# CROSWELL-LEXINGTON COMMUNITY SCHOOLS

# MEYER ELEMENTARY HVAC Controls Upgrade

CROSWELL, MICHIGAN PROJECT NO. 2022-017

APRIL 8, 2022

BID DOCUMENTS



architects planners interiors

# LIST OF DRAWINGS

### **I**MECHANICAL

M0.00 MECHANICAL GENERAL INFORMATION

11.10 MECHANICAL HVAC COMPOSITE NEW WORK PLA

M8.00 TEMPERATURE CONTROLS

MECHANICAL ABBREVIATIONS		MECHANICAL ABBREVIATIONS		MECHANICAL ABBREVIATIONS		MECHAN	
ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION	ABBREV.	
AAV	AUTOMATIC AIR VENT / AIR ADMITTANCE VALVE	HR	HOUR	UR	URINAL	<u> </u>	RECTANG
AD	ACCESS DOOR	HTG	HEATING	VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)	<del></del>	
AE	AIR EXTRACTOR	HYD	HYDRANT	VTR	VENT THRU ROOF		RECTANG
AFF	ABOVE FINISHED FLOOR	HZ	HERTZ	W	WASTE	<b>├</b>	ROUND 1
APD	AIR PRESSURE DROP	ID	INSIDE DIAMETER	W&V	WASTE AND VENT	<del></del>	
ASR	AUTOMATIC SPRINKLER RISER	IE	INVERT ELEVATION	WB	WET BULB TEMPERATURE		ROUND 1
BFP	BACKFLOW PREVENTER	IN	INCHES	WC	WATER CLOSET		SPIN-IN
BHP	BRAKE HORSEPOWER	INST	INSTALLED	WG	WATER GAUGE		ELBOW (
BOD	BOTTOM OF DUCT	INV	INVERT	WH	WALL HYDRANT		LLBOW (
BTU	BRITISH THERMAL UNIT	ISP	INTERNAL STATIC PRESSURE				RADIUS I
BTUH BWV	BRITISH THERMAL UNITS PER HOUR  BACKWATER VALVE	IW KW	INDIRECT WASTE  KILOWATT				RADIUS I
CAP	CAPACITY	LAT	LEAVING AIR TEMPERATURE	MECH	IANICAL PIPING SYMBOLS	<b>H</b>	
CAV	CONSTANT AIR VOLUME	LAV	LAVATORY	ABBREV.	DESCRIPTION		RECTANG
CFH	CUBIC FEET PER HOUR	LBS/HR	POUNDS PER HOUR		PIPE ELBOW UP		ROUND (
CFM	CUBIC FEET PER MINUTE	LDB	LEAVING DRY BULB TEMPERATURE	<del></del> ə	PIPE ELBOW DOWN	<u> </u>	DECTANO
CIRC	CIRCULATING	LRA	LOCKED ROTOR AMPS	<del></del>	PIPE TEE DOWN		RECTANG
CLG	COOLING	LWB	LEAVING WET BULB TEMPERATURE	<b></b>	DIRECTION OF FLOW		ROUND (
СО	CLEAN OUT	MAV	MANUAL AIR VENT	——II	UNION	<del></del>	CONCENT
CONT	CONTINUATION OR CONTINUED	MAX	MAXIMUM	<del></del>	STRAINER	ţt	CONCLIN
CONV	CONVECTOR	МВН	1000 BRITISH THERMAL UNITS PER HOUR		CONCENTRIC REDUCER	$\leftarrow$	CONCENT
CUH	CABINET UNIT HEATER	MCA	MINIMUM CIRCUIT AMPACITY		ECCENTRIC REDUCER		ECCENTR
CV	CONTROL VALVE	MECH	MECHANICAL	<del></del>	EXPANSION JOINT	'	
DB	DRY BULB TEMPERATURE	MFR	MANUFACTURER		FLEXIBLE CONNECTION	<b>├──</b>	ECCENTR
DEG	DEGREES	МН	MANHOLE	<del></del>	PIPE ANCHOR	R	INCLINED (DOUBLE
DDC	DIRECT DIGITAL CONTROL	MIN	MINIMUM		PIPE GUIDE	<u> </u>	INCLINED
DN	DOWN	MISC	MISCELLANEOUS		PIPE CAP OR PLUG	_	(SINGLE
DTC	DRAIN TILE CONNECTION	MOD	MOTOR OPERATED DAMPER (AUTOMATIC)	<b>──</b>	ISOLATION VALVE		INCLINED (DOUBLE
DWH	DOMESTIC WATER HEATER	MOP	MAXIMUM OVER-CURRENT PROTECTION	————	CIRCULATING PUMP	. D .	INCLINED
(E)	EXISTING	N.C.	NOISE CRITERIA	——————————————————————————————————————	GLOBE VALVE	<u> </u>	(SINGLE
EA/EXH	EXHAUST AIR	NIC	NOT IN CONTRACT	——	BALL VALVE		FLEXIBLE
EAT	ENTERING AIR TEMPERATURE	NC	NORMALLY CLOSED	——//——	BUTTERFLY VALVE		FLEXIBLE
EDB	ENTERING DRY BULB TEMPERATURE	NO	NORMALLY OPEN	<b>∑</b>	ANGLE VALVE (SWING)		DIFFUSER
EF EJ	EXHAUST FAN  EXPANSION JOINT	NOM OA	NOMINAL OUTSIDE AIR		CHECK VALVE (SWING)  CHECK VALVE (SPRING)	<b>\</b>	SUPPLY
EL	ELEVATION	OBD	OPPOSED BLADE DAMPER	——————————————————————————————————————	PLUG VALVE		
ELECT	ELECTRICAL	OC	ON CENTER / CENTER TO CENTER	—— <del>—</del> —————————————————————————————————	NEEDLE VALVE		LINEAR S
EMS	ENERGY MANAGEMENT SYSTEM	OD	OUTSIDE DIAMETER		OUTSIDE SCREW AND YOKE VALVE (OS&Y)	$\leftarrow$	RETURN
ESP	EXTERNAL STATIC PRESSURE	OED	OPEN ENDED DUCT		PRESSURE REGULATING VALVE	<del>, ] ,</del>	TRANSFE
EWB	ENTERING WET BULB TEMPERATURE	ORS	OVERFLOW ROOF SUMP		SOLENOID VALVE	中	IKANSEL
EWC	ELECTRIC WATER COOLER	OS&Y	OUTSIDE SCREW AND YOKE	-\$ <del>-\$</del> -	CONTROL VALVE (2-WAY / 3-WAY)		CROSS S
<b>°</b> F	DEGREES FAHRENHEIT	PD	PRESSURE DROP (FEET OF WATER)		CENTRIFUGAL FAN		CROSS S
FA	FACE AREA (COIL) / FREE AREA (LOUVER)	PRV	PRESSURE REDUCING VALVE	6	AUTOMATIC GAS SHUT-OFF VALVE		DUCT
FC	FLEXIBLE CONNECTION	PSIA	POUNDS PER SQUARE INCH - ABSOLUTE	oc—	TRAP (PLAN VIEW)		EXISTING F
FD	FLOOR DRAIN	PSIG	POUNDS PER SQUARE INCH - GAUGE		FLOOR DRAIN / FUNNEL FLOOR DRAIN (PLAN VIEW)		NEW
FDC	FIRE DEPARTMENT CONNECTION	PT	PRESSURE / TEMPERATURE PORT	_Y -\$\forall P	FLOOR DRAIN / FUNNEL FLOOR DRAIN (ELEVATION)		EXISTING
FH	FIRE HYDRANT	RA	RETURN AIR	——©	ROOF SUMP	_	NEW F
FHC	FIRE HOSE CABINET	RH	RELATIVE HUMIDITY	——→ CO	CLEAN OUT (IN FLOOR)		EXISTING
FHR	FIRE HOSE RACK	REQD	REQUIRED		CLEAN OUT (IN LINE)		S NEW
FHV	FIRE HOSE VALVE	REL.A	RELIEF AIR	⊣∣wco	CLEAN OUT (WALL)		
FLA	FULL LOAD AMPS	RPM	REVOLUTIONS PER MINUTE	BFP	BACKFLOW PREVENTER	<b>~</b>	EXISTING C
FLR	FLOOR	RPZ	REDUCED PRESSURE ZONE	$M \sim M \sim M$	WATER METER ASSEMBLY	•	NEW
FPM	FEET PER MINUTE	RS	ROOF SUMP	+	HOSE BIBB, WALL HYDRANT	78	EXISTING C
FFD	FUNNEL FLOOR DRAIN	SA	SUPPLY AIR		DIRECTION OF PIPE PITCH		NEW (
FFE	FINISHED FLOOR ELEVATION	SH	SHOWER	<ul><li>4</li></ul>	SPRINKLER HEAD (SIDEWALL)		VOLUME
FS FT	FLOOR SINK FEET	SP SgFt / SF	STATIC PRESSURE  SQUARE FOOT/SQUARE FEET	< — FS	SPRINKLER HEAD (SIDEWALL) FLOW SWITCH		
FURN	FURNISHED	Sqrt / Sr SS	SERVICE SINK	~rs <	SIAMESE CONNECTION (YARD)	— – <u>M</u>	MOTORIZ
FV	FACE VELOCITY	TC	TEMPERATURE CONTROL	<b>₹</b>	SIAMESE CONNECTION (WALL MOUNTED)	SD	SMOKE [
FVC	FIRE VALVE CABINET	Т & Р	TEMPERATURE AND PRESSURE	→ ⊢ <u></u>	FIRE HYDRANT		000 05
GAL	GALLON	TSP	TOTAL STATIC PRESSURE	→ <b>ÿ</b>	FLOW MEASURING DEVICE	CO2)	CO2 SEN
GPH	GALLONS PER HOUR	TYP	TYPICAL	<i>"</i> /	BALANCING VALVE	$\bigcirc$	THERMOS TEMPERA
GPM	GALLONS PER MINLITE	UG	UNDERGROUND	₽	COMBINATION FLOW MEASURING AND BALANCING DEVICE		HIIMIDIST

UNDERGROUND

UNIT HEATER

UNDERWRITERS LABORATORY

UNLESS NOTED OTHERWISE

GALLONS PER MINUTE

HUB OUTLET

HORSEPOWER

#### MECHANICAL SYMBOLS PIPING LEGEND

ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION
<del>\</del>	RECTANGULAR TAKE-OFF (SINGLE LINE)	——CA——	COMPRESSED AIR PIPING
<del>\</del>		——CD——	CONDENSATE DRAIN PIPING
	RECTANGULAR TAKE-OFF (DOUBLE LINE)	——DT——	DRAIN TILE
<del>\</del>	ROUND TAKE-OFF (SINGLE LINE)	——F——	FIRE PROTECTION PIPING
<del>                                     </del>	DOLIND TAKE OFF (DOLIDLE LINE)	FOR	FUEL OIL RETURN PIPING
	ROUND TAKE-OFF (DOUBLE LINE)	——F0S——	FUEL OIL SUPPLY PIPING
	SPIN-IN FITTING (WITH VOLUME DAMPER)	——-G——	NATURAL GAS PIPING
	ELBOW (WITH TURNING VANES)	——BCW——	BOOSTED-DOMESTIC COLD WATER PIPING
<u> </u>	LEBON (MINI TORRING WINES)	BHW	BOOSTED-DOMESTIC HOT WATER PIPING
	RADIUS RECTANGULAR ELBOW	CW	DOMESTIC COLD WATER PIPING
	RADIUS ROUND ELBOW	——NPCW——	NON POTABLE COLD WATER PIPING
H		——TW——	TEMPERED WATER PIPING
	RECTANGULAR ELBOW UP	——HW—— —HW(140°F)—	DOMESTIC HOT WATER PIPING  DOMESTIC 140°F HOT WATER PIPING
	ROUND ELBOW UP	——HWR——	DOMESTIC 1407 HOT WATER FIFTING  DOMESTIC HOT WATER RETURN PIPING
L		SAN	SANITARY WASTE PIPING
<u> </u>	RECTANGULAR ELBOW DOWN	PSAN	PUMPED SANITARY PIPING
	ROUND ELBOW DOWN	V	VENT PIPING
<del> </del>	CONCENTRIC TRANSITION (DOUBLE LINE)	ST	STORM SEWER PIPING
	CONCENTRIC TRANSITION (DOUBLE LINE)	PST	PUMPED STORM PIPING
$\leftarrow$	CONCENTRIC TRANSITION (SINGLE LINE)	RC	RAIN CONDUCTOR PIPING
<u> </u>	ECCENTRIC TRANSITION (DOUBLE LINE)	ORC	OVERFLOW RAIN CONDUCTOR PIPING
	LOOLITHIO TIVITOTI (BOODLE LINE)	CHWR	CHILLED WATER RETURN PIPING
$\leftarrow$	ECCENTRIC TRANSITION (SINGLE LINE)	CHWS	CHILLED WATER SUPPLY PIPING
R	INCLINED RISE IN DIRECTION OF AIR FLOW	CWR	CONDENSER WATER RETURN PIPING
' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	(DOUBLE LINE) INCLINED RISE IN DIRECTION OF AIR FLOW	CWS	CONDENSER WATER SUPPLY PIPING
<del>\                                    </del>	(SINGLE LINE)	——HHWR——	HEATING HOT WATER RETURN PIPING
	INCLINED DROP IN DIRECTION OF AIR FLOW (DOUBLE LINE)	——HHWS——	HEATING HOT WATER SUPPLY PIPING
D	INCLINED DROP IN DIRECTION OF AIR FLOW	HPLR	HEAT PUMP LOOP RETURN PIPING
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	(SINGLE LINE)	HPLS	HEAT PUMP LOOP SUPPLY PIPING
	FLEXIBLE CONNECTION	RL	REFRIGERANT LIQUID PIPING
TTr	FLEXIBLE DUCT CONNECTION TO SUPPLY	RS	REFRIGERANT SUCTION PIPING
	DIFFUSER	HGB	HOT GAS BY-PASS PIPING
$\leftarrow$	SUPPLY DIFFUSER	——GXHR——	GEO HEAT EXCHANGE RETURN
		——GXHS—— ——STM——	GEO HEAT EXCHANGE SUPPLY STEAM PIPING
	LINEAR SLOT DIFFUSER	——HPS——	HIGH PRESSURE STEAM PIPING
$\leftarrow$	RETURN OR EXHAUST GRILLE	——LPS——	LOW PRESSURE STEAM PIPING
		CR	STEAM CONDENSATE RETURN PIPING
#	TRANSFER GRILLE	PCR	PUMPED STEAM CONDENSATE RETURN PIPING
	CROSS SECTION OF SUPPLY AIR DUCT	LPC	LOW PRESSURE CONDENSATE PIPING
	CROSS SECTION OF EXHAUST OR RETURN AIR	——НРС——	HIGH PRESSURE CONDENSATE PIPING
	DUCT	МА	MEDICAL AIR PIPING
	EXISTING FIRE DAMPER (HORIZONTAL)	N	NITROGEN GAS PIPING
	NEW Standard (Notable Standard)	02	OXYGEN GAS PIPING
	EXISTING	VAC	VACUUM PIPING
	FIRE DAMPER (VERTICAL) NEW		
*			

SMOKE DAMPER

(HORIZONTAL)

MOTORIZED DAMPER

SMOKE DETECTOR

THERMOSTAT OR TEMPERATURE SENSOR

HUMIDISTAT OR HUMIDITY SENSOR

CO2 SENSOR

COMBINATION FLOW MEASURING AND BALANCING DEVICE

AUTOMATIC AIR VALVE

MANUAL AIR VALVE

COMBINATION FIRE/SMOKE DAMPER (VERTICAL)

COMBINATION FIRE/SMOKE DAMPER

VOLUME DAMPER (MANUALLY ADJUSTABLE)

RETURN OR EXHAUST / SUPPLY AIR FLOW

	DRAWING INDEX		
SHT. NO.	DESCRIPTION		
M0.00	MECHANICAL GENERAL INFORMATION		
M1.10	MECHANICAL HVAC COMPOSITE NEW WORK PLAN		
M8.00	TEMPERATURE CONTROLS		
M8.01	TEMPERATURE CONTROLS		

DRAWING NOTATION

NEW WORK KEY NOTE NO. 1

DEMOLITION KEY NOTE NO. 1

IE: DIFFUSER TYPE = S-1

POINT OF NEW CONNECTION

EXISTING SYSTEM COMPONENT TO BE REMOVED

NECK SIZE = 12x12

CFM = 150 (TYPICAL FOR 2)

EQUIPMENT TAG

AIR TERMINAL TAG:

----- EXISTING DEVICES OR EQUIPMENT

DESCRIPTION

S = SUPPLY R = RETURN

E = EXHAUST

T = TRANSFER

ISSUE DATE	ISSUED FOR
04/08/2022	BID DOCUMENTS
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<u></u>	
<u> </u>	
<u> </u>	
DRAWN	RPL
CHECKED	MPH



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	APPLICABLE CODES AND REGULATIONS			
ÆAR	CODE			
:015	MICHIGAN BUILDING CODE			
.015	MICHIGAN REHABILITATION CODE FOR EXISTING BUILDINGS			
.015	MICHIGAN PLUMBING CODE			
.015	MICHIGAN MECHANICAL CODE			
.015	MICHIGAN UNIFORM ENERGY CODE			
.015	INTERNATIONAL FUEL GAS CODE			

2012 NFPA 101 WITH BFS AMENDMENTS

Croswell-Lexington
Community Schools: Meyer Elementary
HVAC Controls Upgrade

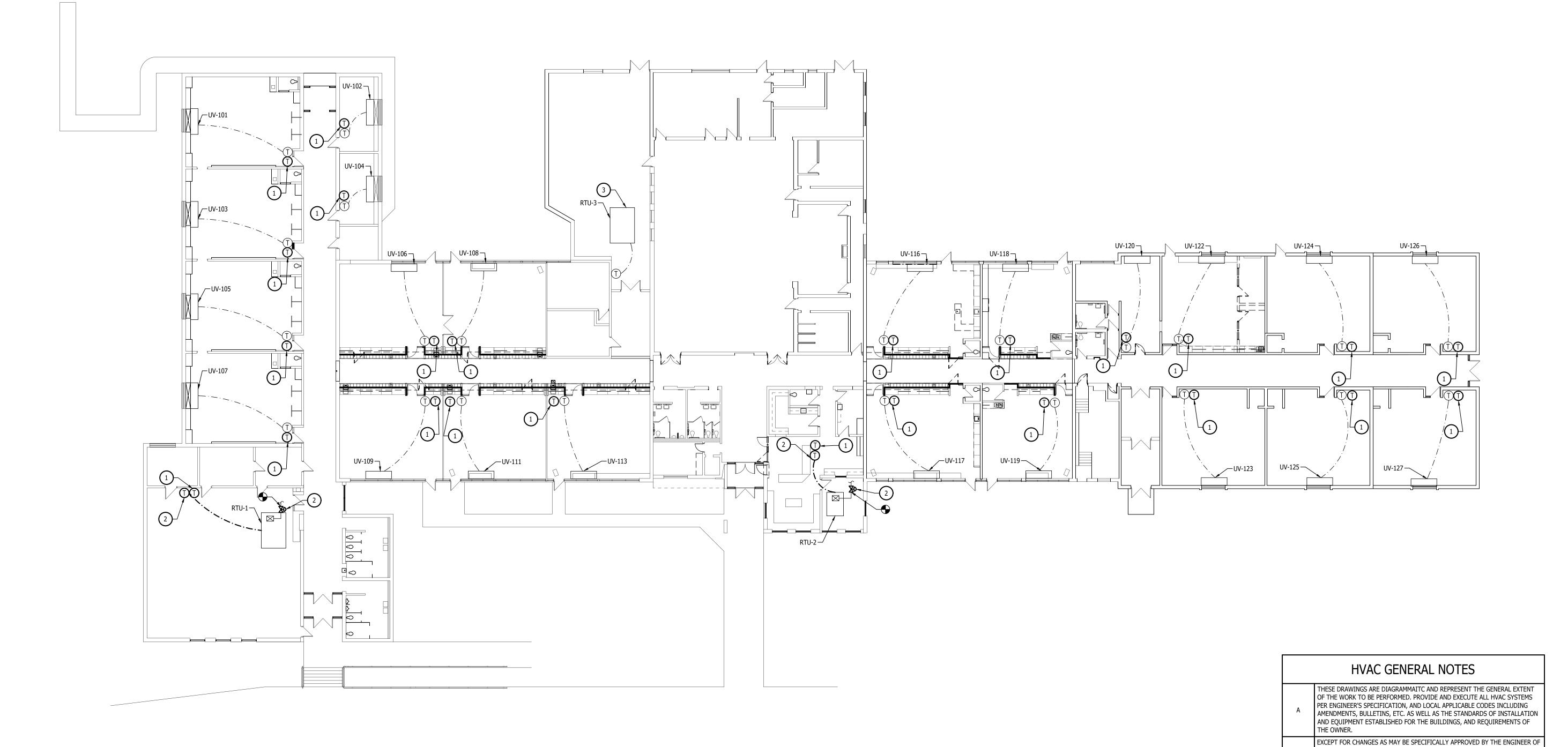
Croswell, Michigan

MECHANICAL GENERAL INFORMATION

PROJECT NUMBER

SHEET NUMBER

2022-017



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

ISSUE DATE	ISSUED FOR	
04/08/2022	BID DOCUMENTS	
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DRAWN	RPL	
CHECKED	MPH	
APPROVED	MPH	



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PROJEC

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.

THE CONTRACTOR AND EACH SUBCONTRACTOR COVENENTS AND AGREES TO IDEMNIFY, 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

CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION

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

PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT,
DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT

CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S

FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS

**NEW WORK KEYED NOTES** 

PLATE TEMPERATURE SENSOR ADJACENT TO EXISTING THERMOSTAT.

ALTERNATE M2: REPLACE PNEUMATIC 3-WAY CONTROL VALVE WITH NEW BACNET COMPATIBLE DEVICE. INSTALL NEW THERMOSTAT IN ADJACENT TO

NEW BACNET COMMUNICATIONS TO BE INSTALLED IN PARALLEL THRU EXISTING CEILING GRID. CONTRACTOR TO REPAIR/REPLACE ALL BROKEN CEILING TILES.

ALTERNATE M1: EXISTING PNEUMATIC THERMOSTAT TO REMAIN. INSTALL FLAT

DAMAGE, OR IMPROPER CONSTRUCTION PROTOCOL.

CONTRACT DOCUMENTS.

REQUIRED BY THE OWNER.

EXISTING PNEUMATIC DEVICE.

CLEARANCE.

G CERTIFIED DRAWINGS.

Croswell-Lexington
Community Schools:
Meyer Elementary
HVAC Controls Upgrade

Croswell, Michigan

SHEET

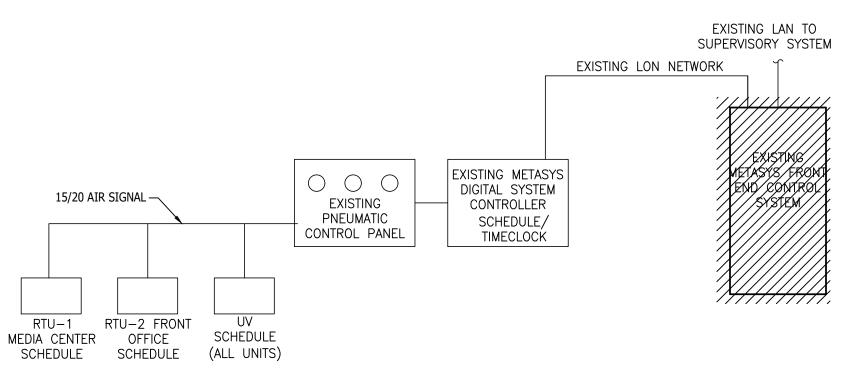
MECHANICAL HVAC COMPOSITE NEW WORK PLAN

PROJECT NUMBER

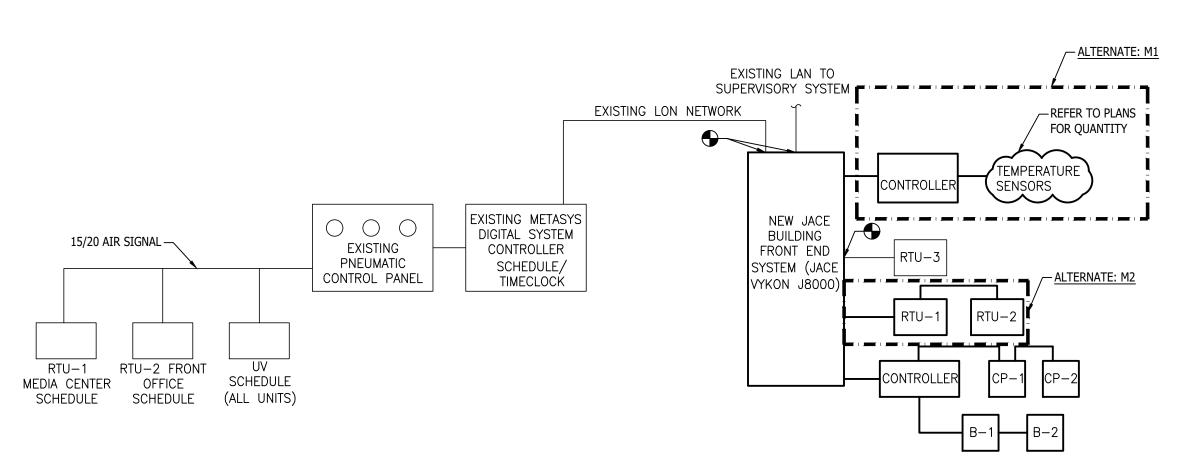
2022-017

SHEET NUMBER

M1.10



# BUILDING AUTOMATION SYSTEM RISER DIAGRAM DEMOLITION



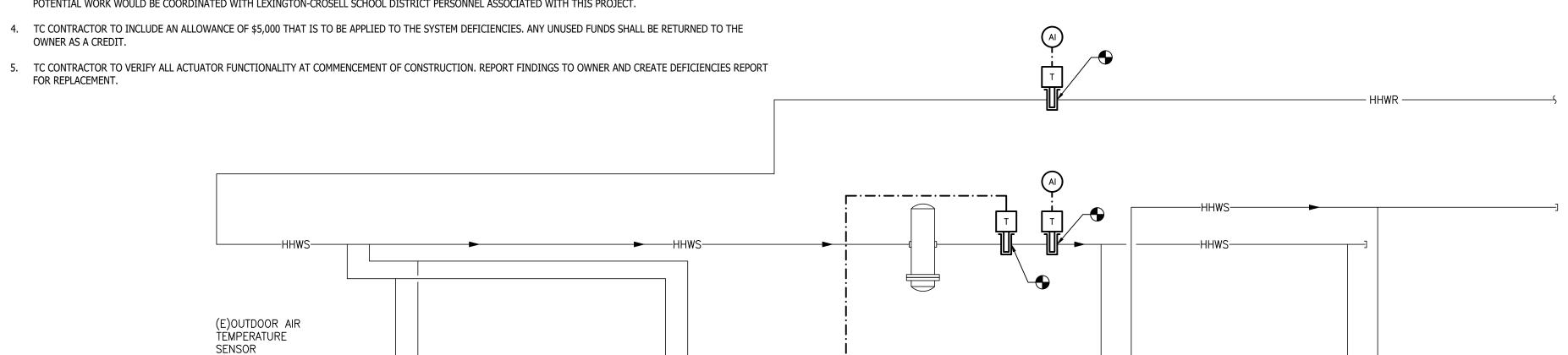
## BUILDING AUTOMATION SYSTEM RISER DIAGRAM NEW WORK

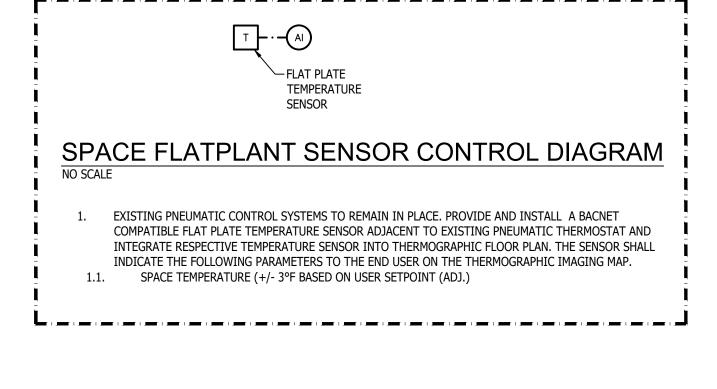
NO SCALE

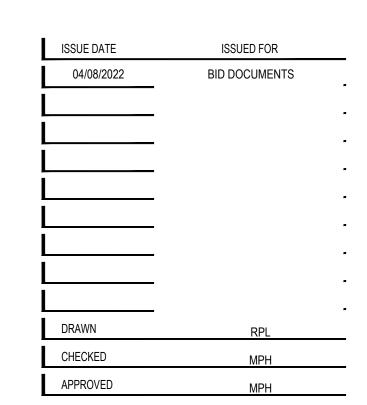
- 1. PROVIDE A SYSTEM EQUIPMENT UPGRADE OF THE DISTRICT'S BUILDING AUTOMATION SYSTEM (AKA ENERGY MANAGEMENT SYSTEM) FRONT END SYSTEM (CURRENTLY METASYS/PNEUMATIC) TO BACNET TRIDIUM NIAGARA AX SUPERVISOR VERSION N4 WITH CURRENT PATCHES. PROVIDE FOR BACNET OVER IP LICENSING AND COMMUNICATION FOR THE BUILDING.
- 2. <u>ALTERNATE M1:</u> PROVIDE BUILDING FLOOR PLANS WITH INTERACTIVE SPACE THERMAL IMAGING INDICATING THE RESPECTIVE EQUIPMENT OPERATION. PROVIDE AN "EMERGENCY MASTER SHUT OFF" OPERATION FOR THE BUILDING MANAGEMENT SYSTEM.
- 3. TC CONTRACTOR TO DEVELOP A DEFICIENCIES LIST OF EXISTING TERMINAL EQUIPMENT AND RELATED COMPONENTS SYSTEM THAT MAY HAVE ISSUES, ASSUME FOR BIDDING PURPOSES THAT COMMUNICATIONS AND WIRING IS IN TACT. SCOPE OF WORK DOES NOT REQUIRE TO CORRECT ANY IDENTIFIED DEFICIENCIES ANY POTENTIAL WORK WOULD BE COORDINATED WITH LEXINGTON-CROSELL SCHOOL DISTRICT PERSONNEL ASSOCIATED WITH THIS PROJECT.

(E)EMERGENCY SHUT OFF SWITCH

STATUS S CS









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# 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.

1. 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".

- 2. THE DDC SYSTEM SHALL ALTERNATE PUMP OPERATION BASED ON RUN TIME HOURS OR AT THE BEGINNING OF EACH
- 3. 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.
- 4. 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.
- 6. 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.
- 7. 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).
- 8. THE BUILDING DDC SYSTEM SHALL MONITOR ALL TEMPERATURE POINTS INDICATED, BOILER STATUS, BOILER ALARM, PUMP ALARM, PUMP STATUS, AND OUTSIDE AIR TEMPERATURE.

	ER SUPPLY (HHWS) CHEDULE	
	OUTSIDE AIR TEMP.	HHWS TEMPERATURE
	≥ 50°F	150 <b>°</b> F
	≤ 25°F	180°F

Croswell-Lexington
Community Schools:
Meyer Elementary
HVAC Controls Upgrade

Croswell, Michigan

SHEET

TEMPERATURE CONTROLS

PROJECT NUMBER

2022-017

SHEET NUMBER

M8.00

HEATING HOT WATER SYSTEM CONTROL DIAGRAM
NO SCALE

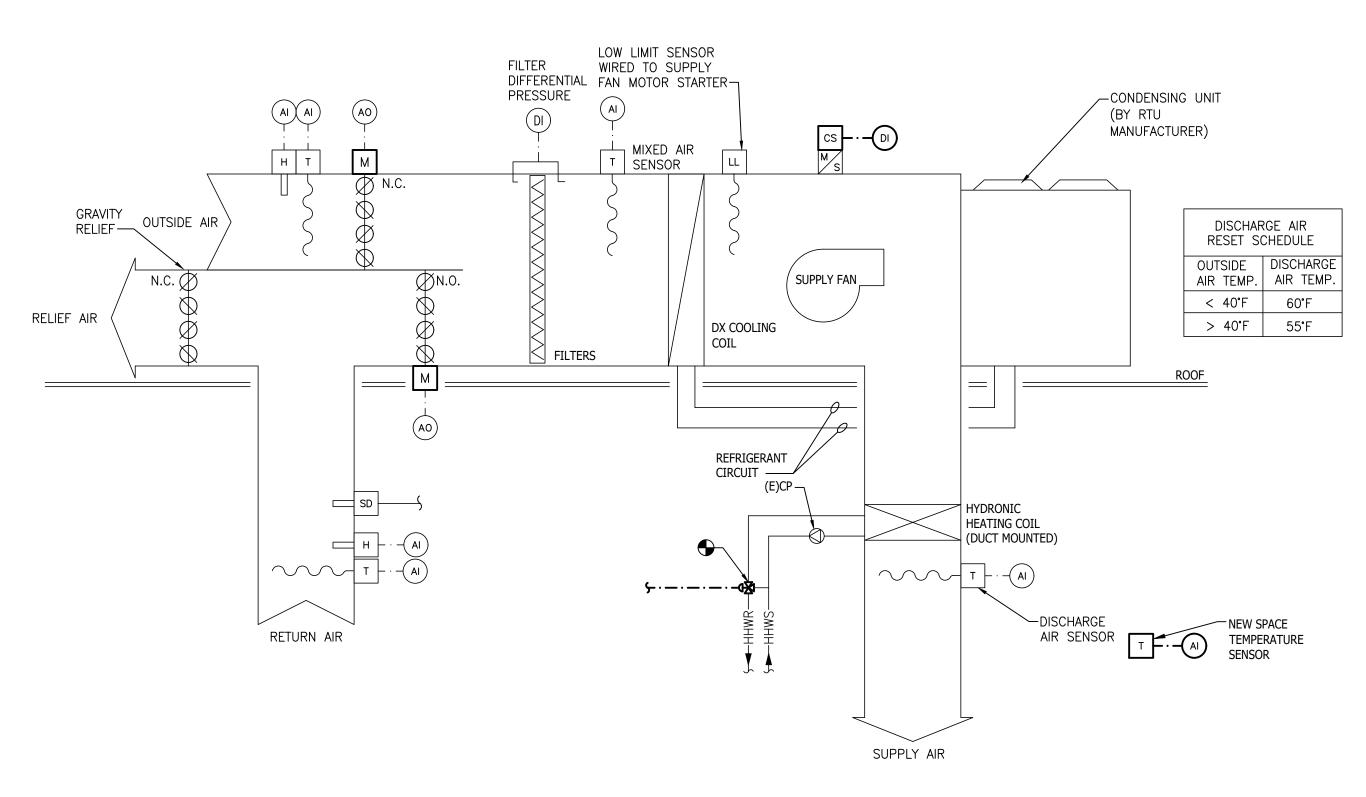
-GATEWAY -

TO OWNER'S CONTROLS SYSTEM.
PROVIDE GATEWAY AS REQUIRED.

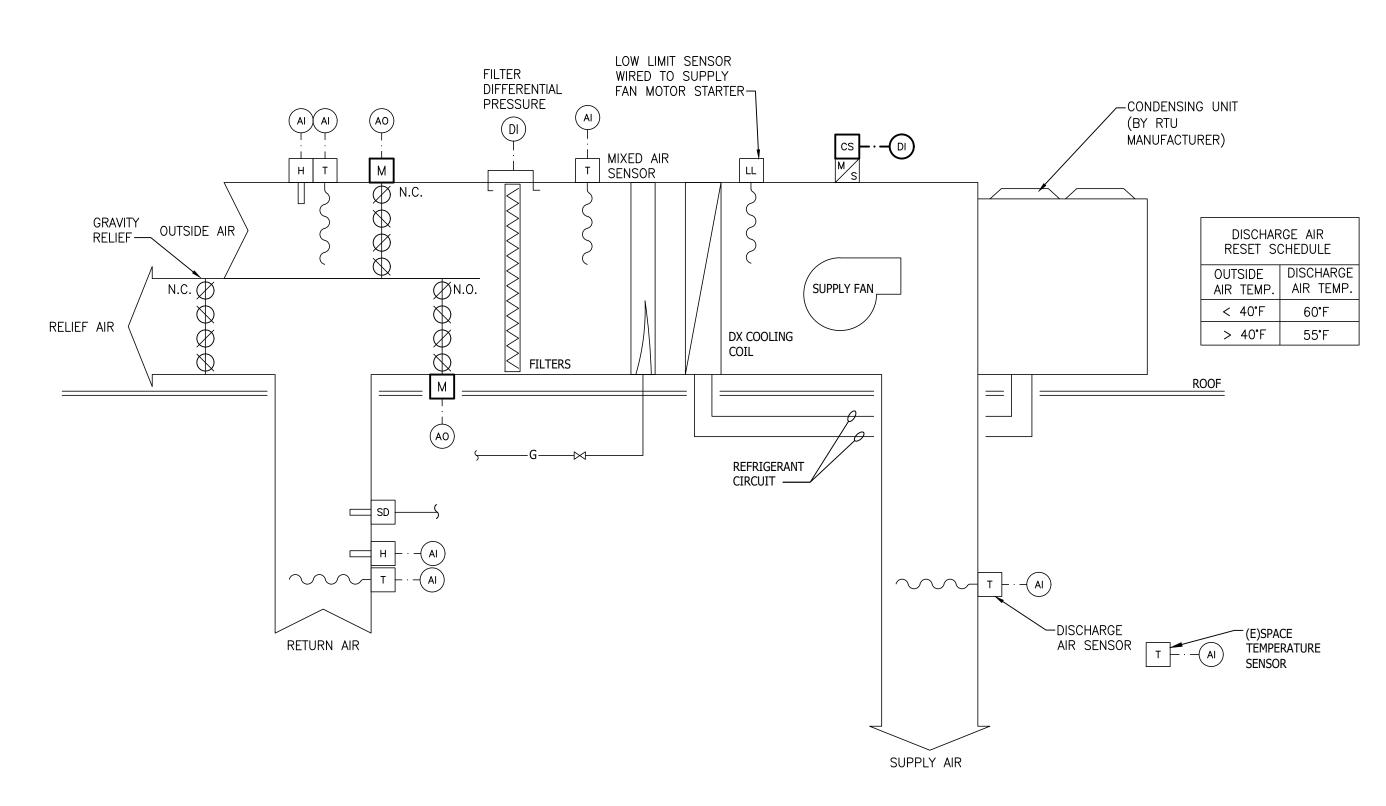
<u>B-2</u>

BACNET TO
NEXT BOILER

CS - · DI STATUS



(E)PACKAGED ROOFTOP UNIT CONTROL DIAGRAM (ALTERNATE: M2)



(E)PACKAGED ROOFTOP UNIT CONTROL DIAGRAM
NO SCALE

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

- 1. 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.
- 2. 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.
- 3. 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.
- 4. 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.
- 5. 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.
- 8. 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.
- 10. THE BUILDING MANAGEMENT SYSTEM (BMS) SHALL GRAPHICALLY SHOW MONITOR AND CONTROL THE FOLLOWING
- 10.1. OUTDOOR AIR TEMPERATURE (°F)
- 10.2. OCCUPIED COMMAND
- 10.3. SUPPLY FAN COMMAND 10.4. SUPPLY FAN STATUS
- CAFETERIA SPACE TEMPERATURE (°F) 10.5.
- 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
- 10.14. DX COOLING STAGE 2 COMMAND
- DX PERCENT COOLING COMMAND MIXED AIR DAMPER COMMAND
- MINIMUM OA DAMPER POSITION 10.17.
- 10.18. ECONOMIZER SETPOINT
- AIR FILTER STATUIS 10.19. DISCHARGE AIR LOW LIMIT (°F)
- 10.21. OA ENTHALPY SETPOINT (BTU/LB)

- 1. EXISTING EQUIPMENT CONTROLLER TO REMAIN. 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 STATUIS
- 1.20. DISCHARGE AIR LOW LIMIT (°F)
- OA ENTHALPY SETPOINT (BTU/LB)

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Croswell-Lexington Community Schools: Meyer Elementary **HVAC Controls Upgrade** 

Croswell, Michigan

TEMPERATURE CONTROLS

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