

MECHANICAL ABBREVIATIONS

AFF	ABOVE FINISH FLOOR	ID	INSIDE DIAMETER
AC	AIR COMPRESSOR	I.E.	INVERT ELEVATION
AHU	AIR HANDLING UNIT	IAH	INTAKE HOOD
AS	AIR SEPARATOR		
A.T.C.	ARCHITECTURAL TRADES CONTRACTOR	LAT	LEAVING AIR TEMPERATURE
		LH	LATENT HEAT (MBH)
		LWT	LEAVING WATER TEMPERATURE
B	BOILER	MAX	MAXIMUM
B.A.S.	BUILDING AUTOMATION SYSTEM	MBH	BTU PER HOUR (THOUSAND)
CAF	COMBUSTION AIR FAN	MIN	MINIMUM
CC	COOLING COIL	M.T.C.	MECHANICAL TRADES CONTRACTOR
CFM	CUBIC FEET PER MINUTE		
CHLR	CHILLER	N.C.	NOISE CRITERIA
CHP	CONSOLE HEAT PUMP	NFFA	NATIONAL FIRE PROTECTION ASSOCIATION
CONV	CONVECTOR	NTS	NOT TO SCALE
CT	COOLING TOWER		
CJ	CONDENSING UNIT	P	PUMP
CUH	CABINET UNIT HEATER	PCR	PUMPED CONDENSATE RETURN
CV	CONTROL VALVE	PD	PRESSURE DROP
CWP	CHILLED WATER PUMP		
DB	DRY BULB	PCP	RADIANT CEILING PANEL
DFU	DUCT FURNACE	REQ'D	REQUIRED
DIA	DIAMETER	RG	RETURN GRILLE
DN	DOWN	RH	RELATIVE HUMIDITY
DPR	DAMPER	RLH	RELIEF HOOD
DS	DUCT SILENCER	RTU	ROOF TOP UNIT
		SD	SUPPLY DIFFUSER
EAT	ENTERING AIR TEMPERATURE	SF	SUPPLY FAN
EF	EXHAUST FAN	SG	SUPPLY GRILLE
EG	EXHAUST GRILLE	SH	SENSIBLE HEAT (MBH)
E.T.C.	ELECTRICAL TRADES CONTRACTOR	SM	SHEET METAL
EVR	EVAPORATOR	SQ. FT.	SQUARE FEET
EWT	ENTERING WATER TEMPERATURE	SST	SATURATED SUCTION TEMPERATURE
EXH	EXHAUST	STR	STRAINER
EXIST	EXISTING		
		TC	TOTAL COOLING (MBH)
FF	FINISH FLOOR	TCL	TEMPERATURE CONTROL
FFM	FEET PER MINUTE	T&P	TEMPERATURE & PRESSURE RELIEF VALVE
FT	FEET	TYP	TYPICAL
FTR	FINNED TUBE RADIATION		
FU	FURNACE	UH	UNIT HEATER
		VAV	VARIABLE AIR VOLUME BOX
GAL	GALLON	VRH	VARIABLE AIR VOLUME REHEAT BOX
GFRH	GAS FIRED RADIANT HEATER	FPVAV	FAN POWERED VARIABLE AIR VOLUME BOX
GR	GRILLE	V.F.D	VARIABLE FREQUENCY DRIVE
		ZD	ZONE DAMPER
H	HUMIDIFIER	X-SA	EXISTING ITEM (EXISTING SUPPLY AIR DUCT)
HC	HEATING COIL		ITEM
HD	HEAD (FT)		EXISTING
HP	HORSE POWER		
HHP	HORIZONTAL HEAT PUMP		
HTG	HEATING		
HVAC	HEATING, VENTILATION, & AIR CONDITIONING		
HWP	HEATING WATER PUMP		
HX	HEAT EXCHANGER		

GENERAL HVAC NOTES

- ALL WORK SHALL CONFORM TO MICHIGAN MECHANICAL CODE, LATEST APPLICABLE EDITION.
- LOCATE EXHAUST OUTLETS OF VENTILATION SYSTEMS, COMBUSTION EQUIPMENT STACKS, & PLUMBING VENTS AT LEAST 10 FEET FROM OUTDOOR AIR INTAKES.
- INSTALL ALL EQUIPMENT, MATERIALS, AND ACCESSORIES PER MANUFACTURERS WRITTEN INSTRUCTIONS.
- ALL EXISTING SYSTEMS (INCLUDING EXHAUST FANS, AIR HANDLING UNITS, PUMPS) THAT SERVES AREAS BEING RENOVATED SHALL BE REBALANCED AS REQUIRED.
- NOTIFY OWNER OF ANY PIPING OR DUCTWORK DEMOLITION THAT MAY AFFECT NORMAL OPERATION OF OTHER AREAS.
- FIELD VERIFY LOCATIONS OF EXISTING PIPING THAT MAY CONFLICT WITH NEW CONSTRUCTION AND RELOCATE AS NEEDED.
- CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER DISCIPLINES PRIOR TO CONSTRUCTION TO AVOID CONFLICTS.
- PROVIDE MANUAL AIR VENTS WITH 3/4" HOSE CONNECTION AT ALL HIGH POINTS.
- THE CONTRACTOR SHALL FIELD VERIFY THE SIZES, LOCATION, ELEVATIONS, AND DETAILS OF ALL EXISTING CONDITIONS THAT MAY AFFECT THE WORK.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY OF ALL EQUIPMENT AND MATERIALS IN A "NEW" CONDITION DURING CONSTRUCTION.
- ALL WORK SHALL BE PERFORMED BY LICENSED CONTRACTORS AND SUBCONTRACTORS AS REQUIRED BY LAW.
- ALL CONDENSATE DRAIN PIPING SET @ MIN. 1% SLOPE.
- ALL CONDENSATE DRAIN PIPING TO TERMINATE TO DRAIN VIA AIR GAP.
- IF THERE IS CONFLICTING INFORMATION IN THE PLANS OR SPECIFICATIONS THE MORE STRINGENT AND GREATER COST ITEM SHALL BE USED.
- DRAWINGS INDICATE REQUIRED SIZES AND POINTS OF TERMINATION OF PIPES AND DUCTS AND SUGGESTED ROUTES. IT IS NOT INTENTION OF DRAWINGS TO INDICATE ALL NECESSARY OFFSETS. INSTALL WORK IN MANNER TO CONFORM TO STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE HEADROOM AND KEEP OPENINGS AND PASSAGEWAYS CLEAR. DO NOT SCALE FROM DRAWINGS.

- ANY INFORMATION FOUND ON THE DRAWINGS AND NOT IN THE SPECIFICATIONS, OR FOUND IN SPECIFICATIONS AND NOT IN THE DRAWINGS, SHALL BE CONSTRUED AS TO BE INCLUDED IN BOTH THE SPECIFICATIONS AND THE DRAWINGS. ANY CONFLICT BETWEEN THE PLANS AND THE SPECIFICATIONS WILL BE INTERPRETED BY THE ARCHITECT. IN THE EVENT OF CONFLICT, FOR THE PURPOSE OF BIDDING, THE CONTRACTOR SHALL PRESUME THE MOST EXPENSIVE COMBINATION OF QUALITY AND QUANTITY OF WORK SHALL PREVAIL.
- PERFORM WORK IN ACCORDANCE WITH THE LATEST EDITIONS, REVISIONS, AMENDMENTS, OR SUPPLEMENTS OF APPLICABLE STATUTES, ORDINANCES, CODES OR REGULATIONS OF FEDERAL, STATE, AND LOCAL AUTHORITIES HAVING JURISDICTION IN EFFECT ON THE DATE BIDS ARE RECEIVED.
- WHERE APPROVED STANDARDS HAVE BEEN ESTABLISHED BY OSHA, UNDERWRITERS LABORATORIES, AMERICAN CODES, ASA, ASHRAE, ARI, NEC, STATE FIRE INSURANCE REGULATION BODY, NFPA OR OTHERS, THESE STANDARDS SHALL BE FOLLOWED WHETHER OR NOT INDICATED ON THE DRAWING AND SPECIFICATIONS.
- COORDINATE CUTTING AND PATCHING WITH GENERAL CONTRACTOR.
- ALL BOLD DASHED LINES INDICATE ITEMS TO BE REMOVED UNLESS NOTED BY KEYNOTE. ALL OTHER EXISTING SYSTEMS SHOWN FOR REFERENCE ONLY.
- PATCH AND REPAIR ALL FLOOR AND WALL SURFACES LEFT DAMAGED OR INCOMPLETE FROM REMOVAL OF EXISTING PARTITIONS, MILLWORK, CASEWORK, OR OTHER FIXED ACCESSORIES AND EQUIPMENT WITH MATERIALS TO MATCH EXISTING, AS ACCEPTABLE TO THE ARCHITECT.
- NOTATIONS ARE MADE IN VARIOUS PLACES ON THE DRAWINGS TO CALL ATTENTION TO DEMOLITION WHICH IS REQUIRED. HOWEVER, THESE DRAWINGS ARE NOT INTENDED TO SHOW EACH AND EVERY ITEM TO BE REMOVED. CONTRACTOR SHALL REMOVE ALL MATERIALS RELATED TO THEIR RESPECTIVE TRADES AS REQUIRED TO PERMIT THE CONSTRUCTION OF THE NEW WORK AS SHOWN.
- THE GENERAL CONTRACTOR SHALL COORDINATE THE EXTENT OF THE REQUIRED DEMOLITION OF THE EXISTING BUILDING AS REQUIRED TO FACILITATE THE CONSTRUCTION OF THE PROJECT AS SHOWN AS PART OF THIS WORK.
- ALL DEMOLITION SHALL BE APPROVED BY THE OWNER/TENANT PRIOR TO COMMENCEMENT AND SHALL BE PERFORMED UNDER REQUIREMENTS AND APPROVAL OF THE LOCAL CODE JURISDICTIONS.
- ASBESTOS ABATEMENT: CONTRACTOR SHALL NOTIFY BUILDING REPRESENTATIVE IMMEDIATELY WHEN AND IF ANY ITEMS ARE ENCOUNTERED THAT IN ANY WAY, SHAPE, OR FORM APPEAR TO BE HAZARDOUS OF NATURE. ASBESTOS ABATEMENT IS NOT PART OF THE SCOPE OF THE DESIGN PROFESSIONALS DOCUMENTATION OR RESPONSIBILITY TO SURVEY, IDENTIFY, OR FOR CONSULTATION OF PROPER DISPOSAL.
- PROTECT ALL EXISTING WORK WHICH IS TO REMAIN AND RESTORE IN AN APPROVED MANNER ANY SUCH WORK WHICH BECOMES DAMAGED.
- RUBBISH AND DEBRIS RESULTING FROM THE WORK SHALL BE REMOVED IMMEDIATELY FROM THE SITE IN A SAFE AND LEGAL MANNER BY THE CONTRACTOR.
- TEMPORARY LIGHTING AND POWER SHALL BE PART OF THE SCOPE OF THIS WORK. SEE ELECTRICAL.
- DEMOLITION CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT BUILDING REPRESENTATIVE TO CLARIFY ANY ITEMS NOT SHOWN ON THESE DOCUMENTS OR SHOWN NOT MATCHING FIELD CONDITIONS.

GENERAL DEMOLITION NOTES

- EXISTING EQUIPMENT LAYOUT IS SCHEMATIC. EXACT LOCATION OF EXISTING DUCT/PIPING AND EQUIPMENT SHALL BE COORDINATED WITH BUILDING STRUCTURE. EQUIPMENT FURNISHED, ARCHITECTURAL DRAWINGS AND ALL OTHER TRADES PRIOR TO DEMOLITION.
- PERFORM WORK IN ACCORDANCE WITH THE LATEST EDITIONS, REVISIONS, AMENDMENTS, OR SUPPLEMENTS OF APPLICABLE STATUTES, ORDINANCES, CODES OR REGULATIONS OF FEDERAL, STATE, AND LOCAL AUTHORITIES HAVING JURISDICTION IN EFFECT ON THE DATE BIDS ARE RECEIVED.
- WHERE APPROVED STANDARDS HAVE BEEN ESTABLISHED BY OSHA, UNDERWRITERS LABORATORIES, AMERICAN CODES, ASA, ASHRAE, ARI, NEC, STATE FIRE INSURANCE REGULATION BODY, NFPA OR OTHERS, THESE STANDARDS SHALL BE FOLLOWED WHETHER OR NOT INDICATED ON THE DRAWING AND SPECIFICATIONS.
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- ALL DEMOLITION SHALL BE APPROVED BY THE OWNER/TENANT PRIOR TO COMMENCEMENT AND SHALL BE PERFORMED UNDER REQUIREMENTS AND APPROVAL OF THE LOCAL CODE JURISDICTIONS.
- ASBESTOS ABATEMENT: CONTRACTOR SHALL NOTIFY BUILDING REPRESENTATIVE IMMEDIATELY WHEN AND IF ANY ITEMS ARE ENCOUNTERED THAT IN ANY WAY, SHAPE, OR FORM APPEAR TO BE HAZARDOUS OF NATURE. ASBESTOS ABATEMENT IS NOT PART OF THE SCOPE OF THE DESIGN PROFESSIONALS DOCUMENTATION OR RESPONSIBILITY TO SURVEY, IDENTIFY, OR FOR CONSULTATION OF PROPER DISPOSAL.
- PROTECT ALL EXISTING WORK WHICH IS TO REMAIN AND RESTORE IN AN APPROVED MANNER ANY SUCH WORK WHICH BECOMES DAMAGED.
- RUBBISH AND DEBRIS RESULTING FROM THE WORK SHALL BE REMOVED IMMEDIATELY FROM THE SITE IN A SAFE AND LEGAL MANNER BY THE CONTRACTOR.
- TEMPORARY LIGHTING AND POWER SHALL BE PART OF THE SCOPE OF THIS WORK. SEE ELECTRICAL.
- DEMOLITION CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT BUILDING REPRESENTATIVE TO CLARIFY ANY ITEMS NOT SHOWN ON THESE DOCUMENTS OR SHOWN NOT MATCHING FIELD CONDITIONS.

MECHANICAL SYMBOLS LEGEND

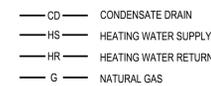
HVAC DUCTWORK SYMBOLS



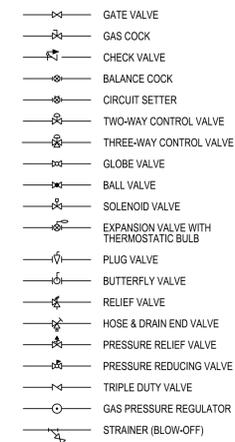
HVAC DUCTWORK & DIFFUSER TAGS



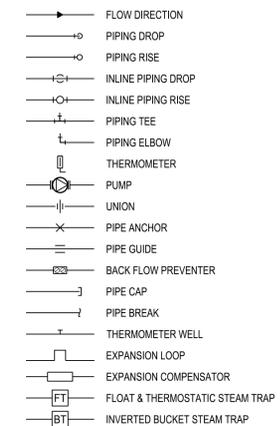
HVAC PIPING



HVAC PIPING VALVES



HVAC PIPING SYMBOLS



TEMPERATURE CONTROL SYMBOLS



PUMP SCHEDULE											
MARK	LOCATION	SERVES	MODEL	GPM	HEAD	ELECTRICAL					COMMENTS
						VOLTAGE	PHASE	FLA	DISCONNECT	STARTER	
BP-3	BOILER RM	B-3	MAGNA 3 80-100	96	8.7	208	1	4.6	EC	EC	1,2,3

NOTES:
1. BASED ON GRUNDFOS
2. INLINE PUMP
3. VARIABLE SPEED PUMP

ABBREVIATIONS:
EC = ELECTRICAL CONTRACTOR
MC = MECHANICAL CONTRACTOR
MFR = MANUFACTURER
NR = NOT REQUIRED

GAS BOILER SCHEDULE																
TAG	MODEL	LOCATION	TYPE	FLUE SIZE	INPUT MBH	OUTPUT MBH	EWT (°F)	LWT (°F)	MAX FLOW (GPM)	FLUID PRESSURE DROP (FT. OF HEAD)	ELECTRICAL					COMMENTS
											VOLTS	PHASE	FLA	DISC.	STARTER	
B-3	FB-2001	BOILER ROOM	CONDENSING	8"	1,999	1,923	140	180	350	8.1	120	1	13	EC	VFD	1,2,3,4,5,6,7

NOTES:
1. BASED ON LOCHINVAR
2. CONDENSATE NEUTRALIZER
3. NATURAL GAS CONDENSING BOILER
4. CASCADING SEQUENCER

5. WIRELESS OUTDOOR AIR SENSOR
6. DEDICATED GAS PRESSURE REGULATOR
7. BAS INTERFACE

ABBREVIATIONS:
EC - ELECTRICAL CONTRACTOR
NR - NOT REQUIRED
VFD - VARIABLE FREQUENCY DRIVE

REVISIONS

04/03/2025	CD	BET

DRAWN

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APPROVED

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PROJECT

ST. JOHNS HIGH SCHOOL - BOILER REPLACEMENT
501 W. SICKLES ST.
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SHEET DESCRIPTION

MECHANICAL SYMBOLS, NOTES, + ABBREVIATIONS

DATE

04/03/2025

PROJECT NUMBER

250033.00

SHEET NUMBER

M-100

MECHANICAL SPECIFICATIONS

- 1. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH ALL APPLICABLE CODES, SPECIFICATIONS, LOCAL ORDINANCES, INDUSTRY STANDARDS AND UTILITY COMPANY REGULATIONS.
- 2. IN CASE OF DIFFERENCE BETWEEN BUILDING CODES, SPECIFICATIONS, STATE LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS, UTILITY COMPANY REGULATIONS, CONTRACT DOCUMENTS, AND AUTHORITY HAVING JURISDICTION, THE MOST STRINGENT SHALL GOVERN. CONTRACTOR SHALL PROMPTLY NOTIFY OWNER IN WRITING OF ANY SUCH DIFFERENCE.
- 3. NON-COMPLIANCE: SHOULD CONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH REQUIREMENTS OF APPLICABLE BUILDING CODES, STATE LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS, UTILITY COMPANY REGULATIONS, CONTRACT DOCUMENTS, OR AUTHORITY HAVING JURISDICTION, HE SHALL BEAR ALL COSTS ARISING IN CORRECTING THE DEFICIENCIES.
- 4. APPLICABLE CODES AND STANDARDS SHALL INCLUDE ALL STATE LAWS, LOCAL ORDINANCES, UTILITY COMPANY REGULATIONS AND APPLICABLE REQUIREMENTS OF MICHIGAN BUILDING CODE, MICHIGAN PLUMBING CODE, MICHIGAN DEPARTMENT OF FIRE AND BUILDING SERVICES.
- 5. EXCEPT AS OTHERWISE SPECIFIED HEREIN, ALL PIPING WORK AND MATERIAL ARE TO CONFORM TO THE AMERICAN STANDARDS ASSOCIATION CODE FOR PRESSURE PIPING.
- 6. PERMITS: CONTRACTOR SHALL PAY FOR ALL BUILDING PERMITS REQUIRED BY WORK AND PERMITS FOR OPENING STREETS AND FOR CONNECTION TO VARIOUS UTILITIES, INCLUDING FEES FOR WATER METER INSTALLATION AND OTHER REQUIREMENTS NECESSARY TO CARRY OUT HIS WORK. WHERE STREETS OR SIDEWALKS ARE CUT, SAME MUST BE REPAIRED TO AT LEAST AS GOOD A CONDITION AS THEY WERE BEFORE, ALL AT EXPENSE OF THIS CONTRACTOR. PERMITS SHALL BE POSTED IN A PROMINENT PLACE AT THE BUILDING SITE AND BE PROPERLY PROTECTED FROM WEATHER AND PHYSICAL DAMAGE.

GUARANTEE

- 1. CONTRACTOR SHALL, BY ACCEPTING THESE DRAWINGS AND SPECIFICATIONS, GUARANTEE THE FOLLOWING:
 - 1.1. HE WILL FURNISH ALL MATERIAL AND EQUIPMENT AS SPECIFIED EXCEPT WHERE SPECIFIC WRITTEN APPROVAL IS GIVEN BY ENGINEER FOR SUBSTITUTION.
 - 1.2. ALL MATERIAL AND EQUIPMENT WILL BE INSTALLED SUBSTANTIALLY AS SHOWN ON DRAWINGS AND AS REQUIRED WITHIN INTENT OF THESE SPECIFICATIONS. ALL EQUIPMENT SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDED INSTALLATION INSTRUCTIONS.
 - 1.3. ALL EQUIPMENT, PIPING, ETC., WILL BE DRIP/TIGHT, AIR/TIGHT, FREE OF VIBRATION, POUNDING AND OTHER OBJECTIONABLE NOISES.
 - 1.4. ALL EQUIPMENT, ACCESSORIES AND MATERIAL FURNISHED BY THE CONTRACTOR, INCLUDING INSTALLATION, PIPE JOINTS, ETC., FURNISHED AND/OR DONE BY HIM FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE AGAINST ALL DEFECTS IN MATERIAL AND WORKMANSHIP.
 - 1.5. IF ANY EQUIPMENT, MATERIAL AND/OR PIPE JOINTS, CONNECTIONS, ETC., FAILS OR DOES NOT OPERATE SATISFACTORILY OR SHOWS UNDEAR WEAR, HE WILL, UPON BEING NOTIFIED, IMMEDIATELY REMEDY DEFECT AT HIS OWN EXPENSE.

WORK AND WORKMANSHIP

- 1. PROVIDE ALL REQUIRED LABOR, MATERIALS, EQUIPMENT AND CONTRACTOR'S SERVICES NECESSARY FOR COMPLETE INSTALLATION OF SYSTEMS REQUIRED IN FULL CONFORMITY WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION, ALL AS INDICATED ON DRAWINGS AND HEREIN SPECIFIED.
- 2. FINISHED JOB SHALL BE FUNCTIONAL AND COMPLETE IN EVERY DETAIL, INCLUDING ANY AND ALL SUCH ITEMS REQUIRED FOR A COMPLETE SYSTEM WHETHER OR NOT THESE ITEMS ARE SPECIFIED OR SHOWN ON DRAWINGS.
- 3. SPECIAL ATTENTION SHALL BE GIVEN TO ACCESSIBILITY OF WORKING PARTS AND CONTROLLING PARTS. ADJUSTABLE PARTS SHALL BE WITHIN EASY REACH. REMOVABLE PARTS SHALL HAVE SPACE FOR REMOVAL.
- 4. EACH CONTRACTOR SHALL ACQUAINT HIMSELF WITH DETAILS OF ALL WORK TO BE PERFORMED BY OTHER TRADES AND TAKE NECESSARY STEPS TO INTEGRATE AND COORDINATE HIS WORK WITH OTHER TRADES.
- 5. IT IS ASSUMED THE CONTRACTOR IS FAMILIAR WITH STANDARD 1ST CLASS INSTALLATION PROCEDURES. THEREFORE, THESE SPECIFICATIONS DO NOT ATTEMPT TO INCLUDE EVERY DETAIL OR OPERATION NECESSARY FOR THE COMPLETE INSTALLATION.
- 6. IT SHOULD BE PARTICULARLY NOTED THAT THE TERMS "FURNISH" AND "PROVIDE" ARE INTERCHANGEABLE AND THAT EACH OF THESE MEANS TO PROVIDE, INSTALL AND CONNECT, UNLESS OTHERWISE STATED.
- 7. WHENEVER TABLES OR SCHEDULES SHOW QUANTITY OF MATERIALS, THEY SHALL NOT BE USED AS A GUIDE TO CONTRACTOR. EACH CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL MATERIALS NOTED ON DRAWINGS AS SPECIFIED.
- 8. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION, SAFE-KEEPING AND CLEANLINESS OF ALL EXISTING EQUIPMENT, MATERIAL, ETC., LOCATED IN SPACES TO BE REMODELED IN WHICH HE IS WORKING. AS PART OF HIS RESPONSIBILITY, HE SHALL PROVIDE NECESSARY COVERS, STRUCTURES, ETC., AS REQUIRED TO KEEP ALL DIRT, WATER, MOISTURE AND DUST FROM EQUIPMENT. METHOD THE CONTRACTOR PROPOSES TO USE IN PROTECTING EQUIPMENT SHALL BE COORDINATED WITH ENGINEER AND OWNER'S REPRESENTATIVE FOR APPROVAL BEFORE ANY WORK IS STARTED. ANY DAMAGE SUSTAINED DURING CONSTRUCTION SHALL BE CORRECTED OR REPLACED BY CONTRACTOR.
- 9. MECHANICAL INSTALLATIONS. COORDINATE MECHANICAL EQUIPMENT AND MATERIALS INSTALLATION WITH OTHER BUILDING COMPONENTS. VERIFY ALL DIMENSIONS BY FIELD MEASUREMENTS, WHERE MOUNTING HEIGHTS ARE NOT DETAILED OR DIMENSIONED. INSTALL MECHANICAL SERVICES AND OVERHEAD EQUIPMENT TO PROVIDE THE MAXIMUM HEADROOM POSSIBLE. INSTALL MECHANICAL EQUIPMENT TO FACILITATE MAINTENANCE AND REPAIR OR REPLACEMENT OF EQUIPMENT COMPONENTS. AS MUCH AS PRACTICAL, CONNECT EQUIPMENT FOR EASE OF DISCONNECTING, WITH MINIMUM OF INTERFERENCE WITH OTHER INSTALLATIONS. COORDINATE THE INSTALLATION OF MECHANICAL MATERIALS AND EQUIPMENT ABOVE CEILINGS WITH SUSPENSION SYSTEM, LIGHT FIXTURES, AND OTHER INSTALLATIONS. INSTALL EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

- 10. OPERATION AND MAINTENANCE DATA: MANUFACTURER'S PRINTED OPERATION PROCEDURES TO INCLUDE START-UP, BREAK-IN, ROUTINE, NORMAL, SUMMER AND WINTER OPERATION INSTRUCTIONS, REGULATION, CONTROL, STOPPING, SHUT-DOWN, AND EMERGENCY INSTRUCTIONS. PROCEDURES FOR ROUTINE PREVENTATIVE MAINTENANCE AND TROUBLESHOOTING DISASSEMBLY, REPAIR, AND REASSEMBLE. ALIGNING AND ADJUSTING INSTRUCTIONS, TRAIN OWNER'S PERSONNEL ON PROCEDURES FOR STARTING, STOPPING, TROUBLESHOOTING, SERVICING, AND MAINTAINING EQUIPMENT. TURN OVER TO THE OWNER.
- 11. RECORD DRAWINGS: THE CONTRACTOR SHALL KEEP A RUNNING RECORD OF EACH CHANGE AND DEVIATION FROM THE DRAWINGS. UPON THE COMPLETION OF THE PROJECT, THE CONTRACTOR SHALL SUBMIT ONE COMPLETE SET OF CLEAN DRAWINGS NEATLY SHOWING DEVIATIONS FROM THE CONTRACT DOCUMENTS WITH DIMENSIONS SHOWING THE EXACT LOCATION OF CONCEALED OR INACCESSIBLE PIPING, DUCTS, ETC.

ASSIGNMENT OF MISCELLANEOUS WORK

- 1. PAINTING: MECHANICAL CONTRACTOR WILL PROVIDE PRIME PAINTING ON ALL FERROUS METALS SUCH AS SUPPORT STEEL OR HANGERS FOR MECHANICAL PIPING AND EQUIPMENT. PIPING IS NOT TO BE PRIMED. ANY FINISH PAINTING

- REQUIRED, INCLUDING PAINTING OF PIPING AND STEEL EXPOSED TO OUTSIDE ENVIRONMENT WILL BE PAINTED BY MECHANICAL CONTRACTOR.
- 2. PLATFORMS AND SUPPORTING STANDS: FOR MECHANICAL EQUIPMENT SHALL BE FURNISHED BY MECHANICAL CONTRACTOR UNLESS NOTED OTHERWISE.
- 3. HOLES THRU STRUCTURAL: HOLES REQUIRED FOR PIPING OR DUCTWORK OF SIZE 5" OR SMALLER SHALL BE CUT IN FIELD AT EXPENSE OF MECHANICAL CONTRACTOR WITH APPROVAL OF STRUCTURAL ENGINEER. OWNER SHALL BE GIVEN APPROVAL PRIOR TO ANY CUTTING. ALL LARGER HOLES SHALL BE PROVIDED BY OTHERS, WITH LOCATION APPROVAL FROM STRUCTURAL ENGINEER.
- 4. CUTTING AND PATCHING: MECHANICAL CONTRACTOR SHALL CUT AND PATCH FINISHED AREAS AS REQUIRED BY MECHANICAL CONTRACTOR. IN ABSENCE OF GENERAL CONTRACTOR, EACH CONTRACTOR SHALL DO HIS OWN CUTTING AND PATCHING.
- 5. ROOF OPENINGS AND FLASHING REQUIRED BY MECHANICAL CONTRACTOR SHALL BE BY MECHANICAL CONTRACTOR. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR CORRECT SIZE AND LOCATION OF SAME. COUNTER FLASHING BY MECHANICAL CONTRACTOR. PIPE CURBS SHALL BE USED FOR ALL ROOF PENETRATIONS CREATED BY PIPING OR CONDUIT RELATED TO MECHANICAL EQUIPMENT.
- 6. PADS AND FOUNDATIONS FOR MECHANICAL EQUIPMENT SHALL BE FORMED AND POURED BY MECHANICAL CONTRACTOR. MECHANICAL CONTRACTOR SHALL VERIFY PADS AND ALL ANCHORING DEVICES.
- 7. EXCAVATING AND BACKFILLING FOR MECHANICAL WORK SHALL BE BY MECHANICAL CONTRACTOR.
- 8. ROOF CURBS AND BASES FOR ROOF INTAKES AND RELIEF SHALL BE FURNISHED BY MECHANICAL CONTRACTOR AND FLASHING WEATHER TIGHT TO ROOF TO SATISFACTION OF ENGINEER. MAINTAIN EXISTING ROOF WARRANTY.

SHOP DRAWING

- 1. COMPLETE SCHEDULE OF EQUIPMENT, ETC., PROPOSED FOR INSTALLATION SHALL BE SUBMITTED FOR APPROVAL BEFORE ORDERS ARE PLACED.
- 2. ELECTRONIC SHOP DRAWINGS SHALL BE REQUIRED WITHIN 30 DAYS OF AWARD ON CONTRACT AND SHALL INCLUDE CATALOG NUMBERS AND OTHER PERTINENT INFORMATION.
- 3. THE CONTRACTOR SHALL SUBMIT EQUIPMENT SHOP DRAWINGS TO THE ARCHITECT FOR APPROVAL PRIOR TO ORDERING OF ANY OF THE FOLLOWING:
 - 1.1. PIPING & ACCESSORIES
 - 1.2. BOILER
 - 1.3. PUMPS

DRAWINGS

- 1. MECHANICAL DRAWINGS SHOW GENERAL ARRANGEMENT OF ALL PIPING EQUIPMENT AND APPURTENANCES. THEY SHALL BE FOLLOWED AS CLOSELY AS ACTUAL BUILDING CONSTRUCTION AND WORK OF OTHER TRADES WILL PERMIT.
- 2. MECHANICAL WORK SHALL CONFORM TO REQUIREMENTS SHOWN ON ALL DRAWINGS. GENERAL AND STRUCTURAL DRAWINGS SHALL TAKE PRECEDENCE OVER MECHANICAL DRAWINGS.
- 3. BECAUSE OF SMALL SCALE OF MECHANICAL DRAWINGS IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS AND ACCESSORIES WHICH MAY BE REQUIRED. CONTRACTOR SHALL INVESTIGATE STRUCTURAL AND FINISH CONDITIONS AFFECTING WORK AND SHALL ARRANGE HIS WORK ACCORDINGLY, PROVIDING SUCH FITTINGS, VALVES AND ACCESSORIES AS MAY BE REQUIRED TO MEET SUCH CONDITIONS.

COORDINATION BETWEEN CONTRACTORS

- 1. EACH CONTRACTOR AND SUBCONTRACTOR SHALL STUDY ALL DRAWINGS APPLICABLE TO THIS WORK SO COMPLETE COORDINATION BETWEEN TRADES WILL BE EFFECTED. SPECIAL ATTENTION SHALL BE GIVEN TO POINTS WHERE DUCTS CROSS OTHER DUCTS OR PIPING, WHERE LIGHTS FIT INTO CEILINGS AND WHERE PIPE, DUCTS AND CONDUIT PASS THRU WALLS AND COLUMNS.
- 2. IT IS RESPONSIBILITY OF EACH CONTRACTOR AND SUBCONTRACTOR TO LEAVE NECESSARY ROOM FOR OTHER TRADES. NO EXTRA COMPENSATION WILL BE ALLOWED TO COVER COST OF REMOVING PIPING, CONDUIT, DUCTS OR EQUIPMENT FOUND ENCRoACHING ON SPACE REQUIRED BY OTHERS.

MINOR DEVIATIONS

- 1. FOR PURPOSE OF CLARITY AND LEGIBILITY, DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC ALTHOUGH SIZE AND LOCATION OF EQUIPMENT AND PIPING ARE DRAWN TO SCALE WHEREVER POSSIBLE. VERIFY CONTRACT DOCUMENT INFORMATION AT SITE.
- 2. DRAWINGS INDICATE REQUIRED SIZES AND POINTS OF TERMINATION OF PIPES AND DUCTS AND SUGGESTED ROUTES. IT IS NOT INTENTION OF DRAWINGS TO INDICATE ALL NECESSARY OFFSETS. INSTALL WORK IN MANNER TO CONFORM TO STRUCTURE. AVOID OBSTRUCTIONS. PRESERVE HEADROOM AND KEEP OPENINGS AND PASSAGEWAYS CLEAR. DO NOT SCALE FROM DRAWINGS.

ATTACHING TO BUILDING CONSTRUCTION

- 1. EQUIPMENT AND PIPING SUPPORTS SHALL BE ATTACHED TO STRUCTURAL MEMBERS (BEAMS, JOISTS, ETC.) RATHER THAN TO FLOOR OR ROOF SLABS.
- 2. WHERE PIPING IS SUSPENDED FROM EXISTING CONCRETE OR MASONRY CONSTRUCTION, USE EXPANSION SHIELDS TO ATTACH PIPE SUPPORTS TO CONSTRUCTION. EXPANSION SHIELD BOLT DIAMETER SHALL BE SAME SIZE AS SUPPORT ROD DIAMETER HEREINAFTER SPECIFIED.
- 3. ERECTION OF METAL SUPPORTS & ANCHORAGES: CUT, FIT, AND PLACE MISCELLANEOUS METAL SUPPORTS ACCURATELY IN LOCATION, ALIGNMENT, AND ELEVATION TO SUPPORT AND ANCHOR MECHANICAL MATERIALS AND EQUIPMENT.

BALANCING

- 1. WORK BY MECHANICAL CONTRACTOR.
 - 2.1. USE PROCEDURES AS OUTLINED IN NATIONAL STANDARDS FOR FIELD MEASUREMENTS AND INSTRUMENTATION. CURRENT VOLUME, AS PUBLISHED BY ASSOCIATED AIR BALANCE COUNCIL.
 - 2.2. IF A PIECE OF EQUIPMENT IS NOT OPERATING IN SATISFACTORY MANNER, COORDINATE WITH MANUFACTURER TO REPAIR OR ADJUST.
 - 2.3. SUBMIT REPORT TO ENGINEER IF SYSTEM OR PIECE OF EQUIPMENT CANNOT BE ADJUSTED TO OPERATE SATISFACTORILY.
- 2. GENERAL: BALANCE AND ADJUST SYSTEMS TO ACHIEVE COMFORT AND PROPER OPERATION OF SYSTEMS.
 - 2.1. USE PROCEDURES AS OUTLINED IN NATIONAL STANDARDS FOR FIELD MEASUREMENTS AND INSTRUMENTATION. CURRENT VOLUME, AS PUBLISHED BY ASSOCIATED AIR BALANCE COUNCIL.
 - 2.2. IF A PIECE OF EQUIPMENT IS NOT OPERATING IN SATISFACTORY MANNER, COORDINATE WITH MANUFACTURER TO REPAIR OR ADJUST.
 - 2.3. SUBMIT REPORT TO ENGINEER IF SYSTEM OR PIECE OF EQUIPMENT CANNOT BE ADJUSTED TO OPERATE SATISFACTORILY.

PIPING

- 1. HYDRONIC HOT SUPPLY AND RETURN PIPING
 - 1.1. NPS2-1/2 AND LARGER: SCHEDULE 40 STEEL PIPING WITH WELDED, FLANGED, OR GROOVED MECHANICAL JOINTS.
 - 1.2. NPS2 AND SMALLER IS TYPE K COPPER SOLDERED OR SCHEDULE 40 STEEL.
- 2. MATCH EXISTING LABELING FOR ALL NEW PIPING.
- 3. FURNISH AND INSTALL SUPPORTS, GUIDES AND ANCHORS REQUIRED FOR

- PROPER SUPPORT OF PIPES.
- 4. SUPPORT VERTICAL RUNS WITH HANGER ADJACENT TO ELBOW.
- 5. SUPPORT HORIZONTAL PIPE WITH GALVANIZED ALL-THREAD STEEL RODS (ASTM A107), SPACING: 12'-2" PIPE, 8'-0" ON CENTERS WITH 3/8" DIA. ROD, 2 1/2'-3" PIPE, 12'-0" ON CENTERS WITH 1/2" DIA. ROD.
- 6. GAS:
 - 6.1. PIPING: COMPLY WITH NFPA 70 AND MPC. STEEL PIPE: ASTM A53, TYPE E OR S, GRADE B, SCHEDULE 40, BLACK, MALLEABLE-IRON THREADED FITTINGS: ASME B16.3, CLASS 150, STANDARD PATTERN, UNIONS: ASME B16.39, CLASS 150, MALLEABLE-IRON WITH BRASS TO IRON SEAT, GROUND JOINT, AND THREADED ENDS.
 - 6.2. STOPS: BRONZE BOTH WITH AGA STAMPS. PLUG TYPE WITH BRONZE PLUG AND SQUARE HEAD, 2-PSIG MINIMUM PRESSURE RATING.
- 7. BALL VALVES: TWO PIECE ALLOY, BRONZE BODY WITH FULL PORT, CHROME PLATED BALL, TFE SEATS, 600-PSIG MINIMUM CWP RATING, LEVER HANDLE WITH EXTENDED STEM FOR INSULATION.
- 7.1. USE DIELECTRIC COUPLINGS WHEN JOINING DISSIMILAR PIPING MATERIALS.

PIPE HANGERS

- 1. ADJUSTABLE STEEL CLEVIS HANGERS, NON-METALLIC COATING FOR ELECTRICAL PROTECTION WHERE ATTACHMENTS ARE IN DIRECT WITH COPPER, COPPER U-SHAPED HANGERS FOR UNINSULATED PIPE. COMPLY WITH MSS STANDARD PRACTICE SP-89.

INSULATION

- 1. PIPE INSULATION
 - 1.1. SERVICE-HEATING SUPPLY AND RETURN WATER. MATERIAL: 2" MINERAL FIBER WITH ASJ JACKET, SEAL JOINTS TO PREVENT CONDENSATION.
 - 1.2. APPLY INSULATION ONLY AFTER PIPES HAVE BEEN TESTED AND CLEANED.
 - 1.3. INSTALL INSULATION IN A NEAT WORKMANLIKE MANNER.
 - 1.4. ALL INSULATION: RATING NOT TO EXCEED 25 FLAME, 50 SMOKE, RATED FOR USE IN RETURN AIR PLENUM.

BOILERS

- 1. PERFORMANCE REQUIREMENTS
 - 1.1. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
 - 1.2. ASME COMPLIANCE: FABRICATE AND LABEL BOILERS TO COMPLY WITH ASME BOILER AND PRESSURE VESSEL CODE.
 - 1.3. ASHRAEIES 90.1 COMPLIANCE: BOILERS SHALL HAVE MINIMUM EFFICIENCY IN ACCORDANCE WITH TABLE 6.8.1-6 AND OTHER REQUIREMENTS IN CH. 6 OF ASHRAEIES 90.1.
- 2. ACCEPTABLE MANUFACTURERS:
 - 2.1. LOCHINVAR
 - 2.2. FULTON
 - 2.3. CLEVER BROOKS
 - 2.4. AERCO
- 3. DESCRIPTION: FACTORY-FABRICATED, -ASSEMBLED, AND -TESTED, FIRE-TUBE, FORCED-DRAFT, CONDENSING BOILER WITH HEAT EXCHANGER SEATED. PRESSURE TIGHT, BUILT ON A STEEL BASE, INCLUDING INSULATED JACKET; FLUE-GAS VENT; COMBUSTION-AIR INTAKE CONNECTIONS; WATER SUPPLY, RETURN, AND CONDENSATE DRAIN CONNECTIONS; AND CONTROLS.
- 4. PRIMARY HEAT EXCHANGER: CORROSION-RESISTANT TYPE 316L STAINLESS STEEL.
- 5. COMBUSTION CHAMBER AND FLUE PIPES: CORROSION-RESISTANT STAINLESS STEEL.
- 6. PRESSURE VESSEL: CARBON STEEL WITH WELDED HEADS AND TUBE CONNECTIONS.
- 7. BURNER: NATURAL GAS FORCED DRAFT.
- 8. BLOWER: CENTRIFUGAL FAN TO OPERATE DURING EACH BURNER-FIRING SEQUENCE AND TO PREPURGE AND POSTPURGE THE COMBUSTION CHAMBER.
- 9. GAS TRAIN: COMBINATION GAS VALVE WITH MANUAL SHUTOFF AND PRESSURE REGULATOR.
- 10. IGNITION: DIRECT-SPARK IGNITION OR SILICONE CARBIDE HOT-SURFACE IGNITION WITH 100 PERCENT MAIN-VALVE SHUTOFF AND ELECTRONIC FLAME SUPERVISION.
- 11. CASING:
 - 11.1. JACKET: SHEET METAL WITH SNAP-IN OR INTERLOCKING CLOSURES.
 - 11.2. CONTROL COMPARTMENT ENCLOSURES: NEMA 250, TYPE 1A.
 - 11.3. FINISH: BAKED-ENAMEL PROTECTIVE FINISH.
 - 11.4. INSULATION: MINIMUM 2-INCH-THICK, MINERAL-FIBER INSULATION SURROUNDING THE HEAT EXCHANGER.
 - 11.5. COMBUSTION-AIR CONNECTIONS: INLET AND VENT DUCT COLLARS.

CAPACITIES AND CHARACTERISTICS: REFER TO DRAWINGS

- 13. TRIM - FOR HOT-WATER BOILERS
 - 13.1. SAFETY RELIEF VALVE: ASME RATED.
 - 13.2. PRESSURE AND TEMPERATURE GAUGE: MINIMUM 3/4-INCH-DIAMETER, COMBINATION WATER-PRESSURE AND -TEMPERATURE GAUGE. GAUGES SHALL HAVE OPERATING-PRESSURE AND -TEMPERATURE RANGES, SO NORMAL OPERATING RANGE IS ABOUT 50 PERCENT OF FULL RANGE.
 - 13.3. HIGH AND LOW GAS-PRESSURE SWITCHES.
 - 13.4. ALARM BELL WITH SILENCE SWITCH.
 - 13.5. BOILER AIR VENT: AUTOMATIC.
 - 13.6. DRAIN VALVE: MINIMUM NPS 3/4 HOSE-END GATE VALVE.
 - 13.7. CIRCULATION PUMP: NONOVERLOADING, IN-LINE PUMP WITH SPLIT-CAPACITOR MOTOR HAVING THERMAL-OVERLOAD PROTECTION AND LUBRICATED BEARINGS; DESIGNED TO OPERATE AT SPECIFIED BOILER PRESSURES AND TEMPERATURES.

- 14. CONNECT NEW BOILER TO EXISTING CONDENSING BOILER SEQUENCER, TIE TO BUILDING BAS.

- 15. BOILER VENTING: DIRECT VENT SYSTEM WITH VERTICAL ROOF TOP TERMINATION OF BOTH EXHAUST AND COMBUSTION AIR. THE FLUE SHALL BE CATEGORY IV APPROVED PVC, CPVC, PP (FB 0751 - 6001) OR CATEGORY IV APPROVED STAINLESS STEEL (FB 0751 - 6001) SEALED VENT MATERIAL TERMINATING AT THE ROOFTOP WITH THE MANUFACTURER'S SPECIFIED VENT TERMINATION. A SEPARATE PIPE SHALL SUPPLY COMBUSTION AIR DIRECTLY TO THE BOILER FROM THE OUTSIDE. THE AIR INLET PIPE MUST BE SEALED AND MAY BE OTHER MATERIALS LISTED IN THE INSTALLATION MANUAL. THE BOILERS TOTAL COMBINED AIR INTAKE LENGTH SHALL NOT EXCEED 100 EQUIVALENT FEET. THE BOILERS TOTAL COMBINED EXHAUST VENTING LENGTH SHALL NOT EXCEED 100 EQUIVALENT FEET. THE AIR INLET MUST TERMINATE ON THE ROOFTOP WITH THE EXHAUST. KIT: COMPLETE SYSTEM, ASTM A959, TYPE 29-4C STAINLESS STEEL PIPE, VENT TERMINAL, THIMBLE, INDOOR PLATE, VENT ADAPTER, CONDENSATE TRAP AND DILUTION TANK, AND SEALANT.
 - 15.1. COMPLY WITH ALL BOILER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
 - 15.2. FIELD FABRICATE AND INSTALL BOILER VENT AND COMBUSTION-AIR INTAKE.
 - 15.3. UTILIZE VENT AND INTAKE DUCT MATERIAL, SIZE, AND CONFIGURATION AS INDICATED IN BOILER MANUFACTURER'S INSTRUCTIONS AND TO COMPLY WITH UL 1738.

- 15.4. COMPLY WITH ALL BOILER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 15.5. CONNECT BOILER VENT FULL SIZE TO BOILER CONNECTIONS.
- 15.6. COMPLY WITH ALL BOILER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 16. CONDENSATE NEUTRALIZER, FACTORY-FABRICATED AND -ASSEMBLED CONDENSATE-NEUTRALIZING ASSEMBLY OF CORROSION-RESISTANT PLASTIC MATERIAL WITH THREADED OR FLANGED INLET AND OUTLET PIPE CONNECTIONS. DEVICE FUNCTIONS TO PREVENT ACIDIC CONDENSATE FROM DAMAGING GRAIN SYSTEM. IT IS TO BE PIPED TO RECEIVE ACIDIC CONDENSATE DISCHARGED FROM CONDENSING BOILER AND NEUTRALIZE IT BY CHEMICAL REACTION WITH REPLACEABLE NEUTRALIZING AGENT. NEUTRALIZED CONDENSATE IS THEN PIPED TO SUITABLE DRAIN.
- 16.1. CONDENSATE NEUTRALIZATION UNIT SHALL FEATURE: ALL CORROSION-RESISTANT MATERIAL, SUITABLE FOR USE ON ALL NATURAL GAS AND PROPANE BOILERS. INCLUDES INITIAL CHARGE OF NEUTRALIZING AGENT, NEUTRALIZING AGENT TO BE EASILY REPLACEABLE WHEN EXHAUSTED, INLET AND OUTLET PIPE CONNECTIONS.
- 16.2. CAPSULE CONFIGURATION: LOW-PROFILE DESIGN FOR APPLICATIONS WHERE BOILER CONDENSATE DRAIN IS CLOSE TO THE FLOOR, EASILY REMOVED AND OPENED FOR NEUTRALIZING AGENT REPLACEMENT. MULTIPLE UNITS MAY BE USED FOR LARGER CAPACITY.
- 17. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO TEST AND INSPECT COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS.
- 17.1. PERFORM INSTALLATION AND STARTUP CHECKS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
- 17.2. LEAK TEST: HYDROSTATIC TEST. REPAIR LEAKS AND RETEST UNTIL NO LEAKS EXIST.
- 17.3. OPERATIONAL TEST: START UNITS TO CONFIRM PROPER MOTOR ROTATION AND UNIT OPERATION. ADJUST AIR-FUEL RATIO AND COMBUSTION.
- 17.4. PREPARE TEST AND INSPECTION REPORT.
- 17.5. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.
- 17.5.1. CHECK AND ADJUST INITIAL OPERATING SET POINTS AND HIGH- AND LOW-LIMIT SAFETY SET POINTS OF FUEL SUPPLY, WATER LEVEL, AND WATER TEMPERATURE.
- 17.5.2. SET FIELD-ADJUSTABLE SWITCHES AND CIRCUIT-BREAKER TRIP RANGES AS INDICATED.

PUMPS

- 1. ACCEPTABLE MANUFACTURERS:
 - 1.1. ARMSTRONG PUMPS INC.
 - 1.2. BELL & GOSSETT, DIV. OF IIT INDUSTRIES.
 - 1.3. TACO, INC.
 - 1.4. GRUNDFOS
- 2. SOURCE LIMITATIONS: OBTAIN PUMPS FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
- 3. DESCRIPTION: FACTORY-ASSEMBLED AND -TESTED, CENTRIFUGAL, OVERHUNG-IMPELLER, CLOSE-COUPLED, IN-LINE PUMP AS DEFINED IN HI 1.1-1.2 AND HI 1.3; DESIGNED FOR INSTALLATION WITH PUMP AND MOTOR SHAFTS MOUNTED HORIZONTALLY OR VERTICALLY.
- 4. PUMP CONSTRUCTION:
 - 4.1. CASING: RADIALLY SPLIT, CAST IRON, WITH THREADED GAUGE TAPPINGS AT INLET AND OUTLET, REPLACEABLE BRONZE WEAR RINGS, AND THREADED UNION-END CONNECTIONS.
 - 4.2. IMPELLER: ASTM B584, CAST BRONZE: STATICALLY AND DYNAMICALLY BALANCED, KEPT TO SHAFT, AND SECURED WITH A LOCKING CAP SCREW. FOR CONSTANT-SPEED PUMPS, TRIM IMPELLER TO MATCH SPECIFIED PERFORMANCE.
 - 4.3. PUMP SHAFT SLEEVE: TYPE 304 STAINLESS STEEL.
 - 4.4. PUMP STUB SHAFT: TYPE 304 OR TYPE 316 STAINLESS STEEL.
 - 4.5. SEAL: MECHANICAL SEAL CONSISTING OF CARBON ROTATING RING AGAINST A CERAMIC SEAT HELD BY A STAINLESS STEEL SPRING, AND NBR RUBBER BELLOW AND GASKET, INCLUDE WATER SLINGER ON SHAFT BETWEEN MOTOR AND SEAL.
 - 4.6. SEAL FLUSHING: FLUSH, COOL, AND LUBRICATE PUMP SEAL BY DIRECTING PUMP DISCHARGE WATER TO FLOW OVER THE SEAL.
- 5. SHAFT COUPLING: RIGID, AXIALLY-SPLIT SPACER COUPLING TO ALLOW SERVICE OF PUMP SEAL WITHOUT DISTURBING PUMP OR MOTOR.
- 6. MOTOR: COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, AND EFFICIENCY REQUIREMENTS FOR MOTORS SPECIFIED IN SECTION 230513 "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT."
 - 6.1. ENCLOSURE: TOTALLY ENCLOSED, FAN COOLED.
 - 6.2. NEMA PREMIUM EFFICIENT MOTORS AS DEFINED IN NEMA MG 1.
 - 6.3. MOTOR SIZES: MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.
 - 6.4. CONTROLLERS: ELECTRICAL DEVICES, AND WIRING: COMPLY WITH REQUIREMENTS FOR ELECTRICAL DEVICES AND CONNECTIONS SPECIFIED IN ELECTRICAL SECTIONS.
 - 6.5. VARIABLE-SPEED MOTOR.
 - 6.6. SEE DRAWINGS FOR MOTOR DESIGN
 - 6.7. PROVIDE INTEGRAL PUMP MOTOR VARIABLE-SPEED CONTROLLER.

CAPACITIES AND CHARACTERISTICS: REFER TO DRAWINGS.

- 7. INTEGRAL PUMP MOTOR VARIABLE-SPEED CONTROLLERS
 - 8.1. WHERE SPECIFIED OR SCHEDULED, PROVIDE PUMPS WITH AN INTEGRAL PUMP MOTOR SPEED CONTROLLER.
 - 8.1.1. MOTOR: OPERATES AS CONSTANT- OR VARIABLE-SPEED PUMP WITH SPEED REGULATED BY AN INTEGRATED VARIABLE-SPEED DRIVE.
 - 8.1.2. INTEGRATED PUMP CONTROLLER: SUPPORTS DIRECT COMMUNICATION WITH THE BUILDING MANAGEMENT SYSTEM (BAS) WITH BUILT-IN SUPPORT FOR THE FOLLOWING PROTOCOLS: BACNET MS/TP, COMMISSIONING AND PUMP SET UP ACCESS TO PUMP CONTROLS VIA THE FOLLOWING:
 - 8.1.4. A WEB INTERFACE (DATA EXCHANGE).
 - 8.1.5. A USER INTERFACE LOCATED ON THE FACE OF SPEED CONTROLLER TO ADJUST MODES AND MODE VALUES.
 - 8.1.6. AN ELECTRONIC DISPLAY THAT READS REAL-TIME MODE SET VALUES, FLOW, HEAD, SPEED, AND POWER AND THAT LOCKS OUT UNAUTHORIZED ADJUSTMENT OF PUMP.
 - 8.2. PROVIDE ELECTRONICS WITH "AUTO" AS FACTORY DEFAULT BUT SLOPE OF THE PROPORTIONAL CURVE WILL AUTOMATICALLY MATCH THE REQUIRED SYSTEM CURVE. CONSTANT PRESSURE CONTROL (DELTA-P/C), VARIABLE DIFFERENTIAL PRESSURE CONTROL (DELTA-P/V), CONSTANT CURVE DUTY (UNCONTROLLED PUMP), AND RPM REGULATION. RPM (SPEED) REGULATION CAN BE ACCOMPLISHED BY THE FOLLOWING:
 - 8.2.1. MANUAL (VIA USER INTERFACE OR HTML).
 - 8.2.2. REMOTE VIA 0 TO 10 VDC.
 - 8.2.3. DATA PROTOCOL COMMUNICATIONS WITH THE BMS.

- 8.3. PUMP ELECTRONICS: STANDARD WITH MULTIPLE DIGITAL INPUTS AND ONE EXTERNAL DIGITAL OUTPUT TO BE AVAILABLE FOR ADDITIONAL MECHANICAL ROOM CONTROL AND PUMP STATUS MONITORING.
- 8.4. CONTROLLER: MOUNTED ON OR ADJACENT TO THE MOTOR, PROVIDE ENCLOSURE RATED TO UL TYPE 12.
- 8.5. ELECTRONICALLY PROTECTED PUMPS: RATED FOR CONTINUOUS DUTY AND WITH BUILT-IN STARTUP CIRCUIT, PROVIDE OVERCURRENT, LINE SURGE AND CURRENT LIMIT PROTECTION; THERMAL MONITORING, HEAT SINK STATUS AND OVER TEMPERATURE PROTECTION.
- 8.6. PUMP CAPABLE OF BEING MONITORED CONTINUOUSLY VIA INTEGRATED INTERNET LINK.
- 8.7. INTEGRATED PUMP CONTROLLER SYSTEM TO HAVE THE FOLLOWING

- FEATURES:
 - 8.7.1. CONTROLLER SOFTWARE SHALL BE CAPABLE OF SENSORLESS CONTROL IN VARIABLE-VOLUME SYSTEMS WITHOUT NEED FOR PUMP-MOUNTED (INTERNAL/EXTERNAL) OR REMOTELY MOUNTED DIFFERENTIAL PRESSURE SENSOR.
 - 8.7.2. INTEGRATED PUMP CONTROLLER SENSORLESS CONTROL: OPERATES UNDER QUADRATIC PRESSURE CONTROL (QP/C) TO ENSURE THAT HEAD REDUCTION WITH REDUCING FLOW CONFORMS TO QUADRATIC CONTROL CURVE.
 - 8.7.3. CONTROLLER.
 - 8.7.3.1. MINIMUM HEAD OF 40 PERCENT OF DESIGN DUTY HEAD.
 - 8.7.3.2. USER-ADJUSTABLE CONTROL MODE SETTINGS AND MINIMUM/MAXIMUM HEAD SET POINTS USING BUILT-IN PROGRAMMING INTERFACE.
 - 8.7.4. CONTROLLER INTEGRATED CONTROL SOFTWARE.
 - 8.7.4.1. CAPABLE OF CONTROLLING PUMP PERFORMANCE FOR NON-OVERLOADING POWER AT EVERY POINT OF OPERATION. CAPABLE OF MAINTAINING FLOW RATE DATA.

- 9. STARTUP SERVICE
 - 9.1. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM STARTUP SERVICE.
 - 9.1.1. COMPLETE INSTALLATION AND STARTUP CHECKS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
 - 9.1.2. CHECK PIPING CONNECTIONS FOR TIGHTNESS.
 - 9.1.3. CLEAN STRAINERS ON SUCTION PIPING. USE STARTUP STRAINER FOR INITIAL STARTUP.
 - 9.1.4. PERFORM THE FOLLOWING STARTUP CHECKS FOR EACH PUMP BEFORE STARTING:
 - 9.1.4.1. VERIFY BEARING LUBRICATION.
 - 9.1.4.2. VERIFY THAT PUMP IS FREE TO ROTATE BY HAND AND THAT PUMP FOR HANDLING HOT LIQUID IS FREE TO ROTATE WITH PUMP HOT AND COLD. IF PUMP IS BOUND OR DRAGS, DO NOT OPERATE UNTIL CAUSE OF TROUBLE IS DETERMINED AND CORRECTED.
 - 9.1.4.3. VERIFY THAT PUMP IS ROTATING IN CORRECT DIRECTION.
 - 9.1.5. PRIME PUMP BY OPENING SUCTION VALVES AND CLOSING DRAINS, AND PREPARE PUMP FOR OPERATION.
 - 9.1.6. START MOTOR.
 - 9.1.7. OPEN DISCHARGE VALVE SLOWLY.

REVISIONS			
04/03/2025			
CD SET			

DRAWN
MTJ
APPROVED
BRH

MATRIX
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Matrix Project No. 250033.00

PROJECT

ST. JOHNS HIGH SCHOOL - BOILER REPLACEMENT

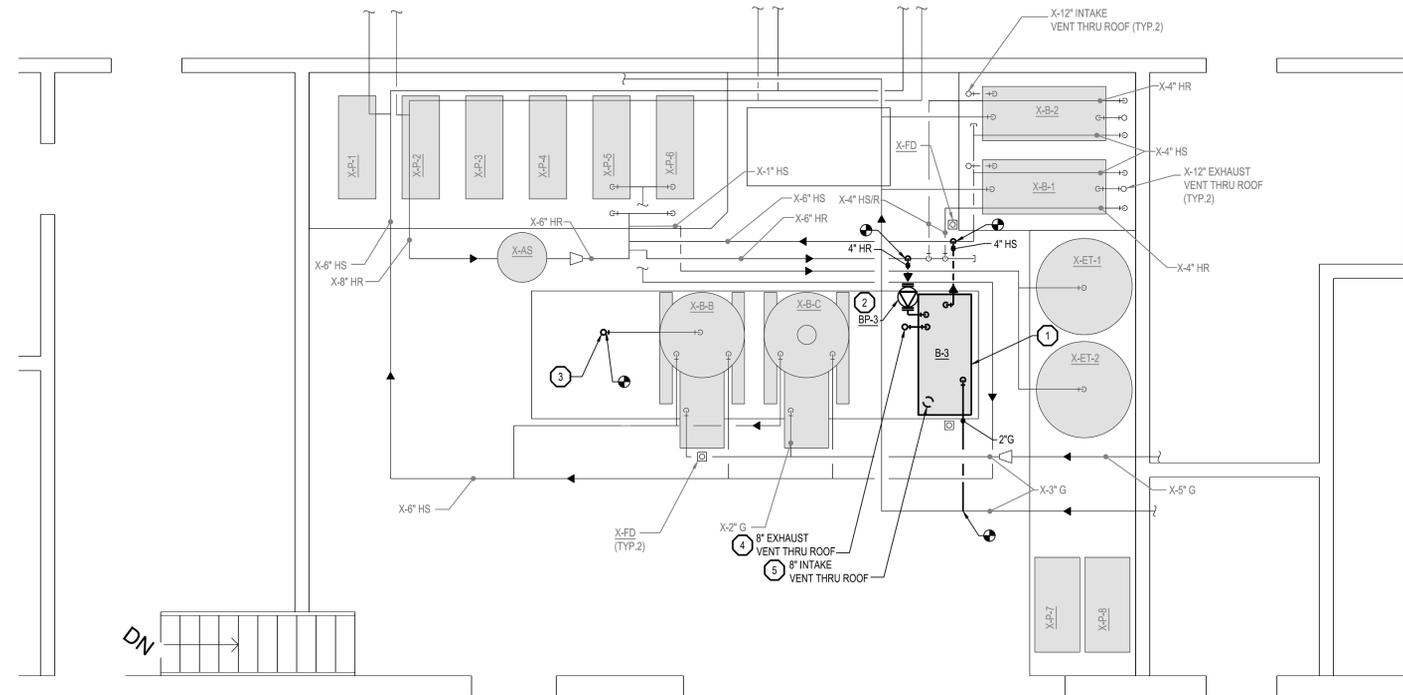
501 W. SICKLES ST.
ST. JOHNS, MI 48879

SHEET DESCRIPTION
MECHANICAL SPECIFICATIONS

DATE
04/03/2025

PROJECT NUMBER
250033.00

SHEET NUMBER
M-101



- MECHANICAL KEY NOTES**
- 1 FURNISH AND INSTALL NEW BOILERS AND ALL ASSOCIATED ACCESSORIES ON EXISTING PAD. MODIFY/EXTEND EXISTING HOT WATER SUPPLY AND RETURN PIPING AS SHOWN FOR INSTALLATION. ROUTE CONDENSATE DRAIN TO NEAREST EXISTING FLOOR DRAIN PER MANUFACTURERS WRITTEN INSTRUCTIONS AND TERMINATE VIA AIR GAP. MAINTAIN ALL REQUIRED MANUFACTURER CLEARANCES.
 - 2 FURNISH AND INSTALL INLINE PUMP AT LOCATION SHOWN.
 - 3 ROUTE AND INSTALL NEW VENT PIPING THROUGH ROOF. MODIFY EXISTING ROOF OPENING AS REQUIRED FOR COMPLETE INSTALLATION AND TO MAINTAIN ROOF WARRANTY. PATCH AND SEAL EXISTING ROOF OPENING WATER TIGHT VENT. UTILIZE EXISTING VENT SIZE.
 - 4 ROUTE AND INSTALL NEW VENT THROUGH ROOF PER MANUFACTURERS WRITTEN INSTRUCTIONS. RE-USE PENETRATION FOR NEW INSTALLATION IF POSSIBLE. MODIFY OPENING AS REQUIRED. MAINTAIN EXISTING ROOF WARRANTY. SEAL OPENING WATER TIGHT.
 - 5 ROUTE AND INSTALL NEW INTAKE THROUGH ROOF PER MANUFACTURERS WRITTEN INSTRUCTIONS. MODIFY OPENING AS REQUIRED. PROVIDE NEW ROOF PENETRATION AND COORDINATE TO MAINTAIN EXISTING ROOF WARRANTY. SEAL OPENING WATER TIGHT.

BOILER ROOM PLAN - PIPING NEW
 SCALE: 1/4" = 1'-0"

REVISIONS	
04/03/2025	CD BET
DRAWN	
MTJ	
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MATRIX
 CONSULTING ENGINEERS, INC.

PROJECT
 ST. JOHNS HIGH SCHOOL - BOILER REPLACEMENT
 501 W. SICKLES ST.
 ST. JOHNS, MI 48879

SHEET DESCRIPTION	
BOILER ROOM PLAN - PIPING NEW	
DATE	
04/03/2025	
PROJECT NUMBER	
250033.00	
SHEET NUMBER	
M-600	

ELECTRICAL SYMBOLS LEGEND

OUTLETS	FIXTURES	SERVICE and EQUIPMENT
⊕ SINGLE RECEPTACLE (120 VOLT)	☐ LIGHT FIXTURE	TVSS TRANSIENT VOLTAGE SURGE SUPPRESSION
⊕ DUPLEX RECEPTACLE	— STRIP FIXTURE	VFD VARIABLE FREQUENCY DRIVE
⊕ EMERGENCY RECEPTACLE	☐ EMERGENCY LIGHT FIXTURE	T TRANSFORMER
⊕ DOUBLE DUPLEX RECEPTACLE	☐ IN-GRADE LIGHT FIXTURE	F FUSED DISCONNECT SWITCH
⊕ F FLUSH FLOOR BOX	☐ SPOTLIGHT (number of heads shown)	M MAGNETIC STARTER
⊕ S SURFACE FLOOR BOX	☐ EXIT SIGN (face & direction as shown)	COMB. STARTER
⊕ SPECIAL EQUIPMENT RECEPTACLE	☐ WALL MOUNT LIGHT FIXTURE	PANELBOARD, SURFACE MOUNTED
▽ TELEPHONE OUTLET	☐ CEILING LIGHT FIXTURE	PANELBOARD, FLUSH MOUNTED
▽ DATA OUTLET	☐ TRACK & FIXTURE	WEATHERHEAD
▽ TELEPHONE / DATA OUTLET	☐ STREET TYPE POLE FIXTURE	UTILITY METER, AS REQUIRED
■ PP POWER POLE	☐ POLE MOUNTED LIGHT FIXTURE	DIGITAL EQUIPMENT METER, AS REQUIRED
⊕ JUNCTION BOX	☐ EXTERIOR WALL MOUNT LIGHT FIXTURE	CT CURRENT TRANSFORMERS
⊕ WALL JUNCTION BOX	☐ WALLPACK LIGHT FIXTURE	GEN GENERATOR, KW SHOWN
⊕ PULL (JUNCTION) BOX	☐ SPECIAL PURPOSE LIGHT FIXTURE	TT TELEPHONE TERMINAL BOARD
⊕ UNDERFLOOR JUNCTION BOX	☐ HIGH BAY LIGHT FIXTURE	⊕ GROUND CONNECTION PER N.E.C.
⊕ CEILING MOUNTED WIFI	☐ EMERGENCY EGRESS LIGHT FIXTURE (number of heads shown)	WIREWAY
SWITCHES	☐ DOCK LIGHT FIXTURE	TS TRANSFER SWITCH
⊕ SINGLE-POLE SWITCH	CIRCUITRY and RACEWAYS	ENCLOSURE CIRCUIT BREAKER
⊕ THREE-WAY SWITCH	— CONDUIT INSTALLED (by E.C.)	CAPACITOR
⊕ FOUR-WAY SWITCH	--- CONDUIT INSTALLED (by others)	CONTROL
⊕ SWITCH WITH PILOT LIGHT	— CONDUIT STUB UP	⊕ THERMOSTAT
⊕ THERMAL OVERLOAD SWITCH	— CONDUIT STUB DOWN	⊕ HUMIDISTAT
⊕ MANUAL MOTOR SWITCH	→ 1,3 HOME RUN (with circuit numbers)	⊕ PHOTOCELL (voltage as required)
⊕ KEY SWITCH	— END OF CONDUIT RUN	⊕ TIME CLOCK (24 hour U.O.N.)
⊕ TIME SWITCH	— END OF CONDUIT RUN, CAP AND STAKE	⊕ PUSHBUTTON STATION (number of buttons indicated)
⊕ DIMMER SWITCH	--- "CONDUIT RUN CONTINUES" INDICATION	⊕ CONTROL TRANSFORMER
MECHANICAL	--- FLEXIBLE PIGTAILS/CONNECTIONS	⊕ LIGHTING CONTACTOR
⊕ SINGLE PHASE MOTOR	— WM WIREMOLD AS SPECIFIED	⊕ IRRIGATION CONTROLLER (120 volt xxVxA connection by x/C)
⊕ THREE PHASE MOTOR	— PM PLUGMOLD AS SPECIFIED	⊕ WALL MOUNT DUAL TECHNOLOGY SENSOR
⊕ RESISTANCE HEATER, KW SHOWN	— BD BUS DUCT	⊕ OCCUPANCY SENSOR / PHOTOCELL
⊕ PIPE TRACE HEATER	— UFD UNDERFLOOR DUCT	⊕ ULTRASONIC SENSOR - 360° - 2 CIRCUIT
⊕ ELECTRIC UNIT HEATER	SOUND and SIGNAL	⊕ DUAL TECHNOLOGY SENSOR - 360° - 1000 SQ FT
⊕ ELECTRIC WATER HEATER	⊕ SPEAKER	⊕ DUAL TECHNOLOGY SENSOR - 360° - 500 SQ FT
NURSE CALL	⊕ WALL MOUNTED SPEAKER	⊕ SWITCH STYLE OCCUPANCY SENSOR
NCC NURSE CALL CONTROLLER	⊕ WALL MOUNTED SPEAKER / CLOCK COMBO	⊕ POWER PACK
M MASTER STATION	⊕ SINGLE FACE CLOCK	FIRE ALARM
P EMERGENCY PULL STATION	⊕ DUAL FACE CLOCK	⊕ SMOKE DETECTOR
E EMERGENCY PUSH STATION	⊕ VIDEO INPUT	⊕ HEAT DETECTOR
CB CODE BLUE STATION	⊕ AUDIO / VIDEO INPUT	⊕ DUCT SMOKE DETECTOR
A PENDENT INTERFACE	⊕ BELL	⊕ DUCT SMOKE DETECTOR
I BED / LIGHT INTERFACE	⊕ VOLUME CONTROL	⊕ HORN
B1 SINGLE BED STATION	⊕ BUZZER	⊕ HORN & LIGHT
B2 DUAL BED STATION	⊕ CHIME	⊕ SPEAKER
⊕ DOME LIGHT	⊕ TELEVISION OUTLET	⊕ SPEAKER & LIGHT
SRS STAFF REGISTER STATION	⊕ MICROPHONE OUTLET	⊕ PULL STATION
S STAFF STATION	⊕ INTERCOM OUTLET	⊕ FIRE ALARM CONTROL PANEL
DS DUTY STATION	⊕ CAMERA	⊕ ANNUNCIATOR PANEL
DESIGNATIONS	⊕ DOOR CONTACT	⊕ END OF LINE DEVICE
⊕ DEMOLITION NOTE	⊕ MOTION DETECTOR	⊕ REMOTE INDICATING LIGHT, WALL MTD.
⊕ PLAN NOTE	⊕ BEAM DETECTOR	⊕ REMOTE INDICATING LIGHT, CLG. MTD.
⊕ ADDENDUM NOTE	⊕ KEY PAD	⊕ MAGNETIC DOOR HOLDER
	⊕ SECURITY SYSTEM CONTROL PANEL	⊕ FIREFIGHTER COMMUNICATION JACK
	⊕ CCTV CONTROL PANEL	⊕ FLOW SWITCH (furnished by FPIC)
	⊕ CARD READER	⊕ TAMPER SWITCH (furnished by FPIC)
	⊕ STUDENT STATION	⊕ VISUAL ONLY UNIT
	⊕ ADMINISTRATION STATION	⊕ FIRE CONTROL POWER SUPPLY
	⊕ TEACHER STATION	⊕ MONITOR MODULE
	⊕ GLASS BREAK	⊕ CONTROL MODULE
		⊕ CARBON MONOXIDE DETECTOR

GENERAL ELECTRICAL NOTES

- ALL WALL AND FLOOR PENETRATIONS ARE TO BE SEALED TO MAINTAIN ORIGINAL RATING.
- ALL CONDUITS TO BE FIELD ROUTED ALONG EXISTING PIPING AND STRUCTURAL STEEL.
- THE DIVISION 26 CONTRACTORS SHALL VISIT THE PROJECT AND DETERMINE THE EXACT EXTENT OF THE DEMOLITION WORK REQUIRED BEFORE BIDDING THE PROJECT.
- REMOVE ALL EXISTING OBSOLETE EXPOSED CONDUIT, WIRE AND UNUSED EQUIPMENT WHERE WORK IS BEING DONE EXCEPT ITEMS NOTED OTHERWISE.
- WHERE BUILDING SURFACES ARE DAMAGED BY THE REMOVAL OF OLD WORK, SURFACES SHALL BE PATCHED TO MATCH ADJACENT.
- EXISTING WORK WHICH IS PRESENTLY CONCEALED AND WHICH WILL REMAIN CONCEALED AND DOES NOT INTERFERE WITH ANY NEW WORK OF ANY TRADE NEED NOT BE REMOVED. HOWEVER, ALL CONDUIT SHALL BE CAPPED BELOW FINISH SURFACE AND THEN PATCHED TO MATCH, OR AS NOTED.
- EXISTING OPENINGS, WHICH ARE TO BE REUSED, SHALL BE MODIFIED OR ENLARGED TO SUIT THE NEW SYSTEMS AS REQUIRED. PROVIDE ALL REQUIRED CUTTING AND PATCHING.
- IF ASBESTOS IS PRESENT, IT WILL BE REMOVED OR RENDERED HARMLESS UNDER SEPARATE CONTRACT BY THE OWNER.
- THE DIVISION 26 CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING THE EXISTING WALLS TO MATCH THE ADJACENT SURFACES BEHIND ALL SURFACE MOUNTED EQUIPMENT.
- CONTRACTOR SHALL FIELD VERIFY ALL EQUIPMENT VOLTAGES AND LOADS PRIOR TO INSTALLING SERVICE TO EQUIPMENT.
- DRAWINGS ARE BASED ON EXISTING RECORD DOCUMENT AND CASUAL FIELD OBSERVATION. REPORT ANY DISCREPANCIES TO ENGINEER FOR CLARIFICATION.

ABBREVIATIONS LEGEND

A AMPS	GC GENERAL CONTRACTOR	P POLE
AC ABOVE COUNTER	GFI GROUND FAULT INTERRUPTER	P- PUMP
ACU-AIR CONDITIONING UNIT	GND GROUND	PB- PULL BOX
AFF ABOVE FINISHED FLOOR		PNL PANEL
AHJ AUTHORITY HAVING JURISDICTION	H- HUMIDIFIER	PRV- POWER ROOF VENTILATOR
AHU-AIR HANDLING UNIT	HID HIGH INTENSITY DISCHARGE	PVC POLY VINYL CHLORIDE
AIC AMPS INTERRUPTING CAPACITY	HOA HAND-OFF-AUTO SELECTOR SWITCH	PWR POWER
AS ABOVE SHELF	HP HORSEPOWER	
ATS AUTOMATIC TRANSFER SWITCH	HR HOUR	RECEPT RECEPTACLE
	HVAC HEATING/VENTILATING/AIR CONDITIONING	RGC RIGID GALVANIZED STEEL CONDUIT
B- BOILER		RTU- ROOF TOP UNIT
BC BELOW COUNTER	IG ISOLATED GROUND	SF- SUPPLY FAN
BLDG BUILDING	IMC INTERMEDIATE METAL CONDUIT	SPEC SPECIFICATIONS
		SW SWITCH
CHLR- CHILLER	JB JUNCTION BOX	SWBD SWITCHBOARD
CND CONDUIT		
CKT CIRCUIT	LC LIGHT CONTROL	TOC TEMPERATURE CONTROL CONTRACTOR
CKT BKR CIRCUIT BREAKER	LT LIGHT	TR TAMPER PROOF RECEPTACLE
CT- COOLING TOWER	LTG LIGHTING	TS TAMPER PROOF SWITCH
CJ- CONDENSING UNIT	LT FLEX LIQUID TIGHT FLEXIBLE METAL CONDUIT	TYP TYPICAL
CUH- CABINET UNIT HEATER		
	MAX MAXIMUM	UF UNDER FLOOR
DFU- DUCT FURNACE	MC MECHANICAL CONTRACTOR	UH- UNIT HEATER
DISC DISCONNECT	MCC MOTOR CONTROL CENTER	UL UNDERWRITERS' LABORATORIES, INC.
DWG DRAWING	MIN MINIMUM	UNO UNLESS NOTED OTHERWISE
DWH- DOMESTIC WATER HEATER	MLO MAIN LUG ONLY	
	MT MOUNT	V VOLTS
EBB- ELECTRIC BASEBOARD	MTD MOUNTED	VL VERIFY LOCATION WITH OWNER
EC ELECTRICAL CONTRACTOR	MTG MOUNTING	
EF- EXHAUST FAN	MUAU- MAKE-UP AIR UNIT	W WATTS
EM EMERGENCY		W/ WITH
EMT ELECTRICAL METALLIC TUBING	NC NORMALLY CLOSED	W/O WITHOUT
EW- ELECTRIC WATER COOLER	NIC NOT IN CONTRACT	WP WEATHER PROOF
EWX EXISTING	NL NIGHT LIGHT	
	NO NORMALLY OPEN	
FLA FULL LOAD AMPS	NTS NOT TO SCALE	XFMR TRANSFORMER
FLEX FLEXIBLE CONDUIT		
FLR FLOOR		
FLUOR FLUORESCENT		
FSES FOOD SERVICE EQUIP. SUPPLIER		
FIS FIRE/SMOKE		
FU- FURNACE		

REVISIONS

04/03/2025	CD SET
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MATRIX
CONSULTING ENGINEERS, INC.

PROJECT

ST. JOHNS HIGH SCHOOL - BOILER REPLACEMENT
501 W. SICKLES ST.
ST. JOHNS, MI 48879

SHEET DESCRIPTION

ELECTRICAL SYMBOLS ABBREV. AND NOTES

DATE

04/03/2025

PROJECT NUMBER

250033.00

SHEET NUMBER

E-100

DIVISION 26 ELECTRICAL SPECIFICATIONS

DIVISION 26 - ELECTRICAL SPECIFICATIONS

DESCRIPTION OF WORK
WORK SHALL INCLUDE, BUT IS NOT NECESSARILY LIMITED TO, THE FOLLOWING:

1. DEMOLITION
2. TEMPORARY POWER AND LIGHTING
3. CONDUIT AND RACEWAYS
4. CONDUCTORS
5. GROUNDING
6. SAFETY DISCONNECT SWITCHES
7. MOTOR STARTERS AND CONTROLS

STANDARDS

ELECTRICAL MATERIALS AND EQUIPMENT SHALL CONFORM TO THE REQUIREMENTS LISTED BELOW. ALL ELECTRICAL MATERIALS AND EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. IN THE ABSENCE OF SPECIFIC INSTRUCTION IN THE TECHNICAL SPECIFICATIONS, EQUIPMENT AND INSTALLATION SHALL CONFORM TO THE FOLLOWING APPLICABLE CODES, STANDARDS AND REGULATIONS, LATEST EDITIONS:

1. AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM).
2. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
3. UNDERWRITER'S LABORATORIES, INC. (UL).
4. AMERICAN WELDING SOCIETY CODE (AWS).
5. LOCAL BUILDING, ELECTRICAL, AND FIRE CODES.
6. NATIONAL ELECTRICAL CODE (NEC).
7. SERVICE RULES AND REGULATIONS OF LOCAL ELECTRICAL UTILITY COMPANY.
8. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA).
9. U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES "HRS-M-HF" 84_1.
10. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA).
11. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA).
12. AMERICANS WITH DISABILITIES ACT (ADA).

CODES AND ORDINANCES

COMPLY WITH ALL LOCAL, STATE AND NATIONAL CODES AND ORDINANCES. COMPLY WITH OWNER'S SPECIFICATIONS, GUIDELINES AND REQUIREMENTS. BIDDERS SHALL FAMILIARIZE THEMSELVES WITH CODE REQUIREMENTS FOR THE TYPE OF FACILITY WHERE THE WORK IS BEING PERFORMED.

PERMITS AND INSPECTION FEES

THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS AND INSPECTION FEES. FINAL INSPECTION CERTIFICATES BY THE AUTHORITIES HAVING JURISDICTION, INCLUDING THE LOCAL ELECTRICAL INSPECTOR AND FIRE MARSHAL, SHALL BE OBTAINED BY THE CONTRACTOR. COPIES SHALL BE SUBMITTED IN DUPLICATE TO THE OWNER.

SUBMITTALS

SUBMIT PRODUCT DATA, SHOP DRAWINGS, WIRING DIAGRAMS, AND DESCRIPTIVE LITERATURE FOR ALL ELECTRICAL MATERIALS AND EQUIPMENT TO BE INSTALLED UNDER THIS CONTRACT. MAKE SUBMITTALS WITHIN THIRTY (30) DAYS AFTER THE SIGNING OF THE CONTRACT. PRODUCT SHIPMENTS ARE NOT PERMITTED UNTIL SUBMITTALS HAVE RECEIVED FINAL APPROVAL.

AS-CONSTRUCTED DOCUMENTS

UPON PROJECT COMPLETION, THE CONTRACTOR SHALL PROVIDE A MARKED-UP COPY OF THE ORIGINAL CONTRACT DOCUMENTS TO THE OWNER, INDICATING CHANGES, ADDITIONS AND MODIFICATIONS TO THE ORIGINAL DESIGN. DRAWINGS SHALL BE MANUALLY-PREPARED.

OPERATION & MAINTENANCE MANUALS

PROVIDE OPERATING INSTRUCTIONS AND MAINTENANCE INFORMATION, FOR EACH SYSTEM AND EQUIPMENT SPECIFIED, FOR USE BY FACILITY OPERATION AND MAINTENANCE PERSONNEL. MANUALS SHALL BE PROVIDED IN 3-RING BINDERS OR ELECTRONIC COPIES. THE MANUALS SHALL INCLUDE:

1. WIRING DIAGRAMS, CONTROL DIAGRAMS, AND CONTROL SEQUENCE FOR EACH SYSTEM AND ITEM OF EQUIPMENT.
2. START-UP, PROPER ADJUSTMENT, OPERATING, LUBRICATION, AND SHUTDOWN PROCEDURES.
3. SAFETY PRECAUTIONS.
4. THE PROCEDURE TO BE FOLLOWED IN THE EVENT OF EQUIPMENT FAILURE.
5. OTHER ITEMS OF INSTRUCTION AS RECOMMENDED BY THE MANUFACTURER OF EACH SYSTEM OR ITEM OF EQUIPMENT.

TRAINING

DURING OR UPON COMPLETION OF THE PROJECT, CONTRACTOR SHALL PROVIDE TRAINING OF OPERATION AND MAINTENANCE PERSONNEL FOR ALL REQUIRED ELECTRICAL COMPONENTS AND SYSTEMS. TRAINING SHALL BE CONDUCTED AT THE OWNER'S FACILITY. COORDINATE WITH THE OWNER FOR SCHEDULE.

SIGNAGE AND IDENTIFICATION OF SYSTEMS AND EQUIPMENT

1. OPERATING INSTRUCTIONS: PRINT OR ENGRAVE INSTRUCTIONS AND FRAME UNDER GLASS OR APPROVED LAMINATED PLASTIC. POST INSTRUCTIONS IN VIEW OF EQUIPMENT. PROVIDE WEATHER-RESISTANT MATERIALS FOR EXTERIOR APPLICATIONS.
2. EQUIPMENT: PROVIDE NAMEPLATES FOR ALL EQUIPMENT AND DEVICES. NAMEPLATES SHALL BE SELF-ADHESIVE WITH ENGRAVED, LAMINATED ACRYLIC OR MELAMINE LABELS. PROVIDE NAMEPLATES WITH WHITE LETTERS ON A BLACK BACKGROUND. MINIMUM LETTER HEIGHT SHALL BE 1/8-INCH.
3. WARNING SIGNS: PROVIDE A SELF-ADHESIVE WARNING LABEL THAT IS FACTORY PRINTED AND MULTI-COLOR. COMPLY WITH N.E.C. 70 AND 29 CFR 1910.145. LABELS FOR MULTIPLE POWER SOURCES SHALL READ: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES". LABELS FOR OTHER EQUIPMENT REQUIRING WORK SPACE CLEARANCES SHALL READ: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES".
4. ARC-FLASH WARNING SIGNS: PROVIDE A SELF-ADHESIVE ARC-FLASH WARNING LABEL ON ALL SAFETY SWITCHES, STARTERS, SWITCHBOARDS, PANELBOARDS AND OTHER REQUIRED EQUIPMENT. LABEL SHALL READ: "WARNING: ARC FLASH AND SHOCK HAZARD. APPROPRIATE PPE AND TOOLS REQUIRED WHEN WORKING ON THIS EQUIPMENT."

GUARANTEE

PROVIDE WRITTEN GUARANTEE FOR ALL LABOR AND MATERIALS FOR ONE (1) YEAR AFTER OWNER'S WRITTEN ACCEPTANCE OF THE PROJECT.

LAYOUT OF THE WORK

THE CONTRACTOR SHALL EXAMINE THE AREA OF WORK, AND ALL OTHER DISCIPLINE DRAWINGS, BEFORE PROCEEDING WITH THE LAYOUT AND INSTALLATION OF THE ELECTRICAL WORK. LOCATE ELECTRICAL EQUIPMENT ESSENTIALLY AS SHOWN ON THE DRAWINGS. EXACT LOCATION OF EQUIPMENT SHALL BE DETERMINED AT THE JOB SITE, TO SUIT ACTUAL CONDITIONS. THE CONTRACTOR SHALL COORDINATE WITH OTHER TRADES PRIOR TO INSTALLATION, SO THAT ALL COMPONENTS WILL BE INSTALLED IN PROPER RELATIONSHIP AND SEQUENCE.

DEMOLITION

CONTRACTOR SHALL REMOVE ALL EQUIPMENT AND MATERIAL INDICATED ON THE DEMOLITION PLANS OR AS REQUIRED TO INSTALL THE EQUIPMENT THAT IS PART OF THIS CONTRACT. LIGHT FIXTURES INDICATED TO BE REUSED SHALL BE REMOVED, CLEANED AND RE-LAMPED BEFORE REINSTALLING. REMOVED LIGHT FIXTURES TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER UNLESS OTHERWISE SPECIFIED. ALL OTHER ELECTRICAL DEMOLITION ITEMS SHALL BE REMOVED FROM THE SITE. EXISTING CONDUITS MAY BE REUSED WHEN PRACTICAL. CONTRACTOR SHALL PATCH EXISTING WALL AND CEILING OPENINGS IN FINISHED AREAS UPON REMOVAL OF ELECTRICAL EQUIPMENT. CONTRACTOR SHALL PROTECT ALL EXISTING ELECTRICAL EQUIPMENT, INDICATED TO REMAIN, DURING CONSTRUCTION PERIOD.

CUTTING AND PATCHING

ALL NECESSARY CUTTING AND PATCHING OF THE BUILDING WALLS, FLOORS AND CEILINGS REQUIRED FOR REMOVAL OR INSTALLATION OF THE NEW WORK, SHALL BE FURNISHED BY THE CONTRACTOR. NO STRUCTURAL MEMBERS OF THE BUILDING SHALL BE CUT WITHOUT PRIOR APPROVAL OF THE ENGINEER. ALL NECESSARY PATCHING AND PAINTING OF SURFACES SHALL BE BY CONTRACTOR. PAINT SHALL MATCH EXISTING.

TEMPORARY POWER AND LIGHTING

CONTRACTOR SHALL SUPPLY TEMPORARY POWER AND LIGHTING IN NEW WORK AREAS AND EXISTING AREAS WHERE POWER OR LIGHTING IS BEING MODIFIED. THIS INCLUDES POWER TO EXISTING CRITICAL AND LIFE SAFETY SYSTEMS. TEMPORARY LIGHTING SHALL EQUAL OR EXCEED EXISTING LIGHT LEVELS. MINIMUM ILLUMINATION LEVEL SHALL BE 10-FOOT-CANDLES. COORDINATE ALL POWER AND LIGHTING SHUTDOWNS WITH OWNER.

GROUNDING

ALL ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN A MANNER APPROVED BY THE AUTHORITY HAVING JURISDICTION. PROVIDE GROUND RODS AND BARE COPPER GROUND CONDUCTORS AT UTILITY TRANSFORMER PAD. PROVIDE A GROUND ROD AND GROUND CONDUCTOR AT THE BUILDING MAIN DISCONNECT SWITCH. PROVIDE A GROUND CONDUCTOR IN ALL POWER RACEWAYS. GROUND ELECTRICAL SYSTEMS PER NEC ARTICLE 250 OR AS DETAILED ON THE DRAWINGS.

WIRE AND CABLE

PRIMARY FEEDERS SHALL BE TYPE UD EPR, 15KV RATED, COLORED BLACK. COLOR CODE ALL PRIMARY FEEDERS. SECONDARY FEEDERS SHALL BE TYPE THWN-2 or XHHW-2, 600V RATED, COLORED BLACK OR COLOR CODED. BRANCH CIRCUIT WIRING SHALL BE TYPE THWN-2 OR XHHW-2, 600V RATED, 7 STRAND, #12 AWG MINIMUM, COLORED HOT-BLACK, NEUTRAL-WHITE AND GROUND-GREEN. BARE COPPER GROUND WIRE SHALL BE STRANDED TYPE.

ALL BRANCH CIRCUIT WIRING SHALL BE CONTINUOUS BETWEEN JUNCTION BOXES, WITH SPLICES MADE ONLY WITHIN BOXES. SOLDERLESS PRESSURE-TYPE CONNECTORS, PROPERLY INSULATED, SHALL BE USED FOR ALL SPLICES. NO POWER WIRE SMALLER THAN #12 AWG MAY BE USED UNLESS SPECIFIED UNDER DESCRIPTIONS OF SPECIAL SYSTEMS.

LABEL ALL CONDUCTORS WITH CIRCUIT NUMBERS AT BOTH ENDS, MINIMUM.

CONDUIT AND BOXES

CONDUIT SHALL BE 3/4" MINIMUM. EXPOSED OUTDOOR CONDUIT SHALL BE RGC. BELOW GRADE CONDUIT SHALL BE SCHEDULE 40 PVC OR HDPE. EXPOSED INTERIOR CONDUIT SHALL BE EMT. CONDUIT INSTALLED IN INDUSTRIAL FACILITIES SHALL BE RGC. CONDUIT FOR CONDUCTORS GREATER THAN 80VOLTS SHALL BE RGC. CONCEALED INTERIOR CONDUIT SHALL BE EMT. CONDUIT AND BOXES IN CORROSIVE ENVIRONMENTS SHALL BE PVC-COATED RGC. BELOW GRADE, NON-METALLIC CONDUIT CONTAINING DATA AND COMMUNICATIONS WIRING, SHALL BE INSTALLED WITH A TRACER WIRE.

WHERE FLEXIBLE CONNECTIONS ARE REQUIRED, SUCH AS CONNECTIONS TO MOTORS AND LIGHT FIXTURES, LIQUID-TIGHT, FLEXIBLE METAL CONDUIT SHALL BE USED, WHERE PERMITTED BY THE NEC.

EXTERIOR RGC CONDUIT JOINTS SHALL BE MADE WATERTIGHT BY COATING THREADS WITH A ZINC PAINT.

EXTERIOR-MOUNTED DEVICE BOXES AND BOXES INSTALLED IN INDUSTRIAL FACILITIES SHALL BE CAST TYPE. INTERIOR OUTLET BOXES SHALL BE PRESSED STEEL, COMPLETE WITH PLASTER RING IF NECESSARY. FOR EACH SWITCH, RECEPTACLE OR DEVICE BOX, CEILING OUTLET BOXES SHALL BE 4-INCH OCTAGON, 1-1/2 INCH DEEP. EACH OUTLET SHALL BE RIGIDLY SUPPORTED FROM THE BUILDING CONSTRUCTION (INDEPENDENT OF THE RACEWAY SYSTEM). LIGHT FIXTURE BOXES SHALL BE SUPPLIED WITH FIXTURE SUPPORT HARDWARE AND SUPPORTED TO WITHSTAND 80 LBS.

SUPPORTS AND HANGERS

PROVIDE AND INSTALL NECESSARY STEEL BRACKETS, RODS, CHANNELS, CLAMPS, ETC., FOR SUPPORT OF ALL WORK UNDER THIS CONTRACT. MOUNT SECURELY TO CEILING OR WALL.

SAFETY DISCONNECT SWITCHES

SAFETY DISCONNECT SWITCHES SHALL BE CIRCUIT BREAKER OR FUSED TYPE, 250VAC OR 480VAC, CLASS A, HEAVY DUTY, DUAL HORSEPOWER RATED IN NEMA 1 ENCLOSURE OR WEATHER-PROOF AS INDICATED ON DRAWINGS. BUILDING SAFETY DISCONNECT SWITCHES SHALL BE RATED FOR "SERVICE ENTRANCE.". VOLTAGE, CURRENT RATING, NUMBER OF POLES, CIRCUIT BREAKER OR FUSES AS INDICATED. CONSTRUCTION SHALL BE SUCH THAT, WHEN THE SWITCH HANDLE IS IN THE "ON" POSITION, THE COVER CANNOT BE OPENED. SWITCHES FOR 30-AMPERE TO 200-AMPERE LOADING SHALL BE SQUARE D TYPE HD OR EQUAL.

MOTOR STARTERS

THREE-PHASE MOTOR STARTERS SHALL BE COMBINATION TYPE, 250VAC OR 480VAC AS REQUIRED, CLASS A, HEAVY DUTY, DUAL HORSEPOWER RATED WITH OVERLOADS AND TIME DELAY SWITCH. UNITS SHALL BE SQUARE D OR EQUAL.

FRACTIONAL HORSEPOWER MOTOR STARTERS SHALL BE TOGGLE TYPE, 120VAC WITH RED PILOT LIGHT.

END OF DIVISION 26

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PROJECT

ST. JOHNS HIGH SCHOOL - BOILER REPLACEMENT
501 W. SICKLES ST.
ST. JOHNS, MI 48879

SHEET DESCRIPTION

**ELECTRICAL
SPEC'S**

DATE

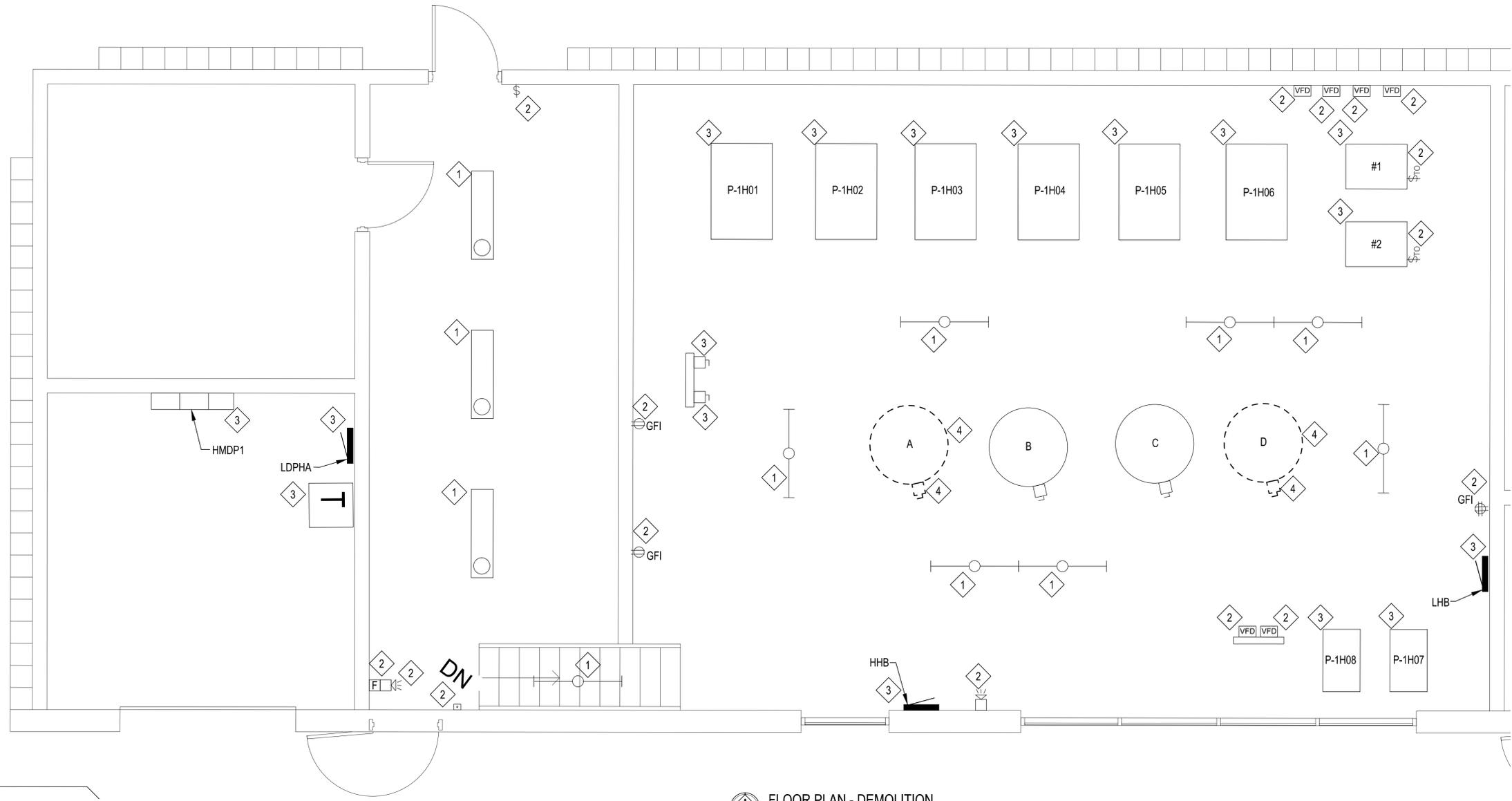
04/03/2025

PROJECT NUMBER

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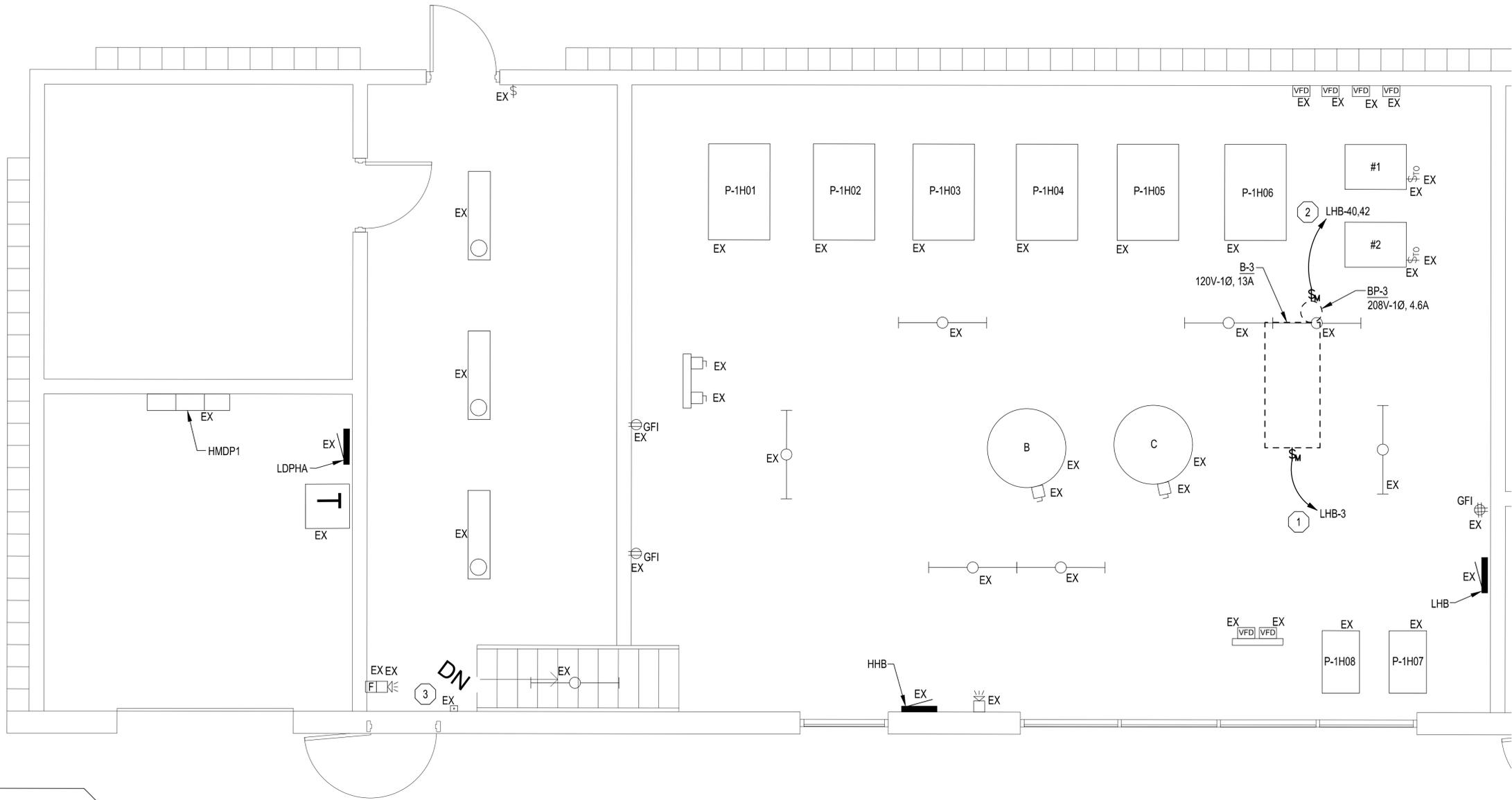
E-101



- DEMOLITION NOTES**
- 1 EXISTING LIGHT FIXTURE TO REMAIN.
 - 2 EXISTING DEVICE TO REMAIN.
 - 3 EXISTING EQUIPMENT TO REMAIN.
 - 4 DISCONNECT & REMOVE EXISTING EQUIPMENT. REMOVE ASSOCIATED CONDUIT & WIRE.

FLOOR PLAN - DEMOLITION

0 1 5 10
SCALE: 1/4" = 1'-0"



- ELECTRICAL KEY NOTES**
- CONTRACTOR SHALL CIRCUIT TO EXISTING SPARE 20A-1P BREAKER.
 - CONTRACTOR SHALL REMOVE (2) EXISTING SPARE 20A-1P BREAKERS IN EXISTING PANEL; TURN BREAKERS OVER TO OWNER. CONTRACTOR SHALL PROVIDE AND INSTALL NEW 20A-2P BREAKER IN EXISTING EATON PRILA PANEL.
 - CONTRACTOR SHALL INTEGRATE EXISTING EMERGENCY PUSH BUTTON WITH NEW BOILER (B-3) FOR BOILER SHUT OFF.

FLOOR PLAN - POWER
SCALE: 1/4" = 1'-0"

