMITTED FROM ONE BUT IMPLIED IN THE OTHER IS FULLY AND PROPERLY REQUIRED.

C. WHEREVER DIFFERENCES OCCUR IN THE TENDER DOCUMENTS, THE MOST ONEROUS CONDITION GOVERNS. BASE THE BID ON THE COSTLIEST ARRANGEMENT.

D. CONFORM TO THE LATEST EDITION OF ONTARIO BUILDING CODE (CSA STANDARDS), ONTARIO FIRE CODE, LOCAL & DISTRICT BYLAWS, REGULATIONS, & PUBLISHED ENGINEERING STANDARDS.

E. NOTIFY CONSULTANT UPON DISCOVERY OF CONDITIONS WHICH ADVERSELY AFFECT WORK OF THIS DIVISION. NO ALLOWANCE WILL BE MADE AFTER LETTING OF CONTRACT FOR ANY EXPENSES INCURRED THROUGH FAILURE TO DO SO.

F. ARRANGE AND PAY FOR PERMITS AND INSPECTIONS BY AUTHORITIES HAVING JURISDICTION, REQUIRED IN THE UNDERTAKING OF THIS DIVISION. MAKE MODIFICATIONS REQUIRED BY AUTHORITIES.

G. ALL TRADESMEN EMPLOYED ON THE PROJECT SHALL HOLD VALID TRADE CERTIFICATES/LICENSES AND SHALL MAKE A COPY AVAILABLE FOR REVIEW BY THE CONSULTANT AND/OR OWNER WHEN REQUESTED

1.2 SCOPE OF WORK

A. PRODUCTS AND METHODS MENTIONED OR SHOWN IN THE CONTRACT DOCUMENTS COMPLETE WITH INCIDENTALS NECESSARY FOR A COMPLETE OPERATING INSTALLATION. PROVIDE ALL TOOLS, EQUIPMENT AND SERVICES REQUIRED TO DO THE WORK.

B. SITE EXAMINE EXISTING CONDITIONS WHICH MAY AFFECT WORK OF THIS DIVISION. EXAMINE ALL CONTRACT DOCUMENTS IN CONJUNCTION WITH SITE EXAMINATION TO ENSURE THAT WORK OF THIS DIVISION MAY BE SATISFACTORILY COMPLETED.

C. DISCONNECTION AND REMOVAL OF VARIOUS MECHANICAL EQUIPMENT.

D. DISCONNECTION AND MAKING SAFE OF VARIOUS MECHANICAL SYSTEMS AND EQUIPMENT IN AREAS TO BE DEMOLISHED AND/OR RENOVATED.

E. ISOLATE AND DRAIN (OR PIPE FREEZE IF DRAINING IS NOT FEASIBLE) SYSTEMS AS REQUIRED TO EFFECT DEMOLITION, RENOVATIONS, MODIFICATIONS AND/OR REPAIRS. DISCONNECT, CAP AND MAKE SAFE ALL MECHANICAL SERVICES TO THE BUILDING INCLUDING, BUT NOT LIMITED TO; SANITARY SEWER(S), STORM SEWER(S), WATER SERVICE

F. ON COMPLETION OF RENOVATIONS, MODIFICATIONS AND/OR REPAIRS, TEST ENTIRE SYSTEM AS IF NEW. REPORT REPAIRS OR REPLACEMENTS REQUIRED OF EXISTING EQUIPMENT, PIPING, FITTINGS OR DEVICES THAT ARE NOT INCLUDED IN CONTRACT TO CONSULTANT AND OWNER FOR INSTRUCTION. FLUSH, CLEAN AND REFILL RENOVATED SYSTEMS AS SPECIFIED FOR NEW.

G. CUTTING AND PATCHING OF NEW OR EXISTING WORK.

H. IDENTIFICATION OF EQUIPMENT, PIPING, VALVES AND CONTROLLERS.

I. PERFORM START–UP AND COMPLETELY COMMISSION ALL EQUIPMENT AND SYSTEMS INSTALLED AND/OR MODIFIED UNDER THIS CONTRACT. COMMISSIONING WORK SHALL BE COMPLETED TO THE SATISFACTION OF THE CONSULTANT PRIOR TO ACCEPTANCE OF THE WORK OR ANY PART THEREOF.

J. APPLY FOR & OBTAIN ALL PERMITS INCLUDING BUILDING PERMITS, & TSSA APPLICATIONS, LICENSES, OR CERTIFICATES NECESSARY FOR THE PERFORMANCE OF THE WORK. COORDINATE ALL WORK WITH BUILDING OFFICIALS & AUTHORITIES HAVING JURISDICTION.

K. TAKE SUCH MEASURES AND INCLUDE IN BID PRICE FOR THE PROPER PROTECTION OF THE EXISTING BUILDING AND ITS FINISHES AT ALL TIMES DURING ALTERATIONS AND CONSTRUCTION OF THE NEW ADDITION. COORDINATE THIS PROTECTIVE WORK WITH ALL TRADES.

L. VERIFY THE CORRECT OPERATION OF EACH EQUIPMENT ITEM PROVIDED AND/OR ALTERED AND EACH SYSTEM IN TOTAL AND OBTAIN THE OWNER'S APPROVAL PRIOR TO STARTING AND/OR RETURNING TO OPERATION.

5

M. REPLACE CONSTRUCTION AND CARBON FILTERS ON ALL NEW AIR HANDLING UNITS, UNIT VENTILATORS AND ENERGY RECOVERY UNITS WITH NEW PRIOR TO PROJECT TURNOVER.

N. SUPERVISE AND PROVIDE TRAINING OF NEW EQUIPMENT TO OWNERS MAINTENANCE STAFF. PROVIDE MINIMUM OF (2) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION. THESE OBJECTIVES WILL BE DIVIDED INTO GROUPINGS:
 .1 BOILERS & PUMPS
 .2 ROOFTOP EQUIPMENT & UNIT VENTILATORS.

O. INSTALL AND COMMISSION ALL EQUIPMENT THAT HAS BEEN PRE–ORDERED BY OWNER. REFER TO ARCHITECTURAL SPECIFICATIONS 01030 FOR FULL DETAILS. SUPPLY AND INSTALL NEW EQUIPMENT WHERE INDICATED (BOILERS, PUMPS, HYDRONIC SPECIALTIES ETC.)

P. SUPPLY AND INSTALL ROOF CURBS FOR RTU–1 AND RTU–2

Q. CONTRACTOR TO REPLACE HVAC EQUIPMENT CONSTRUCTION FILTERS WITH NEW AT PROJECT TURNOVER. PROVIDE ADDITIONAL TWO (2) SETS OF SPARE FILTERS FOR ALL NEW EQUIPMENT.

1.3 SUBMITTALS

A. SHOP DRAWINGS: PREPARE AND SUBMIT TWO (2) COPIES OF SHOP DRAWINGS OF ALL EQUIPMENT ITEMS TO THE CONSULTANT FOR REVIEW. THE CONSULTANT WILL RETURN ONE COPY, MARKED WITH COMMENTS AND HIS REVIEW STAMP AS HE DEEMS APPROPRIATE.
 .1 CLEARLY INDICATE MANUFACTURER'S AND SUPPLIER'S NAMES, MODEL NUMBERS, DETAILS OF CONSTRUCTION, ACCURATE DIMENSIONS, CAPACITIES AND PERFORMANCE. PRIOR TO SUBMISSION CHECK AND CERTIFY AS CORRECT, SHOP DRAWINGS AND DATA SHEETS. DO NOT ORDER EQUIPMENT UNTIL A COPY OF THE SHOP DRAWINGS, REVIEWED BY CONSULTANT, HAS BEEN RETURNED TO CONTRACTOR.
 .2 THE CONSULTANT WILL NOT REVIEW SHOP DRAWINGS THAT FAIL TO BEAR THE CONTRACTOR'S STAMP OF APPROVAL OR CERTIFICATION.

B. REQUESTS FOR SHUT–DOWN: OBTAIN PERMISSION FOR SYSTEMS SHUT–DOWN AND/OR SERVICE INTERRUPTION FROM THE OWNER PRIOR TO DISRUPTION OF ANY SYSTEM OR SERVICE IN USE BY THE OWNER. EMPLOY THE OWNER'S STANDARD FORM OF REQUEST WHERE AVAILABLE.

C. REQUESTS FOR START–UP: OBTAIN PERMISSION FROM THE OWNER TO START–UP OR TO RETURN TO SERVICE ANY ITEM OF EQUIPMENT, SYSTEM OR SERVICE INSTALLED NEW OR PREVIOUSLY SHUT–DOWN.

D. WARRANTY: PROVIDE WRITTEN GUARANTEE FOR ALL NEW EQUIPMENT & WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION. FIVE (5) YEARS FOR COMPRESSOR & HEAT EXCHANGER. DEFECTIVE PARTS REPAIRED OR REPLACED WITHOUT CHARGE.

2 COMMON WORK RESULTS

2.1 PIPING SPECIALTIES

A. CAST BRASS, PRESSURE, COPPER TO COPPER UNIONS SHALL BE USED WITH SEAMLESS COPPER TUBING SMALLER THAN 3" (75 MM).

B. CAST BRASS FLANGES SHALL BE USED WITH SEAMLESS COPPER TUBING, TYPE L FOR TUBING 3" (75 MM) AND LARGER.

2.2 FIRE STOPPING COMPOUNDS

A. APPROVED MANUFACTURER: 3M PRODUCTS INDICATED.

B. OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS: DOW CORNING, JOHN MANVILLE, HILTI FIRESTOP SYSTEMS

C. FIRE RATED SEALANTS: INTUMESCENT MATERIAL, SYNTHETIC ELASOMERS, CAPABLE OF EXPANDING UP TO 8 TO 10 TIMES WHEN EXPOSED TO TEMPERATURES OF 250°F (121°C) OR HIGHER. ULC LISTED AND LABELLED.

2.3 NAMEPLATES

A. PROVIDE LAMINATED PLASTIC PLATES WITH BLACK FACE AND WHITE CENTRE OF MINIMUM SIZE 3–1/2" X 1–1/2" X 3/32" (90 X 40 X 2 MM) NOMINAL THICKNESS, ENGRAVED WITH 1/4" (6 MM) HIGH LETTERING. USE 1" (25 MM) LETTERING FOR MAJOR EQUIPMENT.

B. FASTEN NAMEPLATES SECURELY IN CONSPICUOUS PLACE. WHERE NAMEPLATES CANNOT BE MOUNTED ON COOL SURFACE, PROVIDE STANDOFFS.

C. IDENTIFY EQUIPMENT TYPE AND NUMBER AND SERVICE OF AREAS OR ZONE OF BUILDING SERVED.

D. FOR EACH ITEM OF EQUIPMENT WHICH MAY BE STARTED AUTOMATICALLY OR REMOTELY, ADD A RED LAMACOID PLATE, 2–1/2" X 9" (65 X 230 MM), READING: "WARNING. THIS EQUIPMENT IS AUTOMATICALLY CONTROLLED AND MAY START AT ANY TIME."

2.4 ACCESS DOORS

A. STANDARD UNIVERSAL FLUSH
 .1 MATERIAL: UPT TO 16" X 16" (400X400) 16 GAUGE MOUNTING FRAME,

MECHANICAL SPECIFICATIONS – GENERAL

OVER 16" X 16" (400X400) 14 GAUGE DOOR, 16 GAUGE MOUNTING FRAME.
 .2 HINGE: CONTINUOUS, CONCEALED.
 .3 LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH
 .4 FINISH: STEEL: 5–STAGE IRON PHOSPHATE PREPARATION WITH PRIME COAT OF WHITE, ALKYD BAKING ENAMEL OR STAINLESS STEEL TYPE 304, NO. 4 SATIN POLISH.
 .5 MANUFACTURERS: ACUDOR ACORN, CEB, MIFAB, CENDRES CONTOUR

B. RECESSED ACCESS DOOR
 .1 MATERIAL: STEEL OR STAINLESS STEEL, 22 GAUGE DOOR, 22 GAUGE MOUNTING FRAME. DOOR –RECESSED 5/8"
 .2 HINGE: CONTINUOUS, CONCEALED.
 .3 LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH
 .4 FINISH: SATIN COAT STEEL
 .5 MANUFACTURERS: ACUDOR ACORN, CEB, MIFAB, CENDRES CONTOUR

C. FIRE RATED
 .1 ACCESS DOORS IN FIRE SEPARATIONS OR FIRE RATED ASSEMBLIES: ULC LABELLED. REFER TO ARCHITECTURAL DRAWINGS FOR RATINGS OF FIRE SEPARATIONS AND ASSEMBLIES. MINIMUM 12 GAUGE.
 .2 HINGE: CONTINUOUS, CONCEALED.
 .3 LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH
 .4 FINISH: STEEL: 5–STAGE IRON PHOSPHATE PREPARATION WITH PRIME COAT OF WHITE, ALKYD BAKING ENAMEL OR STAINLESS STEEL TYPE 304, NO. 4 SATIN POLISH.
 .5 MANUFACTURERS: ACUDOR ACORN, CEB, MIFAB, CENDRES CONTOUR

3 SUPPORTS & ANCHORS

3.1 ACCESSORIES

A. HANGER RODS: GALVANIZED, CARBON STEEL CONTINUOUS THREADED.

B. INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER ROD

3.2 EQUIPMENT ROOF CURBS

A. FABRICATION: WELDED 0.05" (1.2 MM) GALVANIZED STEEL SHELL AND BASE, MITRED 3" (75 MM) CANT, VARIABLE STEP TO MATCH ROOF INSULATION, FACTORY INSTALLED WOOD NAILER.

3.3 PIPE HANGER SPACING:

PIPE SIZE (IN)	ROD DIAMETER (IN)	SUPPORT SPACING (FT) STEEL PIPE
1/2	3/8	7
3/4	3/8	7
1	3/8	7
1–1/4	3/8	7
1–1/2	3/8	9
2	3/8	10

3.4 FUEL GAS PIPE HANGER SPACING:

PIPE SIZE (IN)	SUPPORT SPACING (FT)
1/2	6
3/4 – 1	8
1–1/4 – 2–1/2	10
3 – 4	15
5 – 8	20
10 OR LARGER	25
ALL VERTICAL	EVERY FLOOR
TUBING (ALL SIZES)	6

3.5 DUCT HANGER SPACING:

DUCT SIZES (LARGEST SIDE) SPACING	ANGLE SIZE	ROD SIZE
UP TO 30" DIAMETER 10 FT	1" X 1" X 1/8"	1/4"
31" TO 42" DIAMETER 10 FT	1–1/2" X 1–1/2" X 1/8"	1/4"
43" TO 60" DIAMETER 10 FT	1–1/2" X 1–1/2" X 1/8"	3/8"
61" TO 84" DIAMETER 8 FT	2" X 2" 1/8"	3/8"

HVAC SPECIFICATIONS

1 HVAC HYDRONIC PIPING

1.1 HYDRONIC PIPING – GENERAL:

A. KEEP OPEN ENDS OF PIPE FREE FROM SCALE AND DIRT. PROTECT OPEN ENDS WITH TEMPORARY PLUGS OR CAPS. AFTER COMPLETION, FILL, CLEAN, AND TREAT SYSTEMS.

B. PROVIDE NON–CONDUCTING DIELECTRIC CONNECTIONS WHENEVER JOINTING DISSIMILAR METALS IN OPEN SYSTEMS.

C. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.

D. AIR VENTS SHALL BE SELECTED TO SUIT THE SYSTEM OPERATING PRESSURES AND SHALL BE AUTOMATIC AND COMPLETE WITH ISOLATING VALVES.

E. PIPE ALL DISCHARGE FROM TEMPERATURE & PRESSURE SAFETY RELIEF VALVES TO A POINT OF SAFE DISCHARGE DIRECTLY INTO A FLOOR DRAIN, HUB DRAIN OR SAFE OUTDOOR LOCATION.

F. AUTOMATIC FEED VALVES: PROVIDE AUTOMATIC FEED VALVE ON THE COLD WATER MAKE–UP LINE TO EACH NEW HOT WATER HEATING SYSTEM.

G. TEST LIQUID HEAT TRANSFER PIPING HYDROSTATICALLY AT NOT LESS THAN 150% OF OPERATING PRESSURE OR NOT LESS THAN 125 PSI (860 KPA) WHICHEVER IS THE GREATER. TEST PERIOD SHALL BE NOT LESS THAN SIX (6) HOURS DURATION DURING WHICH TIME EACH JOINT SHALL BE INSPECTED, GIVEN A SHARP TAP WITH A HAMMER AND CHECKED FOR LEAKS.

1.2 VALVES – GENERAL

A. CONFORM TO REQUIREMENTS OF ANSI, ASTM, ASME, AND APPLICABLE MSS STANDARDS.

B. MANUFACTURER'S NAME AND PRESSURE RATING CLEARLY MARKED ON BODY TO MSS–SP–25.

C. VALID CRN (CANADIAN REGISTRATION NUMBER) REQUIRED FOR EACH VALVE.

D. MATERIALS:
 .1 BRONZE: ASTM B62 OR B61 AS APPLICABLE
 .2 BRASS: ASTM B283 C3770
 .3 CAST IRON: ASTM A126 CLASS B

E. END CONNECTIONS:
 .1 THREADED ENDS: ANSI B1.20.1
 .2 FLANGED ENDS: ANSI B16.1 (CLASS 125), ANSI B16.5
 .3 FACE–TO–FACE DIMENSIONS: ANSI B16.10

F. DESIGN AND TESTING:
 .1 BRONZE GATE & CHECK VALVES: MSS–SP–80
 .2 BALL VALVES: MSS–SP–110
 .3 CAST IRON GATE VALVES: MSS–SP–70
 .4 CAST IRON GLOBE VALVES: MSS–SP–85
 .5 CAST IRON CHECK: MSS–SP–71
 .6 BUTTERFLY VALVES: MSS–SP–67

G. ACCEPTABLE MANUFACTURERS: KITZ, CRANE, JENKINS, CONBRACO, NIBCO

1.3 HYDRONIC SYSTEMS TO 150 PSIG, ABOVE GROUND

A.	NOMINAL OPERATING PRESSURE	125 PSIG
B.	DESIGN PRESSURE	150 PSIG
C.	TEST PRESSURE	225 PSIG
D.	DESIGN TEMPERATURE	350°F
E.	CORROSION ALLOWANCE	0.0625 IN.
F.	STEEL PIPE	ASTM A53 GR.B ERW OR ASTM A106 GR.B SMLS, SCH 4
G.	JOINTS, 2" AND SMALLER	SCREWED
H.	SCREWED FITTINGS	150 LB. MALLEABLE IRON
I.	UNIONS	CL.150, ASTM A–47 MALLEABLE IRON, ASTM A–153 GALVANIZED, ANSI B2.1 THREADS.
J.	JOINTS	2–1/2" AND LARGER WELDED, WITH FLANGES AT CONNECTIONS TO EQUIPMENT
K.	BUTT WELD FITTINGS	ASTM A234 GR. WFB
L.	FLANGES	ASTM A105, CLASS 150, RAISED FACE, WELD NECK OR SLIP ON
M.	BOLTS	ASTM A307 C.S. BOLTS, SQ. HEAD; ASTM A563 NUTS, HEX HEAD
N.	GASKETS	1/16" (1.6 MM) THICK PREFORMED NON–ASBESTOS GRAPHITE FIBRE.
O.	COPPER TUBING	2" AND SMALLER ASTM B88, TYPE L, HARD DRAWN.
P.	JOINTS:	SOLDER, LEAD FREE, ASTM B32, 95–5 TIN–ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 220°C TO 280°C.
Q.	FITTINGS:	ASME B16.18, CAST BRASS, OR ASME B16.22, SOLDER WROUGHT COPPER
R.	DIELECTRIC UNIONS:	UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.

S. VALVES, 2" AND SMALLER: ASTM A105
 .1 GATE VALVES (ISOLATING) 300 PSIG NON–SHOCK WOG, ASTM B62 BRONZE BODY, SOLID WEDGE DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #25
 .2 GLOBE VALVES (THROTTLING) 300 PSIG NON–SHOCK WOG, ASTM B62 BRONZE BODY, COMPOSITION (TEFLON) DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #09
 .3 CHECK VALVES (BACKFLOW) 300 PSIG NON–SHOCK WOG, ASTM B62 BRONZE BODY, Y–PATTERN HORIZONTAL, SWING TYPE DISC, THREADED ENDS, KITZ #29
 .4 BALL VALVES (DRAIN) 600 PSIG NON–SHOCK WOG, FORGED BRASS, 2–PIECE, CHROME BALL AND STEM, FULL PORT, BLOW–OUT PROOF PTFE SEATS & STEM, LEVER HANDLE, THREADED ENDS, KITZ #68AC.

T. VALVES, 2–1/2" AND LARGER: ASTM A216
 .1 GATE VALVES (ISOLATING) 200 PSIG NON–SHOCK WOG, ASTM A126 CLASS B CAST IRON BODY, BOLTED BONNET, BRONZE MOUNTED, SOLID WEDGE DISC, OS&Y, NON–ASBESTOS PACKING, FLANGED ENDS, KITZ #72.
 .2 GLOBE VALVES (THROTTLING) 200 PSIG NON–SHOCK WOG, ASTM A126 CLASS B CAST IRON BODY, BOLTED BONNET, BRONZE MOUNTED, BEVELLED WEDGE DISC, OS&Y, NON–ASBESTOS PACKING, FLANGED ENDS, KITZ #76.
 .3 CHECK (BACKFLOW) 200 PSIG NON–SHOCK WOG, ASTM 126 CLASS B CAST IRON BODY, BOLTED COVER, BRONZE MOUNTED, SWING TYPE DISC, FLANGED ENDS, KITZ #78

U. PROVIDE STEM EXTENSIONS FOR INSULATED PIPING.

V. PROVIDE GEAR OPERATOR AND CHAIN ON VALVES INSTALLED ABOVE 10FT AFF.

W. STRAINERS, 2" AND SMALLER CLASS 250, 400 PSIG WOG, CAST IRON BODY, Y–PATTERN, SCREWED CAP AND ENDS, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS. MUELLER STEAM 11M.

X. STRAINERS, 2–1/2" AND LARGER CLASS 250 PSIG NON–SHOCK WOG, CAST IRON, Y–PATTERN, BOLTED FLANGE COVER, BLOW–OUT PLUG, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS, FLANGED ENDS, MUELLER STEAM 752.

1.4 EQUIPMENT DRAINS AND OVERFLOWS

A. COPPER TUBING: ASTM B88, TYPE M AND DWV, HARD DRAWN.
 .1 FITTINGS: ASME B16.18, CAST BRASS, OR ASME B16.22 SOLDER WROUGHT COPPER.
 .2 JOINTS: SOLDER, LEAD FREE, ASTM B32, 95–5 TIN–ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 4428°F TO 536°F (220°C TO 280°C).

1.5 CIRCUIT BALANCING VALVES

A. CIRCUIT BALANCING VALVES; 2" (50 MM) AND SMALLER)
 .1 SCREWED CONNECTION, GLOBE STYLE DESIGN, NONFERROUS, PRESSURE DIE–CAST, NONPOROUS AMETAL COPPER ALLOY. EACH VALVE SHALL BE SUCH THAT WHEN INSTALLED IN ANY DIRECTION, IT WILL NOT AFFECT FLOW MEASUREMENT.
 .2 VALVES SHALL PROVIDE THE FOLLOWING FUNCTIONS:
  .1 PRECISE FLOW MEASUREMENT.
  .2 PRECISION FLOW BALANCING.
  .3 POSITIVE SHUT OFF WITH NO DRIP SEAT AND TEFLON DISC.
  .4 DRAIN CONNECTION WITH PROTECTIVE CAP.
 .3 VALVES SHALL HAVE FOUR 360° ADJUSTMENT TURNS OF HANDWHEEL FOR MAXIMUM VERNIER–TYPE SETTING WITH "HIDDEN MEMORY" FEATURE TO PROGRAM THE VALVE WITH PRECISION TAMPER–PROOF BALANCING SETTING.
 .4 VALVES SHALL BE SHIPPED IN A 4.5 R FACTOR POLYURETHANE CONTAINER THAT SHALL BE USED AS INSULATION AFTER VALVE IN INSTALLED.
 .5 PROVIDE VALVES SUITABLE FOR MAXIMUM WORKING PRESSURE OF 250 PSI (1720 KPA) AND MAXIMUM OPERATING TEMPERATURE OF 250°F (121°C).

HVAC SPECIFICATIONS

 .6 ACCEPTABLE PRODUCTS: S.A. ARMSTRONG CRV I INDICATED OR TOUR & ANDERSON STA–D OR NEWMAN HATTERSLEY.

B. CIRCUIT BALANCING VALVES 2 1/2" (65 MM) AND LARGER
 .1 FLANGED, LINE SIZE CONNECTION, GLOBE STYLE DESIGN, NONFERROUS, PRESSURE DIE–CAST, NONPOROUS AMETAL COPPER ALLOY.
 .2 VALVES, SHALL PROVIDE THE FOLLOWING FUNCTIONS:
  .1 PRECISE FLOW MEASUREMENT.
  .2 PRECISION FLOW BALANCING.
  .3 POSITIVE SHUT OFF WITH NO DRIP SEAT AND TEFLON DISC.
 .3 VALVES SHALL HAVE TWELVE 360° ADJUSTMENT TURNS OF HANDWHEEL FOR MAXIMUM VERNIER–TYPE SETTING WITH "HIDDEN MEMORY" FEATURE TO PROGRAM THE VALVE WITH PRECISION TAMPER–PROOF BALANCING SETTING.
 .4 VALVES SHALL BE SUITABLE FOR MAXIMUM WORKING PRESSURE OF 250 PSI (1720 KPA) AND MAXIMUM OPERATING TEMPERATURE OF 250°F (120°C).
 .5 ACCEPTABLE PRODUCTS: S.A. ARMSTRONG CBV II INDICATED OR TOUR & ANDERSON STA–F OR NEWMAN HATTERSLEY.

2 HVAC DUCT INSULATION

2.1 GLASS FIBRE, FLEXIBLE

A. MANUFACTURER: CERTAINTEED SOFT TOUCH AND WIDE WRAP

B. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE MICROLITE.

C. INSULATION: ASTM C553; ASTM C1290, CAN 51.11–92, ASTM C1136, NFPA 90A, ASTM E84, ASTM E136.
 .1 'KSI' VALUE : ASTM C518, 0.039 AT 24 °C (0.27 @ 75.2 °F)
 .2 MAXIMUM SERVICE TEMPERATURE: 121 °C (250 °F).
 .3 MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.
 .4 MAXIMUM FLAME SPREAD INDEX: 25
 .5 MAXIMUM SMOKE DEV INDEX: 50

D. VAPOUR BARRIER JACKET:
 .1 KRAFT PAPER WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM. (FSK)
 .2 KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO WHITE METALIZED POLYPROPYLENE
 .3 MOISTURE VAPOUR TRANSMISSION: ASTM E96; 0.02 PERM.
 .4 SECURE WITH PRESSURE SENSITIVE TAPE.

E. VAPOUR BARRIER TAPE:
 .1 KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.

F. DOOR VAPOUR BARRIER MASTIC:
 .1 VINYL EMULSION TYPE ACRYLIC OR MASTIC, COMPATIBLE WITH INSULATION, BLACK COLOUR.

G. TIE WIRE: ANNEALED STEEL, 1/16" (1.5 MM).

2.2 GLASS FIBRE, RIGID

A. MANUFACTURER: CERTAINTEED CERTAPRO BOARD.

B. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE 800 SERIES SPIN–GLASS

C. INSULATION: ASTM C612; RIGID, NONCOMBUSTIBLE BLANKET.
 .1 'KSI' VALUE : ASTM C518, 0.25 BTU–in/Hr–Sq.Ft– F AT 75 F
 .2 MAXIMUM SERVICE TEMPERATURE: 250 °F (121 °C).
 .3 MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.

D. VAPOUR BARRIER JACKET:
 .1 KRAFT PAPER WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM.
 .2 MOISTURE VAPOUR TRANSMISSION: ASTM E96; 0.04 PERM.
 .3 SECURE WITH PRESSURE SENSITIVE TAPE.

2.3 ALUMINUM JACKETING (APPLY TO OUTDOOR DUCTWORK)

MANUFACTURER: JOHNS MANVILLE ALUMINUM ROLL AND SHEET
COMPLIANCE: ASTM C1729, ASTM E84
FINISH: SMOOTH PLAIN MILL FINISH
EMITTANCE: ASTM C1371
MAXIMUM FLAME SPREAD INDEX: 0
MAXIMUM SMOKE DEVELOPMENT INDEX: 5

2.4 DUCT INSULATION

A. INSULATE NEW OR ALTERED DUCTWORK AND RE–INSULATE EXISTING DUCTWORK WHERE INSULATION HAS BEEN REMOVED OR DAMAGED AS FOLLOWS:

SERVICE	INSULATION TYPE	THICKNESS
AIR SUPPLY – RECTANGULAR	RIGID	1"
AIR SUPPLY – ROUND	FLEXIBLE	1"
EXHAUST WITHIN 6' OF OUTSIDE – RECTANGULAR	RIGID	3"
EXHAUST WITHIN 6' OF OUTSIDE – ROUND	FLEXIBLE	3"
EXHAUST AIR PLENUMS	RIGID	3"
DUCTWORK OUTDOORS (SUPPLY & RETURN)	RIGID	3"

B. INLINE DUCT SILENCERS SHALL BE INSULATED IN THE SAME MANNER AS DUCTWORK.

3. HVAC PIPING INSULATION

3.1 GLASS FIBRE

A. APPROVED MANUFACTURERS: JOHNSMANVILLE MICRO–LOK

B. OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS: OWENS CORING FIBERGLASS, CERTAINTEED CRIMPWRAP.

C. INSULATION: ASTM C547; ASTM C411, ASTM C356 ASTM E84, ASTM D774, NFPA 259.
 .1 'KSI' VALUE: 0.23 BTU–in/Hr–Sq.Ft°F AT 75°F, 0.33 W/m– C AT 24 °C.
 .2 MINIMUM SERVICE TEMPERATURE: 0°F (–18°C).
 .3 MAXIMUM SERVICE TEMPERATURE: 850°F (454°C).
 .4 MAXIMUM MOISTURE ABSORPTION: <5% BY WEIGHT.

D. VAPOUR BARRIER JACKET
 .1 ASTM C136 TYPE I, WHITE KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM.
 .2 MOISTURE VAPOUR TRANSMISSION: ASTM E96; 0.02 PERM.
 .3 SECURE WITH SELF SEALING LONGITUDINAL LAPS AND BUTT STRIPS.
 .4 SECURE WITH OUTWARD CLINCH EXPANDING STAPLES AND VAPOUR BARRIER MASTIC

E. TIE WIRE: 1.3 MM STAINLESS STEEL WITH TWISTED ENDS ON MAXIMUM 12" (300 MM) CENTRES

F. VAPOUR BARRIER LAP ADHESIVE
 .1 COMPATIBLE WITH INSULATION.

G. INSULATING CEMENT/MASTIC
 .1 ASTM C195; HYDRAULIC SETTING ON MINERAL WOOL, VOC CONTENT NOT TO EXCEED 80 G/L.

H. FIBROUS GLASS FABRIC
 .1 CLOTH: UNTREATED; 9 OZ/SQ YD (305 G/SQ M) WEIGHT.
 .2 BLANKET: 1.0 LB/CU FT (16 KG/CU M) DENSITY.

I. INDOOR VAPOUR BARRIER FINISH
 .1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, WHITE COLOUR, VOC CONTENT NOT TO EXCEED 250 G/L.

3.2 JACKETS

A. PVC PLASTIC
 .1 JACKET: ONE PIECE MOULDED TYPE FITTING COVERS AND SHEET MATERIAL. ASTM E84, ASTM D1784, ULC S102–M88.
 .2 MAXIMUM SERVICE TEMPERATURE: 151°F (66°C).
 .3 FINISH: GLOSS.
 .4 MAXIMUM FLAME SPREAD: ASTM E84; 25 OR LESS.
 .5 MAXIMUM SMOKE DEVELOPED: ASTM E84; 50 OR LESS.
 .6 THICKNESS: 20 MIL (0.4 MM) MINIMUM. 30 MIL (0.8 MM) MINIMUM FOR OUTDOOR USE.
 .7 COLOUR: STANDARD OFF–WHITE
 .8 COVERING ADHESIVE MASTIC
  .1 COMPATIBLE WITH INSULATION, MAXIMUM VOC CONTENT OF 50 G/L.
 .9 APPROVED MANUFACTURER: CEEL–CO 300 SERIES, ZESTON PVC

HVAC SPECIFICATIONS

3.3 PIPE INSULATION

A. INSULATE NEW OR ALTERED PIPING WITH RIGID PIPE INSULATION AND RE–INSULATE EXISTING PIPING WHERE INSULATION HAS BEEN REMOVED OR DAMAGED AS FOLLOWS:

RIGID PIPE INSULATION

SERVICE	OPERATING TEMP. (°F)	PIPE ø IN.	INSUL. THK. IN.
HYDRONIC HEATING (HOT WATER)	141 TO 200	1–1/4 AND SMALLER	1–1/2
		1–1/2 & LARGER	2

4 HYDRONIC SPECIALTIES

4.1 AIR VENTS

A. MANUAL TYPE: SHORT VERTICAL SECTIONS OF 2" (50 MM) DIAMETER PIPE TO FORM AIR CHAMBER, WITH 3 MM BRASS NEEDLE VALVE AT TOP OF CHAMBER

B. FLOAT TYPE:
 .1 MANUFACTURERS: ARMSTRONG, AMTROL, TACO
 .2 BRASS OR SEMI–STEEL BODY, COPPER, POLYPROPYLENE, OR SOLID NON–METALLIC FLOAT, STAINLESS STEEL VALVE AND VALVE SEAT; SUITABLE FOR SYSTEM OPERATING TEMPERATURE AND PRESSURE; WITH ISOLATING VALVE.

4.2 STRAINERS

A. SIZE 2" (50 MM) AND UNDER:
 .1 MANUFACTURERS: SARCO SB, CRANE, ARMSTRONG, COLTON

B. SCREWED BRASS OR IRON BODY FOR 175 PSI (1200 KPA) WORKING PRESSURE, Y PATTERN WITH 0.8 MM STAINLESS STEEL PERFORATED SCREEN.

C. SIZE 2–1/2" TO 4" (65 MM TO 100 MM):
 .1 FLANGED IRON BODY FOR 175 PSI (1200 KPA) WORKING PRESSURE, Y PATTERN WITH 1.2 MM STAINLESS STEEL PERFORATED SCREEN.

D. SIZE 6" (150 MM) AND LARGER:
 .1 FLANGED IRON BODY FOR 175 PSI (1200 KPA) WORKING PRESSURE, BASKET PATTERN WITH 3.2 MM STAINLESS STEEL PERFORATED SCREEN.

4.3 RELIEF VALVES

A. MANUFACTURERS: SARCO, WATTS, BELL & GOSSETT, CONBRAC

B. BRONZE BODY, TEFLON SEAT, STAINLESS STEEL STEM AND SPRINGS, AUTOMATIC, DIRECT PRESSURE ACTUATED, CAPACITIES ASME CERTIFIED AND LABELLED

5 REFRIGERATION PIPING & SPECIALTIES

5.1 PIPING

A. COPPER TUBING: ASTM B280, TYPE ACR HARD DRAWN OR ANNEALED.
 .1 FITTINGS: ASME B16.22 WROUGHT COPPER.
 .2 JOINTS: BRAZE, AWS A5.8 BCUP SILVER/PHOSPHORUS/COPPER ALLOY WITH MELTING RANGE 640 TO 805 DEGREES C.

B. COPPER TUBING TO 22 MM OD: ASTM B88, TYPE K, ANNEALED.
 .1 FITTINGS: ASME B16.26 CAST COPPER.
 .2 JOINTS: FLARED.

C. PIPE SUPPORTS AND ANCHORS:
 .1 CONFORM TO ASME B31.5.
 .2 HANGERS FOR PIPE SIZES 13 TO 38 MM: MALLEABLE IRON ADJUSTABLE SWIVEL, SPLIT RING.
 .3 HANGERS FOR PIPE SIZES 50 MM AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.
 .4 MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.
 .5 WALL SUPPORT FOR PIPE SIZES TO 75 MM: CAST IRON HOOK.
 .6 WALL SUPPORT FOR PIPE SIZES 100 MM AND OVER: WELDED STEEL BRACKET AND WROUGHT STEEL CLAMP.
 .7 VERTICAL SUPPORT: STEEL RISER CLAMP.
 .8 FLOOR SUPPORT: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.
 .9 COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.
 .10 HANGER RODS: MILD STEEL THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUS THREADED.
 .11 INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER RODS.

5.2 REFRIGERANT INSULATION: CLOSED–CELL ELASTOMERIC

A. MANUFACTURER: ARMACELL AP ARMAFLEX
COMPLIANCE: ASTM C534, ASTM E84, ULC–S102, NFPA 90A, ASTM D1056
THERMAL CONDUCTIVITY: 0.235 BTU–in/Hr–Sq.Ft– F AT 50 F (0.034 W/mk AT 10 C)
PERMEABILITY: 0.05 PERM–IN
MAXIMUM FLAME SPREAD INDEX: 25
MAXIMUM SMOKE DEVELOPMENT INDEX: 50
WATER ABSORPTION: 0.2% BY VOLUME
MAXIMUM SERVICE TEMPERATURE: 220 F (105 C)
MINIMUM SERVICE TEMPERATURE: –297 F (–183 C)
FOR OUTDOOR USE: PAINT INSULATION WITH ARMAFLEX WB STANDARD WHITE FINISH. PIGMENTED LATEX. VOC < 50 G/L.

5.3 REFRIGERANT INSULATION SIZES

A. INSULATE ALL REFRIGERANT SUCTION AND HOT GAS PIPING AND FITTINGS.
INSULATE LIQUID LINES WHERE EXPOSED TO EXTERIOR CONDITIONS. INSULATION SHALL FIT PIPE. THICKNESS SHALL BE AS FOLLOWS: 1/2" (13 MM) THICK FOR PIPE 1" (25 MM) O.D. AND SMALLER; 3/4" (20 MM) THICK FOR PIPE 1–1/8" (28 MM) TO 2" (50 MM) O.D.; 1" (25 MM) THICK FOR PIPES 2–1/8" (54 MM) O.D. AND LARGER
SLIP INSULATION ON TO TUBING BEFORE TUBING SECTIONS AND FITTINGS ARE ASSEMBLED. KEEP SLITTING OF INSULATION TO A VERY MINIMUM. SEAL ALL JOINTS IN THE INSULATION WITH ARMAFLEX 520 BLV. INSULATE FLEXIBLE PIPE CONNECTORS.
ON INSULATION EXPOSED OUTSIDE THE BUILDING, PLACE "SLIT" JOINT SEAMS ON BOTTOM OF PIPE AND PROVIDE TWO COATS OF ARMAFLEX WB FINISH. EXTEND INSULATION THROUGH PIPE SUPPORT CLAMPS. PROVIDE A 6" (150 MM) LONG, 20 GAUGE (1.1 MM) GALVANIZED STEEL SLEEVE AROUND PIPE INSULATION AT EACH SUPPORT

5.4 MOISTURE AND LIQUID INDICATORS

A. INDICATORS: SINGLE PORT TYPE, UL LISTED, WITH COPPER OR BRASS BODY, FLARED OR SOLDER ENDS, SIGHT GLASS, COLOUR CODED PAPER MOISTURE INDICATOR WITH REMOVABLE ELEMENT CARTRIDGE AND PLASTIC CAP; FOR MAXIMUM WORKING PRESSURE OF 3450 KPA, AND MAXIMUM TEMPERATURE OF 93 DEGREES C.

5.5 VALVES

A. BALL VALVES:
 .1 TWO PIECE BOLTED FORGED BRASS BODY WITH TEFLON BALL SEALS AND COPPER TUBE EXTENSIONS, BRASS BONNET AND SEAL CAP, CHROME PLATED BALL, STEM WITH NEOPRENE RING STEM SEALS; FOR MAXIMUM WORKING PRESSURE OF 3450 KPA AND MAXIMUM TEMPERATURE OF 149 DEGREES C.

B. SERVICE VALVES:
 .1 FORGED BRASS BODY WITH COPPER STUBS, BRASS CAPS, REMOVABLE VALVE CORE, INTEGRAL BALL CHECK VALVE, FLARED OR SOLDER ENDS, FOR MAXIMUM PRESSURE OF 3450 KPA.

5.6 STRAINERS

A. STRAIGHT LINE OR ANGLE LINE TYPE:
 .1 BRASS OR STEEL SHELL, STEEL CAP AND FLANGE, AND REPLACEABLE CARTRIDGE, WITH SCREEN OF STAINLESS STEEL WIRE OR MONEL REINFORCED WITH BRASS; FOR MAXIMUM WORKING PRESSURE OF 2960 KPA.

B. STRAIGHT LINE, NON–CLEANABLE TYPE:
 .1 STEEL SHELL, COPPER PLATED FITTINGS, STAINLESS STEEL WIRE SCREEN,

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2. ISSUED FOR REVIEW 10.10.23
3. ISSUED FOR PERMIT 14.11.23
4. ISSUED FOR TENDER 14.02.24
5. ISSUED FOR ADDENDUM 14.02.24

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PROJECT #:
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CONTROLS & INSTRUMENTATION SPEC.

13. CONTROLLER SOFTWARE

A. FURNISH THE FOLLOWING APPLICATIONS SOFTWARE FOR BUILDING AND ENERGY MANAGEMENT. ALL SOFTWARE APPLICATIONS SHALL RESIDE AND RUN IN THE SYSTEM CONTROLLERS. EDITING OF APPLICATIONS SHALL OCCUR AT THE BUILDING OPERATOR INTERFACE.

.1 SCHEDULING. PROVIDE THE CAPABILITY TO SCHEDULE EACH OBJECT OR GROUP OF OBJECTS IN THE SYSTEM. EACH OF THESE SCHEDULES SHALL INCLUDE THE CAPABILITY FOR START, STOP, OPTIMAL START, OPTIMAL STOP, AND NIGHT ECONOMIZER ACTIONS. EACH SCHEDULE MAY CONSIST OF UP TO [10] EVENTS. WHEN A GROUP OF OBJECTS ARE SCHEDULED TOGETHER, PROVIDE THE CAPABILITY TO DEFINE ADVANCES AND DELAYS FOR EACH MEMBER. EACH SCHEDULE SHALL CONSIST OF THE FOLLOWING:

.1 WEEKLY SCHEDULE:

PROVIDE SEPARATE SCHEDULES FOR EACH DAY OF THE WEEK.

.2 EXCEPTION SCHEDULES:

PROVIDE THE ABILITY FOR THE OPERATOR TO DESIGNATE ANY DAY OF THE YEAR AS AN EXCEPTION SCHEDULE. THIS EXCEPTION SCHEDULE SHALL OVERRIDE THE STANDARD SCHEDULE FOR THAT DAY. EXCEPTION SCHEDULES MAY BE DEFINED UP TO A YEAR IN ADVANCE. ONCE AN EXCEPTION SCHEDULE IS EXECUTED IT WILL BE DISCARDED AND REPLACED BY THE STANDARD SCHEDULE FOR THAT DAY OF THE WEEK.

.3 HOLIDAY SCHEDULES:

PROVIDE THE CAPABILITY FOR THE OPERATOR TO DEFINE UP TO 99 SPECIAL OR HOLIDAY SCHEDULES. THESE SCHEDULES MAY BE PLACED ON THE SCHEDULING CALENDAR AND WILL BE REPEATED EACH YEAR. THE OPERATOR SHALL BE ABLE TO DEFINE THE LENGTH OF EACH HOLIDAY PERIOD.

.4 OPTIMAL START:

THE SCHEDULING APPLICATION OUTLINED ABOVE SHALL SUPPORT AN OPTIMAL START ALGORITHM. THIS SHALL CALCULATE THE THERMAL CHARACTERISTICS OF A ZONE AND START THE EQUIPMENT PRIOR TO OCCUPANCY TO ACHIEVE THE DESIRED SPACE TEMPERATURE AT THE SPECIFIED OCCUPANCY TIME. THE ALGORITHM SHALL CALCULATE SEPARATE SETS OF HEATING AND COOLING RATES FOR ZONES THAT HAVE BEEN UNOCCUPIED FOR LESS THEN AND GREATER THAN 24 HOURS. PROVIDE THE ABILITY TO MODIFY THE START ALGORITHM BASED ON OUTDOOR AIR TEMPERATURE. PROVIDE AN EARLY START LIMIT IN MINUTES TO PREVENT THE SYSTEM FROM STARTING BEFORE AN OPERATOR DETERMINED TIME LIMIT.

.2 TREND LOG APPLICATION

.1 TREND LOG DATA SHALL BE SAMPLED AND STORED ON THE SYSTEM CONTROLLER PANEL AND SHALL CAPABLE OF BEING ARCHIVED TO A BACNET WORKSTATION FOR LONGER TERM STORAGE.

.2 TREND LOGS SHALL INCLUDE INTERVAL, START–TIME, AND STOP–TIME.

.3 TREND LOG INTERVALS SHALL BE CONFIGURABLE AS FREQUENTLY AS 1 MINUTE AND AS INFREQUENTLY AS 1 YEAR.

.3 TREND LOGS

.1 THE SYSTEM CONTROLLER SHALL CREATE TREND LOGS FOR DEFINED KEY PERFORMANCE INDICATORS FOR EACH CONTROLLED HVAC DEVICE AND HVAC APPLICATION.

.2 THE TREND LOGS SHALL MONITOR THESE PARAMETERS FOR A MINIMUM OF 7 DAYS AT 15 MINUTE INTERVALS. THE AUTOMATIC TREND LOGS SHALL BE USER ADJUSTABLE.

.4 ALARM/EVENT LOG

.1 ANY OBJECT IN THE SYSTEM SHALL BE CONFIGURABLE TO GENERATE AN ALARM WHEN TRANSITIONING IN AND OUT OF A NORMAL OR FAULT STATE.

.2 ANY OBJECT IN THE SYSTEM SHALL ALLOW THE ALARM LIMITS, WARNING LIMITS, STATES, AND REACTIONS TO BE CONFIGURED FOR EACH OBJECT IN THE SYSTEM.

.3 AN ALARM/EVENT SHALL BE CAPABLE OF TRIGGERING ANY OF THE FOLLOWING ACTIONS:

.1 ROUTE THE ALARM/EVENT TO ONE OR MORE ALARM LOG

.2 THE ALARM MESSAGE SHALL INCLUDE THE NAME OF THE ALARM LOCATION, THE DEVICE THAT GENERATED THE ALARM, AND THE ALARM MESSAGE ITSELF.

.3 ROUTE AN E–MAIL MESSAGE TO AN OPERATOR(S)

.4 LOG A DATA POINT(S) FOR A PERIOD OF TIME

.5 RUN A CUSTOM CONTROL PROGRAM

.5 POINT CONTROL. USER SHALL HAVE THE OPTION TO SET THE UPDATE INTERVAL, MINIMUM ON/OFF TIME, EVENT NOTIFICATION, CUSTOM PROGRAMMING ON CHANGE OF EVENTS.

.6 TIMED OVERRIDE. A STANDARD APPLICATION SHALL BE UTILIZED TO ENABLE/DISABLE TEMPERATURE CONTROL WHEN A USER SELECTS ON/CANCEL AT THE ZONE SENSOR, BUILDING OPERATOR INTERFACE, OR THE LOCAL OPERATOR DISPLAY. THE AMOUNT OF TIME THAT THE OVERRIDE TAKES PRECEDENCE WILL BE SELECTABLE FROM THE BUILDING OPERATOR INTERFACE.

.7 ANTI–SHORT CYCLING. ALL BINARY OUTPUT POINTS SHALL BE PROTECTED FROM SHORT CYCLING

14. BUILDING CONTROLLERS

A. THERE SHALL BE ONE OR MORE INDEPENDENT, STANDALONE MICROPROCESSOR BASED SYSTEM CONTROLLERS TO MANAGE THE GLOBAL STRATEGIES DESCRIBED IN APPLICATION AND CONTROL SOFTWARE SECTION.

B. THE SYSTEM CONTROLLER SHALL HAVE SUFFICIENT MEMORY TO SUPPORT ITS OPERATING SYSTEM, DATABASE, AND PROGRAMMING REQUIREMENTS.

C. THE CONTROLLER SHALL PROVIDE A USB COMMUNICATIONS PORT FOR CONNECTION TO A PC.

D. THE OPERATING SYSTEM OF THE CONTROLLER SHALL MANAGE THE INPUT AND OUTPUT COMMUNICATIONS SIGNALS TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL POINT INFORMATION AND ALLOW CENTRAL MONITORING AND ALARMS.

E. ALL SYSTEM CONTROLLERS SHALL HAVE A REAL TIME CLOCK.

F. DATA SHALL BE SHARED BETWEEN NETWORKED SYSTEM CONTROLLERS.

G. THE SYSTEM CONTROLLER SHALL CONTINUALLY CHECK THE STATUS OF ITS PROCESSOR AND MEMORY CIRCUITS. IF AN ABNORMAL OPERATION IS DETECTED, THE CONTROLLER SHALL:

.1 ASSUME A PREDETERMINED FAILURE MODE.

.2 GENERATE AN ALARM NOTIFICATION.

.3 CREATE A RETRIEVABLE FILE OF THE STATE OF ALL APPLICABLE MEMORY LOCATIONS AT THE TIME OF THE FAILURE.

.4 AUTOMATICALLY RESET THE SYSTEM CONTROLLER TO RETURN TO A NORMAL OPERATING MODE.

H. ENVIRONMENT. CONTROLLER HARDWARE SHALL BE SUITABLE FOR THE ANTICIPATED AMBIENT CONDITIONS. CONTROLLER USED IN CONDITIONED AMBIENT SHALL BE MOUNTED IN AN ENCLOSURE, AND SHALL BE RATED FOR OPERATION AT –40° C TO 50° C [–40° F TO 122° F].

I. CLOCK SYNCHRONIZATION.

.1 ALL SYSTEM CONTROLLERS SHALL BE ABLE TO SYNCHRONIZE WITH A NTP SERVER FOR AUTOMATIC TIME SYNCHRONIZATION.

.2 ALL SYSTEM CONTROLLERS SHALL BE ABLE TO ACCEPT A BACNET TIME SYNCHRONIZATION COMMAND FOR AUTOMATIC TIME SYNCHRONIZATION.

.3 ALL SYSTEM CONTROLLERS SHALL AUTOMATICALLY ADJUST FOR DAYLIGHT SAVINGS TIME IF APPLICABLE.

J. SERVICEABILITY

.1 PROVIDE DIAGNOSTIC LEDS FOR POWER, COMMUNICATIONS, AND PROCESSOR.

.2 THE SYSTEM CONTROLLER SHALL HAVE A DISPLAY ON THE MAIN BOARD THAT INDICATES THE CURRENT OPERATING MODE OF THE CONTROLLER.

.3 SD CARD SHOULD BE PROVIDED AND USED FOR LOCAL BACKUP. IF LOCAL BACKUP THROUGH SD CARD OR SIMILAR DEVICE IS NOT AVAILABLE THEN PROVIDE OPERATOR WORKSTATION WITH SUFFICIENT MEMORY PROVIDE SCHEDULED BACKUPS OF THE SYSTEM. BAS SERVICE PROVIDER SHALL BE RESPONSIBLE FOR BAS BACKUPS DURING THE WARRANTY PERIOD.

.4 ALL WIRING CONNECTIONS SHALL BE MADE TO FIELD REMOVABLE, MODULAR TERMINAL CONNECTORS.

.5 THE SYSTEM CONTROLLER SHALL UTILIZE STANDARD DIN MOUNTING METHODS FOR INSTALLATION AND REPLACEMENT.

.6 MEMORY. THE SYSTEM CONTROLLER SHALL MAINTAIN ALL BIOS AND PROGRAMMING INFORMATION INDEFINITELY WITHOUT POWER TO THE SYSTEM CONTROLLER.

.7 IMMUNITY TO POWER AND NOISE. CONTROLLER SHALL BE ABLE TO OPERATE AT 90% TO 110% OF NOMINAL VOLTAGE RATING AND SHALL PERFORM AN ORDERLY SHUT–DOWN BELOW 80% NOMINAL VOLTAGE.

.8 BACNET TEST LABS (BTL) LISTING. EACH SYSTEM CONTROLLER SHALL BE LISTED AS A BUILDING CONTROLLER (B–BC) BY THE BACNET TEST LABS WITH A MINIMUM BACNET PROTOCOL REVISION OF 14.

CONTROLS & INSTRUMENTATION SPEC.

15. AUXILLARY CONTROL DEVICES

A. BINARY TEMPERATURE DEVICES

.1 LOW–VOLTAGE SPACE THERMOSTAT SHALL BE 24 V, BIMETAL–OPERATED, MERCURY–SWITCH TYPE, WITH EITHER ADJUSTABLE OR FIXED ANTICIPATION HEATER, CONCEALED SETPOINT ADJUSTMENT, 13°C TO 30°C (55°F TO 85°F) SETPOINT RANGE, 1°C (2°F) MAXIMUM DIFFERENTIAL, AND VENTED ABS PLASTIC COVER.

.2 LINE–VOLTAGE SPACE THERMOSTAT SHALL BE BIMETAL–ACTUATED, OPEN CONTACT TYPE, OR BELLOWS–ACTUATED, ENCLOSED, SNAP–SWITCH TYPE OR EQUIVALENT SOLID–STATE TYPE, WITH HEAT ANTICIPATOR, UL LISTED FOR ELECTRICAL RATING, CONCEALED SETPOINT ADJUSTMENT, 13°C TO 30°C (55°F TO 85°F) SETPOINT RANGE, 1°C (2°F) MAXIMUM DIFFERENTIAL, AND VENTED ABS PLASTIC COVER.

.3 LOW–LIMIT THERMOSTATS. LOW–LIMIT AIRSTREAM THERMOSTATS SHALL BE UL LISTED, VAPOR PRESSURE TYPE, WITH AN ELEMENT OF 6 M (20 FT) MINIMUM LENGTH. ELEMENT SHALL RESPOND TO THE LOWEST TEMPERATURE SENSED BY ANY 30 CM (1 FT) SECTION. THE LOW–LIMIT THERMOSTAT SHALL BE MANUAL RESET ONLY.

16. COORDINATION

A. SITE

.1 WHERE THE MECHANICAL WORK WILL BE INSTALLED IN CLOSE PROXIMITY TO, OR WILL INTERFERE WITH, WORK OF OTHER TRADES, THE CONTRACTOR SHALL ASSIST IN WORKING OUT SPACE CONDITIONS TO MAKE A SATISFACTORY ADJUSTMENT. IF THE CONTRACTOR INSTALLS HIS/HER WORK BEFORE COORDINATING WITH OTHER TRADES, SO AS TO CAUSE ANY INTERFERENCE WITH WORK OF OTHER TRADES, THE CONTRACTOR SHALL MAKE THE NECESSARY CHANGES IN HIS/HER WORK TO CORRECT THE CONDITION WITHOUT EXTRA CHARGE.

.2 COORDINATE AND SCHEDULE WORK WITH ALL OTHER WORK IN THE SAME AREA, OR WITH WORK THAT IS DEPENDENT UPON OTHER WORK, TO FACILITATE MUTUAL PROGRESS.

B. TEST AND BALANCE

.1 THE CONTRACTOR SHALL FURNISH A SINGLE SET OF ALL TOOLS NECESSARY TO INTERFACE TO THE CONTROL SYSTEM FOR TEST AND BALANCE PURPOSES.

.2 THE CONTRACTOR SHALL PROVIDE TRAINING IN THE USE OF THESE TOOLS. THIS TRAINING WILL BE PLANNED FOR A DURATION OF 4 HOURS.

.3 IN ADDITION, THE CONTRACTOR SHALL PROVIDE A QUALIFIED TECHNICIAN TO ASSIST IN THE TEST AND BALANCE PROCESS, UNTIL THE FIRST 20 TERMINAL UNITS ARE BALANCED.

.4 THE TOOLS USED DURING THE TEST AND BALANCE PROCESS SHALL BE RETURNED TO THE CONTRACTOR AT THE COMPLETION OF THE TESTING AND BALANCING.

C. COORDINATION WITH CONTROLS SPECIFIED IN OTHER SECTIONS OR DIVISIONS. OTHER SECTIONS AND/OR DIVISIONS OF THIS SPECIFICATION INCLUDE CONTROLS AND CONTROL DEVICES THAT ARE TO BE PART OF OR INTERFACED TO THE CONTROL SYSTEM SPECIFIED IN THIS SECTION. THESE CONTROLS SHALL BE INTEGRATED INTO THE SYSTEM AND COORDINATED BY THE CONTRACTOR AS FOLLOWS:

.1 ALL COMMUNICATION MEDIA AND EQUIPMENT SHALL BE PROVIDED AS SPECIFIED IN THE "COMMUNICATION" SECTION OF THIS SPECIFICATION

.2 EACH SUPPLIER OF A CONTROLS PRODUCT IS RESPONSIBLE FOR THE CONFIGURATION, PROGRAMMING, START–UP, AND TESTING OF THAT PRODUCT TO MEET THE SEQUENCES OF OPERATION DESCRIBED IN THIS SECTION

.3 THE CONTRACTOR SHALL COORDINATE AND RESOLVE ANY INCOMPATIBILITY ISSUES THAT ARISE BETWEEN THE CONTROL PRODUCTS PROVIDED UNDER THIS SECTION AND THOSE PROVIDED UNDER OTHER SECTIONS OR DIVISIONS OF THIS SPECIFICATION.

D. PARTS SUPPLIED BY CONTROLS CONTRACTOR MUST BE TURNED OVER TO THE MECHANICAL CONTRACTOR FOR INSTALLATION. PARTS INCLUDE BUT ARE NOT LIMITED TO CONTROL VALVES, DAMPERS, INLINE DEVICES, THERMAL DEVICES, THERMAL WELLS.

17. WIRING

A. BAS INSTALLING CONTRACTOR IS RESPONSIBLE FOR ALL MECHANICAL INTERLOCK WIRING, SENSOR WIRING, AND CONTROL WIRING REQUIRED UNLESS SPECIFIED TO BE FACTORY MOUNTED PER DIVISION 23.

B. ALL CONTROL AND INTERLOCK WIRING SHALL COMPLY WITH THE NATIONAL, LOCAL ELECTRICAL CODES, AND SECTION 26 00 00 OF THESE CONTRACT DOCUMENT SPECIFICATIONS. WHERE THE REQUIREMENTS OF THIS SECTION DIFFER WITH THOSE IN ELECTRICAL SPECIFICATIONS, THE REQUIREMENTS OF THIS SECTION SHALL TAKE PRECEDENCE. THIS WORK INCLUDES INTERLOCK WIRING FOR MECHANICAL EQUIPMENT REQUIRED FOR A COMPLETE INSTALLATION. EQUIPMENT SPECIFIED TO HAVE FACTORY MOUNTED CONTROLLERS AND DEVICE ARE NOT INCLUDE BY THIS DIVISION.

C. ALL CEC CLASS 1 (LINE VOLTAGE) WIRING SHALL BE UL LISTED IN APPROVED RACEWAY ACCORDING TO CEC REQUIREMENTS.

D. WHERE CLASS 2 WIRES ARE IN CONCEALED AND ACCESSIBLE LOCATIONS; INCLUDING CEILING RETURN AIR PLENUMS, APPROVED CABLES OUTSIDE OF ELECTRICAL RACEWAY CAN BE USED PROVIDED THAT THE FOLLOWING CONDITIONS ARE MET:

.1 CIRCUITS MEET CEC CLASS 2 (CURRENT_LIMITED) REQUIREMENTS. (LOW_VOLTAGE POWER CIRCUITS SHALL BE SUB_FUSED WHEN REQUIRED TO MEET CLASS 2 CURRENT_LIMIT.)

.2 ALL CABLES SHALL BE UL LISTED FOR APPLICATION (I.E., CABLES USED IN CEILING PLENUMS SHALL BE UL LISTED SPECIFICALLY FOR THAT PURPOSE).

E. DO NOT INSTALL CLASS 2 WIRING IN CONDUITS CONTAINING CLASS 1 WIRING. BOXES AND PANELS CONTAINING HIGH VOLTAGE MAY NOT BE USED FOR LOW VOLTAGE WIRING EXCEPT FOR THE PURPOSE OF INTERFACING THE TWO VIA CONTROL RELAYS AND TRANSFORMERS.

F. WHERE CLASS 2 WIRING IS RUN EXPOSED, WIRING SHALL BE RUN PARALLEL ALONG A SURFACE OR PERPENDICULAR TO IT, AND BUNDLED, USING APPROVED WIRE TIES AT NO GREATER THAN 3 M (10 FT.) INTERVALS. SUCH BUNDLED CABLE SHALL BE FASTENED TO THE STRUCTURE, USING INDUSTRY APPROVED FASTENERS, AT 1.5 M (5 FT.) INTERVALS OR MORE OFTEN TO ACHIEVE A NEAT AND WORKMANLIKE RESULT.

G. ALL WIRE–TO–DEVICE CONNECTIONS SHALL BE MADE AT A TERMINAL BLOCKS OR TERMINAL STRIP. ALL WIRE–TO WIRE CONNECTIONS SHALL BE AT A TERMINAL BLOCK, OR WITH A CRIMPED CONNECTOR. ALL WIRING WITHIN ENCLOSURES SHALL BE NEATLY BUNDLED AND ANCHORED TO PERMIT ACCESS AND PREVENT RESTRICTION TO DEVICES AND TERMINALS.

H. MAXIMUM ALLOWABLE VOLTAGE FOR CONTROL WIRING SHALL BE 120VAC. IF ONLY HIGHER VOLTAGES ARE AVAILABLE FOR USE, THE BAS MANUFACTURER SHALL PROVIDE STEP–DOWN TRANSFORMERS TO ACHIEVE THE DESIRED CONTROL VOLTAGES.

I. ALL CONTROL WIRING SHALL BE INSTALLED AS CONTINUOUS LENGTHS, WHERE POSSIBLE. ANY REQUIRED SPLICES SHALL BE MADE ONLY WITHIN AN APPROVED JUNCTION BOX OR OTHER APPROVED PROTECTIVE DEVICE.

J. INSTALL PLENUM WIRING IN SLEEVES WHERE IT PASSES THROUGH WALLS AND FLOORS. MAINTAIN FIRE RATING AT ALL PENETRATIONS IN ACCORDANCE WITH CONTRACT DOCUMENTS AND NATIONAL AND/OR LOCAL CODES.

K. CONDUIT AND WIRE SIZING SHALL BE DETERMINED BY THE BAS MANUFACTURER IN ORDER TO MAINTAIN MANUFACTURER'S RECOMMENDATION AND MEET NATIONAL AND LOCAL CODES.

L. CONTROL AND STATUS RELAYS ARE TO BE LOCATED IN PRE–FABRICATED ENCLOSURES THAT MEET THE APPLICATION. THESE RELAYS MAY ALSO BE LOCATED WITHIN PACKAGED EQUIPMENT CONTROL PANEL ENCLOSURES AS COORDINATED. THESE RELAYS SHALL NOT BE LOCATED WITHIN CLASS 1 STARTER ENCLOSURES.

M. FOLLOW MANUFACTURER'S INSTALLATION RECOMMENDATIONS FOR ALL COMMUNICATION AND NETWORK BUS CABLING. NETWORK OR COMMUNICATION CABLING SHALL BE RUN SEPARATELY FROM ALL CONTROL POWER WIRING.

N. ADHERE TO ELECTRICAL REQUIREMENTS FOR INSTALLATION OF ELECTRICAL RACEWAYS.

O. BAS MANUFACTURER SHALL TERMINATE ALL CONTROL AND/OR INTERLOCK WIRING AND SHALL MAINTAIN UPDATED (AS_BUILT) WIRING DIAGRAMS WITH TERMINATIONS IDENTIFIED AT THE JOB SITE.

P. FLEXIBLE METAL CONDUITS AND LIQUID_TIGHT FLEXIBLE METAL CONDUITS SHALL NOT EXCEED 3' IN LENGTH AND SHALL BE SUPPORTED AT EACH END. FLEXIBLE METAL CONDUIT LESS THAN 1/2" ELECTRICAL TRADE SIZE SHALL NOT BE USED. IN AREAS EXPOSED TO MOISTURE, INCLUDING CHILLER AND BOILER ROOMS, LIQUID_TIGHT, FLEXIBLE METAL CONDUITS SHALL BE USED.

18. SUPPLY OF CONTROL DEVICES

CONTROLS & INSTRUMENTATION SPEC.

A. UNLESS OTHERWISE SPECIFIED, SUPPLY ALL REQUIRED CONTROL DAMPERS. HAND THE DAMPERS TO THE SHEET METAL TRADE AT THE SITE IN THE LOCATION WHERE THEY ARE REQUIRED FOR INSTALLATION AS PART OF THE SHEET METAL WORK. ENSURE THAT EACH DAMPER IS CORRECTLY LOCATED AND MOUNTED.

B. PROVIDE LINKAGE AND OPERATORS FOR THE DAMPERS. WHEREVER POSSIBLE LOCATE DAMPER OPERATORS SO THAT THEY ARE ACCESSIBLE FROM OUTSIDE DUCT, PLENUM, AND EQUIPMENT CASINGS. BRACKET MOUNT OPERATORS ON DUCTS OR PLENUMS CLEAR OF INSULATION WHERE APPLICABLE.

C. WHERE SEQUENCE OPERATION IS INDICATED, OR WHERE MULTIPLE OPERATORS DRIVE A SERIES OF DAMPERS, PROVIDE PILOT POSITIONERS TO COUPLE THEIR ACTION.

D. ENSURE THAT DAMPERS LOCATED IN DUCTWORK OTHER THAN GALVANIZED STEEL ARE CONSTRUCTED OF TYPE 316 STAINLESS STEEL.

E. UNLESS OTHERWISE SPECIFIED, SUPPLY ALL REQUIRED AUTOMATIC CONTROL VALVES. HAND THE VALVES TO THE APPROPRIATE PIPING TRADES AT THE SITE IN THE LOCATIONS THEY ARE REQUIRED FOR INSTALLATION AS PART OF THE PIPING WORK. ENSURE THAT EACH VALVE IS PROPERLY SIZED, LOCATED AND INSTALLED.

F. PROVIDE AN OPERATOR FOR EACH VALVE WITH ON/OFF CONTROL FOR 2 POSITION, 0–10VDC OR 4–20MA FOR MODULATING FOR CONTROL. SPRING RETURN ACTUATORS ARE REQUIRED ON AS DEFINED ON THE DRAWINGS FOR FAIL SAFE OPERATION, OR AS NEEDED TO PROTECT THE EQUIPMENT, SUCH AS NORMAL CLOSED POSITION FOR OUTSIDE AIR DAMPERS.

5

19. TRAINING

A. PROVIDE MINIMUM OF (2) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION, THROUGHOUT THE CONTRACT PERIOD. THE TRAINING WILL BE PROVIDED FOR PERSONNEL DESIGNATED BY THE OWNER.

B. THESE OBJECTIVES WILL BE DIVIDED INTO LOGICAL GROUPINGS; PARTICIPANTS MAY ATTEND ONE OR MORE OF THESE, DEPENDING ON LEVEL OF KNOWLEDGE REQUIRED:

.1 DAY–TO–DAY BAS OPERATORS

.2 BAS TROUBLESHOOTING & MAINTENANCE

C. THE INSTRUCTOR(S) SHALL BE FACTORY–TRAINED AND EXPERIENCED IN TEACHING THIS TECHNICAL MATERIAL.

D. TRAINING WILL BEGIN WHEN THE OPERATING AND MAINTENANCE MANUALS HAVE BEEN DELIVERED TO THE OWNER OR REVIEWED BY THE ENGINEER'S REPRESENTATIVE.

E. BUILDING WALK THROUGH AND LOCATION OF CONTROL DEVICES

F. OPERATING PROCEDURES

G. MAINTENANCE PROCEDURES

H. TROUBLE–SHOOTING PROCEDURES

I. SPARE PARTS REQUIRED

J. PROJECT RECORD DOCUMENTS: UPON COMPLETION OF INSTALLATION, SUBMIT AN ELECTRONIC COPY. THE DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL COMPLETION AND INCLUDE:

.1 PROJECT RECORD DRAWINGS – THESE SHALL BE AS–BUILT VERSIONS OF THE SUBMITTAL SHOP DRAWINGS. ONE SET OF ELECTRONIC MEDIA .PDF DRAWING FILES SHALL BE PROVIDED.

.2 TESTING AND COMMISSIONING REPORTS AND CHECKLISTS SIGNED OFF BY TRAINED FACTORY (EQUIPMENT MANUFACTURERS) AND FIELD (BAS) COMMISSIONING PERSONNEL.

20. OPERATING AND MAINTENANCE (O & M) MANUALS

A. THESE SHALL BE AS–BUILT VERSIONS OF THE SUBMITTAL PRODUCT DATA. IN ADDITION TO THE INFORMATION REQUIRED FOR THE SUBMITTALS, OPERATING & MAINTENANCE MANUAL SHALL INCLUDE:

.1 24–HOUR/7–DAY PER WEEK EMERGENCY SERVICE TELEPHONE NUMBERS OF CONTRACTOR SERVICE DEPARTMENT ALONG WITH NAMES, ADDRESS OF SERVICE PERSONNEL RESPONSIBLE FOR SUPPORTING THE ONGOING WARRANTY AND SERVICES OF THE CONTROL SYSTEM.

.2 PREVENTATIVE MAINTENANCE AND CALIBRATION PROCEDURES; HARDWARE TROUBLESHOOTING; AND HARDWARE REPAIR AND/OR REPLACEMENT PROCEDURES.

.3 ONE SET OF ELECTRONIC MEDIA CONTAINING FILES OF ALL OPERATOR COLOR GRAPHIC SCREENS FOR THE PROJECT.

.4 LOCAL SUPPLY STORE SHOULD HAVE A MINIMUM 3 UNIT CONTROLLERS, SYSTEM CONTROLLERS, AND ROOM SENSORS AVAILABLE FOR SAME DAY PURCHASE.

.5 DOCUMENTATION, INSTALLATION, AND MAINTENANCE INFORMATION FOR ALL THIRD PARTY HARDWARE/SOFTWARE PRODUCTS PROVIDED INCLUDING PERSONAL COMPUTERS, PRINTERS, HUBS, SENSORS, VALVES, ETC.

.6 ORIGINAL ISSUE MEDIA FOR ALL SOFTWARE PROVIDED, INCLUDING OPERATING SYSTEMS, PROGRAMMING LANGUAGE, OPERATOR WORKSTATION SOFTWARE, AND GRAPHICS SOFTWARE.

.7 LICENSES, GUARANTEE, AND WARRANTY DOCUMENTS FOR ALL EQUIPMENT AND SYSTEMS.

.8 RECOMMENDED PREVENTIVE MAINTENANCE PROCEDURES FOR ALL SYSTEM COMPONENTS INCLUDING A SCHEDULE OF TASKS (INSPECTION, CLEANING, CALIBRATION, ETC.) AND TASK DESCRIPTIONS.

21. SEQUENCE OF OEPRATIONS

21.1 ENERGY RECOVERY VENTILATOR (ERV–1)

A. RUN CONDITIONS – CONTINUOUS:

THE UNIT SHALL RUN CONTINUOUSLY.

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING SMOKE DETECTOR STATUS.

B. DAMPER OPERATION:

THE OUTSIDE AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE SUPPLY FAN SHALL START ONLY AFTER THE DAMPER STATUS HAS PROVEN THE DAMPER IS OPEN. THE OUTSIDE AIR DAMPER SHALL CLOSE 4SEC (ADJ.) AFTER THE SUPPLY FAN STOPS.

THE CORE DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE SUPPLY FAN SHALL START ONLY AFTER THE DAMPER STATUS HAS PROVEN THE DAMPER IS OPEN. THE OUTSIDE AIR DAMPER SHALL CLOSE 4SEC (ADJ.) AFTER THE SUPPLY FAN STOPS.

THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST FAN SHALL START ONLY AFTER THE DAMPER STATUS HAS PROVEN THE DAMPER IS OPEN. THE OUTSIDE AIR DAMPER SHALL CLOSE 4SEC (ADJ.) AFTER THE EXHAUST FAN STOPS.

C. FAN OPERATION:

THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME, UNLESS SHUTDOWN ON SAFETIES.

THE EXHAUST FAN SHALL RUN WHENEVER THE SUPPLY FAN RUNS, UNLESS SHUTDOWN ON SAFETIES.

SUPPLY AIR TEMPERATURE:

THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE. DURING WINTER CONDITIONS WHEN HEATING IS ENABLED THE CONTROLLER SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT OF 72°F (ADJ.)

D. GAS HEATING STAGE:

THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THE STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE SUPPLY AIR TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE FAN STATUS IS ON.

E. FILTER MONITOR:

THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE:

- PREFILTER.
- FINAL FILTER.
- RETURN FILTER
- CARBON FILTER

CONTROLS & INSTRUMENTATION SPEC.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- OUTSIDE AIR DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- OUTSIDE AIR DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- CORE DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- CORE DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- EXHAUST AIR DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- EXHAUST AIR DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- EXHAUST FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- EXHAUST FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- EXHAUST FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- PREFILTER CHANGE REQUIRED: PREFILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- CARBON FILTER CHANGE REQUIRED: CARBON FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- RETURN FILTER CHANGE REQUIRED: RETURN FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

21.2 AIRHANDLING UNIT WITH ENTHALPY WHEEL (RTU–1)

A. RUN CONDITIONS:

THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:

OCCUPIED MODE: THE UNIT SHALL MAINTAIN

- A 75°F (ADJ.) COOLING SETPOINT
- A 70°F (ADJ.) HEATING SETPOINT.
- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- A 80°F (ADJ.) COOLING SETPOINT.
- A 65°F (ADJ.) HEATING SETPOINT.

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

B. ZONE OPTIMAL START:

THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START–UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM–UP OR COOL–DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF A SCHEDULED OCCUPIED PERIOD.

C. FAN OPRATION:

THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE RETURN FAN SHALL RUN WHENEVER THE SUPPLY FAN RUNS, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE RETURN FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

D. ENTHALPY WHEEL:

THE CONTROLLER SHALL RUN THE ENTHALPY WHEEL FOR ENERGY RECOVERY AS FOLLOWS.

COOLING MODE:

THE ENTHALPY WHEEL SHALL RUN FOR FULL COOL RECOVERY WHENEVER:

- THE OUTSIDE AIR ENTHALPY IS GREATER THAN THE RETURN AIR ENTHALPY.
- AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
- AND THE SUPPLY FAN IS ON.

THE ENTHALPY WHEEL SHALL RUN FOR PARTIAL COOL RECOVERY WHENEVER:

- THE OUTSIDE AIR HUMIDITY RATIO IS LESS THAN THE RETURN AIR HUMIDITY RATIO
- AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE RETURN AIR TEMPERATURE
- AND THE UNIT DISCHARGE AIR DRYBULB DOES NOT DROP BELOW THE ENTHALPY WHEEL SUPPLY AIR DEWPOINT
- AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT
- AND THE SUPPLY FAN IS ON.

HEATING MODE:

THE ENTHALPY WHEEL SHALL RUN FOR FULL HEAT RECOVERY WHENEVER:

- OUTSIDE AIR ENTHALPY IS LESS THAN RETURN AIR ENTHALPY
- AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE SUPPLY FAN IS ON.

PERIODIC SELF–CLEANING:

THE ENTHALPY WHEEL SHALL RUN FOR 10SEC (ADJ.) EVERY 4HR (ADJ.) THE UNIT RUNS.

FROST PROTECTION:

THE ENTHALPY WHEEL FROST PROTECTION CONTROLS SHALL BE SUPPLIED AND OPERATED AS PER THE MANUFACTURERS INSTRUCTIONS.

F. COOLING STAGES:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE COOLING TO MAINTAIN ITS COOLING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE COOLING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- AND THE ECONOMIZER (IF PRESENT) IS DISABLED OR FULLY OPEN.
- AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
- AND THE SUPPLY FAN STATUS IS ON.
- AND THE HEATING IS NOT ACTIVE.

J. GAS HEATING STAGE:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THE STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE SUPPLY FAN STATUS IS ON.
- AND THE COOLING IS NOT ACTIVE.

CONTROLS & INSTRUMENTATION SPEC.

K. ECONOMIZER:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2°F LESS THAN THE ZONE COOLING SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN WHENEVER OCCUPIED.

THE ECONOMIZER SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE OUTSIDE AIR ENTHALPY IS LESS THAN 22BTU/LB (ADJ.).
- AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE.
- AND THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY.
- AND THE SUPPLY FAN STATUS IS ON.

THE ECONOMIZER SHALL CLOSE WHENEVER:

- MIXED AIR TEMPERATURE DROPS FROM 45°F TO 40°F (ADJ.).
- OR ON LOSS OF SUPPLY FAN STATUS.
- OR FREEZESTAT (IF PRESENT) IS ON.

THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START UP IS AVAILABLE, THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED.

L. CARBON DIOXIDE (CO_2) CONTROL:

WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE RETURN AIR CO_2 LEVELS AND MODULATE THE OUTSIDE AIR DAMPERS OPEN ON RISING CO_2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A CO_2 SETPOINT OF 750 PPM (ADJ.).

M. DEHUMIDIFICATION:

THE CONTROLLER SHALL MEASURE THE RETURN AIR HUMIDITY AND OVERRIDE THE COOLING SEQUENCE TO MAINTAIN RETURN AIR HUMIDITY AT OR BELOW 60% RH (ADJ.).

DURING DEHUMIDIFICATION, THE MODULATING CONDENSER REHEAT SHALL MODULATE TO MAINTAIN A SETPOINT 1°F (ADJ.) LESS THAN THE ZONE COOLING SETPOINT.

DEHUMIDIFICATION SHALL BE ENABLED WHENEVER:

- THE SUPPLY FAN STATUS IS ON.
- AND ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT.

N. MISCELLEANOUS MONITORING:

THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE PREFILTER.

THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FINAL FILTER.

THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL.

O. RETURN AIR CARBON DIOXIDE (CO_2) CONCENTRATION MONITORING:

THE CONTROLLER SHALL MEASURE THE RETURN AIR CO_2 CONCENTRATION.

THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY AND USE AS REQUIRED FOR ECONOMIZER CONTROL.

THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL.

THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- RETURN FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RETURN FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RETURN FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- ENTHALPY WHEEL ROTATION FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- ENTHALPY WHEEL IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- ENTHALPY WHEEL RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- PREFILTER CHANGE REQUIRED: PREFILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).
- LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).
- HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION: IF THE RETURN AIR CO_2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE OCCUPIED MODE.
- HIGH RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS GREATER THAN 70% (ADJ.).
- LOW RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS LESS THAN 35% (ADJ.).
- HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).
- LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).
- HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

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PROJECT:
HVAC Renovations

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TRUE NORTH:

DRAWING TITLE:
Mechanical Specifications

SCALE:
AS NOTED

DRAWN:
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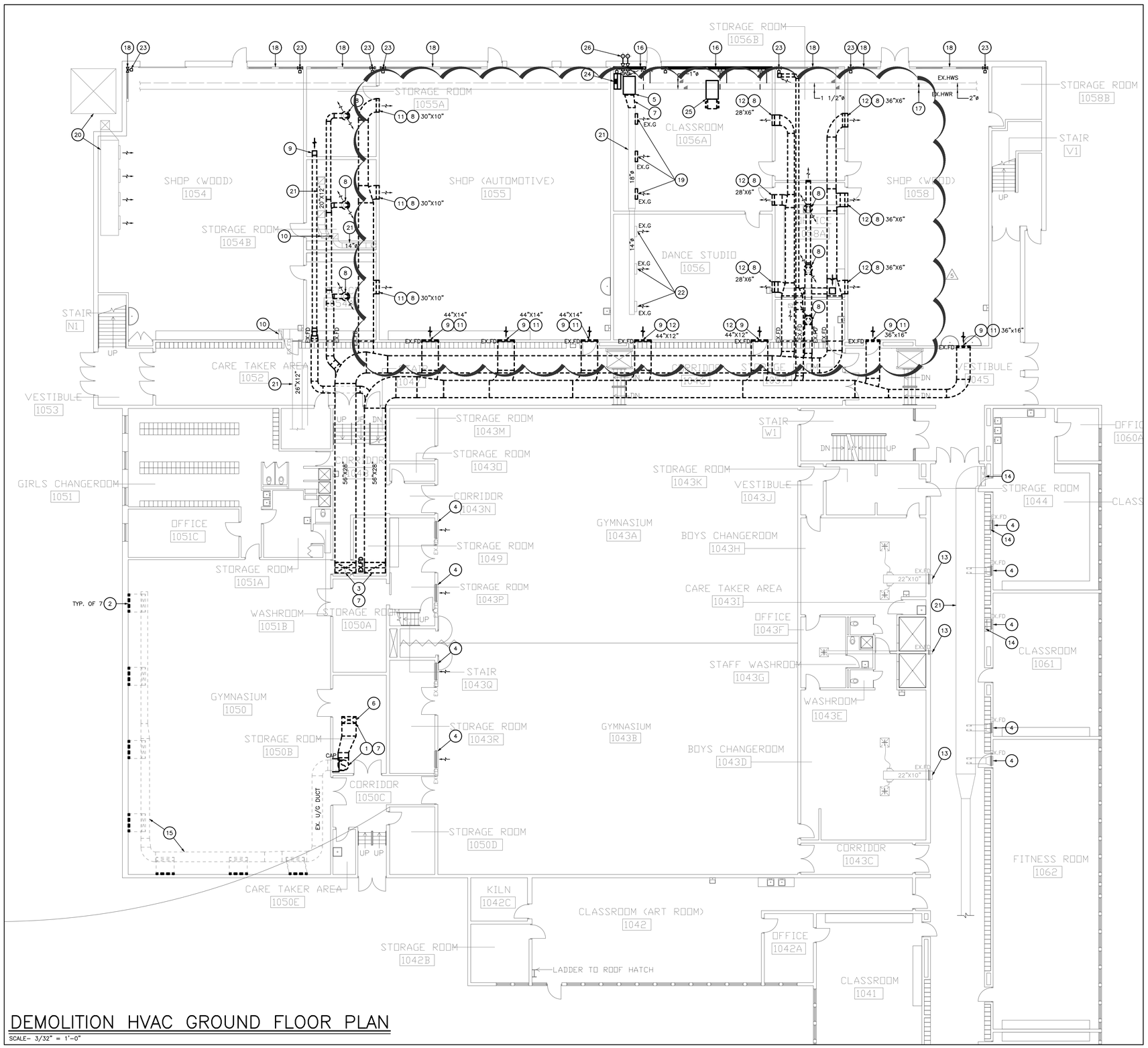

DEMOLITION HVAC GROUND FLOOR PLAN

SCALE– 3/32" = 1'–0"

DRAWING NOTES

1. EXISTING SUPPLY AIR DUCTWORK DOWN TO BELOW GRADE. BELOW GRADE DUCT IS TO BE ABANDONED. DEMOLISH EXPOSED SECTION. CAP AT FLOOR LEVEL.
2. EXISTING DUCTWORK UP TO SIDEWALL GRILLE ABOVE. CONTRACTOR TO REMOVE GRILLE AND COVER OPENING. DUCTWORK BELOW GRADE TO BE ABANDONED.
3. EXISTING DUCTWORK UP TO MECHANICAL ROOM ABOVE TO BE DEMOLISHED AND DISPOSED OF. SEAL OPENING.
4. EXISTING GRILLE C/W FIRE DAMPERS TO REMAIN.
5. DEMOLISH AND DISPOSE OF EXISTING CEILING HUNG COOLING UNIT. CONTRACTOR TO DEMOLISH ASSOCIATED REMOTE CONDENSING UNIT AND PIPING.
6. DISCONNECT EXISTING SUPPLY AIR DUCTWORK FROM SUPPLY FAN THROUGH CEILING SLAB ABOVE.
7. EXISTING DUCTWORK TO BE DEMOLISHED TO EXTENT SHOWN.
8. EXISTING SUPPLY AIR REGISTER TO BE DEMOLISHED AND DISPOSED OF.
9. EXISTING RETURN AIR GRILLE TO BE DEMOLISHED AND DISPOSED OF.
10. EXISTING DUCT DOWN FROM ABOVE TO REMAIN.
11. EXISTING WALL OPENING FOR AIR GRILLE TO REMAIN AND BE REUSED.
12. EXISTING WALL OPENING FOR AIR GRILLE TO BE PATCHED. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS.
13. EXISTING CAPPED DUCTWORK C/W FIRE DAMPER. CONTRACTOR TO REMOVE CAPPING AND PREPARE FOR CONNECTION.
14. EXISTING DUCT RISER FROM ABOVE TO REMAIN.
15. EXISTING UNDERGROUND DUCTWORK TO BE ABANDONED.
16. DEMOLISH AND DISPOSE OF EXISTING PERIMETER RADIATOR. REMOVE ALL ASSOCIATED VALVES AND FITTINGS CUT PIPE BACK TO MAIN AND PROVIDE TEMPORARY CAPPED CONNECTION.
17. EXISTING HOT WATER SUPPLY AND RETURN PIPING TO REMAIN.
18. EXISTING PERIMETER RADIATOR TO REMAIN.
19. REMOVE AND DISPOSE OF EXISTING DUCT MOUNTED AIR GRILLE. BLANK OFF THE EXISTING OPENING AND SEAL DUCTWORK.
20. EXISTING DUST COLLECTER AND ALL ASSOCIATED PIPING AND DUCTWORK TO REMAIN.
21. EXISTING DUCT WORK TO REMAIN.
22. EXISTING GRILLE TO REMAIN AND BE REBALANCED
23. DEMOLISH EXISTING PNEUMATIC CONTROL VALVE ON EXISTING PERIMETER RADIATOR. DEMOLISH AND CAP EXISTING COMPRESSED AIR PIPES BACK TO EXISTING MAIN.
24. DEMOLISH AND DISPOSE OF ABANDONED FUME HOOD AND ALL ASSOCIATED DUCTWORK.
25. DEMOLISH AND DISPOSE OF ABANDONED EXHAUST FAN AND ASSOCIATED DUCTWORK.
26. EXISTING REFRIGERANT PIPING RUNNING UP TO ROOF LEVEL TO BE DEMOLISHED AND DISPOSED OF.

GENERAL NOTES

A) THE EXISTING SERVICES SHOWN ON THIS DRAWING HAVE BEEN TAKEN FROM THE ORIGINAL AS–BUILT DRAWINGS. THIS INFORMATION MUST NOT BE ASSUMED TO BE COMPLETE OR UP–TO–DATE. THE MECHANICAL CONTRACTOR SHALL CARRY OUT A FULL SURVEY OF ALL EXISTING SERVICES AND STRUCTURE TO CONFIRM THE SIZE AND LOCATION OF THESE SERVICES, BEFORE THE COMMENCEMENT OF ANY WORK.

B) ALL DISCONNECTED DUCTWORK AND PIPING TO BE CAPPED OFF UNLESS OTHERWISE NOTED

C) ALL CUTTING AND PATCHING OF EXISTING ROOF, FLOORS AND WALLS TO BE BY MECHANICAL CONTRACTOR

D) FOR DRAWING LEGENDS SEE DRAWING M0.0

1. ISSUED FOR REVIEW 22.09.23
2. ISSUED FOR REVIEW 10.10.23
3. ISSUED FOR PERMIT 14.11.23
4. ISSUED FOR TENDER 14.02.24
5. ISSUED FOR ADDENDUM 14.02.24

PROJECT:
HVAC Renovations

Glendale Secondary School

145 Rainbow Dr, Hamilton, ON
For the HWDSB

SEAL:

EXP Services Inc.
t: 905.525.6069 | f: 905.528.7310
1266 South Service Road,
Suite C1-1, Stoney Creek,
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Canada

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• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

TRUE NORTH:

DRAWING TITLE:
Demolition HVAC Ground Floor Plan

SCALE:
AS NOTED

DRAWN:
C.M. / J.L.

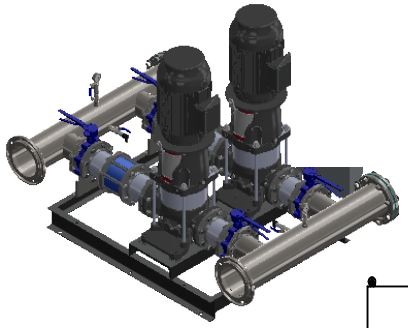
DATE:
SEPTEMBER 2023

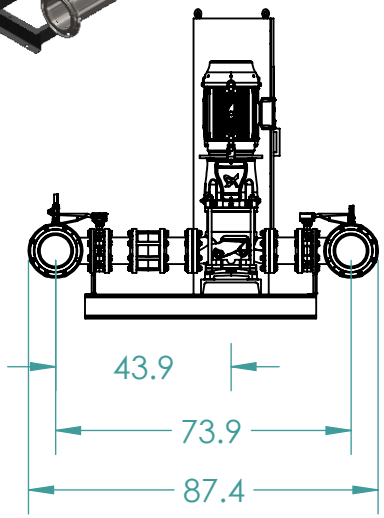
PROJECT #:
ALL–23010629–A0

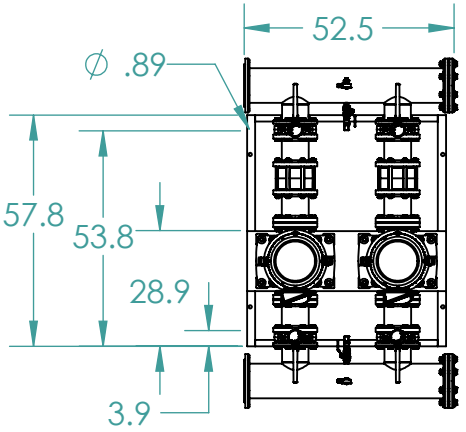
DRAWING #:
M1.1

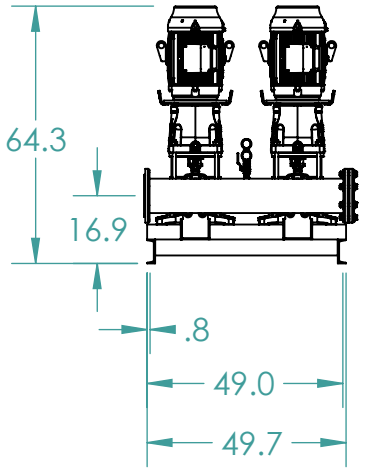
1. Manifolds 8" Class 150 AISI 316SS Schedule 10s ASTM A312 or ∅219.1mm x2mm
2. Base/Frame ASTM A36 Steel
3. Standard system layout : panel right facing suction
4. 6" lug style ANSI 150# class butterfly valve
5. UL Type 3R/12 rated electrical panel

Note: panel size will vary with options









GRUNDFOS

FRESNO, CALIFORNIA 93727 USA

Note:
All dimensions are ±0.5"
Not for Construction
All dimensions subject to change without notice.

Model: HYDRO NP (ABB) 2CR125-1					
Power: 3x208-230 60HZ 2x25HP					
Job:				Scale:	1:48
Dwg No:	Rev: 0	Date: 6/5/2023	Drawer: 79690	Page:	1 of 1