



PERMANENT CHILLER COVER SHEET

Issue for Bid - Worcester, MA - 11/19/2025

PACKAGE CODES:		
<div></div>	■	NOT ISSUED
<div></div>	○	FOR REFERENCE
<div></div>	●	FOR CONSTRUCTION

SHEET INDEX				
		SCHEMATIC DESIGN	90% CONSTRUCTION DOCUMENTS	ISSUE FOR BID
NO	NAME			
GENERAL				
X-0	COVER SHEET			
1				
STRUCTURAL				
S0-001	GENERAL NOTES			
S0-002	GENERAL NOTES			
S1-101	PARTIAL FRAMING PLAN & DETAILS			
3				
ARCHITECTURE				
A1-1	CHILLER ROOM REFERENCE PLAN			
A3-1	ENLARGED CHILLER ROOM PLAN - LEVEL 1			
A3-2	ENLARGED CHILLER ROOM PLAN - LEVEL 2			
A3-2A	ENLARGED CHILLER ROOM PLAN - LEVEL 2 MEZZANINE			
A3-3	ENLARGED CHILLER ROOM PLAN - LEVEL 3			
A5-1	EXTERIOR ELEVATIONS			
A7-1	BUILDING SECTIONS			
7				
ELECTRICAL				
E-001	ELECTRICAL LEGEND SHEET			
E-301	ELEC POWER - CHILLER ROOM - PART PLAN SHEET			
E-500	ELECTRICAL PARTIAL RISER DIAGRAM			
3				
MECHANICAL				
M-001	HVAC LEGEND 1			
M-002	HVAC LEGEND 2			
M-003	HVAC LEGEND 3			
M-202	HVAC - MAIN CONCOURSE LEVEL 2			
M-203	HVAC - LEVEL 2 MEZZANINE			
M-501	HVAC DETAIL			
M-601	HVAC SCHEDULE			
M-801	HVAC CONTROLS			
M-802	HVAC CONTROLS			
M-803	HVAC CONTROLS			
10				
24				

POPULOUS

Project Number: 23.5724

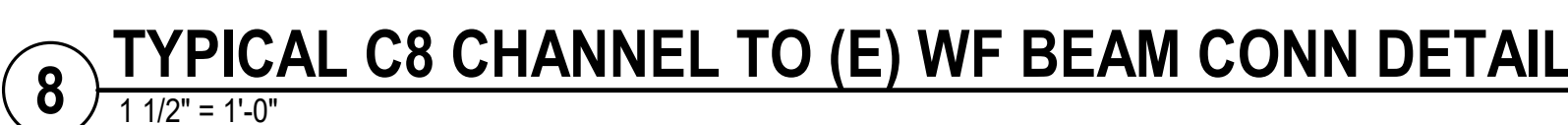
architect
Populous
294 Washington Street, Suite 706
Boston, MA 02108
657.415.3642

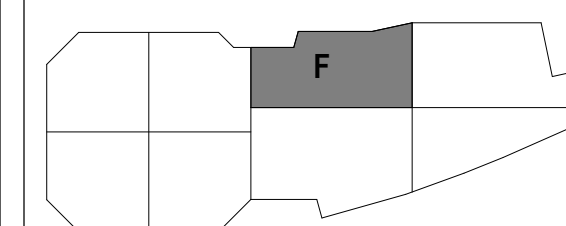
structural engineer
Thornton Tomasetti
101 Arch Street, Suite 1600
Boston, MA 02110
617.250.4100

MEP/FP engineer
Vanderweil
274 Summer Street
Boston, MA 02210
617.423.7423

- X-0
 - ☐ Civil
 - ☐ Landscape
 - ☒ Structural
 - ☐ Life Safety
 - ☒ Architecture
- ☒ Plumbing
 - ☒ Mechanical
 - ☒ Electrical
 - ☐ Fire Alarm
 - ☐ Fire Protection
- ☐ Technology
 - ☐ Audio Visual
 - ☐ Food Service MEP
 - ☐ Food Service
 - ☐ Graphics & Signage

1 ABBREVIATION LIST



[illegible]

PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

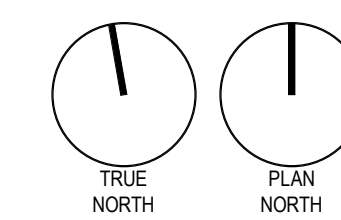
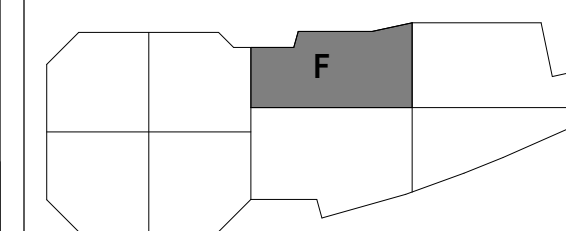
ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

**CHILLER ROOM
REFERENCE PLAN**

A1-1

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

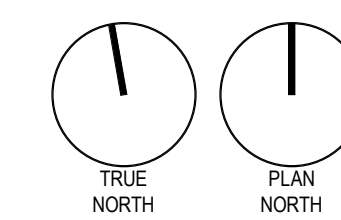
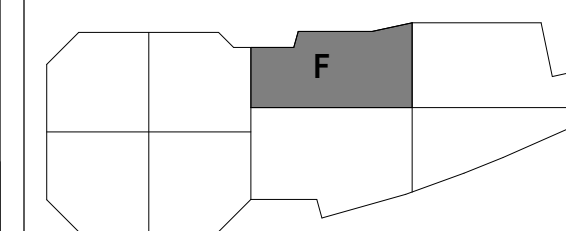
PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

**ENLARGED CHILLER
ROOM PLAN - LEVEL 1**

SHEET NUMBER

A3-1

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

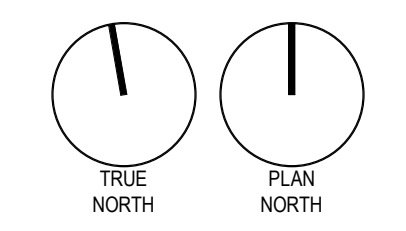
PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

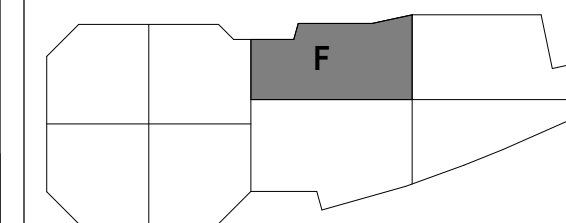
**ENLARGED CHILLER
ROOM PLAN - LEVEL 2**

SHEET NUMBER

A3-2



10
11

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

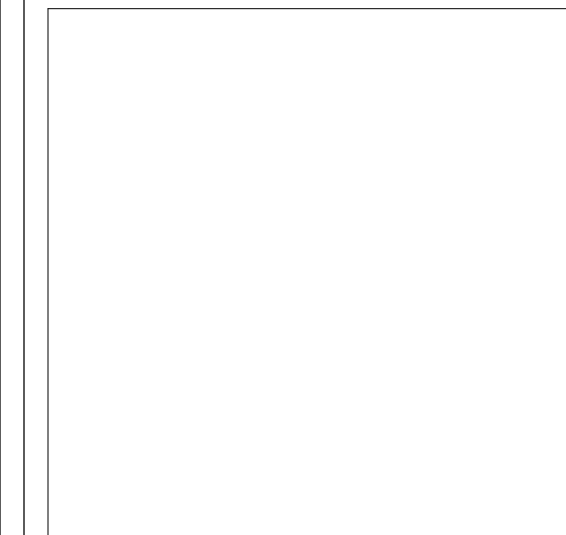
PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

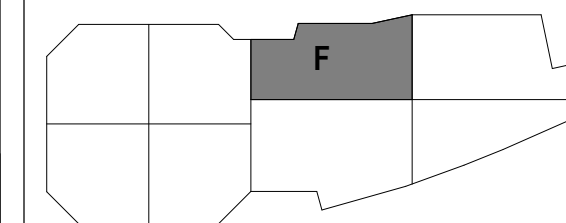
**ENLARGED CHILLER
ROOM PLAN - LEVEL 2
MEZZANINE**

SHEET NUMBER

A3-2A



--

[illegible]

PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

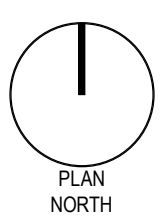
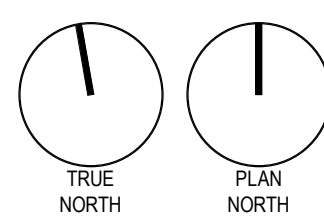
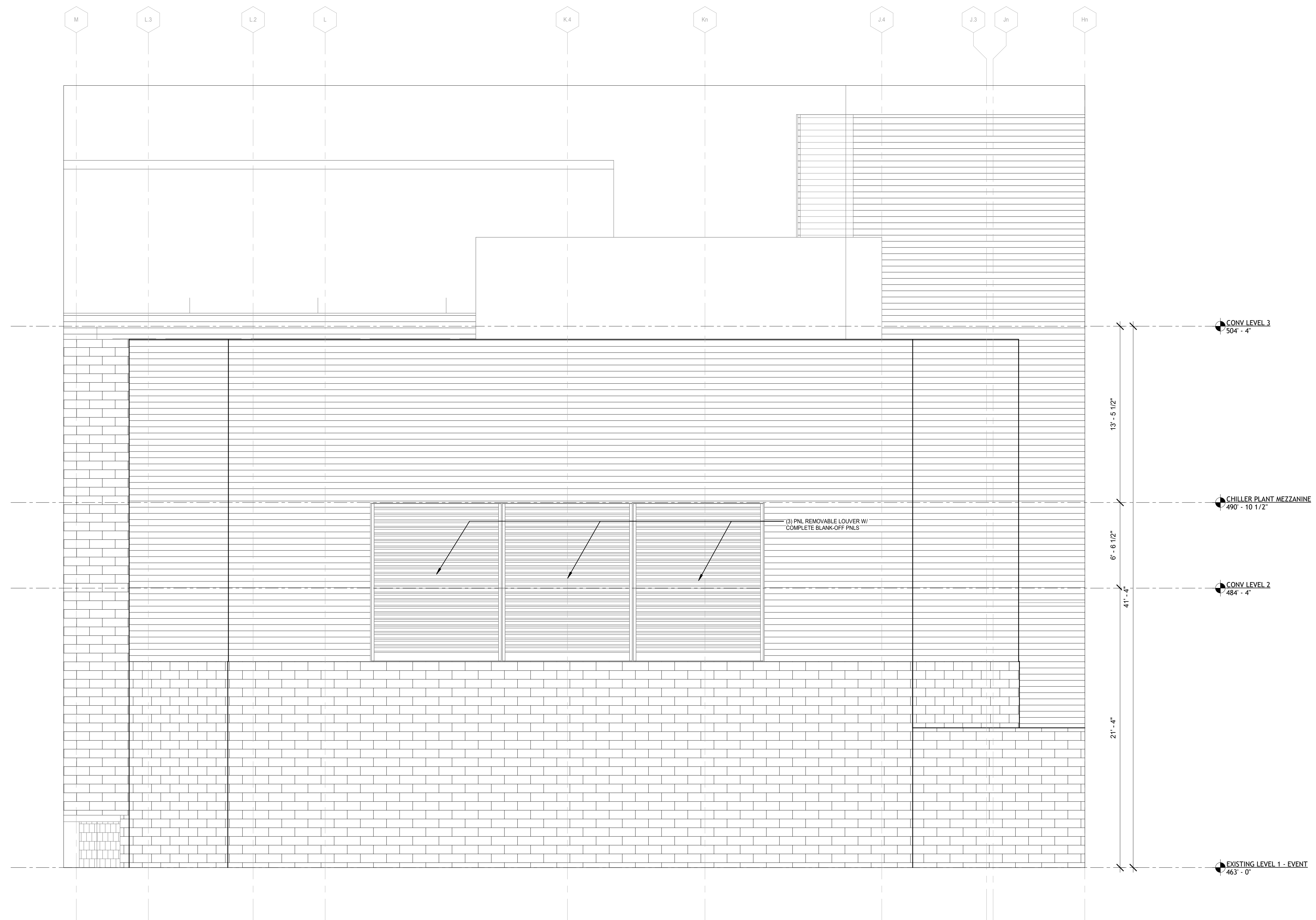
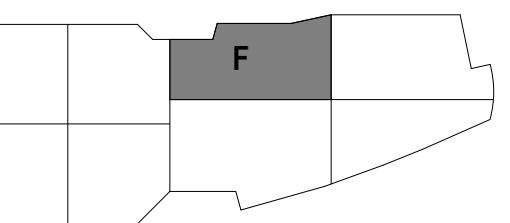
**ENLARGED CHILLER
ROOM PLAN - LEVEL 3**

A3-3



NOTES:

1. REMOVAL OF LOUVER PANELS TO BE DOCUMENTED WITH PHOTOS
2. LOUVER PANELS SELECTED TO BE REMOVED TO BE COORDINATED WITH ARCHITECT
3. REINSTALLATION OF LOUVER PANELS TO BE DOCUMENTED WITH PHOTOS

[illegible]

PERMANENT CHILLER

Foster Street
Worcester, MA 01608-1398

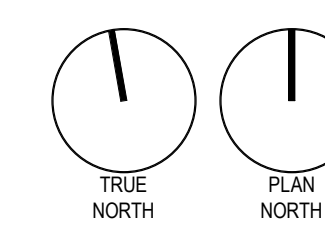
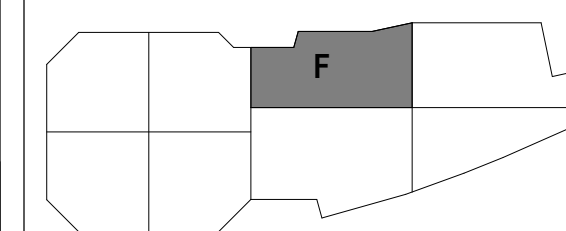
SUE FOR BID

ISSUED DATE	ISSUED BY
1/19/25	POPULOUS
PROJECT NUMBER	PAPER SIZE
3.5724	E1

EXTERIOR ELEVATIONS

SHEET NUMBER

A5-1

[illegible]

PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

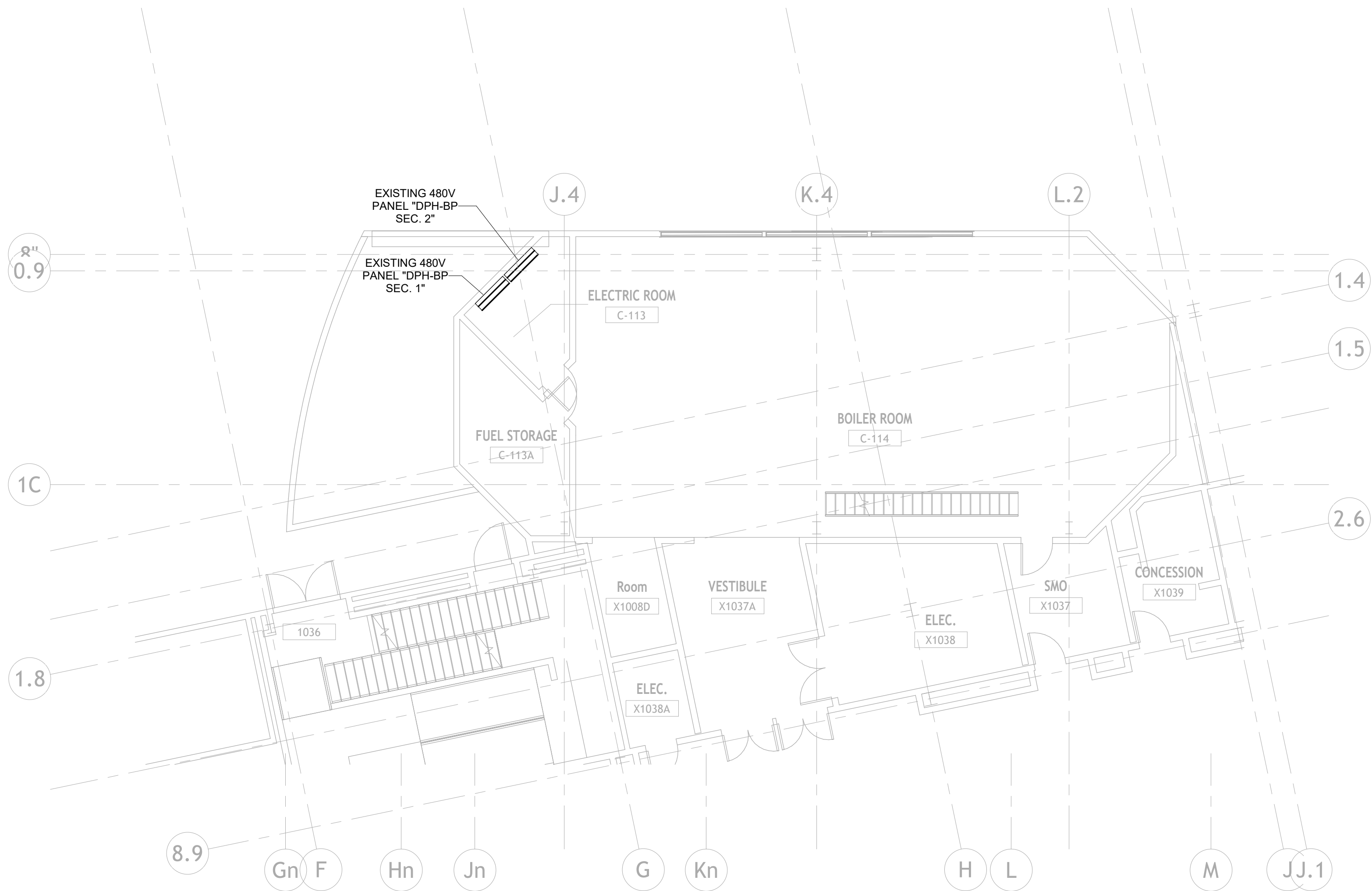
ISSUED DATE	ISSUED BY
11/19/25	POPULOUS
PROJECT NUMBER	PAPER SIZE
23.5724	E1

SHEET NAME

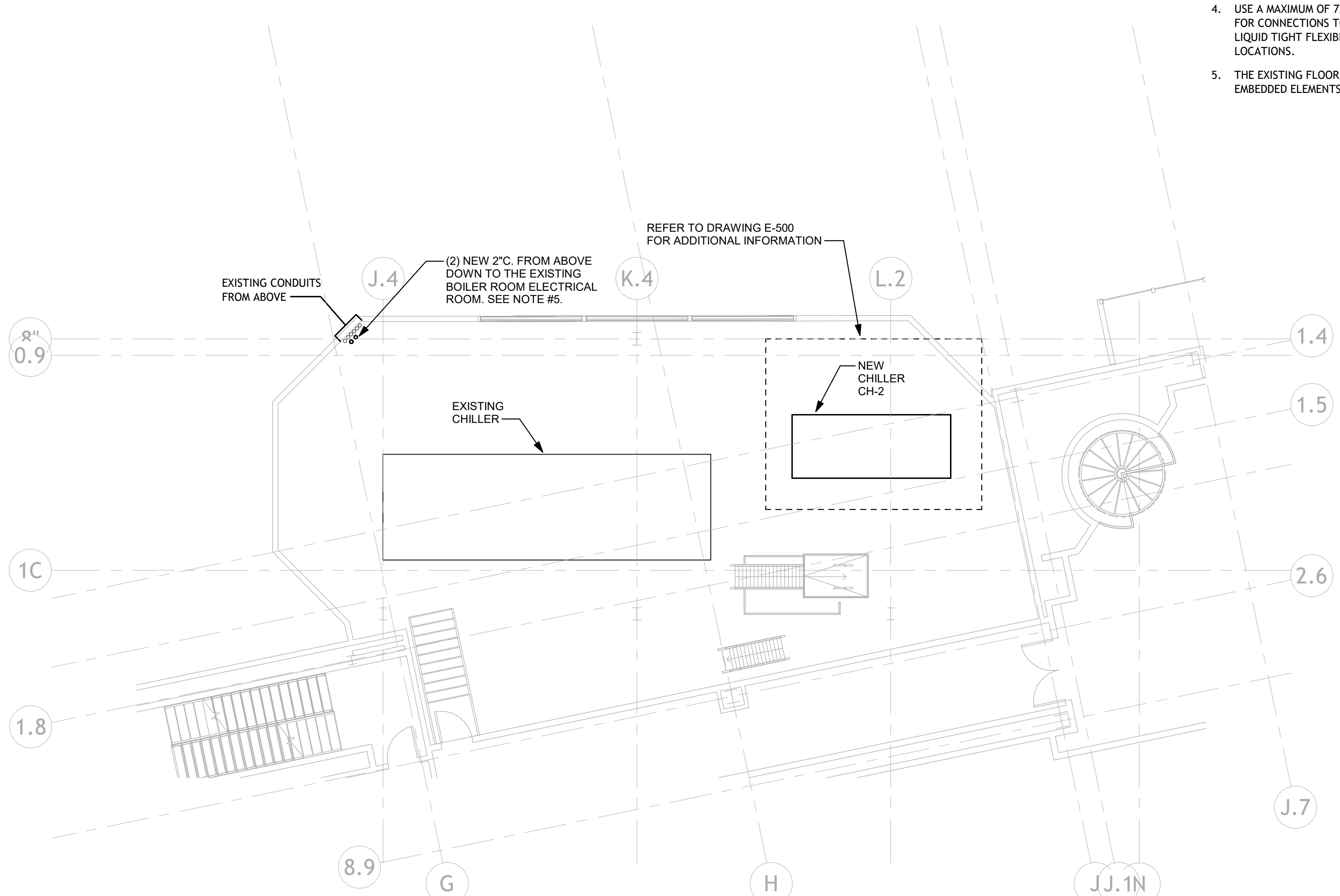
BUILDING SECTIONS

SHEET NUMBER

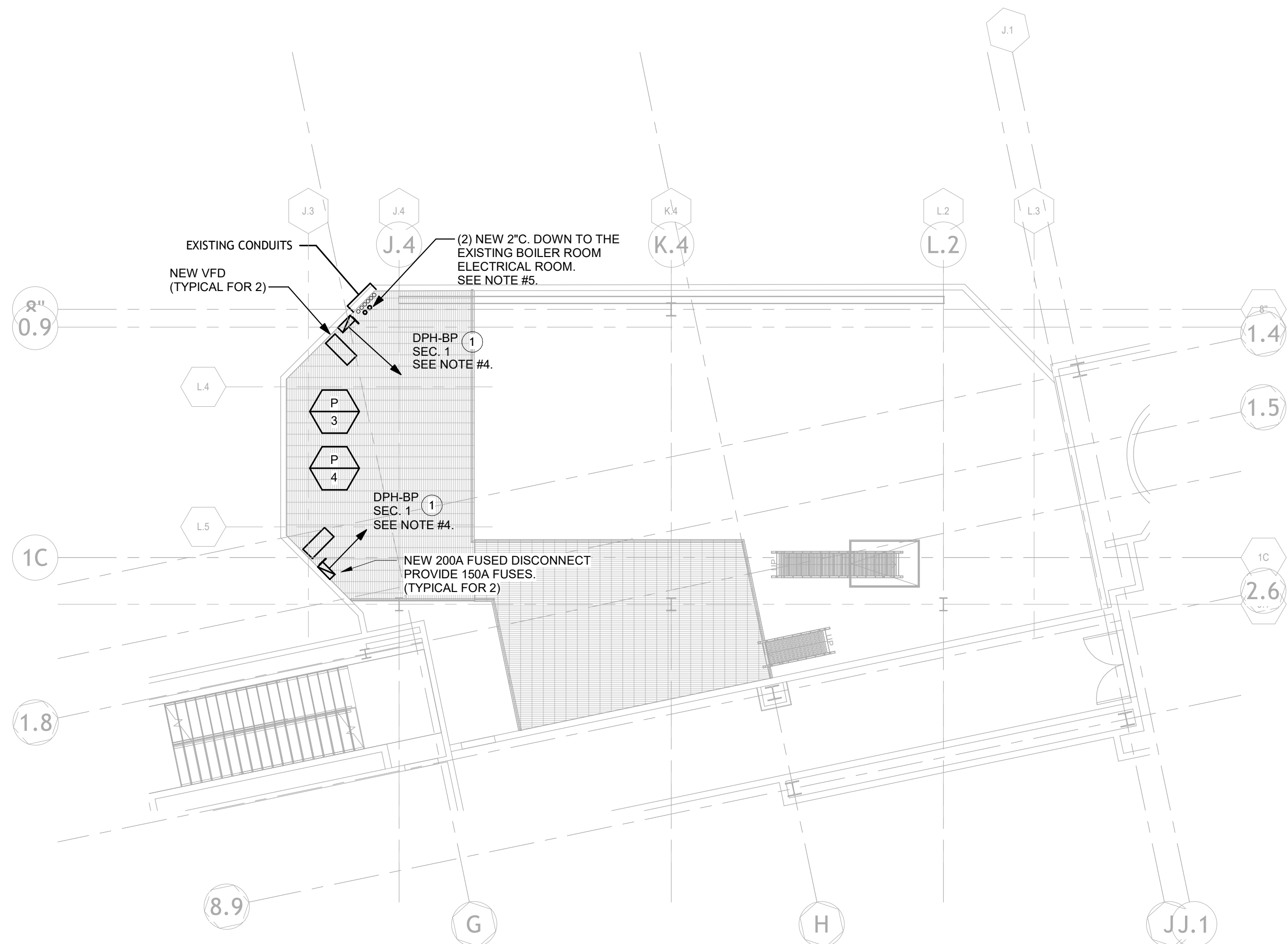
A7-1



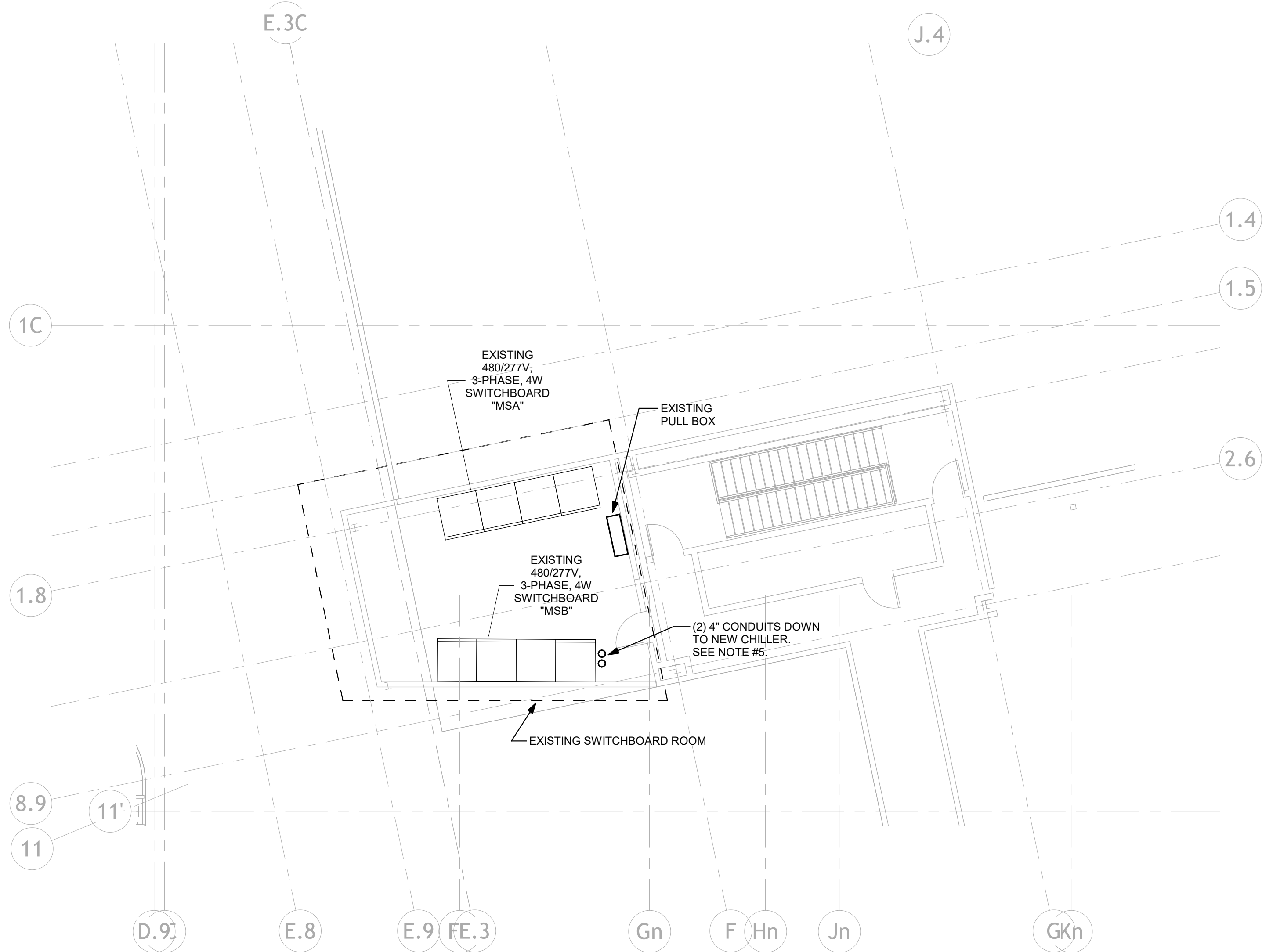
POWER - CHILLER PLANT - 01 EVENT
LEVEL
1
1/8" = 1'-0"



POWER - CHILLER PLANT - LEVEL 2
1/8" = 1'-0"



POWER - CHILLER PLANT - MEZZANINE
1/8" = 1'-0"



POWER - SWITCHBOARD ROOM
1/8" = 1'-0"

KEYED NOTES

- UTILIZE THE (2) SPARE 200A-3P CIRCUIT BREAKERS IN EXISTING 480V, 3-PHASE PANEL "DPH-BP" SECTION 1 TO SERVE NEW PUMPS P-3 AND P-4.

POWER NOTES:

- REFER TO DRAWING E-001 FOR THE ELECTRICAL LEGEND SHEET.
- REFER TO DRAWING E-500 FOR THE PARTIAL POWER ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- REFER TO ARCHITECTURAL DRAWINGS FOR PAINTING AND PATCHING REQUIREMENTS.
- USE A MAXIMUM OF 72 INCHES OF FLEXIBLE CONDUIT FOR CONNECTIONS TO VIBRATING EQUIPMENT. USE LIQUID TIGHT FLEXIBLE CONDUIT IN DAMP OR WET LOCATIONS.
- THE EXISTING FLOOR SLAB SHALL BE SCANNED TO IDENTIFY ANY EMBEDDED ELEMENTS PRIOR TO CORING.

POPULOUS

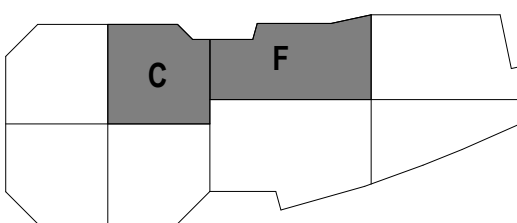
Architecture - Interior Design - Landscape Design
Brand Activation - Wayfinding - Product Design
Event - Urban Design - Populous Design Build

architect
Populous
294 Washington Street, Suite 706
Boston, MA 02108
857.415.3642

structural engineer
Thornton Tomasetti
101 Arch Street, Suite 1600
Boston, MA 02110
617.252.4100

MEPFP engineer
Vanderweil
274 Summer Street
Boston, MA 02210
617.423.7423

REVISIONS		
NO.	DATE	DESCRIPTION



PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

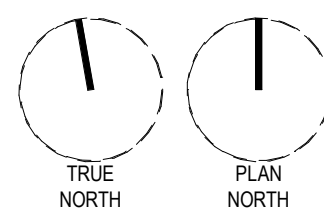
ISSUED NAME
ISSUE FOR BID

ISSUED DATE
11/19/25
PROJECT NUMBER
31937.00
ISSUED BY
POPULOUS
PAPER SIZE
E1

SHEET NAME
ELEC POWER - CHILLER
ROOM - PART PLAN SHEET

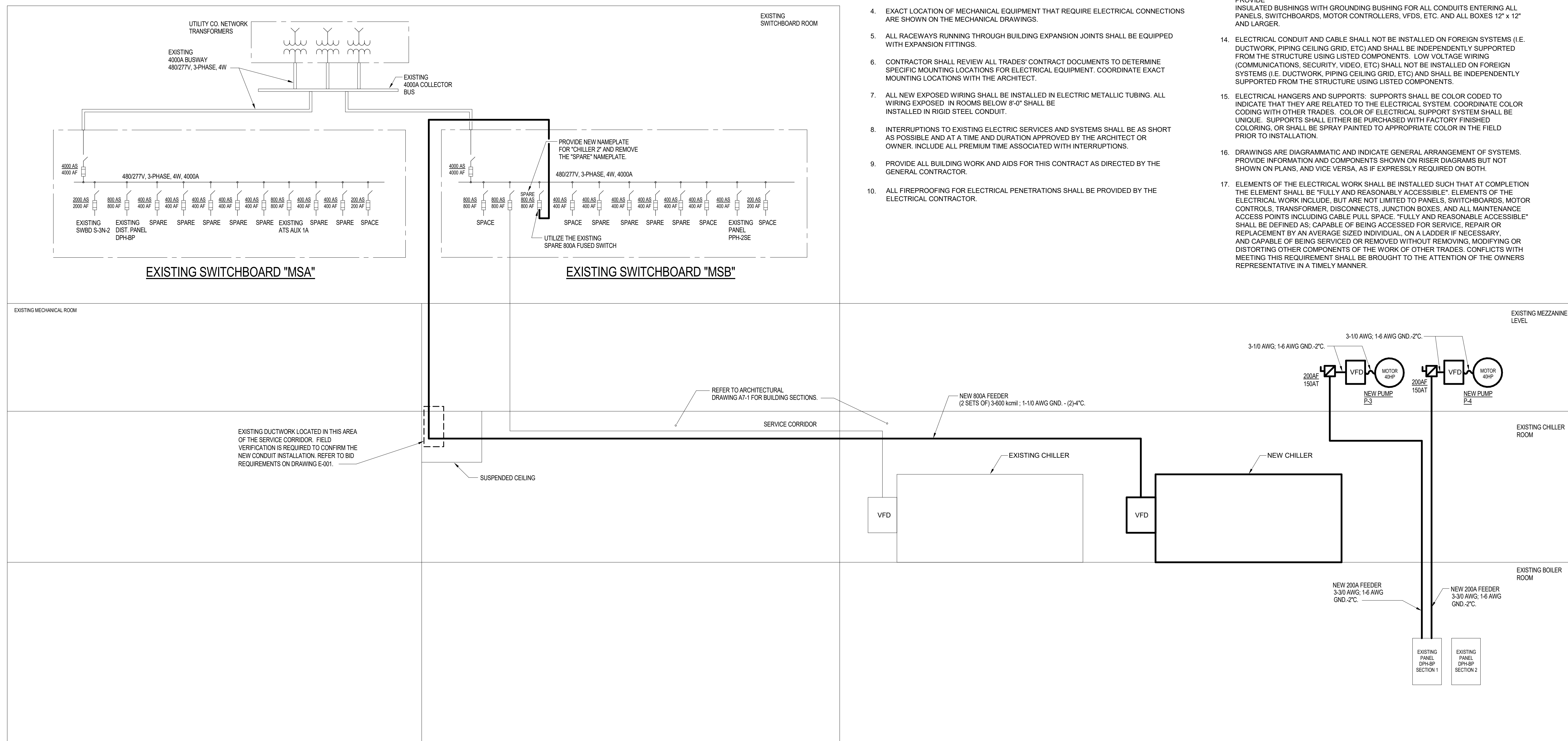
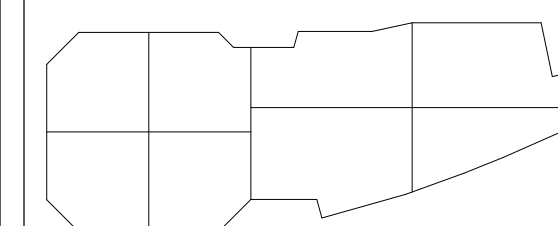
SHEET NUMBER

E-301



1. PERFORM WORK AND PROVIDE MATERIALS AND EQUIPMENT AS SHOWN ON DRAWINGS. COORDINATE ELECTRICAL WORK WITH WORK OF OTHER SECTIONS.
2. ALL WIRING SHALL BE RUN CONCEALED UNLESS SPECIFIED OTHERWISE. ALL WIRING WITHIN JUNCTION BOXES, TROUGHS AND POINTS OF TERMINATION IN PANELBOARDS SHALL BE IDENTIFIED WITH CIRCUIT NUMBER WITH WIRE MARKERS.
3. ALL EQUIPMENT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER, RECTILINEAR TO BUILDING STRUCTURE.
4. EXACT LOCATION OF MECHANICAL EQUIPMENT THAT REQUIRE ELECTRICAL CONNECTIONS ARE SHOWN ON THE MECHANICAL DRAWINGS.
5. ALL RACEWAYS RUNNING THROUGH BUILDING EXPANSION JOINTS SHALL BE EQUIPPED WITH EXPANSION FITTINGS.
6. CONTRACTOR SHALL REVIEW ALL TRADES' CONTRACT DOCUMENTS TO DETERMINE SPECIFIC MOUNTING LOCATIONS FOR ELECTRICAL EQUIPMENT. COORDINATE EXACT MOUNTING LOCATIONS WITH THE ARCHITECT.
7. ALL NEW EXPOSED WIRING SHALL BE INSTALLED IN ELECTRIC METALLIC TUBING. ALL WIRING EXPOSED IN ROOMS BELOW 8'-0" SHALL BE INSTALLED IN RIGID STEEL CONDUIT.
8. INTERRUPTIONS TO EXISTING ELECTRICAL SERVICES AND SYSTEMS SHALL BE AS SHORT AS POSSIBLE AND AT A TIME AND DURATION APPROVED BY THE ARCHITECT OR OWNER. INCLUDE ALL PREMIUM TIME ASSOCIATED WITH INTERRUPTIONS.
9. PROVIDE ALL BUILDING WORK AND AIDS FOR THIS CONTRACT AS DIRECTED BY THE GENERAL CONTRACTOR.
10. ALL FIREPROOFING FOR ELECTRICAL PENETRATIONS SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

11. SYSTEMS FEEDERS AND BRANCH CIRCUITS WHICH PASS THROUGH ALTERED AREAS AND SERVE OTHER AREAS SHALL BE MAINTAINED AS REQUIRED AND AS DIRECTED BY THE ARCHITECT.
12. FURNISH AND INSTALL NAMEPLATES ON ALL ELECTRICAL EQUIPMENT (SCREW ON TYPE) AND TYPEWRITTEN SCHEDULES OF CIRCUITS IN ALL PANELBOARDS.
13. PROVIDE INSULATED BUSHINGS ON ALL RACEWAYS:
PROVIDE
INSULATED BUSHINGS WITH GROUNDING BUSHING FOR ALL CONDUITS ENTERING ALL PANELS, SWITCHBOARDS, MOTOR CONTROLLERS, VFDs, ETC. AND ALL BOXES 12" x 12" AND LARGER.
14. ELECTRICAL CONDUIT AND CABLE SHALL NOT BE INSTALLED ON FOREIGN SYSTEMS (I.E. DUCTWORK, PIPING, CEILING GRID, ETC) SHALL BE INDEPENDENTLY SUPPORTED FROM THE STRUCTURE USING LISTED COMPONENTS. LOW VOLTAGE WIRING (COMMUNICATIONS, SECURITY, VIDEO, ETC) SHALL NOT BE INSTALLED ON FOREIGN SYSTEMS (I.E. DUCTWORK, PIPING, CEILING GRID, ETC) SHALL BE INDEPENDENTLY SUPPORTED FROM THE STRUCTURE USING LISTED COMPONENTS.
15. ELECTRICAL HANGERS AND SUPPORTS. SUPPORTS SHALL BE COLOR CODED TO INDICATE THAT THEY ARE RELATED TO THE ELECTRICAL SYSTEM. COORDINATE COLOR CODING WITH OTHER TRADES. COLOR OF ELECTRICAL SUPPORT SYSTEM SHALL BE UNIQUE. SUPPORTS SHALL EITHER BE PURCHASED WITH FACTORY FINISHED COLOR OR SHALL BE SPRAY PAINTED TO APPROPRIATE COLOR IN THE FIELD PRIOR TO INSTALLATION.
16. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS. PROVIDE INFORMATION AND COMPONENTS SHOWN ON RISER DIAGRAMS BUT NOT SHOWN ON PLANS, AND VICE VERSA, AS IF EXPRESSLY REQUIRED ON BOTH.
17. ELEMENTS OF THE ELECTRICAL WORK SHALL BE INSTALLED SUCH THAT AT COMPLETION THE ELEMENT SHALL BE "FULLY AND REASONABLY ACCESSIBLE". ELEMENTS OF THE ELECTRICAL WORK INCLUDE, BUT ARE NOT LIMITED TO PANELS, SWITCHBOARDS, MOTOR CONTROLLERS, TRANSFORMER, DISCONNECTS, JUNCTION BOXES, AND ALL MAINTENANCE ACCESS POINTS INCLUDING CABLE PULL SPACE. "FULLY AND REASONABLE ACCESSIBLE" SHALL BE DEFINED AS: CAPABLE OF BEING ACCESSED FOR SERVICE, REPAIR OR REPLACEMENT BY AN ELECTRICIAN WITHOUT THE NEED FOR REMOVAL OF OBSTACLES AND CAPABLE OF BEING SERVICED OR REMOVED WITHOUT REMOVING, MODIFYING OR DISTORTING OTHER COMPONENTS OF THE WORK OF OTHER TRADES. CONFLICTS WITH MEETING THIS REQUIREMENT SHALL BE BROUGHT TO THE ATTENTION OF THE OWNERS REPRESENTATIVE BY THE CONTRACTOR.

[illegible]

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

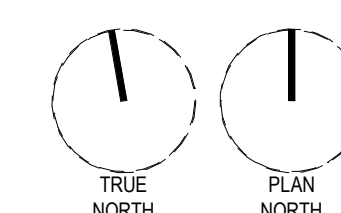
PROJECT NUMBER	PAPER SIZE
31937 00	E1

SHEET NAME

**ELECTRICAL PARTIAL
RISER DIAGRAM**

SHEET NUMBER

E-500



GENERIC HVAC ABBREVIATIONS (REFER TO CONTROL ABBREVIATIONS FOR ADDITIONAL NOMENCLATURE)

CV	AUTOMATIC CONTROL VALVE	LWT	LEAVING WATER TEMPERATURE
S	AIR SEPARATOR	MAV	MANUAL AIR VENT
	AUTOMATIC AIR VENT		
4	CHILLER	NPSH	NET POSITIVE SUCTION HEAD
HEM	CHEMICAL FEED		
HW	CHILLED WATER	OS&Y	OUTSIDE STEM AND YOKE
HWR	CHILLED WATER RETURN		
HWS	CHILLED WATER SUPPLY	P	PUMP
	COOLING TOWER	PHX	PLATE HEAT EXCHANGER
TBD	COOLING TOWER BLOW DOWN		
FW	COOLING TOWER WATER		
TWR	COOLING TOWER WATER RETURN		
WWS	COOLING TOWER WATER SUPPLY		
WR	CONDENSER WATER RETURN	SXXX	SECONDARY (SYSTEM DEPENDANT) PREFIX
	CONDENSER WATER SUPPLY	SCHWR	SECONDARY CHILLED WATER RETURN
		SCHWS	SECONDARY CHILLED WATER SUPPLY
DV	DRAIN OFF VALVE		
WT	EXPANSION TANK	TXXX	TERTIARY (SYSTEM DEPENDANT PREFIX)
	ENTERING WATER TEMPERATURE	TDH	TOTAL DYNAMIC HEAD
S	GLYCOL SUPPLY		
S	HOSE BIBB CONN W/CHAINED CAP		
			WATER PRESSURE DROP
W	HOT WATER		
WCUH	HOT WATER CABINET UNIT HEATER	ALTERNATIVE HYDRONIC PIPING SYSTEM LABELING:	
WR	HOT WATER RETURN	HWS180	HOT WATER SUPPLY 180 DEGREE SYSTEM
WUH	HOT WATER UNIT HEATER	HWR180	HOT WATER RETURN 180 DEGREE SYSTEM
		CHWS42	CHILLED WATER SUPPLY 42 DEGREE SYS
		CHWR42	CHILLED WATER RETURN 42 DEGREE SYS
CHWR	LOW TEMP. CHILLED WATER RETURN		
CHWS	LOW TEMP. CHILLED WATER SUPPLY		

AIR SYSTEM SPECIFIC ABBREVIATIONS			
C	AIR CONDITIONING	IH	INTAKE HOOD
CC	AIR COOLED CONDENSER		
CCU	AIR COOLED CONDENSING UNIT	LAT	LEAVING AIR TEMPERATURE
CU	AUTOMATIC CONTROL DAMPER	LD	LINEAR DIFFUSER
CU	AIR CONDITIONING UNIT	LUVR	LOUVER
F	AIR FOIL	LVR	LOUVERED DOOR
HU	AIR HANDLING UNIT	OA	OUTSIDE AIR
LD	ACOUSTICALLY LINED DUCTWORK	OA1	OUTSIDE AIR INTAKE
PD	AIR PRESSURE DROP	OBD	OPPOSED BLADE DAMPER
PD	AIR TERMINAL DEVICE	OED	OPEN END DUCT
PD	AIR VOLUME TRAVERSE STATION	PHC	PREHEAT COIL
OD	BACKDRAFT DAMPER	RA	RETURN AIR
	BACKWARD INCLINED	RLF	RELIEF
OD	BOTTOM OF DUCT	RV	ROOF VENT
OD	COOLING COIL	SA	SUPPLY AIR
OD	CEILING DIFFUSER	SD	SMOKE DAMPER
OD	CUBIC FEET PER MINUTE	SM	SHEETMETAL
FF	DIFFUSER	SP	STATIC PRESSURE
	DIRECT EXPANSION	TSP	TOTAL STATIC PRESSURE
A	EXHAUST AIR	VD	VOLUME DAMPER
R	EXHAUST FAN	WMS	WIRE MESH SCREEN
	EXHAUST REGISTER		
NHC	ELECTRIC REHEAT COIL		
SP	EXTERNAL STATIC PRESSURE		
	FAN		
AB	FACE AND BYPASS		
B	FAN BOX		
CC	FORWARD CURVED		
CC	FREE AREA		
D	FIRE DAMPER (W/ ACCESS DOOR)		
TR	FILTER		
	COMBINATION AUTOMATIC FIRE/SMOKE		
	DAMPER WITH ACCESS DOOR		
E	GENERAL EXHAUST		
H	GRAVITY HOOD		
	HEATING COIL		
GGA	HIGH EFFICIENCY GAS ABSORBER AIR FILTER		
EPA	HIGH EFFICIENCY PARTICULATE AIR FILTER		

HVAC GENERAL NOTES:

HVAC GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL "M" SERIES DRAWINGS.

DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO INDICATE CAPACITY, SIZE, APPROXIMATE LOCATION AND GENERAL ARRANGEMENT. DETERMINE EXACT LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.

DRAWINGS MAY NOT BE FULLY AND CORRECTLY INTERPRETED WITHOUT REFERENCE TO LEGENDS, DETAILS, SCHEDULES AND SPECIFICATIONS. IT IS THE INTENT OF THE DRAWINGS TO SHOW THE INSTALLATION, AS DETAILLED BY THE SYMBOL ARRANGEMENT. ITEMS SHOWN ONCE ON THE FLOOR PLANS, ELEVATIONS, DETAILS, OF DIAGRAMS MAY NOT BE REPEATED IN FULL FOR OTHER TYPICAL INSTANCES.

REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

PROVIDE INFORMATION AND HARDWARE AS NECESSARY TO COORDINATE CONCRETE PADS AND STEEL PLATFORMS REQUIRED FOR MECHANICAL WORK.

COORDINATE ROOF AND WALL PENETRATIONS WITH WORK OF OTHER SECTIONS AND WITH FLASHING REQUIREMENTS. COORDINATE SLAB PENETRATIONS WITH WORK OF OTHER SECTIONS AND WITH EXISTING POST-TENSION CABLES.

INSTALL SENSORS (TEMPERATURE, THERMOSTATS, PALM PUSH BUTTONS, HORN & STROBE) AT LOCATIONS SHOWN ON PLANS OR AS DIRECTED BY ARCHITECT. MOUNTING HEIGHT AFF SHALL COMPLY WITH ADA AND SHALL BE MOUNTED LEVEL WITH ADJACENT SWITCHES (IE LIGHT SWITCHES).

COORDINATE WORK OF THIS SECTION WITH THAT OF OTHER SECTIONS AND WITH ALL TRADES INVOLVED. PROVIDE OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS.

ELEMENTS OF THE WORK SHALL BE INSTALLED IN A MANNER SUCH THAT AT SUBSTANTIAL COMPLETION THE FOLLOWING ITEMS, NEW OR EXISTING, SHALL BE FULLY AND REASONABLY ACCESSIBLE: HVAC CONTROL BOXES, FLOWING BOXES, VALVES (OF EVERY SHAPE, SORT AND FUNCTION), DDC CONTROL BOXES, ELECTRICAL PANELS, FILTERS, BELTS, WATER COLDS, DISCONNECT SWITCHES, AND MAINTENANCE ACCESS ELEMENTS INCLUDING PULL SPACE.

A. "FULLY AND REASONABLY ACCESSIBLE" SHALL BE DEFINED AS: NATIONAL ELECTRIC CODE REQUIRED CLEARANCE FOR POWERED EQUIPMENT AND CAPABLE OF BEING ACCESSED FOR SERVICE, REPAIR OR REPLACEMENT BY AN AVERAGE SIZE INDIVIDUAL (ON A LADDER IF NECESSARY) AND CAPABLE OF BEING SERVICED OR REMOVED WITHOUT REMOVING OR MODIFYING OR DISTORTING OTHER COMPONENTS OF THE WORK. THE DESIGN INTENT PROVIDES A MINIMUM 2'X2' ZONE FOR MAINTENANCE.

B. CONFLICT WITH MEETING THESE REQUIREMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE IN A TIMELY MANNER AND SHALL BE CORRECTED AT NO ADDITIONAL COST.

SUPPORT ALL EQUIPMENT, PIPING AND DUCTWORK FROM BUILDING STRUCTURE. PROVIDE VIBRATION ISOLATION FOR ROTATING EQUIPMENT. DUCTWORK AND PIPING IN ACCORDANCE WITH THE SPECIFICATIONS. PROVIDE TO A LIST OF ALL WEIGHTS AND METHODS OF SUPPORT FOR COORDINATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH NEC, AND DIVISION 26000 SPECIFICATIONS.

ALL MATERIALS AND EQUIPMENT SHALL BE NEW, UNLESS LISTED OTHERWISE.

SYSTEM SPECIFIC NOTES:

VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.

SHEETMETAL FITTINGS SHOWN ARE TO BE PROVIDED. NO SUBSTITUTES SHALL BE ALLOWED WITHOUT PRIOR CONSENT FROM ARCHITECT/ENGINEER.

REFER TO SPECIFICATIONS FOR DUCTWORK CONSTRUCTION CLASSES, SEAL, AND LEAKAGE CLASSES.

EXTERIOR LOUVERS ARE INDICATED FOR LOCATION ONLY.

ELBOWS IN DUCT SYSTEMS SHALL BE FULL RADIUS (CENTERLINE RADIUS = 1.5 DUCT WIDTH) WHERE SPACE PERMITS. WHERE LIMITED CLEARANCE OCCURS, PROVIDE SHORT RADIUS ELBOW WITH FULL LENGTH SPLITTER VANES PER SMACNA, MITERED (SQUARE) ELBOWS WITH TURNING VANES MAY NOT BE USED.

MANUAL DAMPERS ARE NOT SHOWN ON THE DRAWINGS IN ORDER FOR DRAWING CLARITY. PROVIDE MANUAL ADJUSTABLE DAMPERS FOR ALL SYSTEMS (WHICH REQUIRE SUPPLY, RETURN, AND EXHAUST DUCT TAKE OFF, AT EACH TAKE OFF TO REGISTERS, GRILLES, DIFFUSERS).

G SYSTEM SPECIFIC NOTES:

VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER CERTIFIED DRAWINGS. VERIFY AND PROVIDE FITTINGS TO TRANSITION TO FURNISHED EQUIPMENT CONNECTION SIZES. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.

PERFORM SPECIFIED TESTS BEFORE INSULATING PIPING.

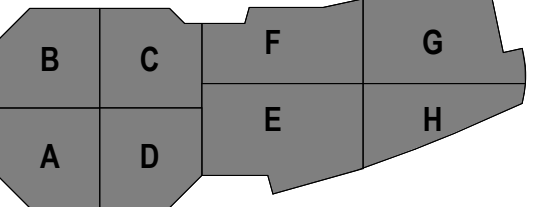
PROVIDE HANGERS, CLAMPS, OFFSETS, EXPANSION JOINTS, ANCHORS AND GUIDES TO PREVENT STRESS ON PIPING.

PROVIDE VALVES AT HIGH POINTS IN PIPING SYSTEMS AND DRAIN VALVES AT LOW POINTS.

ISOLATION VENTS IN PIPING SYSTEMS ARE NOT SHOWN ON THE PLANS (FOR CLARITY) BUT ARE REQUIRED AT ALL PIPE BRANCHES AND CONNECTIONS TO EQUIPMENT. REFER TO DETAIL SHEETS AND FLOW DIAGRAMS.

PITCH DRAINAGE (WATER) PIPING UPWARD IN DIRECTION OF FLOW.

REFER TO EQUIPMENT SCHEDULES FOR PIPE RUN-OUT SIZES TO INDIVIDUAL PIECES OF EQUIPMENT.

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

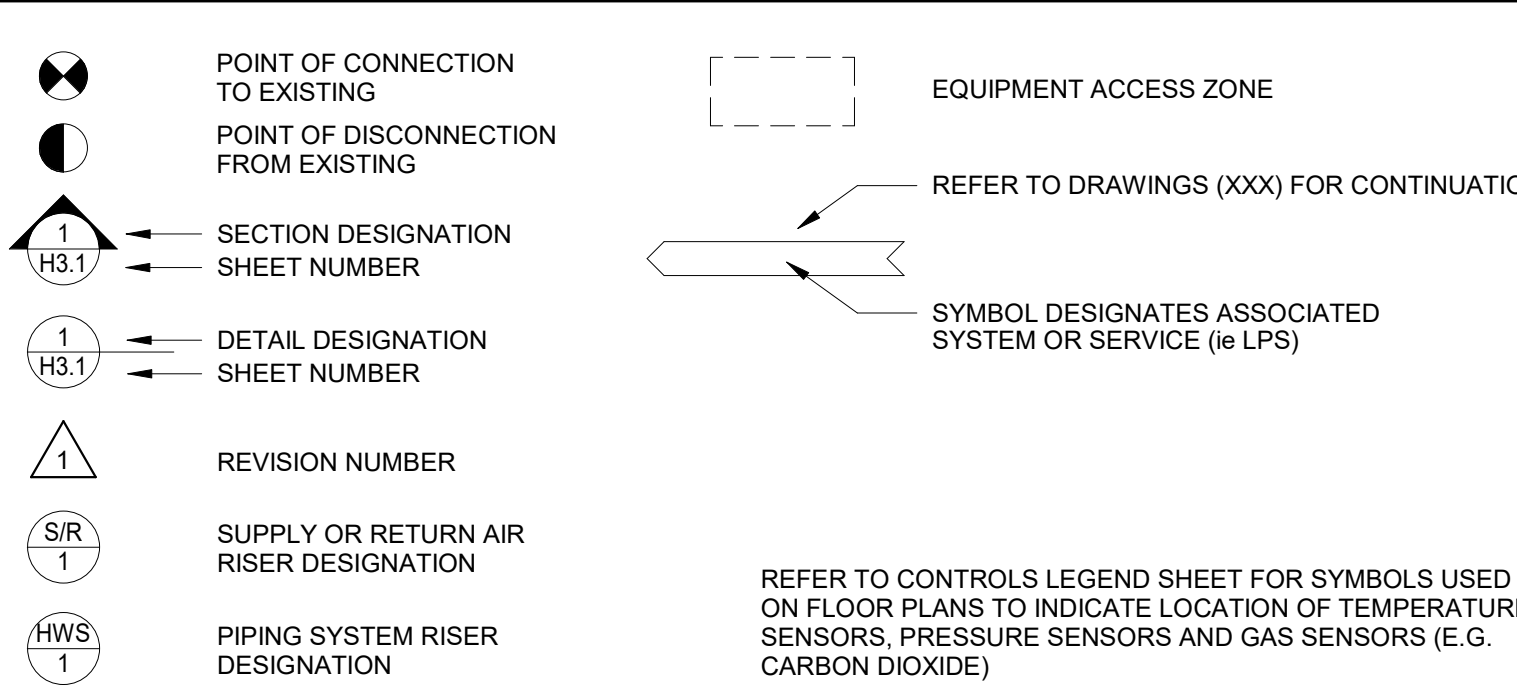
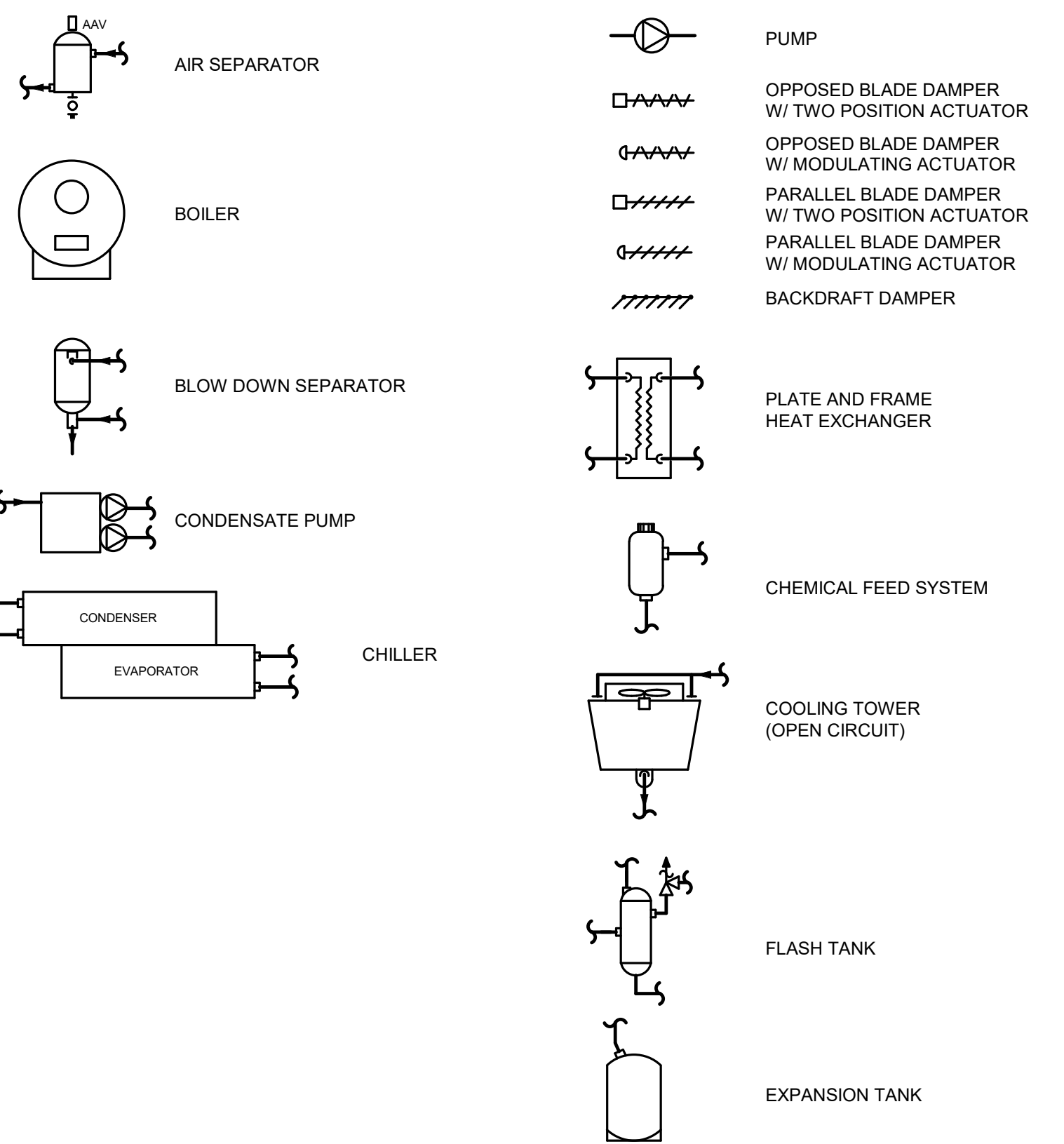
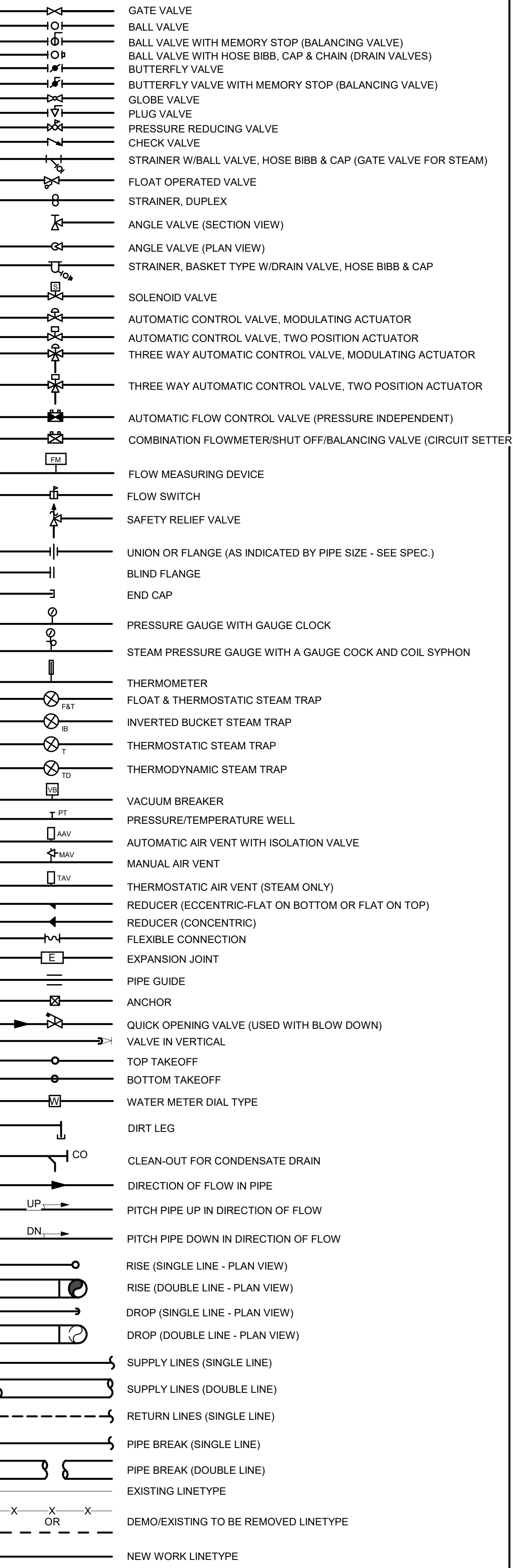
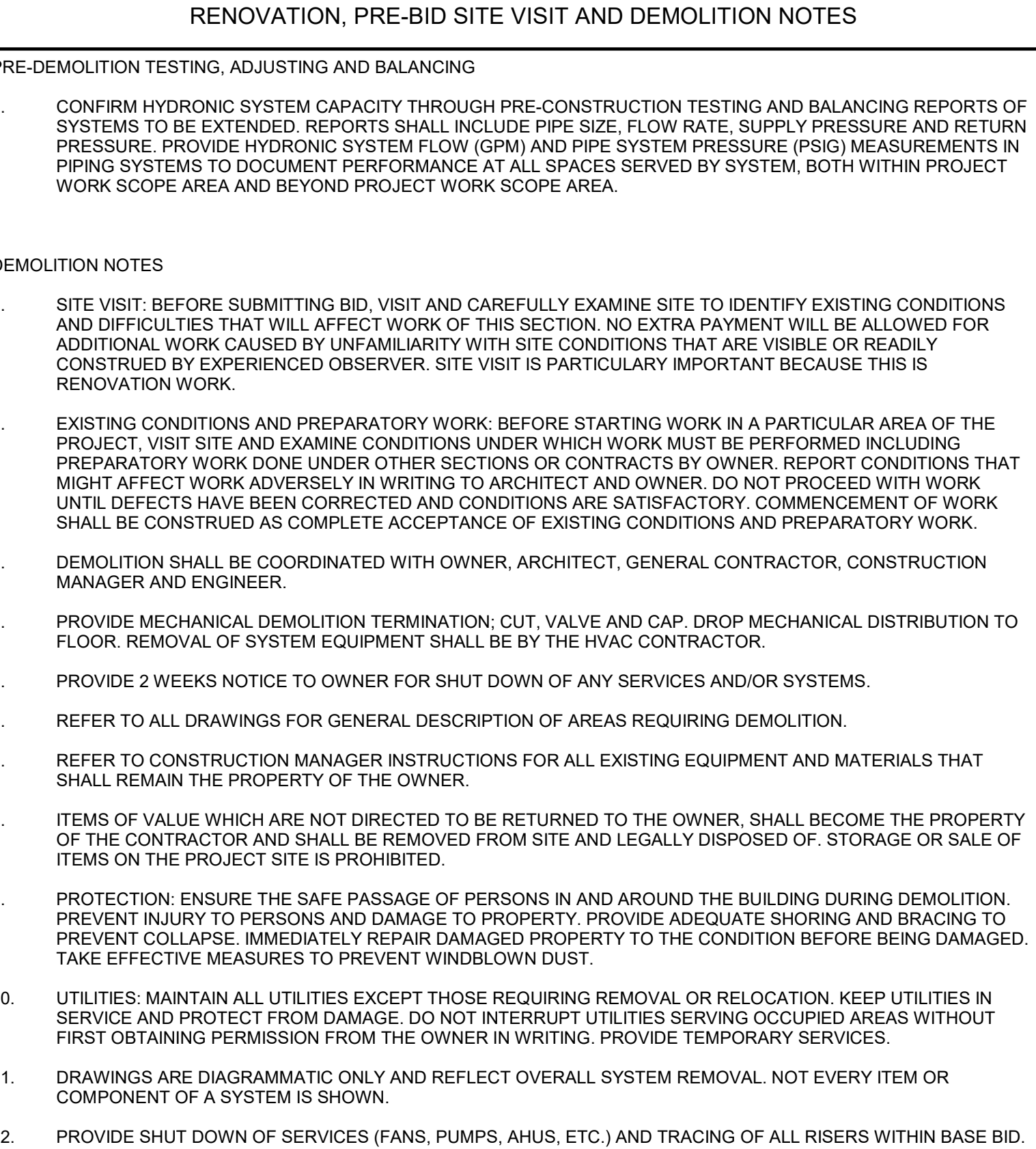
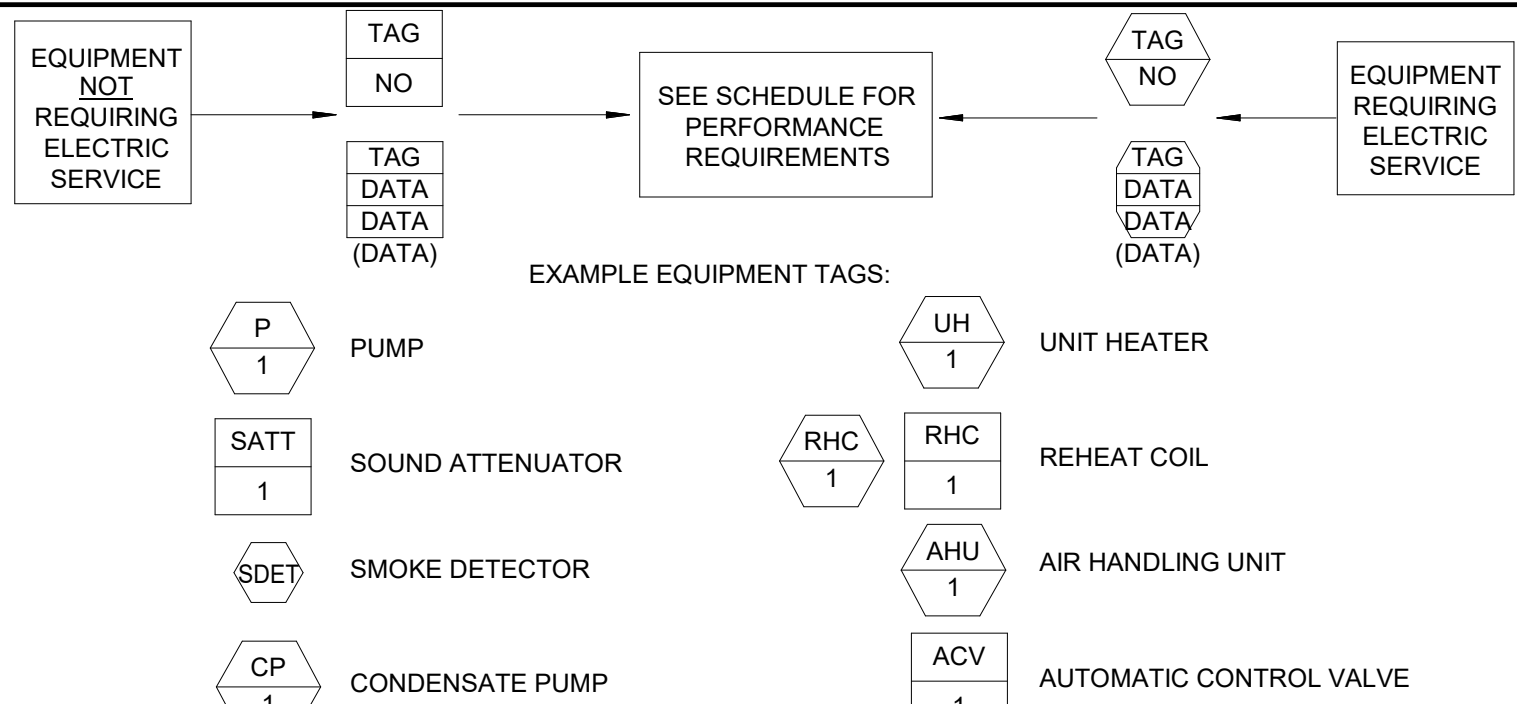
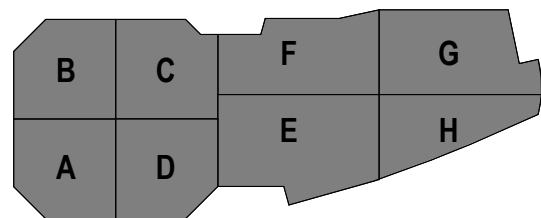
ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
31937.00	E1

HVAC LEGEND 1

SHEET NUMBER

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
31937.00	E1

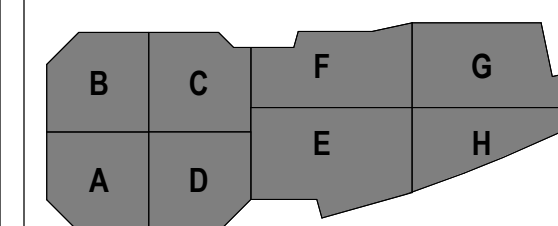
SHEET NAME

HVAC LEGEND 2

SHEET NUMBER

M-002

DUCTWORK			
SINGLE LINE		DOUBLE LINE	
	EXISTING DUCT LINETYPE		
	NEW DUCT LINETYPE		
	HORIZONTAL OFFSET SUPPLY/RETURN /EXHAUST		
	RISE OR DROP SUPPLY/RETURN/ EXHAUST		
	STANDARD RADIUS ELBOW (R = W)		
	BULLHEAD SPLIT SUPPLY		
	TAKEOFF TO DIFF/GRILLE W/BRANCH TAKE-OFF VOLUME DAMPER		
	HARD ELBOW		
	CEILING DUCT MTD DIFF/GRILLE W/BRANCH TAKE-OFF VOLUME DAMPER		
	ACOUSTICALLY LINED DUCT		
	EXISTING DUCT TO BE REMOVED		
	OPEN END DUCT W/W/D & 1/2" X 1/2" WMS		
	FLEXIBLE DUCT		
	VD MANUAL VOLUME DAMPER		
	FD SELF-CLOSING FIRE DAMPER W/ACCESS DOOR		
	ACD AUTOMATIC CONTROL DAMPER W/ACCESS DOOR		
	SD AUTOMATIC SMOKE DAMPER W/ACCESS DOOR		
	FSD COMBINATION SMOKE/FIRE DAMPER W/ACCESS DOOR		
	BDD BACKDRAFT DAMPER		
	90° TAKE-OFF W/BRANCH TAKE-OFF VOLUME DAMPER (VD IN LOW PRESSURE SYSTEMS ONLY)		
	BULLHEAD CONVERGE RETURN/EXHAUST W/BRANCH TAKE-OFF VOLUME DAMPER		
	SIDEWALL DUCT MTD REGISTER/GRILLE W/BRANCH TAKE-OFF VOLUME DAMPER		
	SUPPLY SIDEWALL LINEAR DIFFUSER (W/1" INTERNALLY LINED SM PLENUM) BRANCH CONN W/W/D FOR EVERY 4' OF LINEAR		
	SUPPLY CEILING LINEAR DIFFUSER (W/1" INTERNALLY LINED SM PLENUM) BRANCH CONN W/W/D FOR EVERY 4' OF LINEAR		
	RING DUCT		
	BOOT BY LD MFR		
	ROOF EXHAUST FAN SHOWN ON ROOF		
	ROOF EXHAUST FAN SHOWN ON FLOOR PLAN		
	RETURN OR EXHAUST AIR FLOW		
	SUPPLY AIR FLOW		

[illegible]

50 Foster Street
Worcester, MA 01608-1398

ISSUED NAME
ISSUE FOR BID

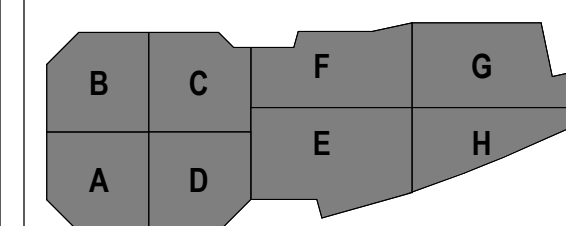
ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
31937.00	E1

SHEET NAME
HVAC LEGEND 3

SHEET NUMBER

M-003

[illegible]

PROJECT NAME
PERMANENT CHILLER

50 Foster Street
Worcester, MA 01608-1398

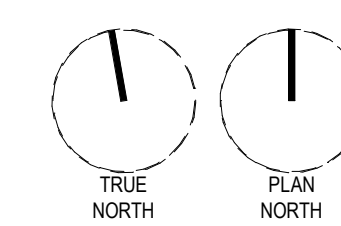
ISSUED NAME
ISSUE FOR BID

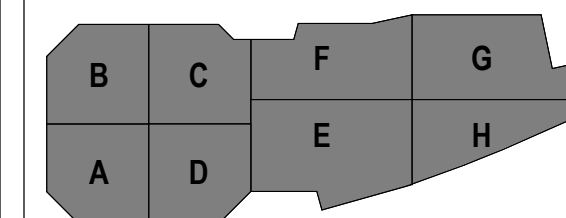
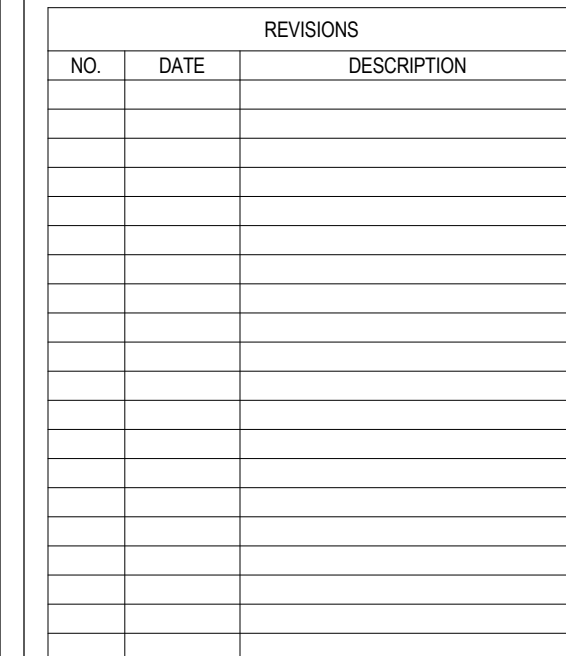
ISSUED DATE	ISSUED BY
11/19/25	POPULOUS
PROJECT NUMBER	PAPER SIZE
31937.00	E1

SHEET NAME
**HVAC - MAIN CONCOURSE
LEVEL 2**

SHEET NUMBER

M-202





50 Foster Street
Worcester, MA 01608-1398

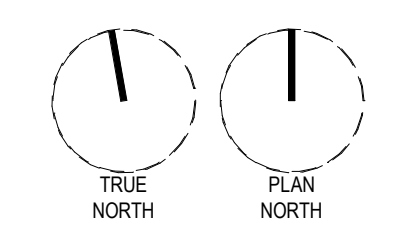
ISSUED DATE	ISSUED BY
11/19/25	POPULOUS

PROJECT NUMBER	PAPER SIZE
31937.00	E1

SHEET NAME
**HVAC - LEVEL 2
MEZZANINE**

SHEET NUMBER

M-203



Water Cooled Chiller Schedule																									
Unit No.	Type	Minimum Capacity (Tons)	Chilled Water				Condenser Water				Min. Cond. EWT (°F)	Refrig. Type	Capacity Control	Max. Size			Electric Service				Minimum Efficiency		Manufacturer Model Number (AS Standard)	Remarks	
			GPM	EWT (°F)	LWT (°F)	Max PD (FT)	GPM	EWT (°F)	LWT (°F)	Max PD (FT)				Max KW	L (FT)	W (FT)	H (FT)	V	PH	HZ	SCCR	Peak (KW/Ton)			IPLV/NPLV (KW/Ton)
CH-2	Centrifugal Chiller	500	966	54.4	42.0	12.0	1405	94.0	84.0	18.9	290.3		R513A	10-100%	15.25	6.0	6.0	460	3	60	100kA	0.5806	0.32/0.3414	CARRIER 19MV43	

ES:
 PROVIDE NEW INERTIA BASE AND SPRING ISOLATORS
 PROVIDE DEDICATED VFD PER PUMP
 PROVIDE NEW CONTROLS INTEGRATION WITH EXISTING CHILLER PLANT
 PROVIDE SHAFT GROUNDING RING

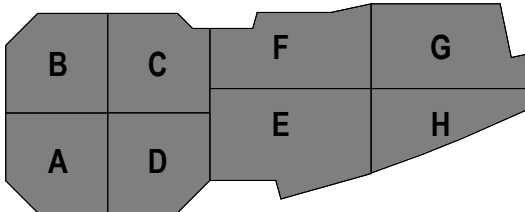
UNIT NO.	EQUIPMENT LOCATION	SERVICE	PUMP TYPE	PUMP DATA				FLUID DATA			ELECTRIC SERVICE							OPERATING WEIGHT	MANUFACTURER NUMBER (AS STANDARD)	REMARKS	
				FLOW (GPM)	HEAD PRESSURE (FT WC)	NPSHR (FT WC)	PUMP SPEED (RPM)	IMPELLER SIZE (IN)	FLUID TEMP (°F)	FLUID TYPE	% GLYCOL	MOTOR SPEED (RPM)	BHP	RATED HP	CONTROL TYPE	V	PH				HZ
P-3 & P-4	CHILLER PLANT MEZZ	CHILLED WATER	HORIZONTAL SPLIT-CASE PUMP	966	120	31.3	1767	12.125	54.4	WATER	N/A	1800	35.6	40	VFD	460	3	60	868	BELL & GOSSETT 4x6x12-e-HSC	

POPULOUS®
Architecture • Interior Design • Landscape Design
Brand Activation • Wayfinding • Product Design
Event • Urban Design • Populous Design Build

architect
Populous
294 Washington Street, Suite 705
Boston, MA 02108
857.415.3642

structural engineer
Thornton Tomasetti
101 Arch Street, Suite 1600
Boston, MA 02110
617.250.4100

MEP/PE engineer
Vanderweil
274 Summer Street
Boston, MA 02210
617.423.7423

[illegible]

50 Foster Street
Worcester, MA 01608-1398

ISSUE FOR BID

ISSUED DATE	ISSUED BY
11/19/25	POPULOUS
PROJECT NUMBER	PAPER SIZE
31937.00	E1

HVAC SCHEDULE

SHEET NUMBER

M-601



- ## MECHANICAL COOLING CYCLE

- THE NUMBER OF PRIMARY PUMPS & CHILLERS ON AT ANY TIME SHALL BE DETERMINED BY A COMBINATION OF BOTH FLOW AND TEMPERATURE AS FOLLOWS:
- a. NORMALLY A MINIMUM OF ONE CHILLER (LEAD) SHALL BE ENERGIZED AT ALL TIMES WHEN THERE IS A NEED FOR CHILLED WATER. START SEQUENCE MAY BE DISABLED BY THE OPERATOR THROUGH THE CHILLER DDCP.
 - b. AFTER THE LEAD CHILLER HAS BEEN ON FOR 60 MINUTES, IF THE TEMPERATURE AT CHILLED WATER SUPPLY TEMPERATURE TRANSMITTER RISES 2 °F OR MORE (ADJ.) ABOVE PRIMARY CHILLED WATER TEMPERATURE AT TRANSMITTER FOR 10 CONSECUTIVE MINUTES, THE LAG CHILLER START SEQUENCE SHALL BE INITIATED - THE LAG CHILLER'S FLOW CONTROL VALVES SHALL OPEN THE LAG PRIMARY CHILLED WATER PUMP SHALL START AND THE LAG CHILLER SHALL BE STARTED.
 - d. WITH TWO CHILLERS ON FOR 30 MINUTES, AND THE LEAD CHILLED WATER FLOW, AS MEASURED BY FLOW TRANSMITTER IS 50% LESS THAN THE PRIMARY CHILLED WATER FLOW AS MEASURED BY THE TOTAL OF THE EQUIVALENT FLOW THROUGH THE CHILLERS AS DETERMINED BY CHARACTERIZING THE DIFFERENTIAL PRESSURE ACROSS THE CHILLER AS EQUIVALENT TO FLOW ACROSS A FIXED ORIFICE, THE FOLLOWING SHALL OCCUR:
 - (1) AFTER 15 CONSECUTIVE MINUTES, THE CHILLER DDCP SHALL STOP THE LAG CHILLER, CLOSE THE CHILLER'S FLOW CONTROL ISOLATION VALVES AND 30 SECONDS AFTER EACH VALVES "OPEN" END SWITCH INDICATES THAT ITS RESPECTIVE VALVE HAS BEGUN TO CLOSE, STOP THE ASSOCIATED PUMP, THE CHILLER DDCP SHALL DETERMINE TOTAL FLOW THROUGH THE CHILLERS AND SHALL CONTINUOUSLY CALIBRATE READINGS BY COMPARING IT AGAINST THE TOTAL FLOW OF THE OPERATING PRIMARY CHILLED WATER PUMP.
 - e. IF A CHILLER FAILS, IT SHALL BE LOCKED OUT. ITS ISOLATION VALVES SHALL BE CLOSED & AN AUDIBLE AND VISUAL ALARM SHALL BE GENERATED AT THE DDCP. REMAINING CHILLER SHALL IMMEDIATELY BE STARTED. THE CHILLER DDCP SHALL NOT ATTEMPT TO START THE FAILED CHILLER UNTIL THE LOCKOUT IS MANUALLY RESET.

VARIABLE FLOW CHILLED WATER PUMP (CHWP-3 & 4) CONTROL

- d. IF, WITH THE LEAD AND LAG PUMPS BOTH ON FOR 30 MINUTES, THE CHILLED WATER FLOW AT FLOW TRANSMITTER GOES BELOW 91% SCHEDULED PUMP FLOW FOR 10 CONSECUTIVE MINUTES, THE LAG PUMP SHALL BE STOPPED AND THE VFD OF THE LEAD PUMP SHALL BE MODULATED TO MAINTAIN THE SETPOINT AT THE END OF MAIN PRESSURE DIFFERENTIAL SENSOR
- e. IF, WITH THE LEAD PUMP ON, THE FLOW DROPS TO 35% (ADJUSTABLE), THE MINIMUM SPEED FLOW OF THE PUMP AS DETERMINED BY THE MANUFACTURER, THE LOW FLOW BYPASS VALVE SHALL BE MODULATED OPEN TO MAINTAIN THE REQUIRED MINIMUM FLOW OF THE PUMP. (ATC CONTRACTOR SHALL REVIEW OPERATION OF THE EXISTING TO REMAIN BYPASS VALVE DETERMINE THIS VALUE IN THE FIELD)
- f. THE DDCP SHALL ROTATE THE LEAD/LAG POSITIONS TO EQUALIZE RUN TIME.

EQUIPMENT FAILURE MODES

1. FAILURE OF A PRIMARY CHILLED WATER PUMP
 - a. IF ANY PUMP FAILS, AN ALARM SHALL BE SIGNALLED AT THE MANUFACTURER'S DDCP.
 - b. THE CHILLER CONTROL PANEL SHALL MONITOR THE HOA SWITCHES. IF A SWITCH IS NOT IN AUTO, THE CHILLER CONTROL PANEL SHALL NOT ATTEMPT TO START THAT PUMP UNTIL ITS SWITCH IS PUT BACK INTO AUTO.
2. FAILURE OF CHILLER
 - a. IF A CHILLER OR CHILLER ISOLATION VALVE FAILS, THE CHILLER CONTROL PANEL SHALL ALARM AT ITS DDCP AND SHUTDOWN THE CHILLER AND ASSOCIATED PUMPS.

OPERATION ON STANDBY (GENERATOR) POWER

1. ALL CONTROL PANELS AND CONTROLS SHALL BE ON UPS POWER. THE CONTROL SYSTEM SHALL BE INTERFACED WITH THE ELECTRICAL SYSTEM TO SENSE A NORMAL POWER FAILURE.
2. UPON A LOSS OF NORMAL POWER, ALL CHILLER PLANT DEVICES SHALL RETURN TO THEIR FAULTSAFE POSITIONS. ONCE STANDBY (GENERATOR) POWER IS ESTABLISHED, THE DDCFP SHALL POWER AN AUTOMATIC RESTART.
3. UPON RESTORATION OF NORMAL POWER AN AUTOMATIC RESTART OF ALL SYSTEMS SHALL TAKE PLACE.

HISTORIES/TRENDING & REPORTS

1. THE CHILLER CONTROL PANEL SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPORTS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH DEVICE SHOWN. INCLUDE GRAPHING CAPABILITY IN REPORT GENERATING SOFTWARE. DATA RECORDING SHALL BE CAPABLE OF STORING HOURLY READINGS, DAILY AVERAGE READING, WEEKLY AVERAGE READING AND MONTHLY AVERAGE READING. SOFTWARE SHALL ALSO BE CAPABLE OF REPORTING DAILY AND MONTHLY HIGH/LOW PEAK READINGS.

