UNIVERSITY OF COLORADO DENVER
LAWRENCE STREET CENTER - BOILER RE-PIPING

1380 LAWRENCE ST.
Denver, Colorado 80204

University of Colorado Denver

CU DENVER PROJECT NO. 22-162936
RE-ISSUED BID DOCUMENTS - JULY 13, 2023

PROJECT DESCRIPTION

THE SCOPE OF WORK INCLUDES REPLACING AUTOMATIC BOILER ISOLATION VALVES WITH BOILER CIRCULATORS, WHICH WILL PROVIDE CONSTANT FLOW THROUGH EACH ACTIVE BOILER.

THE EXISTING PRIMARY-ONLY HEATING WATER DISTRIBUTION SYSTEM WILL ALSO BE RECONFIGURED TO PROVIDE PRIMARY-SECONDARY DISTRIBUTION. PRIMARY FLOW WILL BE PROVIDED BY THE BOILER CIRCULATORS. SECONDARY FLOW (BUILDING DISTRIBUTION) WILL CONTINUE TO BE PROVIDED BY EXISTING ZONE PUMPS.

ALTERNATE #1 - REPLACE PANEL DP15: REPLACE AGING 480Y/277V POWER DISTRIBUTION PANEL AND PROVIDE 208Y/120V SUBPANEL WITH TRANSFORMER.

ALTERNATE #2 - REPLACE HWP STARTERS: REPLACE (7) AGING 480V/3PH PUMP STARTERS.

ALTERNATE #3 - REPLACE SPECIFIED ALUMINUM CONDUCTORS WITH COPPER.

BUILDING CODE REFERENCES

IBC	INTERNATIONAL BUILDING CODE (2021 EDITION)
IFC	INTERNATIONAL FIRE CODE (2021 EDITION)
IMC	INTERNATIONAL MECHANICAL CODE (2021 EDITION)
IPC	INTERNATIONAL PLUMBING CODE (2018 EDITION)
IFGC	INTERNATIONAL FUEL GAS CODE (2018 EDITION)
NEC	NATIONAL ELECTRIC CODE (2020 EDITION)
IECC	INTERNATIONAL ENERGY CONSERVATION CODE (2021 EDITION)

PROJECT TEAM

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DRAWING INDEX

VICINITY MAP

SCALE: NOT TO SCALE

NORTH

NOTE:
EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:
THIS WORK SHOWN AS EXISTING CONDITIONS WAS TAKEN FROM OWNER FURNISHED DRAWINGS BY SHAFFER BAUCOM ENGINEERING & CONSULTING, (SBEC) IS NOT RESPONSIBLE FOR THE ACCURACY OF ANY INFORMATION OR THE ADEQUACY, SAFETY AND CONFORMANCE TO CURRENT PREVAILING CODES OF ANY WORK SHOWN AS EXISTING ON THE DOCUMENTS.

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LAWRENCE STREET CENTER
1380 LAWRENCE STREET, DENVER, CO 80204
PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

SBEC Project #:	220016
Scale:	AS SHOWN
Drawn By:	TMH/DRP
Designed By:	MG
Checked By:	GS

Issued For:	Date:
RE-ISSUED BID DOCS.	07/13/2023

COVER SHEET

G-001

SINGLE/DOUBLE LINE DUCT LEGEND

(Not all symbols listed below are used on these drawings)

SINGLE LINE	DOUBLE LINE	SINGLE LINE	DOUBLE LINE
45° TEE (ROUND)		SEE DUCT TAKE-OFF DETAIL — 90° TEE (RECTANGULAR)	
45° TEE (RECTANGULAR)		CONICAL TEE — 90° TEE (ROUND)	
DUCT SPLIT		90° RADIUS ELB	
45° ELB		VOLUME DAMPER — SPIN IN	
MANUAL VOLUME DAMPER		RIGID — FLEX — FLEX DUCT	
REDUCER		90° ELB	

SINGLE/DOUBLE LINE PIPING LEGEND

(Not all symbols listed below are used on these drawings)

SINGLE LINE	DOUBLE LINE	SINGLE LINE	DOUBLE LINE
BALL VALVE		CHECK VALVE	
BUTTERFLY VALVE		PRESSURE GAUGE	
GLOBE VALVE		STRAINER	
GATE VALVE		UNION/FLANGE	
PRESSURE REDUCING VALVE		FLEXIBLE CONNECTION	
2-WAY CONTROL VALVE		IN-LINE PUMP	
FLOW METER		BFP — PRESSURE DIFFERENTIAL BACKFLOW PREVENTER	

HVAC LEGEND

(Not all symbols listed below are used on these drawings)

ABBR.	SYMBOL	DESCRIPTION	ABBR.	SYMBOL	DESCRIPTION
LPS	LPS	LOW PRESSURE STEAM SUPPLY PIPING	SBFX-X	SBF4-1	SUPPLY BOOSTER FAN ON 4TH FLOOR #1
LPR	LPR	LOW PRESSURE CONDENSATE RETURN PIPING	XFY	26F12	26" x 12" SPIRAL FLAT OVAL DUCT
MPS	MPS	MEDIUM PRESSURE STEAM SUPPLY PIPING	DAD		DUCT ACCESS DOOR
MPR	MPR	MEDIUM PRESSURE CONDENSATE RETURN PIPING	EOMD	EOMD	END OF MAIN DRIP
HPS	HPS	HIGH PRESSURE STEAM SUPPLY PIPING	FS		FLOW SWITCH
HPR	HPR	HIGH PRESSURE CONDENSATE RETURN PIPING			SUPPLY DUCT UP / SUPPLY DUCT DOWN
PD	PD	STEAM CONDENSATE PUMP DISCHARGE PIPING			RETURN DUCT UP RETURN DUCT DOWN
HS	HS	HEATING WATER SUPPLY PIPING	A.L.		ACOUSTICALLY LINED DUCTWORK
HR	HR	HEATING WATER RETURN PIPING	BDD		BACKDRAFT DAMPER
CH	CH	CHILLED WATER SUPPLY PIPING			FLEXIBLE DUCT CONNECTION
CHR	CHR	CHILLED WATER RETURN PIPING			TURNING VANES IN DUCT ELBOW
CS	CS	CONDENSER WATER SUPPLY PIPING			SPIN-IN FITTING W/ MANUAL VOLUME DAMPER
CR	CR	CONDENSER WATER RETURN PIPING			ROUND FLEXIBLE DUCTWORK
CN	CN	COOLING COIL DRAIN PIPING	MVD		MANUAL VOLUME DAMPER
RL	RL	REFRIGERANT LIQUID PIPING	DFD		DUCT FIRE DAMPER
RS	RS	REFRIGERANT SUCTION PIPING	FSD		COMBINATION DUCT SMOKE & FIRE DAMPER
RH	RH	REFRIGERANT HOT-GAS BYPASS PIPING	SD		DUCT SMOKE DAMPER
GHS	GHS	GLYCOL HEATING WATER SUPPLY PIPING	O.B.D.		OPPOSED BLADE DAMPER
GHR	GHR	GLYCOL HEATING WATER RETURN PIPING	P.B.D.		PARALLEL BLADE DAMPER
RHS	RHS	RADIANT HEATING WATER SUPPLY PIPING	TCD		TEMPERATURE CONTROL DAMPER
RHR	RHR	RADIANT HEATING WATER RETURN PIPING	TCDAD		TEMPERATURE CONTROL OUTSIDE AIR DAMPER
CTFS	CTFS	COOLING TOWER FILTER SUPPLY PIPING	TCRAD		TEMPERATURE CONTROL RETURN AIR DAMPER
CTFR	CTFR	COOLING TOWER FILTER RETURN PIPING	TCEAD		TEMPERATURE CONTROL EXHAUST AIR DAMPER
PCS	PCS	PROCESS COOLING WATER SUPPLY PIPING	DSD		DUCT SMOKE DETECTOR
PCR	PCR	PROCESS COOLING WATER RETURN PIPING	EP		ELECTRIC-PNEUMATIC CONTROL SWITCH
FOS	FOS	FUEL OIL SUPPLY PIPING	PE		PNEUMATIC-ELECTRIC CONTROL SWITCH
FOR	FOR	FUEL OIL RETURN PIPING		T	WALL MOUNTED THERMOSTAT
FOV	FOV	FUEL OIL VENT PIPING			UNIT MOUNTED THERMOSTAT
ICW	ICW	INDUSTRIAL COLD WATER PIPING		H	HUMIDISTAT
TT	TT	THERMOSTATIC STEAM TRAP	CO	CO	CARBON MONOXIDE DETECTOR
F&T	F&T	FLOAT AND THERMOSTATIC STEAM TRAP	CO2	CO2	CARBON DIOXIDE DETECTOR
IBT	IBT	INVERTED BUCKET STEAM TRAP		PS	PRESSURE SWITCH
TCV		(2 OR 3-WAY) TEMPERATURE CONTROL VALVE		U.C.	UNDERCUT DOOR
BFV		2-POSITION BUTTERFLY CONTROL VALVE			LOUVER
RSV		REFRIGERANT SERVICE VALVE	SP IN WC		STATIC PRESSURE IN INCHES WATER COLUMN
DPS	DPS	DIFFERENTIAL PRESSURE SWITCH	MAV		MANUAL AIR VENT
DPT	DPT	DIFFERENTIAL PRESSURE TRANSMITTER	AAV		AUTOMATIC AIR VENT
	M	PNEUMATICALLY CONTROLLED ACTUATOR			REFRIGERANT FILTER DRIER
		DIFFERENTIAL PRESSURE GAUGE			REFRIGERANT EXPANSION VALVE
	SO	SCHEDULE OVERRIDE SWITCH	(+)	(+)	SINGLE POSITIVE ROOM PRESSURE *
	MS	MOTOR STARTER	(+ +)	(+ +)	DOUBLE POSITIVE ROOM PRESSURE *
			(-)	(-)	SINGLE NEGATIVE ROOM PRESSURE *
			(- -)	(- -)	DOUBLE NEGATIVE ROOM PRESSURE *
	M	MOTORIZED ACTUATOR	(0)	(0)	NEUTRAL PRESSURE *
	TT	TEMPERATURE TRANSMITTER	SFP-X	SFP-1	SUPPLY FAN IN PENTHOUSE #1
		ROOM DIFFERENTIAL PRESSURE CONTROLLER			DESIGNATES BUILDING LEVEL (FLOOR)
GX	GX	GENERAL EXHAUST VAV DAMPER		WIDTH/DEPTH	RECTANGULAR DUCT DIMENSIONS
HZ	HZ	FUME EXHAUST VAV DAMPER		WIDTH F DEPTH	FLAT OVAL DUCT DIMENSIONS
TB-XXX	TB-301	TERMINAL BOX ON 3RD FLOOR #1 BOX			* BASED ON SPECIFIED REFERENCE

GENERAL HVAC PIPING NOTES

1. INSTALL ALL (N) PIPING, EQUIPMENT AND ACCESSORIES, TO MAINTAIN AND ALLOW FOR ACCESS TO SERVICE ALL EQUIPMENT AND SHUT-OFF VALVES.
2. PROVIDE ADDITIONAL PIPING FITTINGS AND OFFSETS TO MAINTAIN MAXIMUM HEADROOM AND CEILING CLEARANCE.
3. NO FABRICATION OR INSTALLATION OF HYDRONIC PIPING SYSTEMS SHALL BEGIN UNTIL THE CONTRACTOR-SUBMITTED SHOP DRAWINGS ARE REVIEWED AND ACCEPTED BY THE ARCHITECT/ ENGINEER AND OWNER.
4. INSULATE ALL (E) PIPING WHICH HAS UN-INSULATED SURFACES FROM DEMOLITION OR (N) TO (E) CONNECTIONS.
5. CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL PIPE PENETRATIONS AND POST INSTALLED ANCHORS WITH (E) STRUCTURAL SYSTEM. DO NOT DAMAGE (E) STRUCTURAL REINFORCING DURING INSTALLATION. COORDINATE WITH STRUCTURAL ENGINEER FOR ALL PENETRATIONS.
6. COORDINATE REPLACEMENT/REPAIR OF CEILING AND WALLS WITH GENERAL CONTRACTOR. MATCH EXISTING BUILDING STANDARDS.
7. CONTRACTOR SHALL COORDINATE WITH OWNER FOR ALL UTILITY OUTAGES AND PROVIDE ANY TEMPORARY FACILITIES REQUESTED BY OWNER TO MAINTAIN OPERATION OF CRITICAL SPACES AS IDENTIFIED BY OWNER. EXTREME CARE SHALL BE EXERCISED BY CONTRACTOR FOR ALL WORK IN AND SURROUNDING AREAS OF CRITICAL SPACES IDENTIFIED BY OWNER. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO EQUIPMENT, ETC. AS A RESULT OF CONSTRUCTION ACTIVITIES.
8. DRAWINGS ARE DIAGRAMMATIC IN CHARACTER AND DO NOT NECESSARILY INDICATE EVERY REQUIRED PIPE OFFSET, TRANSITION, ETC. ITEMS NOT SPECIFICALLY MENTIONED IN THE SPECIFICATION OR NOTED ON THE DRAWINGS, BUT WHICH ARE NECESSARY TO MAKE A COMPLETE WORKING INSTALLATION, SHALL BE INCLUDED.
9. DRAWINGS SHALL NOT BE SCALED FOR ROUGH-IN MEASUREMENTS OR USED AS SHOP DRAWINGS. WHERE DRAWINGS ARE REQUIRED FOR THESE PURPOSES OR HAVE TO BE MADE FROM FIELD MEASUREMENTS, THE CONTRACTOR SHALL TAKE THE NECESSARY MEASUREMENTS AND PREPARE THE DRAWINGS.
10. CONTRACTOR IS RESPONSIBLE FOR DRAINING THE HEATING WATER SYSTEM TO THE EXTENT NECESSARY TO COMPLETE THE SCOPE OF WORK. HEATING WATER SYSTEM SHALL BE FILLED, FLUSHED AND ALL AIR VENTED UPON RETURNING THE SYSTEM TO SERVICE.

GENERAL DEMOLITION NOTES

1. TAG AND GIVE OWNER FIRST RIGHT OF REFUSAL FOR ALL (D) EQUIPMENT, VALVES, AND CONTROLS IN GOOD WORKING CONDITION OR AS OTHERWISE INSTRUCTED BY THE OWNER. ALL ITEMS TAGGED BY OWNER SHALL BE CAREFULLY REMOVED, PROTECTED FROM DAMAGE AND STORED AS DIRECTED. ALL ITEMS NOT RE-USED OR WANTED BY THE OWNER SHALL BE REMOVED FROM THE PREMISES.
2. RETAIN AND PROTECT EXISTING EQUIPMENT TO BE DEMOLISHED UNTIL RECEIPT OF REPLACEMENT EQUIPMENT, TYP. CONTRACTOR SHALL COORDINATE AND BE RESPONSIBLE FOR PROTECTION AND STORAGE OF EQUIPMENT.
3. REPORT ANY (E) DAMAGED EQUIPMENT AND/OR DEVICES. REPORT ANY (E) TO REMAIN PIPING THAT IS LEAKING TO THE ARCHITECT/ENGINEER AND OWNER IN WRITING PRIOR TO STARTING ANY WORK. REPAIR/REPLACE DAMAGED EQUIPMENT AND/OR DEVICES AND ANY LEAKING PIPING AS DIRECTED.
4. COORDINATE EXTENT OF DEMOLITION WITH NEW WORK. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES PRIOR TO DEMOLITION.
5. DEMOLITION OF MECHANICAL PIPING OR DEVICES MEANS TO REMOVE IN ITS ENTIRETY. REMOVE ALL ABANDONED PIPING, HANGERS, CONTROLS, ACCESSORIES, ETC. ASSOCIATED WITH (E) MECHANICAL SYSTEMS OR NOT REQUIRED FOR (N) MECHANICAL SYSTEMS. COORDINATE WITH E.C. FOR DEMOLITION OF POWER TO MECHANICAL EQUIPMENT AS REQUIRED. REMOVE EXISTING BRANCH PIPING/DUCTWORK BACK TO NEAREST MAIN AND CAPPED.
6. ALL INFORMATION SHOWN ON THESE DRAWINGS INCLUDING LOCATIONS AND SIZES ARE BASED ON THE BEST INFORMATION AVAILABLE. INFORMATION SHOWN IS TO INDICATE THE INTENT OF THE MECHANICAL SYSTEM WORK BUT MAY NOT REFLECT THE EXACT ROUTING AND LOCATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY EXISTING EQUIPMENT, PIPING, DUCTWORK, STRUCTURE, ELECTRICAL, LIGHTING AND ARCHITECTURAL INFLUENCES PRIOR TO INSTALLATION OF THE NEW WORK TO AVOID ANY CONFLICTS WITH SYSTEMS REQUIRING MODIFICATIONS. NOTIFY ARCHITECT/ENGINEER OF ANY CONFLICTS PRIOR TO PERFORMING WORK.
7. IF SUSPECTED HAZARDOUS MATERIALS ARE ENCOUNTERED, DO NOT DISTURB; IMMEDIATELY NOTIFY OWNER AND ARCHITECT. HAZARDOUS MATERIALS SHALL BE REMOVED BY OWNER UNDER A SEPARATE CONTRACT.
8. ALL EXISTING EQUIPMENT AND DEVICES TO REMAIN UNLESS NOTED OTHERWISE.

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	GC	GENERAL CONTRACTOR	(R)	RELOCATED
AFG	ABOVE FINISHED GRADE	IE	INVERT ELEVATION	RA	RETURN AIR
AVTR	ACID RESISTANT VENT THRU ROOF	KEC	KITCHEN EQUIPMENT CONTRACTOR	RIH	RADIOISOTOPE FUME HOOD
BOD	BOTTOM OF DUCT	KW	KILOWATTS	(RR)	REMOVE & RELOCATE
BOP	BOTTOM OF PIPE	MC	MECHANICAL CONTRACTOR	SA	SUPPLY AIR
BSC	BIOSAFETY CABINET	MH	MANHOLE	SS	STAINLESS STEEL
CB	CATCH BASIN	(N)	NEW	TCC	TEMPERATURE CONTROLS CONTRACTOR
CFH	CHEMICAL FUME HOOD	NC	NORMALLY CLOSED	(TYP.)	TYPICAL
CI	CAST IRON	NIC	NOT IN CONTRACT	UF	UNDER FLOOR
(D)	DEMOLISH & REMOVE	NO	NORMALLY OPEN	UG	UNDER GROUND
DAD	DUCT ACCESS DOOR	NTS	NOT TO SCALE	V	VOLTS
(E)	EXISTING	OA	OUTSIDE AIR	VCP	VITRIFIED CLAY PIPE
EA	EXHAUST AIR	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED	VFD	VARIABLE FREQUENCY DRIVE
EC	ELECTRICAL CONTRACTOR	PC	PLUMBING CONTRACTOR	VTR	VENT THRU ROOF
(F)	FUTURE	PVC	POLYVINYL CHLORIDE	WAD	WALL ACCESS DOOR

GENERAL LEGEND

(Not all symbols listed below are used on these drawings)

ABBR.	SYMBOL	DESCRIPTION	ABBR.	SYMBOL	DESCRIPTION
		CAP END OF PIPE	EJ		EXPANSION JOINT
	XX	SLOPED PIPE IN DIRECTION OF ARROW	BJ		BALL JOINT EXPANSION COMPENSATOR
		PIPE ANCHOR			SOLENOID VALVE
		PIPE ALIGNMENT GUIDE			HOSE END DRAIN VALVE
		UNION OR FLANGE	P/T	P/T	PRESSURE/TEMPERATURE TAP
		CONCENTRIC PIPE REDUCER			STRAINER
		ECCENTRIC PIPE REDUCER			STRAINER W/ BLOWDOWN VALVE
PRV		PRESSURE REDUCING VALVE			FLEXIBLE PIPE CONNECTOR
PTRV		PRESSURE AND/OR TEMP. RELIEF VALVE			THERMOMETER
BC		BALANCING VALVE			CEILING ACCESS PANEL
GV		GATE VALVE			PUMP
GLV		GLOBE VALVE			PRESSURE GAUGE
BFV		BUTTERFLY VALVE	TB		THRUST BLOCK
BV		BALL VALVE			DIRECTION OF FLOW IN PIPE
CV		CHECK VALVE			DIAMETER
FM		FLOW METER			POINT OF CONNECTION, NEW TO EXISTING
CBV		CALIBRATED BALANCE VALVE			(E) MECHANICAL TO BE REMOVED
		PIPE UP AND PIPE DN.			VALVE IN RISER (UP/DN.)
		BRANCH TEE TOP TAKE-OFF			BRANCH TEE BOTTOM TAKE-OFF

REFERENCE SYMBOLS

(Not all symbols listed below are used on these drawings)

1	KEY NOTE DESIGNATION
1	REVISION TAG DESIGNATION
HWP-1	ELECTRICALLY POWERED MECHANICAL EQUIPMENT DESIGNATION
XX-#	MECHANICAL EQUIPMENT DESIGNATION

A / M-X — RISER DIAGRAM NUMBER; SHEET RISER IS DRAWN ON

B / M6.4 | M6.6 — SECTION DESIGNATION; SECTION DRAWN ON THIS SHEET; SECTION CUT ON THIS SHEET

SUPPLEMENTARY SYMBOLS

(Not all symbols listed below are used on these drawings)

	EXISTING CONDITION LINEWEIGHT
	NEW WORK LINEWEIGHT

GENERAL BALANCING NOTES

1. PERFORM A PRE-CONSTRUCTION INSPECTION OF EXISTING HYDRONIC EQUIPMENT THAT IS TO REMAIN AND BE REUSED. PERFORM TESTING AND BALANCING OF EXISTING SYSTEMS TO THE EXTENT THAT EXISTING SYSTEMS ARE AFFECTED BY THE RENOVATION WORK. MEASURE AND RECORD THE OPERATING SPEED, OPERATING AMPERAGE, VERIFY IMPELLER SIZE, FLOW RATE, AND SYSTEM PRESSURE, ETC. OF EACH PUMP. MEASURE AND RECORD THE WATER FLOW RATES, AND PRESSURE OF EACH PIECE OF EQUIPMENT IDENTIFIED IN THE PLANS. REFER TO SPECIFICATION SECTION 230593 FOR ADDITIONAL INFORMATION.

MECHANICAL DRAWING INDEX

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MECHANICAL LEGENDS AND GENERAL NOTES

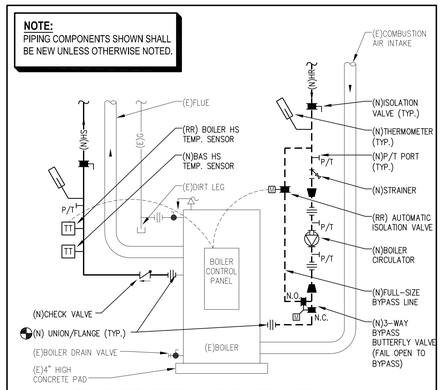
M-001

MECHANICAL EQUIPMENT COORDINATION SCHEDULE

	120V (115V)-SINGLE PHASE	208V (200V)-SINGLE PHASE	208V (200V)-THREE PHASE, THREE WIRE	208V (200V)-THREE PHASE, FOUR WIRE	240V (230V)-SINGLE PHASE	240V (230V)-THREE PHASE	277V (265V)-SINGLE PHASE	480V (460V)-THREE PHASE, THREE WIRE	480V (460V)-THREE PHASE, FOUR WIRE	MANUAL MOTOR STARTER BY ES	MANUAL MOTOR STARTER BY EC	MANUAL MOTOR STARTER WITH THERMAL OVERLOADS BY ES	MANUAL MOTOR STARTER WITH THERMAL OVERLOADS BY EC	LOCAL FUSED DISCONNECT BY ES	LOCAL FUSED DISCONNECT BY EC	LOCAL NON-FUSED DISCONNECT BY ES	LOCAL NON-FUSED DISCONNECT BY EC	CORD AND PLUG BY ES AND RECEPTACLE BY EC	COMBINATION MOTOR STARTER DISCONNECT WITH H-O-A BY ES	COMBINATION MOTOR STARTER DISCONNECT WITH H-O-A BY EC	MOTOR STARTER WITH H-O-A BY MC	MOTOR STARTER WITH H-O-A BY EC	MOTOR STARTER WITH REMOTE H-O-A BY MC	MOTOR STARTER WITH REMOTE H-O-A BY EC	MOTOR STARTER WITH PUSH BUTTONS BY MC	MOTOR STARTER WITH PUSH BUTTONS BY EC	MOTOR STARTER WITH REMOTE PUSHBUTTONS BY MC	MOTOR STARTER WITH REMOTE PUSHBUTTONS BY EC	MOTOR STARTER WITH H-O-A IN MOTOR CONTROL CENTER BY EC	REMOTE CONTROL RELAY BY TCC	CONTROL PANEL WITH ALL STARTING AND/OR CONTROL EQUIPMENT BY ES	VARIABLE FREQUENCY DRIVE BY ES	VARIABLE FREQUENCY DRIVE BY MC	CONTROL WIRING BY TCC	CONTROL WIRING BY EC	CONNECTED TO LIFE SAFETY BRANCH	CONNECTED TO AUTO-EQUIPMENT BRANCH	CONNECTED TO STAND-BY BRANCH			REMARKS
EQUIPMENT DESIGNATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
BP-1A	1																17													30				34				38			
BP-1B	1																17													30				34				38			
BP-2A	1																17													30				34				38			
BP-2B	1																17													30				34				38			

ABBREVIATIONS: EC=ELECTRICAL CONTRACTOR, ES=EQUIPMENT SUPPLIER, MC=MECHANICAL CONTRACTOR, TCC=TEMPERATURE CONTROLS CONTRACTOR

NOTE:
PIPING COMPONENTS SHOWN SHALL BE NEW UNLESS OTHERWISE NOTED.



BOILER PIPING SCHEMATIC

SCALE: NONE

HYDRAULIC SEPARATOR SCHEDULE

DESIG.	MFR.	MODEL	SERVICE	SEPARATOR TYPE	FLUID TYPE	MAX. OPER. TEMP. (°F)	FLOW RATE (GPM)	DP @ RATED FLOW (FT W.C.)	AIR REMOVAL EFF. @ RATED FLOW (%)	CONNECTION SIZE		APPROX. OPERATING WT. (LBS)	REMARKS
										INLET (IN)	OUTLET (IN)		
HS-1	SPIRO-THERM	VXN600	HEATING WATER	HYDRAULIC, AIR & DIRT	WATER	200	300	0.80	96	6	6	850	1, 2, 3

1. REFER TO SPEC. FOR ADDITIONAL REQUIREMENTS.
2. PROVIDE PIPE SUPPORT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
3. PROVIDE DRAIN PIPE AND EXTEND TO BLOWDOWN VALVE. TERMINATE DISCHARGE INTO FLOOR DRAIN.

PUMP SCHEDULE

DESIG.	SERVICE	LOCATION	MFR.	MODEL	PUMP TYPE	FLUID TYPE	FLUID TEMP. (°F)	MAX. FLUID TEMP. (°F)	GPM	TDH (FT)	EFF. (%)	MOTOR (HP)	RPM	SIZE (IN)		REMARKS
														SUCTION	DISCH.	
BP-1A	BOILER B-1A	BOILER ROOM	ARMSTRONG	COMPASS R25	IN-LINE	WATER	180	210	75	10.0	61	1/2	2,000	1-1/2	1-1/2	1 - 5
BP-1B	BOILER B-1B	BOILER ROOM	ARMSTRONG	COMPASS R25	IN-LINE	WATER	180	210	75	10.0	61	1/2	2,000	1-1/2	1-1/2	1 - 5
BP-2A	BOILER B-2A	BOILER ROOM	ARMSTRONG	COMPASS R25	IN-LINE	WATER	180	210	75	10.0	61	1/2	2,000	1-1/2	1-1/2	1 - 5
BP-2B	BOILER B-2B	BOILER ROOM	ARMSTRONG	COMPASS R25	IN-LINE	WATER	180	210	75	10.0	61	1/2	2,000	1-1/2	1-1/2	1 - 5

1. REFER TO ELECTRICAL DRAWINGS, FOR ELECTRICAL CHARACTERISTICS.
2. ALL PERFORMANCE CAPACITIES BASED ON SITE SPECIFIC CONDITIONS.
3. REFER TO SPEC. FOR CONTROLS.
4. MINIMUM REQUIRED MOTOR HP. PROVIDE ECM WITH DYNAMIC CONSTANT-VOLUME CONTROL.
5. PERFORMANCE BASED ON FLUID TYPE SPECIFIED.

NOTE:
EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:
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UNIVERSITY OF COLORADO DENVER
LAWRENCE STREET CENTER
1380 LAWRENCE STREET, DENVER, CO 80204
PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

SBEC Project #:	220016
Scale:	AS SHOWN
Drawn By:	TMH/DRP
Designed By:	MG
Checked By:	GS

Issued For:	Date:
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MECHANICAL SCHEDULES AND DETAILS

M-002

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GENERAL NOTES

1. FOR GENERAL NOTES, REFER TO SHEET M-001.

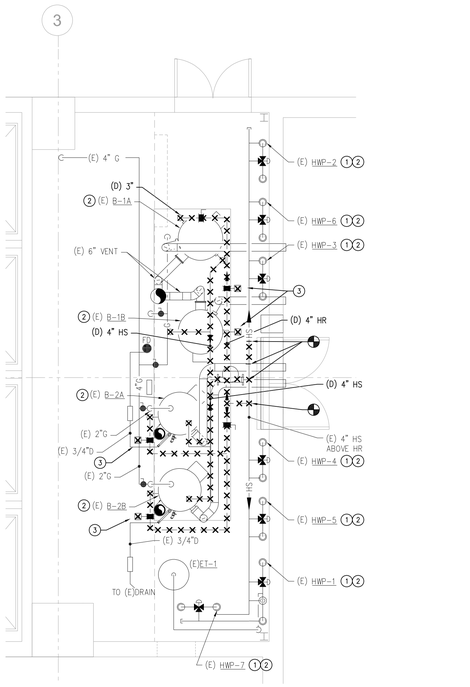
KEY NOTES - DEMOLITION

1. PRIOR TO COMMENCEMENT OF DEMOLITION WORK, MEASURE AND RECORD ZONE PUMP FLOW RATE.
2. PRIOR TO COMMENCEMENT OF DEMOLITION WORK, MEASURE AND RECORD BOILER FLOW RATES AND PRESSURE DROPS WITH ALL ZONE PUMPS ON AND BOILER ISOLATION VALVES OPEN. PROVIDE REPORT TO ENGINEER BEFORE SUBMITTING AND ORDERING CIRCULATION PUMPS.
3. DISCONNECT AUTOMATIC ISOLATION VALVE FROM LOCAL BOILER CONTROLLER, REMOVE, PROTECT, AND STORE UNTIL REINSTALLATION.
4. ALTERNATE #3: REMOVE (E)PUMP MOTOR STARTER. COORDINATE WITH ELECTRICAL AND TEMPERATURE-CONTROLS CONTRACTORS FOR POWER AND CONTROL WIRING DISCONNECTION.

KEY NOTES - NEW WORK

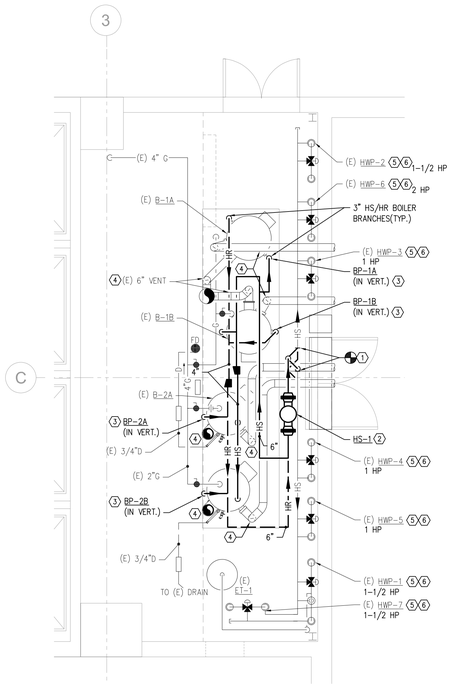
1. 6" HS FROM HS-1 WITH (2) 4" BRANCHES TO (E) HS. HR CONNECTIONS SIMILAR, BELOW. PROVIDE 6" HS/HR BYPASS PIPING WITH 3-WAY BUTTERFLY VALVES. REFER TO BOILER PIPING SCHEMATIC, M-501.
2. HYDRAULIC SEPARATOR, HS-1, SHALL BE SUPPORTED BY PIPING. REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE 1" BALL VALVE AND BLOWDOWN DRAIN LINE AND ROUTE TO NEAREST FLOOR DRAIN. PROVIDE DELEGATED DESIGN TO CONFIRM STRUCTURAL CAPACITY IS ADEQUATE FOR WEIGHT OF HYDRAULIC SEPARATOR AND INCREASED PIPE SIZE.
3. PROVIDE BOILER CIRCULATOR, INTEGRATED WITH EXISTING BUILDING AUTOMATION SYSTEM. PROVIDE 3" BYPASS LINE WITH 3-WAY BUTTERFLY VALVE. REINSTALL BOILER AUTOMATIC ISOLATION VALVE IN BYPASS LINE AND RECONNECT TO BOILER CONTROL PANEL. REFER TO BOILER PIPING SCHEMATIC, M-501.
4. REMOVE/REINSTALL COMBUSTION AIR INTAKE DUCTS (6" SINGLE-WALL GALVANIZED DUCT) AND BOILER FLUES (6" DOUBLE-WALL STAINLESS STEEL CATEGORY IV, HEATFAB SAF-T VENT CI PLUS) AS NECESSARY TO FACILITATE NEW PIPING.
5. UPON COMPLETION OF NEW WORK INSTALLATION, RE-MEASURE ZONE PUMP FLOW RATE AND ADJUST BALANCING VALVE AS NECESSARY TO ACHIEVE ORIGINAL FLOW RATE.
6. ALTERNATE #3: FURNISH AND INSTALL REPLACEMENT PUMP MOTOR STARTER SUITABLE FOR MOTOR SIZE INDICATED*. COORDINATE WITH ELECTRICAL AND TEMPERATURE-CONTROLS CONTRACTORS FOR POWER AND CONTROL WIRING.

*(E)MOTOR SIZE IS BASED ON AVAILABLE RECORD DRAWINGS. FIELD-VERIFY PRIOR TO ORDERING REPLACEMENT MOTOR STARTERS.



1 ENLARGED MECHANICAL ROOM PLANS - DEMOLITION
SCALE: 1/4" = 1'-0"

NORTH



2 ENLARGED MECHANICAL ROOM PLANS - NEW WORK
SCALE: 1/4" = 1'-0"

NORTH

AREA OF WORK

KEY PLAN

NORTH

NOTE:

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ENLARGED MECHANICAL ROOM PLANS

M-401

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GENERAL NOTES

1. FOR GENERAL NOTES, REFER TO SHEET M-001.

KEY NOTES - DEMOLITION

(1) DISCONNECT AUTOMATIC ISOLATION VALVE FROM LOCAL BOILER CONTROLLER, REMOVE, PROTECT, AND STORE UNTIL REINSTALLATION.

(2) REMOVE BOILER HEATING WATER SUPPLY TEMPERATURE SENSOR SERVING LOCAL BOILER CONTROLLER FROM (E) SENSOR WELL. PROTECT DURING CONSTRUCTION ACTIVITIES.

KEY NOTES - NEW WORK

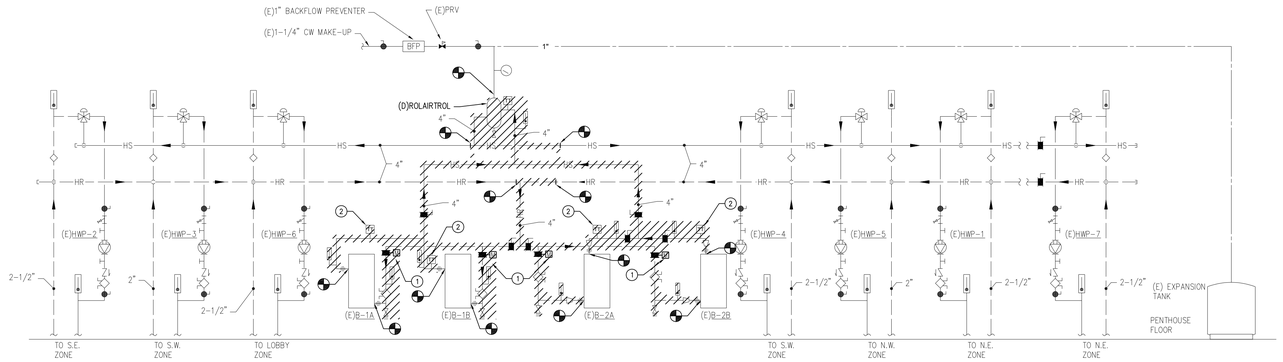
(1) PROVIDE PUMP AND ACCESSORIES AS SHOWN. PUMP SHALL BE PROGRAMMED FOR CONSTANT FLOW. REFER TO PUMP SCHEDULE.

(2) REINSTALL BOILER HEATING WATER SUPPLY TEMPERATURE SENSOR SERVING LOCAL BOILER CONTROLLER IN NEW SENSOR WELL.

(3) PROVIDE 1" BALL VALVE AND BLOWDOWN LINE AND ROUTE TO NEAREST FLOOR DRAIN.

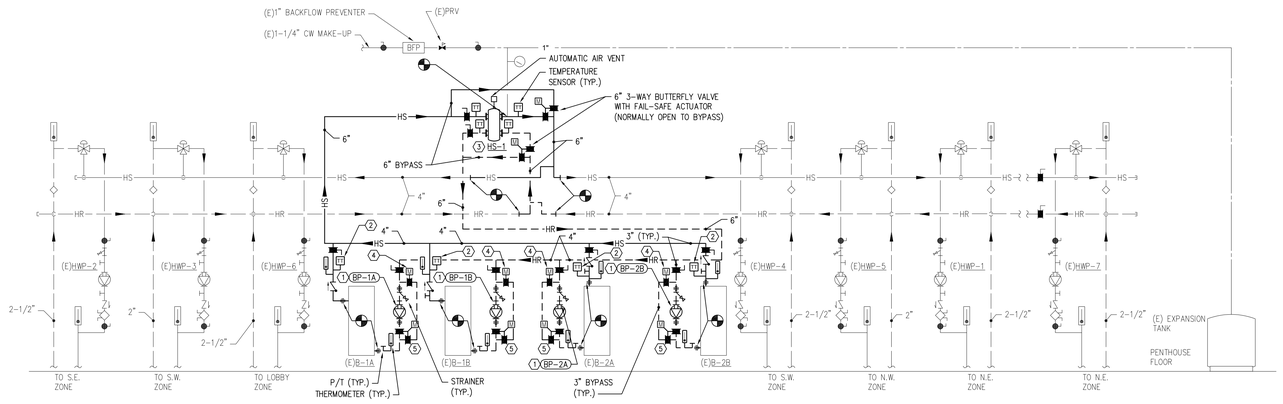
(4) REINSTALL BOILER AUTOMATIC ISOLATION VALVE IN BYPASS LINE AND RECONNECT TO BOILER CONTROL PANEL.

(5) PROVIDE 3" 3-WAY BUTTERFLY VALVE WITH FAIL-SAFE ACTUATOR, NORMALLY OPEN TO BYPASS.



1 BOILER PIPING SCHEMATIC - DEMOLITION

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



2 BOILER PIPING SCHEMATIC - NEW WORK

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MECHANICAL PIPING SCHEMATICS

M-501

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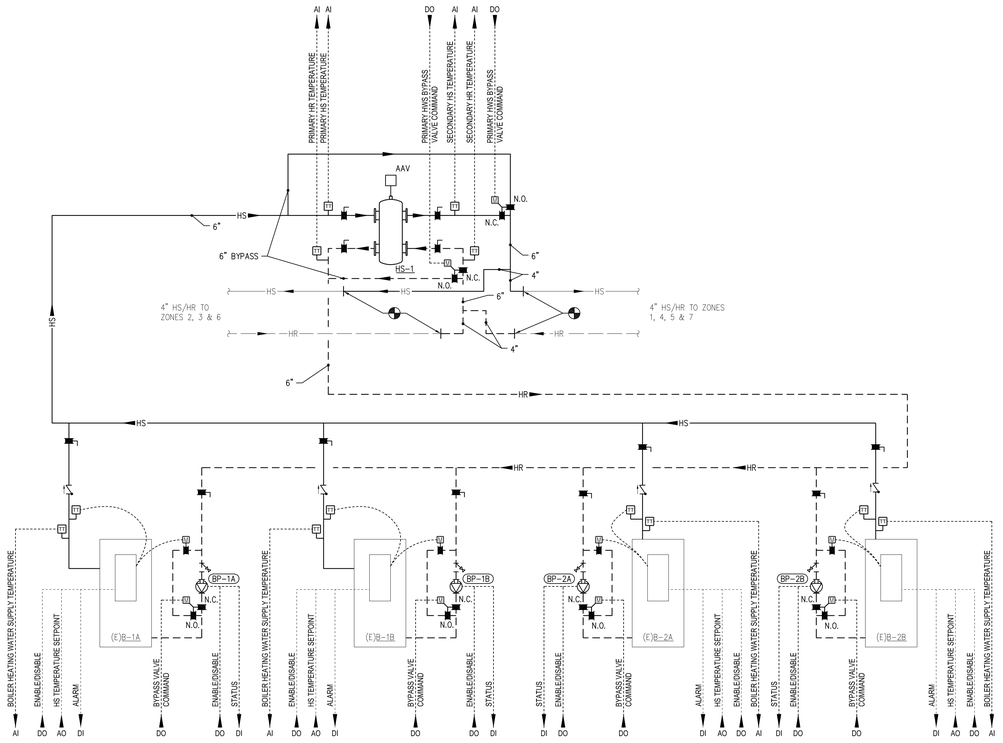
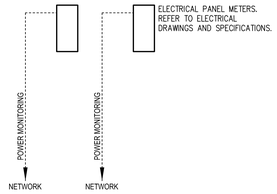


1 BOILER CONTROL SCHEMATIC
SCALE: 1/4" = 1'-0"



1. THE INTENT OF THIS WORK IS TO RECONFIGURE THE HEATING WATER SYSTEM FOR PRIMARY (BOILERS) AND SECONDARY (HEATING ZONES) OPERATION.
2. RATHER THAN USING CLOSELY SPACED TEES, THE POINT OF INTERFACE BETWEEN THE PRIMARY AND SECONDARY LOOPS IS THE HYDRAULIC SEPARATOR, HS-1, DUE TO THE SPACE CONSTRAINTS IN THE BOILER ROOM, THE HYDRAULIC SEPARATOR ALLOWS FOR MORE FAVORABLE INSTALLATION, WHILE ALSO SERVING AS AN AIR/DIRT SEPARATOR.
3. EACH BOILER WILL BE PROVIDED WITH ITS OWN CIRCULATOR IN LIEU OF THE CURRENTLY INSTALLED AUTOMATIC ISOLATION VALVES. THE (E)AUTOMATIC ISOLATION VALVES SHALL BE RETAINED FOR USE IN THE BOILER HEATING WATER RETURN BYPASS LINES.
4. EXISTING ZONE PUMPS (SECONDARY LOOP) WILL REMAIN UNDER THEIR CURRENT OPERATING SEQUENCES.
5. UNDER NORMAL OPERATION, 3-WAY BUTTERFLY VALVES SHALL BE DRIVEN CLOSED TO BYPASS TO ENABLE PRIMARY/SECONDARY OPERATION. IN THE EVENT OF POWER FAILURE, BYPASS VALVES SHALL FAIL OPEN TO BYPASS TO ALLOW PRIMARY-ONLY FLOW DRIVEN BY ZONE CIRCULATORS.

B. EXISTING SEQUENCE OF OPERATION (AS DESCRIBED BY SIEMENS RECORD DRAWINGS, 3/24/2022). CHANGES TO THIS SEQUENCE ARE ~~STRICKEN OUT~~ AND/OR UNDERLINED.

1. ENABLE/DISABLE – THE PLANT SHALL BE ENABLED WHENEVER OUTDOOR AIR TEMPERATURE IS LESS THAN 50 DEGREES F (ADJ.).
2. RESET HEATING WATER SUPPLY TEMPERATURE IN ACCORDANCE WITH RESET SCHEDULE BY STEP FIRING BOILERS UTILIZING CONDENSING BOILERS B-2A AND B-2B AS LEAD BOILER SYSTEMS AND B-1A AND B-1B FOR HIGH HEATING DEMAND. ALL BOILERS SHALL BE FIRED IF TEMPERATURE SET POINT CANNOT BE REACHED WITHIN A PREDETERMINED (ADJ.) TIME REGARDLESS OF RETURN WATER TEMPERATURE.
3. TEMPERATURE RESET SHALL BE 5 DEGREES HIGHER THAN THE HIGHEST ZONE WATER TEMPERATURE SETPOINT.
4. EXISTING INDEPENDENT ZONE SEQUENCES SHALL REMAIN: EACH ZONE VALVE SHALL MODULATE ON AN INDEPENDENT RESET SCHEDULE. THE SUPPLY WATER TEMPERATURE SETPOINT FOR EACH ZONE SHALL RESET LINEARLY BETWEEN MAXIMUM AND MINIMUM AS FOLLOWS WITH ADJUSTABLE SETPOINTS:
   a. IF THE REFERENCE ROOM TEMPERATURE IS 69 DEGREES F (ADJ.) OR LOWER, HEATING WATER SUPPLY TEMPERATURE SETPOINT SHALL BE 180 DEGREES F (ADJ.).
   b. IF THE REFERENCE ROOM TEMPERATURE IS 73 DEGREES F (ADJ.) OR HIGHER, HEATING WATER SUPPLY TEMPERATURE SETPOINT SHALL BE 110 DEGREES F (ADJ.).
5. EACH ZONE SHALL HAVE A MINIMUM VALVE POSITION TO ~~ALLOW FLOW TO THE BOILERS AT ALL TIMES~~ ACCOUNT FOR ZONE HEATING WATER PUMP MINIMUM FLOW REQUIREMENTS.
6. BOILER SEQUENCING:
   a. THE BOILER PLANT SHALL BE SPLIT INTO TWO DISTINCT GROUPS DEPENDING ON THEIR INDIVIDUAL FUNCTION AND CAPABILITIES. THE GROUPS SHALL BE CONDENSING GROUP CONSISTING OF BOILERS B-2A AND B-2B AND NON-CONDENSING GROUP CONSISTING OF BOILERS B-1A AND B-1B.
   b. THE CONDENSING GROUP BOILERS SHALL ALWAYS BE LEAD POSITION TO BENEFIT FROM RETURN WATER TEMPERATURES BELOW 130 DEGREES F.
   c. THE CONDENSING GROUP SHALL UTILIZE EACH INDIVIDUAL CONDENSING BOILER IN THE GROUP TO MAINTAIN THE DISCHARGE WATER TEMPERATURE AS DETERMINED BY THE RESET SCHEDULE BY UTILIZING LEAD/LAG/FAILOVER ROUTINE. IF THE DISCHARGE TEMPERATURE CANNOT BE MAINTAINED, THE NON-CONDENSING GROUP SHALL STAGE ON UNTIL THE DISCHARGE TEMPERATURE CAN BE MAINTAINED UTILIZING ITS LEAD/LAG/FAILOVER ROUTINE.
   d. STAGE UP AND DOWN WITH DELAY TIMERS (ADJ.) SHALL BE UTILIZED TO PREVENT SHORT CYCLING OF BOILERS.
   e. EACH BOILER SHALL HAVE AN OUT OF SERVICE VIRTUAL POINT TO MAKE IT UNAVAILABLE FOR SEQUENCING PURPOSES.
   f. TEMPERATURE SENSORS DIRECTLY WIRED TO EACH BOILER'S ONBOARD CONTROLLER.
   g. LEAD/LAG BOILER PAIRS SHALL SWITCH ONCE A WEEK ON TUESDAY AT 10 AM (ADJ.).
   h. THE BOILER'S INDIVIDUAL CONTROLLER SHALL MODULATE EACH BOILER FIRING RATE TO MAINTAIN ITS LEAVING WATER TEMPERATURE AT SETPOINT IN A MANNER THAT AVOIDS SHORT CYCLING AND THAT SHALL ALLOW THE SYSTEM TO MODIFY THE RAMP SPEED DEPENDING ON ITS OWN HISTORY.
   i. EACH INDIVIDUAL BOILER SHALL BE STARTED IN A SEQUENCE WHICH CHECKS ALL SAFETIES, AND PURGES THE COMBUSTION CHAMBER, AND OPENS THE INDIVIDUAL BOILER HOT WATER ISOLATION VALVE (LOCATED IN THE BYPAAS LINE), PRIOR TO STARTING THE BOILER IGNITION SEQUENCE. [SEE BELOW FOR BOILER SEQUENCE CHANGES.]
   j. IN THE EVENT OF A BOILER OR GROUP FAILURE THE NEXT BOILER IN THE GROUP OR THE OTHER GROUP SHALL STAGE ON TO MAINTAIN DISCHARGE TEMPERATURE.
7. ZONE 1 THROUGH ZONE 6: IF THE BOILER SYSTEM IS ON, THE SIX ZONES SHALL BE STAGED ON AND RUN CONTINUOUSLY. THE THREE-WAY HEATING WATER VALVES SHALL MODULATE TO MAINTAIN THE ZONE SPACE TEMPERATURE.
8. ZONE 7 (13TH FLOOR): IF THE BOILER SYSTEM IS ON AND THE MOST OPEN VAV HEATING WATER VALVE IS ABOVE 15%, THEN TURN ON PUMP 7. THE THREE-WAY HEATING WATER VALVE ON ZONE 7 SHALL MODULATE TO MAINTAIN 140 DEG F WHEN ZONE 7 IS ENABLED.

C. PRIMARY HEATING WATER LOOP CONTROL SEQUENCE CHANGES:

1. EXISTING AUTOMATIC BOILER ISOLATION VALVES SHALL BE RELOCATED TO THE BOILER RETURN BYPASS LINE. DURING NORMAL OPERATION, FLOW THROUGH BOILERS WILL BE GENERATED BY EACH BOILER'S DEDICATED CIRCULATOR. IN THE EVENT OF POWER FAILURE, THE MAIN SUPPLY/RETURN AND INDIVIDUAL BOILER 3-WAY VALVES SHALL FAIL OPEN TO BYPASS. FLOW THROUGH ACTIVE BOILER(S) WILL BE PERMITTED BY AUTOMATIC ISOLATION VALVE (LOCATED IN BYPASS LEG) AND INDUCED BY HEATING ZONE PUMPS (AS IN CURRENT OPERATION).
2. IN ADDITION TO THE CURRENT SEQUENCE (OR IN LIEU OF STRICKEN OUT PORTIONS OF THE EXISTING SEQUENCE ABOVE), PROVIDE THE FOLLOWING CONTROL STEPS.
3. STEP-UP STAGING OF BOILERS:
   a. A DELAY OF 5 MINUTES (ADJ.) SHALL BE ENACTED TO ALLOW THE SYSTEM TO REACH STEADY-STATE FOLLOWING EACH CHANGE OF SETPOINT OR STAGING OF BOILERS. THE BAS SHALL NOT ENGAGE LAG BOILERS OR INITIATE A FAILOVER SEQUENCE (OTHER THAN ON PUMP FAILURE) DURING THIS DELAY PERIOD.
   b. PRIOR TO ENABLING ANY BOILER THE BAS SHALL START ITS RESPECTIVE CIRCULATOR. FOLLOWING A STARTUP DELAY OF 30 SECONDS (ADJ.), IF ANY BOILER CIRCULATOR FAILS, ITS RESPECTIVE BOILER SHALL BE DISABLED AND THE FAILOVER SEQUENCE INITIATED.
   c. FOR CONDENSING BOILERS (B-2A & B-2B), UPON PROOF OF CIRCULATOR STATUS, THE BOILER SHALL BE ENABLED.
   d. FOR NON-CONDENSING BOILERS (B-1A & B-1B), THE SYSTEM HEATING WATER SUPPLY TEMPERATURE SETPOINT SHALL BE OVERRIDDEN TO A MINIMUM OF 160 DEGREES F (ADJ.). FOLLOWING PROOF OF CIRCULATOR STATUS, WHEN THE NON-CONDENSING BOILER'S HEATING WATER SUPPLY TEMPERATURE REACHES 130 DEGREES F (ADJ.) THE BOILER SHALL BE ENABLED.
4. STEP-DOWN STAGING OF BOILERS
   a. FOLLOWING THE DISABLING OF A BOILER, ITS RESPECTIVE CIRCULATOR SHALL CONTINUE TO RUN FOR 2 MINUTES (ADJ.) BEFORE BEING DISABLED.
   b. WHEN BOTH NON-CONDENSING BOILERS ARE DISABLED, THE HEATING WATER SUPPLY TEMPERATURE SETPOINT OVERRIDE SHALL BE RELEASED.

TEMPERATURE CONTROL MATRIX

POINTS LIST:	NUMBER OF UNITS	POINT TYPE: DIGITAL INPUT	POINT TYPE: DIGITAL OUTPUT	POINT TYPE: ANALOG INPUT	POINT TYPE: ANALOG OUTPUT	ANALOG IND.: TEMPERATURE	ANALOG IND.: REL. HUMIDITY	ANALOG IND.: POSITION/SPEED	ANALOG IND.: PRESSURE	STATUS	REMARKS
BOILER PLANT CONTROL											
BOILER ENABLE/DISABLE	4		X								1, 2
BOILER ALARM	4	X									1, 2
BOILER HEATING WATER SUPPLY TEMPERATURE SETPOINT	4				X	X					1, 2
BOILER HEATING WATER SUPPLY TEMPERATURE (LOCAL)	4				--	--					1, 2, 3
BOILER HEATING WATER SUPPLY TEMPERATURE (DDC)	4			X		X					
ISOLATION CONTROL VALVE COMMAND	4		--								2, 4
PUMP START/STOP	4		X								
PUMP STATUS	4	X								X	5
PRIMARY HEATING WATER SUPPLY TEMPERATURE	1			X		X					
PRIMARY HEATING WATER RETURN TEMPERATURE	1			X		X					
SECONDARY HEATING WATER SUPPLY TEMPERATURE	1			X		X					
SECONDARY HEATING WATER RETURN TEMPERATURE	1			X		X					
BYPASS VALVE COMMAND	6		X								7
ELECTRICAL PANEL METERING											
ELECTRICAL PANEL POWER METER	2										6

GENERAL NOTES:
1. QUANTITY AND TYPE OF CONTROL POINTS LISTED ARE MINIMUM. TCC SHALL VERIFY REQUIRED QUANTITY, TYPE, AND FUNCTION OF CONTROL POINTS PRIOR TO BID AND ADJUST ACCORDING TO SEQUENCE OF OPERATION AND EQUIPMENT FOR A COMPLETE FUNCTIONING SYSTEM.
2. TCC SHALL PROVIDE TRANSFORMERS AS REQUIRED TO SUPPORT LOW VOLTAGE SENSORS, TRANSMITTERS, ACTUATORS OR OTHER LOW VOLTAGE CONTROL EQUIPMENT REQUIRED TO ALLOW THE SYSTEM TO FUNCTION AS DEFINED IN THE SEQUENCE OF OPERATION.
3. ALARMS SHALL BE COORDINATED WITH OWNER'S OPERATIONS/FACILITIES PERSONNEL.
4. REFER TO DRAWINGS FOR SENSOR LOCATIONS.

REMARKS:
1. EXISTING CONTROL POINT TO REMAIN.
2. ALL OTHER BOILER AND ZONE PUMP CONTROLS SHALL REMAIN AS-IS.
3. (RR) TEMPERATURE SENSOR CONNECTS TO INDIVIDUAL BOILER CONTROL PANEL. REMOVE, PROTECT, AND REINSTALL OR REPLACE SENSOR AS NEEDED.
4. (RR) VALVE. DISCONNECT FROM BOILER AUXILIARY-ENABLE AND SAFETY INTERLOCK TERMINALS AHEAD OF DEMOLITION WORK. REINSTALL IN BOILER BYPASS LOOP AND RECONNECT. REFER TO BOILER MANUFACTURER'S INSTRUCTIONS.
5. PROVIDE CURRENT SWITCH FOR STATUS MONITORING.
6. PROVIDE BACNET/ETHERNET CONNECTION FOR INTEGRATION WITH BAS. COORDINATE WITH OWNER'S FACILITIES PERSONNEL FOR INTEGRATION REQUIREMENTS.
7. VALVE ACTUATOR SHALL HAVE SPRING- OR CAPACITOR-DRIVEN FAIL-SAFE TO BYPASS UPON POWER LOSS. UNDER NORMAL POWER, VALVE SHALL BE DRIVEN AND HELD CLOSED TO BYPASS.

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CONTROL DIAGRAM & SEQUENCE OF OPERATION

M-601

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GENERAL DEMOLITION NOTES

1. WORK SHOWN HATCHED IS TO BE REMOVED; WORK SHOWN WITH LIGHT LINE WEIGHT IS (E) TO REMAIN. MAKE MODIFICATIONS TO (E) BRANCH CIRCUITS TO RETAIN CONTINUITY, INCLUDING EQUIPMENT AND DEVICES OUTSIDE THE AREA OF WORK AND RELOCATED EQUIPMENT AND DEVICES.
2. DEMOLITION DRAWINGS ARE INCLUDED TO GIVE A COMMON BASIS FOR BIDDING. CONTRACTOR IS TO VERIFY (E) CONDITIONS AND REQUIRED DEMOLITION WORK PRIOR TO BID.
3. ALL WIRING, CONDUIT, BOXES AND SUPPORTS NO LONGER REQUIRED SHALL BE COMPLETELY REMOVED FROM THE AREA OF WORK. ALL ABANDONED CONDUIT AND WIRE SHALL BE REMOVED IN ITS ENTIRETY BACK TO SOURCE.
4. THE OWNER SHALL HAVE FIRST RIGHT TO REMOVED DEVICES AND EQUIPMENT. IF THE OWNER DOES NOT WANT THE REMOVED DEVICES OR EQUIPMENT, THEN THE CONTRACTOR SHALL DISPOSE OF PROPERLY.
5. FIRE SEAL ALL FIRE RATED WALL AND FLOOR PENETRATIONS.
6. WHERE DEVICES AND EQUIPMENT ARE TO BE REMOVED, WALLS SHALL BE PATCHED TO MATCH ORIGINAL FINISH.
7. EQUIPMENT MOUNTED ON CEILINGS BEING REMOVED FOR ANY REASON SHALL BE TEMPORARILY SUPPORTED AND INSTALLED ON THE REPLACEMENT CEILING, UNLESS OTHERWISE NOTED.
8. COORDINATE FIRE ALARM SCOPE OF WORK WITH THE LOCAL JURISDICTION AND FIRE ALARM SUPPLIER. REMOVE ALL DEVICES, BOXES, WIRE, CONDUIT, ETC. OF EQUIPMENT NO LONGER REQUIRED.
9. FOR DEMOLISHED EQUIPMENT, ASSUME THAT FEEDER TO BE DEMOLISHED IS 60A 3-PHASE UNLESS NOTED OTHERWISE.

GENERAL NOTES

1. PROVIDE CONDUITS AND BOXES FOR TEMPERATURE CONTROL WIRING. REFER TO TEMPERATURE CONTROL CONDUIT ROUTING SCHEDULE FOR ADDITIONAL INFORMATION.
2. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF LOCAL JURISDICTIONAL AUTHORITY AND BASE BUILDING STANDARDS.
3. WORK INCLUDED IN CONTRACT IS SHOWN WITH HEAVIER LINE WEIGHT; WORK SHOWN WITH LIGHT LINE WEIGHT IS (E) TO REMAIN. MAKE MODIFICATIONS TO (E) BRANCH CIRCUITS TO RETAIN CONTINUITY, INCLUDING EQUIPMENT OUTSIDE THE AREA OF WORK.
4. COORDINATE REQUIREMENTS AND LOCATIONS OF MECHANICAL EQUIPMENT WITH MECHANICAL DRAWINGS AND MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.
5. MAKE ALL FINAL ELECTRICAL CONNECTIONS TO EQUIPMENT.
6. ALL CONDUIT SHALL BE INSTALLED CONCEALED IN FINISHED AREAS UNLESS OTHERWISE NOTED.
7. FIRE SEAL ALL FIRE RATED WALL AND FLOOR PENETRATIONS.
8. EACH MULTI-WIRE BRANCH CIRCUIT SHALL BE PROVIDED WITH A SEPARATE NEUTRAL FOR EACH BRANCH CIRCUIT.
9. DISCONNECT SWITCH AND VFD LOCATIONS ARE DIAGRAMMATIC AND SHALL BE INSTALLED IN ACCESSIBLE LOCATIONS TO SUIT EQUIPMENT AND SPACE. DISCONNECT SWITCH SHALL BE WITHIN SIGHT OF EQUIPMENT SERVED AND SHALL MAINTAIN REQUIRED CLEARANCES.
10. COORDINATE WITH TEMPERATURE CONTROL CONTRACTOR FOR LOCATION OF TEMPERATURE CONTROL PANELS REQUIRING 120V POWER. CONNECT TO 120V CIRCUIT INDICATED ON SCHEDULES.
11. COORDINATE WITH MECHANICAL CONTRACTOR THE LOCATION OF FIRE/SMOKE AND SMOKE DAMPERS. DAMPERS CONTROLLED INDIVIDUALLY BY THE FIRE ALARM CONTROL PANEL VIA DEDICATED CONTROL MODULES. PROVIDE SYSTEM DUCT DETECTOR AT EACH DAMPER. CONNECT TO 120V CIRCUIT SHOWN.
12. COORDINATE WITH STRUCTURAL ENGINEER PRIOR TO CORING OR DRILLING THROUGH CONCRETE FLOORS. OBTAIN WRITTEN APPROVAL FROM STRUCTURAL ENGINEER PRIOR TO CORING OR DRILLING THROUGH ANY STRUCTURAL ELEMENTS. OFFSET NEW CONDUITS AS REQUIRED TO ACCOMMODATE THE STRUCTURE AND EXISTING SYSTEMS.

ELECTRICAL LEGEND

(Not all symbols listed below are used on these drawings)

FIRE ALARM

SYMBOL	DESCRIPTION
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL
EVAC	VOICE EVACUATION CONTROL UNIT
MIC	REMOTE VOICE EVACUATION MICROPHONE
GAP	GRAPHIC ANNUNCIATOR PANEL
ECCU	EMERGENCY COMMUNICATIONS CONTROL UNIT
FSCP	FIRE SUPPRESSION CONTROL PANEL
ARCM	AREA OF REFUGE EMERGENCY COMMUNICATION SYSTEM/MASTER UNIT
ARCR	AREA OF REFUGE EMERGENCY COMMUNICATION SYSTEM/REMOTE UNIT
ESR	ELEVATOR STATUS/RECALL
DACT	DIGITAL ALARM COMMUNICATOR TRANSMITTER
HVAC	CONTROL PANEL FOR VENTILATION, PRESSURIZATION
KB	KNOX BOX
F	MANUAL PULL STATION
AIM	ADDRESSABLE INPUT MODULE
AOM	ADDRESSABLE OUTPUT MODULE
WF	SPRINKLER FLOW SWITCH
VS	VALVE SUPERVISORY SWITCH
PS	PRESSURE SWITCH
DH	DOOR HOLDER, MAGNETIC
DCL	DOOR CLOSER
RTS	DUCT SMOKE DETECTOR REMOTE INDICATOR/TEST STATION
	AIR SAMPLING DETECTOR PIPING AND PORT
A, J, H	FIRE SERVICE OR EMERGENCY PHONE (* INDICATES DEVICE) ACCESSIBLE JACK HANDSET
S, P, I, BT, BR, UF, AS, SS	SMOKE DETECTOR (* INDICATES DEVICE) PHOTOELECTRIC IONIZATION BEAM TRANSMITTER BEAM RECEIVER BELOW RAISED ACCESS FLOOR AIR SAMPLING SINGLE STATION
S, S, R, P, I	DUCT SMOKE DETECTOR (* INDICATES DEVICE) SUPPLY RETURN PHOTOELECTRIC IONIZATION
1, F, R	HEAT DETECTOR/SENSOR (* INDICATES DEVICE) FIXED TEMPERATURE RATE OF RISE
A, UV, IF	FLAME DETECTOR (* INDICATES DEVICE) ULTRAVIOLET INFRARED
CO	CARBON MONOXIDE DETECTOR
SD	SMOKE/HEAT DETECTOR/SENSOR COMBINATION
H	AUDIBLE NOTIFICATION HORN
S	AUDIBLE NOTIFICATION SPEAKER
H, S	COMBINATION AUDIBLE/VISIBLE NOTIFICATION HORN/STROBE
S	COMBINATION NOTIFICATION SPEAKER/STROBE
cd, cd	VISIBLE FIRE ALARM STROBE (CEILING & WALL MOUNTED) cd - CANDELA RATING (IF SHOWN)
cd, cd	VISIBLE MASS NOTIFICATION STROBE (CEILING & WALL MOUNTED) cd - CANDELA RATING (IF SHOWN)
R1, R1	REMOTE INDICATOR LIGHT (CEILING & WALL MOUNTED) cd - CANDELA RATING (IF SHOWN)
	FIRE ALARM BELL
A	ABORT SWITCH
M	MANUAL RELEASING STATION

COMMUNICATION

SYMBOL	DESCRIPTION
	TELEPHONE TERMINAL BOARD
W, P	VOICE DEVICE WALL PAY
	VOICE DEVICE FLOOR MOUNTED
	TELEVISION DEVICE
B, C	BELL/CLOCK DEVICE
WAP	WIRELESS ACCESS POINT
	DATA DEVICE
	DATA DEVICE, FLOOR MOUNTED
	COMBINATION TELEPHONE/DATA DEVICE
	COMBINATION TELEPHONE/DATA DEVICE, FLOOR MOUNTED
	COMMUNICATION/POWER FLOOR BOX, DEVICES AS INDICATED
	COMMUNICATION/POWER POKE THROUGH, DEVICES AS INDICATED
	COMMUNICATION/POWER POLE, DEVICES AS INDICATED

SECURITY AND PUBLIC ADDRESS

SYMBOL	DESCRIPTION
SCP	SECURITY CONTROL PANEL
PAMC	PUBLIC ADDRESS MASTER CONTROL
PAA	PUBLIC ADDRESS AMPLIFIER
P	PUBLIC ADDRESS (* INDICATES DEVICE)
P, B, BZ, I, MC, PB, S, V	FLOOR MOUNTED BELL BUZZER INTERCOM STATION MICROPHONE PUSHBUTTON SPEAKER VOLUME CONTROL
S, AC, C, CR, DR, DS, ED, DL, GB, H, KP, M, MDI, MDU, PB	SECURITY DEVICE (* INDICATES DEVICE) ACCESS CONTROL CAMERA CARD READER DOOR RELEASE PUSHBUTTON DOOR SENSOR ELECTRIC DOOR STRIKE ELECTRIC DOOR LATCH GLASS BREAK SENSOR HORN KEY PAD MONITOR MOTION DETECTOR INFRARED MOTION DETECTOR ULTRASONIC PANIC PUSHBUTTON

NURSE CALL

SYMBOL	DESCRIPTION
NCCP	NURSE CALL CONTROL PANEL
NCPP	NURSE CALL CONSOLE
N, N	NURSE CALL: CEILING, WALL MOUNTED (* INDICATES DEVICE)
CB	CORE ZERO (CODE BLUE)
CC	CALL CANCEL
DL	DOME LIGHT
DLZ	DOME LIGHT ZONE
DS	DUTY STATION
EB	EMERGENCY CALL STATION WITH PUSHBUTTON
EF	EMERGENCY CALL STATION WITH FOOT SWITCH
EL	ELAPSE TIMECLOCK
EP	EMERGENCY CALL STATION WITH PULL CORD
ES	EMERGENCY CALL STATION WITH PULL CORD, SHOWER
LCD	SLAVE MASTER STATION DISPLAY
MS	MASTER STATION
P	PATIENT STATION
PB	PUSH BUTTON
PS	PRESENCE STATION
R	REMOTE TIMECLOCK CONTROL
SL	STAFF LOCATOR STATION
SS	STAFF STATION

GROUNDING AND LIGHTNING PROTECTION

SYMBOL	DESCRIPTION
	INSPECTION WELL
	GROUND ROD
	GROUND BAR
	AIR TERMINAL
	EXOTHERMIC CONNECTION
LP	LIGHTNING PROTECTION BARE CONDUCTOR

REFERENCE SYMBOLS

SYMBOL	DESCRIPTION
X, 3	KEY NOTE REFERENCE (DEMOLITION, WHERE APPLICABLE)
	INDICATES DEMOLITION (DASHED or HATCHED)
X	FEEDER REFERENCE
XXXXX	EQUIPMENT REFERENCE (REFER TO EQUIPMENT SCHEDULE)
XX, XXX	DETAIL REFERENCE
1	REVISION DELTA
A-1,3,5	BRANCH CIRCUIT HOME RUN: (ALL CIRCUITS HAVE A DEDICATED NEUTRAL) ARROWS INDICATE NUMBER OF CIRCUITS TEXT INDICATES PANELBOARD CIRCUIT
PNL, #	CIRCUIT INDICATION FOR ALL DEVICES WITHIN AN AREA OR ROOM. OCCASIONALLY A CIRCUIT NUMBER IS ADJACENT FOR CLARITY. (ALL CIRCUITS HAVE A DEDICATED NEUTRAL.)

LIGHTING

SYMBOL	DESCRIPTION
	SURFACE LUMINAIRE
	RECESSED LUMINAIRE
OR	EMERGENCY OPERATION
OR	CRITICAL OPERATION
	STRIP LUMINAIRE
	SURFACE CEILING MOUNTED LUMINAIRE
	RECESSED CEILING MOUNTED LUMINAIRE
	WALL MOUNTED LUMINAIRE
	COVE LIGHT/UNDERCOUNTER LUMINAIRE
	RECESSED WALL LUMINAIRE
	RECESSED WALL WASH LUMINAIRE
	SURFACE WALL WASH LUMINAIRE
	DARKROOM SAFE LIGHT, AS INDICATED
E	EMERGENCY BATTERY PACK UNIT
	SINGLE FACE EXIT SIGN WITH DIRECTIONAL ARROWS
	DOUBLE FACE EXIT SIGN WITH DIRECTIONAL ARROWS
	POLE MOUNTED LUMINAIRE
	FLOOD LIGHT
	TRACK LIGHTING
A	UPPER CASE DESIGNATES LUMINAIRE TYPE
a	SUBSCRIPT INDICATES SWITCHLEG

POWER

SYMBOL	DESCRIPTION
	SINGLE RECEPTACLE
IG	DUPLEX RECEPTACLE (ESSENTIAL POWER) ISOLATED GROUND
	DOUBLE DUPLEX RECEPTACLE (ESSENTIAL POWER)
	DUPLEX RECEPTACLE, CEILING MOUNTED (ESSENTIAL POWER)
	DOUBLE DUPLEX RECEPTACLE, CEILING MOUNTED (ESSENTIAL POWER)
	DUPLEX RECEPTACLE, FLOOR MOUNTED (ESSENTIAL POWER)
	DOUBLE DUPLEX RECEPTACLE, FLOOR MOUNTED (ESSENTIAL POWER)
GFCI, WP	DUPLEX RECEPTACLE, WITH GFCI PROTECTION WEATHER PROOF (WEATHERPROOF WHILE IN-USE)
	SPECIAL DUPLEX RECEPTACLE
USB	TWO INTEGRAL USB PORTS
SW	HALF SWITCHED
	SPECIAL RECEPTACLE: WALL, FLOOR, CEILING
	COMMUNICATION/POWER FLOOR BOX, DEVICES AS INDICATED
	COMMUNICATION/POWER POKE THROUGH, DEVICES AS INDICATED
	COMMUNICATION/POWER POLE, DEVICES AS INDICATED
B, B	BUSWAY
M#	MULTI-OUTLET ASSEMBLY # INDICATES DEVICE SPACING ON-CENTER
	EXISTING PANELBOARD
	NEW PANELBOARD OR NEW LOCATION
T	TRANSFORMER
M	UTILITY METER
	NON-FUSED DISCONNECT SWITCH
F	FUSED DISCONNECT SWITCH
CB	CIRCUIT BREAKER
VFD	VARIABLE FREQUENCY DRIVE
	MOTOR STARTER
	COMBINATION STARTER/DISCONNECT
M	MOTOR
T	PAD MOUNTED TRANSFORMER
	DISTRIBUTION EQUIPMENT

SWITCHING

SYMBOL	DESCRIPTION
S	SINGLE POLE SWITCH (LOW VOLTAGE SWITCH)
a	SWITCHING ZONE
2	TWO POLE SWITCH
3	THREE-WAY SWITCH
4	FOUR-WAY SWITCH
K	KEY OPERATED SWITCH
M(TO)	MOTOR RATED SWITCH (THERMAL OVERLOAD)
D	DIMMER SWITCH
EP	EXPLOSION PROOF SWITCH
MC	MOMENTARY CONTACT SWITCH
OS	OCCUPANCY SENSOR
P	SWITCH with ILLUMINATED HAND (LOAD OFF)
PI	SWITCH with PILOT LOGHT (LOAD ON)
VS	VARIABLE SPEED SWITCH
OS, (VS)	OCCUPANCY SENSOR (VACANCY SENSOR)
A	UPPER CASE DESIGNATES TYPE
a	SUBSCRIPT INDICATES SWITCH LEG
	PUSHBUTTON
EPO	EMERGENCY POWER OFF
PAD	POWER ASSIST DOOR
OHD	OVERHEAD DOOR
x	LIGHTING CONTACTOR (REFERENCE SCHEDULE)
P	PHOTOCELL CONTROL
TC	TIMECLOCK

RACEWAYS

SYMBOL	DESCRIPTION
	CONDUIT
UG	CONDUIT, UNDERGROUND(UG) OR UNDERFLOOR(UF)
	J-HOOK SYSTEM
	CABLE TRAY
PB	PULL BOX
	INDICATES DEMOLITION
OR	CONDUIT TURNED DOWN OR UP
	FLEXIBLE CONNECTION
	BUSHED CONDUIT
OR	CONDUIT CAP OR BUSHED CONDUIT WITH CONDUCTOR
	SEAL-OFF
OR	JUNCTION BOX, WALL OR CEILING MOUNTED (FLOOR MOUNTED)

ONE-LINE DIAGRAM SYMBOLS

SYMBOL	DESCRIPTION
	DISCONNECT SWITCH
	DISCONNECT SWITCH, FUSED
	CIRCUIT BREAKER
	FUSE
	GROUND
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	WEATHERHEAD
1	SHORT CIRCUIT CURRENT NODE
	CONTACT, NORMALLY OPEN
	CONTACT, NORMALLY CLOSED
LB, NLB	TERMINATIONS LOAD BREAK NO LOAD BREAK
#	ANSI PROTECTIVE DEVICE
	DRAW-OUT DEVICE
OR F	DISCONNECT SWITCH, F INDICATES FUSED
CB	ENCLOSED CIRCUIT BREAKER
VFD	VARIABLE FREQUENCY DRIVE
T, #	TRANSFORMER
T	PAD MOUNTED TRANSFORMER
A	PANELBOARD
DM	DIGITAL METER
VS	VOLTMETER TEST SWITCH
AS	AMMETER TEST SWITCH
V	VOLTMETER
A	AMMETER
	FEEDER REFERENCE
E	ENGINE GENERATOR
ATS, MTS	TRANSFER SWITCH AUTOMATIC MANUAL
GFP	GROUND FAULT PROTECTION
SPD-x	SURGE PROTECTIVE DEVICE (REFERENCE SCHEDULE)
EGAP	ENGINE GENERATOR ANNUNCIATOR PANEL
M	METER
	COMBINATION STARTER/DISCONNECT
	MOTOR STARTER
M	MOTOR
	EQUIPMENT ENCLOSURE

ELECTRICAL DRAWING INDEX

ABBREVIATIONS

A	AMPERES	NIC	NOT IN CONTRACT
ac	ABOVE COUNTER	NTS	NOT TO SCALE
AFF	ABOVE FINISHED FLOOR	(N)	NEW
AFG	ABOVE FINISHED GRADE	NC	NORMALLY CLOSED
ATS	AUTOMATIC TRANSFER SWITCH	NO	NORMALLY OPEN
BFG	BELOW FINISHED GRADE	NL	NIGHT LIGHT
C	CONDUIT	OC	ON CENTER
CATV	CABLE TELEVISION	OHD	OVERHEAD DOOR
CCTV	CLOSED CIRCUIT TELEVISION	OHP	OVERHEAD PROJECTOR
CB	CIRCUIT BREAKER	PVC	POLY VINYL CHLORIDE
(D)	DEMOLISH & REMOVE	(R)	RELOCATED
(E)	EXISTING	(RR)	REMOVE & RELOCATE
E/G	ENGINE GENERATOR	RAF	RAISED ACCESS FLOOR
EM	EMERGENCY	RMC	RIGID METAL (STEEL) CONDUIT
EMT	ELECTRICAL METALLIC TUBING	RGS	RIGID GALVANIZED STEEL CONDUIT
EP	EXPLOSION PROOF	SB	STAND-BY
EWC	ELECTRIC WATER COOLER	SPD	SURGE PROTECTIVE DEVICE
(F)	FUTURE	TP	TAMPER PROOF
FA	FIRE ALARM	TYP	TYPICAL
G	GROUND	UF	UNDER FLOOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	UG	UNDER GROUND
GFI	GROUND FAULT INDICATION	UNO	UNLESS NOTED OTHERWISE
GFP	GROUND FAULT PROTECTION	UPS	UNINTERRUPTABLE POWER SUPPLY
HOA	HAND "OFF" AUTOMATIC	V	VOLTS
IG	ISOLATED GROUND	VA	VOLTS AMPERES
KVA	KILOVOLT AMPERES	VFD	VARIABLE FREQUENCY DRIVE
KW	KILOWATTS	W/	WITH
MCB	MAIN CIRCUIT BREAKER	W/O	WITHOUT
MCC	MOTOR CONTROL CENTER	WG	WIREGUARD
MLO	MAIN LUGS ONLY	WP	WEATHER PROOF
MV	MEDIUM VOLTAGE	XFMR	TRANSFORMER

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UNIVERSITY OF COLORADO DENVER
LAWRENCE STREET CENTER
1380 LAWRENCE STREET, DENVER, CO 80204
PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

SBEC Project #:	220016
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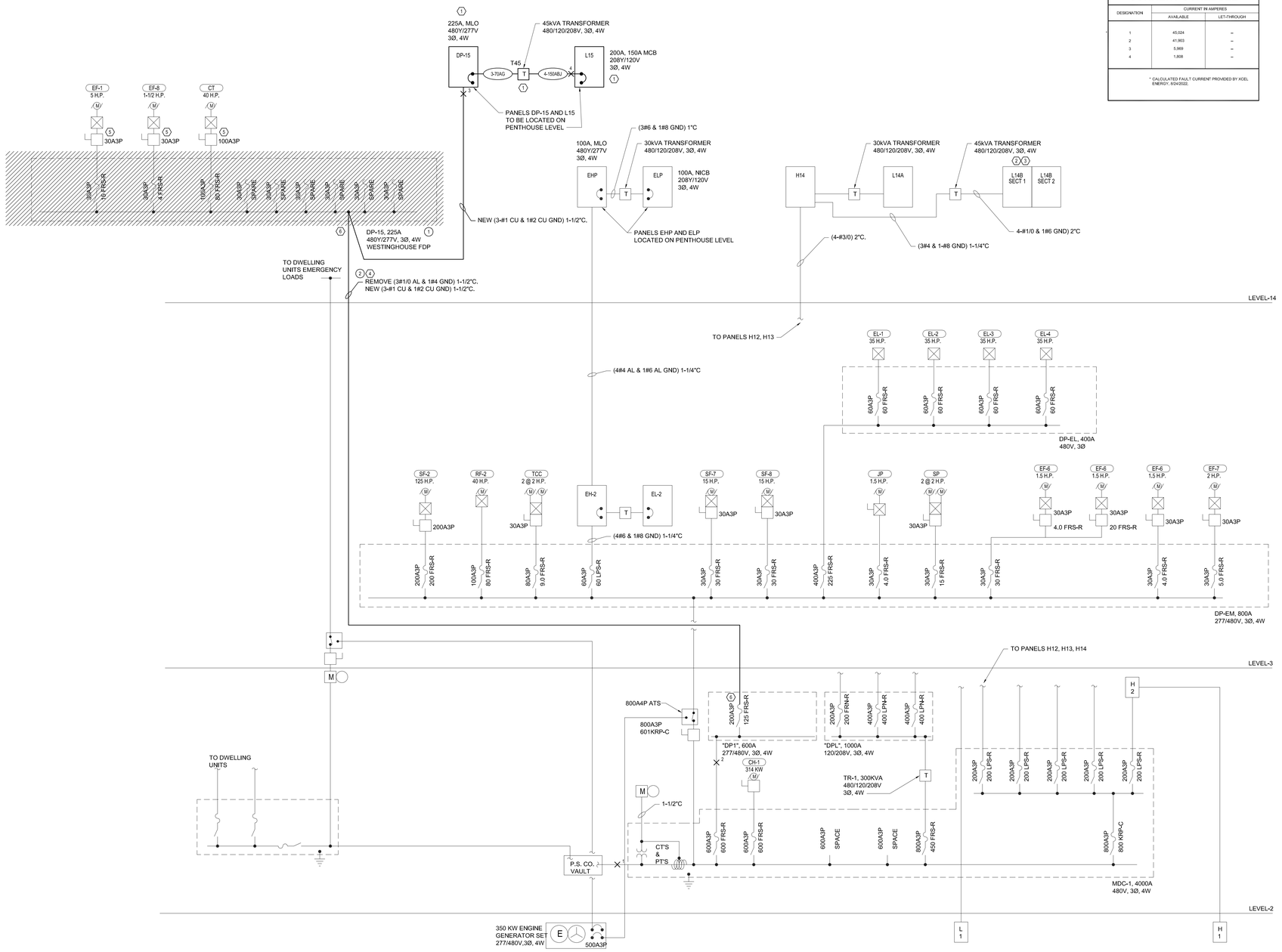
Drawn By:	TMH/ORP
Designed By:	AB
Checked By:	JE

Issued For:	Date:
RE-ISSUED BID DOCS.	07/13/2023

ELECTRICAL LEGENDS AND GENERAL NOTES

E-001

THE ORIGINAL OF THIS DRAWING IS 30" X 42". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED.



PARTIAL ELECTRICAL ONE-LINE DIAGRAM

SCALE: NONE

SHORT CIRCUIT CURRENT SCHEDULE

DESIGNATION	CURRENT IN AMPERES	
	AVAILABLE	LET-THROUGH
1	45,024	--
2	41,903	--
3	5,969	--
4	1,808	--

* CALCULATED FAULT CURRENT PROVIDED BY XCEL ENERGY, 6/24/2022.

GENERAL NOTES

1. FOR GENERAL NOTES, REFER TO SHEET E-001.

KEY NOTES - DEMOLITION

(1) ALTERNATE #1: REMOVE PANEL "DP-15". PROTECT ALL EXISTING BRANCH CIRCUITS AND FEEDER CONDUCTORS AND CONDUITS.

(2) ALTERNATE #3: REMOVE EXISTING ALUMINUM CONDUCTORS. PROTECT EXISTING CONDUIT FOR RE-USE.

KEY NOTES - NEW WORK

(1) ALTERNATE #1: PROVIDE NEW 480Y/277V, 3-PHASE, 4-WIRE 225A PANELBOARD "DP-15", 45KVA TRANSFORMER, AND 208Y/120V, 3-PHASE, 4-WIRE PANEL "L15". SEE PANEL SCHEDULES FOR BRANCH CIRCUIT BREAKER SIZES AND QUANTITIES. PROVIDE SHARK 100 MULTIFUNCTION METER, MOUNT ON NEW PANELBOARD. RECONNECT EXISTING FEEDERS AND BRANCH CIRCUITRY TO NEW PANEL IN THE SAME CIRCUITS. REWORK CONDUIT AND WIRING AS REQUIRED.

(2) BRANCH CIRCUIT WORK, THIS CONTRACT.

(3) PROVIDE 30-DAY METERING USING A DIGITAL RECORDING METER. THE METERING DEVICE SHALL RECORD VOLTAGE AND AMPERAGE FOR EACH PHASE, NEUTRAL AMPERAGE, AS WELL AS TOTAL KW DEMAND AND AVERAGE POWER FACTOR AT 15-MINUTE INTERVALS. THE REPORT DATA SHALL BE SUBMITTED IN XLSX FORMAT AND ORGANIZED IN A TABLE WITH THE DATE/TIME FOR EACH ROW AND ELECTRICAL DATA VALUES UNDER EACH COLUMN DESCRIPTION. AFTER 7 DAYS, DOWNLOAD THE INITIAL DATA AND SUBMIT A PRELIMINARY METERING REPORT TO THE ENGINEER FOR REVIEW. AFTER 30 TOTAL DAYS, DOWNLOAD THE DATA, COMBINE THE 7-DAY AND 23-DAY REPORT DATA AS NECESSARY, AND SUBMIT THE FULL 30-DAY METERING REPORT THE ENGINEER.

(4) ALTERNATE #3: PROVIDE NEW COPPER CONDUCTORS IN EXISTING CONDUIT AS SHOWN.

(5) EXTEND TO NEW PANELBOARD.

(6) BASE BID: DISCONNECT EXISTING ALUMINUM CONDUCTORS AND CLEAN WITH WIRE BRUSH. APPLY LISTED OXIDE INHIBITING COMPOUND. RE-TERMINATE CONDUCTORS AND TORQUE TO MANUFACTURER RECOMMENDED VALUE.

LOAD SUMMARY SCHEDULE-MDC-1

LAST 12 MONTHS MAXIMUM DEMAND FROM UTILITY 8-17-2022 TO 9-16-2022	=	420.0	KW
ASSUMED POWER FACTOR	=	0.8	PF
APPARENT POWER	=	525.0	KVA
EXISTING ELECTRICAL LOAD WITH 125% EXISTING LOAD FACTOR APPLIED (PER NEC 220.87)	=	656.3	KVA
LOAD REMOVED			
	=	0.0	KVA
TOTAL LOAD REMOVED	=	0.0	KVA
LOAD ADDED			
BOILER PUMPS	=	4.7	KVA
LARGEST MOTOR 25% DEMAND [BP1A]	=	0.3	KVA
TOTAL LOAD ADDED	=	5.0	KVA
NET LOAD CHANGED	=	5.0	KVA
TOTAL NEC LOAD	=	661.3	KVA
AT 480 VOLTS 3 PHASE		795	AMPERES

AVAILABLE CAPACITY	=	4,000	A
CALCULATED LOAD	=	795	A
REMAINING CAPACITY	=	3,205	A 80.1%

NOTE:

EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:

THIS WORK SHOWN AS EXISTING CONDITIONS WAS TAKEN FROM OWNER FURNISHED DRAWINGS BY SHAFFER BAUCOM ENGINEERING & CONSULTING, (SBEC) IS NOT RESPONSIBLE FOR THE ACCURACY OF ANY INFORMATION OR THE ADEQUACY, SAFETY AND CONFORMANCE TO CURRENT PREVAILING CODES OF ANY WORK SHOWN AS EXISTING ON THE DOCUMENTS.

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ELECTRICAL ONE-LINE DIAGRAM

E-002

PANELBOARD: L15 NOTE 1

MANUFACTURER AND TYPE: SQUARE D NQ
X NEW
EXISTING
BUS RATING = 225 AMPERES
AIC RATING = 10,000 AMPERES
VOLTAGE = 208 Y/120V, 3 PHASE, 4 WIRE

X NEUTRAL
X GROUND
X MAIN CB
MLO
X SURFACE

TVSS
ISO-GROUND
RATING: 150 AMPERES
RECESSED

TYP	VA	LOAD DESCRIPTION	P	CB	CCT	PH	CCT	CB	P	LOAD DESCRIPTION	VA	TYP	
		SPARE	3	20	1	A	2	20	1	SPARE			
		--			3	B	4	20	1	SPARE			
		--			5	C	6	20	1	SPARE			
		SPARE	1	20	7	A	8	20	1	SPARE			
		SPARE	1	20	9	B	10	20	1	SPARE			
		SPARE	1	20	11	C	12	20	1	SPARE			
		SPARE	1	20	13	A	14	20	1	SPARE			
		SPARE	1	20	15	B	16	20	1	BP-1A	1180	M	2
		SPARE	1	20	17	C	18	20	1	BP-1B	1180	M	2
		SPARE	1	20	19	A	20	20	1	BP-2A	1180	M	2
		SPARE	1	20	21	B	22	20	1	BP-2B	1180	M	2
		SPARE	1	20	23	C	24	20		SPARE			
		SPARE	3	20	25	A	26	20	3	SPARE			
		--			27	B	28			--			
		--			29	C	30			--			
		SPARE	1	20	31	A	32			SPACE			
		SPARE	1	20	33	B	34			SPACE			
		SPARE	1	20	35	C	36			SPACE			
		SPARE	1	20	37	A	38			SPACE			
		SPARE	1	20	39	B	40			SPACE			
		SPARE	1	20	41	C	42			SPACE			

CONNECTED LOAD
A = 1,180 VA
PHASE A TO B = 50 %
LOADING B = 2,360 VA
AND B TO C = 50 %
BALANCE C = 1,180 VA
C TO A = 100 %

LOAD TYPE
E = EQUIPMENT
H = HEATING
K = KITCHEN EQUIPMENT
L = LIGHTING
M = MOTOR
P = PANELBOARD
R = RECEPTACLE
T = TRANSFORMER

		CONNECTED (VA)	DEMAND FACTOR	DEMAND LOAD (VA)	NEC DEMAND	NEC DEMAND LOAD (VA)
LIGHTING (L)		-	1,0	-	1,25	-
REC (R)	1st 10 KVA	-	1,0	-	1,0	-
	REMAINING	-	1,0	-	0,5	-
LARGEST MOTORS (M)		1,180	1,0	1,180	1,25	1,475
REMAINING MOTORS (M)		3,540	1,0	3,540	1,0	3,540
EQUIPMENT (E)		-	1,0	-	1,0	-
HEATING (H)		-	1,0	-	1,25	-
KITCHEN (K)		-	1,0	-	1,00	-
PANEL and/or XFMR (P)(T)		-	1,0	-	1,0	-
TOTAL		4,720		4,720		5,015

NEC DEMAND LOAD = 14 A
SPARE CAPACITY = 111 A 88.9 %
TOTAL AVAILABLE = 125 A

NOTES:
1. PRICE PANELBOARD REPLACEMENT AS ALTERNATE #1.
2. ALTERNATE #1: NEW LOAD ON NEW CIRCUIT BREAKERS.

PANELBOARD: H14 (NOTE 1)

MANUFACTURER AND TYPE: WESTINGHOUSE
NEW
X EXISTING
BUS RATING = 225 AMPERES
AIC RATING = 14,000 AMPERES
VOLTAGE = 480 Y/ 277V, 3 PHASE, 4 WIRE

X NEUTRAL
X GROUND
MAIN CB
X MLO
X SURFACE

TVSS
ISO-GROUND
RATING: AMPERES
RECESSED

TYP	VA	LOAD DESCRIPTION	P	CB	CCT	PH	CCT	CB	P	LOAD DESCRIPTION	VA	TYP
L	4400	CORE RR LTG	1	20	1	A	2	20	1	LTG	4400	L
L	4400	LTG	1	20	3	B	4	20	1	LTG	4400	L
L	4400	LTG	1	20	5	C	6	20	1	LTG	4400	L
L	4400	LTG	1	20	7	A	8	50	3	PANEL "L14A"	30000	P
L	4400	LTG	1	20	9	B	10			--		
		SPARE	1	20	11	C	12			--		
H	13000	HEAT PUMP	3	20	13	A	14			SPACE		
		--			15	B	16			SPACE		
		--			17	C	18			SPACE		
		SPACE			19	A	20	70	3	PANEL "L14B"	22975	P
		SPACE			21	B	22			--		
		SPACE			23	C	24			--		
		SPACE			25	A	26			SPACE		
		SPACE			27	B	28			SPACE		
		SPACE			29	C	30			SPACE		
		SPACE			31	A	32			SPACE		

CONNECTED LOAD
A = 35,192 VA
PHASE A TO B = 100 %
LOADING B = 35,192 VA
AND B TO C = 87 %
BALANCE C = 30,792 VA
C TO A = 87 %

LOAD TYPE
E = EQUIPMENT
H = HEATING
K = KITCHEN EQUIPMENT
L = LIGHTING
M = MOTOR
P = PANELBOARD
R = RECEPTACLE
T = TRANSFORMER

		CONNECTED (VA)	DEMAND FACTOR	DEMAND LOAD (VA)	NEC DEMAND	NEC DEMAND LOAD (VA)
LIGHTING (L)		35,200	1,0	35,200	1,25	44,000
REC (R)	1st 10 KVA	-	1,0	-	1,0	-
	REMAINING	-	1,0	-	0,5	-
LARGEST MOTORS (M)		-	1,0	-	1,25	-
REMAINING MOTORS (M)		-	1,0	-	1,0	-
EQUIPMENT (E)		-	1,0	-	1,0	-
HEATING (H)		13,000	1,0	13,000	1,25	16,250
KITCHEN (K)		-	1,0	-	1,00	-
PANEL and/or XFMR (P)(T)		52,975	1,0	52,975	1,0	52,975
TOTAL		101,175		101,175		113,225

NEC DEMAND LOAD = 136 A
SPARE CAPACITY = NOTE 1 A -103.3 %
TOTAL AVAILABLE = 67 A

NOTES:
1. PANELBOARD TO BE METERED FOR LOAD JUSTIFICATION AS PART OF BASE BID. IF ALTERNATE #1 IS ACCEPTED, THEN NO NEW LOAD ADDED.

PANELBOARD: DP-15, NOTE 1

MANUFACTURER AND TYPE: SQUARE D NF
X NEW
EXISTING
BUS RATING = 225 AMPERES
AIC RATING = 14,000 AMPERES
VOLTAGE = 480 Y/ 277V, 3 PHASE, 4 WIRE

X NEUTRAL
X GROUND
MAIN CB
X MLO
X SURFACE

TVSS
ISO-GROUND
RATING: AMPERES
RECESSED

TYP	VA	LOAD DESCRIPTION	P	CB	CCT	PH	CCT	CB	P	LOAD DESCRIPTION	VA	TYP	
2	M 6320	EF-1	3	15	1	A	2	70	3	PANEL "L15"	5015	P	
		--			3	B	4			--			
		--			5	C	6			--			
2	M 2490	EF-8	3	15	7	A	8	30	3	SPARE			
		--			9	B	10			--			
		--			11	C	12			--			
2	M 43230	CT COOLING TOWER	3	80	13	A	14	30	3	SPARE			
		--			15	B	16			--			
		--			17	C	18			--			
		SPARE	3	15	19	A	20	20	3	SPARE			
		--			21	B	22			--			
		--			23	C	24			--			
		SPARE	3	15	25	A	26	20	3	SPARE			
		--			27	B	28			--			
		--			29	C	30			--			
		SPARE	1	20	31	A	32	30	3	SPARE			
		SPARE	1	20	33	B	34			--			
		SPARE	1	20	35	C	36			--			
		SPARE	3	30	37	A	38	30	3	SPARE			
		--			39	B	40			--			
		--			41	C	42			--			

CONNECTED LOAD
A = 19,018 VA
PHASE A TO B = 100 %
LOADING B = 19,018 VA
AND B TO C = 100 %
BALANCE C = 19,018 VA
C TO A = 100 %

LOAD TYPE
E = EQUIPMENT
H = HEATING
K = KITCHEN EQUIPMENT
L = LIGHTING
M = MOTOR
P = PANELBOARD
R = RECEPTACLE
T = TRANSFORMER

		CONNECTED (VA)	DEMAND FACTOR	DEMAND LOAD (VA)	NEC DEMAND	NEC DEMAND LOAD (VA)
LIGHTING (L)		-	1,0	-	1,25	-
REC (R)	1st 10 KVA	-	1,0	-	1,0	-
	REMAINING	-	1,0	-	0,5	-
LARGEST MOTORS (M)		43,230	1,0	43,230	1,25	54,038
REMAINING MOTORS (M)		8,810	1,0	8,810	1,0	8,810
EQUIPMENT (E)		-	1,0	-	1,0	-
HEATING (H)		-	1,0	-	1,25	-
KITCHEN (K)		-	1,0	-	1,00	-
PANEL and/or XFMR (P)(T)		5,015	1,0	5,015	1,0	5,015
TOTAL		57,055		57,055		67,863

NEC DEMAND LOAD = 82 A
SPARE CAPACITY = 43 A 34.7 %
TOTAL AVAILABLE = 125 A

NOTES:
1. PRICE AS ALTERNATE #1.
2.CIRCUIT EXTENDED TO NEW LOCATION OF PANELBOARD.

EQUIPMENT SCHEDULE

DESIGNATION	DESCRIPTION	ELECTRICAL CHARACTERISTICS						LOCAL DISCONNECT		BRANCH CIRCUIT OR FEEDER	PANELBOARD/ DISTRIBUTION BOARD	REMARKS
		HP	KVA	FLA	MCA	VOLTAGE	PHASE	SWITCH	FUSE			
BP-1A	BOILER PUMP	1/2	1,18	9,8	--	120	1	SMTO	--	2-20AG	L14B	1
BP-1B	BOILER PUMP	1/2	1,18	9,8	--	120	1	SMTO	--	2-20AG	L14B	1
BP-2A	BOILER PUMP	1/2	1,18	9,8	--	120	1	SMTO	--	2-20AG	L14B	1
BP-2B	BOILER PUMP	1/2	1,18	9,8	--	120	1	SMTO	--	2-20AG	L14B	1

GENERAL REMARKS:

A VERIFY THE INFORMATION SCHEDULED WITH MECHANICAL CONTRACTOR AND SUBMITTALS, INFORM DESIGN TEAM OF ANY DEVIATION.

B COORDINATE LOCATION OF POINTS OF CONNECTION WITH EQUIPMENT SUPPLIED PRIOR TO ROUGH-IN.

C PROVIDE APPROPRIATE NEMA RATED ENCLOSURE BASED UPON THE LOCATION OF ELECTRICAL COMPONENTS.

SPECIFIC REMARKS:

1 BASE BID: EQUIPMENT TO BE FED FROM PANELBOARD L14B. ALTERNATE #1: EQUIPMENT TO BE FED FROM NEW PANELBOARD L15.

THREE PHASE DRY-TYPE TRANSFORMER SCHEDULE

XFMR DESIGNATION	XFMR CAPACITY kVA	PRIMARY				SECONDARY				GROUNDING ELECTRODE CONDUCTOR	REMARKS
		VOLTS	FLA	OCP	FEEDER	VOLTS	FLA	OCP	FEEDER		
T45	45	480Δ	54	70A	3-70AG	208Y/120V	125	150A	4-150ABJ	6GEC	1,2,3

GENERAL REMARKS:

A FOUR (4) INCH HIGH CONCRETE BASE SHALL EXTEND 2 INCHES BEYOND ACTUAL FOOTPRINT OF FLOOR MOUNTED TRANSFORMERS.

SPECIFIC REMARKS:

1 COPPER COIL WINDINGS.

2 115 DEG C RISE ABOVE 40 DEG C AMBIENT TEMPERATURE INSULATION CLASS.

3 EQUIPMENT IS PART OF ALTERNATE #1

PANELBOARD: L14B NOTES 1,2

MANUFACTURER AND TYPE: SQUARE D PRL-A
NEW
X EXISTING
BUS RATING = 225 AMPERES
AIC RATING = 10,000 AMPERES
VOLTAGE = 208 Y/120V, 3 PHASE, 4 WIRE

X NEUTRAL
X GROUND
X MAIN CB
MLO
X SURFACE

TVSS
ISO-GROUND
RATING: 150 AMPERES
RECESSED

TYP	VA	LOAD DESCRIPTION	P	CB	CCT	PH	CCT	CB	P	LOAD DESCRIPTION	VA	TYP	
		SPARE	1	20	1	A	2	20	1	FURNITURE SYSTEM	720	R	
		SPARE	1	20	3	B	4	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	5	C	6	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	7	A	8	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	9	B	10	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	11	C	12	20	1	FURNITURE SYSTEM	720	R	
R	720	OFFICE LW 1441	1	20	13	A	14	20	1	FURNITURE SYSTEM	720	R	
R	720	OFFICE LW 1442	1	20	15	B	16	20	1	FURNITURE SYSTEM	720	R	
R	720	OFFICE LW 1443	1	20	17	C	18	20	1	FURNITURE SYSTEM	720	R	
		SPARE	1	20	19	A	20	20	1	BP-1A	1180	M	3
		SPARE	1	20	21	B	22	20	1	BP-1B	1180	M	3
R	2160	FURNITURE SYSTEM	3	20	23	C	24	20	1	BP-2A	1180	M	3
		--			25	A	26	20	1	BP-2B	1180	M	3
		--			27	B	28	20	1	SPARE			
		SPARE	1	20	29	C	30	20	1	SPARE			
R	720	FURNITURE SYSTEM	1	20	31	A	32	20	1	SPARE			
R	720	FURNITURE SYSTEM	1	20	33	B	34	20	1	SPARE			
R	720	FURNITURE SYSTEM	1	20	35	C	36	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	37	A	38	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	39	B	40	20	1	FURNITURE SYSTEM	720	R	
R	720	FURNITURE SYSTEM	1	20	41	C	42	20	1	SPARE			

TYP	VA	LOAD DESCRIPTION	P	CB	CCT	PH	CCT	CB	P	LOAD DESCRIPTION	VA	TYP	
		SPARE	1	20	43	A	44	20	1	SPARE			
		SPARE	1	20	45	B	46	20	1	SPARE			
		SPARE	1	20	47	C	48	20	1	SPARE			
		SPARE	1	20	49	A	50	20	1	FURNITURE SYSTEM	720	R	
		SPARE	1	20	51	B	52	20	1	FURNITURE SYSTEM	720	R	
		SPARE	1	20	53	C	54	20	1	FURNITURE SYSTEM	720	R	
		SPARE	2	20	55	A	56	20	1	SPARE			
		--			57	B	58	20	1	SPARE			
		SPARE	1	30	59	C	60	20	1	AIR COMPRESSOR	1800	E	
					61	A	62						
					63	B	64						
					65	C	66						
					67	A	68						
					69	B	70						
					71	C	72						
					73	A	74						
					75	B	76						
					77	C	78						
					79	A	80						
					81	B	82						
					83	C	84						

CONNECTED LOAD
A = 9,560 VA
PHASE A TO B = 88 %
LOADING B = 8,380 VA
AND B TO C = 77 %
BALANCE C = 10,900 VA
C TO A = 88 %

LOAD TYPE
E = EQUIPMENT
H = HEATING
K = KITCHEN EQUIPMENT
L = LIGHTING
M = MOTOR
P = PANELBOARD
R = RECEPTACLE
T = TRANSFORMER

		CONNECTED (VA)	DEMAND FACTOR	DEMAND LOAD (VA)	NEC DEMAND	NEC DEMAND LOAD (VA)
LIGHTING (L)		-	1,0	-	1,25	-
REC (R)	1st 10 KVA	10,000	1,0	10,000	1,0	10,000
	REMAINING	12,320	1,0	12,320	0,5	6,160
LARGEST MOTORS (M)		1,180	1,0	1,180	1,25	1,475
REMAINING MOTORS (M)		3,540	1,0	3,540	1,0	3,540
EQUIPMENT (E)		1,800	1,0	1,800	1,0	1,800
HEATING (H)		-	1,0	-	1,25	-
KITCHEN (K)		-	1,0	-	1,00	-
PANEL and/or XFMR (P)(T)		-	1,0	-	1,0	-
TOTAL (SECTIONS 1 AND 2)		28,840		28,840		22,975

NEC DEMAND LOAD = 64 A
SPARE CAPACITY = 60 A 48,6 %
TOTAL AVAILABLE = 124 A

NOTES:
1. PANELBOARD TO BE METERED FOR LOAD JUSTIFICATION
2. PANELBOARD L14B IS IN TWO 30-BREAKER SECTIONS.
3. BASE BID: NEW LOAD ON EXISTING CIRCUIT BREAKER. IF ALTERNATE #1 IS ACCEPTED, EXISTING CIRCUIT BREAKER TO REMAIN.

NOTE:

EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:
THIS WORK SHOWN AS EXISTING CONDITIONS WAS TAKEN FROM OWNER FURNISHED DRAWINGS BY SHAFFER BAUCOM ENGINEERING & CONSULTING, (SBEC) IS NOT RESPONSIBLE FOR THE ACCURACY OF ANY INFORMATION OR THE ADEQUACY, SAFETY AND CONFORMANCE TO CURRENT PREVAILING CODES OF ANY WORK SHOWN AS EXISTING ON THE DOCUMENTS.

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UNIVERSITY OF COLORADO DENVER
LAWRENCE STREET CENTER
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PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

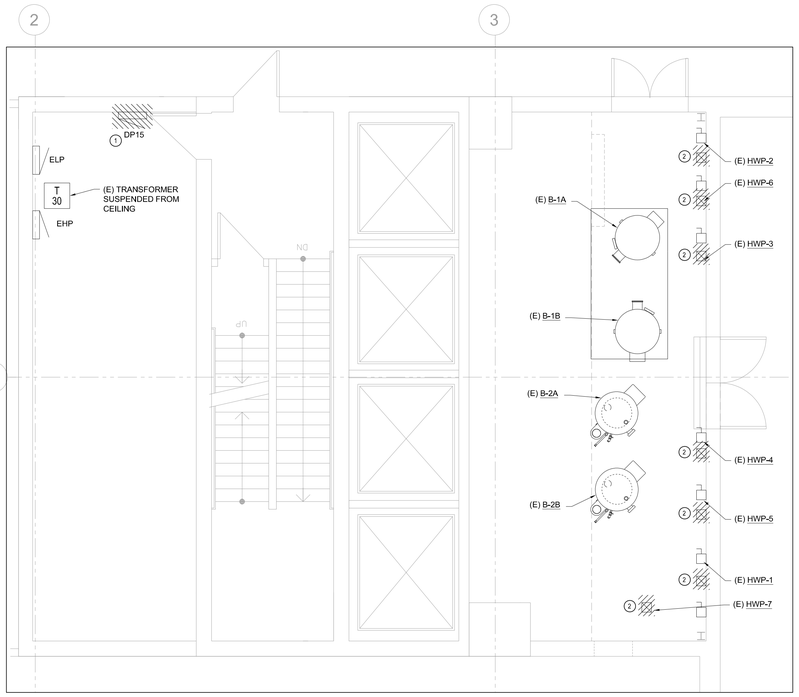
SBEC Project #: 220016
Scale: AS SHOWN
Drawn By: TMH/DRP
Designed By: AB
Checked By: JE

Issued For: Date:
RE-ISSUED BID DOCS. 07/13/2023

ELECTRICAL SCHEDULES

E-003

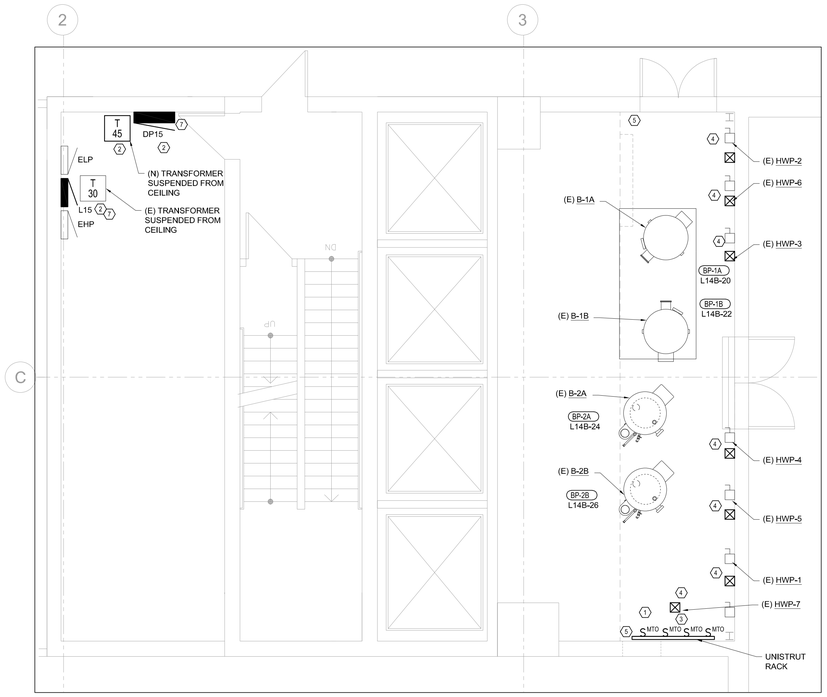
THE ORIGINAL OF THIS DRAWING IS 30" X 42". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED.



1 ENLARGED MECHANICAL ROOM ELECTRICAL PLANS - DEMOLITION

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

NORTH



2 ENLARGED MECHANICAL ROOM ELECTRICAL PLANS - NEW WORK

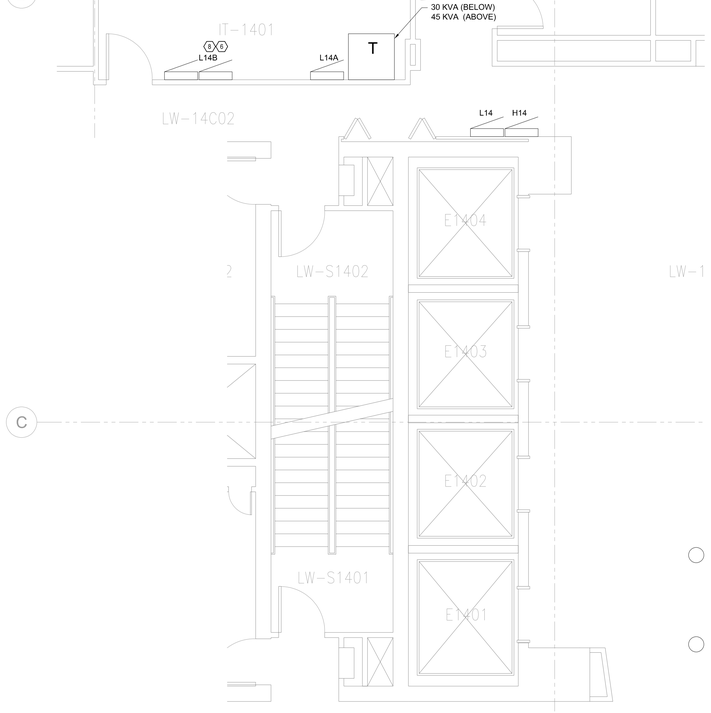
SCALE: 1/4" = 1'-0"

NORTH

NOTE:

CONTRACTOR SHALL LOCATE THE FLOOR POST TENSION STEEL TENDONS AND OTHER REINFORCING PRIOR TO SAW CUTTING, CORING, OR DRILLING INTO CONCRETE FLOORS. UTILIZE CONVENTIONAL X-RAY METHOD FOR ABOVE GRADE (ACCESS TO BOTH SIDES OF FLOOR) AND THE IMPULSE RADAR INSTRUMENT FOR ON GRADE APPLICATIONS (ACCESS TO ONLY ONE SIDE OF FLOOR.) COSTS FOR X-RAY OR IMPULSE RADAR INSTRUMENTATION TESTING SHALL BE BOURNE BY THE CONTRACTOR. CONTRACTOR SHALL SCHEDULE ALL X-RAY WORK AFTER BUILDING WORK HOURS AND EVACUATE BUILDING OCCUPANTS TO A SAFE DISTANCE.

REVIEW THE RESULTS WITH THE OWNER TO DETERMINE ACCEPTABLE LOCATIONS FOR SAW CUTTING, CORING, AND PATCHING, AND OBTAIN WRITTEN APPROVAL PRIOR TO WORK.



3 ENLARGED 14TH FLOOR ELECTRICAL PLAN - NEW WORK

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

NORTH

GENERAL NOTES

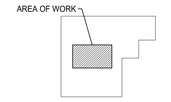
1. FOR GENERAL NOTES, REFER TO SHEET E-001.

KEY NOTES - DEMOLITION

1. ALTERNATE #1: REMOVE PANEL "DP-15". PROTECT ALL EXISTING BRANCH CIRCUITS AND FEEDER CONDUCTORS AND CONDUITS.
2. ALTERNATE #2: REMOVE EXISTING HOT WATER PUMP MOTOR STARTER, TYPICAL OF 7.

KEY NOTES - NEW WORK

1. PROVIDE NEW UNISTRUT RACK FOR MOUNTING NEW DISCONNECTS. RACK TO EXTEND PAST STEEL BEAM TO PROVIDE ACCESSIBLE MOUNTING OF DISCONNECTS.
2. ALTERNATE #1: PROVIDE NEW 480V/277, 3-PHASE, 4-WIRE 225A PANELBOARD "DP-15", 45kVA TRANSFORMER; SUSPENDED ABOVE LADDER RACK, AND 208V/120, 3-PHASE, 4-WIRE 150A PANELBOARD "L15", SEE PANEL SCHEDULES FOR BRANCH CIRCUIT BREAKER SIZES AND QUANTITIES.
3. DISCONNECTS FOR BOILER PUMPS TO BE MOUNTED ON NEW UNISTRUT RACK, (TYPICAL OF 4)
4. ALTERNATE #2: PROVIDE NEW MOTOR STARTER FOR HOT WATER PUMP, MAGNETIC, FVNR WITH ENCLOSURE AND HEATER, 2 HP, SIZE 00, 480V/277V, 3-PHASE. PROVIDE PHASE MONITOR, SEE MECHANICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION. CONNECT TO EXISTING CIRCUITS, TYPICAL OF 7.
5. PROVIDE CORE DRILLS THROUGH EXISTING MASONRY WALL AS NECESSARY. PROVIDE SEALANT TO ACHIEVE A WATERTIGHT INSTALLATION AND TO MAINTAIN THE RATING OF THE WALL ASSEMBLY.
6. VERIFY CONDUIT PATHWAY FOR NEW BOILER PUMP FEEDS TO PANEL "L14B" IN IT ROOM R1401 ON 14TH FLOOR. EXTERIOR CONDUIT TO BE GALVANIZED RIGID STEEL CONDUIT, MOUNT NEW CONDUIT ON EXISTING EXTERIOR LADDER RACK WHERE POSSIBLE. COORDINATE ALL PENETRATIONS AND CONDUIT ROUTING WITH UNIVERSITY OF COLORADO DENVER PRIOR TO INSTALLATION.
7. PROVIDE DATA PORT FOR SHARK METER. COORDINATE WITH UNIVERSITY OF COLORADO DENVER INFORMATION TECHNOLOGY TO INTEGRATE METER DATA INTO NETWORK.
8. BRANCH CIRCUIT WORK- BASE BID ONLY.



KEY PLAN

NORTH

NOTE:

EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:

THIS WORK SHOWN AS EXISTING CONDITIONS WAS TAKEN FROM OWNER FURNISHED DRAWINGS BY SHAFFER BAUCOM ENGINEERING & CONSULTING, (SBEC) IS NOT RESPONSIBLE FOR THE ACCURACY OF ANY INFORMATION OR THE ADEQUACY, SAFETY AND CONFORMANCE TO CURRENT PREVAILING CODES OF ANY WORK SHOWN AS EXISTING ON THE DOCUMENTS.

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UNIVERSITY OF COLORADO DENVER
LAWRENCE STREET CENTER
1380 LAWRENCE STREET, DENVER, CO 80204
PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

SBEC Project #:	220016
Scale:	AS SHOWN
Drawn By:	TMH/DRP
Designed By:	AB
Checked By:	JE

Issued For:	Date:
RE-ISSUED BID DOCS.	07/13/2023

ENLARGED MECHANICAL ROOM ELECTRICAL PLANS

E-401

THE ORIGINAL OF THIS DRAWING IS 30" X 42". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED.

NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. ORANGE BACKGROUND WITH BLACK TEXT FOR TITLE, YELLOW BACKGROUND WITH BLACK TEXT FOR GRAPHIC SYMBOLS, REST WHITE BACKGROUND WITH RED TEXT FOR BRACKETED INFORMATION (EXCEPT THE BOTTOM RECTANGLE) AND BLACK FOR STATIC INFORMATION.
3. PROVIDE ARC FLASH CALCULATIONS FOR EACH PIECE OF ELECTRICAL DISTRIBUTION EQUIPMENT AND FILL OUT INFORMATION INDICATED BY BRACKETS OR CHECK BOXES.

⚠ WARNING 1/2"

QUALIFIED WORKERS ONLY 1/4"

ARC FLASH AND 1/4"
SHOCK HAZARD 1/4"
APPROPRIATE PPE 1/4"
REQUIRED 1/4"

WARNING: CHANGES IN ELECTRICAL DISTRIBUTION EQUIPMENT SETTINGS OR SYSTEM CONFIGURATION OR INCORRECT INFORMATION PROVIDED BY OTHERS WILL INVALIDATE THE CALCULATED VALUES AND PPE REQUIREMENTS.

Equipment: [XXXXX] 1/4"

[XX INCHES] FLASH HAZARD BOUNDARY
[XX INCHES] FLASH HAZARD CATEGORY
[XX] INCIDENT ENERGY AT WORKING DISTANCE (CAL/CM²)
[XX] FLASH RISK/HAZARD CATEGORY AT WORKING DISTANCE
[XX] VAC SHOCK HAZARD WHEN COVER IS REMOVED
[XX] GLOVE CLASS
[XX INCHES] LIMITED APPROACH
[XX INCHES] RESTRICTED APPROACH
[XX INCHES] PROHIBITED APPROACH

Fed From: [MDB] 1/4"
Overcurrent: [400A Circuit Breaker] 1/4"

[INSTALLED LOCATION LOGO]

PREPARED BY: [XXXXX]
PROJECT #: [XXXXX] DATE: [XX/XX/2013]

ARC FLASH AND SHOCK WARNING SIGN DETAIL
SCALE: NONE

1/2 INCH [EQUIPMENT DESIGNATION]
1/4 INCH [100A] [FRS-R] AMPERES
[208Y/120] VOLTS, [3] PHASE, [4] WIRE

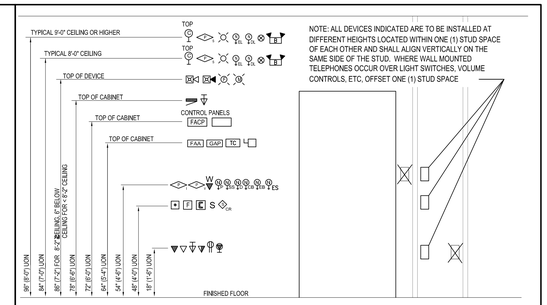
FED FROM [EQUIPMENT DESIGNATION]

[CIRCUIT NUMBER]
[10,000] A.I.C.

BRANCH CIRCUIT: [3#10, 1#10 GROUND IN 1-1/4 INCH CONDUIT]

NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNO.
2. APPLIES TO EQUIPMENT DISCONNECT SWITCHES AND FUSED DISCONNECTS.

EQUIPMENT NAMEPLATE DETAIL
SCALE: NONE



NOTE: ALL DEVICES INDICATED ARE TO BE INSTALLED AT DIFFERENT HEIGHTS LOCATED WITHIN ONE (1) STUD SPACE OF EACH OTHER AND SHALL ALIGN VERTICALLY ON THE SAME SIDE OF THE STUD. WHERE WALL MOUNTED TELEPHONES OCCUR OVER LIGHT SWITCHES, VOLUME CONTROLS, ETC., OFFSET ONE (1) STUD SPACE

NOTES:
1. HEIGHTS SHOWN ARE TYPICAL TO CENTERLINE OF BOX UNLESS NOTED OTHERWISE.
2. WHEREVER DEVICES ARE NOTED TO BE ABOVE DOORS, DEVICE SHALL BE CENTERED BETWEEN TOP OF DOOR TRIM AND CEILING LINE.
3. MOUNTING HEIGHTS SHOWN ON ARCHITECTURAL ELEVATIONS SHALL GOVERN OVER THOSE SHOWN ABOVE.
4. OUTLETS ABOVE COUNTERS SHALL BE MOUNTED 8" ABOVE COUNTER OR 4" ABOVE BACKSPLASH.
5. MOUNTING HEIGHTS SHALL COMPLY WITH ADA REQUIREMENTS.

DEVICE MOUNTING HEIGHT DETAIL
SCALE: NONE

1/2 INCH [DISTRIBUTION EQUIPMENT DESIGNATION]
3/8 INCH [ELECTRICAL SYSTEM] BRANCH

[1600] AMPERES, [3] PHASE, [4] WIRE

FED FROM [EQUIPMENT DESIGNATION]

[65,000] A.I.C.
CALCULATED AVAILABLE SHORT CIRCUIT CURRENT [46,000] AMPERES
DATE OF CALCULATION [01/01/2018]

[480Y/277] VOLTS

FEEDER: [5 SETS OF 4#400, 1#4/0 GROUND IN 3-1/2 INCH CONDUIT]

NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. APPLIES TO SWITCHBOARDS, PANELBOARDS AND BUSWAYS.
3. DEPENDING ON BUILDING TYPE AND ELECTRICAL SYSTEM CONFIGURATION, INSERT THE APPROPRIATE [ELECTRICAL SYSTEM] FROM THE FOLLOWING POSSIBLE BRANCHES: NORMAL, EQUIPMENT, CRITICAL, LIFE SAFETY, EMERGENCY, LEGALLY REQUIRED, STANDBY.

DISTRIBUTION EQUIPMENT NAMEPLATE DETAIL
SCALE: NONE

NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. WHITE LETTERS ON BLACK BACKGROUND FOR NORMAL POWER EQUIPMENT.
3. WHITE LETTERS ON RED BACKGROUND FOR EMERGENCY POWER EQUIPMENT.

1/4 INCH EQUIPMENT DESIGNATION [EF-1]

OVERCURRENT RATING [100A] [FRS-R]

FED FROM [PANELBOARD UH1A1C] IN ROOM [# OR DESIGNATION]

[CIRCUIT NUMBER]
[10,000] A.I.C.
CALCULATED AVAILABLE SHORT CIRCUIT CURRENT [4,000] AMPERES
DATE OF CALCULATION [01/01/2011]

[208Y/120] VOLTS

FEEDER OR BRANCH CIRCUIT: [3#10, 1#10 GROUND IN 1-1/4 INCH CONDUIT]
INSULATION TYPE [THWN], CONDUCTOR MATERIAL [COPPER]

NAMEPLATE DETAIL - DISCONNECT SWITCH OR ENCLOSED CIRCUIT BREAKER
SCALE: NONE

1/2 INCH [TRANSFORMER DESIGNATION]
3/8 INCH [ELECTRICAL SYSTEM] BRANCH

[112.5] KVA, [3] PHASE, [480] VOLTS [DELTA] PRI, [208Y/120] VOLTS SEC

FED FROM [EQUIPMENT DESIGNATION]

[3.0] PERCENT IMPEDANCE (% Z)
CALCULATED AVAILABLE SHORT CIRCUIT CURRENT [22,000] AMPERES
DATE OF CALCULATION [01/01/2018]

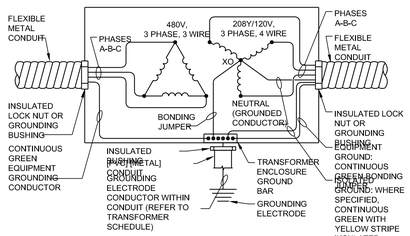
FEEDER IN: [3#2/0, 1#6 GROUND IN 2 INCH CONDUIT]

FEEDER OUT: [2 SETS OF 4#3/0, 1#2 BONDING JUMPER IN 2-1/2 INCH CONDUIT]

GROUNDING ELECTRODE CONDUCTOR: [1/0]

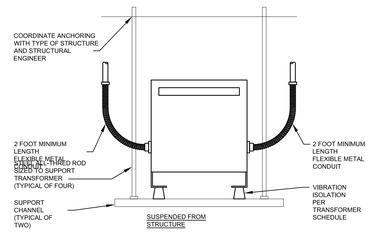
NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. DEPENDING ON BUILDING TYPE AND ELECTRICAL SYSTEM CONFIGURATION, INSERT THE APPROPRIATE [ELECTRICAL SYSTEM] FROM THE FOLLOWING POSSIBLE BRANCHES: NORMAL, EQUIPMENT, CRITICAL, LIFE SAFETY, EMERGENCY, LEGALLY REQUIRED, STANDBY.

TRANSFORMER NAMEPLATE DETAIL
SCALE: NONE



NOTE:
IF GROUNDING BUSHINGS ARE UTILIZED TO TERMINATE CONDUITS TO TRANSFORMER, THEN BOND EACH BUSHING TO TRANSFORMER ENCLOSURE GROUND BAR WITH [illegible] JUMPER.

TRANSFORMER GROUNDING DETAIL
SCALE: NONE



SUSPENDED TRANSFORMER DETAIL
SCALE: NONE

NOTES:
1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. WHITE LETTERS ON BLACK BACKGROUND FOR NORMAL POWER EQUIPMENT.
3. WHITE LETTERS ON RED BACKGROUND FOR EMERGENCY POWER EQUIPMENT.
4. MOUNT ON DISTRIBUTION BOARD NEXT TO ASSOCIATED LOAD OVERCURRENT DEVICE.

1/4 INCH EQUIPMENT DESIGNATION [AHU-1]

OVERCURRENT RATING [100A] [FRS-R]

[CIRCUIT BREAKER SETTINGS:]

[208] VOLTS

LOCATED IN ROOM [# OR DESIGNATION]

FEEDER OR BRANCH CIRCUIT: [3#4, 1#10 GROUND IN 1-1/4 INCH CONDUIT]
INSULATION TYPE [THWN] CONDUCTOR MATERIAL [COPPER]

NAMEPLATE DETAIL - LOAD ON DISTRIBUTION BOARD OR SWITCHBOARD
SCALE: NONE

1/4 INCH [PANELBOARD] - [CIRCUIT NUMBER]

DEVICE NAMEPLATE DETAIL
SCALE: NONE

NOTE:
EXISTING CONDITIONS ARE SHOWN WITH LIGHT LINE WEIGHT.

NEW WORK INCLUDED IN THIS CONTRACT IS SHOWN WITH HEAVY LINE WEIGHT.

NOTE:
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LAWRENCE STREET CENTER
1380 LAWRENCE STREET, DENVER, CO 80204
PROJECT NUMBER: 22-162936 -- BOILER RE-PIPING

SBEC Project #:	220016
Scale:	AS SHOWN
Drawn By:	TMH/DRP
Designed By:	AB
Checked By:	JE

Issued For:	Date:
RE-ISSUED BID DOCS.	07/13/2023

ELECTRICAL DETAILS

E-601