

CROSWELL-LEXINGTON  
COMMUNITY SCHOOLS

HIGH SCHOOL  
HVAC Controls Upgrade

CROSWELL, MICHIGAN  
PROJECT NO. 2022-017

APRIL 8, 2022 BID DOCUMENTS



architects planners interiors

LIST OF DRAWINGS

MECHANICAL

M0.00	MECHANICAL GENERAL INFORMATION
M1.10A	MECHANICAL HVAC NEW WORK PLAN- UNIT A
M1.10B	MECHANICAL HVAC NEW WORK PLAN- UNIT B
M1.10C	MECHANICAL HVAC NEW WORK PLAN- UNIT C
M8.00	TEMPERATURE CONTROLS
M8.01	TEMPERATURE CONTROLS

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
AAV	AUTOMATIC AIR VENT / AIR ADMITTANCE VALVE
AD	ACCESS DOOR
AE	AIR EXTRACTOR
AFF	ABOVE FINISHED FLOOR
APD	AIR PRESSURE DROP
ASR	AUTOMATIC SPRINKLER RISER
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BWV	BACKWATER VALVE
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CIRC	CIRCULATING
CLG	COOLING
CO	CLEAN OUT
CONT	CONTINUATION OR CONTINUED
CONV	CONVECTOR
CUH	CABINET UNIT HEATER
CV	CONTROL VALVE
DB	DRY BULB TEMPERATURE
DEG	DEGREES
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DTC	DRAIN TILE CONNECTION
DWH	DOMESTIC WATER HEATER
(E)	EXISTING
EA/EXH	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EF	EXHAUST FAN
EJ	EXPANSION JOINT
EL	ELEVATION
ELECT	ELECTRICAL
EMS	ENERGY MANAGEMENT SYSTEM
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB TEMPERATURE
EWC	ELECTRIC WATER COOLER
*F	DEGREES FAHRENHEIT
FA	FACE AREA (COIL) / FREE AREA (LOUVER)
FC	FLEXIBLE CONNECTION
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FLA	FULL LOAD AMPS
FLR	FLOOR
FPM	FEET PER MINUTE
FFD	FUNNEL FLOOR DRAIN
FFE	FINISHED FLOOR ELEVATION
FS	FLOOR SINK
FT	FEET
FURN	FURNISHED
FV	FACE VELOCITY
FVC	FIRE VALVE CABINET
GAL	GALLON
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HB	HOSE BIBB
HO	HUB OUTLET
HP	HORSEPOWER

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
HR	HOUR
HTG	HEATING
HYD	HYDRANT
HZ	HERTZ
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
INST	INSTALLED
INV	INVERT
ISP	INTERNAL STATIC PRESSURE
IW	INDIRECT WASTE
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LBS/HR	POUNDS PER HOUR
LDB	LEAVING DRY BULB TEMPERATURE
LRA	LOCKED ROTOR AMPS
LWB	LEAVING WET BULB TEMPERATURE
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MBH	1000 BRITISH THERMAL UNITS PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MOD	MOTOR OPERATED DAMPER (AUTOMATIC)
MOP	MAXIMUM OVER-CURRENT PROTECTION
N.C.	NOISE CRITERIA
NIC	NOT IN CONTRACT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NOM	NOMINAL
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER / CENTER TO CENTER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
ORS	OVERFLOW ROOF SUMP
OS&Y	OUTSIDE SCREW AND YOKE
PD	PRESSURE DROP (FEET OF WATER)
PRV	PRESSURE REDUCING VALVE
PSIA	POUNDS PER SQUARE INCH – ABSOLUTE
PSIG	POUNDS PER SQUARE INCH – GAUGE
PT	PRESSURE / TEMPERATURE PORT
RA	RETURN AIR
RH	RELATIVE HUMIDITY
REQD	REQUIRED
RELA	RELIEF AIR
RPM	REVOLUTIONS PER MINUTE
RPZ	REDUCED PRESSURE ZONE
RS	ROOF SUMP
SA	SUPPLY AIR
SH	SHOWER
SP	STATIC PRESSURE
SqFt / SF	SQUARE FOOT/SQUARE FEET
SS	SERVICE SINK
TC	TEMPERATURE CONTROL
T & P	TEMPERATURE AND PRESSURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORY
UNO	UNLESS NOTED OTHERWISE

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
UR	URINAL
VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)
VTR	VENT THRU ROOF
W	WASTE
W&V	WASTE AND VENT
WB	WET BULB TEMPERATURE
WC	WATER CLOSET
WG	WATER GAUGE
WH	WALL HYDRANT

MECHANICAL PIPING SYMBOLS

ABBREV.	DESCRIPTION
	PIPE ELBOW UP
	PIPE ELBOW DOWN
	PIPE TEE DOWN
	DIRECTION OF FLOW
	UNION
	STRAINER
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	EXPANSION JOINT
	FLEXIBLE CONNECTION
	PIPE ANCHOR
	PIPE GUIDE
	PIPE CAP OR PLUG
	ISOLATION VALVE
	CIRCULATING PUMP
	GLOBE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	ANGLE VALVE
	CHECK VALVE (SWING)
	CHECK VALVE (SPRING)
	PLUG VALVE
	NEEDLE VALVE
	OUTSIDE SCREW AND YOKE VALVE (OS&Y)
	PRESSURE REGULATING VALVE
	SOLENOID VALVE
	CONTROL VALVE (2-WAY / 3-WAY)
	CENTRIFUGAL FAN
	AUTOMATIC GAS SHUT-OFF VALVE
	TRAP (PLAN VIEW)
	FLOOR DRAIN / FUNNEL FLOOR DRAIN (PLAN VIEW)
	FLOOR DRAIN / FUNNEL FLOOR DRAIN (ELEVATION)
	ROOF SUMP
	CLEAN OUT (IN FLOOR)
	CLEAN OUT (IN LINE)
	CLEAN OUT (WALL)
	BACKFLOW PREVENTER
	WATER METER ASSEMBLY
	HOSE BIBB, WALL HYDRANT
	DIRECTION OF PIPE PITCH
	SPRINKLER HEAD (UPRIGHT)
	SPRINKLER HEAD (SIDEWALL)
	FLOW SWITCH
	SIAMESE CONNECTION (YARD)
	SIAMESE CONNECTION (WALL MOUNTED)
	FIRE HYDRANT
	FLOW MEASURING DEVICE
	BALANCING VALVE
	COMBINATION FLOW MEASURING AND BALANCING DEVICE
	AUTOMATIC AIR VALVE
	MANUAL AIR VALVE

MECHANICAL SYMBOLS

ABBREV.	DESCRIPTION
	RECTANGULAR TAKE-OFF (SINGLE LINE)
	RECTANGULAR TAKE-OFF (DOUBLE LINE)
	ROUND TAKE-OFF (SINGLE LINE)
	ROUND TAKE-OFF (DOUBLE LINE)
	SPIN-IN FITTING (WITH VOLUME DAMPER)
	ELBOW (WITH TURNING VANES)
	RADIUS RECTANGULAR ELBOW
	RADIUS ROUND ELBOW
	RECTANGULAR ELBOW UP
	ROUND ELBOW UP
	RECTANGULAR ELBOW DOWN
	ROUND ELBOW DOWN
	CONCENTRIC TRANSITION (DOUBLE LINE)
	CONCENTRIC TRANSITION (SINGLE LINE)
	ECCENTRIC TRANSITION (DOUBLE LINE)
	ECCENTRIC TRANSITION (SINGLE LINE)
	INCLINED RISE IN DIRECTION OF AIR FLOW (DOUBLE LINE)
	INCLINED RISE IN DIRECTION OF AIR FLOW (SINGLE LINE)
	INCLINED DROP IN DIRECTION OF AIR FLOW (DOUBLE LINE)
	INCLINED DROP IN DIRECTION OF AIR FLOW (SINGLE LINE)
	FLEXIBLE CONNECTION
	FLEXIBLE DUCT CONNECTION TO SUPPLY DIFFUSER
	SUPPLY DIFFUSER
	LINEAR SLOT DIFFUSER
	RETURN OR EXHAUST GRILLE
	TRANSFER GRILLE
	CROSS SECTION OF SUPPLY AIR DUCT
	CROSS SECTION OF EXHAUST OR RETURN AIR DUCT
	EXISTING FIRE DAMPER (HORIZONTAL)
	NEW FIRE DAMPER (HORIZONTAL)
	EXISTING FIRE DAMPER (VERTICAL)
	NEW FIRE DAMPER (VERTICAL)
	EXISTING SMOKE DAMPER
	NEW SMOKE DAMPER
	EXISTING COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
	NEW COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
	EXISTING COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
	NEW COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
	VOLUME DAMPER (MANUALLY ADJUSTABLE)
	MOTORIZED DAMPER
	SMOKE DETECTOR
	CO2 SENSOR
	THERMOSTAT OR TEMPERATURE SENSOR
	HUMIDISTAT OR HUMIDITY SENSOR
	RETURN OR EXHAUST / SUPPLY AIR FLOW

PIPING LEGEND

ABBREV.	DESCRIPTION
—CA—	COMPRESSED AIR PIPING
—CD—	CONDENSATE DRAIN PIPING
—DT—	DRAIN TILE
—F—	FIRE PROTECTION PIPING
—FOR—	FUEL OIL RETURN PIPING
—FOS—	FUEL OIL SUPPLY PIPING
—G—	NATURAL GAS PIPING
—BCW—	BOOSTED-DOMESTIC COLD WATER PIPING
—BHW—	BOOSTED-DOMESTIC HOT WATER PIPING
—CW—	DOMESTIC COLD WATER PIPING
—NPCW—	NON POTABLE COLD WATER PIPING
—TW—	TEMPERED WATER PIPING
—HW—	DOMESTIC HOT WATER PIPING
—HW(140°F)—	DOMESTIC 140°F HOT WATER PIPING
—HWR—	DOMESTIC HOT WATER RETURN PIPING
—SAN—	SANITARY WASTE PIPING
—PSAN—	PUMPED SANITARY PIPING
—V—	VENT PIPING
—ST—	STORM SEWER PIPING
—PST—	PUMPED STORM PIPING
—RC—	RAIN CONDUCTOR PIPING
—ORC—	OVERFLOW RAIN CONDUCTOR PIPING
—CHWR—	CHILLED WATER RETURN PIPING
—CHWS—	CHILLED WATER SUPPLY PIPING
—CWR—	CONDENSER WATER RETURN PIPING
—CWS—	CONDENSER WATER SUPPLY PIPING
—HHWR—	HEATING HOT WATER RETURN PIPING
—HHWS—	HEATING HOT WATER SUPPLY PIPING
—HPLR—	HEAT PUMP LOOP RETURN PIPING
—HPLS—	HEAT PUMP LOOP SUPPLY PIPING
—RL—	REFRIGERANT LIQUID PIPING
—RS—	REFRIGERANT SUCTION PIPING
—HGB—	HOT GAS BY-PASS PIPING
—GXHR—	GEO HEAT EXCHANGE RETURN
—GXHS—	GEO HEAT EXCHANGE SUPPLY
—STM—	STEAM PIPING
—HPS—	HIGH PRESSURE STEAM PIPING
—LPS—	LOW PRESSURE STEAM PIPING
—CR—	STEAM CONDENSATE RETURN PIPING
—PCR—	PUMPED STEAM CONDENSATE RETURN PIPING
—LPC—	LOW PRESSURE CONDENSATE PIPING
—HPC—	HIGH PRESSURE CONDENSATE PIPING
—MA—	MEDICAL AIR PIPING
—N—	NITROGEN GAS PIPING
—O2—	OXYGEN GAS PIPING
—VAC—	VACUUM PIPING

DRAWING INDEX	
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M8.00	TEMPERATURE CONTROLS
M8.01	TEMPERATURE CONTROLS

DRAWING NOTATION

SYMBOL	DESCRIPTION
	NEW WORK KEY NOTE NO. 1
	DEMOLITION KEY NOTE NO. 1
AHU-1	EQUIPMENT TAG
S-1 12x12 150-2	AIR TERMINAL TAG: IE: DIFFUSER TYPE = S-1 NECK SIZE = 12x12 CFM = 150 (TYPICAL FOR 2)
	EXISTING DEVICES OR EQUIPMENT
	NEW OR MODIFIED DEVICES OR EQUIPMENT
	EXISTING SYSTEM COMPONENT TO BE REMOVED
	POINT OF NEW CONNECTION

APPLICABLE CODES AND REGULATIONS	
YEAR	CODE
2015	MICHIGAN BUILDING CODE
2015	MICHIGAN REHABILITATION CODE FOR EXISTING BUILDINGS
2015	MICHIGAN PLUMBING CODE
2015	MICHIGAN MECHANICAL CODE
2015	MICHIGAN UNIFORM ENERGY CODE
2015	INTERNATIONAL FUEL GAS CODE
2012	NFPA 101 WITH BFS AMENDMENTS

PROJECT

Croswell-Lexington  
Community Schools:  
High School  
HVAC Controls Upgrade

Croswell,  
Michigan

SHEET

MECHANICAL GENERAL  
INFORMATION

PROJECT NUMBER

2022-017

SHEET NUMBER

M0.00



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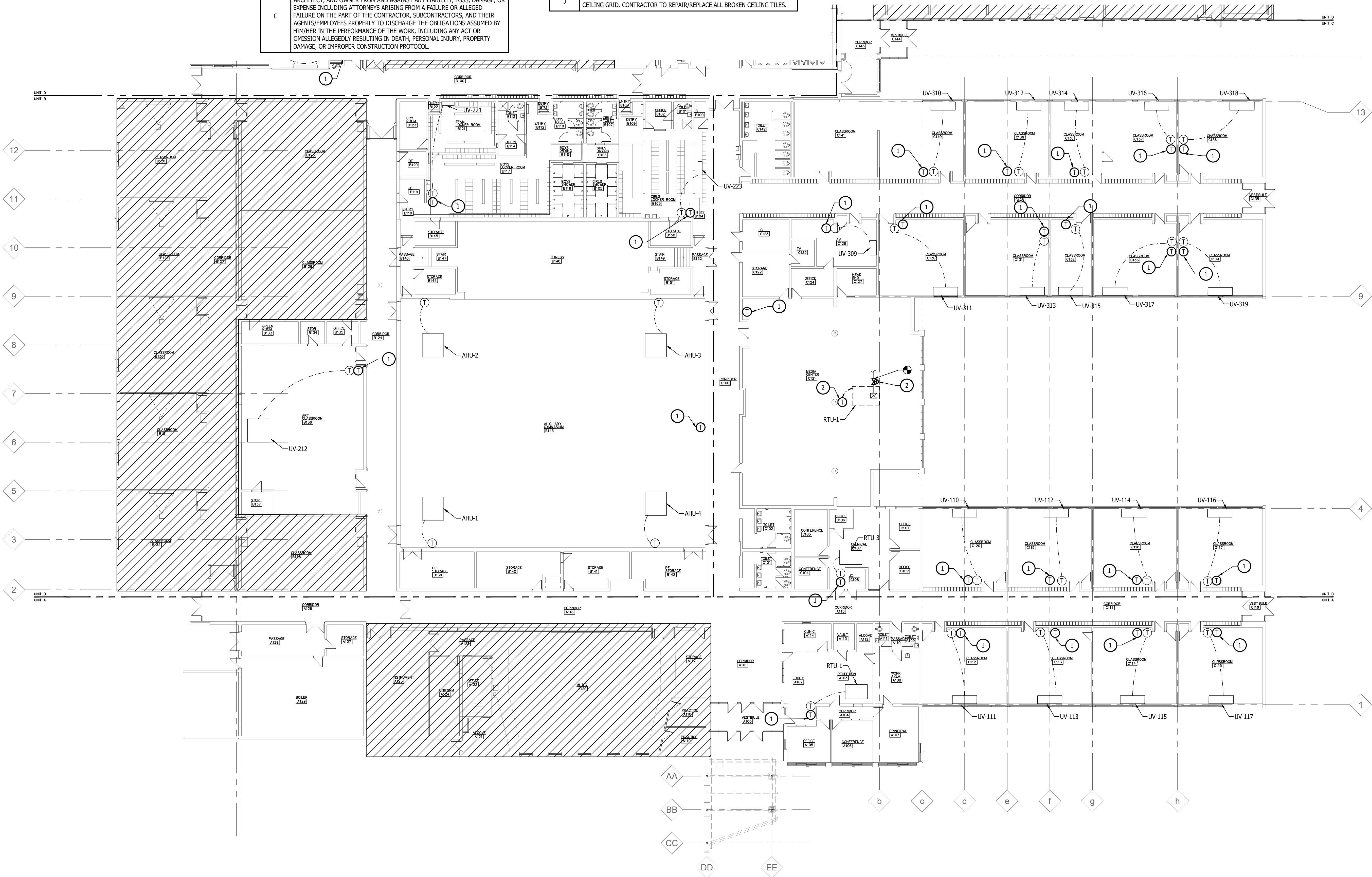
236 MILL STREET  
ROCHESTER, MI  
48307  
T: 248.656.1377  
french@frenchassociates.com  
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HVAC GENERAL NOTES	
A	THESE DRAWINGS ARE DIAGRAMMATIC AND REPRESENT THE GENERAL EXTENT OF THE WORK TO BE PERFORMED. PROVIDE AND EXECUTE ALL HVAC SYSTEMS PER ENGINEER'S SPECIFICATION, AND LOCAL APPLICABLE CODES INCLUDING AMENDMENTS, BULLETINS, ETC. AS WELL AS THE STANDARDS OF INSTALLATION AND EQUIPMENT ESTABLISHED FOR THE BUILDINGS, AND REQUIREMENTS OF THE OWNER.
B	EXCEPT FOR CHANGES AS MAY BE SPECIFICALLY APPROVED BY THE ENGINEER OF RECORD, IN ACCORDANCE WITH ALTERNATES OF OPTIONS AS STATED HEREINAFTER, ALL WORK MUST BE IN FULL ACCORDANCE WITH THE INTENT OF THE PLANS AND SPECIFICATIONS. SYSTEMS ARE TO BE COMPLETE, EFFICIENT, AND SATISFACTORY OPERATION WHEN PROJECT IS DELIVERED TO THE OWNER.
C	THE CONTRACTOR AND EACH SUBCONTRACTOR COVENANTS AND AGREES TO INDEMNIFY, DEFEND, AND HOLD HARMLESS THE CONSULTING ENGINEER, ARCHITECT, AND OWNER FROM AND AGAINST ANY LIABILITY, LOSS, DAMAGE, OR EXPENSE INCLUDING ATTORNEYS ARISING FROM A FAILURE OR ALLEGED FAILURE ON THE PART OF THE CONTRACTOR, SUBCONTRACTORS, AND THEIR AGENTS/EMPLOYEES PROPERLY TO DISCHARGE THE OBLIGATIONS ASSUMED BY HIM/HER IN THE PERFORMANCE OF THE WORK, INCLUDING ANY ACT OR OMISSION ALLEGEDLY RESULTING IN DEATH, PERSONAL INJURY, PROPERTY DAMAGE, OR IMPROPER CONSTRUCTION PROTOCOL.

D	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
E	CONTRACTOR TO EXAMINE ALL ADJOINING WORK BEFORE COMMENCEMENT OF HIS/HER SCOPE OF WORK. REPORT ANY DISCREPANCIES TO THE CONSTRUCTION MANAGER FOR REVIEW AND APPROVAL. COORDINATE ALL WORK WITH OTHER TRADES TO ENSURE THAT INSTALLATION IS MADE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
F	PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT, DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
G	CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS.
H	FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS REQUIRED BY THE OWNER.
J	NEW BACNET COMMUNICATIONS TO BE INSTALLED IN PARALLEL THRU EXISTING CEILING GRID. CONTRACTOR TO REPAIR/REPLACE ALL BROKEN CEILING TILES.

NEW WORK KEYED NOTES	
1	ALTERNATE M1: EXISTING PNEUMATIC THERMOSTAT TO REMAIN. INSTALL FLAT PLATE TEMPERATURE SENSOR ADJACENT TO EXISTING THERMOSTAT.
2	ALTERNATE M2: REPLACE PNEUMATIC 3-WAY CONTROL VALVE WITH NEW BACNET COMPATIBLE DEVICE. INSTALL NEW THERMOSTAT IN ADJACENT TO EXISTING PNEUMATIC DEVICE.



MECHANICAL HVAC NEW WORK PLAN - UNIT A  
SCALE: 1/16" = 1'-0"

KEY PLAN

ISSUE DATE

04/08/2022

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ROCHESTER, MI 48307

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frenchcia.com

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PROJECT  
Croswell-Lexington  
Community Schools:  
High School  
HVAC Controls Upgrade  
Croswell,  
Michigan

SHEET  
MECHANICAL HVAC NEW  
WORK PLAN - UNIT A

PROJECT NUMBER  
2022-017  
SHEET NUMBER  
M1.10A





SCALE: 1/16" = 1'-0"

SHEET NUMBER

M1.10B







CHECKED	MPH
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5. TC CONTRACTOR TO VERIFY ALL ACTUATOR FUNCTIONALITY AT COMMENCEMENT OF CONSTRUCTION. REPORT FINDINGS TO OWNER AND CREATE DEFICIENCIES REPORT FOR REPLACEMENT.

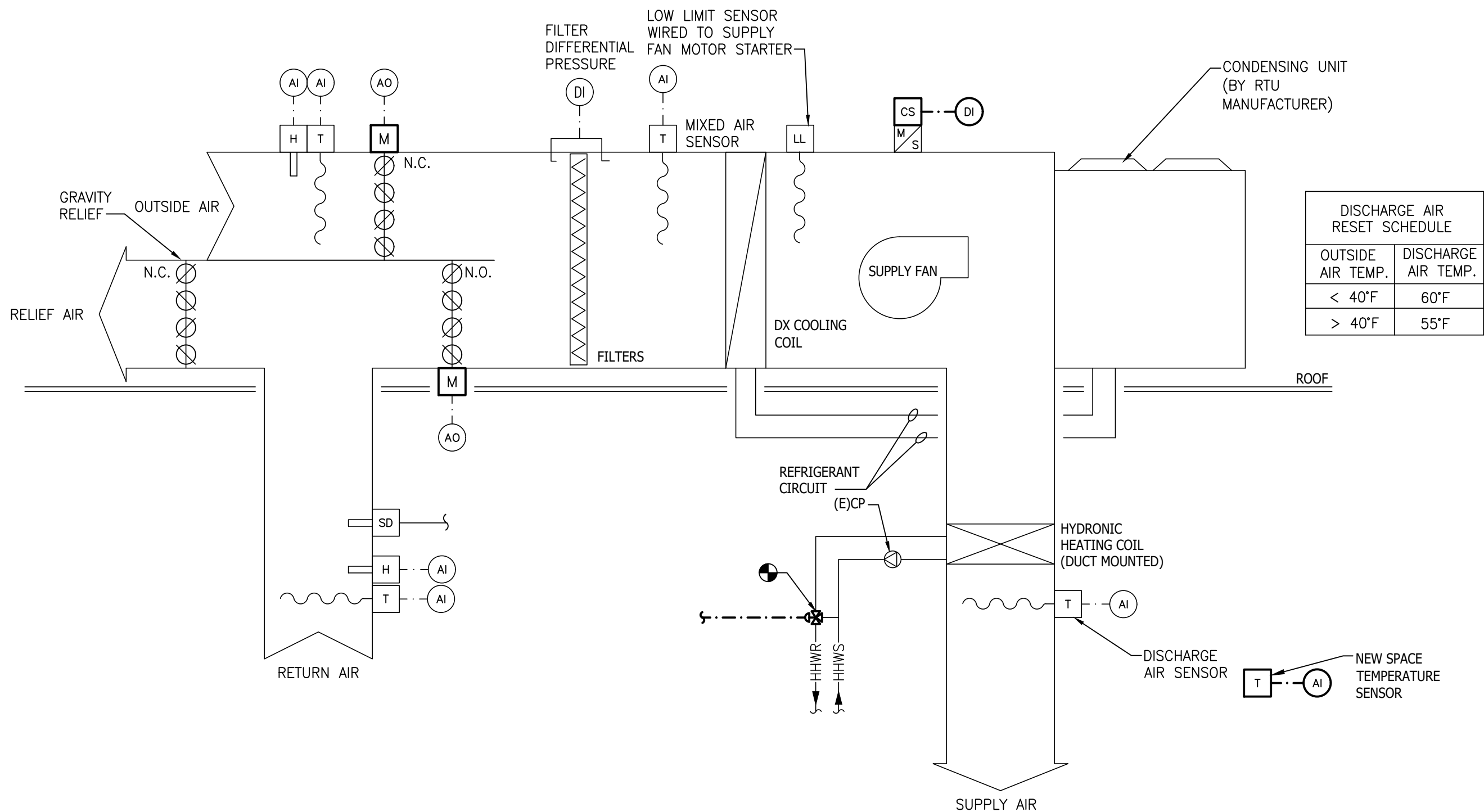


## TEMPERATURE CONTROLS

2022-017

M8.00





(E)PACKAGED ROOFTOP UNIT CONTROL DIAGRAM (ALTERNATE: M2)  
NO SCALE (RTU-2)

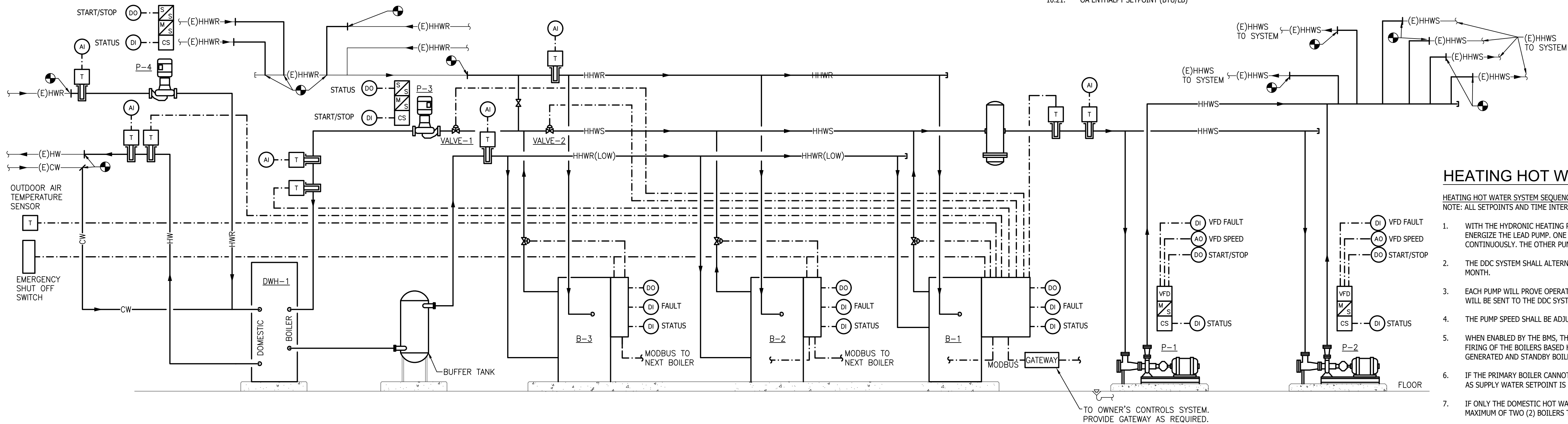
VARIABLE VOLUME RTU WITH HYDRONIC HEATING COIL SEQUENCE OF OPERATIONS:  
NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR.

- WITH THE SUPPLY FAN'S ECM MOTOR' HAND/OFF/AUTO SWITCH IN THE "AUTO" POSITION, THE SUPPLY FAN SHALL BE AUTOMATICALLY STARTED AND STOPPED WITH THE DDC SYSTEM OCCUPANCY SCHEDULE.
- THE SUPPLY FAN WILL PROVE FLOW TO THE DDC SYSTEM WITH ITS CURRENT SENSING SWITCH. IF THE FAN FAILS, THE SYSTEM WILL BE DE-ENERGIZED AND AN ALARM WILL BE SENT TO THE DDC SYSTEM.
- OCCUPIED MODE: WHEN THE DDC SYSTEM ENERGIZES THE SUPPLY FAN IT SHALL RUN CONTINUOUSLY. THE RETURN, RELIEF AND OUTSIDE AIR DAMPERS WILL MODULATE TO MAINTAIN MINIMUM OUTSIDE AIRFLOW AS DETERMINED BY THE OUTSIDE AIR DAMPER'S MINIMUM POSITION.
- THE DISCHARGE HIGH STATIC PRESSURE SENSOR (LOCATED AT THE RTU) SHALL MODULATE THE SUPPLY FAN VFD TO PREVENT THE DISCHARGE STATIC PRESSURE FROM EXCEEDING THE HIGH LIMIT SETPOINT OF 2.0" W.G. IF THE DISCHARGE HIGH STATIC PRESSURE SENSOR REACHES 2.5" W.G., THE SUPPLY FAN SHALL BE DE-ENERGIZED.
- THE DISCHARGE AIR TEMPERATURE SENSOR SHALL MODULATE THE DX STAGES OF COOLING, MIXED AIR DAMPERS, AND THE HEATING COIL CONTROL VALVE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE.
- ECONOMIZER MODE: WHEN THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, DDC SHALL MODULATE THE MIXED AIR DAMPERS AND DX STAGES OF COOLING TO MAINTAIN THE TEMPERATURE SETPOINT WHILE MAINTAINING THE MINIMUM OUTSIDE AIRFLOW. WHEN THE OUTSIDE AIR ENTHALPY IS GREATER THAN THE RETURN AIR ENTHALPY, DDC SHALL MODULATE THE MIXED AIR DAMPERS TO MAINTAIN THE MINIMUM OUTSIDE AIRFLOW. THE SPACE TEMPERATURE SETPOINT SHALL BE 75°F (ADJUSTABLE).
- UNOCCUPIED MODE: IF THE SPACE TEMPERATURE SENSORS DROPS BELOW 60°F, THE SUPPLY FAN SHALL BE ENERGIZED, THE OUTSIDE AND RELIEF DAMPERS SHALL REMAIN CLOSED, THE RETURN DAMPER SHALL BE FULLY OPENED AND THE HEATING COIL CONTROL VALVE SHALL OPEN. AFTER ALL OF THE SPACES HAVE REACHED 63°F (ADJ), THE UNIT SHALL BE DE-ENERGIZED.
- IF THE FREEZE-STAT SETPOINT IS REACHED (35°F OR BELOW), THEN THE SUPPLY FAN SHALL BE DE-ENERGIZED AND THE PUMP SHALL BE ENERGIZED. IF THE DUCT MOUNTED SMOKE DETECTORS DETECT SMOKE, THEN THE SUPPLY FAN SHALL BE DE-ENERGIZED.
- WHEN THE SUPPLY FAN IS DE-ENERGIZED, THE OUTSIDE AND RELIEF DAMPERS SHALL BE CLOSED. THE RETURN AIR DAMPER SHALL BE OPEN.
- THE BUILDING MANAGEMENT SYSTEM (BMS) SHALL GRAPHICALLY SHOW MONITOR AND CONTROL THE FOLLOWING POINTS:
  - OUTDOOR AIR TEMPERATURE (°F)
  - OCCUPIED COMMAND
  - SUPPLY FAN COMMAND
  - SUPPLY FAN STATUS
  - CAFETERIA SPACE TEMPERATURE (°F)
  - OCCUPIED SETPOINT (°F)
  - WARM/COOL ADJUST (°F)
  - ACTUAL HEATING SETPOINT (°F)
  - ACTUAL COOLING SETPOINT (°F)
  - DISCHARGE AIR TEMPERATURE (°F)
  - HEATING STAGE 1 COMMAND
  - PERCENT HEATING COMMAND
  - DX COOLING STAGE 1 COMMAND
  - DX COOLING STAGE 2 COMMAND
  - DX PERCENT COOLING COMMAND
  - MIXED AIR DAMPER COMMAND
  - MINIMUM OA DAMPER POSITION
  - ECONOMIZER SETPOINT
  - AIR FILTER STATUS
  - DISCHARGE AIR LOW LIMIT (°F)
  - OA ENTHALPY SETPOINT (BTU/LB)

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236 MILL STREET  
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T: 248.656.1377  
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DOMESTIC HOT WATER SYSTEM CONTROL DIAGRAM  
NO SCALE

HEATING HOT WATER SYSTEM CONTROL DIAGRAM  
NO SCALE

HEATING HOT WATER SUPPLY (HHWS) RESET SCHEDULE	
OUTSIDE AIR TEMP.	HHWS TEMPERATURE
≥ 50°F	150°F
≤ 25°F	180°F

VALVE SEQUENCING SCHEDULE					
	VALVE-1	VALVE-2	P-3	B-2 - BLDG	B-3 - DHW
HEATING & DHW LOADS PRESENT	CLOSE	OPEN	ON	HEATING MODE	CONSTANT SETPOINT
HEATING LOAD PRESENT (<100%) NO DHW	CLOSE	OPEN	OFF	HEATING MODE	STANDBY
HEATING LOAD PRESENT (B-1 & B-2=100%) NO DHW	OPEN	OPEN	OFF	HEATING MODE	HEATING MODE
HEATING LOAD PRESENT (B-1 & B-2=100%) DHW PRESENT	CLOSE	OPEN	ON	HEATING MODE	CONSTANT SETPOINT
HEATING & DHW LOADS PRESENT (B-3=90%, >10 MINS)	OPEN	CLOSE	ON	CONSTANT SETPOINT	CONSTANT SETPOINT

## HEATING HOT WATER SYSTEM CONTROL DIAGRAM

HEATING HOT WATER SYSTEM SEQUENCE OF OPERATIONS:  
NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR.

- WITH THE HYDRONIC HEATING PUMPS' HAND/AUTO/OFF SWITCH IN THE "AUTO" POSITION, THE DDC SYSTEM SHALL ENERGIZE THE LEAD PUMP. ONE OF THE PUMPS SHALL BE DESIGNATED "LEAD PUMP" AND SHALL OPERATE CONTINUOUSLY. THE OTHER PUMP SHALL SERVE AS THE "STANDBY PUMP".
- THE DDC SYSTEM SHALL ALTERNATE PUMP OPERATION BASED ON RUN TIME HOURS OR AT THE BEGINNING OF EACH MONTH.
- EACH PUMP WILL PROVE OPERATION TO THE DDC SYSTEM WITH ITS CURRENT SWITCH. IF A PUMP FAILS, AN ALARM WILL BE SENT TO THE DDC SYSTEM AND THE STANDBY PUMP WILL BE ACTIVATED.
- THE PUMP SPEED SHALL BE ADJUSTED DURING BALANCING AND SET AT A FIXED OPERATING SPEED.
- WHEN ENABLED BY THE BMS, THE BOILER CONTROL PANEL (INTERNAL TO THE LEAD BOILER) SHALL CONTROL THE FIRING OF THE BOILERS BASED HEATING HOT WATER SUPPLY WATER SETPOINT. IF A BOILER FAILS, AN ALARM WILL BE GENERATED AND STANDBY BOILERS WILL BE ACTIVATED.
- IF THE PRIMARY BOILER CANNOT MAINTAIN SUPPLY WATER SETPOINT, THE FIRST LAG BOILERS SHALL BE ENERGIZED. AS SUPPLY WATER SETPOINT IS MET, THE LAG BOILERS SHALL BE DE-ENERGIZED.
- IF ONLY THE DOMESTIC HOT WATER CIRCULATION PUMP (P-3) IS OPERATING, THE BOILER SYSTEM SHALL ALLOW A MAXIMUM OF TWO (2) BOILERS TO BE OPERATIONAL (MOTORIZED ISOLATION VALVES).
- THE DDC SYSTEM SHALL ENERGIZE THE DOMESTIC HOT WATER PUMP (P-3) TO MAINTAIN HOT WATER RETURN TEMPERATURE. THE CIRCULATING PUMP SHALL PROVE OPERATION WITH ITS CURRENT SENSING SWITCH. B-3 SHALL OPERATE AS THE PRIMARY DOMESTIC HOT WATER HEATING BOILER. REFER TO VALVE SEQUENCING SCHEDULE FOR FURTHER OPERATION.
- THE DOMESTIC HOT WATER RE-CIRCULATION PUMP (P-4) SHALL BE CONTROLLED ON AN OCCUPIED SCHEDULE SET BY THE SYSTEM OPERATOR.
- WHEN THE EMERGENCY SHUT OFF SWITCH IS ACTIVATED, THE BOILERS SHALL IMMEDIATELY BE DE-ENERGIZED AND AN ALARM SHALL BE SENT TO THE BMS (THRU MONITORING OF THE EMERGENCY SHUT-OFF SWITCH).
- THE BUILDING DDC SYSTEM SHALL MONITOR ALL TEMPERATURE POINTS INDICATED, BOILER STATUS, BOILER ALARM, PUMP ALARM, PUMP STATUS, AND OUTSIDE AIR TEMPERATURE.

## PROJECT

Croswell-Lexington  
Community Schools:  
High School  
HVAC Controls Upgrade

Croswell,  
Michigan

## SHEET

TEMPERATURE  
CONTROLS

## PROJECT NUMBER

2022-017

## SHEET NUMBER

M8.01