# CROSWELL-LEXINGTON COMMUNITY SCHOOLS

# FROSTICK ELEMENTARY HVAC Controls Upgrade

CROSWELL, MICHIGAN PROJECT NO. 2022-017

APRIL 8, 2022

BID DOCUMENTS



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# LIST OF DRAWINGS

### ARCHITECTURAL

M0.00 MECHANICAL GENERAL INFORMATION

11.10 MECHANICAL HVAC COMPOSITE NEW WORK PLA

M8.00 TEMPERATURE CONTROL

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	<del>\</del>	RECTANG
AD	ACCESS DOOR	HTG	HEATING	VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)	<u> </u>	55051110
AE	AIR EXTRACTOR	HYD	HYDRANT	VTR	VENT THRU ROOF		RECTANG
AFF	ABOVE FINISHED FLOOR	HZ	HERTZ	W	WASTE	\\	ROUND 1
APD	AIR PRESSURE DROP	ID	INSIDE DIAMETER	W&V	WASTE AND VENT		ROUND 1
ASR BFP	AUTOMATIC SPRINKLER RISER  BACKFLOW PREVENTER	IE IN	INVERT ELEVATION INCHES	WB	WET BULB TEMPERATURE	. M	
BHP	BRAKE HORSEPOWER	IN INST	INCHES	WC WG	WATER CLOSET WATER GAUGE		SPIN-IN
BOD	BOTTOM OF DUCT	INV	INVERT	WH	WALL HYDRANT		ELBOW (
BTU	BRITISH THERMAL UNIT	ISP	INTERNAL STATIC PRESSURE			<u> </u>	DADILIC
BTUH	BRITISH THERMAL UNITS PER HOUR	IW	INDIRECT WASTE				RADIUS I
BWV	BACKWATER VALVE	KW	KILOWATT	MECH	ANICAL PIPING SYMBOLS		RADIUS I
CAP	CAPACITY	LAT	LEAVING AIR TEMPERATURE	MEGII	ANICAL FIFTING STRIBULS		RECTANG
CAV	CONSTANT AIR VOLUME	LAV	LAVATORY	ABBREV.	DESCRIPTION		
CFH	CUBIC FEET PER HOUR	LBS/HR	POUNDS PER HOUR		PIPE ELBOW UP		ROUND E
CFM	CUBIC FEET PER MINUTE	LDB	LEAVING DRY BULB TEMPERATURE		PIPE ELBOW DOWN		RECTANG
CIRC	CIRCULATING	LRA	LOCKED ROTOR AMPS	<del></del>	PIPE TEE DOWN		DOLIND 1
CLG	COOLING	LWB	LEAVING WET BULB TEMPERATURE		DIRECTION OF FLOW		ROUND E
CO	CLEAN OUT	MAV	MANUAL AIR VENT	——————————————————————————————————————	UNION		CONCENT
CONT	CONTINUATION OR CONTINUED	MAX	MAXIMUM	<del></del>	STRAINER	$\leftarrow$	CONCENT
CONV	CONVECTOR	MBH	1000 BRITISH THERMAL UNITS PER HOUR		CONCENTRIC REDUCER	, [ ,	CONCLIN
CUH	CABINET UNIT HEATER	MCA	MINIMUM CIRCUIT AMPACITY		ECCENTRIC REDUCER		ECCENTR
CV	CONTROL VALVE	MECH	MECHANICAL		EXPANSION JOINT	<b>├─</b>	ECCENTR
DB DEG	DRY BULB TEMPERATURE  DEGREES	MFR MH	MANUFACTURER  MANHOLE	——————————————————————————————————————	FLEXIBLE CONNECTION  PIPE ANCHOR	ı R ı	
DDC	DIRECT DIGITAL CONTROL	MIN	MINIMUM		PIPE GUIDE	R	(DOUBLE
DN	DOWN	MISC	MISCELLANEOUS	——i	PIPE CAP OR PLUG	<u> </u>	INCLINED (SINGLE
DTC	DRAIN TILE CONNECTION	MOD	MOTOR OPERATED DAMPER (AUTOMATIC)	<u> </u> ₩——	ISOLATION VALVE	D	INCLINED
DWH	DOMESTIC WATER HEATER	MOP	MAXIMUM OVER-CURRENT PROTECTION	———	CIRCULATING PUMP	<u> </u>	(DOUBLE
(E)	EXISTING	N.C.	NOISE CRITERIA	——¤——	GLOBE VALVE	<u> </u>	INCLINED (SINGLE
EA/EXH	EXHAUST AIR	NIC	NOT IN CONTRACT	——Б—	BALL VALVE		FLEXIBLE
EAT	ENTERING AIR TEMPERATURE	NC	NORMALLY CLOSED	—— × ——	BUTTERFLY VALVE	<u>                                     </u>	TELXIDEE
EDB	ENTERING DRY BULB TEMPERATURE	NO	NORMALLY OPEN	<b>≱</b>	ANGLE VALVE		FLEXIBLE DIFFUSER
EF	EXHAUST FAN	NOM	NOMINAL		CHECK VALVE (SWING)	<u> </u>	
EJ	EXPANSION JOINT	OA	OUTSIDE AIR	——*\%\	CHECK VALVE (SPRING)	<b></b>	SUPPLY
EL	ELEVATION	OBD	OPPOSED BLADE DAMPER	Ι√ι	PLUG VALVE		LINEAR S
ELECT	ELECTRICAL	OC	ON CENTER / CENTER TO CENTER	—— <del>———————————————————————————————————</del>	NEEDLE VALVE	, 🖂	DET! 10.1
EMS	ENERGY MANAGEMENT SYSTEM	OD	OUTSIDE DIAMETER	——————————————————————————————————————	OUTSIDE SCREW AND YOKE VALVE (OS&Y)	<b>\</b>	RETURN
ESP	EXTERNAL STATIC PRESSURE	OED	OPEN ENDED DUCT		PRESSURE REGULATING VALVE	#	TRANSFE
EWB	ENTERING WET BULB TEMPERATURE	ORS	OVERFLOW ROOF SUMP	<u>\S</u>	SOLENOID VALVE		CROSS S
EWC	ELECTRIC WATER COOLER	OS&Y	OUTSIDE SCREW AND YOKE	<b>-</b> \$	CONTROL VALVE (2-WAY / 3-WAY)		
°F	DEGREES FAHRENHEIT	PD	PRESSURE DROP (FEET OF WATER)		CENTRIFUGAL FAN		CROSS S DUCT
FA FC	FACE AREA (COIL) / FREE AREA (LOUVER)	PRV	PRESSURE REDUCING VALVE	& &—	AUTOMATIC GAS SHUT-OFF VALVE TRAP (PLAN VIEW)		EXISTING
FD	FLEXIBLE CONNECTION FLOOR DRAIN	PSIA PSIG	POUNDS PER SQUARE INCH — ABSOLUTE  POUNDS PER SQUARE INCH — GAUGE		FLOOR DRAIN / FUNNEL FLOOR DRAIN (PLAN VIEW)		F NEW
FDC	FIRE DEPARTMENT CONNECTION	PT	PRESSURE / TEMPERATURE PORT		FLOOR DRAIN / FUNNEL FLOOR DRAIN (ELEVATION)	_	EXISTING
FH	FIRE HYDRANT	RA	RETURN AIR	— ©	ROOF SUMP		F
FHC	FIRE HOSE CABINET	RH	RELATIVE HUMIDITY	——• CO	CLEAN OUT (IN FLOOR)	•	NEW
FHR	FIRE HOSE RACK	REQD	REQUIRED		CLEAN OUT (IN LINE)		EXISTING S
FHV	FIRE HOSE VALVE	REL.A	RELIEF AIR	wco	CLEAN OUT (WALL)	•	NEW
FLA	FULL LOAD AMPS	RPM	REVOLUTIONS PER MINUTE	BFP	BACKFLOW PREVENTER	7	EXISTING C
FLR	FLOOR	RPZ	REDUCED PRESSURE ZONE	$\bowtie \nearrow \bowtie - \bowtie$	WATER METER ASSEMBLY	_ <b>_</b>	NEW (\
FPM	FEET PER MINUTE	RS	ROOF SUMP	+	HOSE BIBB, WALL HYDRANT	7	EXISTING
FFD	FUNNEL FLOOR DRAIN	SA	SUPPLY AIR		DIRECTION OF PIPE PITCH		C NEW (H
FFE	FINISHED FLOOR ELEVATION	SH	SHOWER	<b>©</b>	SPRINKLER HEAD (UPRIGHT)		
FS	FLOOR SINK	SP	STATIC PRESSURE	$\triangleleft$	SPRINKLER HEAD (SIDEWALL)		VOLUME
FT	FEET	SqFt / SF	SQUARE FOOT/SQUARE FEET	—FS	FLOW SWITCH	— - — M	MOTORIZ
FURN	FURNISHED	SS	SERVICE SINK	ď,	SIAMESE CONNECTION (YARD)		CHOKE
FV	FACE VELOCITY	TC	TEMPERATURE CONTROL	<u></u>	SIAMESE CONNECTION (WALL MOUNTED)	SD	SMOKE [
FVC	FIRE VALVE CABINET	Т & Р	TEMPERATURE AND PRESSURE	⊬ <del></del>	FIRE HYDRANT	(CO2)	CO2 SEN
GAL	GALLON	TSP	TOTAL STATIC PRESSURE	— <u> </u>	FLOW MEASURING DEVICE	$\bigcirc$	THERMOS
GPH	GALLONS PER MUNITE	TYP	TYPICAL	፟	BALANCING VALVE	$\bigcup$	TEMPERA

UNDERGROUND

UNIT HEATER

UNDERWRITERS LABORATORY

UNLESS NOTED OTHERWISE

GALLONS PER MINUTE

HOSE BIBB

HUB OUTLET

HORSEPOWER

### MECHANICAL SYMBOLS PIPING LEGEND

ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION
<del>\</del>	RECTANGULAR TAKE—OFF (SINGLE LINE)	——CA——	COMPRESSED AIR PIPING
<u> </u>	(,	——CD——	CONDENSATE DRAIN PIPING
	RECTANGULAR TAKE-OFF (DOUBLE LINE)	——DT——	DRAIN TILE
<del>\</del>	ROUND TAKE-OFF (SINGLE LINE)	——F——	FIRE PROTECTION PIPING
<del>11</del>		——FOR——	FUEL OIL RETURN PIPING
	ROUND TAKE-OFF (DOUBLE LINE)	F0S	FUEL OIL SUPPLY PIPING
<del></del>	SPIN-IN FITTING (WITH VOLUME DAMPER)	——-G——	NATURAL GAS PIPING
<u> </u>	FI DOW (WITH THENING MANES)	BCW	BOOSTED-DOMESTIC COLD WATER PIPING
	ELBOW (WITH TURNING VANES)	BHW	BOOSTED-DOMESTIC HOT WATER PIPING
	RADIUS RECTANGULAR ELBOW	CW	DOMESTIC COLD WATER PIPING
£	DADILIC DOLLNID ELDOW	NPCW	NON POTABLE COLD WATER PIPING
	RADIUS ROUND ELBOW	——TW——	TEMPERED WATER PIPING
	RECTANGULAR ELBOW UP	——HW——	DOMESTIC HOT WATER PIPING
( ) ( )	ROUND ELBOW UP	—HW(140°F)—	DOMESTIC 140°F HOT WATER PIPING
	NOOND ELBOW OF	HWR	DOMESTIC HOT WATER RETURN PIPING
	RECTANGULAR ELBOW DOWN	SAN	SANITARY WASTE PIPING
	ROUND ELBOW DOWN	——PSAN——	PUMPED SANITARY PIPING
		V	VENT PIPING
	CONCENTRIC TRANSITION (DOUBLE LINE)	——ST——	STORM SEWER PIPING
$\leftarrow$	CONCENTRIC TRANSITION (SINGLE LINE)	——PST——	PUMPED STORM PIPING  RAIN CONDUCTOR PIPING
<u></u>	· · · ·	——RC—— ——ORC——	OVERFLOW RAIN CONDUCTOR PIPING
	ECCENTRIC TRANSITION (DOUBLE LINE)	——CHWR——	CHILLED WATER RETURN PIPING
<b>├</b>	ECCENTRIC TRANSITION (SINGLE LINE)	CHWS	CHILLED WATER SUPPLY PIPING
, R	INCLINED RISE IN DIRECTION OF AIR FLOW		CONDENSER WATER RETURN PIPING
<u>}  -                                   </u>	(DOUBLE LINE)	CWS	CONDENSER WATER SUPPLY PIPING
<u> </u>	INCLINED RISE IN DIRECTION OF AIR FLOW (SINGLE LINE)	——HHWR——	HEATING HOT WATER RETURN PIPING
↓ D	INCLINED DROP IN DIRECTION OF AIR FLOW	——HHWS——	HEATING HOT WATER SUPPLY PIPING
<del>                                     </del>	(DOUBLE LINE)	HPLR	HEAT PUMP LOOP RETURN PIPING
<u> </u>	INCLINED DROP IN DIRECTION OF AIR FLOW (SINGLE LINE)	HPLS	HEAT PUMP LOOP SUPPLY PIPING
	FLEXIBLE CONNECTION	RL	REFRIGERANT LIQUID PIPING
X   		RS	REFRIGERANT SUCTION PIPING
Fww.	FLEXIBLE DUCT CONNECTION TO SUPPLY DIFFUSER	HGB	HOT GAS BY-PASS PIPING
T^1		GXHR	GEO HEAT EXCHANGE RETURN
<b>-</b>	SUPPLY DIFFUSER	GXHS	GEO HEAT EXCHANGE SUPPLY
	LINEAR SLOT DIFFUSER	STM	STEAM PIPING
. 🖂		HPS	HIGH PRESSURE STEAM PIPING
	RETURN OR EXHAUST GRILLE	LPS	LOW PRESSURE STEAM PIPING
中	TRANSFER GRILLE	CR	STEAM CONDENSATE RETURN PIPING
	ODOCC CECTION OF CHIRDLY AID DUCT	——PCR——	PUMPED STEAM CONDENSATE RETURN PIPING
	CROSS SECTION OF SUPPLY AIR DUCT	——LPC——	LOW PRESSURE CONDENSATE PIPING
	CROSS SECTION OF EXHAUST OR RETURN AIR DUCT	——HPC——	HIGH PRESSURE CONDENSATE PIPING
	EXISTING	MA	MEDICAL AIR PIPING
	FIRE DAMPER (HORIZONTAL) NEW	——N——	NITROGEN GAS PIPING
		02	OXYGEN GAS PIPING
	EXISTING FIRE DAMPER (VERTICAL)	VAC	VACUUM PIPING
•	NEW		
	FXISTING		

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.	HT. 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

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DRAWN	RPL
CHECKED	MDH

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### 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: Frostick Elementary

> Croswell, Michigan

SHEET

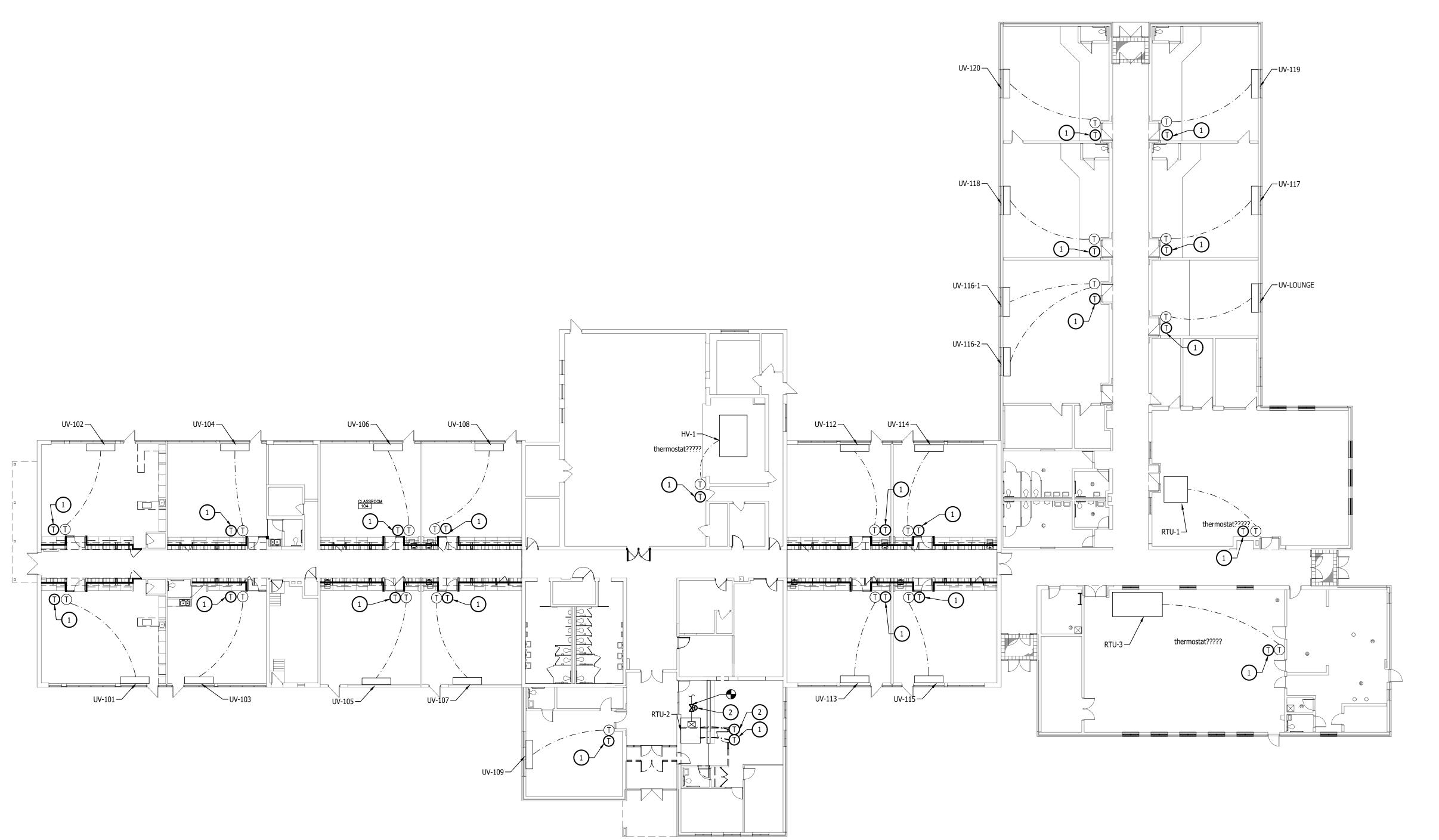
MECHANICAL GENERAL INFORMATION

HVAC Controls Upgrade

PROJECT NUMBER

2022-017

SHEET NUMBER





	HVAC GENERAL NOTES
A	THESE DRAWINGS ARE DIAGRAMMAITC 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.
В	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.
С	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 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

CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S

FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS

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

### NEW WORK KEYED NOTES

CLEARANCE.

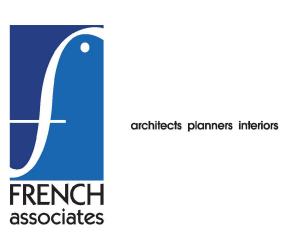
CERTIFIED DRAWINGS.

REQUIRED BY THE OWNER.

- 1 ALTERNATE M1: EXISTING PNEUMATIC THERMOSTAT TO REMAIN. INSTALL FLAT 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 EXISTING PNEUMATIC DEVICE.

KEY PLAN

ISSUE DATE	ISSUED FOR
04/08/2022	BID DOCUMENTS
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DRAWN	RPL
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PRO

Croswell-Lexington
Community Schools:
Frostick Elementary
HVAC Controls Upgrade

Croswell, Michigan

SHEE

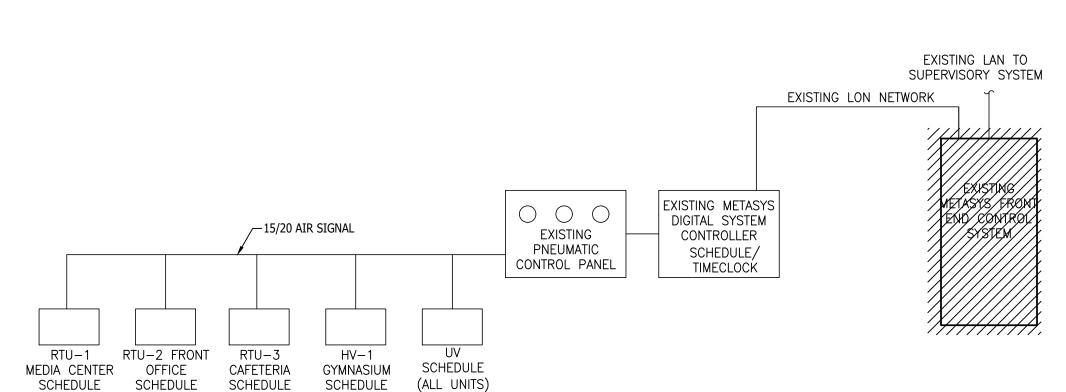
MECHANICAL HVAC COMPOSITE NEW WORK PLAN

PROJECT NUMBER

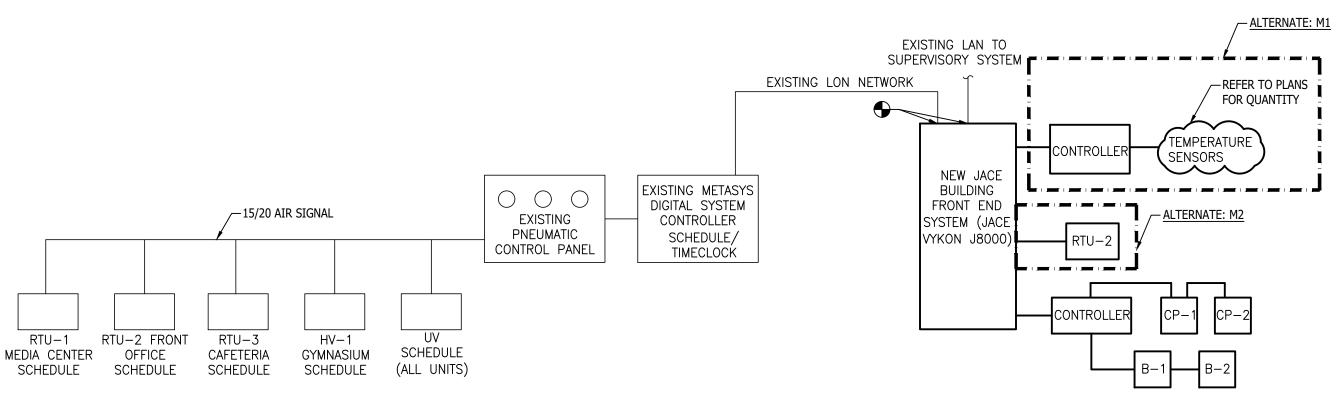
2022-017

SHEET NUMBER

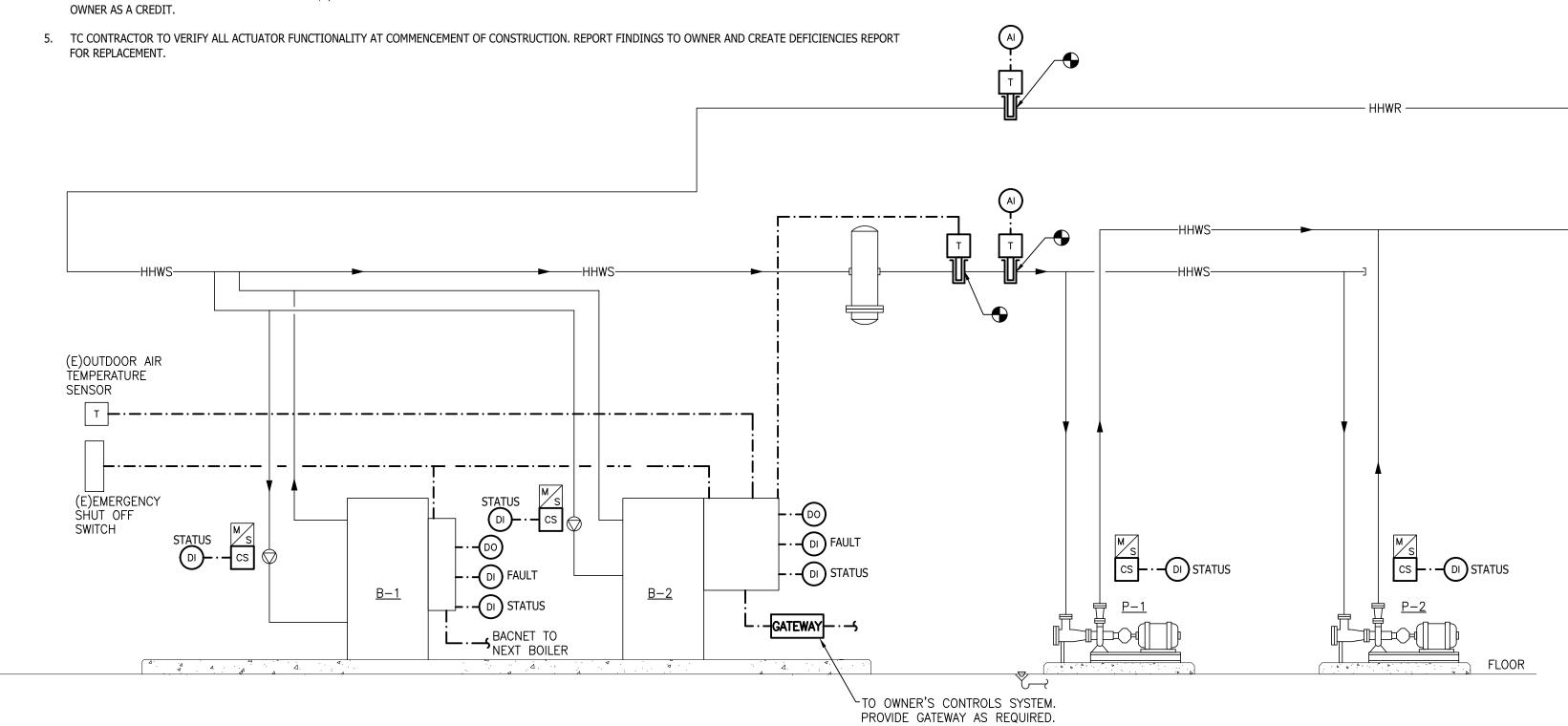
M1.10



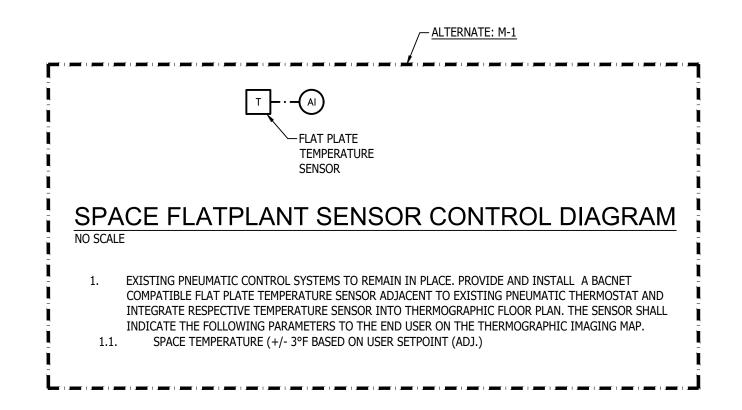
# BUILDING AUTOMATION SYSTEM RISER DIAGRAM DEMOLITION



- BUILDING AUTOMATION SYSTEM RISER DIAGRAM NEW WORK
- 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.
- 4. TC CONTRACTOR TO INCLUDE AN ALLOWANCE OF \$5,000 THAT IS TO BE APPLIED TO THE SYSTEM DEFICIENCIES. ANY UNUSED FUNDS SHALL BE RETURNED TO THE OWNER AS A CREDIT.



HEATING HOT WATER SYSTEM CONTROL DIAGRAM



## 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".
- 2. 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.
- 5. 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.

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

ISSUE DATE	ISSUED FOR
04/08/2022	BID DOCUMENTS
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KEY PLAN



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PROJEC

Croswell-Lexington
Community Schools:
Frostick Elementary
HVAC Controls Upgrade

Croswell, Michigan

SHEET

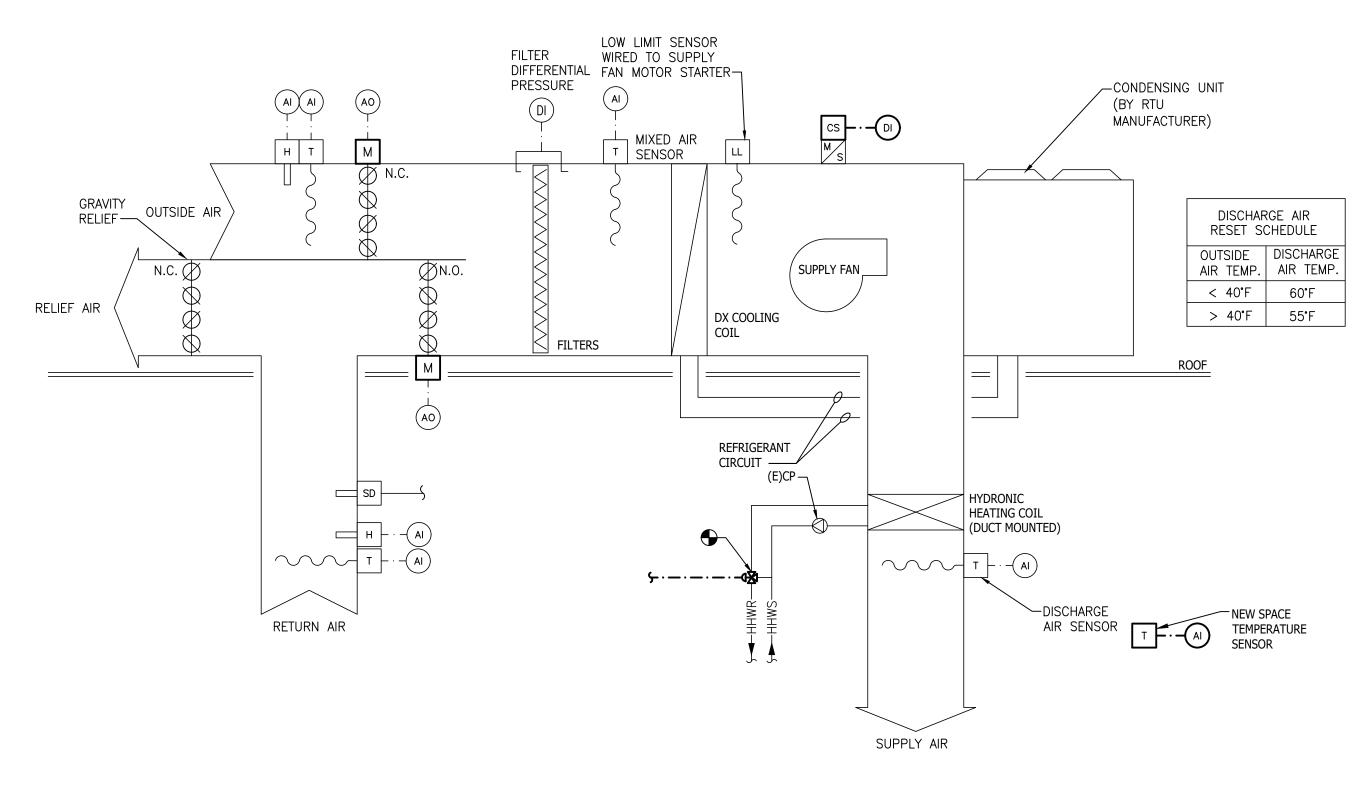
TEMPERATURE CONTROLS

PROJECT NUMBER

2022-017

SHEET NUMBER

M8.00



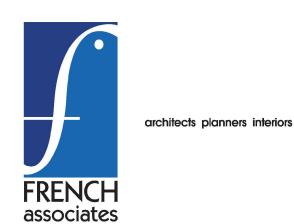
(E)PACKAGED ROOFTOP UNIT CONTROL DIAGRAM (ALTERNATE: M2)

### 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.
- 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.
- 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.
- 6. 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).
- 7. 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.
- 9. 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 POINTS:
- 10.1. OUTDOOR AIR TEMPERATURE (°F)
- OCCUPIED COMMAND 10.3. SUPPLY FAN COMMAND
- 10.4. 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 10.16.
- MINIMUM OA DAMPER POSITION 10.17.
- 10.18. ECONOMIZER SETPOINT 10.19. AIR FILTER STATUIS
- 10.20. DISCHARGE AIR LOW LIMIT (°F) 10.21. OA ENTHALPY SETPOINT (BTU/LB)

EY PLAN			

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



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Croswell-Lexington Community Schools: Frostick Elementary HVAC Controls Upgrade

Croswell, Michigan

TEMPERATURE CONTROLS

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