DRAWING LIST

DWG No.	DRAWING TITLE
M000	LEGEND AND DRAWING LIST
M001	KEY PLAN
M002	MECHANICAL SPECIFICATIONS
M003	MECHANICAL SPECIFICATIONS
M004	MECHANICAL SPECIFICATIONS
M005	MECHANICAL SPECIFICATIONS
M006	MECHANICAL SPECIFICATIONS
M100	DEMOLITION PLUMBING & DRAINAGE PLAN
M101	PROPOSED PLUMBING & DRAINAGE PLAN
M200	DEMOLITION HVAC PLAN
M201	DEMOLITION HVAC ROOF PLAN
M202	PROPOSED HVAC PLAN
M203	PROPOSED HVAC ROOF PLAN
M300	MECHANICAL DETAILS
M400	MECHANICAL SCHEDULES
ME100	MECHANICAL & ELECTRICAL SCHEDULES

PIPING LEGEND

	HOT WATER SUPPLY (HWS)
	HOT WATER RETURN (HWR)
HPS	HEAT PUMP SUPPLY
HPR	HEAT PUMP RETURN
CHS	CHILLED WATER SUPPLY
CHR	CHILLED WATER RETURN
D	EQUIPMENT DRAIN LINE
G	GAS
R	REFRIGERANT CIRCUIT (LIQUID & SUCTION)
RV	RELIEF VENT
	PIPE ANCHOR
	PIPE GUIDE OR SLEEVE
	EXPANSION COMPENSATOR c/w GUIDES
	BOTTOM TAKE-OFF
	TOP TAKE-OFF
	ELBOW UP
	ELBOW DOWN
	VALVE - SEE SPECIFICATIONS
	UNION CONNECTION
	FLANGED CONNECTION
	PLUG CAP
	FLEXIBLE CONNECTION
LWCO	LOW WATER CUT OFF
	THERMOMETER
PG	PRESSURE GAUGE
P-1	PUMP AND DESIGNATION
AV	AIR VENT
AAV	AUTOMATIC AIR VENT
PP	PETES PLUG
FS	FLOW SWITCH
TW	THERMO WELL
T G	THERMOSTAT w/GUARD
FM	FLOW METERING DEVICE (FMD)
	CABINET HEATERS (CH_)
	RADIANT PANELS (RP_)
	REHEAT COILS
U/C	UNDERCUT DOOR
AFF	ABOVE FINISHED FLOOR
CBV	CIRCUIT BALANCING VALVE
GPM	GALLONS PER MINUTE
REQ'D	REQUIRED
TCV	THERMOSTATIC CONTROL VALVE
TYP.	TYPICAL
HX	HEAT EXCHANGER
RFH	RADIANT FLOOR HEATER (IN-FLOOR HEATING)
FW	FOOT WASH
TFD	TRENCH FLOOR DRAIN
BFP	BACK FLOW PREVENTOR
CFH	CUBIC FEET HOUR

PLUMBING LEGEND

X	STORM ABOVE GRADE
	SANITARY ABOVE GRADE
X	STORM BURIED
	SANITARY BURIED
	DOMESTIC COLD WATER
	DOMESTIC HOT WATER
	DOMESTIC RECIRCULATED WATER
V	VENT LINE
RV	RELIEF VENT
D	EQUIPMENT DRAIN LINE
F	FIRE LINE
CO	CLEANOUT
AD	AREA DRAIN
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
HD	HUB DRAIN
RD	ROOF DRAIN
HS	HOSE STATION
FHC	FIRE HOSE CABINET
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER c/w CABINET
FB	FIRE BLANKET
RWL	RAIN WATER LEADER
WC	WATER CLOSET
WCH	WATER CLOSET (HANDICAPPED)
U	URINAL
SH	SHOWER
ESH	EMERGENCY SHOWER
L	LAVATORY
LH	LAVATORY (HANDICAPPED)
SS	STAINLESS STEEL SINK
JS	JANITOR SINK
DF	DRINKING FOUNTAIN
EEW	EMERGENCY EYE WASH
HWT	HOT WATER TANK
FH	FIRE HYDRANT
	FIRE DEPT. SIAMESE CONNECTION
F TB	THRUST BLOCK
INV. ELEV.	INVERT ELEVATION
OBV. ELEV.	OBVERT ELEVATION
	HAND HOLE TRAP
	RUNNING TRAP
ABFP	APPROVED BACKFLOW PREVENTOR
HB	HOSE BIBB
P-1	PUMP AND DESIGNATION
FP	FIRE PUMP
SMV	SHOWER MIXING VALVE
SD	SLAB DRAIN
PD	PLANTER DRAIN
G	SANITARY TO GREASE INTERCEPTOR

VENTILATION LEGEND

	SOUND INSULATION
	FLEXIBLE CONNECTION
DN	DUCT OFFSET
	DUCT OFFSET (SINGLE LINE)
	TURNING VANES
FSF	FIRE STOP FLAP
BD	BALANCING DAMPER
FD	FIRE DAMPER
SD	SPLITTER DAMPER
BDD	BACKDRAFT DAMPER
OBD	OPPOSED BLADE DAMPER
MD	MOTORIZED DAMPER
	SUPPLY DUCT SECTION
	RETURN DUCT SECTION
	SUPPLY DIFFUSER
	LINEAR DIFFUSER
	EXHAUST GRILLE
D- XXX	DIFFUSER DESIGNATION AND CFM
G- XXX	GRILLE DESIGNATION AND CFM
	FLEXIBLE ROUND DUCT
	CAPPED END DUCT
	DUCT REDUCER/ENLARGER
	TRANSITION TO ROUND
T	THERMOSTAT
T_G	THERMOSTAT w/GUARD
T	THERMOSTAT c/w SUB BASE
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
CFM	CUBIC FEET PER MINUTE
EF	EXHAUST FAN
CH	CABINET HEATER
MUA	MAKE-UP AIR UNIT
CBV	CIRCUIT BALANCING VALVE

CONTROL LEGEND

T	THERMOSTAT
T_G	THERMOSTAT w/ GUARD
T	THERMOSTAT c/w SUB BASE
H	HUMIDISTAT
O	OCCUPANCY SENSOR
CA	CO2 ROOM SENSOR
TS	TEMPERATURE SENSOR
PS	PRESSURE SWITCH OR SENSOR
HS	HUMIDITY SENSOR
FS	FLOW SWITCH
EP	ELECTRIC-PNEUMATIC RELAY
PE	PNEUMATIC-ELECTRIC RELAY
SD	SMOKE DETECTOR
SV	SOLENOID VALVE
F	FIRESTAT
FZ	FREEZESTAT
PDS	PRESSURE DIFFERENTIAL SWITCH
MD	MOTORIZED DAMPER
PG	PRESSURE GAUGE
T	TEMPERATURE GAUGE
CV-1 A AB	2-WAY CONTROL VALVE
CV-1 A AB AB	3-WAY CONTROL VALVE
H C	HEATING COIL
C C	COOLING COIL
OA	OUTSIDE AIR
RA	RETURN AIR
SA	SUPPLY AIR
EA	EXHAUST AIR
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
M	MOTOR
TCV	TEMPERATURE CONTROL VALVE

FIRE PROT. LEGEND

FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER c/w CABINET

VALVE LEGEND

	VALVE - SEE SPEC
	CHECK VALVE
	STRAINER
	PRESSURE REDUCING VALVE
	CONTROL VALVE
	2-WAY CONTROL VALVE
	3-WAY CONTROL VALVE
R	RELIEF VALVE
	PLUG VALVE
SV	SOLENOID VALVE
	NORMALLY CLOSED VALVE
	PET COCK
	CIRCUIT BALANCE VALVE

LEGEND NOTES:

THESE ARE STANDARD LEGENDS. ALL SYMBOLS MAY NOT NECESSARILY BE USED ON THESE DRAWINGS.

GENERAL NOTES

1. REFER TO SITE AND OWNER INSTRUCTIONS FOR PHASING AND STAGING.
2. THE CONTRACTOR SHALL CO-ORDINATE WITH THE STRUCTURAL TO PROVIDE OPENINGS AND SLEEVES THROUGH STRUCTURAL ELEMENTS WHERE REQUIRED.
3. PENETRATIONS OF CONCRETE SHALL BE SAW-CUT OR CORE BORED-IMPACT HAMMERS ARE NOT ALLOWED, SEAL ALL DUCTWORK & SLEEVES TO PREVENT LEAKAGE THRU FLOOR.
4. DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES. OBTAIN ALL DIMENSIONS FROM ARCHITECTURAL PLANS, MANUFACTURER'S SHOP DRAWINGS, AND ON SITE INSPECTIONS.
5. MECHANICAL, DIV. 2-14 AND ELECTRICAL TRADES SHALL WORK IN CONJUNCTION WITH ONE ANOTHER SO AS TO AVOID INTERFERENCE'S BETWEEN PIPING, DUCTWORK, CONDUIT, LIGHTING FIXTURES, ETC.
6. WORK SHALL BE CO-ORDINATED THROUGH THE GENERAL CONTRACTOR PRIOR TO INSTALLATION OF ANY EQUIPMENT, DUCTWORK AND CONTROLS. CO-ORDINATE WITH ARCHITECTURAL ELEVATIONS FOR ARCHITECTURAL, MECHANICAL, AND ELECTRICAL SPACE ALLOCATIONS.
7. PROPERLY SUPPORT CEILING MOUNTED EQUIPMENT AND ANY OTHER EQUIPMENT INDEPENDENT OF CEILING SUPPORT SYSTEM. REFER TO ARCHITECTURAL DETAILS AND CO-ORDINATE WITH STRUCTURAL TRADE.
8. REFER TO ARCHITECTURAL FOR OWNER SUPPLIED EQUIPMENT. CONFIRM ALL MECHANICAL REQUIREMENTS AND PROVIDE TO SUIT.
9. REVIEW ARCHITECTURAL, ELECTRICAL, AND STRUCTURAL DRAWINGS AND PROVIDE ON SITE INSPECTIONS TO DETERMINE FULL EXTENT OF PROJECT PRIOR TO SUBMITTING BID.
10. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL MECHANICAL SERVICES TO THE OCCUPIED AREA THROUGHOUT THE PHASING OF THE WORK. PROVIDE CONSTRUCTION VALVES, TEMPORARY DUCTWORK AND PIPING AS REQUIRED TO LIMIT THE SHUT DOWN OF SERVICES TO ONE TIME.
11. EXISTING MECHANICAL SERVICES SHOWN ON THESE DRAWINGS WERE TAKEN FROM THE ORIGINAL CONTRACT DRAWINGS AS LISTED BELOW. THE CONTRACTOR SHALL VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES ON SITE AND SHALL REMOVE ALL REDUNDANT SERVICES IN THE AREAS OF CONSTRUCTION.
12. ALL DRAWINGS ARE INTEGRATED WITH THE SPECIFICATIONS 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. WHEREVER DIFFERENCE OCCURS, THE MOST ONEROUS CONDITION GOVERNS.
13. PENETRATIONS OF EITHER FIRE OR SMOKE BARRIER RESISTANT WALLS SHALL BE SLEEVED & SEALED AGAINST THE PASSAGE OF FLAME OR SMOKE W/SUITABLE NON-COMBUSTIBLE MATERIALS EQUAL TO THE CONSTRUCTION TO BE PENETRATED.
14. AVOID ANY DIRECT CONTACT BETWEEN ANY PIPING, DUCTING AND ELECTRICAL CONDUIT SYSTEMS. TO PREVENT SOUND TRANSMISSION.
15. IF ANY AREAS ARE AFFECTED BY THE NEW SCOPE OF WORK, CONTRACTOR TO CARRY COSTS FOR THE REMOVAL AND INSTALLATION OF THE EXISTING CEILING TILES. REFER TO ARCHITECTURAL NEW REFLECTED CEILING PLAN FOR SCOPE OF NEW CEILING.
16. INSTALLATION SHALL BE COMPLETE AND FULLY FUNCTIONAL. PROVIDE ALL LABOR, MATERIALS, TOOLS, SERVICES, EQUIPMENT, ETC. AS REQUIRED.
17. PROVIDE ACCESS FOR SERVICING EQUIPMENT AS INDICATED, AS REQUIRED BY CODE AND AS RECOMMENDED BY THE MANUFACTURER.
18. PROVIDE ACCESS DOORS AS NECESSARY FOR ACCESS TO VALVES, DAMPERS, AND OTHER COMPONENTS REQUIRING MONITORING, INSPECTION, AND MAINTENANCE.
19. INSTALL EQUIPMENT, DUCTS, AND PIPES PARALLEL TO OR PERPENDICULAR TO BUILDING LINES. PROVIDE SPACE, UNIONS AND FLANGES FOR DISASSEMBLY, SERVICING AND REMOVAL OF EQUIPMENT.
20. THE CONTRACTOR SHALL, WITH APPROVAL OF THE OWNER AND AT NO ADDITIONAL CONTRACT COST, REMOVE, REARRANGE AND/OR RELOCATE ANY OBSTRUCTIONS WHICH INTERFERE WITH INSTALLATION OF NEW WORK.
21. ALL SHUTDOWN OF ANY PORTION OF EXISTING BUILDING SYSTEMS SHALL BE PERFORMED WITH THE OWNER'S CONSENT. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER FOR TIME AND DURATION OF SERVICE INTERRUPTIONS. INCLUDE COST OF PREMIUM TIME IN THE CONTRACT PRICE FOR WORK PERFORMED DURING NIGHTS, WEEK-ENDS OR OTHER TIME OUTSIDE NORMAL WORKING HOURS AS NECESSARY TO MAINTAIN MECHANICAL SERVICES IN OPERATION.
22. WHEN A CONFLICT OCCURS BETWEEN INSTALLATION DETAILS, DIAGRAMS, ETC. INDICATED IN THE CONTRACT DOCUMENTS AND MANUFACTURER'S INSTALLATION INSTRUCTIONS, THE MANUFACTURER'S INSTRUCTIONS SHALL GOVERN AND SHALL BE FOLLOWED.
23. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH CODES, APPLICABLE STANDARDS, BULLETINS ETC., AND REQUIREMENTS OF ALL INSPECTION AUTHORITIES FOR THE **TOWN OF OAKVILLE**.
24. DUE TO INCONSISTENT RECORD OF EXISTING SERVICES NOT ALL SERVICES MAY BE SHOWN, OR IF SHOWN MAY NOT BE ACCURATE. IT IS CONTRACTORS RESPONSIBILITY TO FIELD CONFIRM ALL SERVICES.
25. CONTRACTOR IS TO VERIFY CONNECTION POINTS TO EXISTING SERVICES ON SITE.
26. CHECK AND VERIFY LOCATION OF ALL PIPES, DUCTS AND EQUIPMENT WITH ALL OTHER TRADES TO PREVENT INTERFERENCE. REMOVAL OR RELOCATION OF ANY SUCH WORK INTERFERING WITH WORK OF OTHER TRADES IS THE RESPONSIBILITY OF THE MECHANICAL TRADE CONCERNED UNLESS OTHERWISE APPROVED IN WRITING.
27. PROVIDE ACCESS DOOR FOR ALL VALVES LOCATED ABOVE DRY WALL CEILING.
28. IN ALL INSTANCES THE NEED FOR ACCESS DOOR IN GWB CEILINGS SHOULD BE AVOIDED IF POSSIBLE. WHERE INSTALLATION OF COMPONENTS WHICH REQUIRE ACCESS CANNOT BE AVOIDED, SUBMIT (DIMENSIONED) LAYOUT ON ARCHITECTURAL REFLECTED CEILING PLANS TO CONSULTANTS FOR APPROVAL PRIOR TO INSTALLATION OF COMPONENT.
29. BEFORE CUTTING ANY HOLES THROUGH THE EXISTING SLAB REFER TO STRUCTURAL DRAWINGS FOR GENERAL REQUIREMENTS.
30. PROVIDE SIGN IDENTIFYING LOCATION OF ALL VALVES INSTALLED IN CEILING SPACE.

PLUMBING NOTES

1. CONTRACTOR IS TO CLEAR EXISTING DUCTWORK WHEN INSTALLING NEW PIPING. CLEARANCES TO BE VERIFIED ON SITE.
2. PROVIDE A CLEANOUT AT THE BOTTOM OF EVERY SOIL AND WASTE STACK THAT CONNECTS TO A HORIZONTAL DRAINAGE PIPE.
3. PROVIDE A CLEANOUT FROM EACH PLUMBING FIXTURE WHERE REQUIRED BY ONTARIO BUILDING CODE, PART 7 - PLUMBING.
4. ALL PLUMBING FIXTURES INCLUDING FLOOR DRAINS (HUB, FUNNEL FLOOR DRAINS) TO BE TRAPPED AND VENTED AS REQUIRED BY ONTARIO BUILDING CODE, PART 7 - PLUMBING.
5. FOR MOUNTING HEIGHT OF ALL PLUMBING FIXTURES REFER TO ARCHITECTURAL DRAWINGS.
6. PROVIDE ACCESS DOOR FOR ALL CLEANOUTS LOCATED ABOVE DRY WALL CEILING.
7. CONTRACTOR IS TO REMOVE ALL OBSOLETE PIPING WHEREVER POSSIBLE.
8. CONTRACTOR IS TO ENSURE THAT ALL EXISTING PIPING SERVING EXISTING AREAS REMAIN IN SERVICE UNTIL THESE AREAS ARE RECONNECTED TO NEW SERVICES. ONLY THEN OBSOLETE PIPING IS TO BE REMOVED AS SHOWN.
9. RECONNECT VENTS FROM EXISTING EQUIPMENT AND PLUMBING FIXTURES WHICH ARE TO REMAIN TO NEW VENTS AS REQUIRED.
10. WHENEVER COLD AND HOT WATER DISTRIBUTION TO LAVATORIES IS TO RUN UNDER COUNTER, PIPING DISTRIBUTION IS TO BE INSTALLED AS TIGHT TO UNDER SIDE OF THE COUNTER AS POSSIBLE.
11. ALL WATER, SANITARY, SEWER AND VENT COPPER PIPING WITH SOLDER JOINTS SHALL BE LEAD FREE. DO NOT INSTALL WATER LINES IN OUTSIDE WALL WHERE THEY MAY FREEZE, UNLESS BOTH THE WALL AND THE PIPES ARE PROPERLY INSULATED.
12. INSTALL SHUT-OFF VALVES AT EACH PLUMBING FIXTURE.
13. PROVIDE PIPE FREEZING TO EXISTING PIPE DISTRIBUTION WHERE DEMOLITION AND NEW CONNECTIONS ARE MADE TO EXISTING SYSTEM

HVAC NOTES

1. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR CO-ORDINATION OF GRILLES, DIFFUSERS AND OTHER ELEMENTS.
2. CONTRACTORS SHALL COORDINATE ALL CEILING FINISHES WITH OWNER AND MATCH EXISTING. CONTRACTOR SHALL REVIEW MECHANICAL DRAWINGS, ARCHITECTURAL REFLECTED CEILING PLANS AND ARCHITECTURAL ROOM FINISH SCHEDULES AS SOON AS CONTRACT DOCUMENTS ARE SIGNED. ADVISE CONSULTANT OF ANY CONFLICTS BETWEEN CEILING TYPE AND DIFFUSER/GRILLE TYPE.
3. THE CONTRACTOR SHALL VERIFY ALL CEILING FINISHES WITH ARCHITECTURAL DRAWINGS. CONTRACTOR AND DIFFUSER/GRILLE SUPPLIER ARE RESPONSIBLE TO PROVIDE ALL PLASTER AND FINISHING FRAMES, MOUNTING HARDWARE, AND ACCESSORIES TO SUIT ARCHITECTURAL CEILING TYPES. MECHANICAL CONTRACTOR SHALL CO-ORDINATE AND PROVIDE DETAILS OF MOUNTING REQUIREMENTS OF DIFFUSERS AND GRILLES IN DRYWALL CEILINGS TO DRYWALL TRADE AND ENSURE EDGES OF OPENINGS ARE FRAMED BY DRYWALL TRADE TO SUPPORT DIFFUSERS AND GRILLES PROPERLY. DIFFUSERS AND GRILLES MUST NOT BE SUPPORTED SOLELY BY HANGER WIRES.
4. CONTRACTOR TO CARRY FOR ADDITIONAL DUCTS AND DUCT FITTING REQUIRED TO CLEAR THE INTERFERENCES IN THE CEILING SPACE.
5. ALL NEW DUCTWORK TO BE CLEANED.
6. ALL DUCTWORK FITTINGS SHALL BE RIGID GALVANIZED IRON.
7. CONTRACTOR TO TAKE ALL MEASUREMENTS NECESSARY TO DETERMINE CURRENT SYSTEMS PERFORMANCE IN AREAS THAT WILL CONTINUE TO BE SERVED BY EXISTING AIR HANDLING EQUIPMENT AND SHALL REPORT ALL MEASUREMENTS MADE PRIOR TO START OF DEMOLITION.
8. ON COMPLETION OF DUCT ALTERATIONS, AIR BALANCE TECHNICIAN SHALL REBALANCE ALL EXISTING SYSTEMS TO DELIVER PRE-CONSTRUCTION FLOWS.
9. WHERE MODIFICATIONS HAVE BEEN DONE TO THE HEATING WATER CIRCUITS CONTRACTOR MUST REBALANCE THE AFFECTED PARTS.
10. PROVIDE PIPE FREEZING TO EXISTING PIPE DISTRIBUTION WHERE DEMOLITION AND NEW CONNECTIONS ARE MADE TO EXISTING SYSTEM
11. REPLACE ALL HUV FILTERS WITH NEW PRIOR TO PROJECT COMPLETION
12. INSTALL/REINSTALL T-STATS TO 1,200mm A.F.F UNLESS OTHER WISE INDICATED

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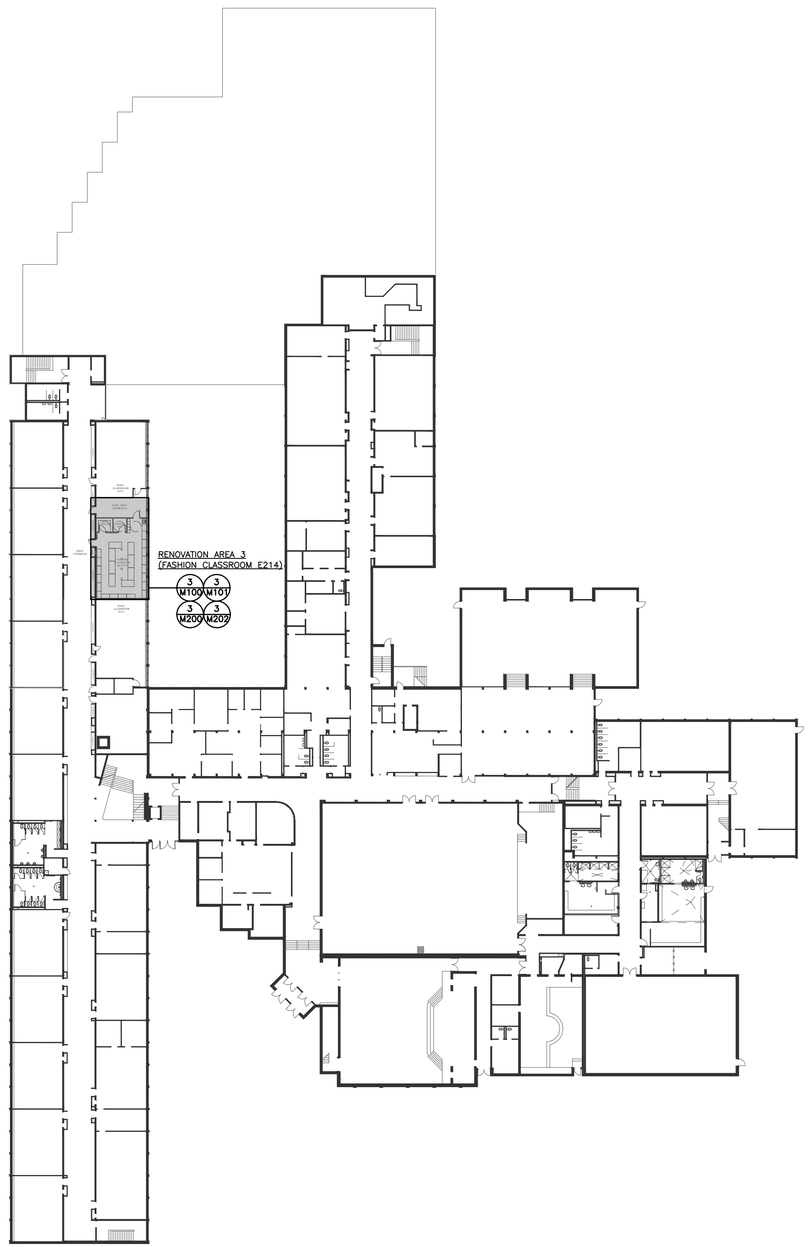
Key Plan N.T.S.

Project North True North

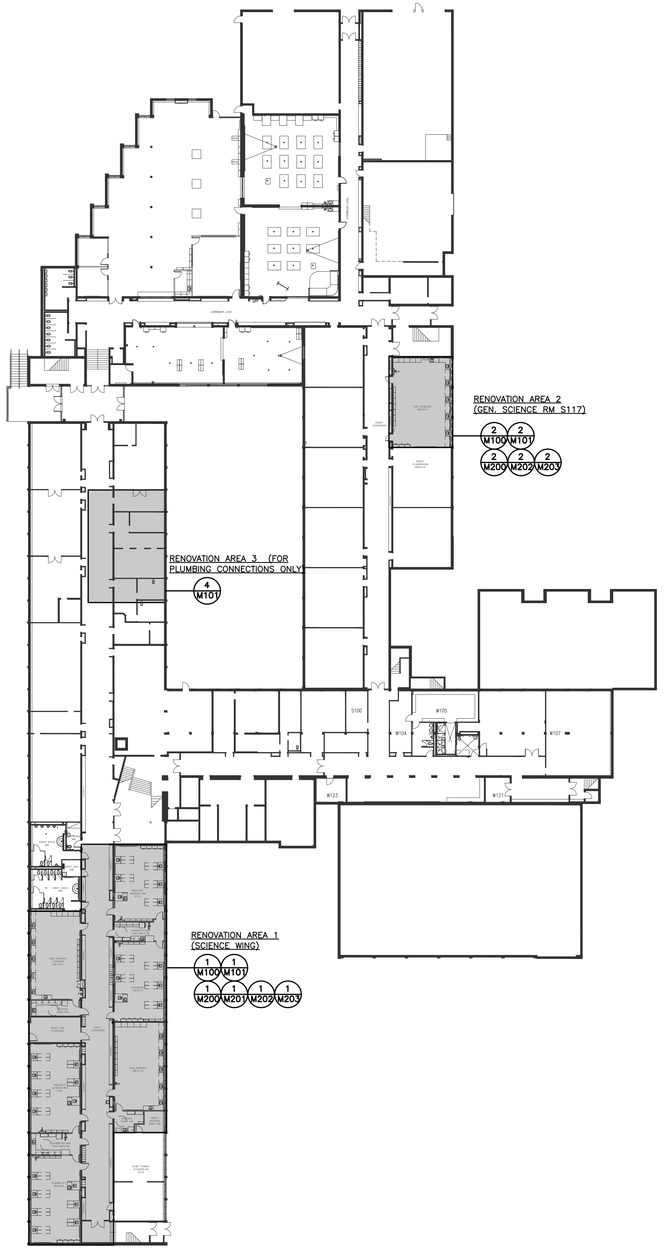
No.	Revisions	Date
5.	Issued for Construction	2024 05 23
4.	Re-Issued for Permit	2024 04 18
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
MECHANICAL LEGENDS AND DRAWING LIST

Scale:	-	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M000



2 M001 LEVEL 1 KEY PLAN
1:400



1 M001 LEVEL 0 KEY PLAN
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KEY PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M001

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. ENSURE SUB-CONTRACTORS UNDERTAKING THE WORK PROVIDE A 50% PERFORMANCE BOND AND A 50% LABOUR AND MATERIALS PAYMENT BOND. IN ADDITION, ENSURE SUB-CONTRACTORS EMPLOYED TO UNDERTAKE ANY PART OF THE WORK THAT IS $50,000.00 OR GREATER IN CONTRACT VALUE PROVIDE A 50% PERFORMANCE BOND AND A 50% LABOUR AND MATERIALS BOND TO THE PARTY THEY ARE IN CONTRACT WITH.

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

F. 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.

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

H. 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 IN AREAS TO BE TURNED OVER TO THE OWNER.

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, NATURAL GAS SERVICE AND HOT WATER HEATING SYSTEMS.

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. BE RESPONSIBLE FOR THE EXCAVATION & BACKFILL NECESSARY FOR INSTALLATION OF UNDERGROUND WORK. EXCAVATE WITH SUITABLE MACHINERY OR BY HAND AS NECESSARY.

H. CUTTING AND PATCHING OF NEW OR EXISTING WORK.

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

J. 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.

K. 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.

L. 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.

M. 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.

N. ARRANGE FOR AND PROVIDE OWNERS TRAINING ON 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. AS-BUILT RECORDS: BEFORE FINAL PAYMENT, SUBMIT TWO SETS OF AS-BUILTS DRAWINGS IN AUTOCAD FORMAT SHOWING ALL CHANGES & CONCEALED SERVICES DIMENSIONED.

C. 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.

D. 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.

E. 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. DART TYPE, 125 LB. (860 KPA) BLACK MALLEABLE IRON UNIONS SHALL BE USED WITH ALL STEEL PIPE FOR PIPING 2-1/2" (65 MM) AND SMALLER.

C. PIPING SPECIALTIES INCLUDING BACKFLOW PREVENTERS, STRAINERS, VALVES ETC. SHALL BE LINE SIZE UNLESS INDICATED OTHERWISE ON DRAWINGS.

D. STRAINERS
  .1 APPROVED MANUFACTURERS: SARCO SB, S.A. ARMSTRONG, CRANE, CONBRACO, COLTON
  .2 IN COPPER TUBING: CLASS 250, WYE TYPE, BRONZE, SCREWED CONNECTION, WITH BLIND CAPS, AND 1/32" (0.8 MM) PERFORATED STAINLESS STEEL SCREEN.
  .3 IN STEEL PIPING: 2" (50MM) AND SMALLER
    .1 BODY AND COVER: SCREWED, LINE SIZE Y TYPE STRAINER, SEMI-STEEL CONFORMING TO ASTM A278-85, CLASS 30, COMPLETE WITH SCREWED BLIND CAP. PRIMARY SERVICE RATING OF 125 PSI @ 350 F (860 KPA @ 178 C). BODY SHALL HAVE SIDE DRAIN CONNECTION.
    .2 SCREEN: PERFORATED TYPE 304 STAINLESS STEEL SERVICE
      .1 WATER 1/32" (0.8 MM)

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.

MECHANICAL SPECIFICATIONS – GENERAL

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 PRESSURE GAUGES

A. APPROVED MANUFACTURER: TRERRICE MODEL 600C.

B. OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS: WEISS, WINTER, MORRISSON, TAYLOR.

C. GAUGE: 4-1/2" (115MM) DIAMETER BLACK CAST ALUMINUM, PHOSPHOR BRONZE BOURDON TUBE, ROTARY BRASS MOVEMENT, BRASS SOCKET, WITH FRONT RECALIBRATION ADJUSTMENT, BLACK SCALE ON WHITE BACKGROUND, MID-SCALE ACCURACY: 1%, SCALE: PSI AND KPA

D. GAUGE COCK: TEE OR LEVER HANDLE, BRASS FOR MAXIMUM 150 PSI (1034 KPAO.

E. NEEDLE VALVE: BRASS, 1/4" (6 MM) NPT FOR MINIMUM 150 PSI (1034 KPA).

F. PULSATION DAMPER: PRESSURE SNUBBER, BRASS WITH 1/4" (6 MM) CONNECTIONS.

G. SYPHON: STEEL, SCHEDULE 40, 1/4" (6 MM) ANGLE OR STRAIGHT PATTERN.

2.5 STEM TYPE THERMOMETERS

A. APPROVED MANUFACTURER: TRERRICE MODEL BX91403-1/2.

B. OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS: WEISS MODEL 9VS3-1/2, WINTER, MORRISON, TAYLOR.

C. THERMOMETER: 9" (230MM) SCALE, RED APPEARING THERMAL FLUID WITH BLACK FIGURES ON WHITE SCALE, CALIBRATED IN BOTH DEGREES F AND DEGREES C, ACCURACY TO ASTM E77 OF 2%, CLEAR GLASS LENS FRONT TUBE, CAST ALUMINUM CASE WITH ENAMEL FINISH, CAST ALUMINUM ADJUSTABLE JOINT WITH POSITIVE LOCKING DEVICE, 3/4" (20MM) NPT BRASS STEM.

D. ALL THERMOMETERS TO INCLUDE A SEPARABLE WELL.

E. SOCKET: BRASS SEPARABLE SOCKETS FOR THERMOMETER STEMS WITH OR WITHOUT EXTENSIONS AS REQUIRED, AND WITH CAP AND CHAIN.

F. FLANGE: 3" (75 MM) OUTSIDE DIAMETER REVERSIBLE FLANGE, DESIGNED TO FASTEN TO SHEET METAL AIR DUCTS, WITH BRASS PERFORATED STEM

2.6 SLEEVES

A. MATERIALS: MINIMUM SCHEDULE 20 GALVANIZED STEEL OR CAST IRON.

2.7 FLASHINGS AND COUNTER FLASHINGS

A. THALER OR EQUIVALENT MECHANICAL/ELECTRICAL FLASHINGS AS RECOMMENDED FOR SPECIFIC PURPOSE.

B. STAINLESS STEEL FLASHING SLEEVE, INTEGRAL DECK FLANGE AND EPDM SEAL.

2.8 PENETRATION SEALS

A. APPROVED MANUFACTURER: LINK-SEA OR EQUAL

B. MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO CONTINUOUSLY FILL THE ANNULAR SPACE BETWEEN THE PIPE AND WALL OPENING. LINKS SHALL BE LOOSELY ASSEMBLED WITH BOLTS TO FORM A CONTINUOUS RUBBER BELT AROUND THE PIPE WITH A PRESSURE PLATE UNDER EACH BOLT HEAD AND NUT.

2.9 ACCESS DOORS

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

A. APPROVED MANUFACTURERS: ANVIL, MYAT

B. PLUMBING PIPING – DRAIN, WASTE, AND VENT:
  .1 CONFORM TO ASME B31.9.
  .2 HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (15 TO 40 MM): MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.
  .3 MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.
  .4 WALL SUPPORT FOR PIPE SIZES TO 3-1/4" (80 MM): CAST IRON HOOK.
  .5 COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

C. PLUMBING PIPING – WATER:
  .1 CONFORM TO ASME B31.9.
  .2 HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (15 TO 40 MM): MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.
  .6 MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SUPPORTS OR SPACERS AND HANGER RODS.
  .7 MULTIPLE OR TRAPEZE HANGERS FOR HOT PIPE SIZES 6" (150 MM) AND OVER: STEEL CHANNELS WITH WELDED SUPPORTS OR SPACERS AND HANGER RODS, CAST IRON ROLL.
  .8 WALL SUPPORT FOR PIPE SIZES TO 3-1/4" (80 MM): CAST IRON HOOK.
  .9 VERTICAL SUPPORT: STEEL RISER CLAMP.
  .10 FLOOR SUPPORT FOR COLD PIPE: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.
  .11 COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

D. HYDRONIC PIPING:
  .1 CONFORM TO CSA B-51 AND ASME B31.9.
  .2 HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (13 TO 38 MM): CARBON STEEL, ADJUSTABLE SWIVEL, SPLIT RING.
  .3 HANGERS FOR COLD PIPE SIZES 2" (50 MM) AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.
  .4 HANGERS FOR HOT PIPE SIZES 2" TO 4" (50 TO 100 MM): CARBON STEEL, ADJUSTABLE, CLEVIS.
  .5 MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.
  .6 FLOOR SUPPORT FOR COLD PIPE: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.
  .7 COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.
  .13 COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

E. REFRIGERANT PIPING:
  .1 CONFORM TO ASME B31.5.
  .2 HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (13 TO 38 MM): CARBON

MECHANICAL SPECIFICATIONS – GENERAL

STEEL, ADJUSTABLE SWIVEL, SPLIT RING.
  .3 HANGERS FOR PIPE SIZES 2" (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 3" (75 MM): CAST IRON HOOK.
  .6 WALL SUPPORT FOR PIPE SIZES 4" (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.

3.2 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

3.3 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.

3.4 ROOFTOP PIPE/DUCT SUPPORTS

A. ACCEPTABLE MANUFACTURERS: PORTABLE PIPE HANGERS, INC, UNISTRUT

B. PRE-ENGINEERED PIPE/DUCT SUPPORT SYSTEM INCLUDING:
  .1 BASES: WEATHER RESISTANT AND UV RADIATION RESISTANT WITH SEISMIC ATTACHMENTS
  .2 FRAMING: 1-5/8" (41.3MM) STRUT OR 1-7/8" (47.6MM) STRUT, FABRICATED OF STEEL TO ASTM A570, GRADE 33., ROLL FORMED OF 12-GAUGE (2.7MM THICK) STEEL INTO 3-SIDED OR TUBULAR SHAPE.
  .3 PIPE SUPPORTS AND HANGERS: CONFORM TO MSS SP-58 AND MSS SP-69, FABRICATED OF CARBON STEEL. SINGLE ROLLER SUPPORTS FOR PIPING SUBJECT TO EXPANSION AND CONTRACTION.
  .4 FINISHES:
    .1 PLASTICS AS MOULDED WITH UV RADIATION PROTECTION.
    .2 METAL SURFACES HOT DIP GALVANIZED FREE OF ROUGHNESS, WHISKERS, UNSIGHTLY SPANGLES, ICICLES, RUNS, BARBS, SAGS, DROPLETS AND OTHER SURFACE BLEMISHES. GALVANIZING SHALL CONFORM TO ASTM A123 FOR TUBING AND TO ASTM A153 FOR HARDWARE AND ACCESSORIES.

3.5 PIPE HANGER SPACING:

PIPE SIZE (IN)	ROD DIAMETER (IN)	SUPPORT SPACING (FT)	
		STEEL PIPE	COPPER TUBE
1/2	3/8	7	6
3/4	3/8	7	6
1	3/8	7	6
1-1/4	3/8	7	6
1-1/2	3/8	9	8
2	3/8	10	9

3.6 DUCT HANGER SPACING:

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

3.7 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

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:

HVAC SPECIFICATIONS

  .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. PROVIDE STEM EXTENSIONS FOR INSULATED PIPING.

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

V. 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.

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

1.5 VICTAULIC SERIES 799/79V KOIL-KIT™ COIL PACK

A. INSTALL SERIES 786, 787, OR 78K TOUR & ANDERSSON BALANCING VALVE, VICTAULIC SERIES 78U UNION PORT FITTING, SERIES 78Y STRAINER/BALL VALVE OR SERIES 78T UNION/BALL VALVE COMBINATION, AND TWO STAINLESS STEEL FLEXIBLE HOSES TO COMPLETE TERMINAL HOOKUP AT COIL OUTLET. VICTAULIC SERIES 799 OR SERIES 79V WITH ATC VALVE.

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. OUTDOOR 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 (0.036 W/M- C AT 24 C).
  .2 MAXIMUM SERVICE TEMPERATURE: 250 °F (121 °C).
  .3 MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.

HVAC SPECIFICATIONS

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 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"
FRESH AIR INTAKE – RECTANGULAR	RIGID	3"
FRESH AIR INTAKE – ROUND	FLEXIBLE	3"

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.

J. OUTDOOR VAPOUR BARRIER MASTIC
  .1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, WHITE COLOUR.

K. INSULATING CEMENT
  .1 ASTM C449, VOC CONTENT NOT TO EXCEED 80 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

B. ALUMINUM JACKET: ASTM E84. (APPLY TO ALL EXTERIOR PIPING ONLY)
  .1 THICKNESS: ASTM C1729 REQUIREMENTS FOR RIGID AND NON-RIGID INSULATION FINISH.
  .2 FINISH: SMOOTH PLAIN MILL FINISH.
  .3 JOINING: LONGITUDINAL SLIP JOINTS AND 2" (50 MM) LAPS.
  .4 FITTINGS: 0.02" (0.40 MM) THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER.
  .5 METAL JACKET BANDS: 3/8" (10 MM) WIDE; 0.01" (0.38 MM) THICK ALUMINUM.

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 DIAMETER IN.	THK. IN.
HYDRONIC HEATING (HOT WATER & GLYCOL/WATER)	105 TO 140	1-1/4 AND SMALLER	1
		1-1/2 & LARGER	1-1/2
	141 TO 200	1-1/4 AND SMALLER	1-1/2
		1-1/2 & LARGER	2

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Key Plan N.T.S.

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Project North | True North

No.	Revisions	Date

No.	Issue	Date
4.	Issued for Construction	2024 05 23
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12

Drawing Title:
MECHANICAL SPECIFICATIONS

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M002

HVAC SPECIFICATIONS

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.

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

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

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, FOR MAXIMUM WORKING PRESSURE TO SUIT APPLICATION.

5.7 CHECK VALVES

A. GLOBE TYPE:
- .1 CAST BRONZE OR FORGED BRASS BODY, FORGED BRASS CAP WITH NEOPRENE SEAL, BRASS GUIDE AND DISC HOLDER, PHOSPHOR–BRONZE OR STAINLESS STEEL SPRING, TEFLON SEAT DISC; FOR MAXIMUM WORKING PRESSURE OF 2930 KPA AND MAXIMUM TEMPERATURE OF 149 DEGREES C.

B. STRAIGHT THROUGH TYPE:
- .1 BRASS BODY AND DISC, PHOSPHOR–BRONZE OR STAINLESS STEEL SPRING, NEOPRENE SEAT; FOR MAXIMUM WORKING PRESSURE OF 3450 KPA AND MAXIMUM TEMPERATURE OF 93 DEGREES C.

5.8 PRESSURE REGULATORS

A. BRASS BODY, STAINLESS STEEL DIAPHRAGM, DIRECT ACTING, ADJUSTABLE OVER 0 TO 550 KPA RANGE, FOR MAXIMUM WORKING PRESSURE OF 3100 KPA.

5.9 PRESSURE RELIEF VALVES

A. STRAIGHT THROUGH OR ANGLE TYPE: BRASS BODY AND DISC, NEOPRENE SEAT, FACTORY SEALED AND STAMPED WITH ASME UV AND NATIONAL BOARD CERTIFICATION NB; FOR STANDARD 1620 KPA SETTING; SELECTED TO ASHRAE 15.

HVAC SPECIFICATIONS

5.10 FILTER–DRIERS

A. REPLACEABLE CARTRIDGE ANGLE TYPE:
- .1 SHELL: ARI 710, UL LISTED, BRASS, REMOVABLE CAP, FOR MAXIMUM WORKING PRESSURE OF 2410 KPA.
- .2 FILTER CARTRIDGE: PLEATED MEDIA WITH INTEGRAL END RINGS, STAINLESS STEEL SUPPORT.
- .3 FILTER/DRYER CARTRIDGE: PLEATED MEDIA WITH SOLID CORE SIEVE WITH ACTIVATED ALUMINA.
- .4 WAX REMOVAL CARTRIDGE: MOULDED BONDED CORE OF ACTIVATED CHARCOAL WITH INTEGRAL GASKETS.

B. PERMANENT STRAIGHT THROUGH TYPE:
- .1 ARI 710, UL LISTED, STEEL SHELL WITH MOULDED DESICCANT FILTER CORE, FOR MAXIMUM WORKING PRESSURE OF 2410 KPA.

5.11 SOLENOID VALVES

A. VALVE: ARI 760, PILOT OPERATED, COPPER OR BRASS OR STEEL BODY AND INTERNAL PARTS, SYNTHETIC SEAT, STAINLESS STEEL STEM AND PLUNGER ASSEMBLY, INTEGRAL STRAINER, WITH FLARED, SOLDER, OR THREADED ENDS; FOR MAXIMUM WORKING PRESSURE OF 3450 KPA. STEM TO PERMIT MANUAL OPERATION IN CASE OF COIL FAILURE.

B. COIL ASSEMBLY: UL 429, UL LISTED, REPLACEABLE WITH MOULDED ELECTROMAGNETIC COIL, MOISTURE AND FUNGUS PROOF, WITH SURGE PROTECTOR AND COLOUR CODED LEAD WIRES, INTEGRAL JUNCTION BOX WITH PILOT LIGHT.

C. ELECTRICAL CHARACTERISTICS: 120 VOLTS, SINGLE PHASE, 60 HZ.

5.12 EXPANSION VALVES

A. ANGLE OR STRAIGHT THROUGH TYPE: ARI 750; DESIGN SUITABLE FOR REFRIGERANT, BRASS BODY, INTERNAL OR EXTERNAL EQUALIZER, BLEED HOLE, SUPERHEAT SETTING, REPLACEABLE INLET STRAINER, WITH NON–REPLACEABLE CAPILLARY TUBE AND REMOTE SENSING BULB AND REMOTE BULB WELL.

B. SELECTION: EVALUATE REFRIGERANT PRESSURE DROP THROUGH SYSTEM TO DETERMINE AVAILABLE PRESSURE DROP ACROSS VALVE. SELECT VALVE FOR MAXIMUM LOAD AT DESIGN OPERATING PRESSURE AND MINIMUM 6 DEGREES C SUPERHEAT. SELECT TO AVOID BEING UNDERSIZED AT FULL LOAD AND EXCESSIVELY OVERSIZED AT PART LOAD.

5.13 RECEIVERS

A. INTERNAL DIAMETER 150 MM AND SMALLER:
- .1 ARI 495, UL LISTED, STEEL, BRAZED; 2760 KPA MAXIMUM PRESSURE RATING, WITH TAPPINGS FOR INLET, OUTLET, AND PRESSURE RELIEF VALVE.

B. INTERNAL DIAMETER OVER 150 MM:
- .1 ARI 495, WELDED STEEL, TESTED AND STAMPED TO ASME SEC 8D; 2760 KPA WITH TAPPINGS FOR LIQUID INLET AND OUTLET VALVES, PRESSURE RELIEF VALVE , AND MAGNETIC LIQUID LEVEL INDICATOR.

5.14 FLEXIBLE CONNECTORS

A. CORRUGATED STAINLESS STEEL HOSE WITH SINGLE LAYER OF STAINLESS STEEL EXTERIOR BRAIDING, MINIMUM 230 MM LONG WITH COPPER TUBE ENDS; FOR MAXIMUM WORKING PRESSURE 3450 KPA.

6 HVAC DUCTWORK

6.1 HVAC DUCTWORK – GENERAL:

A. INSTALL AND SEAL DUCTS TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE.

B. SUPPORT ALL DUCTWORK FROM STRUCTURAL MEMBERS. WHERE STRUCTURAL BEARINGS DO NOT EXIST, SUSPEND STRAPPING OR HANGERS FROM STEEL CHANNELS OR ANGLES. PROVIDE SUPPLEMENTARY STRUCTURAL MEMBERS.

C. DO NOT BREAK CONTINUITY OF INSULATION VAPOUR BARRIER BY HANGERS OR RODS.

D. DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.

E. PROVIDE OPENINGS IN DUCT WORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PILOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.

F. BALANCING DAMPERS SHALL BE INSTALLED ON BRANCHES AS PER LOCATIONS SHOWN ON THE DRAWINGS AND AS PER THE REQUIREMENTS OF NEBB AND AABC LISTING/MEASURING STANDARDS.

G. PROVIDE DRAIN IN EVERY FRESH AIR INTAKE AND EXHAUST PLENUM.

H. DUCTWORK SHALL BE LEAK TESTED IN ACCORDANCE WITH THE SMACNA "HVAC AIR DUCT LEAKAGE TEST MANUAL". THE MAXIMUM PERMITTED DUCT LEAKAGE SHALL BE DETERMINED BY MULTIPLYING THE LEAKAGE FACTOR FROM PARAGRAPH 2.4 ABOVE BY THE SURFACE AREA OF THE DUCTWORK IN THE TEST ZONE.

6.2 MATERIALS

A. RIGID HVAC DUCTS, CASINGS AND FITTINGS:
- .1 ASTM A653 GALVANIZED STEEL SHEET, LOCK FORM QUALITY, G90 ZINC COATING (0.90 OZ/FT2) TO ASTM A90. SHEETS FREE OF PITS, BLISTERS, SLIVERS, AND UNGALVANIZED SPOTS.

B. ALUMINUM DUCTS, DRYER VENTS:
- .1 ASTM B209; ALUMINUM SHEET, ALLOY 3003–H14. ALUMINUM CONNECTORS AND BAR STOCK: ALLOY 6061– T6 OR OF EQUIVALENT STRENGTH.

6.3 DUCT SEALING

SEAL DUCTWORK IN ACCORDANCE WITH SMACNA SEALING REQUIREMENT AS FOLLOWS:

A. SEAL CLASS A: ALL TRANVERSE JOINTS, LONGITUDINAL SEAMS AND DUCT WALL PENETRATIONS

B. SEAL CLASS B: ALL TRANVERSE JOINTS AND LONGITUDINAL SEAMS

C. SEAL CLASS C: ALL TRANVERSE JOINTS

6.4 DUCTWORK FABRICATION

A. ALL DUCTWORK SHALL BE CONSTRUCTED TO WITHSTAND 1–1/2 TIMES FAN PRESSURE AT SHUT–OFF AND 2" (500 PA) MINIMUM.

B. FABRICATE AND SUPPORT TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED. PROVIDE DUCT MATERIAL, GAUGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED IN ACCORDANCE WITH RECOMMENDATIONS OF ASHRAE AND SMACNA.

C. JOINTS AND REINFORCEMENTS:
- .1 TO SMACNA AND ASHRAE
- .2 MAY BE MADE WITH THE DUCTMATE SYSTEM OR NEXUS SYSTEM. SYSTEM COMPONENTS SHALL BE MADE OF STANDARD CATALOGUE MANUFACTURE AS SUPPLIED BY DUCTMATE INDUSTRIES, INC. OR NEXUS INC.

D. CONSTRUCT TEES, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1–1/2 TIMES WIDTH OF DUCT ON CENTRELINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE AIR FOIL TURNING VANES. WHERE ACOUSTICAL LINING IS INDICATED, PROVIDE TURNING VANES OF PERFORATED METAL WITH GLASS FIBRE INSULATION.

E. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

F. FABRICATE CONTINUOUSLY WELDED ROUND AND OVAL DUCT FITTINGS TWO GAUGES HEAVIER THAN DUCT GAUGES INDICATED IN SMACNA STANDARD. JOINTS: MINIMUM 80 MM CEMENTED SLIP JOINT, BRAZED OR ELECTRIC WELDED. PRIME COAT WELDED JOINTS.

G. PROVIDE STANDARD 45–DEGREE LATERAL WYE TAKEOFFS. ALTERNATIVE 90–DEGREE CONICAL TEE CONNECTIONS MAY BE USED ONLY WHERE SPECIFICALLY INDICATED.

6.5 FLEXIBLE DUCTWORK

A. MANUFACTURER: THERMAFLEX M–KC

B. FLEXIBLE DUCTWORK CONFORMING TO UNDERWRITERS LABORATORIES LISTED AS CLASS 1 AIR DUCT, UL STANDARD 181 AND CUL S110 WITH NO LIMITATIONS TO 14 FEET RUNS.

C. CONFORMS TO NFPA 90A AND 90B.

D. HEAVY WOVEN AND COATED FIBERGLASS CLOTH CORE.

E. GREENGUARD CERTIFIED.

F. FIBERGLASS INSULATING BLANKET AND LOW PERMEABILITY OUTER VAPOR BARRIER OF FIBERGLASS REINFORCED METALLIZED FILM LAMINATE.

G. 20/50 FLAME/SMOKE SPREAD RATING.

H. 0.05 PERM VAPOR TRANSMISSION RATING

HVAC SPECIFICATIONS

7 DUCT ACCESSORIES

7.1 AIR TURNING DEVICES / EXTRACTORS

A. TURNING VANES IN RECTANGULAR DUCT ELBOWS SHALL BE DOUBLE WALLED, MULTI–BLADE VANES WITH BLADES ALIGNED IN SHORT DIMENSION; STEEL CONSTRUCTION; WITH INDIVIDUALLY ADJUSTABLE BLADES, MOUNTING STRAPS. ACCEPTABLE PRODUCTS: DURO–DYNE "DURO VANE RAIL", HART & COOLEY "DUCTURN", DYN–AIR OR TUTTLE AND BAILY.

B. VOLUME EXTRACTORS: GANG OPERATED CURVED BLADES, ADJUSTABLE FROM FULL OPEN TO FULL CLOSED POSITIONS. UNITS SHALL BE FACTORY ASSEMBLED, FABRICATED FROM 14 GA. AND 22 GA. (2 AND .9 MM) STEEL, WITH BLADES ON 1" (25 MM) CENTRES, AND NO. 2 OR NO. 3 OPERATORS TO SUIT APPLICATION.

C. ACCEPTABLE MANUFACTURERS: EH PRICE MODEL AE1 INDICATED. KRUEGER MODEL EX–8, DURO–DYNE, DYN–AIR.

7.2 BACKDRAFT DAMPERS.

A. GRAVITY BACKDRAFT DAMPERS, SIZE 18" X 18" (450 X 450 MM) OR SMALLER, PROVIDED WITH AIR MOVING EQUIPMENT: AIR MOVING EQUIPMENT MANUFACTURERS STANDARD CONSTRUCTION.

B. MULTI–BLADE, PARALLEL ACTION GRAVITY BALANCED BACKDRAFT DAMPERS: 1/16" (1.5 MM) THICK GALVANIZED STEEL, OR, WITH CENTRE PIVOTED BLADES OF MAXIMUM 6" (150 MM) WIDTH, WITH FELT OR FLEXIBLE VINYL SEALED EDGES, LINKED TOGETHER IN RATTLE–FREE MANNER WITH 90 DEGREE STOP, STEEL BALL BEARINGS, AND PLATED STEEL PIVOT PIN; ADJUSTMENT DEVICE TO PERMIT SETTING FOR VARYING DIFFERENTIAL STATIC PRESSURE.

C. ACCEPTABLE MANUFACTURERS: EH PRICE.

7.3 VOLUME CONTROL DAMPERS

A. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED.

B. SPLITTER DAMPERS:
- .1 MATERIAL: SAME GAUGE AS DUCT TO 24" (600 MM) SIZE IN EITHER DIRECTION, AND TWO GAUGES HEAVIER FOR SIZES OVER 24" (600 MM).
- .2 BLADE: FABRICATE OF SINGLE THICKNESS SHEET METAL TO STREAMLINE SHAPE, SECURED WITH CONTINUOUS HINGE OR ROD.
- .3 OPERATOR: MINIMUM 24" (600 MM) DIAMETER ROD IN SELF ALIGNING, UNIVERSAL JOINT ACTION, FLANGED BUSHING WITH SET SCREW.

C. SINGLE LEAF DAMPERS: FABRICATED FROM MINIMUM 20 GAUGE (1.0 MM) GALVANIZED STEEL, SUITABLY REINFORCED TO PREVENT VIBRATION AND FITTED WITH INDICATING REGULATOR. DURO–DYNE, LAWSON & TAYLOR, DYN–AIR.

D. MULTI–BLADE OPPOSED ACTION DAMPERS: FABRICATED FROM 16 GAUGE (1.6 MM) GALVANIZED STEEL, MOUNTED IN SEPARATE CHANNEL FRAMES, REINFORCED TO PREVENT VIBRATION, AND FITTED WITH OPPOSED ACTION LINKAGE HARDWARE. DURO–DYNE "OPAX" BLADE KIT, LAWSON & TAYLOR, DYN–AIR

E. END BEARINGS: EXCEPT IN ROUND DUCTWORK 12" (300 MM) AND SMALLER, PROVIDE END BEARINGS. ON MULTIPLE BLADE DAMPERS, PROVIDE OIL–IMPREGNATED NYLON OR SINTERED BRONZE BEARINGS.

F. QUADRANTS:
- .1 PROVIDE LOCKING, INDICATING QUADRANT REGULATORS ON SINGLE AND MULTI–BLADE DAMPERS.
- .2 ON INSULATED DUCTS MOUNT QUADRANT REGULATORS ON STAND–OFF MOUNTING BRACKETS, BASES, OR ADAPTERS.
- .3 WHERE ROD LENGTHS EXCEED 30" (750 MM) PROVIDE REGULATOR AT BOTH ENDS.

G. ACCEPTABLE MANUFACTURERS: DURO–DYNE, DYN–AIR, PRICE, LAWSON & TAYLOR

7.4 FIRE DAMPERS

A. MANUFACTURERS: PRICE, RUSKIN, NAILOR

B. FIRE DAMPERS SHALL BE ULC LISTED, LABELLED, OR WARNOCK–HERSEY LABEL, MEET ALL REQUIREMENTS OF NFPA 90A, AND CONSTRUCTED AND RATED IN CONFORMANCE WITH:
- .1 CAN4–S92–M82, "STANDARD FOR FIRE DAMPERS", WHEN USED IN A FIRE SEPARATION OF NOT MORE THAN 2 HOURS, AND WHICH IS NOT A FIREWALL.
- .2 CAN4–S104–M80, "STANDARD METHOD FOR FIRE TESTS OF DOOR ASSEMBLIES", WHEN USED IN A FIRE SEPARATION OF MORE THAN 2 HOURS, OR USED IN A FIREWALL.
- .3 CAN4–S92.2–M84, "FIRE TEST OF CEILING FIRESTOP FLAP ASSEMBLIES", WHEN USED IN A CEILING FIRE SEPARATION.

C. FIRE DAMPERS SHALL BE GALVANIZED STEEL CHANNEL FRAME CURTAIN TYPE GALVANIZED STEEL INTERLOCKING BLADES, MINIMUM 22 GAUGE (0.9 MM) GALVANIZED STEEL ENCLOSURE, AND 160°F (71°C) FUSIBLE LINK STANDARD.

D. FIRE DAMPERS FOR HORIZONTAL INSTALLATION IN VERTICAL DUCTWORK SHALL BE OPERATED BY A STAINLESS STEEL CLOSURE SPRING AND LATCH.

E. FIRE DAMPER CONFIGURATION SHALL BE LOW RESISTANCE TYPE B WITH BLADES LOCATED OUTSIDE OF THE AIR STREAM FOR RECTANGULAR DUCTWORK, AND TYPE C FOR ROUND OR OVAL DUCTWORK.

F. CEILING FIRE DAMPERS SHALL BE ULC LABELLED, FOR FIRE RATED MEMBRANE TYPE CEILINGS, GALVANIZED STEEL CONSTRUCTION WITH HEAT RETARDANT BLANKET (NON–ASBESTOS) WITH STANDARD 160°F (71°C) FUSIBLE LINK.

G. THERMAL BLANKET SHALL BE ULC LABELLED, FOR FIRE RATED MEMBRANE TYPE CEILINGS, TO COMPLETELY ENSHROUD CEILING PENETRATION.

H. FIRE DAMPERS IN STAINLESS STEEL DUCTWORK SHALL BE OF ALL STAINLESS STEEL CONSTRUCTION.

I. FUSIBLE LINKS: UL 33, SEPARATE AT 160°F (71°C) WITH ADJUSTABLE LINK STRAPS FOR COMBINATION FIRE/BALANCING DAMPERS.

7.5 FIRE DAMPERS (DYNAMIC)

A. DYNAMIC FIRE DAMPERS TESTED, CONSTRUCTED AND LABELED IN ACCORDANCE WITH THE LATEST EDITION OF UL STANDARD 555. DAMPERS SHALL HAVE A FIRE RATING OF 1–1/2 HOURS OR 3 HOURS AND SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF NFPA90A.

B. EACH DAMPER SHALL INCLUDE A 165°F (74°C) FUSIBLE LINK AND SHALL BE LABELED FOR USE IN DYNAMIC SYSTEMS. THE DAMPER SHALL BE RATED FOR DYNAMIC CLOSURE AT 2000FPM (10.16M/S) AND 4 INCHES W.G. (1 KPA) STATIC PRESSURE AND SHALL BE RATED TO CLOSE WITH AIRFLOW IN EITHER DIRECTION.

C. EACH DYNAMIC FIRE DAMPER SHALL INCLUDE A STEEL SLEEVE AND MOUNTING ANGLES FURNISHED BY THE DAMPER MANUFACTURER TO ENSURE APPROPRIATE INSTALLATION. SUBMITTALS INFORMATION SHALL INCLUDE THE FIRE PROTECTION RATING, MAXIMUM VELOCITY/PRESSURE RATINGS AND THE MANUFACTURER'S UL INSTALLATION INSTRUCTIONS. THE DAMPERS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S UL INSTALLATION INSTRUCTIONS.

D. ACCEPTABLE PRODUCT: RUSKIN DIBD2/DIBD23, NCA, VENTEX, PRICE, CONTROLLED AIR.

7.6 COMBINATION FIRE/SMOKE DAMPERS

A. MANUFACTURER: RUSKIN, GREENHECK, PRICE, NAILOR

B. COMBINATION FIRE/SMOKE DAMPERS, COMPLETE WITH SLEEVES AND OPERATORS, DESIGNED AND TESTED TO MEET BOTH UL555 REQUIREMENTS FOR FIRE DAMPERS AND UL555S FOR LEAKAGE CLASS 1 RATED SMOKE DAMPERS. PROVIDE WITH END SWITCHES. CONSTRUCT FRAME FROM 1.6MM (16 GAUGE) GALVANIZED STEEL.CONSTRUCT SINGLE PIECE CONSTRUCTION AIR FOIL BLADES FROM 2.0MM (14 GAUGE) GALVANIZED STEEL, WITH STAINLESS STEEL SLEEVE BEARINGS, SQUARE PLATED STEEL AXLES AND CONCEALED LINKAGES. USE STAINLESS STEEL SPRING. DESIGN FOR OPERATOR MOUNTED OUT OF THE AIR STREAM. EQUIP WITH 120 DEGREES C (250 DEGREE F) SNAP DISC. DESIGN FOR OPERATOR MOUNTED OUT OF AIR STREAM. PROVIDE DAMPER ACTUATORS FOR COMPLETE CUL LISTED AND TESTED DAMPER ASSEMBLY.

C. USE ONLY FIRE DAMPER ASSEMBLIES TESTED IN ACCORDANCE WITH CAN4 S92

M "STANDARD METHOD OF FIRE TEST OF FIRE DAMPER ASSEMBLIES" AND LISTED INMOST RECENT ULC "LIST OF EQUIPMENT AND MATERIALS" OR BY ANOTHER RECOGNIZED INDEPENDENT TESTING AND CERTIFICATION AGENCY ACCEPTANCE TO THE CONSULTANT. LABEL EACH DAMPER TO INDICATE COMPLIANCE WITH THESE REQUIREMENTS.

D. LINKS SHALL COMPLY WITH ULC S505 "STANDARD FOR FUSIBLE LINKS FOR FIRE PROTECTION SERVICE".

E. FABRICATE ALL DAMPERS FROM GALVANIZED STEEL EXCEPT IN COPPER, STAINLESS STEEL OR ALUMINUM DUCT SYSTEMS. IN THESE SYSTEMS, USE ALL STAINLESS STEEL CONSTRUCTION.

F. FIRE PROTECTION RATINGS OF DAMPER ASSEMBLIES SHALL COMPLY WITH ONTARIO BUILDING CODE REQUIREMENTS FOR FIRE RESISTANCE RATINGS OF THE FIRE SEPARATIONS THROUGH WHICH THE PROTECTED OPENINGS PASS. PROVIDE AN APPROVAL LABEL, STATING THE FIRE RATING, FROM A

HVAC SPECIFICATIONS

RECOGNIZED INDEPENDENT TESTING LABORATORY ACCEPTABLE TO THE CONSULTANT, ON EACH ASSEMBLY.

G. PROVIDE WITH EACH DAMPER, DETAILED INSTALLATION INSTRUCTIONS. INCLUDE ILLUSTRATIONS AND ADEQUATE INFORMATION TO ATTAIN PROPER AND SAFE INSTALLATION OF THE SMOKE/FIRE DAMPER ASSEMBLY.

H. DAMPER TO COME COMPLETE WITH OPTIONAL 120V TO 24V TRANSFORMER AND DUCT SMOKE DETECTOR. ELECTRICAL DIVISION TO WIRE COMPONENTS.

7.6 DUCT ACCESS DOORS

A. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED.

B. FABRICATION: RIGID AND CLOSE–FITTING OF GALVANIZED STEEL WITH SEALING GASKETS AND QUICK FASTENING LOCKING DEVICES. FOR INSULATED DUCT WORK, INSTALL MINIMUM 1" (25 MM) THICK INSULATION WITH SHEET METAL COVER.
- .1 LESS THAN 12" (300 MM) SQUARE: SECURE WITH SASH LOCKS.
- .2 UP TO 18" (450 MM) SQUARE: PROVIDE TWO HINGES AND TWO SASH LOCKS.
- .3 UP TO 24" X 48" (600 X 1200 MM): THREE HINGES AND TWO COMPRESSION LATCHES WITH OUTSIDE AND INSIDE HANDLES.
- .4 LARGER SIZES: PROVIDE AN ADDITIONAL HINGE.

C. ACCESS DOORS WITH SHEET METAL SCREW FASTENERS ARE NOT ACCEPTABLE.

D. ACCEPTABLE MANUFACTURER: ACUDOOR, DURO–DYNE, DYN–AIR, NAILOR, KREUGER

7.7 DUCT TEST HOLES

A. PROVIDE TEST PORTS TO SUIT INTENDED APPLICATION, (IE. INSULATED/UNINSULATED DUCT, ROUND/RECTANGULAR DUCT).

B. TEMPORARY TEST HOLES: CUT OR DRILL IN DUCTS AS REQUIRED. CAP WITH NEAT PATCHES, NEOPRENE PLUGS, THREADED PLUGS, OR THREADED OR TWIST–ON METAL CAPS.

C. PERMANENT TEST HOLES: FACTORY FABRICATED, AIR TIGHT FLANGED FITTINGS WITH SCREW CAP. PROVIDE EXTENDED NECK FITTINGS TO CLEAR INSULATION.

D. ACCEPTABLE MANUFACTURERS: AIR POWER CO..

7.8 FLEXIBLE DUCT CONNECTIONS

A. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED.
- .1 MIL–C–20696B PARA. 4.4.3, 4.4.4 (OIL AND HYDRO CARBON RESISTANCE)
- .2 UL CERTIFIED NFPA 701 TESTS FOR FLAME PROPAGATION OF FABRICS AND FILM.
- .3 10/120 ASTM E84 FLAME/SMOKE RATING.
- .4 –40F TO 250F CONTINUOUS TEMPERATURE RANGE.
- .5 WHITE WOVEN FIBERGLASS COLOUR
- .6 GALVANIZED STEEL CONFORMING TO ASTM–A–525 G 60 OR BETTER

B. ACCEPTABLE MANUFACTURERS" DURO–DYNE, DDFDC.

7.9 HANGERS AND SUPPORTS

A. FABRICATE STRAP HANGERS TO SAME MATERIAL AS DUCT. HANGER CONFIGURATION TO SMACNA DETAILS. 20" (500 MM) IS MAXIMUM DUCT SIZE TO BE SUPPORTED BY STRAP HANGER.

B. ROD AND ANGLE HANGERS: GALVANIZED STEEL TO SMACNA DETAILS.

C. HANGER ATTACHMENTS: MANUFACTURED CONCRETE INSERTS, EXPANSION SHIELDS AND BOLTED STEEL CLAMPS. DO NOT WELD RODS TO STEEL DECKS OR USE POWDER ACTUATED FASTENERS.

7.10 ACOUSTIC LINING

MANUFACTURER: ARMACELL AP ARMAFLEX SA

COMPLIANCE: ASTM C54, ASTM E84, ULC–S102, NFPA 90A, ASTM C1534, ASTM D1056

THICKNESS: 25mm (1") THICK

THERMAL CONDUCTIVITY: 0.245 BTU–in/Hr–Sq.Ft– F AT 75 F (0.0353 W/mk AT 24 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: 180 F (82 C)

MINIMUM SERVICE TEMPERATURE: –30 F (34 C)

EROSION RESISTANCE: ASTM C1071.

7.11 DUCT SEALANT

A. GENERAL: LOW VOC, WATER BASED SEALANT, NON–TOXIC, NON–COMBUSTIBLE, NON–FLAMMABLE, AND TESTED IN ACCORDANCE WITH CAN4/ULC–S102. FLAME SPREAD SHALL NOT EXCEED 25 AND SMOKE DEVELOPED SHALL NOT EXCEED 50.

B. ACCEPTABLE PRODUCTS: MULTI–PURPOSE DUCT SEALANT AS MANUFACTURED BY TRANS CONTINENTAL EQUIPMENT, DURO DYNE SWB DUCT SEALER, IRON GRIP 601 AS SUPPLIED BY ALPHA SHEET METAL CO., OR UNI–GRIP DUCT SEALER FROM UNITED MCGILL CORPORATION.

7.12 ELECTRONIC DAMPER ACTUATORS

A. MANUFACTURED, BRAND LABELED OR DISTRIBUTED BY BELIMO OR APPROVED EQUIVALENT.

B. SIZE FOR TORQUE REQUIRED FOR DAMPER SEAL AT LOAD CONDITIONS.

C. COUPLING: V–BOLT DUAL NUT CLAMP WITH A V–SHAPED, TOOTHED CRADLE.

D. MOUNTING: ACTUATORS SHALL BE CAPABLE OF BEING MECHANICALLY AND ELECTRICALLY PARALLELED TO INCREASE TORQUE IF REQUIRED.

E. OVERLOAD PROTECTION: ELECTRONIC OVERLOAD OR DIGITAL ROTATION–SENSING CIRCUITRY WITHOUT THE USE OF END SWITCHES TO PREVENT ANY DAMAGE TO THE ACTUATOR DURING A STALL CONDITION.

F. FAIL–SAFE OPERATION: MECHANICAL, SPRING–RETURN MECHANISM.

G. POWER REQUIREMENTS (SPRING RETURN): 120 V AC, MAXIMUM 10 VA AT 24–V AC OR 8 W AT 24–V DC.

H. PROPORTIONAL ACTUATORS SHALL BE FULLY PROGRAMMABLE. CONTROL INPUT, POSITION FEEDBACK AND RUNNING TIME SHALL BE FACTORY OR FIELD PROGRAMMABLE BY USE OF EXTERNAL COMPUTER SOFTWARE DIAGNOSTIC FEEDBACK SHALL PROVIDE INDICATIONS OF HUNTING OR OSCILLATION, MECHANICAL OVERLOAD AND MECHANICAL TRAVEL. PROGRAMMING SHALL BE THROUGH AN EEPROM WITHOUT THE USE OF ACTUATOR MOUNTED SWITCHES.

I. TEMPERATURE RATING: –22 TO +122°F (–30 TO +50°C)

J. HOUSING: MINIMUM REQUIREMENT NEMA TYPE 2 MOUNTED IN ANY ORIENTATION.

K. AGENCY LISTING: ISO 9001, CULUS, AND CSA C22.2 NO. 24–93.

L. THE MANUFACTURER SHALL WARRANT ALL COMPONENTS FOR A PERIOD OF 5 YEARS FROM THE DATE OF PRODUCTION, WITH THE FIRST TWO YEARS UNCONDITIONAL.

8 TESTING, ADJUSTING, BALANCING

8.1 PREPARATION

A. PROVIDE INSTRUMENTS REQUIRED FOR TESTING, ADJUSTING, AND BALANCING OPERATIONS. MAKE INSTRUMENTS AVAILABLE TO CONSULTANT TO FACILITATE SPOT CHECKS DURING TESTING.

B. PROVIDE ADDITIONAL BALANCING DEVICES AS REQUIRED.

8.2 INSTALLATION TOLERANCES

A. AIR HANDLING SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN FOR SUPPLY SYSTEMS AND PLUS OR MINUS 5 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.

B. AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 5 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN.

C. HYDRONIC SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

8.3 ADJUSTING

A. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.

B. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.

C. AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.

D. LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.

E. AT FINAL INSPECTION, RECHECK RANDOM SELECTIONS OF DATA RECORDED IN

HVAC SPECIFICATIONS

REPORT. RECHECK POINTS OR AREAS AS SELECTED AND WITNESSED BY THE OWNER.

F. CHECK AND ADJUST SYSTEMS APPROXIMATELY SIX MONTHS AFTER FINAL ACCEPTANCE AND SUBMIT REPORT.

9.4 AIR SYSTEM PROCEDURE

A. ADJUST AIR HANDLING MULTI–ZONE DAMPER DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES AT SITE ALTITUDE. ADJUST ERV DISTRIBUTION SYSTEM TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, OUTDOOR AIR, AND EXHAUST AIR QUANTITIES AT SITE ALTITUDE.

B. MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS–SECTIONAL AREA OF DUCT.

C. MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.

D. ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.

E. USE BRANCH VOLUME CONTROL DAMPERS AND SPLITTERS TO REGULATE AIR QUANTITIES. DEVICES AT AIR OUTLETS MAY BE USED ONLY TO THE EXTENT THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS.

F. VARY TOTAL SYSTEM AIR QUANTITIES BY ADJUSTMENT OF FAN SPEEDS. ADJUST AIRFLOW TO DESIGN QUANTITY. PROVIDE DRIVE CHANGES AS REQUIRED. MAKE ALLOWANCES FOR LOADING OF FILTERS TO 50% OF MANUFACTURERS' RECOMMENDATIONS FOR FINAL PRESSURE AT FANS WITH FIXED SPEED DRIVES AND TO 100% OF MANUFACTURERS' RECOMMENDATIONS FOR FINAL PRESSURE AT FANS WITH VARIABLE SPEED DRIVES.

G. PROVIDE SYSTEM SCHEMATIC WITH REQUIRED AND ACTUAL AIR QUANTITIES RECORDED AT EACH OUTLET OR INLET.

H. MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN.

I. ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.

J. MEASURE TEMPERATURE CONDITIONS ACROSS OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS TO CHECK LEAKAGE.

K. WHERE MODULATING DAMPERS ARE PROVIDED, TAKE MEASUREMENTS AND BALANCE AT EXTREME CONDITIONS. BALANCE VARIABLE VOLUME SYSTEMS AT MAXIMUM AIR FLOW RATE, FULL COOLING, AND AT MINIMUM AIR FLOW RATE, FULL HEATING.

L. CHECK MULTI–ZONE UNITS FOR MOTORIZED DAMPER LEAKAGE. ADJUST AIR QUANTITIES WITH MIXING DAMPERS SET FIRST FOR COOLING, THEN HEATING, THEN MODULATING.

10.5 WATER SYSTEM PROCEDURE

A. ADJUST WATER SYSTEMS TO PROVIDE REQUIRED OR DESIGN QUANTITIES.

B. USE CALIBRATED VENTURI TUBES, ORIFICES, OR OTHER METERED FITTINGS AND PRESSURE GAUGES TO DETERMINE FLOW RATES FOR SYSTEM BALANCE. WHERE FLOW METERING DEVICES ARE NOT INSTALLED, BASE FLOW BALANCE ON TEMPERATURE DIFFERENCE ACROSS VARIOUS HEAT TRANSFER ELEMENTS IN THE SYSTEM.

C. ADJUST SYSTEMS TO PROVIDE SPECIFIED PRESSURE DROPS AND FLOWS THROUGH HEAT TRANSFER ELEMENTS PRIOR TO THERMAL TESTING. PERFORM BALANCING BY MEASUREMENT OF TEMPERATURE DIFFERENTIAL IN CONJUNCTION WITH AIR BALANCING.

D. EFFECT SYSTEM BALANCE WITH AUTOMATIC CONTROL VALVES FULLY OPEN TO HEAT TRANSFER ELEMENTS.

E. EFFECT ADJUSTMENT OF WATER DISTRIBUTION SYSTEMS BY MEANS OF BALANCING COCKS, VALVES, AND FITTINGS. DO NOT USE SERVICE OR SHUT–OFF VALVES FOR BALANCING UNLESS INDEXED FOR BALANCE POINT.

F. WHERE AVAILABLE PUMP CAPACITY IS LESS THAN TOTAL FLOW REQUIREMENTS OR INDIVIDUAL SYSTEM PARTS, FULL FLOW IN ONE PART MAY BE SIMULATED BY TEMPORARY RESTRICTION OF FLOW TO OTHER PARTS.

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Key Plan N.T.S.

Project North True North

No.	Revisions	Date
6.	Issued for Construction	2024 05 23
5.	Re-Issued for Permit	2024 04 18
4.	Mechanical Addendum No. 01	2024 04 17
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

General Contractor shall check and verify all dimensions and report all errors and omissions to the Architect. Do not scale the drawings. Drawings shall not be used for construction purposes until issued by the Architect for construction.

Drawing Title:
MECHANICAL SPECIFICATIONS

Scale: AS NOTED	Date: 02/01/2024
Drawn by: C.M.	Checked by: W.D.
Job No. 2215B	Drawing No. M003

FIRE PROTECTION SPECIFICATIONS

1. GENERAL

1.1 GENERAL REQUIREMENT

A. COOPERATE WITH OTHER TRADES WHOSE WORK AFFECTS OR IS AFFECTED BY WORK OF THIS DIVISION TO ENSURE SATISFACTORY INSTALLATION AND TO AVOID DELAYS. MATERIALS TO BE BUILT-IN SUCH AS SLEEVES, ANCHORS, ETC., TOGETHER WITH ACCURATE DIMENSIONS OR TEMPLATES, PROMPTLY.

B. PROVIDE FIRE EXTINGUISHERS WHERE INDICATED AND IN CONFORMANCE WITH THE ONTARIO FIRE CODE AND NFPA 10.
  .1 PROVIDE 10 LB. (4.54 KG) MULTI-PURPOSE EXTINGUISHERS IN EACH HFIRE HOSE CABINET AND IN MECHANICAL ROOMS.

2. FIRE EXTINGUISHERS

2.1 ACCEPTABLE MANUFACTURERS
A. NATIONAL FIRE EQUIPMENT, FLAG, KENT, PYRENE CANADA, CFH, SAFETY SUPPLY CHUBB

2.2 MULTI-PUPURPOSE DRY CHEMICAL
A. TYPE: MULTI-PURPOSE (ABC) TYPE, DRY CHEMICAL
B. SIZE: 5 LB. (2.27 KG)
C. RATING: MINIMUM 3A:10BC.
OR
A. TYPE: MULTI-PURPOSE (ABC) TYPE, DRY CHEMICAL
B. SIZE: 10 LB. (4.54 KG)
C. RATING: MINIMUM 4A:60BC

PLUMBING SPECIFICATIONS

1 PLUMBING PIPING

1.1 PLUMBING PIPING – GENERAL:
A. VERIFY THAT EXCAVATIONS ARE TO REQUIRED GRADE, DRY, AND NOT OVER-EXCAVATED
B. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE. REMOVE SCALE AND DIRT, ON INSIDE AND OUTSIDE, BEFORE ASSEMBLY. PREPARE PIPING CONNECTIONS TO EQUIPMENT WITH FLANGES OR UNIONS.
C. PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHEREVER JOINTING DISSIMILAR METALS.
D. PROVIDE ACCESS WHERE VALVES AND FITTINGS ARE NOT EXPOSED. COORDINATE SIZE AND LOCATION OF ACCESS DOORS WITH GENERAL TRADES.
E. INSTALL VENT PIPING PENETRATING ROOFED AREAS TO MAINTAIN INTEGRITY OF ROOF ASSEMBLY
F. SUPPORT VERTICAL PIPING AT EVERY OTHER FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING
G. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.
H. SUPPORT CAST IRON DRAINAGE PIPING AT EVERY JOINT.
I. DO HYDROSTATIC TESTING PRIOR TO BACKFILLING OVER JOINTS
J. DISINFECT ALL NEW AND ALTERED WATER DISTRIBUTION PIPING.
H. VERIFY THAT PIPING SYSTEM IS COMPLETE AND HAS BEEN FLUSHED, CLEANED, INSPECTED, AND PRESSURE TESTED.
I. ISOLATE EXISTING PIPING TO FULL EXTENT POSSIBLE. ENSURE THAT ALL FIXTURES, EXITING AND NEW THAT ARE SERVED FROM PIPING BEING DISINFECTED, ARE TAKEN OUT OF SERVICE AND SIGNS ARE PLACED AT EACH FIXTURE PROHIBITING USE DURING THE DISINFECTION PERIOD.
J. ENSURE PH OF WATER TO BE TREATED IS BETWEEN 7.4 AND 7.6 BY ADDING ALKALI (CAUSTIC SODA OR SODA ASH) OR ACID (HYDROCHLORIC). INJECT DISINFECTANT, FREE CHLORINE IN LIQUID, POWDER, TABLET OR GAS FORM, THROUGHOUT SYSTEM TO OBTAIN 50 TO 80 MG/L RESIDUAL.

1.2 SANITARY SEWER PIPING, BURIED
A. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT.
  .1 FITTINGS: CAST IRON.
  .2 JOINTS: HUB-AND-SPIGOT, CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS
B. CAST IRON PIPE: CISPI 301, HUBLESS.
  .1 FITTINGS: CAST IRON.
  .2 JOINTS: CISPI 310, NEOPRENE GASKET AND STAINLESS STEEL CLAMP AND SHIELD ASSEMBLIES.
C. COPPER TUBE: ASTM B306, DWV.
  .1 FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER.
  .2 JOINTS: ASTM B32, SOLDER, GRADE 50B.
D. ABS PIPE: ASTM D2751 OR ASTM F628.
  .1 FITTINGS: ABS.
  .2 JOINTS: ASTM D2235, SOLVENT WELD.
E. ABS PIPE: ASTM D2661 OR ASTM D2751.
  .1 FITTINGS: ABS.
  .2 JOINTS: ASTM D2235, SOLVENT WELD.
F. PVC PIPE: ASTM D2665 OR ASTM D3034.
  .1 FITTINGS: PVC.
  .2 JOINTS: ASTM D2855, SOLVENT WELD WITH ASTM D2564 SOLVENT CEMENT.
G. PVC PIPE: ASTM D2665, ASTM D3034, OR ASTM F679.
  .1 FITTINGS: PVC.
  .2 JOINTS: ASTM F477, ELASTOMERIC GASKETS.

1.3 SANITARY SEWER PIPING, ABOVE GRADE
A. CAST IRON PIPE: ASTM A74, SERVICE WEIGHT.
  .1 FITTINGS: CAST IRON.
  .2 JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM
B. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT.
  .1 FITTINGS: CAST IRON.
  .2 JOINTS: CISPI 310, NEOPRENE GASKETS AND STAINLESS STEEL CLAMP-AND-SHIELD ASSEMBLIES.
C. COPPER TUBE: ASTM B306, DWV.
  .1 FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER, OR ASME B16.32, SOVENT.
  .2 JOINTS: ASTM B32, SOLDER, GRADE 50B.

1.4 SANITARY SEWER PIPING, ABOVE GRADE.(URINALS ONLY)
A. COPPER TUBING: ASTM B88M, TYPE K, HARD DRAWN.
  .1 FITTINGS: ASME B18.18 CAST COPPER ALLOW OR ASME B16.22, WROUGHT COPPER AND BRONZE.
  .2 JOINTS: ASTM B32, SOLDER, GRADE 95TA

1.5 SANITARY VENT PIPING, BURIED
A. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT.
1. FITTINGS: CAST IRON.
2. JOINTS: HUB-AND-SPIGOT, CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS OR LEAD AND OAKUM.
B. CAST IRON PIPE: CISPI 301, HUBLESS.
1. FITTINGS: CAST IRON.
2. JOINTS: CISPI 310, NEOPRENE GASKET AND STAINLESS STEEL CLAMP AND SHIELD ASSEMBLIES.
C. COPPER TUBE: ASTM B306, DWV.
1. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER.
2. JOINTS: ASTM B32, SOLDER, GRADE 50B.

1.6 SANITARY VENT PIPING, ABOVE GRADE
A. CAST IRON PIPE: ASTM A74, SERVICE WEIGHT.
1. FITTINGS: CAST IRON.
2. JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM
B. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT.
1. FITTINGS: CAST IRON.
2. JOINTS: CISPI 310, NEOPRENE GASKETS AND STAINLESS STEEL CLAMP-AND-SHIELD ASSEMBLIES.
C. COPPER TUBE: ASTM B306, DWV.
1. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER,

PLUMBING SPECIFICATIONS

OR ASME B16.32, SOVENT.
2. JOINTS: ASTM B32, SOLDER, GRADE 50B.

1.7 WATER PIPING, ABOVE GRADE
A. DOMESTIC HOT AND COLD WATER.
  .1 COPPER TUBING: ASTM B88M, TYPE L, HARD DRAWN.
    .1 FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE.
    .2 JOINTS: ASTM B32, SOLDER, GRADE 95TA.
B. DOMESTIC HOT WATER RE-CIRCULATION.
  .1 COPPER TUBING: ASTM B88M, TYPE L, SOFT ANNEALED.
    .1 FITTINGS: ASME B18.18 CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE.
    .2 JOINTS: ASTM B32, SOLDER, GRADE 95TA.

1.8 ACID WASTE PIPING, BURIED & ABOVE GRADE
A. WATTS ORION BLUELINE

THE CORROSIVE WASTE DRAINAGE SYSTEM, CONFORMING TO ASTM F1412, SHALL BE WATTS ORION'S BLUELINE FLAME RETARDANT PIPE AND FITTINGS. THE PIPE IS SUPPLIED IN 10 FT. LENGTHS. THE PIPING & FITTINGS WILL MEET OR EXCEED SCHEDULE 40 DIMENSIONS. THE POLYPROPYLENE MATERIAL WILL CONFORM TO ASTM D4101.

.1 FITTINGS/JOINTS: PIPE AND FITTINGS WILL BE JOINED USING THE ORION SOCKET FUSION SYSTEM CONFORMING TO ASTM D2657.

1.9 FLANGES, UNIONS, AND COUPLINGS
A. PIPE SIZE 3-1/4" (80 MM) AND UNDER:
  .1 FERROUS PIPE: CLASS 150 MALLEABLE IRON THREADED UNIONS.
  .2 COPPER TUBE AND PIPE: CLASS 150 BRONZE UNIONS WITH SOLDERED JOINTS.
B. PIPE SIZE OVER 1" (25 MM):
  .1 FERROUS PIPE: CLASS 150 MALLEABLE IRON THREADED OR FORGED STEEL SLIP-ON FLANGES; PREFORMED NEOPRENE GASKETS.
  .2 COPPER TUBE AND PIPE: CLASS 150 SLIP-ON BRONZE FLANGES; PREFORMED NEOPRENE GASKETS.
C. GROOVED AND SHOULDERED PIPE END COUPLINGS:
  .1 HOUSING: MALLEABLE IRON CLAMPS TO ENGAGE AND LOCK, DESIGNED TO PERMIT SOME ANGULAR DEFLECTION, CONTRACTION, AND EXPANSION; STEEL BOLTS, NUTS, AND WASHERS; GALVANIZED FOR GALVANIZED PIPE.
  .2 SEALING GASKET: "C" SHAPE COMPOSITION SEALING GASKET.
D. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.

1.10 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) ISSUED BY PROVINCE OF ONTARIO 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 FLANGED ENDS: ANSI B16.1 (CLASS 125), ANSI B16.5
  .2 FACE-TO-FACE DIMENSIONS: ANSI B16.10

1.11 ISOLATION VALVES
A. UP TO AND INCLUDING 2" (50MM) – BALL TYPE
  .1 MANUFACTURER: KITZ #69AMLL
  .2 CONSTRUCTION: MSS SP-110, CLASS 150, 600 PSI (4140 KPA) CWP, FORGED BRASS, TWO PIECE BODY, STAINLESS STEEL BALL AND STEM, FULL PORT, VIRGIN PTFE SEATS AND STEM PACKING, BLOW-OUT PROOF STEM, LEVER HANDLE WITH BALANCING STOPS, STEM EXTENSIONS FOR INSULATED PIPING, SOLDER ENDS.

1.12 DRAIN VALVES
A. UP TO 150 PSIG – BALL TYPE:
  .1 MANUFACTURERS: KITZ 68C
  .2 CONSTRUCTION: 150 PSIG (1034 KPA), 600 WOG, BRASS BODY TO ASTM C37700, TWO PIECE BODY, FULL PORT, PTFE SEATS AND STEM PACKING OR DOUBLE "O" RING, BLOW-OUT PROOF STEM, CHROME PLATED BALL, LEVER HANDLE WITH CAP AND CHAIN, (3/4") 20 MM HOSE CONNECTION.

1.13 STRAINERS
A. UP TO 125 PSIG:
  .1 SIZE 2" (50 MM) AND UNDER:
    .1 MANUFACTURERS: MUELLER STEAM 351M
    .2 CONSTRUCTION : 860 KPA (125 PSIG) 200 WOG RATING, BRONZE BODY, SCREWED CAP, Y PATTERN, 304 STAINLESS STEEL SCREEN WITH 20 MESH PERFORATION, THREADED ENDS.
  .2 SIZE 2-1/2" (65 MM) AND LARGER:
    .1 MANUFACTURERS: MUELLER STEAM 758
    .2 CONSTRUCTION : 860 KPA (125 PSIG)/ 200 WOG RATING, CAST IRON BODY, BOLTED COVER, Y PATTERN, 304 STAINLESS STEEL SCREEN WITH 1/16 & 1/8 PERFORATION, THREADED ENDS.
B. UP TO 250 PSIG:
  .1 SIZE 2" (50 MM) AND UNDER:
    .1 MANUFACTURERS: MUELLER STEAM 11M
    .2 CONSTRUCTION : CLASS 250, 400 PSIG WOG, CAST IRON BODY, Y-PATTERN, SCREWED CAP AND ENDS, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS.
  .2 SIZE 2-1/2" (65 MM) AND LARGER:
    .1 MANUFACTURERS: MUELLER STEAM 758
    .2 CONSTRUCTION : 300 PSIG NON-SHOCK WOG, CAST IRON, Y-PATTERN, BOLTED COVER, BLOW-OUT PLUG, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS, FLANGED ENDS.

2. PLUMBING PIPING INSULATION

2.1 GENERAL INSTALLATION
A. FINISHES:
EXPOSED INDOORS: PVC JACKET.
CONCEALED, INDOORS: CANVAS ON VALVES, FITTINGS. NO FURTHER FINISH.
USE VAPOUR RETARDER JACKET ON TIAC CODE A-3 INSULATION COMPATIBLE WITH INSULATION.
FINISH ATTACHMENTS: SS, BANDS, AT 150 MM ON CENTRE. SEALS: CLOSED.

2.2 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.

PLUMBING SPECIFICATIONS

  .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.
J. OUTDOOR VAPOUR BARRIER MASTIC
  .1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, WHITE COLOUR.
K. INSULATING CEMENT
  .1 ASTM C449, VOC CONTENT NOT TO EXCEED 80 G/L.

2.3 JACKETS (APPLY TO ALL INTERIOR EXPOSED PIPING ONLY)
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
B. ALUMINUM JACKET: ASTM E84. (APPLY TO ALL EXTERIOR PIPING ONLY)
  .1 THICKNESS: ASTM C1729 REQUIREMENTS FOR RIGID AND NON-RIGID INSULATION FINISH.
  .2 FINISH: SMOOTH PLAIN MILL FINISH.
  .3 JOINING: LONGITUDINAL SLIP JOINTS AND 2" (50 MM) LAPS.
  .4 FITTINGS: 0.02" (0.40 MM) THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER.
  .5 METAL JACKET BANDS: 3/8" (10 MM) WIDE; 0.01" (0.38 MM) THICK ALUMINUM.

2.4 PIPE INSULATION THICKNESS

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

OPERATING TEMP.	RANGE °F	PIPE DIAMETER IN.	INSULATION THK. IN.
DOMESTIC COLD WATER	0 TO 850	ALL SIZES	1
DOMESTIC HOT WATER &			
DHW RECIRCULATION	105 TO 140	1-1/4 & SMALLER	1
		1-1/2 & LARGER	1-1/2
SANITARY DRAINAGE	40 TO 55	ALL SIZES	1
STORM DRAINAGE	40 TO 55	ALL SIZES	1

2.5 PLUMBING AND DRAINAGE TESTING

A. AFTER ALL PIPES HAVE BEEN PLACED IN POSITION AND ALL BRANCHES INSTALLED, BUT BEFORE FIXTURES HAVE BEEN SET OR CONNECTED, TEST THE TIGHTNESS OF ALL JOINTS AND THE SOUNDNESS OF ALL PIPES.

B. MAKE ALL TESTS BEFORE PIPING IS FURRED IN.

C. NOTIFY CONSULTANT AT LEAST 48 HOURS BEFORE COMMENCING WITH TEST, AND GIVE CONSULTANT A WRITTEN CERTIFICATE CONFIRMING THESE TESTS.

D. STORM, SANITARY, WASTE, AND VENT PIPING: SECURELY CLOSE ALL OPENINGS IN PIPE ENDS THROUGHOUT THE WORK BY MEANS OF APPROVED PLUGS AND FILL THE ENTIRE PIPING SYSTEM, INCLUDING STACKS, BRANCHES TO FIXTURES AND ALL HORIZONTAL RUNS WITH WATER. TEST BY RUNNING WATER INTO ALL PIPES, FIXTURES, TRAPS, AND APPARATUS IN ORDER TO DETECT ANY IMPERFECT MATERIAL OR WORKMANSHIP. WHERE IT IS IMPOSSIBLE TO TEST THE WHOLE SYSTEM AT ONE TIME, DIVIDE INTO PARTS. PERFORM THE WATER TEST IN ACCORDANCE WITH SECTION 7.3 OF OBC. PERFORM AN AIR TEST OR FINAL TEST OR ANY OTHER TEST REQUIRED BYAUTHORITIES HAVING JURISDICTION.

E. TEST ALL WATER LINES HYDROSTATICALLY AT 1-1/2 TIMES THE WORKING PRESSURE BUT AT NOT LESS THAN 1,380 KPA (200 PSI), FORA PERIOD OF NOT LESS THAT TWO (2) HOURS WITHOUT ANY DROP IN PRESSURE. DO TESTING BEFORE PIPING IS BURIED OR FURRED IN AND BEFORE PRESSURE SENSITIVE DEVICES ARE INSTALLED IN THE PIPEWORK. CORRECT ALL DEFECTS DISCLOSED BY TESTS. RETEST UNTIL ALL RESULTS ARE ACCEPTABLE.

F. LF ANY LEAKS ARE DISCOVERED BY THE ABOVE TESTS, REMOVE AND REPLACE THE FAULTY PORTIONS OF THE SYSTEMS AND REPEATTHE TEST. REPEAT THIS PROCEDURE UNTIL THE SYSTEM IS ACCEPTED BY THE CONSULTANT'S REPRESENTATIVE ON THE SITE. DO NOT CAULK THREADED JOINTS.

G. CHECK HORIZONTAL PIPE WITH AN ACCURATE LEVEL FOR ANY ALTERATIONS IN PITCH. INSPECT LATERALS, CROSS ARMS, AND ELIMINATE POCKETS. CORRECT ANY CASES OF WATER HAMMER.

H. FLUSHING AND CLEANING

GENERAL:

INSPECT THE SYSTEMS, AND REMOVE ANY HEAVY DEBRIS AND EXCESSIVE

OIL AND DIRT. FLUSH ALL COMPLETED SYSTEMS WITH CLEAR WATER AT THE HIGHEST OBTAINABLE PRESSURE AND VELOCITY.

DURING FLUSHING AND CLEANING, MAINTAIN ALL ISOLATING AND CONTROL VALVES IN THE OPEN POSITION.

DOMESTIC WATER SYSTEM:
FLUSH, CHLORINATE AND REFLUSH ALL OUTSIDE WATER MAINS

IN ACCORDANCE WITH AWWA C651-99 SPECIFICATION

3. FUEL GAS PIPING

3.1 BURIED PIPING

A. COPPER TUBING: ASTM B88, TYPE K, PROTECTED AGAINST PHYSICAL DAMAGE ABOVE GROUND.
  .1 FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASTM B16.22 WROUGHT COPPER OR BRONZE, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE..
  .2 JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.
B. COPPER TUBING: ASTM B88 TYPE L OR ASTM B837 TYPE G, EXTERNALLY COATED WITH EXTRUDED POLYETHYLENE OR PVC RESIN.
  .1 FITTINGS: ASME B16.26, CAST BRONZE, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE.
  .2 JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.
C. STEEL PIPE: ASTM A53/A53M OR A106, SCHEDULE 40, SEAMLESS
  .1 FITTINGS: STEEL TO ANSI/ASME B 16, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE.

PLUMBING SPECIFICATIONS

  .2 JOINTS: ANSI B31.1 WELDED.
  .3 JACKET: AWWA C105 POLYETHYLENE OR DOUBLE LAYER, HALF-LAPPED 0.25 MM POLYETHYLENE TAPE.

3.2 ABOVE GROUND PIPING
A. COPPER TUBING: ASTM B88, TYPE K, HARD DRAWN.
  .1 FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASTM B16.22 WROUGHT COPPER AND BRONZE.
  .2 JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.
B. STEEL PIPE: ASTM A53/A53M GR. B, ERW OR A106 SMLS, SCHEDULE 40.
  .1 FITTINGS: ASTM B16.3, MALLEABLE IRON CLASS 150, SCREWED OR FLANGED OR ASTM A234/A234M, WROUGHT CARBON STEEL AND ALLOY STEEL WELDING TYPE.
  .2 JOINTS: NFPA 30, THREADED, FLANGED OR WELDED TO ANSI B31.1.
    .1 SCREWED FITTINGS: PULVERIZED LEAD PASTE.
    .2 WELDED FITTINGS: BUTT-WELDING FITTINGS TO CSA W47.1.
    .3 FLANGE GASKETS: NONMETALLIC FLAT, TO ASME B16.5.
    .4 UNIONS: MALLEABLE IRON, BRASS TO IRON, GROUND SEAT, TO ASTM A 47/A47M.
    .5 BOLTS AND NUTS: TO ASME B18.2.1.
    .6 NIPPLES: SCHEDULE 40, TO ASTM A 53/A53M.
C. WHERE PIPING IS INSTALLED IN CEILINGS USED AS RETURN AIR PLENUMS, PROVIDE SEAMLESS PIPE AND WELDING FITTINGS.

3.3 ISOLATION VALVES
A. 2" (50 MM) AND SMALLER: SEMI-STEEL LUBRICATED PLUG VALVES, SCREWED, WRENCH OPERATED. ROCKWELL "NORDSTRUM" FIG. 142, NEWMAN-MILLIKEN 170M.

B. 2-1/2" (65 MM) AND 3" (75 MM): SEMI-STEEL LUBRICATED PLUG VALVES, FLANGED, WRENCH OPERATED. ROCKWELL "NORDSTRUM" FIG. 143, NEWMAN-MILLIKEN 171M.

C. PROVIDE TWO (2) STANDARD PATTERN, CAST HANDLE WRENCHES TO OPERATE VALVES.

3.4 PRESSURE REDUCING VALVES
A. GAS PRESSURE REDUCING AND RELIEF VALVES: SPRING LOADED REGULATOR WITH INTERNAL RELIEF VALVE. CAST IRON BODY, ALUMINUM DIAPHRAGM CASE AND ORIFICE. FOR CAPACITIES REFER TO DRAWINGS. FISHER TYPE 133L OR 133H, OR APPROVED EQUAL AS NOTED ON DRAWINGS.

3.5 GAS PIPE TESTING
A. INSTALL AND TEST GAS PIPING IN COMPLIANCE WITH THE LATEST ISSUE OF THE LOCAL GAS UTILITY REGULATIONS, TSSAB149.1, AND TO THE APPROVAL OF THE LOCAL GAS UTILITY AND LOCAL AUTHORITIES.

B. SUBJECT GAS PIPING TO AN INERT GASES PRESSURE TEST OF 345 KPA (50 PSI) AS PER B149.1 REQUIREMENTS. PURGE AFTER PRESSURE TEST IN ACCORDANCE WITH TSSA B149.1.

C. THE TAGGING OF TESTED GAS PIPING SYSTEMS IS DESCRIBED IN THE REGULATION COVERED BY PARAGRAPH 3.7.1 ABOVE.AFFIX TAGS TO THE PIPING AT POINT OF ENTRY INTO THE BUILDING.

D. IF ANY LEAKS ARE DISCOVERED BY THE ABOVE TESTS, REMOVE AND REPLACE THE FAULTY PORTIONS OF THE SYSTEMS AND REPEATTHE TEST. REPEAT THIS PROCEDURE UNTIL THE SYSTEM IS ACCEPTED BY THE CONSULTANT'S REPRESENTATIVE ON THE SITE. DO NOT CAULK THREADED JOINTS.

E. SLOPE PIPING DOWN IN DIRECTION OF FLOW TO LOW POINTS. USE ECCENTRIC REDUCERS AT PIPE SIZE CHANGES INSTALLED FOT TO PROVIDE POSITIVE DRAINAGE.

F. PROVIDE GAS VALVES TO PERMIT ISOLATION OF BRANCH PIPING AND EACH EQUIPMENT ITEM FROM THE BALANCE OF THE SYSTEM ANDTO ALLOW SAFE AND CONVENIENT ACCESS WITHOUT MOVING EQUIPMENT AND WITH A MINIMUM OF PIPING AND EQUIPMENTDISASSEMBLY.

G. INSTALL SHUTOFF VALVES AT THE FOLLOWING LOCATIONS: MAIN GAS SERVICE BEFORE ENTERING BUILDING. BRANCH GAS PIPING SERVING EACH ITEM OF EQUIPMENT OR APPLIANCE. OUTSIDE MECHANICAL ROOMS CONTAINING GAS FIRED EQUIPMENT. ALL BRANCH GAS LINES FROM GAS RISER

3.6 MASTER GAS SHUT-OFF VALVES:

SOLENOID WITH ZERO DIFFERENTIAL

120V/1/60

0-5 PSI MAX WORKING PRESSURE

TOUGHENED DIE CAST ALUMINUM BODY

FLUSH MOUNT ENCLOSURE C/W HINGES AND LATCHING SYSTEM

3.7 MASTER GAS SHUT-OFF CONTROLLER:

CGS MERLIN 1000S RANGE C/W GAS SOLENIOD VALVE. BUILT-IN EMERGENCY SHUTOFF PUSH BUTTON. 120 VAC. WALL MOUNTED

4. PLUMBING FIXTURES AND TRIM

A. S-1

EPOXY SINK BASIN PROVIDED BY MILLWORK CONTRACTOR. Z825B1-XL POLISHED CHROME-PLATED SINGLE LABORATORY FAUCET WITH INTEGRAL SHANK, QUARTER TURN CERAMIC DISC CARTRIDGE AND A 137 MM (5 3/8 IN) CENTERLINE RIGID OR SWING GOOSENECK SPOUT. 8,3 L (2.2 USGPM), PRESSURE COMPENSATING AERATOR, 64 MM (2 1/2 IN) VANDAL RESISTANT COLOR-CODED METAL LEVER HANDLES, MOUNTING HARDWARE AND A 1/2" COUPLING NUT. ZH8824XL-LRLKQ-8860-12-PC (2) 10 X 300 MM (3/8 X 12") EXTRA HEAVY DUTY QUARTER TURN STOPS, LOW LEAD, DN 1/2 IN COMPRESSION, LOOSE KEY, VERTICAL FLEXIBLE STAINLESS BRAIDED HOSES OF 10 X 300 MM (3/8 X 12 IN), FLANGE, CHROME PLATED FINISH. Z8702-9BD 38 MM (1 1/2") CAST BRASS ADJUSTABLE P-TRAP, 38 MM (1 1/2 IN) WITH CLEANOUT, DEEP SEAL FLANGE, POLISHED CHROME FINISH. FOR ACID USE SINKS PROVIDE WATTS ORION BLUELINE ACID RESISTANT 1-1/2" P-TRAP (SINKS UPSTREAM OF ACID NEUTRALIZATION TANK SHOWN ON DRAWINGS)

PIPE SIZES: 1/2"ø DCW & DHW INLET, 1-1/2"ø DRAIN OUTLET

B. S-1A

DSE125221-D1125 635 X 559 X 205 MM (25 X 22 X 8 1/16") STAINLESS STEEL SINGLE BOWL SINK, 635 X 559 X 205 MM (25 X 22 X 8 1/16 IN), TYPE 301, 20 GAUGE, SATIN FINISH, SOUND DEADENING PADS, RIM SEAL PRE-INSTALLED, INSTALLATION KIT, 89 MM (3 1/2 IN) REAR CENTERED BASKET STRAINER ASSEMBLY, PRE-DRILLED SINGLE CENTER HOLE. Z825B1-XL POLISHED CHROME-PLATED SINGLE LABORATORY FAUCET WITH INTEGRAL SHANK, QUARTER TURN CERAMIC DISC CARTRIDGE AND A 137 MM (5 3/8 IN) CENTERLINE RIGID OR SWING GOOSENECK SPOUT. 8,3 L (2.2 USGPM), PRESSURE COMPENSATING AERATOR, 64 MM (2 1/2 IN) VANDAL RESISTANT COLOR-CODED METAL LEVER HANDLES, MOUNTING HARDWARE AND A 1/2" COUPLING NUT. ZH8824XL-LRLKQ-8860-12-PC (2) 10 X 300 MM (3/8 X 12") EXTRA HEAVY DUTY QUARTER TURN STOPS, LOW LEAD, DN 1/2 IN COMPRESSION, LOOSE KEY, VERTICAL FLEXIBLE STAINLESS BRAIDED HOSES OF 10 X 300 MM (3/8 X 12 IN), FLANGE, CHROME PLATED FINISH. Z8702-9BD 38 MM (1 1/2") CAST BRASS ADJUSTABLE P-TRAP, 38 MM (1 1/2 IN) WITH CLEANOUT, DEEP SEAL FLANGE, POLISHED CHROME FINISH. FOR ACID USE SINKS PROVIDE WATTS ORION BLUELINE ACID RESISTANT 1-1/2" P-TRAP (SINKS UPSTREAM OF ACID NEUTRALIZATION TANK SHOWN ON DRAWINGS)

PIPE SIZES: 1/2"ø DCW & DHW INLET, 1-1/2"ø DRAIN OUTLET

PLUMBING SPECIFICATIONS

C. EW-1

ENCON 01035401 WALL MOUNTED EMERGENCY EYEWASH OR EYE/FACE WASH, 274 MM (10.8") YELLOW ABS RECEPTOR, LAMINAR FLOW EYEWASH, YELLOW ABS EYEWASH HEAD WITH WATER PRESSURE ACTIVATED YELLOW PLASTIC POP-OFF DUST COVER, INTEGRAL 12 L/MIN (3.2 USGPM) FLOW CONTROL, CHROME-PLATED BRASS STAY-OPEN BALL VALVE EQUIPPED WITH STAINLESS STEEL BALL AND STEM, PUSH FLAG ACTIVATED SIGN, 16 STAINLESS MESH SCREEN (1190 MICRONS) IN-LINE FILTER, DN 1/2" WATER SUPPLY, CAST-ALUMINUM CHROMATE PROTECTED WALL BRACKET, SATIN FINISH CHROME PLATED DN 1 1/4" WASTE WITH UNIVERSAL PICTOGRAM. OPERATING PRESSURE IS 30-70 PSI. PRODUCT'S NOTES : NOTE : FORESEE FAIL-SAFE PRE-MIXED WATER SYSTEM. TA-300-LF-RF WARNING! AN EMERGENCY EQUIPMENT REQUIRES BETWEEN 30 AND 90 PSI ACCORDING TO ANSI REQUIREMENTS. CONSIDERATION MUST BE TAKEN FOR PRESSURE LOSS THROUGHOUT THE MIXING VALVE. BRONZE DURA-TROL® SOLID BI-METAL THERMOSTAT COMPENSATING FOR TEMPERATURE AND PRESSURE VARIATIONS. 1.9-38 L/MIN (0.5 – 10 USGPM) FLOW FOR A PRESSURE LOSS UP TO 45 PSI. MAY BE ADJUSTED TO THE DESIRED TEMPERATURE. LOCKING TEMPERATURE REGULATOR TO PREVENT ACCIDENTAL MOVEMENT SET FOR 29 °C (85 °F), MIXING VALVE WILL CLOSE DOWN ON FAILURE OF COLD WATER SUPPLY. MIXING VALVE WITH SPECIAL INTERNAL COLD WATER BY-PASS CAPABLE OF A MINIMUM 15 L/MIN (4 USGPM) AT 30 PSI (2.1 BAR) UPON FAILURE OF HOT WATER. HIGH TEMPERATURE LIMIT STOP FACTORY PRE-SET AT 32 °C (90 °F). INTEGRAL WALL SUPPORT. DN 1/2 IN INLETS WITH ANGLE CHECK STOPS, DN 1/2 IN OUTLET. ROUGH BRONZE FINISH. DIAL THERMOMETER. REQUIRED HOT WATER SUPPLY AT 60 °C (140 °F) MIN. COMPLIES TO ANSI Z358.1 2004. OPTION : -TOP TOP INLETS.

PIPE SIZES: 1/2"ø DCW & DHW INLET

D. EW-2

ENCON 01050277 COLUMN COMBINATION EMERGENCY DRENCH SHOWER AND EYE/FACE WASH WITH CORROSION RESISTANT COATING, YELLOW ABS SHOWERHEAD WITH INTEGRAL 76 L/MIN (20 USGPM) FLOW CONTROL, 274 MM (10.8") YELLOW ABS RECEPTOR, LAMINAR FLOW EYEWASH, YELLOW ABS EYEWASH HEAD WITH WATER PRESSURE ACTIVATED YELLOW PLASTIC POP-OFF DUST COVER, INTEGRAL 30 L/MIN (8 USGPM) FLOW CONTROL, CHROMEPLATED BRASS STAY-OPEN BALL VALVE EQUIPPED WITH 316 STAINLESS STEEL BALL AND STEM, STAINLESS STEEL TRIANGULAR PULL ROD, PUSH FLAG ACTIVATED SIGN, 16 STAINLESS MESH SCREEN (1190 MICRONS) IN-LINE FILTER, SCH 80 HOT DIP GALVANIZED STEEL DN 1 1/4 IN DIAM. COLUMN AND FITTINGS, FLOOR FLANGE, DN 1 1/4 IN WATER SUPPLY, DN 1 1/4 IN WASTE, UNIVERSAL PICTOGRAM. OPERATING PRESSURE IS 30-70 PSI. ENCON 01120001 ABS DUST COVER. LEONARD TM-600-LF-RF WARNING! AN EMERGENCY EQUIPMENT REQUIRES BETWEEN 30 AND 90 PSI ACCORDING TO ANSI REQUIREMENTS. CONSIDERATION MUST BE TAKEN FOR PRESSURE LOSS THROUGHOUT THE MIXING VALVE. ROUGH BRONZE FINISH DURA-TROL® SOLID BI-METAL THERMOSTAT COMPENSATING FOR TEMPERATURE AND PRESSURE VARIATIONS. 11-220 L/MIN (3-58 USGPM) FLOW FOR A PRESSURE LOSS UP TO 45 PSI. MAY BE ADJUSTED TO THE DESIRED TEMPERATURE. LOCKING TEMPERATURE REGULATOR TO PREVENT ACCIDENTAL MOVEMENT SET FOR 29 °C (85 °F). MIXING VALVE WILL CLOSE DOWN ON FAILURE OF COLD WATER SUPPLY. MIXING VALVE WITH SPECIAL INTERNAL COLD WATER BY-PASS CAPABLE OF A MINIMUM 30 L/MIN (8 USGPM) AT 30 PSI (2.1 BAR) UPON FAILURE OF HOT WATER. HIGH TEMPERATURE LIMIT STOP FACTORY PRESET AT 32 °C (90 °F). INTEGRAL WALL SUPPORT. DN 3/4 IN BOTTOM INLETS WITH ANGLE CHECKSTOPS, DN 1 IN TOP OUTLET. ROUGH BRONZE FINISH. DIAL THERMOMETER. REQUIRED HOT WATER SUPPLY AT 60 °C (140 °F) MIN. COMPLIES TO ANSI Z358.1 2004. OPTION : -TOP TOP INLETS.

PIPE SIZES: 1/2"ø DCW & DHW INLET

E. FD

ZN211-Y5-P CAST IRON FLOOR DRAIN WITH A 165 MM (6 1/2") IN DIAM. BODY WITH A 102 MM (4") IN DIAM. THREADED THROAT TO RECEIVE ADJUSTABLE 127 MM (5") IN DIAM. ADJUSTABLE ROUND STRAINER COMBINED WITH 127 MM (5 X 5") SQUARE POLISHED NICKEL BRONZE REGULAR TRAFFIC GRATE. TRAP PRIMER CONNECTION. 695-01 TRAP PRIMER VALVE WHERE REPLENISHMENT OF WATER IN FLOOR DRAIN TRAPS IS REQUIRED; TRAP PRIMER VALVES SHALL BE 1/2" FIP INLET X 1/2" MIP OUTLET, AUTOMATIC TRAP PRIMER VALVES WHICH ACTIVATE WITH A 10 PSIG PRESSURE DROP BETWEEN 30-150 PSIG. WATER RELEASE SHALL BE FACTORY SET. TRAP PRIMER VALVE SHALL HAVE LARGE PORT OPENINGS AND A NON-CORROSIVE BRASS FINISH.

PIPE SIZES: 1/2"ø DCW TRAP PRIMER INLET, 3"ø DRAIN OUTLET

F. FFD

ZURN ZN-211-BF FUNNEL FLOOR DRAIN, DURA-COATED CAST IRON BODY WITH BOTTOM OUTLET, ADJUSTABLE "TYPE BF" POLISHED NICKEL BRONZE ROUND STRAINER WITH SECURED OPEN THROAT OVAL FUNNEL.TRAP PRIMER CONNECTION. 695-01 TRAP PRIMER VALVE WHERE REPLENISHMENT OF WATER IN FLOOR DRAIN TRAPS IS REQUIRED; TRAP PRIMER VALVES SHALL BE 1/2" FIP INLET X 1/2" MIP OUTLET, AUTOMATIC TRAP PRIMER VALVES WHICH ACTIVATE WITH A 10 PSIG PRESSURE DROP BETWEEN 30-150 PSIG. WATER RELEASE SHALL BE FACTORY SET. TRAP PRIMER VALVE SHALL HAVE LARGE PORT OPENINGS AND A NON-CORROSIVE BRASS FINISH.

PIPE SIZES: 1/2"ø DCW TRAP PRIMER INLET, 3"ø DRAIN OUTLET

G. CO (FLOOR CLEANOUT)

ZURN ZN-1602 ADJUSDTABLE FLOOR CLEANOUT, DURA-COATED CAST IRON BODY WITH NEOPRENE SLEEVE, POLISHED NICKEL BRONZE ADJUSTABLE HEAD AND GASKETED, SECURED, SCORIATED COVER WITH STAINLESS STEEL SCREWS.

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Key Plan N.T.S.

Project North True North

No.	Revisions	Date
4.	Issued for Construction	2024 05 23
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
MECHANICAL SPECIFICATIONS

Scale: AS NOTED	Date: 02/01/2024
Drawn by: C.M.	Checked by: W.D.
Job No. 2215B	Drawing No. M004

CONTROLS AND INSTRUMENTATION SPEC.

1. GENERAL

A. THE WORK SHALL INCLUDE DESIGN, SUPPLY, INSTALLATION, AND COMMISSIONING CONTROL SYSTEM TO ACHIEVE THE PERFORMANCE SPECIFIED IN THE FOLLOWING CLAUSES.

B. FOR EXISTING SITES VISIT THE PREMISES PRIOR TO TENDER TO BECOME FAMILIAR WITH FIELD CONDITIONS AND EXISTING EQUIPMENT.

C. THE CONTROL SYSTEM SHALL BE INSTALLED BY THE CONTROL SUBCONTRACTOR BUT AS AN INTEGRAL PART OF THE MECHANICAL SUB-CONTRACT. THE SYSTEM SHALL BE INSTALLED BY TRADE CERTIFIED ELECTRICIANS REGULARLY EMPLOYED BY THE CONTROL SUB-CONTRACTOR.

D. THE CONTROLS CONTRACTOR WILL SPECIFICALLY READ ALL MECHANICAL AND ELECTRICAL DRAWINGS, SPECIFICATIONS, AND ADDENDA AND DETERMINE THE CONTROLS WORK PROVIDED BY THE MECHANICAL CONTRACTOR, HIS SUBCONTRACTORS, AND THE ELECTRICAL CONTRACTOR.

2. SCOPE OF WORK

E. THIS PROJECT SCOPE SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING WORK

F. FURNISH AND INSTALL ALL CONTROL DEVICES SUCH AS THERMOSTATS, CONTROL VALVES ETC WHERE INDICATED IN THIS SECTION.

G. PROVIDE CONTROL WIRING FROM THERMOSTATS, OR ROOM TEMPERATURE SENSORS, WHERE INDICATED, TO THEIR ASSOCIATED TERMINAL EQUIPMENT OR CONTROL VALVES.

H. SITE COORDINATE THIS WORK WITH OTHER TRADES AFFECTED.

3. WARRANTY REQUIREMENTS

A. WARRANT ALL WORK AS FOLLOWS:

.1 LABOR AND MATERIALS SHALL BE WARRANTED FREE FROM DEFECTS FOR A PERIOD OF TWELVE (12) MONTHS AFTER FINAL COMPLETION ACCEPTANCE BY THE OWNER.

.2 AT THE END OF THE FINAL START-UP/TESTING, IF EQUIPMENT AND SYSTEMS ARE OPERATING SATISFACTORILY TO THE CUSTOMER, THE CUSTOMER SHALL SIGN CERTIFICATES CERTIFYING THAT THE BAS CONTROLS SYSTEM IS OPERATIONAL AND HAS BEEN TESTED AND ACCEPTED IN ACCORDANCE WITH THE TERMS OF THIS SPECIFICATION. THE DATE OF CUSTOMER ACCEPTANCE SHALL BE THE START OF THE WARRANTY PERIOD.

.3 ACCEPTABLE MANUFACTURERS:

AUTOMATED LOGIC
ALTERTON
HONEYWELL
DISTECH CONTROLS

4. AUXILLARY CONTROL DEVICES

A. MOTORIZED DAMPERS, UNLESS OTHERWISE SPECIFIED ELSEWHERE, SHALL BE AS FOLLOWS:

.1 DAMPER FRAMES SHALL BE 16 GAUGE GALVANIZED SHEET METAL OR 1/8" EXTRUDED ALUMINUM WITH REINFORCED CORNER BRACING.

.2 DAMPER BLADES SHALL NOT EXCEED 8" IN WIDTH OR 48" IN LENGTH. BLADES ARE TO BE SUITABLE FOR MEDIUM VELOCITY PERFORMANCE (2,000 FPM). BLADES SHALL BE NOT LESS THAN 16 GAUGE.

.3 DAMPER SHAFT BEARINGS SHALL BE AS RECOMMENDED BY MANUFACTURER FOR APPLICATION.

.4 ALL BLADE EDGES AND TOP AND BOTTOM OF THE FRAME SHALL BE PROVIDED WITH COMPRESSIBLE SEALS. SIDE SEALS SHALL BE COMPRESSIBLE STAINLESS STEEL. THE BLADE SEALS SHALL PROVIDE FOR A MAXIMUM LEAKAGE RATE OF 10 CFM PER SQUARE FOOT AT 2.5" W.C. DIFFERENTIAL PRESSURE.

.5 ALL LEAKAGE TESTING AND PRESSURE RATINGS WILL BE BASED ON AMCA PUBLICATION 500.

.6 INDIVIDUAL DAMPER SECTIONS SHALL NOT BE LARGER THAN 48" X 60". PROVIDE A MINIMUM OF ONE DAMPER ACTUATOR PER SECTION.

B. CONTROL DAMPERS SHALL BE PARALLEL FOR 2 POSITION CONTROL AND OPPOSED BLADE FOR MODULATING CONTROL UNLESS DETAILED ON THE DRAWINGS.

C. ELECTRIC DAMPER/VALVE ACTUATORS

.1 THE ACTUATOR SHALL HAVE ELECTRONIC OVERLOAD OR DIGITAL ROTATION SENSING CIRCUITRY TO PREVENT DAMAGE TO THE ACTUATOR THROUGHOUT THE ROTATION OF THE ACTUATOR

.2 WHERE SHOWN, FOR POWER-FAILURE/SAFETY APPLICATIONS, AN INTERNAL MECHANICAL SPRING RETURN MECHANISM SHALL BE BUILT INTO THE ACTUATOR HOUSING.

.3 ALL ROTARY SPRING RETURN ACTUATORS SHALL BE CAPABLE OF BOTH CLOCKWISE OR COUNTER CLOCKWISE SPRING RETURN OPERATION. LINEAR ACTUATORS SHALL SPRING RETURN TO THE RETRACTED POSITION.

.4 PROPORTIONAL ACTUATORS SHALL ACCEPT A 0-10 VDC OR 0-20 MA CONTROL SIGNAL AND PROVIDE A 2-10 VDC OR 4-20 MA OPERATING RANGE.

.5 ALL NON-SPRING RETURN ACTUATORS SHALL HAVE AN EXTERNAL MANUAL GEAR RELEASE TO ALLOW MANUAL POSITIONING OF THE DAMPER WHEN THE ACTUATOR IS NOT POWERED. SPRING RETURN ACTUATORS WITH MORE THAN 60 IN-LB. TORQUE CAPACITY SHALL HAVE A MANUAL CRANK FOR THIS PURPOSE.

.6 ACTUATORS SHALL BE PROVIDED WITH A CONDUIT FITTING AND A MINIMUM 1M ELECTRICAL CABLE AND SHALL BE PRE-WIRED TO ELIMINATE THE NECESSITY OF OPENING THE ACTUATOR HOUSING TO MAKE ELECTRICAL CONNECTIONS.

.7 ACTUATORS SHALL BE UNDERWRITERS LABORATORIES STANDARD 873 LISTED.

.8 ACTUATORS SHALL BE DESIGNED FOR A MINIMUM OF 60,000 FULL STROKE CYCLES AT THE ACTUATOR'S RATED TORQUE.

D. CONTROL VALVES

.1 CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: VALVE ACTUATOR AND TRIM SHALL BE FURNISHED TO PROVIDE THE FOLLOWING MINIMUM CLOSE-OFF PRESSURE RATINGS:

.1 WATER VALVES:

.1 TWO-WAY: 150% OF TOTAL SYSTEM (PUMP) HEAD.

.2 THREE-WAY: SHALL BE INSTALLED IN MIXING CONFIGURATION, 2 IN 1 OUT. IN THE MIXING CONFIGURATION, ACTUATOR SHALL BE RATED FOR 100% OF TOTAL SYSTEM (PUMP) HEAD

.3 STEAM VALVES: 150% OF OPERATING (INLET) PRESSURE.

.2 WATER VALVES:

.1 BODY AND TRIM STYLE AND MATERIALS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS FOR DESIGN CONDITIONS AND SERVICE SHOWN, WITH EQUAL PERCENTAGE PORTS FOR MODULATING SERVICE.

.2 SIZING CRITERIA:

.1 TWO-POSITION SERVICE: LINE SIZE.

.2 TWO-WAY MODULATING SERVICE: PRESSURE DROP SHALL BE EQUAL TO TWICE THE PRESSURE DROP THROUGH HEAT EXCHANGER (LOAD), 50% OF THE PRESSURE DIFFERENCE BETWEEN SUPPLY AND RETURN MAINS, OR 34.5 KPA (5 PSI), WHICHEVER IS GREATER. VALVE SHALL NOT BE LESS THAN 1 LINE SIZE SMALLER THAN DESIGN PIPING SIZE.

.3 THREE-WAY MODULATING SERVICE: PRESSURE DROP EQUAL TO TWICE THE PRESSURE DROP THROUGH THE COIL EXCHANGER (LOAD), 34.5 KPA (5 PSI) MAXIMUM. VALVE SHALL NOT BE LESS THAN 1 LINE SIZE SMALLER THAN DESIGN PIPING SIZE.

.4 VALVES DN 15 (1/2 IN.) THROUGH DN 50 (2 IN.) SHALL BE BRONZE BODY OR CAST BRASS ANSI CLASS 250, SPRING-LOADED, PTFE PACKING, QUICK OPENING FOR TWO-POSITION SERVICE. TWO-WAY VALVES TO HAVE REPLACEABLE COMPOSITION DISC OR STAINLESS STEEL BALL.

.5 VALVES DN 65 (2 1/2 IN.) AND LARGER SHALL BE CAST IRON ANSI CLASS 125 WITH GUIDED PLUG AND PTFE PACKING.

.3 WATER VALVES SHALL FAIL IN LAST POSITION UNLESS USED FOR EQUIPMENT PROTECTION APPLICATION. EQUIPMENT PROTECTION SHALL FAIL IN NORMALLY OPEN OR CLOSED, AS SCHEDULED ON PLANS, OR AS FOLLOWS:

.1 HEATING COILS IN AIR HANDLERS - NORMALLY OPEN

.2 OTHER APPLICATIONS--AS SCHEDULED OR AS REQUIRED BY SEQUENCES OF OPERATION

.4 ZONE VALVES SHALL BE SIZED TO MEET THE CONTROL APPLICATION AND THEY SHALL MAINTAIN THEIR LAST POSITION IN THE EVENT OF A POWER FAILURE.

E. BINARY TEMPERATURE DEVICES

CONTROLS AND INSTRUMENTATION SPEC.

.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.

F. WIRED TEMPERATURE SENSORS

.1 TEMPERATURE SENSORS SHALL BE RTD OR THERMISTOR.

.2 DUCT SENSORS SHALL BE SINGLE POINT OR AVERAGING AS SHOWN. AVERAGING SENSORS SHALL BE A MINIMUM OF 1.5 M (5 FT) IN LENGTH PER 1 M2 (10 FT2) OF DUCT CROSS SECTION.

.3 IMMERSION SENSORS SHALL BE PROVIDED WITH A SEPARABLE STAINLESS STEEL WELL. PRESSURE RATING OF WELL IS TO BE CONSISTENT WITH THE SYSTEM PRESSURE IN WHICH IT IS TO BE INSTALLED. THE WELL MUST WITHSTAND THE FLOW VELOCITIES IN THE PIPE.

.4 SPACE SENSORS SHALL BE EQUIPPED WITH SETPOINT ADJUSTMENT, OVERRIDE SWITCH, DISPLAY, AND/OR COMMUNICATION PORT AS SHOWN ON PLANS.

.5 PROVIDE MATCHED TEMPERATURE SENSORS FOR DIFFERENTIAL TEMPERATURE MEASUREMENT.

G. RELAYS

.1 CONTROL RELAYS SHALL BE UL LISTED PLUG-IN TYPE WITH DUST COVER AND LED "ENERGIZED" INDICATOR. CONTACT RATING, CONFIGURATION, AND COIL VOLTAGE SHALL BE SUITABLE FOR APPLICATION.

.2 TIME DELAY RELAYS SHALL BE UL LISTED SOLIDSTATE PLUG-IN TYPE WITH ADJUSTABLE TIME DELAY. DELAY SHALL BE ADJUSTABLE ±200% (MINIMUM) FROM SETPOINT SHOWN ON PLANS. CONTACT RATING, CONFIGURATION, AND COIL VOLTAGE SHALL BE SUITABLE FOR APPLICATION. PROVIDE NEMA 1 ENCLOSURE WHEN NOT INSTALLED IN LOCAL CONTROL PANEL.

H. CURRENT SWITCHES

.1 CURRENT-OPERATED SWITCHES SHALL BE SELF-POWERED, SOLID STATE WITH ADJUSTABLE TRIP CURRENT. THE SWITCHES SHALL BE SELECTED TO MATCH THE CURRENT OF THE APPLICATION AND OUTPUT REQUIREMENTS OF THE DDC SYSTEM.

I. DIFFERENTIAL PRESSURE TYPE SWITCHES (AIR OR WATER SERVICE)

.1 SHALL BE UL LISTED, SPDT SNAP-ACTING, PILOT DUTY RATED (125 VA MINIMUM), NEMA 1 ENCLOSURE, WITH SCALE RANGE AND DIFFERENTIAL SUITABLE FOR INTENDED APPLICATION OR AS SHOWN.

5. 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.

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.

6. 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

CONTROLS AND INSTRUMENTATION SPEC.

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. 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.

7. SUPPLY OF CONTROL DEVICES

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.

8. HORIZONTAL UNIT VENTILATORS SEQUENCE OF OPERATION:

RUN CONDITIONS:

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

THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES.

COOLING:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND COMMAND COOLING BY ENERGIZING THE EXPANSION VALVE 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 ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
- AND THE FAN IS ON.

HEATING COIL VALVE:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND ENABLE HEATING TO MAINTAIN HEATING SETPOINT.

WHEN HEATING IS ENABLED THE CONTROLLER SHALL MEASURE THE LEAVING AIR TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN THE ZONE TEMPERATURE SET POINT.

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 FAN IS ON.

THE HEATING COIL VALVE SHALL OPEN WHENEVER THE FREEZESTAT IS ON.

DAMPER OPERATION:

THE OUTSIDE AIR DAMPER SHALL CLOSE WHEN THE UNIT IS OFF.

THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE. SHOULD DISCHARGE TEMPERATURE DROP BELOW A USER DEFINABLE TEMPERATURE (ADJ.), THE CONTROLLER SHALL ENABLE THE HEATING AND CLOSE THE OUTSIDE DAMPER.

VRF SYSTEM:

THE VRF SYSTEM SHALL BE FACTORY CONTROLLED VIA A BACNET INTERFACE. THE INDIVIDUAL HORIZONTAL UNIT VENTILATORS SHALL DIRECTLY ENERGIZE THE EXPANSION VALVE DURING COOLING MODE, AND ENERGIZE THE RE-HEAT CONTROL VALVE DURING HEATING MODE.

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Key Plan N.T.S.

Project North True North

No.	Revisions	Date
4.	Issued for Construction	2024 05 23
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
MECHANICAL SPECIFICATIONS

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M005

MECHANICAL EQUIPMENT SPECIFICATIONS

HORIZONTAL UNIT VENTILATORS

A. ACCEPTABLE MANUFACTURERS: DAIKIN, YORK, CARRIER, HITACHI

B. CABINET AND CHASSIS

UNIT FRAMES SHALL BE OF UNITIZED, WELDED CONSTRUCTION, WITH STRUCTURAL ELEMENTS ALIGNED IN AN ASSEMBLY JIG PRIOR TO WELDING, TO INSURE PROPER DIMENSIONS, RIGIDITY, AND SQUARENESS. FRAMES ASSEMBLED WITH MECHANICAL FASTENERS SHALL NOT BE ACCEPTABLE.

INTERNAL SHEET METAL PARTS SHALL BE CONSTRUCTED OF GALVANIZED STEEL TO INHIBIT CORROSION.

EXTERIOR CABINET PANELS SHALL BE FABRICATED FROM FURNITURE GRADE STEEL OF NOT LESS THAN 18 GAUGE STEEL WITH NO SHARP EDGES AND SHALL RECEIVE AN ELECTROSTATICALLY APPLIED POWDER PAINT, AND BE OVEN BAKED WITH ENVIRONMENTALLY FRIENDLY THERMOSETTING URETHANE POWDER FINISH TO PROVIDE A HIGH QUALITY APPEARANCE. FINISH COLOR SHALL BE OFF– WHITE.

THE INTERIOR AREAS OF THE UNIT VENTILATOR SHALL BE INSULATED FOR SOUND ATTENUATION AND TO PROVIDE PROTECTION AGAINST CONDENSATION OF MOISTURE ON OR WITHIN THE UNIT. THE UNIT SHALL BE PROVIDED WITH AN ULTRA–QUIET SOUND PACKAGE CONSISTING OF ACOUSTICALLY MATCHED LOW SPEED FANS TO FAN HOUSING, SOUND BARRIER INSULATION MATERIAL (NON–FIBERGLASS) ADHERED TO THE BOTTOM UNDERSIDE OF THE UNIT TOP PANEL, SIDES OF THE FAN SECTION AND SOUND ABSORBING INSULATION (NON–FIBERGLASS) MATERIAL APPLIED TO THE UNIT FRONT PANEL.

EACH UNIT SHALL BE PROVIDED WITH A NON–FUSED POWER INTERRUPT SWITCH THAT DISCONNECTS THE MAIN POWER TO THE UNIT FOR SERVICING OR WHEN THE UNIT IS TO BE SHUT DOWN FOR AN EXTENDED PERIOD OF TIME. THE FAN MOTOR AND CONTROLS SHALL HAVE THE HOT LINE(S) PROTECTED BY FACTORY INSTALLED CARTRIDGE TYPE FUSE(S).

C. CEILING UNITS

THREE BOTTOM PANELS, TWO OF WHICH ARE HINGED, SHALL BE PROVIDED FOR EASE OF SERVICE ACCESS AND HANDLING. RETAINER CHAINS SHALL BE PROVIDED TO PREVENT SUDDEN RELEASE OF THE HINGED BOTTOM PANELS. END PANELS SHALL BE SECURED TO THE UNIT WITH RECESSED, TAMPER RESISTANT, ALLEN HEAD FASTENERS. SLOTS FOR FLAT HEAD SCREWDRIVERS SHALL NOT BE ACCEPTABLE AS TAMPER RESISTANT.

CEILING MOUNTED UNITS SHALL HAVE A BUILT–IN METAL WIRE RACEWAY FROM RIGHT END COMPARTMENT TO LEFT END COMPARTMENT TO CONTAIN ANY LINE VOLTAGE ELECTRICAL WIRING SEPARATE FROM THE AIR STREAM. LINE VOLTAGE WIRING SHALL NOT BE TOUCHABLE IN THE AIR STREAM OF THE UNIT DURING NORMAL MAINTENANCE PROCEDURES OF OILING BEARINGS OR MOTORS.

THE DISCHARGE OPENING OF THE UNIT SHALL BE FITTED WITH A DUCT COLLAR.

THE CENTERLINE OF THE COOLING CONDENSATE DRAIN SHALL BE A MINIMUM OF 4" ABOVE THE BOTTOM OF THE UNIT TO ALLOW FOR APPROPRIATE TRAPPING OF THE CONDENSATE DISPOSAL LINE.

D. COILS

COIL ASSEMBLY SHALL BE OF A MODULAR CONSTRUCTION SO THAT IT IS REMOVABLE FROM THE BOTTOM OF THE UNIT.

ALL COILS SHALL BE INSTALLED IN A DRAW THROUGH POSITION TO ASSURE UNIFORM AIR DISTRIBUTION OVER THE FULL–FACE AREA OF THE COIL, AND AN EVEN UNIT DISCHARGE TEMPERATURE.

ALL HEATING COILS SHALL BE CONSTRUCTED WITH COPPER TUBES AND MECHANICALLY BONDED ALUMINUM CORRUGATED PLATE TYPE FINS. ALL COILS SHALL HAVE ALUMINUM INDIVIDUAL UNSHARED FIN SURFACES. AN AIR BREAK SHALL EXIST BETWEEN COILS.

COOLING COILS SHALL BE COMPATIBLE WITH VRF CONDENSING UNITS.

CERTIFICATION – ACCEPTABLE REFRIGERANT COILS ARE TO BE CERTIFIED IN ACCORDANCE WITH ARI STANDARD 410 AND BEAR THE ARI LABEL. COILS EXCEEDING THE SCOPE OF THE MANUFACTURER'S CERTIFICATION AND/OR THE RANGE OF ARI'S STANDARD RATING CONDITIONS WILL BE CONSIDERED PROVIDED THE MANUFACTURER IS A CURRENT MEMBER OF THE ARI AIR–COOLING AND AIR–HEATING COILS CERTIFICATION PROGRAMS AND THAT THE COILS HAVE BEEN RATED IN ACCORDANCE WITH ARI STANDARD 410. MANUFACTURER MUST BE ISO 9002 CERTIFIED.

VRF SYSTEMS, WHERE INDICATED, ARE TO BE INTEGRATED WITH UNIT VENTILATORS UTILIZING A FACTORY INSTALLED VRF DX COIL. ELECTRONIC EXPANSION VALVES AND APPROPRIATE CONTROLS. VRF MANUFACTURER SHALL PROVIDE THE DX COIL, ELECTRONIC EXPANSION VALVES AND CONTROLLERS.

COILS DESIGNED FOR USE WITH REFRIGERANT R–410A. FINS SHALL HAVE A MINIMUM THICKNESS OF 0.0075" OF ALUMINUM PLATE CONSTRUCTION WITH FULL DRAWN COLLARS TO PROVIDE A CONTINUOUS SURFACE COVER OVER THE ENTIRE TUBE FOR MAXIMUM HEAT TRANSFER. TUBES SHALL BE MECHANICALLY EXPANDED INTO THE FINS TO PROVIDE A CONTINUOUS PRIMARY–TO–SECONDARY COMPRESSION BOND OVER THE ENTIRE FINNED LENGTH FOR MAXIMUM HEAT TRANSFER RATES. BARE COPPER TUBE SHALL NOT BE VISIBLE BETWEEN FINS.

REFRIGERANT COILS SHALL BE PROVIDED WITH ROUND SEAMLESS 3/8" O.D. COPPER TUBES ON 1–1/2" CENTERS, STAGGERED IN THE DIRECTION OF AIRFLOW. ALL JOINTS SHALL BE BRAZED.

SWEAT TYPE COPPER SUCTION CONNECTIONS LOCATED AT THE BOTTOM OF THE SUCTION HEADERS FOR GRAVITY OIL DRAINAGE. COILS SHALL BE UNIFORMLY CIRCUITED IN A COUNTERFLOW MANNER FOR INTERLACED FACE SPLIT CAPACITY REDUCTION. PRESSURE TYPE LIQUID DISTRIBUTORS USED. COILS SHALL BE TESTED WITH 315 POUNDS AIR PRESSURE UNDER WARM WATER, AND SUITABLE FOR 250 PSIG WORKING PRESSURE.

E. EXPANSION VALVE

VRF SYSTEM SHALL MONITOR AND MAINTAIN THE UNIT SUPERHEAT (COOLING MODE) OR SUBCOOLING (HEATING MODE) USING A COMPUTERIZED PID CONTROL. INTERNAL UNIT COMPONENTS SHALL BE FACTORY WIRED AND PIPED, AND COMPLETE WITH ELECTRONIC PROPORTIONAL EXPANSION VALVE, FLARE CONNECTIONS, CONDENSATE DRAIN PAN, SELF–DIAGNOSTICS, AND AUTO–RESTART FUNCTION.

EXPANSION VALVE SHALL BE THE DIAPHRAGM AND SPRING–LOADED TYPE WITH EXTERNAL EQUALIZERS, AND BULB AND CAPILLARY TUBING. VALVE SHALL BE EQUIPPED WITH AN EXTERNAL SUPERHEAT ADJUSTMENT ALONG WITH A SEAL CAP. INTERNAL EQUALIZERS MAY BE UTILIZED WHERE FLOWING REFRIGERANT PRESSURE DROP BETWEEN OUTLET OF THE VALVE AND INLET TO THE EVAPORATOR COIL IS NEGLIGIBLE AND PRESSURE DROP ACROSS THE EVAPORATOR IS LESS THAN THE PRESSURE DIFFERENCE CORRESPONDING TO 1°C (2°F) OF SATURATED SUCTION TEMPERATURE AT EVAPORATOR CONDITIONS. PILOT–OPERATED VALVES SHALL HAVE A CHARACTERIZED PLUG TO PROVIDE REQUIRED MODULATING CONTROL.

ELECTRONIC EXPANSION VALVES SHALL BE BRASS BODY, NEEDLE VALVE WITH FLOATING NEEDLE AND MACHINED SEAT, STEPPER MOTOR DRIVE AND COMPATIBLE WITH R410A AND PVE OIL.

ELECTRONIC EXPANSION VALVES SHALL HAVE A TEMPERATURE OPERATION OF –40F TO 300F.

MECHANICAL EQUIPMENT SPECIFICATIONS

ELECTRONIC EXPANSION VALVES SHALL HAVE A WORKING PRESSURE OF 550 PSIG AND SHOULD BE ABLE TO HANDLE UP TO 700PSIG.

THE ACCESS PORT OF THE EXPANSION VALVE MUST BE ON THE VALVE BODY AND NOT ON THE PIPING.

ELECTRONIC EXPANSION VALVES SHALL BE ABLE TO HANDLE THE FLOW WITHOUT ANY PRESSURE DROP.

ELECTRONIC EXPANSION VALVES SHALL BE ABLE TO WORK WITH BI–DIRECTIONAL FLOWS.

F. DRAIN PAN

ALL UNITS SHALL COME FURNISHED WITH AN INSULATED DRAIN PAN CONSTRUCTED OF STAINLESS STEEL. A DRAIN OUTLET SHALL BE PROVIDED ON BOTH ENDS OF THE DRAIN PAN WITH ONE OUTLET CAPPED. THE DRAIN HAND OF CONNECTION SHALL BE EASILY FIELD–REVERSED BY RELOCATING THE CAP TO THE OPPOSITE END WITHOUT DISASSEMBLY OF THE UNIT OR MOVEMENT OF THE UNIT DRAIN PAN.

THE DRAIN PAN SHALL BE ABLE TO BE SLOPED IN EITHER DIRECTION FOR PROPER CONDENSATE REMOVAL.

G. FANS AND MOTOR

THE FAN AND MOTOR ASSEMBLY SHALL BE OF A LOW–SPEED DESIGN TO ASSURE MAXIMUM QUIETNESS AND EFFICIENCY.

FANS SHALL BE DOUBLE–INLET, FORWARD–CURVED, CENTRIFUGAL TYPE WITH OFFSET AERODYNAMIC BLADES. FANS AND SHAFT SHALL BE STATICALLY AND DYNAMICALLY BALANCED AS AN ASSEMBLY IN THE UNIT BEFORE SHIPMENT.

FAN HOUSINGS SHALL BE CONSTRUCTED OF GALVANIZED STEEL INCORPORATING LOGARITHMIC EXPANSION FOR QUIET OPERATION. FAN AND MOTOR ASSEMBLY SHALL BE OF THE DIRECT DRIVE TYPE. BELT DRIVE FANS SHALL NOT BE ALLOWED.

MOTORS SHALL BE 208 VOLT, SINGLE PHASE, 60HZ, ECM WITH AUTO RESET INTERNAL THERMAL OVERLOAD DEVICE DESIGNED SPECIFICALLY FOR UNIT VENTILATOR OPERATION. MOTORS SHALL BE LOCATED OUT OF THE CONDITIONED AIR STREAM.

ALL COMPONENTS OF THE FAN/MOTOR ASSEMBLY SHALL BE REMOVABLE FROM THE BOTTOM OF CEILING MOUNTED UNITS.

UNITS SHALL HAVE SLEEVE TYPE MOTOR AND FAN SHAFT BEARINGS, AND SHALL NOT REQUIRE OILING MORE THAN ANNUALLY. ALL BEARINGS SHALL BE LOCATED OUT OF THE AIRSTREAM. BEARINGS IN THE AIR STREAM ARE NOT ACCEPTABLE.

UNITS SHALL HAVE SLEEVE TYPE MOTOR AND FAN SHAFT BEARINGS , AND SHALL NOT REQUIRE OILING MORE THAN ANNUALLY.

ECM MOTOR SPEED SHALL BE FACTORY PROGRAMED FOR THREE (3) SPEEDS, HIGH–MEDIUM–LOW–OFF (NOT ACCESSIBLE FROM THE EXTERIOR OF THE UNIT). FAN MOTOR SHALL HAVE HOT LEG PROTECTED BY A FACTORY INSTALLED CARTRIDGE FUSE.

H. FACE & BYPASS DAMPER

EACH UNIT SHALL BE PROVIDED WITH A FACTORY–INSTALLED FACE AND BY–PASS DAMPER, CONSTRUCTED OF ALUMINUM. THE LONG SEALING EDGES OF THE DAMPER SHALL HAVE SILICONE RUBBER IMPREGNATED CLOTH SEALS FOR LONG LIFE AND POSITIVE SEALING. FACE AND BYPASS DAMPERS WITHOUT SEALING EDGES TO PREVENT AIR BYPASS SHALL NOT BE ACCEPTABLE. THE DAMPER ENDS SHALL HAVE BLENDED MOHAIR SEALS ALONG THE ENDS GLUED TO THE DAMPER END FOR A POSITIVE SEAL. PLASTIC CLIP–ON BRUSH END SEALS SHALL NOT BE ACCEPTABLE AS AN END SEAL. THE UNIT DESIGN SHALL INCORPORATE THE FACE AND BYPASS DAMPER TO PREVENT COIL SURFACE WIPING AND BE BEFORE THE FAN IN A DRAW–THRU CONFIGURATION. THE FACE AND BY–PASS DAMPER SHALL BE ARRANGED TO HAVE A DEAD AIR SPACE TO MINIMIZE HEAT PICK–UP IN THE BY–PASS POSITION.

I. OUTDOOR & ROOM DAMPERS

EACH UNIT SHALL BE PROVIDED WITH SEPARATE ROOM AIR AND OUTDOOR AIR DAMPERS.

THE ROOM AIR DAMPER SHALL BE TWO–PIECE, DOUBLE–WALL CONSTRUCTION FABRICATED FROM ALUMINUM, AND BE COUNTERBALANCED AGAINST BACKPRESSURE TO CLOSE BY GUSTS OF WIND PRESSURE, THEREBY PREVENTING OUTDOOR AIR FROM BLOWING DIRECTLY INTO THE ROOM.

THE OUTDOOR AIR DAMPER SHALL BE TWO PIECE, DOUBLE WALL CONSTRUCTION FABRICATED FROM GALVANIZED STEEL, WITH 1" THICK, 1½ LB. DENSITY GLASSFIBER INSULATION ENCAPSULATED BETWEEN THE WELDED BLADE HALVES FOR RIGIDITY AND TO INHIBIT CORROSION. THE OUTDOOR AIR DAMPER SHALL HAVE ADDITIONAL FOAM INSULATION ON THE EXTERIOR SURFACE DAMPER BLADE AND ON THE ENDS OF THE OUTDOOR AIR CHAMBER. A SINGLE BLADE DAMPER, WHICH CAN BE TWISTED AND WILL LEAK AIR, WILL NOT BE CONSIDERED.

DAMPERS SHALL BE FITTED WITH BLENDED MOHAIR SEALS ALONG ALL SEALING EDGES. PRESSURE ADHESIVE SPONGE NEOPRENE OR PLASTIC CLIP–ON BRUSH TYPE SEALERS FOR DAMPER SEALS ARE NOT ACCEPTABLE. RUBBER TYPE GASKET USING PRESSURE ADHESIVE FOR FASTENING TO METAL AND EXPOSED TO THE OUTSIDE AIR IS NOT ACCEPTABLE.

DAMPERS SHALL USE THE TURNED–METAL PRINCIPLE ON LONG CLOSING ENDS WITH NO METAL–TO–METAL CONTACT FOR PROPER SEALING.

THE DAMPER SHAFT SHALL BE MECHANICALLY FASTENED TO THE BLADE AND SHALL OPERATE IN BEARINGS MADE OF NYLON OR OTHER MATERIAL WHICH DOES NOT REQUIRE LUBRICATION.

J. FILTER

EACH UNIT VENTILATOR SHALL BE EQUIPPED WITH A ONE–PIECE FILTER LOCATED TO PROVIDE FILTRATION OF THE RETURN AIR/OUTDOOR AIR MIXTURE, IN LIEU OF SEPARATE FILTERS FOR EACH AIR STREAM. THE ENTIRE FILTER SURFACE MUST BE USEABLE FOR FILTRATION OF 100% ROOM AIR OR 100% OF OUTDOOR AIR. THE FILTER SHALL BE EASILY ACCESSIBLE FROM THE BOTTOM, AND REMOVABLE IN ONE PIECE WITHOUT REMOVAL OF THE UNIT RETURN AIR DAMPER STOP. THE UNIT SHALL SHIP WITH A FIELD INSTALLED 1" THICK MERV 13 FILTER.

MECHANICAL EQUIPMENT SPECIFICATIONS

L. CONTROL COMPONENTS

ALL UNIT CONTROLS SHALL BE BY THE CONTROLS CONTRACTOR.

CONDENSING UNIT

A. ACCEPTABLE MANUFACTURERS: DAIKIN, YORK, CARRIER, HITACHI

B. GENERAL REQUIREMENTS:

ALL UNITS SHALL BE LISTED AND RATED BY ANSI/AHRI STANDARD 1230–2010 AND MEET ALL MINIMUM IEER PERFORMANCE REQUIREMENTS AS SCHEDULED.

THE UNITS SHALL BE ANSI/UL STD 1995 LISTED AND LISTED BY ELECTRICAL TESTING LABS (ETL) AND BEAR THE CETL LABEL.

ALL WIRING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC).

THE SYSTEM WILL BE PRODUCED IN AN ISO 9001 AND ISO 14001 FACILITY, WHICH ARE STANDARDS SET BY THE INTERNATIONAL STANDARD ORGANIZATION (ISO). THE SYSTEM SHALL BE FACTORY TESTED FOR SAFETY AND FUNCTION.

THE SYSTEM AND THE DESIGN SHALL BE IN COMPLIANCE WITH CSA B52 MECHANICAL REFRIGERANT CODE.

VRF SYSTEM SHALL AUTOMATICALLY VARY THE TARGET EVAPORATING AND CONDENSING TEMPERATURES BASED ON BUILDING LOAD AND WEATHER CONDITIONS TO INCREASE PART LOAD EFFICIENCY (VARIABLE REFRIGERANT TEMPERATURE). THE CONDENSING UNIT SHALL ALSO FEATURE CUSTOMIZABLE OPERATING MODES WHICH ALLOWS FOR THE MANUAL SETTING OF TARGET EVAPORATING AND CONDENSING TEMPERATURES.

SYSTEM SHALL BE A TWO PIPE HEAT PUMP SWITCHOVER VRF SYSTEM. ALL INDOOR UNITS ON SINGLE REFRIGERANT CIRCUITS SHALL OPERATE IN THE SAME MODE (HEATING OR COOLING). THE SPECIFIED SYSTEM IS NOT A SIMULTANEOUS HEATING AND COOLING HEAT RECOVERY SYSTEM. REFER TO THE CONTROLS SECTION OF THIS SPECIFICATION FOR ANY CENTRAL CONTROLLER AND/OR MODE SWITCHOVER SEQUENCE THAT MAY BE REQUIRED.

INSTALLING CONTRACTOR MUST BE CERTIFIED BY VRF MANUFACTURER. THE BIDDERS SHALL BE REQUIRED TO SUBMIT TRAINING CERTIFICATION PROOF WITH BID DOCUMENTS AND SUBMITTAL DOCUMENTS.

THE MANUFACTURER SHALL PROVIDE A FACTORY TRAINED SERVICE TECHNICIAN TO START–UP EACH UNIT. MANUFACTURER SHALL PROVIDE INSTRUCTION TO THE OWNERS' PERSONNEL ON PROPER UNIT OPERATION AND MAINTENANCE.

THE WARRANTY PERIOD ON ALL PARTS AND COMPRESSORS SHALL COMMENCE ON THE DATE OF INITIAL START–UP AND SHALL CONTINUE FOR A PERIOD OF TEN (10) YEARS NOT TO EXCEED ONE HUNDRED AND TWENTY SIX (126) MONTHS FROM DATE OF SHIPMENT. PROPER MAINTENANCE OF THE EQUIPMENT SHALL BE CONDUCTED BY CERTIFIED TECHNICIANS AS PER THE MANUFACTURER OR MANUFACTURER'S REPRESENTATIVE REQUIREMENTS. MAINTENANCE LOGS SHALL BE SUPPLIED BY THE OWNER UPON REQUEST.

ALL MANUFACTURER WARRANTY SHALL BE FOR PARTS ONLY. ALL DIAGNOSIS AND LABOUR WARRANTY SHALL BE CARRIED OUT BY INSTALLING CONTRACTOR AS PER THE WARRANTY REQUIREMENTS OF THIS PROJECT.

C. REFRIGERANT PIPING:

REFER AND COMPLY WITH THE REFRIGERANT PIPING SPECIFICATIONS, INCLUDING THE SPECIAL CONSIDERATIONS FOR VRF REFRIGERANT PIPING SECTION.

STANDARD T STYLE JOINTS ARE NOT ACCEPTABLE FOR A VARIABLE REFRIGERANT VOLUME SYSTEM. MANUFACTURER SPECIFIC Y JOINTS SHALL BE SUPPLIED BY THE VRF MANUFACTURER.

D. CONDENSING UNITS:

THE CONDENSING UNIT SHALL BE FACTORY ASSEMBLED IN NORTH AMERICA AND PRE–WIRED WITH ALL NECESSARY ELECTRONIC AND REFRIGERANT CONTROLS. THE REFRIGERATION CIRCUIT OF THE CONDENSING UNIT SHALL CONSIST OF DAIKIN INVERTER SCROLL COMPRESSORS, MOTORS, FANS, HEAT EXCHANGER, ELECTRONIC EXPANSION VALVES, SOLENOID VALVES, 4–WAY VALVE, DISTRIBUTION HEADERS, CAPILLARIES, FILTERS, SHUT OFF VALVES, OIL SEPARATORS, SERVICE PORTS, LIQUID RECEIVER (HEAT RECOVERY ONLY) AND SUCTION ACCUMULATOR.

THE SYSTEM WILL AUTOMATICALLY RESTART OPERATION AFTER A POWER FAILURE AND WILL NOT CAUSE ANY SETTINGS TO BE LOST.

THE UNIT SHALL INCORPORATE AN AUTO–CHARGING FEATURE TO ENSURE PROPER REFRIGERANT CHARGE.

THE FOLLOWING SAFETY DEVICES SHALL BE INCLUDED ON THE CONDENSING UNIT: HIGH PRESSURE SENSOR AND SWITCH, LOW PRESSURE SENSOR, CONTROL CIRCUIT FUSES, CRANKCASE HEATERS, FUSIBLE PLUG, OVERLOAD RELAY, INVERTER OVERLOAD PROTECTOR, THERMAL PROTECTORS FOR COMPRESSOR AND FAN MOTORS, OVER CURRENT PROTECTION FOR THE INVERTER, AND ANTI–RECYCLING TIMERS.

THE DAIKIN INVERTER SCROLL COMPRESSORS SHALL BE HIGH EFFICIENCY RELUCTANCE DC (DIGITALLY COMMUTATING), HERMETICALLY SEALED, VARIABLE SPEED TYPE. TEMPERATURES AND PRESSURES SHALL BE READ EVERY 20 SECONDS AND CALCULATED. WITH EACH READING, THE COMPRESSOR CAPACITY (INV FREQUENCY) SHALL BE CONTROLLED TO ELIMINATE DEVIATION FROM TARGET VALUE. NON INVERTER–DRIVEN COMPRESSORS SHALL NOT BE ACCEPTED.

NEODYMIUM MAGNETS SHALL BE ADOPTED IN THE ROTOR CONSTRUCTION TO YIELD A HIGHER TORQUE AND EFFICIENCY IN THE COMPRESSOR INSTEAD OF THE NORMAL FERRITE MAGNET TYPE. UPON COMPLETE STOP OF THE COMPRESSOR, THE NEODYMIUM MAGNETS WILL POSITION THE ROTOR INTO THE OPTIMUM POSITION FOR A LOW TORQUE START.

THE COMPRESSORS' MOTORS SHALL HAVE A COOLING SYSTEM USING DISCHARGE GAS, TO AVOID SUDDEN CHANGES IN TEMPERATURE RESULTING IN SIGNIFICANT STRESSES ON WINDING AND BEARINGS.

INVERTER BOARD SHALL BE REFRIGERANT COOLED TO PREVENT INEFFICIENT AND UNSTABLE OPERATION THAT CAN RESULT FROM AIR–COOLED INVERTER BOARDS DUE TO VARYING AMBIENT CONDITIONS.

THE COMPRESSOR SHALL BE INTERNALLY ISOLATED TO AVOID THE TRANSMISSION OF VIBRATION.

IN THE CASE OF MULTIPLE CONDENSER MODULES, OPERATION HOURS OF THE COMPRESSORS SHALL BE BALANCED BY MEANS OF THE DUTY CYCLING FUNCTION.

E. AIR–COOLED:

THE VARIABLE SPEED INVERTER COMPRESSORS IN AIR–COOLED SYSTEMS SHALL ALSO USE FLASH VAPOR INJECTION TECHNOLOGY WITH BACK PRESSURE CONTROL FOR REDUCED LEAKAGE AND ADDITIONAL BALANCING WEIGHTS ON MAIN SHAFT FOR INCREASED FOR INCREASED COMPRESSOR LIFETIME.

THE FAN MOTOR SHALL HAVE INHERENT PROTECTION AND PERMANENTLY LUBRICATED BEARINGS. THE MOTOR SHALL BE PROVIDED WITH A FAN GUARD TO PREVENT CONTACT WITH MOVING PARTS. THE CONDENSING UNIT SHALL CONSIST OF ONE OR MORE PROPELLER TYPE, DIRECT–DRIVE 600 W FAN MOTORS THAT HAVE MULTIPLE SPEED OPERATION VIA A DC (DIGITALLY COMMUTATING) INVERTER.

MOTORS SHALL BE CAPABLE OF DELIVERING DESIGN AIR AT HIGH EXTERNAL STATIC PRESSURES UP TO 0.32 IN WG (FACTORY SET AS STANDARD AT 0.12 IN. WG) TO ACCOMMODATE FIELD APPLIED CONDENSING UNIT DISCHARGE DUCTWORK.

THE CONDENSING UNIT SHALL HAVE CONFIGURABLE SETTINGS FOR INTERMITTENT FAN OPERATION TO HELP MINIMIZE SNOW ACCUMULATION ON FAN BLADES WHEN THE SYSTEM IS OFF.

NIGHT SETBACK CONTROL FOR LOW NOISE OPERATION SHALL AUTOMATICALLY LIMIT THE MAXIMUM SPEED OF THE FAN MOTOR.

THE HEAT EXCHANGER ON THE CONDENSING UNITS SHALL BE

MECHANICAL EQUIPMENT SPECIFICATIONS

MANUFACTURED FROM HI–X SEAMLESS COPPER TUBES WITH N–SHAPE INTERNAL GROOVES MECHANICALLY BONDED ON TO ALUMINUM FINS TO AN E–PASS DESIGN. THE HEAT EXCHANGER COIL SHALL BE OF A WAFFLE LOUVER FIN AND RIFLED BORE TUBE DESIGN TO ENSURE HIGH EFFICIENCY PERFORMANCE.

THE FINS ARE TO BE COVERED WITH AN ANTI–CORROSION HYDROPHILIC BLUE COATING AS STANDARD WITH A SALT SPRAY TEST RATING OF 1000HR (ASTM B117 & BLISTER RATING:10), ACETIC ACID SALT SPRAY TEST OF 500HR (ASTM G85 & BLISTER RATING:10).

THE CONNECTION RATIO OF INDOOR UNITS TO CONDENSING UNIT SHALL BE PERMITTED AND OPTIMIZED FOR OPERATION UP TO 200% OF NOMINAL CAPACITY.

THE OUTDOOR UNIT SHALL BE CAPABLE OF HEATING OPERATION DOWN TO –4°F AMBIENT TEMPERATURE. TESTED FACTORY DATA ON HEATING CAPACITY AND EFFICIENCY SHALL BE AVAILABLE.

THE OUTDOOR UNIT SHALL BE CAPABLE OF COOLING OPERATION DOWN TO +23°F WITHOUT ANY ADDITIONAL LOW AMBIENT CONTROLS.

THE LOWER PART OF THE OUTDOOR COIL SHALL BE USED FOR INVERTER COOLING, ENHANCING DEFROST DURING HEATING OPERATION.

F. BACNET GATEWAY:

PROVIDE A SEPARATE CONTROL MODULE TO ALLOW FULL INTEGRATION WITH A BACNET IP OR LONWORKS COMPATIBLE BMS.

BACNET GATEWAY SHALL BE WIRED, INSTALLED AND POWERED (24VAC) BY INSTALLING CONTRACTOR. IP CONNECTION SHALL BE BY BMS CONTRACTOR.

VRF MANUFACTURER SHALL COMMISSION THE BACNET GATEWAY. BMS CONTRACTOR SHALL PROVIDE VRF MANUFACTURER WITH STATIC IP ADDRESS AND INSTANCE NUMBER FOR COMMISSIONING.

G. ELECTRICAL:

UNLESS LIMITED BY LOCAL ELECTRICAL CODES AND STANDARDS, MULTIPLE FAN COILS AND BRANCH SELECTOR BOXES CAN BE CONNECTED TO THE SAME BREAKER. FIELD PROVIDED INDIVIDUAL DISCONNECT SWITCHES FOR EACH FAN COIL ARE REQUIRED.

ELECTRICAL POWER FOR CONDENSING UNITS SHALL BE 575 VOLTS, 3 PHASE, 60 HERTZ.

THE CONTROL VOLTAGE BETWEEN THE INDOOR AND OUTDOOR UNIT SHALL BE 16VDC. THE CONTROL WIRING SHALL BE COMMUNICATION TYPE STRANDED NON–SHIELDED 18–2 AWG.

CONTROL WIRING SHALL BE INSTALLED IN A DAISY CHAIN CONFIGURATION BETWEEN ALL VRF COMPONENTS AS PER MANUFACTURER.

H. INSTALLATION:

I NSTALL CONDENSING UNITS ON A FLAT SURFACE LEVEL WITHIN 1/8 INCH AND ELEVATED A MINIMUM OF 18" FROM GROUND OR ROOF SURFACE. PROVIDE INTERMEDIATE SUPPORTS AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.

PROVIDE ALL NECESSARY CONTROL WIRING AS RECOMMENDED BY THE MANUFACTURER.

HIGH/LOW PRESSURE GAS LINE, LIQUID, AND SUCTION LINES MUST BE INDIVIDUALLY INSULATED BETWEEN THE OUTDOOR AND INDOOR UNITS.

CONTACT MANUFACTURER PRIOR TO INSTALLATION TO REVIEW AND CONFIRM PIPING LAYOUT AND LENGTHS.

USE REFRIGERATION BEST PRACTICE TO ALLOW PIPES TO EXPAND AND CONTRACT FREELY. REVIEW MANUFACTURER INSTALLATION INSTRUCTIONS TO ENSURE EXPANSION JOINTS ARE PROPERLY DESIGNED.

PRESSURE TEST ALL SYSTEMS TO 550 PSI AFTER SYSTEM WAS VACUUMED AND HELD TO BELOW 500 MICRONS FOR AT LEAST ONE HOUR. REVIEW MANUFACTURER INSTALLATION INSTRUCTIONS FOR PROPER PRESSURE TEST PROCEDURES.

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Key Plan N.T.S.

Project North

True North

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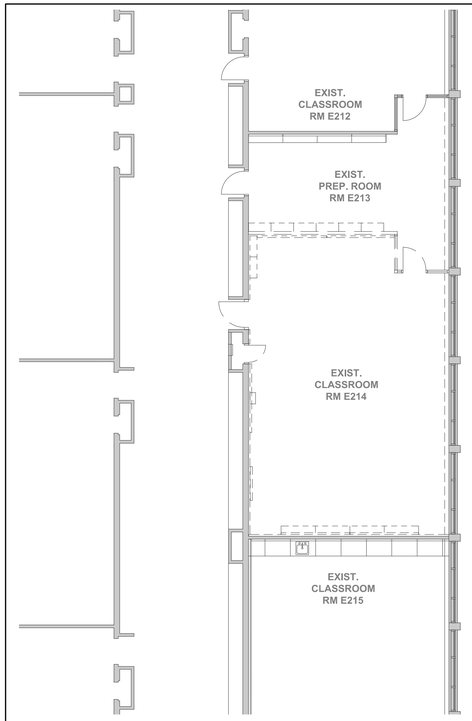
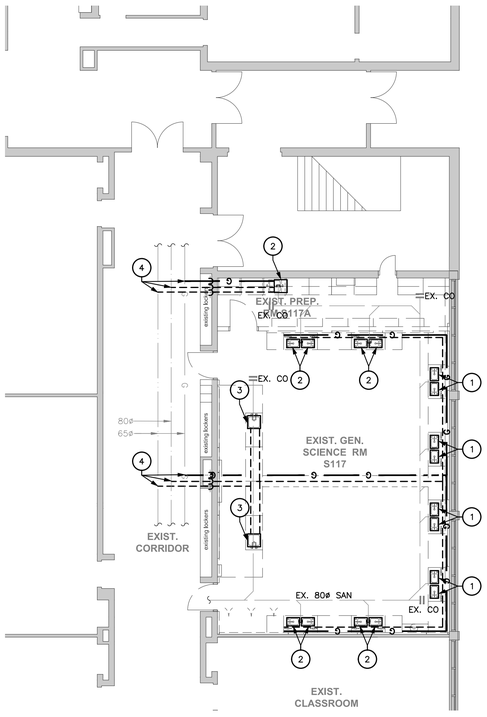


3 M100 AREA 3 - DEMOLITION PLUMBING & DRAINAGE

1:100

DRAWING NOTES

1 –



2 M100 AREA 2 - DEMOLITION PLUMBING & DRAINAGE

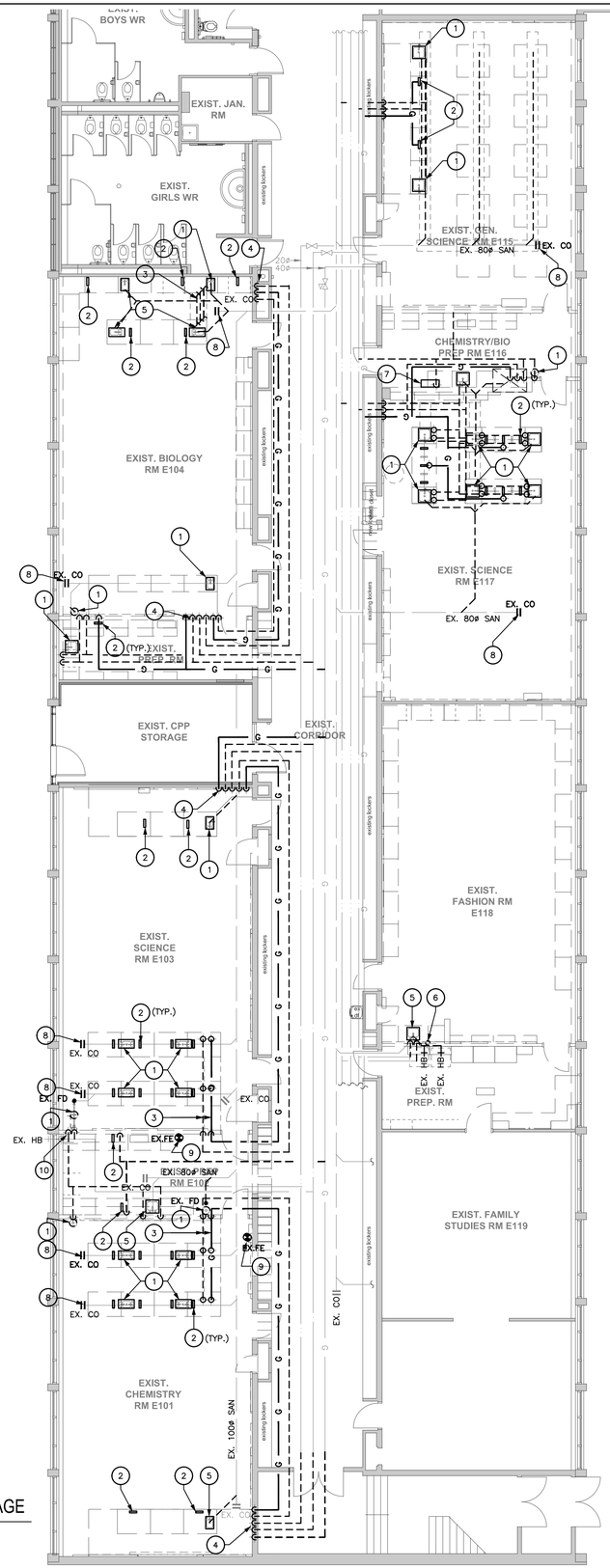
1:100

DRAWING NOTES

1. EXISTING SINK SHALL BE REMOVED AND DISPOSED OF. DEMOLISH ASSOCIATED PLUMBING PIPING. SANITARY CONNECTION TO BE CUT BACK TO A STUB TO BE RE–USED FOR NEW SINK. DEMOLISH ADJACENT COUNTER–MOUNTED GAS TURRETS AND ALL ASSOCIATED GAS PIPING AS INDICATED.
2. EXISTING SINK SHALL BE REMOVED AND DISPOSED OF. DEMOLISH ASSOCIATED PLUMBING PIPING. SANITARY CONNECTION SHALL BE DEMOLISHED TO HORIZONTAL SECTION BELOW FLOOR LEVEL AND CAPPED. DEMOLISH ADJACENT COUNTER–MOUNTED GAS TURRETS AND ALL ASSOCIATED GAS PIPING AS INDICATED.
3. EXISTING SINK SHALL BE REMOVED AND DISPOSED OF. DEMOLISH ASSOCIATED PLUMBING PIPING. SANITARY CONNECTION SHALL BE DEMOLISHED TO HORIZONTAL SECTION BELOW FLOOR LEVEL AND CAPPED.
4. DEMOLISH PIPING BACK TO MAINS IN HALLWAY AND CAP AT EXISTING TEE. CONTRACTOR SHALL ALLOW FOR PIPE FREEZING FOR DOMESTIC WATER PIPES.

DRAWING NOTES

1. EXISTING PLUMBING FIXTURE SHALL BE REMOVED & DISPOSED OF. DEMOLISH ASSOCIATED PLUMBING, VENT, & DRAINAGE PIPING.
2. EXISTING GAS TURRET SHALL BE REMOVED & DISPOSED OF. ASSOCIATED GAS PIPING WITHIN MILLWORK SHALL BE DEMOLISHED.
3. EXISTING PIPING WITHIN TRENCH (GAS & DOMESTIC WATER) SERVING MILLWORK SHALL BE REMOVED & DISPOSED OF.
4. EXISTING PIPE DROPS SERVING INSTRUCTOR STATION, ALL PIPE RUNS FROM PIPE DROPS TO/FROM INSTRUCTOR STATION MILLWORK AND ASSOCIATED VALVES/CONTROL DEVICES SHALL BE REMOVED & DISPOSED OF.
5. EXISTING SINK SHALL BE REMOVED & DISPOSED OF. DEMOLISH ASSOCIATED DOMESTIC WATER PIPING. ASSOCIATED SANITARY PIPING SHALL BE DEMOLISHED TO BELOW–FLOOR LEVEL AND CAPPED.
6. EXISTING VENT PIPING WTIHIN WALL SERVING EXISTING SINK AND DRINKING FOUNTAIN SHALL BE DEMOLISHED AS REQUIRED TO ALLOW DEMOLITION OF WALL. PROVIDE NEW VENT PIPING FOR EXISTING DRINKING FOUNTAIN AS REQUIRED AND CONNECT TO NEAREST VENT PIPING.
7. REMOVE AND DISPOSE OF EXISTING UNDERCOUNTER CHEMICAL DISPENSER AND WATER SOFTENER. REMOVE AND DISPOSE OF ALL ASSOCIATED PIPING.
8. REMOVE AND DISPOSE OF EXISTING FLOOR CLEANOUT, CUT PIPING BACK TO BELOW–FLOOR LEVEL & CAP.
9. EXISTING FIRE EXTINGUISHER & MOUNT SHALL BE REMOVED & DISPOSED OF
10. EXISTING THERMOSTATIC MIXING VALVE & TEMPERED LINE SERVING EYEWASH SHALL BE REMOVED & DISPOSED OF.



1 M100 AREA 1 - DEMOLITION PLUMBING & DRAINAGE

1:100

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Key Plan N.T.S.

Project North True North

No.	Revisions	Date
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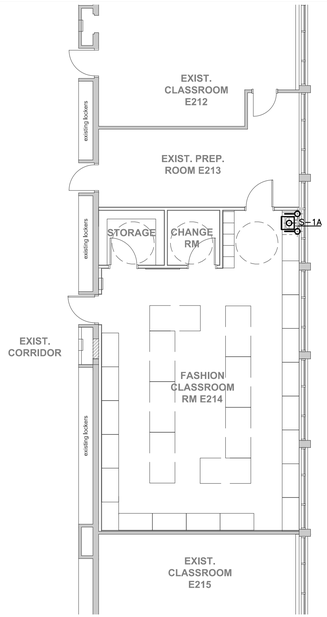
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
DEMOLITION PLUMBING & DRAINAGE PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M100



3 M101 — AREA 3 - PROPOSED PLUMBING & DRAINAGE (LEVEL 1)

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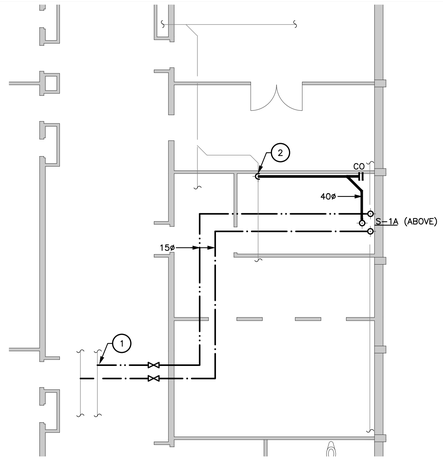


4 M101 — AREA 3 (FLOOR BELOW) - PROPOSED P&D

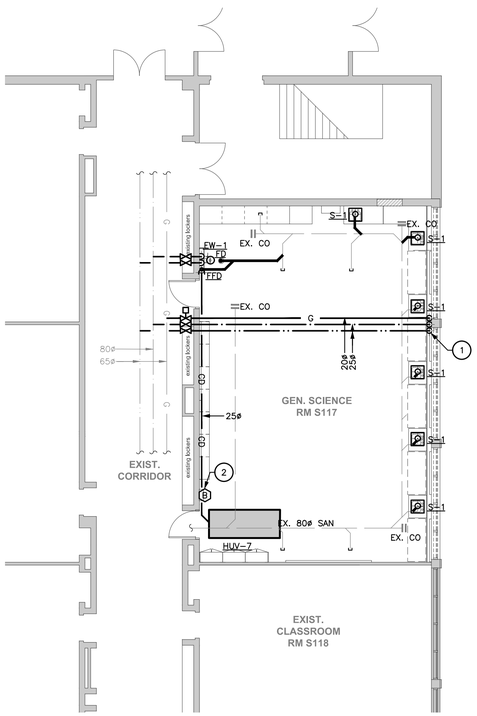
1:100

DRAWING NOTES

1. CONNECT TO EXISTING MAINS IN CORRIDOR. VERIFY EXACT LOCATIONS ON SITE.
2. DROP ABOVE GROUND SANITARY SERVING NEW SINK TO BURIED IN INDICATED LOCATION AND CONNECT TO EXISTING BURIED SANITARY LINE C/W STACK CLEANOUT. LOCATE EXACT EXISTING SANITARY LINE LOCATION BEFORE EXECUTING THIS WORK. REPORT TO ENGINEER OF ANY CONCERNS. NEW SINK SHALL BE VENTED TO NEAREST EX. PLUMBING VENT ON THIS FLOOR.
3. APPLY INSULATION TO EXISTING PIPE UNDERGOING ABATEMENT. COORDINATE WITH DEMOLITION CONTRACTOR FOR FULL EXTENT OF REINSULATION.

DRAWING NOTES

1. ABOVE GROUND SANITARY PIPING FROM PLUMBING FIXTURES SHALL BE CONCEALED WITHIN ARCHITECTURAL KNEE WALL AND MILLWORK. CONNECT TO SURFACE-MOUNTED ACID NEUTRALIZING TANK, THEN DROP TO BURIED AS INDICATED. ALL PIPING UPSTREAM OF NEUTRALIZATION TANK SHALL BE ACID RESISTANT PVC, REFER TO SPECIFICATIONS.
2. DROP CONCEALED GAS, DCW, & DHW PIPING DOWN TO ARCHITECTURAL KNEE WALL AND DISTRIBUTE TO ALL PLUMBING FIXTURES & GAS TURRETS. REFER TO MECHANICAL DETAILS.
3. LOCATION OF NATURAL GAS SHUTOFF BUTTON. INSTALL IN GENERAL CONTRACTOR SUPPLIED AND INSTALLED MILLWORK/MODULAR CONTROL PANEL. REFER TO ELECTRICAL DRAWING E301 AND COORDINATE EXACT LOCATION WITH GENERAL CONTRACTOR
4. LOCATION OF FUME HOOD DRAIN, INSTALL PIPING ABOVE GRADE IN FUME HOOD CABINET C/W ACID RESISTANT P-TRAP, PENETRATE THROUGH FUME HOOD SIDEWALL TO MILLWORK AND CONNECT TO PIPING UPSTREAM OF ACID NEUTRALIZATION TANK.
5. CONNECT 15ø DCW AND GAS TO NEW FUME HOOD (SUPPLIED & INSTALLED BY GENERAL DIVISION) AS PER MANUFACTURER'S INSTRUCTIONS. PIPING SHALL BE CONCEALED.
6. DROP 15ø DCW & DHW PIPING CONCEALED WITHIN WALL. CONNECT TO SINK IN PREP ROOM E102 CONCEALED WITHIN MILLWORK.
7. NEW FUNNEL FLOOR DRAIN TO BE INSTALLED CONCEALED IN MILLWORK C/W TRAP SEAL PRIMER, PROVIDE SLOPED 25ø GRAVITY CONDENSATE PIPING FROM EACH UNIT VENTILATOR IN THE SAME ROOM TO TERMINATE AT DRAIN WITH 25mm AIR GAP. CONDENSATE PIPE DROPS SHALL BE CONCEALED IN WALL OR WITH CUSTOM STEEL PIPE CHASE PAINTED TO MATCH WALL. REFER TO HVAC DRAWINGS FOR HUV LOCATIONS.
8. PROVIDE AND INSTALL ONE (1) DEIONIZING FILTER CARTRIDGE SYSTEM SERVING SINK S-1. DEIONIZING FILTER CARTRIDGE SHALL BE PURE AQUA MODEL #RCD-20BB AND INSTALLED ON DCW BRANCH PIPE UPSTREAM OF SINK AND WITHIN MILLWORK.



2 M101 — AREA 2 - PROPOSED PLUMBING & DRAINAGE

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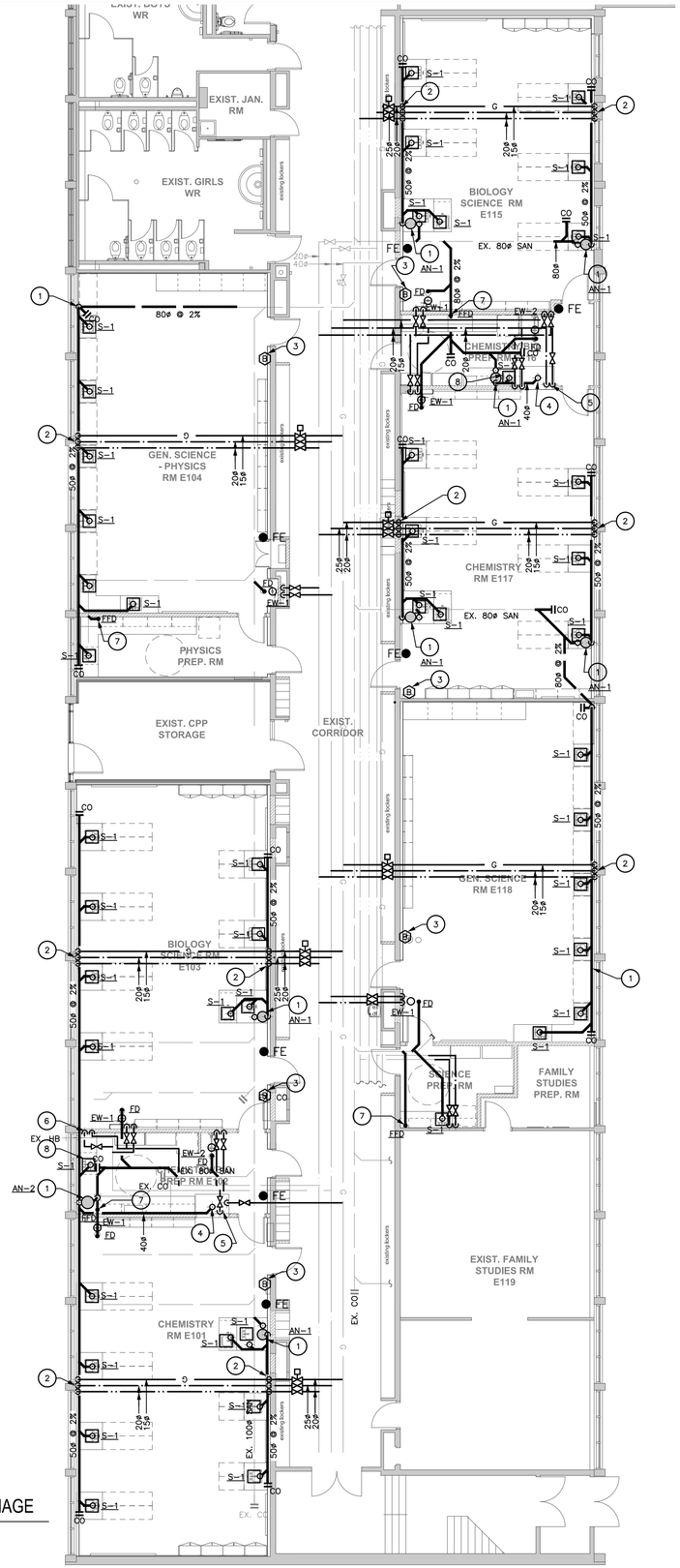
DRAWING NOTES

1. DROP CONCEALED GAS, DCW, & DHW PIPING DOWN TO ARCHITECTURAL KNEE WALL AND DISTRIBUTE TO ALL PLUMBING FIXTURES & GAS TURRETS. REFER TO MECHANICAL DETAILS.
2. LOCATION OF NATURAL GAS SHUTOFF BUTTON TO BE INSTALLED WITHIN MODULAR CONTROL PANEL (SEE ELECTRICAL DRAWINGS). WIRE TO NORMALLY OPEN SOLENOID VALVE IN CORRIDOR. REFER TO MECHANICAL SPECIFICATIONS.



1 M101 — AREA 1 - PROPOSED PLUMBING & DRAINAGE

1:100

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Key Plan N.T.S.

Project North | True North

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6.	Issued for Construction	2024 05 23
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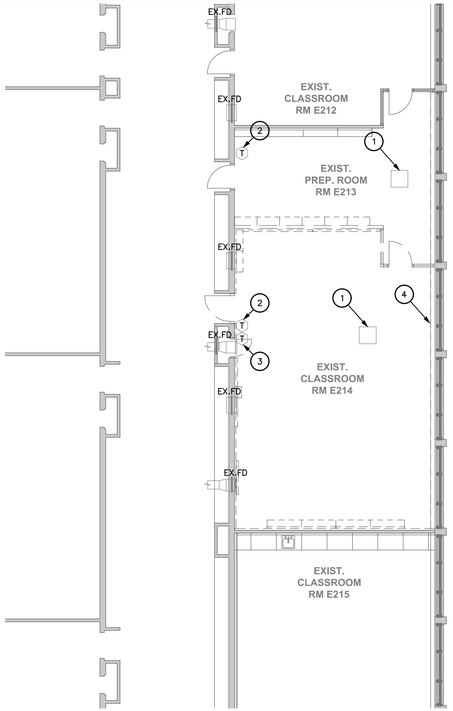
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
PROPOSED PLUMBING & DRAINAGE PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M101

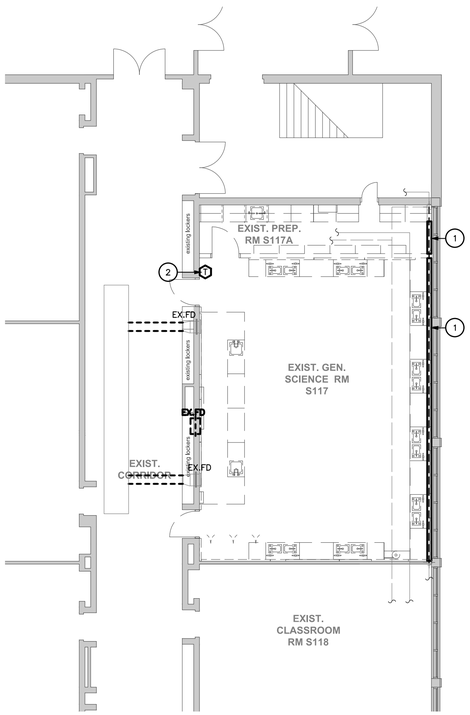


3 M200 AREA 3 - DEMOLITION HVAC

1:100

DRAWING NOTES

1. EXISTING CASSETTE VRF UNIT TO REMAIN AND BE RE-USED. TEMPORARILY REMOVE AND REINSTALL AS REQUIRED TO FACILITATE OTHER WORK IN THE AREA. COORDINATE WITH GENERAL DIVISION.
2. EXISTING T-STAT SERVING VRF CASSETTE UNIT SHALL BE TEMPORARILY REMOVED AND REINSTALLED TO FACILITATE ARCHITECTURAL WORK, PROVIDE NEW/MODIFY CONTROLS WIRING AS REQUIRED. REINSTALL AT 900mm A.F.F.
3. EXISTING PNEUMATIC T-STAT SERVING RADIATOR SHALL BE TEMPORARILY REMOVED AND REINSTALLED TO FACILITATE ARCHITECTURAL WORK, PROVIDE NEW/MODIFY CONTROLS TUBING AS REQUIRED. REINSTALL AT 900mm A.F.F.
4. EXISTING RADIATOR (FED FROM FLOOR BELOW) TO REMAIN AND BE RE-USED.



2 M200 AREA 2 - DEMOLITION HVAC

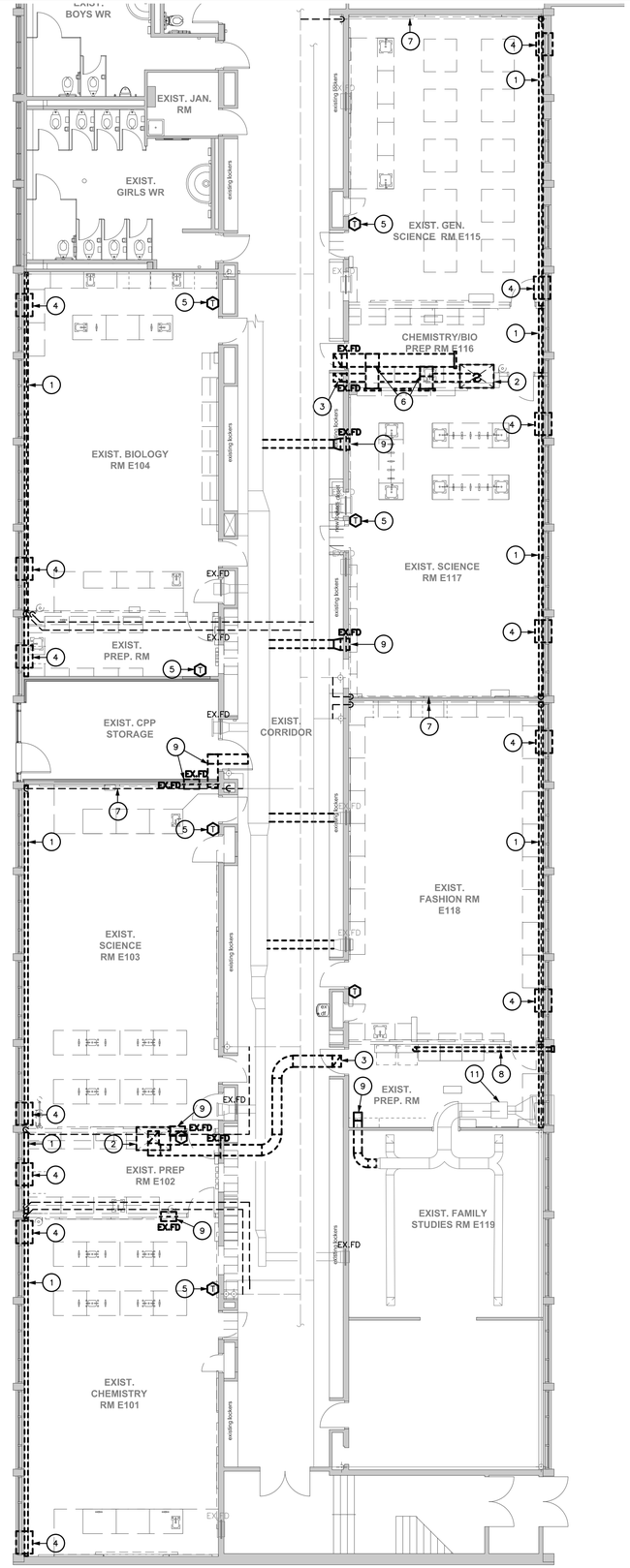
1:100

DRAWING NOTES

1. EXISTING RADIATOR AND ASSOCIATED PIPING/VALVES SHALL BE REMOVED AND DISPOSED OF. PIPING SHALL BE DEMOLISHED BACK TO PIPE DROPS IN WALLS AS INDICATED AND CAPPED TO ALLOW ADJACENT ROOM RADIATORS TO CONTINUE OPERATION.
2. EXISTING THERMOSTAT AND ASSOCIATED CONTROLS WIRING SHALL BE REMOVED AND DISPOSED OF.

DRAWING NOTES

1. EXISTING WALL RADIATOR AND ASSOCIATED PIPING/CONTROLS SHALL BE REMOVED AND DISPOSED OF. DEMOLISH ALL ASSOCIATED PIPING BACK TO CORRIDOR AND CAP AT MAIN. VERIFY ON SITE, REPORT TO ENGINEER OF ANY CONCERNS.
2. EXISTING FUME HOOD AND ASSOCIATED CONTROL DEVICES SHALL BE DISCONNECTED. REMOVAL & DISPOSAL SHALL BE BY DEMOLITION & ABATEMENT CONTRACTOR.
3. REMOVE AND DISPOSE OF FUME HOOD DUCTWORK WHICH CONTINUES UP TO ROOF. ASSOCIATED ROOF-MOUNTED EXHAUST FAN SHALL BE REMOVED AND DISPOSED OF. VERIFY ON SITE, REPORT TO ENGINEER OF ANY CONCERNS.
4. EXISTING WALL-MOUNTED PROPELLER EXHAUST FAN SHALL BE REMOVED & DISPOSED OF.
5. EXISTING THERMOSTAT AND ASSOCIATED CONTROLS WIRING SHALL BE REMOVED & DISPOSED OF.
6. REMOVE AND DISPOSE OF EXISTING CONTROL DAMPERS/ACTUATORS AND ASSOCIATED WIRING.
7. EXISTING BURIED HYDRONIC PIPING SHALL BE ABANDONDED IN PLACE. DEMOLISH PIPE RISES/DROPS TO FLUSH WITH GRADE LEVEL & COVER TO MATCH EXISTING FLOOR.
8. EXISTING DRYER VENT AND ASSOCIATED WALLBOX SHALL BE REMOVED AND DISPOSED OF.
9. DEMOLISH EXISTING DUCT WORK TO EXTENT INDICATED. CAP AND SEAL DUCT AT MAIN TRUNK
10. DEMOLISH EXISTING DUCT WORK TO EXTENT INDICATED. DUCT CONTINUES UP TO FLOOR ABOVE. CAP AND SEAL DUCT IN CEILING SPACE OF THIS LEVEL.
11. EXISTING CEILING HUNG EXHAUST FAN TO REMAIN.



1 M200 AREA 1 - DEMOLITION HVAC

1:100

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Project North True North

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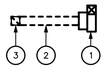
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 01
No.	Issue	Date

Drawing Title:
DEMOLITION HVAC PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M200

DRAWING NOTES

1. EXISTING ROOFTOP UTILITY SET FAN TO BE DEMOLISHED AND REMOVED FROM SITE.
2. DEMOLISH AND REMOVE FROM SITE EXISTING FUME EXHAUST DUCT SERVING EXISTING FUME HOOD.
3. EXHAUST DUCT CONTINUES DOWN TO BELOW REFER TO DEMOLITION HVAC PLAN.



EX. CONDENSING UNITS

EX. EF

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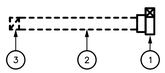

1 / M201 AREA 1 - DEMOLTION ROOF HVAC

1:100

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Drawing Title:
DEMOLITION HVAC ROOF PLAN

Scale:	AS NOTED	Date:	02/01/2024
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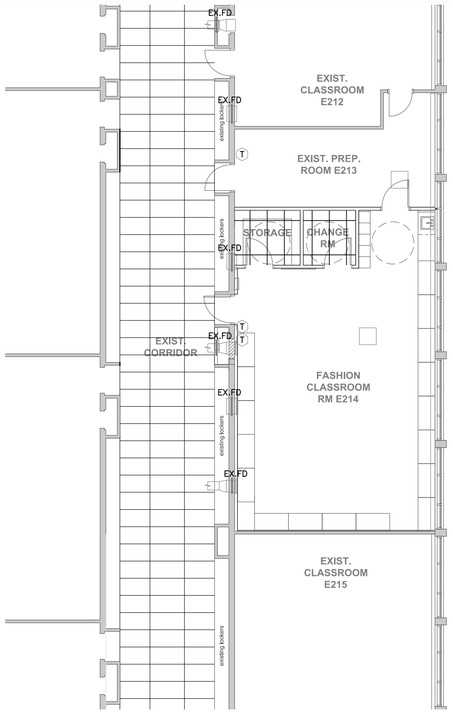
Job No.	2215B	Drawing No.	M201



3 M201 AREA 3 - PROPOSED HVAC

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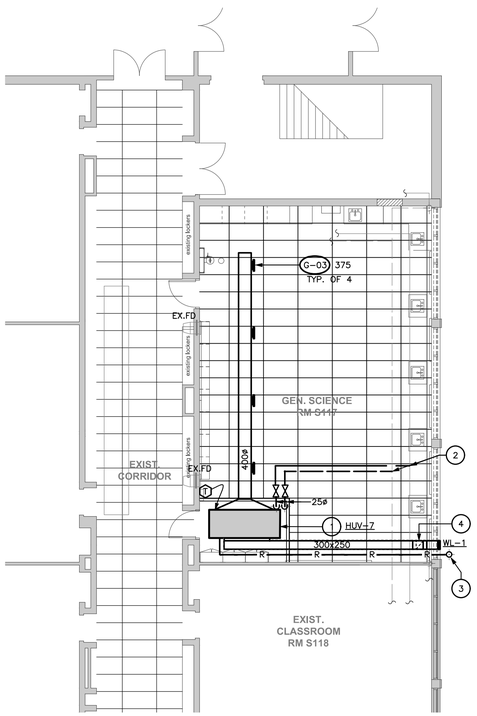
DRAWING NOTES

1 -



2 M201 AREA 2 - PROPOSED HVAC

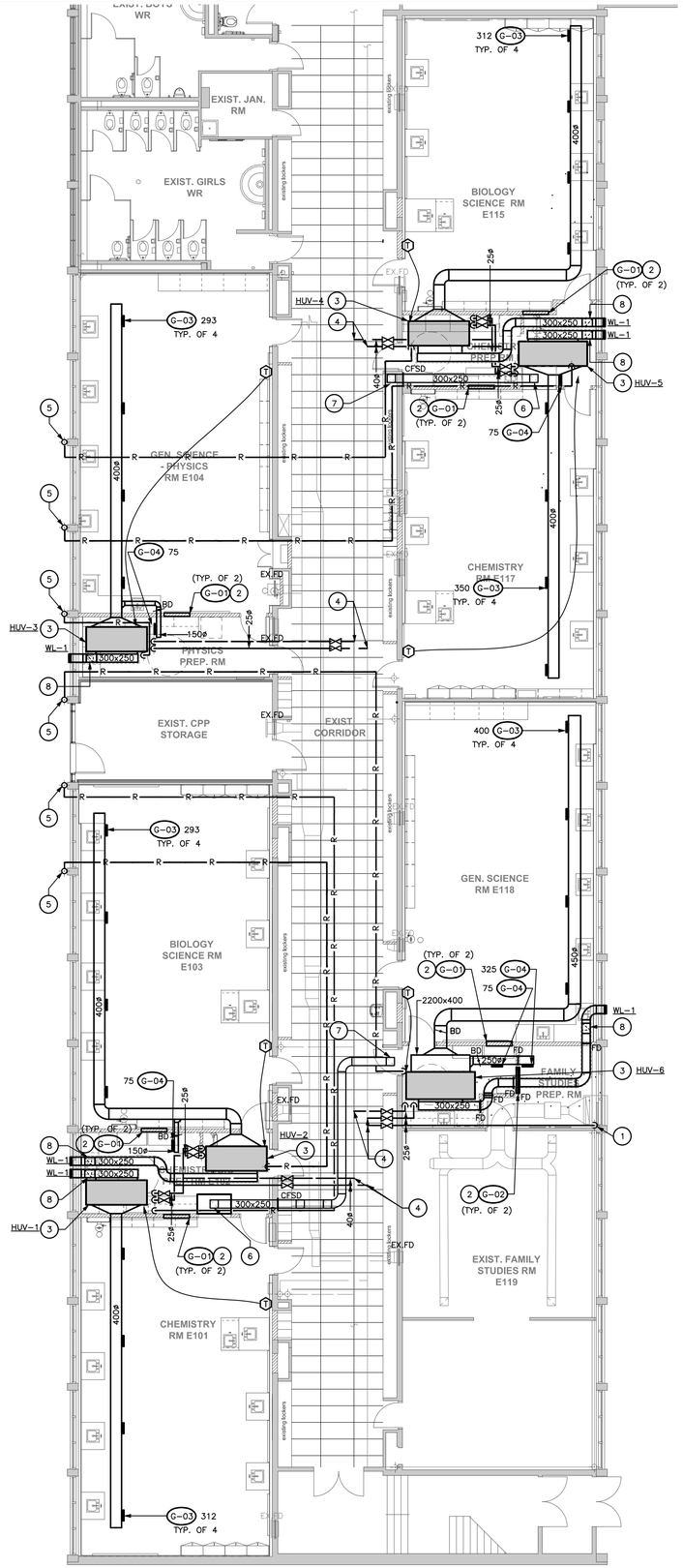
1:100

DRAWING NOTES

1. INSTALL NEW HORIZONTAL UNIT VENTILATOR HUNG FROM HIGH LEVEL AS PER MANUFACTURERS RECOMMENDATIONS. CONNECT HOT WATER SUPPLY AND RETURN PIPING TO HEATING COIL. DUCTWORK TO RUN BELOW CEILING.
2. CONNECT TO EXISTING HEATING PIPING IN APPROX. LOCATION, VERIFY ON SITE.
3. RISE REFRIGERANT PIPE UP TO ROOF ABOVE. KEEP PIPE TIGHT ALONG SIZE WALL. COORDINATE PIPE SIZING WITH EQUIPMENT MANUFACTURER.
4. DROP OUTDOOR AIR DUCT DOWN TO CONNECT TO WEATHER LOUVRE WL-1 LOCATED IN INSULATED WINDOW PANEL. USE SHORT-RADIUS ELBOWS IF REQUIRED.

DRAWING NOTES

1. DROP PIPE AND CONNECT TO EXISTING PIPE DROP TO BELOW GRADE TO SERVE E119 RADIATOR. PIPE DROP SHALL BE CONCEALED.
2. PROVIDE TWO GRILLES BACK-TO-BACK WITHIN WALL FOR RELIEF-AIR TRANSFER AT HIGH LEVEL.
3. INSTALL NEW HORIZONTAL UNIT VENTILATOR HUNG FROM HIGH LEVEL AS PER MANUFACTURERS RECOMMENDATIONS. CONNECT HOT WATER SUPPLY AND RETURN PIPING TO HEATING COIL.
4. CONNECT TO EXISTING HEATING PIPING.
5. RISE REFRIGERANT PIPING (SUCTION & LIQUID FOR EACH CIRCUIT/HUV) UP TO ROOF ABOVE. KEEP PIPE TIGHT ALONG EXTERIOR COLUMN. COORDINATE PIPE SIZING WITH EQUIPMENT MANUFACTURER.
6. CONNECT DUCT TO NEW DOUBLE SIDED FUME HOOD BELOW.
7. FUME HOOD EXHAUST DUCT CONTINUES UP TO NEW EXHAUST FAN ON ROOF ABOVE. EXISTING DUCT SHAFT TO BE REUSED, REPORT TO ENGINEER OF ANY CONCERNS.
8. DROP OUTDOOR AIR DUCT DOWN TO CONNECT TO WEATHER LOUVRE WL-1 LOCATED IN INSULATED WINDOW PANEL. USE SHORT-RADIUS ELBOWS IF REQUIRED.



1 M201 AREA 1 - PROPOSED HVAC

1:100

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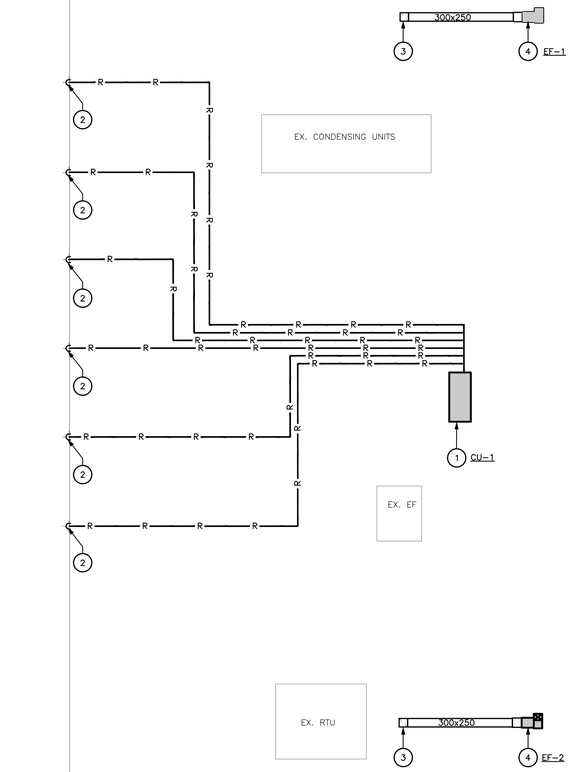
No.	Issue	Date

Drawing Title:
PROPOSED HVAC PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M202

DRAWING NOTES

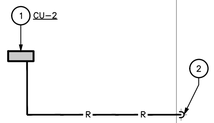
1. INSTALL NEW CONDENSER UNIT AS PER MANUFACTURERS INSTRUCTIONS. INSTALL REFRIGERANT PIPING TO ASSOCIATED EVAPORATOR. REFER TO STRUCTURAL & ARCHITECTURAL DRAWINGS FOR EXACT LOCATION.
2. DROP REFRIGERANT PIPING (SUCTION & LIQUID FOR EACH CIRCUIT) DOWN TO BELOW EXPOSED TIGHT AGAINST EXTERIOR COLUMN. COORDINATE PIPE SIZING WITH EQUIPMENT MANUFACTURER.
3. FUME EXHAUST DUCT DOWN TO NEW FUME HOOD BELOW. EXISTING ROOF PENETRATION TO BE RE-USED, PROVIDE NEW FLASHING.
4. INSTALL NEW UTILITY EXHAUST FAN COMPLETE WITH FUME EXHAUST STACK. INSTALL AS PER MANUFACTURERS INSTRUCTIONS.



1 M201 AREA 1 - ROOFTOP HVAC
1:100

DRAWING NOTES

1. INSTALL NEW CONDENSER UNIT AS PER MANUFACTURERS INSTRUCTIONS. INSTALL REFRIGERANT PIPING TO ASSOCIATED EVAPORATOR. REFER TO STRUCTURAL & ARCHITECTURAL DRAWINGS FOR EXACT LOCATION.
2. DROP REFRIGERANT PIPING (SUCTION & LIQUID) DOWN TO BELOW EXPOSED TIGHT AGAINST EXTERIOR WALL. COORDINATE PIPE SIZING WITH EQUIPMENT MANUFACTURER.



2 M201 AREA 2 - ROOFTOP HVAC
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Key Plan N.T.S.

Project North True North

No.	Revisions	Date
5.	Issued for Construction	2024 05 23
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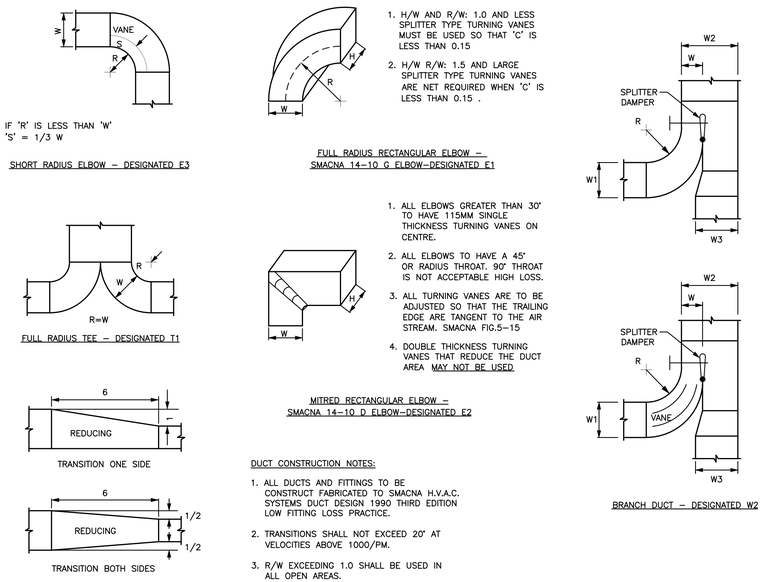
3.	Issued for Bids	2024 04 09
2.	Issued for Permit	2024 03 21
1.	Issued for Progress	2024 03 01
No.	Issue	Date

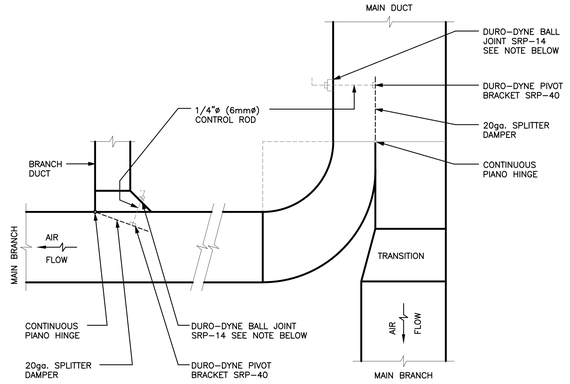
Drawing Title:
PROPOSED HVAC ROOF PLAN

Scale:	AS NOTED	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M203



SQUARE, RADIUS ELBOW AND TRANSITION FITTINGS

N.T.S.



NOTE:

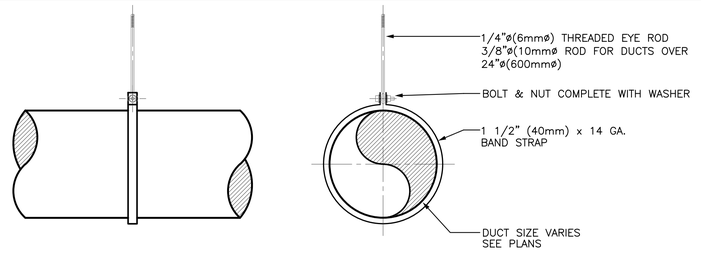
A. DUCT DEPTH UP TO 24"(600mm) 1 CONTROL ROD AND BALL JOINT REQUIRED

B. DUCT DEPTH OVER 24"(600mm) 2 CONTROL ROD AND BALL JOINTS REQUIRED

HARDWARE SHOWN IS DURO–DYNE (SEE SPECIFICATIONS FOR ALTERNATIVES)

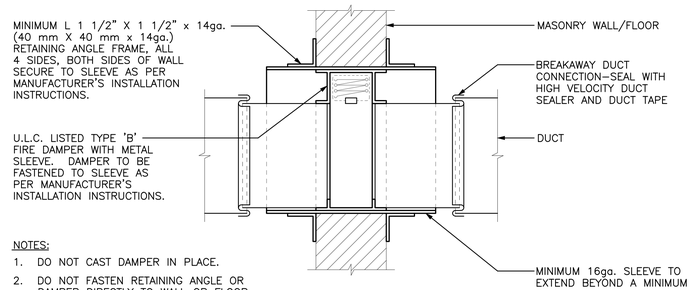
TYPICAL DUCT CONNECTION

N.T.S.



DETAIL – SPIRAL DUCT SUPPORT

N.T.S.

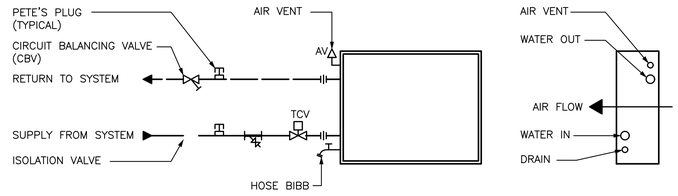


NOTES:

1. DO NOT CAST DAMPER IN PLACE.
2. DO NOT FASTEN RETAINING ANGLE OR DAMPER DIRECTLY TO WALL OR FLOOR.
3. CYCLE DAMPER AFTER INSTALLATION TO INSURE FREE MOVEMENT.
4. INSTALL DAMPER IN PLANE OF FIRE SEPARATION

DETAIL OF FIRE DAMPER IN MASONRY WALL

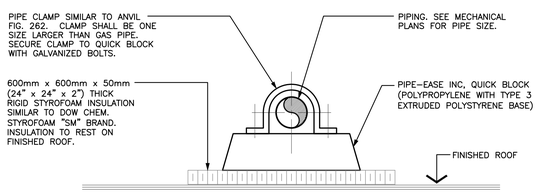
N.T.S.



HEATING COIL TWO–WAY CONTROL VALVE PIPING SCHEMATIC

N.T.S.

H–14A

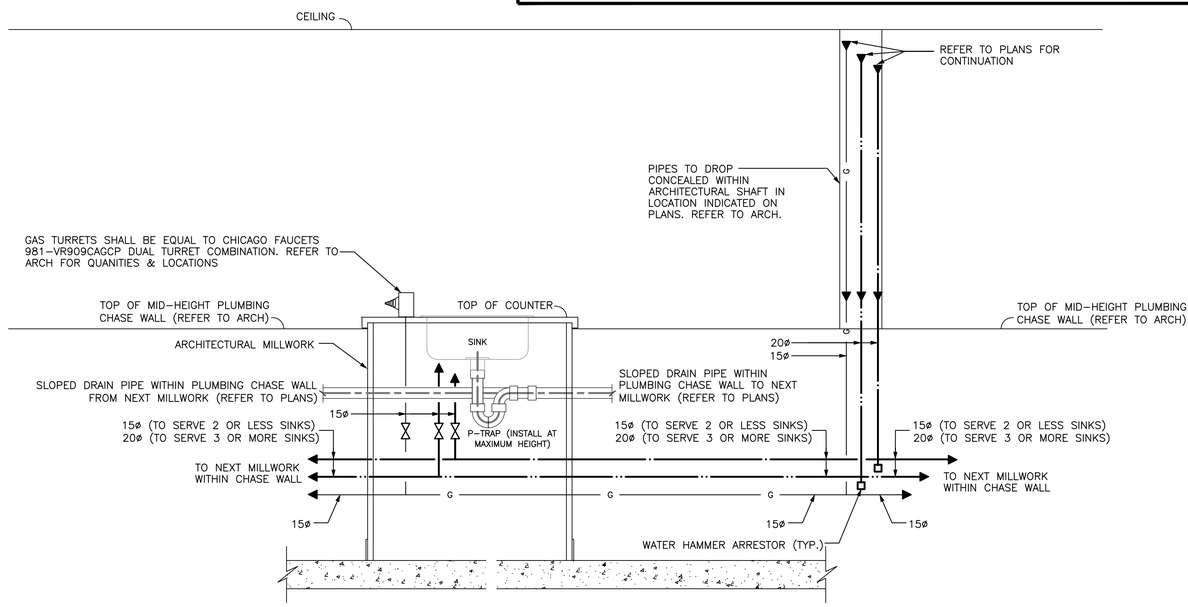


NOTE:

PIPE SUPPORTS TO BE MAXIMUM 2400mm (8'–0") APART.

TYPICAL PIPING SUPPORT ON ROOF

N.T.S.



TYPICAL MILLWORK PLUMBING DISTRIBUTION DETAIL

N.T.S.

Client
Halton District School Board
2050 Guelph Line
Burlington, Ontario

T.A. BLAKELOCK H.S. RENOVATION

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1.	Issued for Progress	2024 02 16
No.	Issue	Date

General Contractor shall check and verify all dimensions and report all errors and omissions to the Architect. Do not scale the drawings. Drawings shall not be used for construction purposes until issued by the Architect for construction.

Drawing Title:
MECHANICAL DETAILS

Scale:	-	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M300

JOB NAME:	T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS	ALL-22020201

MECHANICAL SCHEDULE - ACID NEUTRALIZATION TANK

DWG. DESIGNATION	MANUFACTURER	MODEL SIZE	DIMENSIONS (DIA x HEIGHT) (IN)	CONNECTION SIZE (IN)	LIMESTONE CHARGE (LBS)	EMPTY CAPACITY (GAL)	MECHANICAL REMARKS
AN-1	SMILLIE MCADAMS SUMMERLIN	AN-4	15" x 15"	2	100	7	FLOOR MOUNTED, VENT TO BUILDING PLUMBING VENT SYSTEM AS PER OBC CH.7. CONTRACTOR TO FIELD CHARGE.
AN-2	SMILLIE MCADAMS SUMMERLIN	AN-5	19" x 17"	2	150	12	FLOOR MOUNTED, VENT TO BUILDING PLUMBING VENT SYSTEM AS PER OBC CH.7. CONTRACTOR TO FIELD CHARGE.

PROVIDE DIGITAL PH MONITORING AND ALARM PANEL PER ACID NEUTRALIZATION TANK. PANEL SHALL BE SMS MODEL 47-D.

JOB NAME:	T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS	JOB No.	ALL-22020201

MECHANICAL SCHEDULE - GRILLES AND DIFFUSERS

DWG. DESIGNATION	MODEL			SIZE (L x W) (MM)	CFM		SP (IN W.G.)		MECHANICAL REMARKS
	BORDER	FRAME	CORE		MIN	MAX	MIN	MAX	
G-01	B	-	530	900 x 450	0	2000	0.01	0.016	RETURN AIR GRILLE C/W DAMPER
G-02	B	-	530	600 x 300	0	900	0.01	0.016	RETURN AIR GRILLE C/W DAMPER
G-03	B	-	SDGE	400 x 150	200	400	0.01	0.04	SPIRAL DUCT MOUNTED SUPPLY AIR GRILLE. COMPLETE WITH OBD
G-04	B	-	SDGE	250 x 100	50	200	0.006	0.04	SPIRAL DUCT MOUNTED SUPPLY AIR GRILLE. COMPLETE WITH OBD
G-05	B	-	SDGE	450 x 150	400	550	0.022	0.06	SPIRAL DUCT MOUNTED SUPPLY AIR GRILLE. COMPLETE WITH OBD
D-01	B	-	SCD	300 x 300	0	100	0.01	0.016	SQUARE CONE DIFFUSER, WHITE POWDER COAT FINISH.

OBD = OPPOSED BLADE DAMPER
ALL GRILLES AND DIFFUSERS TO BE COLOUR B12 (WHITE)
ALL GRILLES TO HAVE 'A' FASTENING

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1.	Issued for Progress	2024 03 12
No.	Issue	Date

Drawing Title:
MECHANICAL SCHEDULES

Scale:	-	Date:	02/01/2024
Drawn by:	C.M.	Checked by:	W.D.
Job No.	2215B	Drawing No.	M400

JOB NAME: T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS JOB No. ALL-22020201

MECHANICAL SCHEDULE - UNIT VENTILATORS

DWG. DESIGNATION	SYSTEM and ROOM	MODEL	AIRFLOW (CFM)		FAN ESP (IN. H20)	COOLING					HEATING							WEIGHT (LB)	MECHANICAL REMARKS	WIRING FOR MECHANICAL EQUIPMENT SCHEDULE							ELECTRICAL WIRING INSTRUCTIONS
			TOTAL	OUTDOOR		TOTAL CAPACITY (BTU/H)	SENSIBLE CAPACITY (BTU/H)	TYPE	EDB/EWB (°F)	LDB/LWB (°F)	CAPACITY (BTU/H)	EWT (°F)	LWT (°F)	EDB (°F)	LDB (°F)	GPM	PD (IN. W.G.)			MOTOR HP	MCA	MCOP	VAC/ø	EXPANSION VALVE (SEPARATE FEED) MCA/MOCP	ROOM STARTER TYPE	REMOTE CONTROL DEVICE	DISC. TYPE	
HUV-1	RM E101 CHEMISTRY	DAIKIN UAHF9H13	1250	515	0.4	40,679	27,101	DX	80/67	56.9/54	84,077	140	119	33	95	8	9.19	540	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	1/3	3.8	15	208/1	1.0/15				
HUV-2	RM E103 BIOLOGY	DAIKIN UAHF9H13	1250	525	0.4	40,679	27,101	DX	80/67	56.9/54	80,934	140	120	37	97	8	9.19	540	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	1/3	3.8	15	208/1	1.0/15				
HUV-3	RM E104 PHYSICS	DAIKIN UAHF9H13	1250	515	0.4	40,679	27,101	DX	80/67	56.9/54	80,934	140	120	37	97	8	9.19	540	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	1/3	3.8	15	208/1	1.0/15				
HUV-4	RM E115 BIOLOGY	DAIKIN UAHF9H14	1250	515	0.4	40,679	27,101	DX	80/67	56.9/54	55,594	140	121	42	83	6	6.38	540	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	1/3	3.8	15	208/1	1.0/15				
HUV-5	RM E117 CHEMISTRY	DAIKIN UAHF9H15	1500	510	0.4	50,787	33,382	DX	80/67	55.8/53.9	62,041	140	119	46	85	6	6.38	620	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	3/4	9.1	15	208/1	1.0/15				
HUV-6	RM E118 GENERAL SCIENCE	DAIKIN UAHF9H20	2000	700	0.4	60,000	40,190	DX	80/67	58.2/55.6	73,161	140	119	45	79	7	8.69	680	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	3/4	9.1	15	208/1	1.0/15				
HUV-7	RM S117 GENERAL SCIENCE	DAIKIN UAHF9H15	1500	535	0.4	50,787	33,382	DX	80/67	55.8/53.9	67,227	140	121	42	83	7	8.69	620	CEILING HUNG HORIZONTAL UNIT VENTILATOR. MERV 13 FILTER, DX COOLING, HOT WATER HEATING COIL.	3/4	9.1	15	208/1	1.0/15				

JOB NAME: T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS ALL-22020201

MECHANICAL SCHEDULE - CONDENSING UNITS

DWG. DESIGNATION	EVAPORATOR UNIT DESIGNATION	SYSTEM and ROOM	MODEL	WEIGHT (LBS)	COOLING						MECHANICAL REMARKS	WIRING FOR MECHANICAL EQUIPMENT SCHEDULE				ELECTRICAL WIRING INSTRUCTIONS
					AMBIENT (°F)	NOMINAL CAPACITY (MBH)	RATED CAPACITY (MBH)	SOUND PRESSURE (DBA)	REFRIGERANT	EER		MOTOR (KW)	MCA	MCOP	VAC/ø	
CU-1	HUV-1,2,3,4,5,6	ROOMS E101, E103, E104, E115, E117, E118	DAIKIN REYQ240AATJA	957	95	240	228	69	R-410A	11	MULTI CIRCUIT VRV ROOFTOP CONDENSING UNIT.	N/A	73.7	80	208/3	
CU-2	HUV-7	GENERAL SCIENCE RM S117	DAIKIN RXTQ60TAVJUA	225	95	57.5	57.5	57	R-410A	9.8	VRV ROOFTOP CONDENSING UNIT.	N/A	29.1	35	208/1	

NOTE: OPERATING RANGE = COOLING (23F TO 115F); HEATING (-13 TO 59F)
OUTDOOR UNIT MUST BE INSTALLED ON 18" HIGH STAND SUPPLIED BY THE INSTALLING CONTRACTOR
START UP AND COMMISSIONING SHALL BE PERFORMED BY THE MANUFACTURER SUPPORTED BY INSTALLING CONTRACTOR
UNIT SHALL INCLUDE A MANUFACTURER SUPPLIED SNOW & WIND HOOD KIT FOR EACH MODULE

JOB NAME: T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS ALL-22020201

MECHANICAL SCHEDULE - FANS

DWG. DESIGNATION	SYSTEM and ROOM	MODEL	FLOW (CFM)	ESP (IN W.G.)	RPM	VFD	WEIGHT LBS	MECHANICAL REMARKS	WIRING FOR MECHANICAL EQUIPMENT SCHEDULE				ELECTRICAL WIRING INSTRUCTIONS
									MOTOR W or HP	MCA	MCOP	VAC/ø	
EF-1	FUME EXHAUST ROOF	GREENHECK FCJ-307-BI	630	1.5	2619	NO	166	ROOFTOP UTILITY FAN, COMPLETE WITH 7' FUME STACK, NEMA 3R DISCONNECT SWITCH, WETHERHOOD, DISCHARGE UB, VIBRATION ISOALTORS.	3/4 HP	3.5	15	208/1	
EF-2	FUME EXHAUST ROOF	GREENHECK FCJ-307-BI	630	1.5	2619	NO	166	ROOFTOP UTILITY FAN, COMPLETE WITH 7' FUME STACK, NEMA 3R DISCONNECT SWITCH, WETHERHOOD, DISCHARGE UB, VIBRATION ISOALTORS.	3/4 HP	3.5	15	208/1	

JOB NAME: T.A. BLAKELOCK HIGH SCHOOL RENOVATIONS ALL-22020201

MECHANICAL SCHEDULE - LOUVERS & MOTORIZED DAMPERS

DWG. DESIGNATION	MODEL	SIZE (IN.)		MECHANICAL REMARKS			ELECTRICAL WIRING INSTRUCTIONS
		WIDTH	HEIGHT		MCOP	VAC/ø	
WL-1	GREENHECK ESD-435	12	18	HEAVY GUAGE EXTRUDED ALUMINUM C/W VCD-23 MOTORIZED DAMPER. COLOUR BY ARCHITECT.		120/1	

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Drawing Title:
MECHANICAL & ELECTRICAL SCHEDULES

Scale: - Date: 02/01/2024
Drawn by: C.M. Checked by: W.D.
Job No. 2215B Drawing No. ME100