NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE, ANAHEIM, CA 92801-1819

BOILER REPLACEMENT

Bid Submittal
September 15, 2020

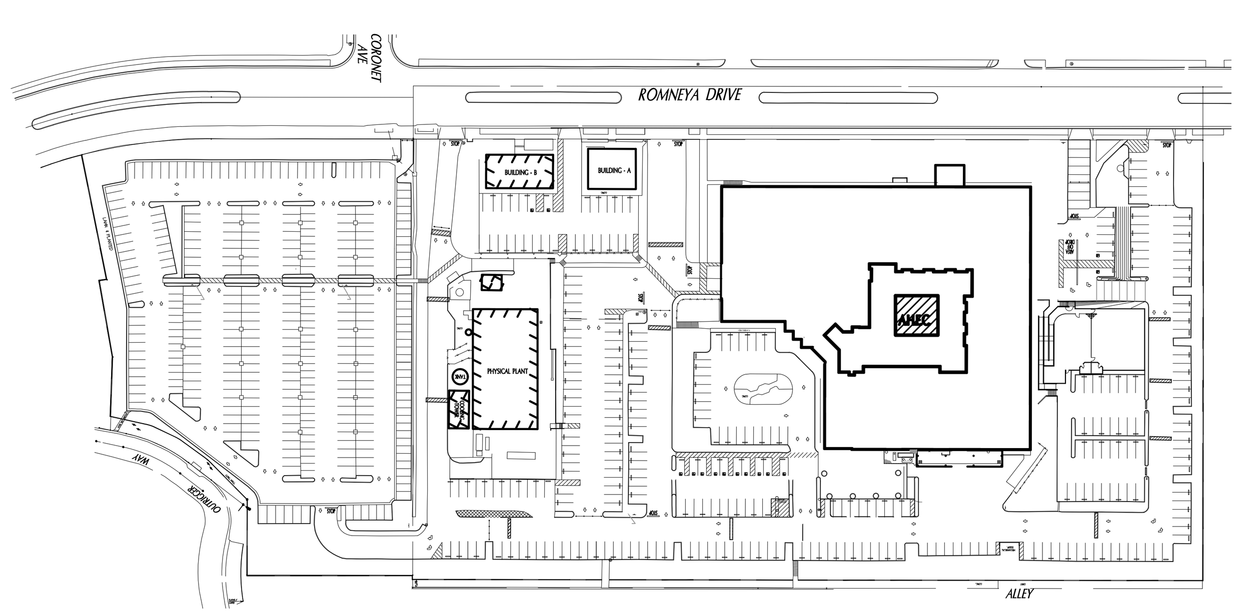
MEP
P2S Inc.
Long Beach, CA
562.497.2999

STRUCTURAL
Brandow & Johnston
Newport Beach, CA
949.862.8500

SITE MAP

LEGEND

PROJECT LOCATION



N
NOT TO SCALE

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GENERAL LEGEND

SYMBOL	DESCRIPTION
	NOTE CALLOUT
	DETAIL CALLOUT - NUMBER ON TOP DENOTES DETAIL NUMBER - NUMBER ON BOTTOM DENOTES SHEET DETAIL IS SHOWN
	MECHANICAL EQUIPMENT CALLOUT, SEE MECHANICAL PLANS FOR EXACT LOCATION AND REQUIREMENTS
	SECTION CALLOUT
	POINT OF CONNECTION
	POINT OF DISCONNECTION
	NEW LINEWORK
	EXISTING LINEWORK
	DEMOLITION LINEWORK
	DIRECTION OF FLOW
	SANITARY VENT
	DOMESTIC / INDUSTRIAL HOT WATER RETURN
	DOMESTIC / INDUSTRIAL HOT WATER SUPPLY
	DOMESTIC / INDUSTRIAL COLD WATER

CONTROL LEGEND

SYMBOLS	DESCRIPTION
XX	DDC PHYSICAL POINT
XX	SENSOR
XX	SWITCH
COMM	COMMUNICATION GATEWAY CONNECTION TO DDC
ECM	ELECTRONICALLY COMMUTATED MOTOR
VFD	VARIABLE FREQUENCY DRIVE
	ELECTRONIC 3-WAY VALVE
	ELECTRONIC 2-WAY VALVE
	ELECTRONIC BUTTERFLY VALVE
	DAMPER WITH ACTUATOR, OPPOSED BLADE
	DAMPER WITH ACTUATOR, PARALLEL BLADE
C C	COOLING COIL
H C	HEATING COIL
	AIR FILTER BANK
TS	AVERAGING AIR TEMPERATURE SENSOR
	FIELD CONTROL WIRING
	FIELD POWER WIRING

PIPING LEGEND

SYMBOL	DESCRIPTION
4" CHWR	NEW PIPING (SIZE-SERVICE)
(E) 4" CHWR	EXISTING PIPING (SIZE-SERVICE)
	DOMESTIC COLD WATER
G	LOW PRESSURE GAS
MPG	MEDIUM PRESSURE GAS
IW	INDIRECT WASTE
	ELBOW FACING AWAY FROM VIEWER
	ELBOW FACING TOWARD VIEWER
	TEE FACING AWAY FROM VIEWER
	TEE FACING TOWARD VIEWER
	PIPE CAP
	TRANSITION, ASYMMETRIC
	TRANSITION, SYMMETRIC
	EXPANSION JOINT (COMPENSATOR)
	PIPE GUIDE
	PIPE ANCHOR
	UNION, SCREWED
	DRAIN, FUNNEL
	PUMP
	BALL VALVE
	BALL VALVE W/ ACTUATOR
	BUTTERFLY VALVE
	BUTTERFLY VALVE W/ ACTUATOR
	GATE VALVE
	GATE VALVE W/ ACTUATOR
	GLOBE VALVE
	GLOBE VALVE W/ ACTUATOR
	THREE-WAY VALVE
	THREE-WAY VALVE W/ ACTUATOR
	CHECK VALVE, SWING
S	CHECK VALVE, SPRING LOADED
	MULTI-PURPOSE VALVE
	FLOW MEASURING AND BALANCING VALVE
	HOSE BIBB VALVE
	LOCK SHIELD MANUAL VALVE
	PLUG VALVE
	PRESSURE REGULATOR
	STRAINER, Y-TYPE
	STRAINER WITH HOSE CONNECTION
	PRESSURE GAUGE WITH SHUTOFF COCK
	PRESSURE GAUGE WITH SNUBBER AND SHUTOFF COCK
	SELF-SEALING PRESSURE AND TEMPERATURE TAP
	THERMOMETER
	THERMOWELL
FM	FLOW METER
FL	FLOW REGULATOR AND FLOW LIMITING VALVE
PSD	PUMP SUCTION DIFFUSER
VB	VACUUM BREAKER
	AIR VENT, AUTOMATIC
	FLEXIBLE CONNECTION
	COMBINATION FLEX-VANE STRAIGHTENER
	SAFETY OR RELIEF VALVE
T	STEAM TRAP
S	AIR SEPARATOR

ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
AAV	AUTOMATIC AIR VENT	HP	HORSEPOWER
AFF	ABOVE FINISHED FLOOR	HT	HEIGHT
AHU	AIR HANDLING UNIT	HZ	HERTZ
AL	ALUMINUM	ICW	INDUSTRIAL COLD WATER
AP	ACCESS PANEL	IN	INCHES
APD	AIRSIDE PRESSURE DROP	KW	KILOWATTS
BD	BLOWDOWN	LAT	LEAVING AIR TEMPERATURE
BDD	BACK DRAFT DAMPER	LBS	POUNDS
BFC	BELOW FINISHED CEILING	LD	LEAK DETECTOR
BFP	BACK FLOW PREVENTER	LWT	LEAVING WATER TEMPERATURE
BHP	BRAKE HORSEPOWER	MAX	MAXIMUM
BLDG	BUILDING	MBH	THOUSAND BTU PER HOUR
BOB	BOTTOM OF BEAM	MC	MECHANICAL CONTRACTOR
BOP	BOTTOM OF PIPE	MCA	MINIMUM CIRCUIT AMPS
BTU	BRITISH THERMAL UNIT	MH	MANHOLE
CFM	CUBIC FEET PER MINUTE	MIN	MINIMUM
CHWR	CHILLED WATER RETURN	MOCP	MAXIMUM OVERLOAD CIRCUIT PROTECTION
CHWS	CHILLED WATER SUPPLY	MPG	MEDIUM PRESSURE GAS
CD	CONDENSATE DRAIN	NFA	NET FREE AREA
CL	CENTER LINE	NIC	NOT IN CONTRACT
CO	CARBON MONOXIDE	NPSHR	NET POSITIVE SUCTION HEAD REQUIRED
CP	CONDENSATE PUMP	OAT	OUTSIDE AIR TEMPERATURE
CT	COOLING TOWER	OBD	OPPOSED BLADE DAMPER
CV	CONSTANT VOLUME BOX	OC	ON CENTER
CW	DOMESTIC COLD WATER	OD	OUTSIDE DIAMETER
CWR	CONDENSER WATER RETURN	OA	OUTSIDE AIR
CWS	CONDENSER WATER SUPPLY	PD	PRESSURE DROP
CWFR	CONDENSER WATER FILTER RETURN	PERF	PERFORATED
CWFS	CONDENSER WATER FILTER SUPPLY	PH	PHASE
D	DRAIN	POD	POINT OF DISCONNECT
DB	DRY BULB	PR	PRESSURE RELIEF
DEG	DEGREES	PRV	PRESSURE REDUCING VALVE
DIA	DIAMETER	PSID	POUNDS PER SQUARE INCH DIFFERENTIAL
DL	DOOR LOUVER	PSIG	POUNDS PER SQUARE INCH GAUGE
DN	DOWN	PVC	POLYVINYL CHLORIDE
DX	DIRECT EXPANSION	RA	RETURN AIR
(E)	EXISTING	RF	RETURN FAN
EA	EACH	RLA	RATED LOAD AMPS
EAT	ENTERING AIR TEMPERATURE	RPM	REVOLUTIONS PER MINUTE
EC	ELECTRICAL CONTRACTOR	SA	SUPPLY AIR
EFF	EFFICIENCY	SOV	SHUT OFF VALVE
EL	ELEVATION	SPEC	SPECIFICATION
ESP	EXTERNAL STATIC PRESSURE	SS	STAINLESS STEEL
EWT	ENTERING WATER TEMPERATURE	STD	STANDARD
°F	DEGREES FAHRENHEIT	TAD	TRANSFER AIR DUCT
FD	FIRE DAMPER	TDH	TOTAL DYNAMIC HEAD
FG	FILTER GRILLE	TEFC	TOTALLY ENCLOSED FAN COOLED
FLA	FULL LOAD AMPS	TSP	TOTAL STATIC PRESSURE
FLR	FLOOR	TYP	TYPICAL
FOB	FLAT ON BOTTOM	UC	UNDERCUT
FOT	FLAT ON TOP	TYP	TYPICAL
FPI	FINS PER INCH	V	VOLTS
FPM	FEET PER MINUTE	VAV	VARIABLE AIR VOLUME
FSD	FIRE SMOKE DAMPER	VD	VOLUME DAMPER
FT	FEET OR FOOT	VFD	VARIABLE FREQUENCY DRIVE
G	LOW PRESSURE GAS	VTR	VENT THRU ROOF
GA	GAUGE	W/	WITH
GALV	GALVANIZED	W/O	WITHOUT
GC	GENERAL CONTRACTOR	WB	WET BULB
GPH	GALLONS PER HOUR	WC	WATER COLUMN
GPM	GALLONS PER MINUTE	WG	WATER GAUGE
HB	HOSE BIBB	WHA	WATER HAMMER ARRESTOR
HD	HEAD	WPD	WATER PRESSURE DROP
HHWR	HEATING HOT WATER RETURN	WT	WEIGHT
HHWS	HEATING HOT WATER SUPPLY		
HP	HEAT PUMP		

IN THE EVENT ABBREVIATIONS NOT MENTIONED HEREIN ARE USED, REFERENCE WILL BE MADE TO ANSI Y1.1, MILITARY STANDARD ABBREVIATIONS, AND OTHER STANDARD INDUSTRY CONVENTIONS.

CONTROL ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
A	ALARM	PS	PRESSURE SWITCH
AFMS	AIRFLOW MONITORING STATION	PT	PRESSURE TRANSMITTER
AI	ANALOG INPUT	RH	RELATIVE HUMIDITY
AO	ANALOG OUTPUT	S	STATUS
CS	CURRENT SWITCH	SC	SPEED CONTROL
DI	DIGITAL INPUT	SI	SPEED INDICATOR
DO	DIGITAL OUTPUT	SP	SETPOINT
DP	DIFFERENTIAL PRESSURE	SS	START/STOP
FS	FLOW SWITCH	T	TEMPERATURE
FM	FLOW METER	TI	TEMPERATURE INDICATOR
HOA	HANDS-OFF-AUTO	VA	DAMPER/VALVE ACTUATOR
KW	KILOWATTS	VP	VELOCITY PRESSURE
LA	LEVEL ALARM	VSH	VIBRATION SWITCH
MOD	MOTOR OPERATED DAMPER	ZC	CLOSED END SWITCH
NC	NORMALLY CLOSED	ZI	POSITION INDICATOR
NO	NORMALLY OPEN	ZO	OPEN END SWITCH

IN THE EVENT ABBREVIATIONS NOT MENTIONED HEREIN ARE USED, REFERENCE WILL BE MADE TO ANSI Y1.1, MILITARY STANDARD ABBREVIATIONS, AND OTHER STANDARD INDUSTRY CONVENTIONS.

GENERAL NOTES

1. ALL WORK SHALL COMPLY WITH THE 2019 EDITIONS OF THE CALIFORNIA BUILDING, MECHANICAL, PLUMBING, AND OTHER APPLICABLE FEDERAL, STATE, OR LOCAL CODES AS ADOPTED AND ENFORCED BY THE LOCAL JURISDICTION. IN CASE THE PLANS SHOW MORE STRINGENT REQUIREMENTS, THE PLANS SHALL GOVERN THE DESIGN, YET NOTHING ON THE DESIGN DOCUMENTS SHALL BE INTERPRETED AS AUTHORITY TO VIOLATE CODE(S) OR REGULATION(S).
2. SUBMISSION OF BID IN CONNECTION WITH THIS WORK SHALL IMPLY THAT THE BIDDER HAS EXAMINED THE JOB SITE UNDER WHICH THE CONTRACTOR WILL BE OBLIGATED TO OPERATE UNDER THIS CONTRACT. NO EXTRA CHARGE WILL BE ALLOWED FOR FAILURE OF ANY BIDDER TO EXAMINE THE SITE PRIOR TO BID.
3. WHERE USED, THE TERM "PROVIDE" SHALL MEAN "FURNISH AND INSTALL".
4. IN THE EVENT OF A CONFLICT OR INCONSISTENCY BETWEEN ITEMS INDICATED ON DRAWINGS AND SPECIFICATIONS WITH CODE REQUIREMENTS, THE MORE STRINGENT STANDARD SHALL PREVAIL.
5. CARE SHALL BE EXERCISED TO MINIMIZE ANY INCONVENIENCE OR DISTURBANCE TO OTHER AREAS OF THE BUILDING WHICH ARE TO REMAIN IN OPERATION. ISOLATE WORK AREAS TO KEEP DUST AND DIRT WITHIN THE CONSTRUCTION AREA.
6. NO PIPING, EQUIPMENT, ETC. SHALL BE REMOVED, DISCONNECTED OR SHUT DOWN WITHOUT PRIOR REVIEW WITH THE OWNER TO CONFIRM THAT AREAS TO REMAIN IN OPERATION WILL NOT BE AFFECTED. IF ANY AREAS NOT WITHIN THE SCOPE OF WORK ARE AFFECTED BY ANY SHUTDOWN, REMOVAL OR DISCONNECTION, SUFFICIENT ADVANCE NOTICE MUST BE GIVEN TO THE OWNER INDICATING WHICH AREAS WILL BE AFFECTED, WHEN THE PROPOSED SHUTDOWN WILL OCCUR, AND FOR HOW LONG A PERIOD OF TIME.
7. THE ARRANGEMENT OF EQUIPMENT AND PIPING SHOWN ON THE DRAWINGS IS BASED UPON INFORMATION AVAILABLE TO THE ENGINEER AT THE TIME OF DESIGN AND IS NOT INTENDED TO SHOW EXACT DIMENSIONS. THIS CONTRACTOR SHALL VERIFY ALL DIMENSIONS AT THE SITE MAKING FIELD MEASUREMENTS AND SHOP DRAWINGS NECESSARY FOR FABRICATION OR ERECTION OF HVAC SYSTEMS. MAKE ALLOWANCE FOR BEAMS, PIPES AND OTHER OBSTRUCTIONS IN BUILDING CONSTRUCTION. CHECK DRAWINGS SHOWING WORK OF OTHER TRADES AND CONSULT WITH THE OWNER'S REPRESENTATIVE IN THE EVENT OF POTENTIAL INTERFERENCE. SHOP DRAWINGS SHALL BE MINIMUM 1/4"=1'-0" SCALE, INDICATING FITTINGS, SIZES, WELDS AND CONFIGURATIONS AND SUBMITTED TO ENGINEER FOR REVIEW.
8. THIS CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL OTHER TRADES PRIOR TO FABRICATION, PURCHASE AND/OR INSTALLATION OF ALL WORK.
9. EXISTING MATERIALS THAT ARE REMOVED SHALL NOT BE REUSED IN NEW SYSTEMS, EXCEPT WHERE INDICATED AS BEING RELOCATED.
10. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS.
11. THIS CONTRACTOR SHALL NOT BORE, NOTCH, CUT, OR PENETRATE INTO A STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM A DESIGNATED STRUCTURAL ENGINEER AND THE OWNER.
12. ALL PIPE ELBOWS SHALL BE LONG RADIUS UNLESS OTHERWISE SPECIFICALLY NOTED ON THE DRAWINGS.
13. COORDINATE ACCESS TO EQUIPMENT WITH WORK OF OTHER TRADES. PROVIDE DUCT ACCESS DOORS AND CEILING ACCESS DOORS TO ALLOW ACCESS FOR FILTER CHANGEOUT, CONTROLS ACCESS AND ACCESS TO SERVICE/REMOVE COMPONENTS INCLUDING, BUT NOT LIMITED TO, FANS, PULLEYS, SHEAVES, BELTS, ETC
14. ALL NEW EQUIPMENT AND MATERIAL TO BE INSTALLED AS PART OF RENOVATION / NEW CONSTRUCTION SHALL BEAR AN UNDERWRITERS' LABORATORIES LABEL (UL), AND INSTALLED IN SUCH A MANNER FOR WHICH THEY ARE DESIGNED AND APPROVED.
15. THIS CONTRACTOR SHALL DOCUMENT AND RELAY ANY MAJOR DEVIATIONS FROM THE DESIGN DOCUMENTS, AND ATTAIN APPROVAL FROM THE MECHANICAL ENGINEER BEFORE PROCEEDING. AS-BUILT COPIES SHALL BE PROVIDED INDICATING ALL CHANGES / DEVIATIONS MADE DURING CONSTRUCTION.
16. ALL PIPING SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS IN A NEAT WORKMANSHIP-LIKE MANNER AND BE SUPPORTED AS REQUIRED BY CODES. PIPING SHALL BE SET UP AND DOWN AND OFFSET AS REQUIRED TO SUIT FIELD CONDITIONS. DIELECTRIC COUPLINGS SHALL BE USED WHERE DISSIMILAR METALS ARE JOINED.
17. THIS CONTRACTOR SHALL PROVIDE ALL NECESSARY SUPPORTS FOR FIXTURES, DUCTWORK, PIPING, AND MECHANICAL EQUIPMENT, IN ORDER TO COMPLY WITH SEISMIC REQUIREMENTS AS OUTLINED BY THE LATEST EDITION(S) OF THE CALIFORNIA BUILDING CODE, SMACNA INSTALLATION STANDARDS, AND ALL RELATED LOCAL ORDINANCES.
18. PIPING AND DUCT SUPPORTS SHALL BE AS FOLLOWS:
    A. ALL BRACING OF DUCTS AND PIPING SHALL BE INSTALLED IN ACCORDANCE WITH SMACNA GUIDELINES, OR AS DETAILED AND SPECIFIED HEREIN.
    B. WHERE BRACING DETAILS ARE NOT SHOWN ON THE DRAWINGS OR IN THE GUIDELINES, THE FIELD INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE MECHANICAL ENGINEER.
    C. A COPY OF THE GUIDELINES PUBLISHED BY SMACNA SHALL BE PROVIDED BY THE CONTRACTOR AND KEPT ON THE JOB AT ALL TIMES.
22. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE MANDATORY MEASURES REQUIRED BY TITLE 24, PART 6 CALIFORNIA ENERGY CODE.
23. INSTALL AUTOMATIC AIR VENTS AT ALL HIGH POINTS IN HHW PIPING EQUAL TO B&G MODEL 107A.

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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
IVAN THOMAS
No. M30691
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
Scale	N/A

Sheet Title

GENERAL NOTES, LEGEND, ABBREVIATIONS AND SHEET INDEX

Sheet Number

M001

P2S No. 0719

FILE PATH & NAME: R:\J0719\MECHANICAL\J0719-M001.DWG MICHAEL NGUYEN
PLOT: Tuesday, September 15, 2020 11:33:34 AM

BOILERS (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	CAPACITY				NATURAL GAS		BOILER DESIGN CONDITIONS					CONNECTIONS							EFFICIENCY		ELECTRICAL				DIMENSIONS L x W x H IN	OPERATING WEIGHT LBS	REMARKS
					INPUT MBH	OUTPUT MBH	TURNDOWN RATIO	WATER VOLUME GAL	CAPACITY CFH	PRESSURE IN WC	DESIGN FLOW GPM	MINIMUM FLOW GPM	PRESSURE DROP FT HD	EWT °F	LWT °F	HOT WATER INLET IN	HOT WATER OUTLET IN	GAS INLET IN	COMBUSTION AIR OPENING IN	EXHAUST FLUE IN	CONDENSATE DRAIN IN	DRAIN IN	EFFICIENCY %	NOx PPM	VOLTAGE	PHASE	HERTZ	FLA			
B-1	LOCHINVAR FBN2001	ROOF PENTHOUSE	FIRE-TUBE CONDENSING	BUILDING HEATING HOT WATER	1,999	1,760	25:1	111	1,999	4" - 14"	90	25	8.1	140	180	4	4	1-1/2	8	8	1	1-1/2	88	<20	120	1	60	16	68 x 30 x 78	2,600	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
B-2	LOCHINVAR FBN2001	ROOF PENTHOUSE	FIRE-TUBE CONDENSING	BUILDING HEATING HOT WATER	1,999	1,760	25:1	111	1,999	4" - 14"	90	25	8.1	140	180	4	4	1-1/2	8	8	1	1-1/2	88	<20	120	1	60	16	68 x 30 x 78	2,600	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

PUMPS (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	DESIGN POINT					MOTOR							DIMENSIONS L x W x H IN	OPERATING WEIGHT LBS	REMARKS
					FLOW GPM	HEAD FT HD	BHP	SPEED RPM	EFFICIENCY %	HP	VOLTAGE	PHASE	HERTZ	RPM	ENCLOSURE	ECM			
HHWP-1	BELL & GOSSETT ECOCIRC XL 110-180	ROOF PENTHOUSE	IN-LINE CENTRIFUGAL	HEATING HOT WATER	90	65	2.6	3,324	56.7	3	460	3	60	3,324	ODP	YES	5 x 15 x 12	50	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
HHWP-2	BELL & GOSSETT ECOCIRC XL 110-180	ROOF PENTHOUSE	IN-LINE CENTRIFUGAL	HEATING HOT WATER	90	65	2.6	3,324	56.7	3	460	3	60	3,324	ODP	YES	5 x 15 x 12	50	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

CONTROL VALVE

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	FLOWRATE GPM	VALVE SIZE IN	PIPE SIZE IN	ACTUATOR	ELECTRICAL VOLTS	CLOSE-OFF PRESSURE IN	REMARKS
CV-HHWBP	BELIMO	ROOF PENTHOUSE	BALL MODULATING	HHW BYPASS	25	1-1/2	1-1/2	ELECTRIC	24 VAC	150	SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

EXPANSION TANK (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	TANK ACCEPTANCE CAPACITY GAL	PRECHARGE PRESSURE PSIG	FILL PRESSURE PSIG	RELIEF PRESSURE PSIG	TANK DIMENSION DIA x HT IN	OPERATING WEIGHT LBS	REMARKS
ET-2	WESSELS NLA-200	ROOF PENTHOUSE	BLADDER	HEATING HOT WATER	53	12	30	45	24"Ø x 43"	660	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

AIR SEPARATOR (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	CONNECTION SIZE IN	WATER FLOW GPM	HEAD FT HD	TANK VOLUME GAL	TANK DIMENSION DIA x HT	OPERATING WEIGHT LBS	REMARKS
AS-2	BELL & GOSSETT CRS-4F	ROOF PENTHOUSE	COALESCING DIRT AND AIR	HEATING HOT WATER	4	180	1	7	8"Ø x 29"	250	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

HEATING HOT WATER FILTER (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	TYPE	SERVICE	FILTER MEDIA		TANK DIMENSIONS DIA x HT	MAX TEMP °F	OPERATING WEIGHT LBS	REMARKS
					MANUFACTURER & MODEL	FILTRATION LEVEL				
HHWF-1	HARMSCO HUR 90 HPSS	ROOF PENTHOUSE	STAINLESS STEEL FILTER	HEATING HOT WATER	HARMSCO HC/90-20HTM	20 MICRONS	13"Ø x 30"	200	350	OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

GAS REGULATOR (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	MANUFACTURER & MODEL	LOCATION	DEMAND CFH	SIZE IN	ORIFICE IN	PRESSURE IN PSI	PRESSURE OUT IN WC	OPERATING WEIGHT LBS	REMARKS
GR-1	AMERICAN METER 1843	ABOVE GRADE	2,000	1-1/2	3/4	5	8.5-14	50	PROVIDE SOV AND PRESSURE GAUGES AT UPSTREAM AND DOWNSTREAM OF REGULATOR. OWNER FURNISHED-CONTRACTOR INSTALLED. SEE SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

PIPING MATERIALS

	SERVICE	MATERIALS
1.	DOMESTIC WATER PIPING ABOVE GRADE:	TYPE "L" COPPER TUBING, HARD DRAWN CONFORMING TO ASTM B 88, WITH WROUGHT COPPER SOLDER SWEAT FITTINGS AND LEAD FREE-SOLDER JOINTS. USE NIBCO BALL FOR PIPING NPS 2 AND SMALLER. USE NIBCO BUTTERFLY OR GATE VALVE FOR PIPING NPS 2-1/2 AND LARGER.
2.	GAS AND REGULATOR VENT PIPING:	SCHEDULE 40 BLACK STEEL PIPE CONFORMING TO ASTM A 53 WITH 150 PSIG MALLEABLE IRON THREADED FITTINGS. WELDED JOINTS FOR PIPE SIZES 2 1/2" AND LARGER OR WELDED FOR ALL SIZES THROUGHOUT WHEN USED FOR MEDIUM PRESSURE. OUTDOOR PIPING EXPOSED TO ATMOSPHERE SHALL BE GALVANIZED STEEL PIPE OR PAINTED WITH RUST INHIBITING PAINT. USE BRONZE BODY PLUG VALVE, ASME B16.33, STRAIGHT WAY TAPER PLUG, REGULAR PATTERN WITH PORT OPENING EQUAL TO THE INTERNAL PIPE AREA. PTFE PACKING FLAT OR SQUARE HEAD WITH LEVER OPERATOR.
3.	CONDENSATE DRAIN OR INDIRECT WASTE PIPING:	TYPE "L" COPPER TUBING, HARD DRAWN CONFORMING TO ASTM B 88, WITH WROUGHT COPPER SOLDER SWEAT FITTINGS AND LEAD-FREE SOLDER JOINTS. ALL CONDENSATE DRAIN PIPING WITHIN BUILDING SHALL BE INSULATED. USE CPVC PIPING WITH GLUED FITTINGS FOR HIGH EFFICIENCY WATER HEATER OR BOILER COMPLETE WITH ACID NEUTRALIZATION KIT.
4.	PIPE PROTECTION: PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS JOINING DISSIMILAR METALS. LEAD FREE BRASS UNIONS WITH 6-INCH LEAD FREE BRASS NIPPLE.	
5.	QUALITY ASSURANCE: THE PIPING SYSTEMS SHALL BE CONSTRUCTED FROM MATERIALS EXTRUDED AND MOLDED USING THE SAME COMPOUND MANUFACTURER.	
6.	QUALITY ASSURANCE: BOTH THE PIPE AND FITTINGS SHALL BE MANUFACTURED IN UNITED STATES OF AMERICA AND MEET OR EXCEED THE REQUIREMENTS SET FORTH BY THE AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM) AND ANSI/NSF STANDARDS 14 AND 61.	

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Revisions

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1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
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Submittal	ISSUE FOR BID
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PART 1 - GENERAL MECHANICAL REQUIREMENTS

1.1 SUMMARY:

A. PROVIDE ALL MATERIAL, LABOR, EQUIPMENT AND APPURTENANCES AS REQUIRED FOR A COMPLETE HEATING. VENTILATING AND AIR CONDITIONING SYSTEMS AS SHOWN ON THE CONTRACT DOCUMENTS AND AS SPECIFIED HEREIN, INCLUDING, BUT NOT LIMITED TO THE FOLLOWING:

1. HEATING HOT WATER BOILER, HARDWARE AND ACCESSORIES.
2. HEATING HOT WATER PIPING, VALVES, HARDWARE AND ACCESSORIES.
3. THERMAL INSULATION.
4. AUTOMATIC TEMPERATURE CONTROLS.
5. TESTING AND BALANCING.
6. IDENTIFICATION OF ALL EQUIPMENT, HARDWARE AND ACCESSORIES.
7. ALL SUPPORTS AND ANCHORAGE OF EQUIPMENT.
8. ALL OTHER ITEMS NOT SPECIFICALLY MENTIONED AND/OR SHOWN BUT NECESSARY FOR A COMPLETE INSTALLATION. IT IS THE INTENTION OF THESE DRAWINGS AND SPECIFICATIONS THAT ALL SYSTEMS SHALL BE COMPLETELY TESTED AND ADJUSTED READY FOR OPERATION.

1.2 ENTIRE MECHANICAL SYSTEMS SHALL COMPLY WITH AND BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF LEGALLY CONSTITUTED AUTHORITIES HAVING JURISDICTION:

A. 2019 CALIFORNIA BUILDING CODE.
B. 2019 CALIFORNIA MECHANICAL CODE.
C. 2019 CALIFORNIA PLUMBING CODE.
D. 2019 CALIFORNIA ELECTRICAL CODE.
E. STATE FIRE MARSHALL.
F. CALIFORNIA ADMINISTRATIVE CODE.
G. NOTHING ONE THESE DRAWINGS AND SPECIFICATIONS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

1.3 GUARANTEES:

A. GUARANTEE THAT THE ENTIRE INSTALLATION AS FURNISHED SHALL BE FREE FROM DEFECTS, POOR WORKMANSHIP, INFERIOR MATERIALS, AND THAT INSTALLATION AS A WHOLE WILL PROVIDE SUCCESSFUL SERVICE UNDER SPECIFIED OPERATING CONDITIONS.
B. CONTRACTOR SHALL REPLACE WITHOUT EXPENSE TO OWNER ANY ITEM WHICH MAY PROVE DEFECTIVE WITHIN ONE (1) YEAR FROM DATE OF ACCEPTANCE BY OWNER.

1.4 EXAMINATION OF THE DRAWINGS AND SITE:

A. EXAMINE BUILDING SITE AND COMPARE DRAWINGS WITH EXISTING CONDITIONS.
B. BEFORE BIDDING THIS WORK, CONTRACTOR SHALL MAKE A CAREFUL EXAMINATION OF THE PREMISES AND SHALL THOROUGHLY FAMILIARIZE WITH THE REQUIREMENTS OF THE CONTRACT, BY THE ACT OF SUBMITTING A BID. THE CONTRACTOR SHALL BE DEEMED TO HAVE MADE SUCH EXAMINATION AND TO HAVE MADE ALLOWANCES THEREFORE IN PREPARING THEIR BID.

1.5 VERIFICATION OF DIMENSIONS:

A. SCALED AND FIGURED DIMENSIONS ARE APPROXIMATE AND ARE GIVEN FOR ESTIMATE PURPOSES ONLY.
B. BEFORE PROCEEDING WITH ANY WORK, CHECK AND VERIFY DIMENSIONS AND SIZES, AND ASSUME FULL RESPONSIBILITY FOR FITTING-IN OF EQUIPMENT AND MATERIALS TO OTHER PARTS OF EQUIPMENT AND TO THE STRUCTURE.

1.6 LOCATIONS:

A. LOCATION OF PIPING, APPARATUS AND EQUIPMENT INDICATED ON THE DRAWINGS ARE APPROXIMATE. PROVIDE SHOP DRAWINGS PRIOR TO PROCUREMENT AND INSTALLATION.

1.7 DRAWINGS:

A. EXAMINE DRAWINGS AND PREMISES IN ORDER TO DETERMINE BEST METHODS. EXACT LOCATIONS, ROUTES AND BUILDING OBSTRUCTIONS.
B. INSTALL APPARATUS AND EQUIPMENT IN AVAILABLE LOCATIONS.

1.8 SUBMITTALS:

A. PROVIDE COMPLETE EQUIPMENT, HARDWARE AND ACCESSORIES SHOP DRAWINGS AND CATALOG CUTSHEETS FOR REVIEW. SHOP DRAWINGS AND CATALOG CUTSHEETS SHALL SHOW SIZES, SECTIONS AND DIMENSIONS OF EQUIPMENT SPECIFIC TO THIS PROJECT. PROVIDE SCALED SHOP DRAWINGS FOR EQUIPMENT, PIPING, HYDRONIC ACCESSORIES, CONTROLS AND HARDWARE FOR REVIEW PRIOR TO INSTALLATION.
B. MATERIAL LIST:

1. BEFORE ENTERING INTO ANY CONTRACT FOR PURCHASE OF MATERIALS, AND BEFORE ANY WORK IS STARTED, SUBMIT IN ELECTRONIC FORMAT AND (1) HARD COPY TO THE PROJECT ENGINEER FOR REVIEW. PROVIDE COMPLETE LIST, INCLUDLNG CATALOGS AND DESCRIPTIVE MATTER, FOR ALL MATERIALS AND EQUIPMENT THAT WILL BE USED SPECIFICALLY ON THIS PROJECT.

a. ALL HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT, PIPING, HARDWARE AND ACCESSORIES.
b. TEMPERATURE CONTROLS.
c. INSULATION.
d. TESTING, ADJUSTING AND BALANCING.
e. ALL HEATING HOT WATER PIPING AND RELATED SPECIALTIES.
f. ALL EQUIPMENT, HANGERS, ELECTRICAL WIRING DIAGRAMS AND OTHER ASSOCIATED STANDARD ITEMS AS REQUIRED TO COMPLETE SHOP DRAWINGS.

1.9 TESTING AND BALANCING:

A. SUBMIT NAME OF TEST AND BALANCE AGENCY TO PROJECT ENGINEER FOR REVIEW WITHIN 15-DAYS AFTER RECEIPT OF CONSTRUCTION CONTRACT. SELECTED AGENCY TO SUBMIT AABC OR NEBB NATIONAL WARRANTY CERTIFICATE WHICH INCLUDES PRE-CONSTRUCTION PLAN CHECK AND FIELD INSPECTION PROGRAM IMMEDIATELY UPON RECEIPT OF TEST AND BALANCE CONTRACT.
B. SUBMIT TO PROJECT ENGINEER ONE (1) WEEK PRIOR TO FINAL INSPECTION. ELECTRONIC FILES OF PRELIMINARY BALANCE REPORT ON SYSTEM OPERATION INCLUDING WATER SYSTEM PERFORMANCE AND OTHER PERTINENT DATA.

1.10 MATERIALS REVIEW:

A. REVIEW OF SUBMITTED MATERIALS SHALL NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ANY DEVIATIONS FROM CONTRACT DOCUMENTS UNLESS IT IS IN WRITING FROM PROJECT ENGINEER. SPECIFIC ATTENTION TO SUCH DEVIATIONS SHALL BE CLEARLY AND CONCISELY NOTED AT TIME OF SUBMISSIONS. REVIEW OF ITEMS SHALL NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR ANY ERRORS IN SUCH SUBMITTALS OR FOR CHANGES REQUIRED TO THE WORK OF OTHER TRADES.

1.11 RECORD DRAWINGS:

A. CONTRACTOR SHALL DOCUMENT AND RELAY ALL DEVIATIONS FROM CONTRACT DOCUMENTS IN THE LATEST VERSION OF AUTOCAD, CLEARLY INDICATING ALL CHANGES AND DEVIATIONS MADE TO THE CONTRACT DOCUMENTS DURING CONSTRUCTION. CONTRACTOR HAND MARKED REDLINED AS-BUILT DRAWINGS WILL NOT BE ACCEPTED.

1.12 OPERATING AND MAINTENANCE DATA:

A. SUBMIT TO PROJECT ENGINEER PRIOR TO ACCEPTANCE OF THE INSTALLATION. COMPLETE AND AT ONE TIME. PARTIAL OR SEPARATE DATA WILL NOT BE ACCEPTED. DATA SHALL CONSIST OF THE FOLLOWING MINIMUM SUBMISSIONS:
B. IDENTIFICATION SCHEDULE: COPY OF CHARTS AS SPECIFIED.

1. EQUIPMENT: LIST OF NAMEPLATES, INCLUDING NAMEPLATES DATA AND SYSTEM SERVED.
2. MANUFACTURER'S LITERATURE: TWO COPIES OF MANUFACTURER'S INSTRUCTION FOR OPERATION AND MAINTENANCE OF ALL MECHANICAL EQUIPMENT, INCLUDING REPLACEMENT PARTS LIST.
3. WRITTEN INSTRUCTIONS: TYPEWRITTEN INSTRUCTIONS FOR OPERATION AND MAINTENANCE OF THESE SYSTEMS COMPOSED OF OPERATING INSTRUCTIONS AND MAINTENANCE INSTRUCTIONS AND MAINTENANCE SCHEDULE. THREE COPIES SUBMITTED TO THE ENGINEER FOR REVIEW.

C. OPERATING INSTRUCTIONS: A BRIEF DESCRIPTION OF THE SYSTEM INDICATING PROPER SETTING OF SWITCHES AND OTHER EQUIPMENT FURNISHED FOR THE PURPOSE OF PROVIDING CONTROL OF THE SYSTEM AND ITS COMPONENTS BY THE OPERATOR. DO NOT INCLUDE ADJUSTMENTS REQUIRING THE TECHNICAL KNOWLEDGE OF THE SERVICE AGENCY PERSONNEL.
D. MAINTENANCE INSTRUCTION: A LIST OF EACH ITEM OF EQUIPMENT REQUIRING INSPECTION OR LUBRICATION, DESCRIBING THE PERFORMANCE OF SUCH MAINTENANCE, AND THE MONTH OF THE YEAR WHEN EACH ITEM OF EQUIPMENT SHOULD BE INSPECTED OR SERVICED.
E. MAINTENANCE SCHEDULE: A LIST OF EACH ITEM OF EQUIPMENT REQUIRING MAINTENANCE SHOWING THE EXACT TYPE OF BEARING ON EVERY COMPONENT OF EACH ITEM OF EQUIPMENT AND THE FREQUENCY WHEN EACH ITEM OF EQUIPMENT SHOULD BE INSPECTED OR SERVICES.
F. COPY OF ALL GUARANTEES AND WARRANTIES ISSUED ON INSTALLATION WITH EXPIRATION DATES.
G. COPY OF PROJECT RECORD DRAWINGS, BALANCING REPORT, PRESSURE TEST SIGNED BY OWNER'S REPRESENTATION. PROOF OF PIPE CLEANING CHEMICAL TREATMENT.

1.13 QUALIFICATIONS OF INSTALLERS:

A. FOR ACTUAL FABRICATION, INSTALLATION AND TESTING OF WORK UNDER THIS SECTION USE ONLY THOROUGHLY TRAINED AND EXPERIENCED WORKERS THAT ARE COMPLETELY FAMILIAR WITH ITEMS REQUIRED AND WITH MANUFACTURER'S RECOMMENDATIONS AS TO THEIR USE.
B. IN ACCEPTANCE OR REJECTION OF FINISHED INSTALLATION. NO ALLOWANCE WILL BE MADE FOR LACK OF SKILL ON PART OF WORKER.

1.14 MANUFACTURER'S DIRECTION:

A. COMPLY WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR ALL PRODUCTS. IF INSTRUCTIONS CONFLICT WITH CONTRACT DOCUMENTS, NOTIFY ENGINEER BEFORE PROCEEDING WITH WORK.
B. DO NOT USE ANY PRODUCT IN ANY MANNER OR FOR ANY PURPOSE NOT RECOMMENDED BY MANUFACTURER.

1.15 OPENINGS, CUTTING AND PATCHING:

A. THIS CONTRACTOR SHALL PROVIDE ALL OPENINGS, CUTTING AND PATCHING AS REQUIRED FOR THEIR WORK AS REQUIRED IN THIS SECTION.

1.16 WORKMANSHIP AND MATERIALS:

A. INSTALLATION: DRAWINGS SHOW GENERAL ARRANGEMENT OF PIPING AND EQUIPMENT. ANY WORK INDICATED ON THE DRAWINGS, BUT NOT SPECIFICALLY MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, SHALL BE FURNISHED AND INSTALLED WITHOUT EXCEPTION.
B. ALL EXPOSED EQUIPMENT, PIPING, CONTROLS, SUPPORTS, HARDWARE AND ACCESSORIES SHALL BE INSTALLED IN A HIGHLY PROFESSIONAL MANNER. ANY WORK THAT IS NOT SUITABLE BY THE OWNER'S REPRESENTATIVE SHALL BE CORRECTED TO THEIR SATISFACTION.
C. IN ALL CASES, WHERE THE MANUFACTURER OF MATERIAL AND EQUIPMENT USED IN THIS CONTRACT, PROVIDES DIRECTIONS COVERING POINTS NOT SHOWN ON THE CONTRACT DOCUMENTS SHALL BE FOLLOWED, UNLESS THEY ARE IN CONFLICT WITH THE APPLICABLE CODES.
D. MATERIALS SHALL BE NEW AND IN PERFECT CONDITION. MATERIALS FOR SIMILAR USE SHALL BE OF THE SAME TYPE AND MANUFACTURER. UNLESS OTHERWISE APPROVED. NO ITEM OF MATERIAL SHALL BE INSTALLED FOR ANY PURPOSE OR IN A MANNER NOT RECOMMENDED BY THE MANUFACTURER. WORKMANSHIP SHALL BE BEST STANDARD PRACTICE OF THE TRADE.

PART 2 - PRODUCTS

2.1 METERS AND GAUGES FOR HVAC PIPING

A. DIAL THERMOMETERS

1. MANUFACTURERS

a. ASHCROFT COMMERCIAL INC.
b. TRERICE, H. O. CO.
c. WEISS INSTRUMENTS, INC.

2. BIMETALLIC-ACTUATED

a. DESCRIPTION: ADJUSTABLE ANGLE, DIRECT-MOUNTING, BIMETALLIC-ACTUATED DIAL THERMOMETERS COMPLYING WITH ASME B40.200.
b. CASE: HIGHLY POLISHED, HERMETICALLY SEALED, STAINLESS STEEL, 5-INCH DIAMETER.
c. ELEMENT: BIMETAL COIL.
d. DIAL: SATIN-FACED, OR HIGHLY POLISHED, NON-REFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED SCALE MARKINGS.
e. POINTER: BLACK METAL.
f. WINDOW: DOUBLE STRENGTH GLASS.
g. RING: STAINLESS STEEL.
h. CONNECTOR: ADJUSTABLE ANGLE, NPT ½ WITH ASME B1.1 SCREW THREADS.
i. STEM: STAINLESS STEEL, FOR THERMO-WELL INSTALLATION AND OF LENGTH TO SUIT INSTALLATION.
j. ACCURACY: PLUS OR MINUS 1 PERCENT OF RANGE OR PLUS OR MINUS 1 SCALE DIVISION TO MAXIMUM OF 1.5 PERCENT OF RANGE.
k. UNITS: SCALE SHALL BE DEGREES FAHRENHEIT, UNLESS OTHERWISE INDICATED, SUITABLE FOR THE MEDIA OPERATING TEMPERATURES.

1) HEATING HOT WATER: 30 TO 240 DEG F, WITH 2-DEGREE SCALE DIVISIONS.

B. THERMOWELLS

1. MANUFACTURERS:

a. ASHCROFT COMMERCIAL INC.
b. TRERICE, H. O. CO.
c. WEISS INSTRUMENTS, INC.

2. THERMOWELLS:

a. STANDARD: ASME B40.200.
b. DESCRIPTION: PRESSURE-TIGHT, SOCKET-TYPE FITTING MADE FOR INSERTION INTO PIPING.
c. PRESSURE RATING: NOT LESS THAN PIPING SYSTEM DESIGN PRESSURE.
d. MATERIAL: STAINLESS STEEL.
e. TYPE: STEPPED SHANK UNLESS STRAIGHT OR TAPERED SHANK IS INDICATED.
f. EXTERNAL THREADS: NPT 1/2, NPT 3/4, OR NPT 1, ASME B1.20.1 PIPE THREADS.
g. INTERNAL THREADS: 1/2, 3/4, AND 1 INCH, WITH ASME B1.1 SCREW THREADS.
h. BORE: DIAMETER REQUIRED TO MATCH THERMOMETER BULB OR STEM.
i. INSERTION LENGTH: EXTEND ONE-THIRD TO TWO-THIRDS OF PIPE DIAMETER INTO FLUID.
j. LAGGING EXTENSION: EXTENSION FOR INSULATED PIPING: 2 INCHES NOMINAL AND NOT LESS THAN THICKNESS OF INSULATION.
k. BUSHINGS: ARE PROHIBITED.
l. HEAT-TRANSFER MEDIUM: MIXTURE OF GRAPHITE AND GLYCERIN.

C. PRESSURE GAUGES

1. MANUFACTURERS:

a. ASHCROFT COMMERCIAL INC.
b. TRERICE, H. O. CO.
c. WEISS INSTRUMENTS, INC.

2. DIRECT-MOUNTING, DIAL-TYPE PRESSURE GAUGES: INDICATING-DIAL TYPE COMPLYING WITH ASME B40.100.

a. CASE: LIQUID-FILLABLE TYPE, 4.5-INCH DIAMETER GRADE-A PHOSPHOR BRONZE OR STAINLESS STEEL.
b. PRESSURE-ELEMENT ASSEMBLY: BOURDON TUBE, UNLESS OTHERWISE INDICATED.
c. PRESSURE CONNECTION: BRASS, OR STAINLESS STEEL, NPT ¼, OR ½, BOTTOM-OUTLET TYPE UNLESS BACK-OUTLET TYPE IS INDICATED.
d. MOVEMENT: MECHANICAL, DIRECT DRIVE OR WITH LINK TO PRESSURE ELEMENT AND CONNECTION TO POINTER.
e. DIAL: SATIN-FACED, NON-REFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED SCALE MARKINGS.
f. POINTER: BLACK METAL.
g. WINDOW: GLASS.
h. RING: STAINLESS STEEL.
i. ACCURACY: GRADE A, PLUS OR MINUS 1 PERCENT OF MIDDLE HALF SCALE.
j. VACUUM-PRESSURE RANGE: 30-IN. HG OF VACUUM TO 15 PSIG OF PRESSURE.
k. RANGE FOR FLUIDS UNDER PRESSURE: TWO TIMES OPERATING PRESSURE.

1) HEATING HOT WATER PIPING: 0 TO 100 PSI.

l. SCALE: SCALE SHALL BE PSIG, INCHES MERCURY VACUUM, COMBINATION OF THOSE TWO DEPENDING ON THE APPLICATION.
m. UNITS: PSI ONLY. DUAL UNIT GAUGES (E.G. KPA AND PSI) ARE PROHIBITED.

D. GAUGE ATTACHMENTS

1. SNUBBERS: ASME B40.100, 303 STAINLESS STEEL; WITH NPT 1/4 OR NPA 1/2, ASME B1.20.1 PIPE THREADS AND SURGE-DAMPENING DEVICE. INCLUDE EXTENSION FOR USE ON INSULATED PIPING.
2. SIPHONS: LOOP-SHAPED SECTION OF STAINLESS-STEEL PIPE WITH THREADED ENDS.
3. VALVES: NPT ¼ OR ½ STAINLESS-STEEL THREADED BALL VALVE TYPE.

E. TEST-PLUG KITS

1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

a. PETERSON EQUIPMENT CO., INC.
b. SISCO MANUFACTURING CO.
c. IMI HYDRONIC ENGINEERING (FLOW DESIGN), INC.

2. FURNISH ONE TEST-PLUG KIT CONTAINING TWO THERMOMETERS, ONE PRESSURE GAUGE AND ADAPTER, AND CARRYING CASE. THERMOMETER SENSING ELEMENTS, PRESSURE GAUGE, AND ADAPTER PROBES SHALL BE OF DIAMETER TO FIT TEST PLUGS AND OF LENGTH TO PROJECT INTO PIPING.
3. LOW-RANGE THERMOMETER: SMALL, BIMETALLIC INSERTION TYPE WITH 2-INCH-DIAMETER DIAL AND TAPERED-END SENSING ELEMENT. DIAL RANGE SHALL BE AT LEAST 25 TO 125 DEG F.
4. HIGH-RANGE THERMOMETER: SMALL, BIMETALLIC INSERTION TYPE WITH 2-INCH-DIAMETER DIAL AND TAPERED-END SENSING ELEMENT. DIAL RANGE SHALL BE AT LEAST 0 TO 220 DEG F.
5. PRESSURE GAUGE: SMALL, BOURDON-TUBE INSERTION TYPE WITH 3-INCH-DIAMETER DIAL AND PROBE. DIAL RANGE SHALL BE AT LEAST 0 TO 200 PSIG.
6. CARRYING CASE: METAL OR PLASTIC, WITH FORMED INSTRUMENT PADDING.

2.2 GENERAL DUTY VALVES FOR HVAC PIPING

A. HIGH-PERFORMANCE BRONZE BALL VALVES, TWO-PIECE WITH FULL PORT AND STAINLESS-STEEL TRIM

1. MANUFACTURERS:

a. NIBCO FIGURE T-585HP-66-LF (HIGH PERFORMANCE)
b. OR EQUAL

2. DESCRIPTION:

a. STANDARD: MSS SP-110.
b. SWP RATING: 150 PSIG.
c. CWP RATING: 600-1000 PSIG.
d. BODY DESIGN: TWO PIECE.
e. BODY MATERIAL: BRONZE.
f. ENDS: THREADED.
g. SEATS: PTFE.
h. STEM: STAINLESS STEEL.
i. BALL: STAINLESS STEEL, VENTED.
j. PORT: FULL.
k. VALVES IN INSULATED PIPING: WITH 2-INCH STEM EXTENSIONS WITH EXTENDED NECKS.

B. HIGH-PERFORMANCE BUTTERFLY VALVES, CLASS 150, SINGLE FLANGE:

1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

a. NIBCO LCS-6822 SERIES
b. CRANE CO. FLOWSEAL; CRANE VALVE GROUP; STOCKHAM DIVISION.
c. JAMESBURY WAFER-SHERE; A SUBSIDIARY OF METSO AUTOMATION.
d. HENRY PRATT HP SERIES.

2. DESCRIPTION:

a. STANDARD: MSS SP-68.
b. CWP RATING: 285 PSIG AT 100 DEG F.
c. BODY DESIGN: LUG TYPE; SUITABLE FOR BIDIRECTIONAL DEAD-END SERVICE AT RATED PRESSURE WITHOUT USE OF DOWNSTREAM FLANGE.
d. BODY MATERIAL: CARBON STEEL WITH POWDER COATED EPOXY FINISH.
e. SEAT: REINFORCED PTFE.
f. STEM: STAINLESS STEEL; ONE PIECE AND OFFSET FROM SEAT PLANE; LIVE LOADED, ADJUSTABLE PACKING.
g. DISC: STAINLESS STEEL.
h. SERVICE: BIDIRECTIONAL.
i. VALVES IN INSULATED PIPING: WITH 2-INCH STEM EXTENSIONS WITH EXTENDED NECKS.

C. HIGH PERFORMANCE NON-SLAM CHECK VALVES WITH RESILIENT SEAT, CLASS 125:

1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

a. CRANE DUO-CHEK.
b. OR APPROVED EQUAL

2. DESCRIPTION:

a. STANDARD: MSS SP-125.
b. NPS 2-1/2 TO NPS 12, CWP RATING: 200 PSIG.
c. NPS 14 TO NPS 24, CWP RATING: 150 PSIG.
d. BODY MATERIAL: ASTM A126, CAST IRON.
e. STYLE: DISK, SPRING LOADED.
f. ENDS: FLANGED.
g. SEAT: EPDM.

D. VALVE SCHEDULE

1. PIPE NPS 2 AND SMALLER: BRONZE BALL VALVES, TWO-PIECE, WITH STAINLESS-STEEL TRIM, FULL PORT, THREADED.
2. PIPE NPS 2-1/2 AND LARGER: HIGH-PERFORMANCE BUTTERFLY VALVES: CLASS 150, SINGLE FLANGE.

2.3 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

A. CARBON-STEEL PIPE HANGERS AND SUPPORTS:

1. DESCRIPTION: MSS SP-58, TYPES 1 THROUGH 58, FACTORY-FABRICATED COMPONENTS.
2. GALVANIZED METALLIC COATINGS: PREGALVANIZED OR HOT DIPPED.
3. NONMETALLIC COATINGS: PLASTIC COATING, JACKET, OR LINER.
4. PADDED HANGERS: HANGER WITH FIBERGLASS OR OTHER PIPE INSULATION PAD OR CUSHION TO SUPPORT BEARING SURFACE OF PIPING.
5. HANGER RODS: CONTINUOUS-THREAD ROD, NUTS, AND WASHER MADE OF CARBON STEEL.

B. THERMAL-HANGER SHIELD INSERTS

1. MANUFACTURERS

a. PIPE SHIELDS INC.
b. PITTSBURG CORNING FOAMGLAS ONE
c. ITW INSULATION SYSTEMS TRYMER 2000 XP

2. HOT PIPING: INSULATION-INSERT MATERIAL - HOT PIPING: WATER-REPELLENT TREATED, ASTM C 533, TYPE I CALCIUM SILICATE WITH 100-PSIG ASTM C 552, TYPE II CELLULAR GLASS WITH 100-PSIG OR ASTM C 591, TYPE VI, GRADE 1 POLYISOCYANURATE WITH 125-PSIG MINIMUM COMPRESSIVE STRENGTH.
3. FOR TRAPEZE OR CLAMPED SYSTEMS: INSERT AND SHIELD SHALL COVER ENTIRE CIRCUMFERENCE OF PIPE.
4. FOR CLEVIS OR BAND HANGERS: INSERT AND SHIELD SHALL COVER LOWER 180 DEGREES OF PIPE.
5. INSERT LENGTH: EXTEND 2 INCHES BEYOND SHEET METAL SHIELD FOR PIPING OPERATING BELOW AMBIENT AIR TEMPERATURE.

2.4 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. METAL LABELS FOR EQUIPMENT:

1. MANUFACTURERS:

a. CRAFTMARK IDENTIFICATION SYSTEMS
b. SETON IDENTIFICATION PRODUCTS
c. MSI MARKING SERVICES
d. SETMARK

2. MATERIAL AND THICKNESS: BRASS OR ANODIZED ALUMINUM, 0.032-INCH MINIMUM THICKNESS AND HAVING PREDRILLED OR STAMPED HOLES FOR ATTACHMENT HARDWARE.
3. MINIMUM LABEL SIZE: LENGTH AND WIDTH VARY FOR REQUIRED LABEL CONTENT, BUT NOT LESS THAN 2-1/2 BY 3/4 INCH.
4. MINIMUM LETTER SIZE: 1/4 INCH FOR NAME OF UNITS IF VIEWING DISTANCE IS LESS THAN 24 INCHES, 1/2 INCH FOR VIEWING DISTANCES UP TO 72 INCHES, AND PROPORTIONATELY LARGER LETTERING FOR GREATER VIEWING DISTANCES. INCLUDE SECONDARY LETTERING TWO-THIRDS TO THREE-FOURTHS THE SIZE OF PRINCIPAL LETTERING.
5. FASTENERS: STAINLESS-STEEL RIVETS OR CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND SUBSTRATE.
6. ADHESIVE: CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND WITH SUBSTRATE.

B. PIPE LABELS

1. MANUFACTURERS:

a. CRAFTMARK IDENTIFICATION SYSTEMS
b. SETON IDENTIFICATION PRODUCTS
c. MSI MARKING SERVICES
d. SETMARK

2. DO NOT USE PIPE LABELS OR PLASTIC TAPES FOR BARE PIPES CONVEYING FLUIDS AT TEMPERATURES OF 125 DEG F (52 DEG C) OR HIGHER.
3. GENERAL REQUIREMENTS FOR MANUFACTURED PIPE LABELS: PREPRINTED, COLOR-CODED, WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION.
4. PRE-TENSIONED PIPE LABELS FOR OUTSIDE DIAMETER LESS OR EQUAL TO 8 INCHES: PRE-COILED, SEMI-RIGID PLASTIC FORMED TO COVER FULL CIRCUMFERENCE OF PIPE AND TO ATTACH TO PIPE WITHOUT FASTENERS OR ADHESIVE.
5. SELF-ADHESIVE PIPE LABELS FOR OUTSIDE DIAMETER GREATER THAN 8 INCHES: PRINTED PLASTIC WITH CONTACT-TYPE, PERMANENT-ADHESIVE BACKING. EITHER MARKER SHALL SHOW ACCEPTED COLOR-CODED BACKGROUND, PROPER COLOR OF LEGEND IN RELATION TO BACKGROUND COLOR, ACCEPTED LEGEND LETTER SIZE, ACCEPTED MARKER LENGTH.
6. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE USING SAME DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS, AND AN ARROW INDICATING FLOW DIRECTION.
7. FLOW-DIRECTION ARROWS: INTEGRAL WITH PIPING SYSTEM SERVICE LETTERING TO ACCOMMODATE BOTH DIRECTIONS, OR AS SEPARATE UNIT ON EACH PIPE LABEL TO INDICATE FLOW DIRECTION.
8. LETTERING SIZE: AT LEAST 1-1/2 INCHES HIGH.
9. HEATING WATER PIPING LABEL COLOR SCHEDULE:

a. BACKGROUND COLOR: YELLOW.
b. LETTER COLOR: BLACK.

C. VALVE TAGS

1. MANUFACTURERS:

a. CRAFTMARK IDENTIFICATION SYSTEMS
b. SETON IDENTIFICATION PRODUCTS
c. MSI MARKING SERVICES
d. SETMARK

2. VALVE TAGS: STAMPED OR ENGRAVED WITH ¼-INCH LETTERS FOR PIPING SYSTEM ABBREVIATION AND ½ INCH SEQUENCED NUMBERS.
3. TAG MATERIAL: BRASS, 0.032-INCH MINIMUM THICKNESS AND HAVING PREDRILLED OR STAMPED HOLES FOR ATTACHMENT HARDWARE.
4. FASTENERS: BRASS WIRE-LINK OR BEADED CHAIN; OR S-HOOK.
5. VALVE SCHEDULES: FOR EACH PIPING SYSTEM, ON 8-1/2 BY 11 INCH BOND PAPER. TABULATE VALVE NUMBER, PIPING SYSTEM, SYSTEM ABBREVIATION (AS SHOWN ON VALVE TAG), LOCATION OF VALVE (ROOM OR SPACE), NORMAL-OPERATING POSITION (OPEN, CLOSED OR MODULATING), AND VARIATIONS FOR IDENTIFICATION. MARK VALVES FOR EMERGENCY SHUTOFF AND SIMILAR SPECIAL USES.
6. VALVE TAG SCHEDULE SHALL BE INCLUDED IN OPERATION AND MAINTENANCE DATA.
7. VALVE-TAG SIZE AND SHAPE: HOT WATER: 2 INCHES, ROUND
8. VALVE-TAG COLOR: HOT WATER: NATURAL
9. LETTER COLOR: HOT WATER: BLACK

2.5 HVAC EQUIPMENT INSULATION

A. CELLULAR GLASS:

1. DESCRIPTION: INORGANIC, INCOMBUSTIBLE, FOAMED OR CELLULATED GLASS WITH ANNEALED, RIGID, HERMETICALLY SEALED CELLS. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE. COMPLY WITH ASTM C 552.
2. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
3. INSULATION MATERIALS FOR USE ON AUSTENITIC STAINLESS STEEL SHALL BE QUALIFIED AS ACCEPTABLE ACCORDING TO ASTM C 795.
4. FOAM INSULATION MATERIALS SHALL NOT USE CFC OR HCFC BLOWING AGENTS IN THE MANUFACTURING PROCESS.
5. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

a. PITTSBURGH CORNING CORPORATION; FOAMGLAS
b. SPECIALTY PRODUCTS & INSULATION (SPI)
c. OR APPROVED EQUAL.

6. MATERIAL PROPERTIES

a. THERMAL CONDUCTIVITY: 0.31 BTU-IN/(H-°F-FT2) MAX. AT 75 °F
b. SERVICE TEMPERATURE RANGE: -450 °F TO 800 °F
c. DENSITY: 6.1 TO 8.6 LB/FT3
d. ABSORPTION OF MOISTURE: 0.2% BY VOL MAX.
e. WATER VAPOR PERMEABILITY: 0.05 PER IN, MAX.
f. COMPRESSIVE STRENGTH: 60 PSI, MIN.
g. FLEXURAL STRENGTH: 41 PSI, MIN.
h. BLOCK INSULATION: ASTM C 552, TYPE I.
i. SPECIAL-SHAPED INSULATION: ASTM C 552, TYPE III.
j. BOARD INSULATION: ASTM C 552, TYPE IV.
k. FACTORY FABRICATE SHAPES ACCORDING TO ASTM C 450 AND ASTM C 585.

B. CELLULAR-GLASS ADHESIVE: TWO-COMPONENT, THERMOSETTING URETHANE ADHESIVE CONTAINING NO FLAMMABLE SOLVENTS, WITH A SERVICE TEMPERATURE RANGE OF MINUS 100 TO PLUS 200 DEG F.

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

a. DESIGN POLYMERICS
b. FOSTER PRODUCTS CORPORATION
c. OR EQUAL.

2. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED.
3. ADHESIVES SHALL COMPLY WITH SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 1168. ADHESIVES SHALL HAVE A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

C. MASTICS

1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES; COMPLY WITH MIL-PRF-19565C, TYPE II.
2. MASTICS SHALL COMPLY WITH SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 1168. MASTICS SHALL HAVE A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).
3. VAPOR-BARRIER MASTIC: WATER BASED; SUITABLE FOR INDOOR AND OUTDOOR USE ON BELOW AMBIENT SERVICES.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) FOSTER BRAND.
2) KNAUF INSULATION.
3) VIMASCO CORPORATION.

b. WATER-VAPOR PERMEANCE: ASTM E 96/E 96M, PROCEDURE B, 0.013 PERM AT 43-MIL DRY FILM THICKNESS.
c. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F.
d. SOLIDS CONTENT: ASTM D 1644, 58 PERCENT BY VOLUME AND 70 PERCENT BY WEIGHT.
e. COLOR: WHITE.

D. SEALANTS

1. JOINT SEALANTS:

a. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
b. PERMANENTLY FLEXIBLE, ELASTOMERIC SEALANT.
c. SERVICE TEMPERATURE RANGE: MINUS 100 TO PLUS 300 DEG F.
d. COLOR: WHITE OR GRAY.

2. FSK AND METAL JACKET FLASHING SEALANTS:

a. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
b. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
c. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
d. COLOR: ALUMINUM.

3. ASJ FLASHING SEALANTS, AND VINYL, PVDC, AND PVC JACKET FLASHING SEALANTS:

a. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
b. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
c. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
d. COLOR: WHITE.

E. FIELD-APPLIED JACKETS

1. FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C 921, TYPE I, UNLESS OTHERWISE INDICATED.
2. PVC JACKET: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH ASTM D 1784, CLASS 16354-C; THICKNESS AS SCHEDULED; ROLL STOCK READY FOR SHOP OR FIELD CUTTING AND FORMING. THICKNESS IS INDICATED IN FIELD-APPLIED JACKET SCHEDULES.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) JOHNS MANVILLE; ZESTON.
2) PROTO CORPORATION; LOSMOKE.
3) SPEEDLINE CORPORATION; SMOKESAFE.

b. ADHESIVE: AS RECOMMENDED BY JACKET MATERIAL MANUFACTURER.
c. COLOR: COLOR-CODED BY SYSTEM: 20 MILS THICK.
d. FACTORY-FABRICATED TANK HEADS AND TANK SIDE PANELS.

F. EQUIPMENT INSULATION SCHEDULE

1. HEATING-HOT-WATER PUMP INSULATION SHALL BE ONE OF THE FOLLOWING:

a. CELLULAR GLASS: 3 INCHES THICK.

2. HEATING-HOT-WATER HEATING HOT WATER FILTER INSULATION, UP TO 200 DEG F, SHALL BE ONE OF THE FOLLOWING:

a. CELLULAR GLASS: 2 INCHES THICK.

3. HEATING-HOT-WATER AIR-SEPARATOR INSULATION, UP TO 200 DEG F, SHALL BE ONE OF THE FOLLOWING:

a. CELLULAR GLASS: 2 INCHES THICK.

G. INDOOR, FIELD-APPLIED JACKET SCHEDULE

1. PVC, COLOR-CODED BY SYSTEM: 20 MILS THICK.

a. HEATING HOT WATER SUPPLY: DARK RED
b. HEATING HOT WATER RETURN: LIGHT RED.

2.6 HVAC PIPING INSULATION

A. INSULATION MATERIALS

1. PRODUCTS SHALL NOT CONTAIN CFC, ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
2. INSULATION SHALL MEET FIRE AND SMOKE HAZARD RATINGS AS TESTED UNDER PROCEDURE ASTM E-84, NFPA 255, AND UL 723 AND SHALL NOT EXCEED FLAME SPREAD RATING OF 25 AND MAXIMUM SMOKE DEVELOPED RATING OF 50.
3. MINERAL-FIBER, PREFORMED PIPE INSULATION:

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) JOHNS MANVILLE'S MICRO-LOK HP ALL-SERVICE (ASJ) VAPOR-RETARDER JACKET WITH A SELF-SEALING LONGITUDINAL CLOSURE LAP (SSL) AND BUTT STRIPS.
2) OWENS CORNING; ASJ FIBERGLAS PIPE INSULATION.

b. PREFORMED MINERAL FIBER PIPE INSULATION WITH FACTORY APPLIED ALL-SERVICE VAPOR-RETARDER JACKET (ASJ) JACKET WITH A SELF-SEALING LONGITUDINAL CLOSURE LAP (SSL) AND BUTT STRIPS OR APPROVED ALTERNATE TO SEAL BUTT JOINTS. PREFORMED MINERAL FIBER PIPE INSULATION SHALL CONFORM TO ASTM C547. THE ASJ FACING SHALL CONFORM TO ASTM C1136 TYPE I.
c. PREFORMED MINERAL FIBER PIPE INSULATION WITH FACTORY APPLIED ALL-SERVICE VAPOR-RETARDER JACKET (ASJ) JACKET SHALL HAVE A FLAME SPREAD RATING NOT GREATER THAN 25 AND A SMOKE DEVELOPED RATING NOT GREATER THAN 50 WHEN TESTED AS IN ACCORDANCE WITH ASTM E84, UL 723.
d. THERMAL CONDUCTIVITY (K-VALUE): 0.23 BTU-IN/HR-FT2-°F AT 75°F
e. PREFORMED MINERAL FIBER PIPE INSULATION SHALL HAVE A WATER VAPOR SORPTION OF LESS THAN 5% BY WEIGHT AS TESTED IN ACCORDANCE ASTM C 547.
f. ALL SERVICE JACKET (ASJ) SHALL HAVE A WATER VAPOR PERMEANCE OF 0.02 PERMS OR LESS AS TESTED IN ACCORDANCE TO ASTM E96, PROCEDURE "A".
g. WHEN A VAPOR MASTIC IS REQUIRED, A WATER VAPOR PERMEANCE OF 0.02 PER ASTM E-96 PROCEDURE B MUST BE ACHIEVED.
h. ALL ACCESSORY MATERIALS SUCH AS FIELD INSTALLED JACKETS, MASTICS, COATINGS, TAPES, FASTENERS SHALL BE RECOMMENDED BY EACH COMPONENT MANUFACTURER FOR THE SPECIFIED APPLICATION OR AS LISTED IN THE NAIMA GUIDE TO INSULATING CHILLED WATER SYSTEMS WITH MINERAL FIBER PIPE INSULATION.
i. FITTINGS, VALVES, TEES, ETC. SHALL BE INSULATED WITH FIBERGLASS INSULATION INSERTS COVERED WITH WHITE PVC INSULATED FITTING COVERS.

4. FLEXIBLE ELASTOMERIC INSULATION:

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) ARMACELL LLC ARMAFLEX.
2) AEROFLEX USA, INC. AEROCEL.
3) K-FLEX USA INSUL-SHEET.

b. CLOSED-CELL. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS.
c. INORGANIC, INCOMBUSTIBLE, FOAMED OR CELLULATED GLASS WITH ANNEALED, RIGID, HERMETICALLY SEALED CELLS. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE.
d. PIPE INSULATION SHALL BE FABRICATED ACCORDING TO THE REQUIREMENTS OF ASTM C1639 "STANDARD SPECIFICATION FOR FABRICATION OF CELLULAR GLASS PIPE AND TUBING INSULATION".
e. THERMAL CONDUCTIVITY: 0.25 BTU-IN/HR-FT2-°F AT 75°F.
f. SHORT RUNS OF PIPE OR VALVES AND FITTINGS WHERE IT IS IMPRACTICAL TO INSTALL TUBING INSULATION SHALL BE INSULATED WITH TWO LAYERS OF 1/4" ELASTOMERIC FOAM TAPE.

B. ADHESIVES

1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED. ADHESIVES SHALL CONTAIN NO FLAMMABLE SOLVENTS IF THAT OPTION IS AVAILABLE.
2. FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) AEROFLEX USA INC.; AEROSEAL.
2) ARMACELL LCC; 520 BLV ADHESIVE.
3) FOSTER PRODUCTS CORPORATION, H. B. FULLER COMPANY; 85-75.
4) RBX CORPORATION; RUBATEX CONTACT ADHESIVE.

b. FOR INDOOR APPLICATIONS USE ADHESIVE THAT HAS A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

3. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) DESIGN POLYMERICS DP 2590-CA
2) ITW TACC, DIVISION OF ILLINOIS TOOL WORKS; SP80, T1080
3) MARATHON INDUSTRIES, INC.

b. FOR INDOOR APPLICATIONS USE ADHESIVE THAT HAS A VOC CONTENT OF 80 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

4. ASJ ADHESIVE, AND FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) DESIGN POLYMERICS DD2590-CA.
2) ITW TACC, DIVISION OF ILLINOIS TOOL WORKS; SP80, T1080
3) MARATHON INDUSTRIES, INC.

b. FOR INDOOR APPLICATIONS USE ADHESIVE THAT HAS A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

5. PVC JACKET ADHESIVE: COMPATIBLE WITH PVC JACKET.

a. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

1) DOW CHEMICAL COMPANY (THE); 739, DOW SILICONE.
2) JOHNS-MANVILLE; ZESTON PERMA-WELD, CEEL-TITE SOLVENT WELDING ADHESIVE.
3) P.I.C. PLASTICS, INC.; WELDING ADHESIVE.
4) SPEEDLINE CORPORATION; SPEEDLINE VINYL ADHESIVE.

b. FOR INDOOR APPLICATIONS USE ADHESIVE THAT HAS A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

C. FIELD-APPLIED JACKET

1. PVC JACKET: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH ASTM D1784, CLASS 16354-C; THICKNESS AS SCHEDULED; ROLL STOCK READY FOR SHOP OR FIELD CUTTING AND FORMING. THICKNESS IS INDICATED IN FIELD-APPLIED JACKET SCHEDULES.
2. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

a. JOHNS MANVILLE; ZESTON.
b. P.I.C. PLASTICS, INC.; FG SERIES.
c. PROTO CORPORATION; LOSMOKE.
d. SPEEDLINE CORPORATION; SMOKESAFE.

3. ADHESIVE: AS RECOMMENDED BY JACKET MATERIAL MANUFACTURER.
4. PVC JACKET COLOR:

a. HEATING HOT WATER SUPPLY: DARK RED
b. HEATING HOT WATER RETURN: LIGHT RED

5. FACTORY-FABRICATED FITTING COVERS TO MATCH JACKET IF AVAILABLE; OTHERWISE, FIELD FABRICATE.

a. SHAPES: 45- AND 90-DEGREE, SHORT- AND LONG-RADIUS ELBOWS, TEES, VALVES, FLANGES, UNIONS, REDUCERS, END CAPS, SOIL-PIPE HUBS, TRAPS, MECHANICAL JOINTS, AND P-TRAP AND SUPPLY COVERS FOR LAVATORIES.

D. ABOVEGROUND PIPING INSULATION SCHEDULE

1. HEATING HOT WATER SUPPLY AND RETURN, 200°F AND BELOW:

a. NPS 1.25 INCH AND SMALLER: MINERAL FIBER, PRE-FORMED PIPE INSULATION, 1.5 INCHES THICK.
b. NPS 1.5 INCH AND LARGER: MINERAL FIBER, PRE-FORMED PIPE INSULATION, 2 INCHES THICK.

2. CONDENSATE DRAIN PIPING:

a. ALL PIPE SIZES: FLEXIBLE ELASTOMERIC, 0.5 INCH THICK.

E. INDOOR, FIELD-APPLIED JACKET SCHEDULE

1. PIPING, EXPOSED: PVC, COLOR-CODED BY SYSTEM, 30 MILS THICK FOR ALL INDOOR APPLICATIONS.

2.7 DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

A. CONTROL SYSTEM

1. PROVIDE THE FOLLOWING APPROVED DDC SYSTEM MANUFACTURER:

a. JOHNSON CONTROLS

2. CONTROL SYSTEM SHALL CONSIST OF SENSORS, INDICATORS, ACTUATORS, FINAL CONTROL ELEMENTS, INTERFACE EQUIPMENT, OTHER APPARATUS, ACCESSORIES, AND SOFTWARE CONNECTED TO DISTRIBUTED CONTROLLERS OPERATING IN MULTIUSER, MULTITASKING ENVIRONMENT ON TOKEN-PASSING NETWORK AND PROGRAMMED TO CONTROL MECHANICAL SYSTEMS. AN OPERATOR WORKSTATION PERMITS INTERFACE WITH THE NETWORK VIA DYNAMIC COLOR GRAPHICS WITH EACH MECHANICAL SYSTEM, BUILDING FLOOR PLAN, AND CONTROL DEVICE DEPICTED BY POINT-AND-CLICK GRAPHICS.
3. CONTROL SYSTEM SHALL BE FULLY COMPATIBLE WITH EXISTING CONTROL SYSTEM ON CAMPUS.
4. WEB SERVER AND COMPLETE GRAPHICS INTEGRATION SHALL BE PROVIDED FOR ALL NEW SYSTEMS TO EXISTING SYSTEM.
5. GRAPHIC SCREENS SHALL BE PROVIDED FOR ALL SYSTEMS INCLUDED IN THE SEQUENCE OF OPERATIONS AND POINTS LIST.
6. CONTROL EQUIPMENT AND NETWORK FAILURES SHALL BE TREATED AS ALARMS AND ANNUNCIATED.
7. ALARMS SHALL BE VISUALLY IDENTIFIED VIA THE HTML GRAPHICS PAGES. OVERRIDES AND SETPOINT CHANGES FOR ALL POINTS SHALL BE CONFIGURED VIA THE HTML INTERFACE.
8. ALARMS SHALL BE ANNUNCIATED IN ANY OF THE FOLLOWING MANNERS AS DEFINED BY THE USER:

a. SCREEN MESSAGE TEXT
b. SMS AND EMAIL MESSAGE
c. GRAPHIC WITH FLASHING ALARM OBJECT(S)

9. ALARMS SHALL BE LOGGED FOR A PERIOD OF NO LESS THAN 1 WEEK
10. THE FOLLOWING SHALL BE RECORDED BY THE WEB SERVER FOR EACH ALARM (AT A MINIMUM):

a. TIME AND DATE
b. LOCATION (BUILDING, FLOOR, ZONE, OFFICE NUMBER, ETC.)
c. EQUIPMENT (COOLING TOWER #, ACCESS WAY, ETC.)

B. COMMUNICATION

1. CONTROL PRODUCTS, COMMUNICATION MEDIA, CONNECTORS, REPEATERS, HUBS, AND ROUTERS SHALL COMPRISE A BACNET INTERNETWORK. CONTROLLER AND OPERATOR INTERFACE COMMUNICATION SHALL CONFORM TO THE LATEST VERSION OF ASHRAE/ANSI STANDARD 135, BACNET.
2. INSTALL NEW WIRING AND NETWORK DEVICES AS REQUIRED PROVIDING A COMPLETE AND WORKABLE CONTROL NETWORK.
3. EACH CONTROLLER SHALL HAVE A COMMUNICATION PORT FOR TEMPORARY CONNECTION TO A LAPTOP COMPUTER OR OTHER OPERATOR INTERFACE. CONNECTION SHALL SUPPORT MEMORY DOWNLOADS AND OTHER COMMISSIONING AND TROUBLESHOOTING OPERATIONS.
4. INTERNETWORK OPERATOR INTERFACE AND VALUE PASSING SHALL BE TRANSPARENT TO INTERNETWORK ARCHITECTURE.

a. AN OPERATOR INTERFACE CONNECTED TO A CONTROLLER SHALL ALLOW THE OPERATOR TO INTERFACE WITH EACH INTERNETWORK CONTROLLER AS IF DIRECTLY CONNECTED. CONTROLLER INFORMATION SUCH AS DATA, STATUS, AND CONTROL ALGORITHMS SHALL BE VIEWABLE AND EDITABLE FROM EACH INTERNETWORK CONTROLLER.
b. INPUTS, OUTPUTS, AND CONTROL VARIABLES USED TO INTEGRATE CONTROL STRATEGIES ACROSS MULTIPLE CONTROLLERS SHALL BE READABLE BY EACH CONTROLLER ON THE INTERNETWORK. PROGRAM AND TEST ALL CROSS-CONTROLLER LINKS REQUIRED TO EXECUTE CONTROL STRATEGIES SPECIFIED IN THIS SECTION. AN AUTHORIZED OPERATOR SHALL BE ABLE TO EDIT CROSS-CONTROLLER LINKS BY TYPING A STANDARD OBJECT ADDRESS OR BY USING A POINT-AND-CLICK INTERFACE.

5. CONTROLLERS WITH REAL-TIME CLOCKS SHALL USE THE BACNET TIME SYNCHRONIZATION SERVICE. SYSTEM SHALL AUTOMATICALLY SYNCHRONIZE SYSTEM CLOCKS DAILY FROM AN OPERATOR-DESIGNATED CONTROLLER VIA THE INTERNETWORK. IF APPLICABLE, SYSTEM SHALL AUTOMATICALLY ADJUST FOR DAYLIGHT SAVING AND STANDARD TIME.
6. SYSTEM SHALL BE EXPANDABLE TO AT LEAST TWICE THE REQUIRED INPUT AND OUTPUT OBJECTS WITH ADDITIONAL CONTROLLERS, ASSOCIATED DEVICES, AND WIRING.
7. SYSTEM SHALL SUPPORT WEB SERVICES DATA EXCHANGE WITH ANY OTHER SYSTEM THAT COMPLIES WITH XML (EXTENSIBLE MARKUP LANGUAGE) AND SOAP (SIMPLE OBJECT

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Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed MN
Drawn MN
Checked IT
Approved IT

Date 09/15/2020

Submittal ISSUE FOR BID

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SPECIFICATIONS

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ACCESS PROTOCOL) STANDARDS SPECIFIED BY THE WEB SERVICES INTEROPERABILITY ORGANIZATION (WS-I) BASIC PROFILE 1.0 OR HIGHER. WEB SERVICES SUPPORT SHALL AS A MINIMUM BE PROVIDED AT THE WORKSTATION OR WEB SERVER LEVEL AND SHALL ENABLE DATA TO BE READ FROM OR WRITTEN TO THE SYSTEM.

a. SYSTEM SHALL SUPPORT WEB SERVICES READ DATA REQUESTS BY RETRIEVING REQUESTED TREND DATA OR POINT VALUES (I/O HARDWARE POINTS, ANALOG VALUE SOFTWARE POINTS, OR BINARY VALUE SOFTWARE POINTS) FROM ANY SYSTEM CONTROLLER OR FROM THE TREND HISTORY DATABASE.
b. SYSTEM SHALL SUPPORT WEB SERVICES WRITE DATA REQUEST TO EACH ANALOG AND BINARY OBJECT THAT CAN BE EDITED THROUGH THE SYSTEM OPERATOR INTERFACE BY DOWNLOADING A NUMERIC VALUE TO THE SPECIFIED OBJECT.
c. FOR READ OR WRITE REQUESTS, THE SYSTEM SHALL REQUIRE USER NAME AND PASSWORD AUTHENTICATION AND SHALL SUPPORT SSL (SECURE SOCKET LAYER) OR EQUIVALENT DATA ENCRYPTION.
d. SYSTEM SHALL SUPPORT DISCOVERY THROUGH A WEB SERVICES CONNECTION OR SHALL PROVIDE A TOOL AVAILABLE THROUGH THE OPERATOR INTERFACE THAT WILL REVEAL THE PATH/IDENTIFIER NEEDED TO ALLOW A THIRD PARTY WEB SERVICES DEVICE TO READ DATA FROM OR WRITE DATA TO ANY OBJECT IN THE SYSTEM WHICH SUPPORTS THIS SERVICE.

C. DDC CONTROL PRODUCTS

1. GENERAL:

a. PROVIDE BUILDING CONTROLLERS (BC), ADVANCED APPLICATION CONTROLLERS (AAC), APPLICATION SPECIFIC CONTROLLERS (ASC), SMART ACTUATORS (SA), AND SMART SENSORS (SS) AS REQUIRED TO ACHIEVE PERFORMANCE SPECIFIED IN THIS SECTION.
b. EVERY DEVICE IN THE SYSTEM WHICH EXECUTES CONTROL LOGIC AND DIRECTLY CONTROLS HVAC EQUIPMENT MUST CONFORM TO A STANDARD BACNET DEVICE PROFILE AS SPECIFIED IN LATEST EDITION OF ASHRAE/ANSI 135, BACNET ANNEX L. UNLESS OTHERWISE SPECIFIED, HARDWIRED ACTUATORS AND SENSORS MAY BE USED IN LIEU OF BACNET SMART ACTUATORS AND SMART SENSORS.

2. BACNET:

a. BUILDING CONTROLLERS (BCS): EACH BC SHALL CONFORM TO BACNET BUILDING CONTROLLER (B-BC) DEVICE PROFILE AS SPECIFIED IN ASHRAE/ANSI 135, BACNET ANNEX L AND SHALL BE LISTED AS A CERTIFIED B-BC IN THE BACNET TESTING LABORATORIES (BTL) PRODUCT LISTING.
b. ADVANCED APPLICATION CONTROLLERS (AACS): EACH AAC SHALL CONFORM TO BACNET ADVANCED APPLICATION CONTROLLER (B-AAC) DEVICE PROFILE AS SPECIFIED IN ASHRAE/ANSI 135, BACNET ANNEX L AND SHALL BE LISTED AS A CERTIFIED B-AAC IN THE BACNET TESTING LABORATORIES (BTL) PRODUCT LISTING.
c. APPLICATION SPECIFIC CONTROLLERS (ASCS): EACH ASC SHALL CONFORM TO BACNET APPLICATION SPECIFIC CONTROLLER (B-ASC) DEVICE PROFILE AS SPECIFIED IN ASHRAE/ANSI 135, BACNET ANNEX L AND SHALL BE LISTED AS A CERTIFIED B-ASC IN THE BACNET TESTING LABORATORIES (BTL) PRODUCT LISTING.
d. SMART ACTUATORS (SAS): EACH SA SHALL CONFORM TO BACNET SMART ACTUATOR (B-SA) DEVICE PROFILE AS SPECIFIED IN ASHRAE/ANSI 135 , BACNET ANNEX L AND SHALL BE LISTED AS A CERTIFIED B-SA IN THE BACNET TESTING LABORATORIES (BTL) PRODUCT LISTING.
e. SMART SENSORS (SSS): EACH SS SHALL CONFORM TO BACNET SMART SENSOR (B-SS) DEVICE PROFILE AS SPECIFIED IN ASHRAE/ANSI 135, BACNET ANNEX L AND SHALL BE LISTED AS A CERTIFIED B-SS IN THE BACNET TESTING LABORATORIES (BTL) PRODUCT LISTING.
f. BACNET COMMUNICATION:

1) EACH BC SHALL RESIDE ON OR BE CONNECTED TO A BACNET NETWORK USING ISO 8802-3 (ETHERNET) DATA LINK/PHYSICAL LAYER PROTOCOL AND BACNET/IP ADDRESSING.
2) BACNET ROUTING SHALL BE PERFORMED BY BCS OR OTHER BACNET DEVICE ROUTERS AS NECESSARY TO CONNECT BCS TO NETWORKS OF AACS AND ASCS.
3) EACH AAC AND ASC SHALL RESIDE ON A BACNET NETWORK USING MS/TP DATA LINK/PHYSICAL LAYER PROTOCOL.
4) EACH SA SHALL RESIDE ON A BACNET NETWORK USING MS/TP DATA LINK/PHYSICAL LAYER PROTOCOL.
5) EACH SS SHALL RESIDE ON A BACNET NETWORK USING ISO 8802-3 (ETHERNET) DATA LINK/PHYSICAL LAYER PROTOCOL WITH BACNET NETWORK USING MS/TP DATA LINK/PHYSICAL LAYER PROTOCOL.

3. COMMUNICATION.

a. SERVICE PORT: EACH CONTROLLER SHALL PROVIDE A SERVICE COMMUNICATION PORT FOR CONNECTION TO A PORTABLE OPERATOR'S TERMINAL. CONNECTION SHALL BE EXTENDED TO SPACE TEMPERATURE SENSOR PORTS WHERE SHOWN ON DRAWINGS.
b. SIGNAL MANAGEMENT: BC AND ASC OPERATING SYSTEMS SHALL MANAGE INPUT AND OUTPUT COMMUNICATION SIGNALS TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL OBJECT INFORMATION AND TO ALLOW FOR CENTRAL MONITORING AND ALARMS.
c. DATA SHARING: EACH BC AND AAC SHALL SHARE DATA AS REQUIRED WITH EACH NETWORKED BC AND AAC.
d. STAND-ALONE OPERATION: EACH PIECE OF EQUIPMENT SPECIFIED THIS SECTION SHALL BE CONTROLLED BY A SINGLE CONTROLLER TO PROVIDE STAND-ALONE CONTROL IN THE EVENT OF COMMUNICATION FAILURE. ALL I/O POINTS SPECIFIED FOR A PIECE OF EQUIPMENT SHALL BE INTEGRAL TO ITS CONTROLLER. PROVIDE STABLE AND RELIABLE STAND-ALONE CONTROL USING DEFAULT VALUES OR OTHER METHOD FOR VALUES NORMALLY READ OVER THE NETWORK.

4. ENVIRONMENT. CONTROLLER HARDWARE SHALL BE SUITABLE FOR ANTICIPATED AMBIENT CONDITIONS.

a. CONTROLLERS USED OUTDOORS OR IN WET AMBIENT CONDITIONS SHALL BE MOUNTED IN WATERPROOF ENCLOSURES AND SHALL BE RATED FOR OPERATION AT -20°F TO 140°F.
b. CONTROLLERS USED IN CONDITIONED SPACE SHALL BE MOUNTED IN DUST-PROTECTIVE ENCLOSURES AND SHALL BE RATED FOR OPERATION AT 32°F TO 120°F.

5. KEYPAD: PROVIDE A LOCAL KEYPAD AND DISPLAY FOR EACH BC AND AAC. OPERATOR SHALL BE ABLE TO USE KEYPAD TO VIEW AND EDIT DATA. KEYPAD AND DISPLAY SHALL REQUIRE PASSWORD TO PREVENT UNAUTHORIZED USE. IF THE MANUFACTURER DOES NOT NORMALLY PROVIDE A KEYPAD AND DISPLAY FOR EACH BC AND AAC, PROVIDE THE SOFTWARE AND ANY INTERFACE CABLING NEEDED TO USE A LAPTOP COMPUTER AS A PORTABLE OPERATOR'S TERMINAL FOR THE SYSTEM.
6. REAL-TIME CLOCK: CONTROLLERS THAT PERFORM SCHEDULING SHALL HAVE A REAL-TIME CLOCK.
7. SERVICEABILITY:

a. CONTROLLERS SHALL HAVE DIAGNOSTIC LEDS FOR POWER, COMMUNICATION, AND PROCESSOR.
b. WIRES SHALL BE CONNECTED TO A FIELD-REMOVABLE MODULAR TERMINAL STRIP OR TO A TERMINATION CARD CONNECTED BY A RIBBON CABLE.
c. EACH BC AND AAC SHALL CONTINUALLY CHECK ITS PROCESSOR AND MEMORY CIRCUIT STATUS AND SHALL GENERATE AN ALARM ON ABNORMAL OPERATION. SYSTEM SHALL CONTINUOUSLY CHECK CONTROLLER NETWORK AND GENERATE ALARM FOR EACH CONTROLLER THAT FAILS TO RESPOND.

8. MEMORY:

a. CONTROLLER MEMORY SHALL SUPPORT OPERATING SYSTEM, DATABASE AND PROGRAMMING REQUIREMENTS.
b. EACH BC AND AAC SHALL RETAIN BIOS AND APPLICATION PROGRAMMING FOR AT LEAST 72 HOURS IN THE EVENT OF POWER LOSS.
c. EACH ASC AND SA SHALL USE NONVOLATILE MEMORY AND SHALL RETAIN BIOS AND APPLICATION PROGRAMMING IN THE EVENT OF POWER LOSS. SYSTEM SHALL AUTOMATICALLY DOWNLOAD DYNAMIC CONTROL PARAMETERS FOLLOWING POWER LOSS.

9. IMMUNITY TO POWER AND NOISE: CONTROLLERS SHALL BE ABLE TO OPERATE AT 90% TO 110% OF NOMINAL VOLTAGE RATING AND SHALL PERFORM AN ORDERLY SHUTDOWN BELOW 80% NOMINAL VOLTAGE. OPERATION SHALL BE PROTECTED AGAINST ELECTRICAL NOISE OF 5 TO 120 HZ AND FROM KEYED RADIOS UP TO 3 FT.
10. TRANSFORMER: ASC POWER SUPPLY SHALL BE FUSED OR CURRENT LIMITING AND SHALL BE RATED AT A MINIMUM OF 125% OF ASC POWER CONSUMPTION.

D. INPUT AND OUTPUT INTERFACE

1. GENERAL: HARD-WIRE INPUT AND OUTPUT POINTS TO BCS, AACS, ASCS, OR SAS.
2. PROTECTION: SHORTING AN INPUT OR OUTPUT POINT TO ITSELF, TO ANOTHER POINT, OR TO GROUND SHALL CAUSE NO CONTROLLER DAMAGE. INPUT OR OUTPUT POINT CONTACT WITH UP TO 24 V FOR ANY DURATION SHALL CAUSE NO CONTROLLER DAMAGE.
3. BINARY INPUTS: BINARY INPUTS SHALL MONITOR THE ON AND OFF SIGNAL FROM A REMOTE DEVICE. BINARY INPUTS SHALL PROVIDE A WETTING CURRENT OF AT LEAST 12 MA AND SHALL BE PROTECTED AGAINST CONTACT BOUNCE AND NOISE. BINARY INPUTS SHALL SENSE DRY CONTACT CLOSURE WITHOUT APPLICATION OF POWER EXTERNAL TO THE CONTROLLER.
4. PULSE ACCUMULATION INPUTS: PULSE ACCUMULATION INPUTS SHALL CONFORM TO BINARY INPUT REQUIREMENTS AND SHALL ACCUMULATE UP TO 10 PULSES PER SECOND.
5. ANALOG INPUTS: ANALOG INPUTS SHALL MONITOR LOW-VOLTAGE (0-10 VDC), CURRENT (4-20 MA), OR RESISTANCE (THERMISTOR OR RTD) SIGNALS. ANALOG INPUTS SHALL BE COMPATIBLE WITH AND FIELD CONFIGURABLE TO COMMONLY AVAILABLE SENSING DEVICES.
6. BINARY OUTPUTS: BINARY OUTPUTS SHALL SEND AN ON-OR-OFF SIGNAL FOR ON AND OFF CONTROL. BUILDING CONTROLLER BINARY OUTPUTS SHALL HAVE THREE-POSITION (ON-OFF-AUTO) OVERRIDE SWITCHES AND STATUS LIGHTS. OUTPUTS SHALL BE SELECTABLE FOR NORMALLY OPEN OR NORMALLY CLOSED OPERATION.
7. ANALOG OUTPUTS: ANALOG OUTPUTS SHALL SEND A MODULATING 0-10 VDC OR 4-20 MA SIGNAL AS REQUIRED TO PROPERLY CONTROL OUTPUT DEVICES. EACH BUILDING CONTROLLER ANALOG OUTPUT SHALL HAVE A TWO-POSITION (AUTO-MANUAL) SWITCH, A MANUALLY ADJUSTABLE POTENTIOMETER, AND STATUS LIGHTS. ANALOG OUTPUTS SHALL NOT DRIFT MORE THAN 0.4% OF RANGE ANNUALLY.
8. UNIVERSAL INPUTS AND OUTPUTS: INPUTS AND OUTPUTS THAT CAN BE DESIGNATED AS EITHER BINARY OR ANALOG IN SOFTWARE SHALL CONFORM TO THE PROVISIONS OF THIS SECTION THAT ARE APPROPRIATE FOR THEIR DESIGNATED USE.

E. POWER SUPPLIES AND LINE FILTERING

1. POWER SUPPLIES. CONTROL TRANSFORMERS SHALL BE UL LISTED. FURNISH CLASS 2 CURRENT-LIMITING TYPE OR FURNISH OVER-CURRENT PROTECTION IN PRIMARY AND SECONDARY CIRCUITS FOR CLASS 2 SERVICE IN ACCORDANCE WITH NEC REQUIREMENTS. LIMIT CONNECTED LOADS TO 80% OF RATED CAPACITY.

a. DC POWER SUPPLY OUTPUT SHALL MATCH OUTPUT CURRENT AND VOLTAGE REQUIREMENTS. UNIT SHALL BE FULL WAVE RECTIFIER TYPE WITH OUTPUT RIPPLE OF 5.0 MV MAXIMUM PEAK-TO-PEAK. REGULATION SHALL BE 1.0% LINE AND LOAD COMBINED, WITH 100-MICROSECOND RESPONSE TIME FOR 50% LOAD CHANGES. UNIT SHALL HAVE BUILT-IN OVER-VOLTAGE AND OVER-CURRENT PROTECTION AND SHALL BE ABLE TO WITHSTAND 150% CURRENT OVERLOAD FOR AT LEAST THREE SECONDS WITHOUT TRIP-OUT OR FAILURE.

1) UNIT SHALL OPERATE BETWEEN 32°F AND 120°F. EM/RF SHALL MEET FCC CLASS B AND VDE 0871 FOR CLASS B AND MILSTD 810C FOR SHOCK AND VIBRATION.
2) LINE VOLTAGE UNITS SHALL BE UL RECOGNIZED AND CSA LISTED.

2. POWER LINE FILTERING.

a. PROVIDE INTERNAL OR EXTERNAL TRANSIENT VOLTAGE AND SURGE SUPPRESSION FOR WORKSTATIONS AND CONTROLLERS. SURGE PROTECTION SHALL HAVE:
b. DIELECTRIC STRENGTH OF 1000 V MINIMUM
c. RESPONSE TIME OF 10 NANOSECONDS OR LESS
d. TRANSVERSE MODE NOISE ATTENUATION OF 65 DB OR GREATER
e. COMMON MODE NOISE ATTENUATION OF 150 DB OR GREATER AT 40-100 HZ

F. THERMOWELLS

1. WHEN THERMOWELLS ARE REQUIRED, THE SENSOR AND WELL SHALL BE SUPPLIED AS A COMPLETE ASSEMBLY INCLUDING WELLHEAD AND GREENFIELD FITTING.
2. THERMOWELLS SHALL BE PRESSURE RATED AND CONSTRUCTED IN ACCORDANCE WITH THE SYSTEM WORKING PRESSURE.
3. THERMOWELLS AND SENSORS SHALL BE MOUNTED IN A THREADOLET OR 1/2" NPT SADDLE AND ALLOW EASY ACCESS TO THE SENSOR FOR REPAIR OR REPLACEMENT.
4. THERMOWELLS SHALL BE CONSTRUCTED OF STAINLESS STEEL, TYPE 304.
5. MANUFACTURER SHALL BE BAPI MODEL BA/4"M304 OR APPROVED EQUAL.

G. LIQUID IMMERSION TEMPERATURE SENSORS

1. BAPI MODEL BA/10K OR APPROVED EQUAL.
2. OPERATING TEMPERATURE -40 TO 240°F
3. SENSING ELEMENT NTC 10K (TYPE II) THERMISTOR
4. ACCURACY AT CALIBRATION TEMPERATURE +/- 1 °F
5. ALL SENSORS MEASURING TEMPERATURES IN PIPES LARGER THAN 2 INCHES IN DIAMETER OR IN PRESSURE VESSELS SHALL BE SUPPLIED WITH WELLS PROPERLY FABRICATED FOR THE SERVICE. WELLS SHALL BE NON-CORROSIVE TO THE MEDIUM BEING MEASURED AND SHALL HAVE SUFFICIENT PHYSICAL STRENGTH TO WITHSTAND PRESSURES AND VELOCITIES TO WHICH THEY ARE SUBJECTED. WELLS SHALL BE INSTALLED IN THE PIPING AT ELBOWS WHERE PIPING IS SMALLER THAN THE LENGTH OF THE WELL TO AFFECT PROPER FLOW ACROSS THE ENTIRE AREA OF THE WELL.
6. STAINLESS STEEL, TYPE 304, SOCKET WITH MINIMUM INSERTION LENGTH OF 4 INCHES.

H. WATER DIFFERENTIAL PRESSURE TRANSMITTERS

1. WATER DIFFERENTIAL PRESSURE SENSORS SHALL BE SETRA MODEL 2301 TRANSMITTERS OR APPROVED EQUAL.
2. PRESSURE TRANSMITTERS SHALL BE CONSTRUCTED TO WITHSTAND 100% PRESSURE OVER-RANGE WITHOUT DAMAGE AND TO HOLD CALIBRATED ACCURACY WHEN SUBJECT TO A MOMENTARY 40% OVER-RANGE INPUT.
3. PROVIDE:

a. NEMA 1 TRANSMITTER HOUSING AND LOCATE IN ACCESSIBLE LOCAL CONTROL PANELS WHEREVER POSSIBLE.
b. BRASS 3-VALVE MANIFOLD ASSEMBLY WITH SHUT-OFF AND SHUNT VALVES.
c. STANDARD VITON/SILICONE BLEED SCREW SEALS.
d. CALIBRATION CERTIFICATE.

4. THE PRESSURE TRANSMITTER SHALL BE CAPABLE OF TRANSMITTING A LINEAR ELECTRONIC SIGNAL PROPORTIONAL TO THE DIFFERENTIAL OF THE PRESSURE INPUT SIGNALS WITH THE FOLLOWING MINIMUM PERFORMANCE SPECIFICATIONS.

a. SPAN: REFER TO POINTS LIST
b. ACCURACY: ±0.25% OF FULL SCALE
c. NON-REPEATABILITY: 0.05%
d. NON-LINEARITY: ±0.20%
e. RESPONSE: 30 TO 50 MS
f. TEMPERATURE STABILITY: LESS THAN 0.02%FS/°F CHANGE
g. OUTPUT: 4 TO 20MA

I. THERMAL-ENERGY METERS

1. ONICON SYSTEM 10-BAC MS/TP BTU METER.
2. PROVIDE SYSTEM WITH FLOW SENSOR, TEMPERATURE SENSORS, TRANSMITTER, INDICATOR AND CONNECTING WIRING FOR INTERFACE VIA BACNET MS/TP BASED SYSTEM.
3. ELECTROMAGNETIC, FULL BORE FLOW SENSOR (NO MOVING PARTS) WITH CORROSION-RESISTANT-METAL BODY AND TRANSMITTER FOR INSTALLATION IN PIPING. ONICON F-3100 SERIES.

a. DESIGN: TOTAL THERMAL-ENERGY MEASUREMENT.
b. MINIMUM PRESSURE RATING: 150 PSIG.
c. MINIMUM TEMPERATURE RANGE: 15 TO 250 DEG F.

4. TEMPERATURE SENSORS.

a. MANUFACTURED BY ONICON.
b. SOLID-STATE SENSORS CALIBRATED USING NIST TRACEABLE TEMPERATURE STANDARDS.
c. DIFFERENTIAL TEMPERATURE ACCURACY ±0.15°F OVER CALIBRATED RANGE.

5. INDICATOR: SOLID-STATE, INTEGRATING-TYPE METER FOR WALL MOUNTING.

a. SIXTEEN CHARACTER ALPHANUMERIC LCD DISPLAY.
b. DISPLAY DATA: TOTAL ENERGY, TOTAL FLOW, ENERGY RATE, FLOW RATE, SUPPLY TEMPERATURE AND RETURN TEMPERATURE.
c. ACCURACY: PLUS OR MINUS 0.05 PERCENT COMPUTING NON-LINEARITY.
d. DISPLAY: VISUALLY INDICATES TOTAL ENERGY, TOTAL FLOW, ENERGY RATE, FLOW RATE, SUPPLY AND RETURN TEMPERATURE.
e. OUTPUT INTERFACE: BACNET MS/TP COMPATIBLE TRANSCEIVER HIGH-SPEED INTERFACE.

J. CURRENT TRANSFORMERS

1. THE CURRENT TRANSFORMERS SHALL BE PROVIDED TO BE INSTALLED OR REMOVED WITHOUT DISMANTLING THE PRIMARY BUS OR CABLES. THE TRANSFORMER SHALL BE OF A SPLIT CORE DESIGN.
2. THE CORE AND WINDINGS SHALL BE COMPLETELY ENCASED IN A UL APPROVED THERMOPLASTIC RATED 94VA. NO METAL PARTS SHALL BE EXPOSED OTHER THAN THE TERMINALS.
3. THE CURRENT TRANSFORMERS SHALL MEET THE FOLLOWING SPECIFICATIONS.

a. FREQUENCY LIMITS: 50 TO 400 HZ.
b. INSULATION: 0.6 KV CLASS, 10 KV BIL.
c. ACCURACY: ± 1 % AT 5.0 TO 25.0 VA ACCURACY CLASS WITH U.P.F. BURDEN.

4. PROVIDE A DISCONNECT SWITCH FOR EACH CURRENT TRANSFORMER.

K. CURRENT SENSING SWITCHES

1. CURRENT SENSING SWITCH SHALL BE SELF-POWERED WITH SOLID-STATE CIRCUITRY AND A DRY CONTACT OUTPUT.
2. CURRENT SENSING SWITCHES SHALL CONSIST OF A SOLID STATE CURRENT SENSING CIRCUIT, ADJUSTABLE TRIP POINT, SOLID STATE SWITCH, SPDT RELAY AND AN LED INDICATING THE ON OR OFF STATUS. A CONDUCTOR OF THE LOAD SHALL BE PASSED THROUGH THE WINDOW OF THE DEVICE. IT SHALL ACCEPT OVER CURRENT UP TO TWICE ITS TRIP INTO RANGE.

L. ELECTRICAL BULK MATERIALS

1. THE CONTROLS CONTRACTOR SHALL BE FULLY RESPONSIBLE TO PROVIDE ALL POWER AND WIRING (LOW VOLTAGE, 120 VOLTS, ETC.) AND CONDUIT (3/4" MINIMUM OR AS REQUIRED BY ELECTRICAL CODES) FOR CONNECTION OF ALL DDC PANELS, CONTROL VALVES, SENSORS AND ANY OTHER DDC COMPONENTS FOR A COMPLETELY OPERATIONAL DDC SYSTEM.
2. ENCLOSURES:

a. TERMINAL BOXES LOCATED INDOORS SHALL BE RATED FOR NEMA 1
b. TERMINAL BOXES LOCATED OUTDOORS SHALL BE RATED FOR NEMA 4X.

1) PROVIDE WITH PROTECTIVE COATINGS SUITABLE TO THE ENVIRONMENT IN WHICH THEY ARE TO BE INSTALLED.
2) ALL ENCLOSURES SHALL BE HINGED WITH LOCKABLE DOORS.

3. TRANSFORMERS: PROVIDE STEP-DOWN TRANSFORMERS WHERE CONTROL EQUIPMENT OPERATES AT LOWER THAN CIRCUIT VOLTAGE. TRANSFORMERS SERVING SHALL BE FED FROM THE FAN MOTOR LEADS, OR FED FROM THE NEAREST DISTRIBUTION PANELBOARD OR MOTOR CONTROL CENTER, USING CIRCUITS PROVIDED FOR THE PURPOSE. TRANSFORMERS, OTHER THAN TRANSFORMERS IN BRIDGE CIRCUITS, SHALL HAVE PRIMARIES WOUND FOR THE VOLTAGE AVAILABLE AND SECONDARIES WOUND FOR THE CORRECT CONTROL CIRCUIT VOLTAGE. SIZE TRANSFORMERS SO THAT 80 PERCENT OF THE RATED CAPACITY EQUALS THE CONNECTED LOAD. ENCLOSE TRANSFORMERS IN A STEEL CABINET WITH CONDUIT CONNECTIONS. PROVIDE A DISCONNECT SWITCH ON THE PRIMARY SIDE AND A FUSE CUTOUT ON THE SECONDARY SIDE. TRANSFORMERS SHALL CONFORM TO UL 506.
4. THE CONTROLS CONTRACTOR SHALL FURNISH ALL ELECTRICAL RELAYS AND COORDINATE WITH THE SUPPLIER OF MAGNETIC STARTERS FOR THE AUXILIARY CONTACT REQUIREMENTS. ALL ELECTRICAL CONTROL DEVICES SHALL BE OF A TYPE TO MEET CURRENT, VOLTAGE, AND SWITCHING REQUIREMENT OF THEIR PARTICULAR APPLICATION. RELAYS SHALL BE PROVIDED WITH 24 VAC COILS AND CONTACTS SHALL BE RATED AT 10 AMPS MINIMUM.
5. WIRING:

a. PROVIDE COMPLETE ELECTRIC WIRING FOR ALL TEMPERATURE CONTROL APPARATUS, INCLUDING WIRING TO TRANSFORMER PRIMARIES, PANELS, VALVES, ETC.
b. CONTROL CIRCUIT CONDUCTORS WHICH RUN IN SAME CONDUIT AS POWER CIRCUIT CONDUCTORS SHALL HAVE SAME INSULATION LEVEL AS POWER CIRCUIT CONDUCTORS.
c. CIRCUITS OPERATING AT MORE THAN 100 VOLTS SHALL BE IN ACCORDANCE WITH DIVISION 26.
d. CIRCUITS OPERATING AT 100 VOLTS OR LESS SHALL BE DEFINED AS LOW VOLTAGE AND SHALL BE RUN IN RIGID OR FLEXIBLE CONDUIT, METALLIC TUBING, METAL RACEWAYS OR WIREWAYS, ARMORED CABLE, OR MULTICONDUCTOR CABLE. USE MULTICONDUCTOR CABLE FOR CONCEALED ACCESSIBLE LOCATIONS ONLY. PROVIDE CIRCUIT AND WIRING PROTECTION AS REQUIRED BY NFPA 70. ALUMINUM-SHEATHED CABLE OR ALUMINUM CONDUIT MAY BE USED BUT SHALL NOT BE BURIED IN CONCRETE.
e. CONDUITS:

1) REFER TO DIVISION 26 SPECIFICATIONS FOR DIFFERENT USAGES OF RIGID CONDUIT, EMT, OR IMT.
2) ALL EXPOSED WIRING SHALL BE IN RIGID CONDUIT, MINIMUM 3/4".
3) ALL WIRING IN RETURN AIR PLENUMS SHALL BE PLENUM RATED.
4) ALL WIRING SHALL BE IN RIGID CONDUIT, MINIMUM 3/4".

f. FOR LESS THAN NOMINAL 120V SERVICE: CABLE IN CONTROL PANELS FOR ANALOG LOOPS SHALL BE TWISTED AND SHIELDED TWO CONDUCTOR, #16 X 30 STRANDED WITH #22 AWG DRAIN WIRE AND ALUMINUM-POLYESTER 100 PERCENT SHIELDING COVER FOR EACH PAIR. CABLE OUTSIDE OF CONTROL PANELS FOR ANALOG SIGNAL LOOPS SHALL BE SINGLE TWISTED #18 AWG SHIELDED PAIR. CONDUCTORS SHALL BE COPPER COATED WITH CLASS B STRAND. INSULATION SHALL BE 30 MILS XPLE RATED AT 300 VOLTS. CABLE FOR DIGITAL SIGNALS SHALL BE TWO CONDUCTOR, #16 X 30 STRANDED. EACH CONDUCTOR SHALL BE COLOR CODED. EACH CABLE SHALL HAVE POLYETHYLENE JACKET.
g. WIRE FOR LOW VOLTAGE DC AND ELECTRONIC CIRCUITS CARRYING LESS THAN 0.5 AMPERE, CABLE OF TWO OR MORE CONDUCTORS, SHALL BE NOT SMALLER THAN NO. 18 AWG STRANDED COPPER (SHIELDED).
h. SHIELD CABLES CARRYING ANALOG SIGNALS AND INSTALL IN SEPARATE CONDUIT FROM AC POWER CIRCUITS.
i. TERMINATE CABLES IN SOLDER OR SCREW TYPE TERMINAL STRIPS. DO NOT TAP CABLES AT INTERMEDIATE POINTS.
j. COLOR CODE OR NUMBER WIRES, WHETHER INDIVIDUAL OR IN CABLES, FOR IDENTIFICATION.
k. CABLES TERMINATING IN SCREW TYPE TERMINAL STRIPS SHALL HAVE PRESSURE TYPE CONNECTORS CONFORMING TO UL 486A. WIRE IN PHYSICAL CONTACT WITH COMPRESSION SCREW IS NOT ACCEPTABLE.
l. ALL VFD WIRING SHALL BE SHIELDED.

M. NETWORK COMMUNICATION REQUIREMENTS

1. WIRED NETWORK COMMUNICATION SHALL FOLLOW THE PUBLISHED GUIDELINES FOR TWISTED PAIR BACNET NETWORK.
2. COMMUNICATION CONDUITS SHALL NOT BE INSTALLED CLOSER THAN SIX FEET FROM HIGH POWER TRANSFORMERS OR RUN PARALLEL WITHIN SIX FEET OF ELECTRICAL HIGH POWER CABLES. CARE SHALL BE TAKEN TO ROUTE THE CABLE AS FAR FROM INTERFERENCE GENERATING DEVICES AS POSSIBLE. WHERE COMMUNICATION WIRE MUST CROSS HIGH POWER WIRE (DEEMED AS 110VAC OR GREATER) IT MUST DO SO AT RIGHT ANGLES.
3. ALL SHIELDS SHALL BE GROUNDED (EARTH GROUND) AT ONE POINT ONLY TO ELIMINATE GROUND LOOPS. ALL SHIELD GROUNDING SHALL BE DONE AT THE CONTROLLER LOCATION WITH THE SHIELD AT THE SENSOR/DEVICE END OF THE APPLICABLE WIRE BEING LEFT LONG AND "SAFED" OFF IN AN APPROPRIATE MANNER.
4. THERE SHALL BE NO POWER WIRING, IN EXCESS OF 30 VAC RMS, RUN IN CONDUIT WITH COMMUNICATIONS WIRING. IN CASES WHERE SIGNAL WIRING IS RUN IN CONDUIT WITH COMMUNICATION WIRING, ALL COMMUNICATION WIRING AND SIGNAL WIRING SHALL BE RUN USING SEPARATE TWISTED PAIRS (24AWG) IN ACCORDANCE WITH THE MANUFACTURER'S WIRING PRACTICES.

N. INPUT/OUTPUT CONTROL WIRING

1. RTD WIRING SHALL BE TWO-WIRE OR FOUR-WIRE TWISTED, SHIELDED, MINIMUM NUMBER 22 GAUGE.
2. OTHER ANALOG INPUTS SHALL BE A MINIMUM OF NUMBER 22 GAUGE, TWISTED, (SHIELDING OPTIONAL).
3. BINARY CONTROL FUNCTION WIRING SHALL BE A MINIMUM OF NUMBER 18 GAUGE.
4. ANALOG OUTPUT CONTROL FUNCTIONS SHALL BE A MINIMUM OF NUMBER 18 GAUGE, TWISTED, SHIELDED.
5. BINARY INPUT WIRING SHALL BE A MINIMUM OF NUMBER 18 GAUGE.

O. SPLICES

1. SPLICES IN SHIELDED CABLES SHALL CONSIST OF TERMINATIONS AND THE USE OF SHIELDED CABLE COUPLERS, WHICH MAINTAIN THE INTEGRITY OF THE SHIELDING. TERMINATIONS SHALL BE IN ACCESSIBLE LOCATIONS. CABLES SHALL BE HARNESSED WITH CABLE TIES AS SPECIFIED HEREIN.

P. CONDUIT AND FITTINGS

1. CONDUIT FOR CONTROL WIRING, CONTROL CABLE AND TRANSMISSION CABLE: ELECTRICAL METALLIC TUBING (EMT) WITH COMPRESSION FITTINGS, COLD ROLLED STEEL, ZINC COATED OR ZINC-COATED RIGID STEEL WITH THREADED CONNECTIONS.
2. OUTLET BOXES (DRY LOCATION): SHERADIZED OR GALVANIZED DRAWN STEEL SUITED TO EACH APPLICATION, IN GENERAL, FOUR INCHES SQUARE OR OCTAGON WITH SUITABLE RAISED COVER.
3. OUTLET BOXES (EXPOSED TO WEATHER): THREADED HUB CAST ALUMINUM OR IRON BOXES WITH GASKET DEVICE PLATE.
4. PULL AND JUNCTION BOXES: SIZE ACCORDING TO NUMBER, SIZE, AND POSITION OF ENTERING RACEWAY AS REQUIRED BY NATIONAL ELECTRICAL CODES. ENCLOSURE TYPE SHALL BE SUITED TO LOCATION.

Q. RELAYS

1. RELAYS OTHER THAN THOSE ASSOCIATED WITH DIGITAL OUTPUTS SHALL BE GENERAL-PURPOSE, ENCLOSED PLUG-IN TYPE WITH 8-PIN OCTAL PLUG AND PROTECTED BY A HEAT AND SHOCK RESISTANT DUCT COVER. NUMBER OF CONTACTS AND OPERATIONAL FUNCTION SHALL BE AS REQUIRED.
2. RELAYS ASSOCIATED WITH DIGITAL OUTPUTS SHALL HAVE THE ABILITY TO OVERRIDE THE CONTROLLED EQUIPMENT AS A FUNCTION OF THE RELAY. RELAYS SHALL BE PROTECTED BY A HEAT AND SHOCK RESISTANT DUCT COVER. NUMBER OF CONTACTS AND OPERATIONAL FUNCTION SHALL BE AS REQUIRED.

R. IDENTIFICATION

1. WIRE TAGS

a. ALL MULTI-CONDUCTOR CABLES IN ALL PULL BOXES AND TERMINAL STRIP CABINETS SHALL BE TAGGED.
b. PROVIDE WIRE TAGS AS PER DIVISION 26.

2. CONDUIT TAGS

a. PROVIDE TAGGING OR LABELING OF CONDUIT SO THAT IT IS ALWAYS READILY OBSERVABLE WHICH CONDUIT WAS INSTALLED OR USED IN IMPLEMENTATION OF THIS WORK.

3. MISCELLANEOUS EQUIPMENT IDENTIFICATION

a. SCREWED-ON, ENGRAVED BLACK LAMICOID SHEET WITH WHITE LETTERING ON ALL CONTROL PANELS AND REMOTE PROCESSING PANELS. LETTERING SIZES SUBJECT TO APPROVAL.
b. INSCRIPTION, SUBJECT TO REVIEW AND ACCEPTANCE, INDICATING EQUIPMENT, SYSTEM NUMBERS, FUNCTIONS AND SWITCHES. FOR PANEL INTERIOR WIRING, INPUT/OUTPUT MODULES, LOCAL CONTROL PANEL DEVICE IDENTIFICATION.

S. GAS METER

1. PROVIDE NATURAL GAS FLOW METER MODEL 5100 ONICON OR APPROVED EQUAL. INTEGRATION SHALL BE THROUGH BACNET.
2. PERFORMANCE SPECIFICATIONS

a. ACCURACY OF POINT VELOCITY - +/- 1% OF 500-7000 SCFM, +/- 2% OF 100-500 SCFM,
b. REPEATABILITY - +/- 0.2% OF FULL SCALE
c. TEMPERATURE COEFFICIENT - +/- 0.02%
d. PRESSURE COEFFICIENT, .02% PER PSI
e. RESPONSE TIME, 200 MILLISECONDS TO 63% OF FINAL VELOCITY VALUE

3. OPERATING SPECIFICATIONS

a. GAS PRESSURE - 120 PSIG MAXIMUM DESIGN PRESSURE
b. PRESSURE DROP - NEGLIGIBLE
c. GAS & AMBIENT TEMPERATURE - GAS -40° TO 176°F, AMBIENT -40° TO 120°F
d. POWER REQUIREMENTS - 18 TO 30 VDC (REGULATED), 625 MA MAXIMUM
e. OUTPUT SIGNAL - LINEAR 0-5 VDC OR 0-10 VDC, 1000 OHMS MINIMUM LOAD RESISTANCE OR LINEAR 4-20 MA PROPORTIONAL TO MASS FLOW RATE, 700 OHMS MAXIMUM RESISTANCE POWER SUPPLY DEPENDENT USER-SELECTABLE. ACTIVE NON-GALVANICALLY SEPARATED OR, PASSIVE GALVANICALLY SEPARATED (LOOP POWER REQUIRED)
f. ALARMS - HARD CONTACT USER-ADJUSTABLE HIGH AND LOW, DEAD BAND ADJUSTABLE WITH SMART INTERFACE™ SOFTWARE, RELAY RATINGS MAXIMUM 42 VAC OR 42 VDC, 140 MA
g. DISPLAYS - ALPHANUMERIC 2 X 12 DIGIT BACKLIT LCD ADJUSTABLE VARIABLES VIA ON-BOARD SWITCHES (PASSWORD PROTECTED) OR, WITH SMART INTERFACE™ SOFTWARE, ADJUSTABLE VARIABLES. . FULL SCALE (50 TO 100 %)TIME RESPONSE (1 TO 7 SECONDS) CORRECTION FACTOR SETTING (0.5 TO 5) ZERO AND SPAN
h. TOTALIZER - EIGHT DIGITS (9,999,999) IN ENGINEERING UNITS, RESETTABLE BY SOFTWARE, ON-BOARD SWITCHES OR EXTERNAL MAGNET

T. ELECTRIC MOTORS: SIZE TO OPERATE WITH SUFFICIENT RESERVE POWER TO PROVIDE SMOOTH MODULATING ACTION OR TWO-POSITION ACTION.

1. PERMANENT SPLIT-CAPACITOR OR SHADED-POLE TYPE: GEAR TRAINS COMPLETELY OIL IMMERSED AND SEALED. EQUIP SPRING-RETURN MOTORS WITH INTEGRAL SPIRAL-SPRING MECHANISM IN HOUSINGS DESIGNED FOR EASY REMOVAL FOR SERVICE OR ADJUSTMENT OF LIMIT SWITCHES, AUXILIARY SWITCHES, OR FEEDBACK POTENTIOMETER.
2. NONSPRING-RETURN MOTORS FOR VALVES LARGER THAN NPS 2-1/2: SIZE FOR RUNNING TORQUE OF 150 IN. X LBF AND BREAKAWAY TORQUE OF 300 IN. X LBF.
3. NONSPRING-RETURN MOTORS FOR DAMPERS LARGER THAN 25 SQ. FT.: SIZE FOR RUNNING TORQUE OF 150 IN. X LBF AND BREAKAWAY TORQUE OF 300 IN. X LBF.

U. ELECTRONIC ACTUATORS: DIRECT-COUPLED TYPE DESIGNED FOR MINIMUM 60,000 FULL-STROKE CYCLES AT RATED TORQUE.

1. MANUFACTURERS:

a. BELIMO AIRCONTROLS (USA), INC.

2. VALVES: SIZE FOR TORQUE REQUIRED FOR VALVE CLOSE OFF AT MAXIMUM PUMP DIFFERENTIAL PRESSURE.

V. CONTROL VALVES

1. MANUFACTURERS:

a. BELIMO AIRCONTROLS (USA), INC.

2. CONTROL VALVES: FACTORY FABRICATED, OF TYPE, BODY MATERIAL, AND PRESSURE CLASS BASED ON MAXIMUM PRESSURE AND TEMPERATURE RATING OF PIPING SYSTEM, UNLESS OTHERWISE INDICATED.
3. HYDRONIC SYSTEM BALL VALVES SHALL HAVE THE FOLLOWING CHARACTERISTICS:

a. NPS 2 AND SMALLER: 400 PSI BRASS BODY, NICKEL PLATED, STAINLESS STEEL TRIM, PTFE SEATS, AND SCREWED ENDS.
b. NPS 2-1/2 AND LARGER: 400 PSI BRASS BODY, NICKEL PLATED, STAINLESS STEEL TRIM, PTFE SEATS, AND FLANGED ENDS.

4. SIZING:

a. TWO POSITION: LINE SIZE.
b. TWO-WAY MODULATING: AS SPECIFIED ON THE DRAWINGS WITH TEFZEL CHARACTERIZING DISC.

5. FLOW CHARACTERISTICS: TWO-WAY VALVES SHALL HAVE EQUAL PERCENTAGE CHARACTERISTICS; THREE-WAY VALVES SHALL HAVE LINEAR CHARACTERISTICS.
6. CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: COMBINATION OF ACTUATOR AND TRIM SHALL PROVIDE MINIMUM CLOSE-OFF PRESSURE RATING AS INDICATED ON THE DRAWING CONTROL VALVE SCHEDULE.

W. ELECTRICAL CONTROL POWER AND LOW VOLTAGE WIRING

1. THE CONTROLS CONTRACTOR SHALL BE FULLY RESPONSIBLE TO PROVIDE ALL WIRING (LOW VOLTAGE, 120 VOLTS, ETC.) AND CONDUIT (3/4" MINIMUM OR AS REQUIRED BY ELECTRICAL CODES) FOR CONTROL PANELS, ALARMS, FLOW SWITCHES, ACTUATING DEVICES FOR TEMPERATURE, HUMIDITY, PRESSURE AND FLOW INDICATION, POINT RESETS AND USER DISCONNECT SWITCHES FOR ELECTRIC HEATING, APPLIANCES CONTROLLED BY THIS SECTION.
2. PROVIDE ALL OTHER WIRING REQUIRED FOR THE COMPLETE OPERATION OF THE SPECIFIED SYSTEMS.
3. INSTALL ALL WIRING RACEWAY SYSTEMS COMPLYING WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.
4. ENCLOSURES:

a. TERMINAL BOXES LOCATED INDOORS SHALL BE RATED FOR NEMA 12.
b. TERMINAL BOXES LOCATED OUTDOORS SHALL BE RATED FOR NEMA 4X.

5. PROVIDE WITH PROTECTIVE COATINGS SUITABLE TO THE ENVIRONMENT IN WHICH THEY ARE TO BE INSTALLED.
6. ALL ENCLOSURES SHALL BE HINGED WITH LOCKABLE DOORS.

2.8 HYDRONIC PIPING

A. COPPER TUBE AND FITTINGS

1. DRAWN-TEMPER COPPER TUBING: ASTM B 88, TYPE L, ASTM B 88 TYPE K.

B. STEEL PIPE AND FITTINGS

1. PIPING AND FITTINGS SHALL BE MANUFACTURED EXCLUSIVELY IN THE UNITED STATES.
2. STEEL PIPE, NPS ¾ THROUGH NPS 1½: ASTM A53, TYPE S (SEAMLESS) GRADE A, SCHEDULE 40, BLACK STEEL, PLAIN ENDS.
3. STEEL PIPE, NPS 2 THROUGH NPS 10: ASTM A53, TYPE S (SEAMLESS) AND TYPE ERW (WELDED) GRADE A OR B, SCHEDULE 40, BLACK STEEL, PLAIN ENDS.
4. STEEL PIPE NIPPLES: ASTM A733 MADE OF ASTM A53, SCHEDULE 40, BLACK STEEL; SEAMLESS.
5. MALLEABLE-IRON THREADED FITTINGS: ASME B16.3, CLASSES 150 AND 300.
6. MALLEABLE-IRON UNIONS: ASME B16.39; CLASSES 150, 250, AND 300.
7. WROUGHT CAST- AND FORGED-STEEL FLANGES AND FLANGED FITTINGS: ASME B16.5, INCLUDING BOLTS, NUTS, AND GASKETS OF THE FOLLOWING MATERIAL GROUP, END CONNECTIONS, AND FACINGS:

a. MATERIAL GROUP: 1.1.
b. END CONNECTIONS: BUTT WELDING.
c. FACINGS: RAISED FACE.

9. WELDING MATERIALS: COMPLY WITH SECTION II, PART C, OF THE ASME BOILER AND PRESSURE VESSEL CODE FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND FOR CHEMICAL ANALYSIS OF PIPE BEING WELDED.
10. GASKET MATERIAL: THICKNESS, MATERIAL, AND TYPE SUITABLE FOR FLUID TO BE HANDLED; AND DESIGN TEMPERATURES AND PRESSURES.

C. PLASTIC PIPE AND FITTINGS

1. CPVC PLASTIC PIPE: ASTM F 441/F 441M, WITH WALL THICKNESS AS INDICATED IN "PIPING APPLICATIONS" ARTICLE.
2. CPVC PLASTIC PIPE FITTINGS: SOCKET-TYPE PIPE FITTINGS, ASTM F 438 FOR SCHEDULE 40 PIPE; ASTM F 439 FOR SCHEDULE 80 PIPE.

D. JOINING MATERIALS

1. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.

a. ASME B16.21, NONMETALLIC, FLAT, ASBESTOS FREE, 1/8-INCH MAXIMUM THICKNESS UNLESS OTHERWISE INDICATED.

1) FULL-FACE TYPE: FOR FLAT-FACE, CLASS 125, CAST-IRON AND CAST-BRONZE FLANGES.
2) NARROW-FACE TYPE: FOR RAISED-FACE, CLASS 250, CAST-IRON AND STEEL FLANGES.

2. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL IF UNEXPOSED, 316 STAINLESS STEEL IF FLANGE IS EXPOSED.
3. PLASTIC, PIPE-FLANGE GASKET, BOLTS, AND NUTS: TYPE AND MATERIAL RECOMMENDED BY PIPING SYSTEM MANUFACTURER UNLESS OTHERWISE INDICATED.
4. SOLDER FILLER METALS: ASTM B 32, LEAD-FREE ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
5. BRAZING FILLER METALS: AWS A5.8/A5.8M, BCUP SERIES, COPPER-PHOSPHORUS ALLOYS FOR JOINING COPPER WITH COPPER; OR BAG-1, SILVER ALLOY FOR JOINING COPPER WITH BRONZE OR STEEL.
6. WELDING FILLER METALS: COMPLY WITH AWS D10.12M/D10.12 FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND CHEMICAL ANALYSIS OF STEEL PIPE BEING WELDED.
7. SOLVENT CEMENTS FOR JOINING PLASTIC PIPING

a. CPVC PIPING: ASTM F 493.

1) CPVC SOLVENT CEMENT SHALL HAVE A VOC CONTENT OF 490 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).
2) ADHESIVE PRIMER SHALL HAVE A VOC CONTENT OF 550 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).
3) SOLVENT CEMENT AND ADHESIVE PRIMER SHALL COMPLY WITH THE TESTING AND PRODUCT REQUIREMENTS OF THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES' "STANDARD PRACTICE FOR THE TESTING OF VOLATILE ORGANIC EMISSIONS FROM VARIOUS SOURCES USING SMALL-SCALE ENVIRONMENTAL CHAMBERS."

E. PIPE SCHEDULE

1. HOT-WATER HEATING PIPING, ABOVEGROUND AREAS, NPS 2-1/2 AND SMALLER, SHALL BE THE FOLLOWING:

a. TYPE L DRAWN-TEMPER COPPER TUBING, WITH 95-5 SOLDERED WROUGHT-COPPER FITTINGS

2. HOT-WATER HEATING PIPING, ABOVEGROUND AREAS, NPS 3 AND LARGER, SHALL BE THE FOLLOWING:

a. BLACK STEEL PIPE, ASTM A53, TYPE S (SEAMLESS) OR TYPE ERW (WELDED); WITH STANDARD WEIGHT ASTM A234 FORGED STEEL FITTINGS FOR BUTT-WELD CONNECTION AND FLANGED JOINTS.

3. BOILER CONDENSATE DRAIN PIPING, ABOVEGROUND, NPS 2 AND SMALLER, SHALL BE THE FOLLOWING:

a. SCHEDULE 80 CPVC PLASTIC PIPE AND FITTINGS AND SOLVENT-WELDED JOINTS.

2.9 HYDRONIC PIPING SPECIALTIES

A. BRONZE, CALIBRATED-ORIFICE, BALANCING VALVES:

1. MANUFACTURERS:

a. BELL & GOSSETT, A ZYLEM BRAND.

2. BODY: BRONZE, BALL OR PLUG TYPE WITH CALIBRATED ORIFICE OR VENTURI.
3. BALL: BRASS OR STAINLESS STEEL.
4. PLUG: RESIN.
5. SEAT: PTFE.
6. END CONNECTIONS: THREADED OR SOCKET.
7. PRESSURE GAGE CONNECTIONS: INTEGRAL SEALS FOR PORTABLE DIFFERENTIAL PRESSURE METER.
8. HANDLE STYLE: LEVER, WITH MEMORY STOP TO RETAIN SET POSITION.
9. CWP RATING: MINIMUM 125 PSIG.
10. MAXIMUM OPERATING TEMPERATURE: 250 DEG F.

B. AUTOMATIC AIR VENTS:

1. MANUFACTURERS:

a. BELL & GOSSETT NO. 87.

2. BODY: BRASS OR BRONZE.
3. INTERNAL PARTS: NONFERROUS.
4. OPERATOR: NONCORROSIVE METAL FLOAT.
5. INLET CONNECTION: NPS 1/2.
6. DISCHARGE CONNECTION: NPS 1/4 OR 1/2.
7. CWP RATING: 150 PSIG.
8. MAXIMUM OPERATING TEMPERATURE: 240 DEG F.

C. BLADDER-TYPE ASME EXPANSION TANKS:

1. MANUFACTURERS:

a. WESSELS TANK COMPANY TYPE NLA.

2. TANK: WELDED STEEL, RATED FOR 125-PSIG WORKING PRESSURE AND 375 DEG F MAXIMUM OPERATING TEMPERATURE. FACTORY TEST AFTER TAPS ARE FABRICATED AND SUPPORTS INSTALLED AND ARE LABELED ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE: SECTION VIII, DIVISION 1.
3. PROVIDE WITH SEISMIC RESTRAINT.
4. BLADDER: HEAVY DUTY BUTYL SECURELY SEALED INTO TANK TO SEPARATE AIR CHARGE FROM SYSTEM WATER TO MAINTAIN REQUIRED EXPANSION CAPACITY.
5. AIR-CHARGE FITTINGS: SCHRADER VALVE, STAINLESS STEEL WITH EPDM SEATS.

D. AIR-CHARGE FITTINGS: SCHRADER VALVE, STAINLESS STEEL WITH EPDM SEATS.
E. COALESCING-TYPE AIR AND DIRT SEPARATORS:

1. MANUFACTURERS:

a. BELL & GOSSETT MODEL CRS.

2. TANK: FABRICATED STEEL TANK; ASME CONSTRUCTED AND STAMPED FOR 125-PSIG WORKING PRESSURE AND 450 DEG F MAXIMUM OPERATING TEMPERATURE.
3. COALESCING MEDIUM: STAINLESS STEEL.
4. AIR VENT: THREADED TO THE TOP OF THE SEPARATOR.
5. INLINE INLET AND OUTLET CONNECTIONS: THREADED FOR NPS 2 AND SMALLER; CLASS 150 FLANGED CONNECTIONS FOR NPS 2-1/2 AND LARGER.
6. BLOWDOWN CONNECTION: THREADED TO THE BOTTOM OF THE SEPARATOR.
7. SIZE: MATCH SYSTEM FLOW CAPACITY.

F. Y-PATTERN STRAINERS NPS 2 AND LARGER:

1. MANUFACTURERS:

a. THE METRAFLEX COMPANY MODEL LPD.
b. OR ENGINEER APPROVED EQUAL.

2. Y-STRAINER SHALL BE OF LOW PRESSURE DROP DESIGN WITH THE FOLLOWING CV VALUES:

a. 3" PIPE 236

3. BODY: ASTM A 126, CLASS B, CAST IRON WITH BOLTED COVER AND BOTTOM DRAIN CONNECTION. STRAINER SHALL BE SUITABLE FOR HORIZONTAL AND VERTICAL MOUNTING.
4. END CONNECTIONS: FLANGED ENDS.
5. STRAINER SCREEN: STAINLESS-STEEL, SCREEN PERFORATIONS SHALL BE:
6. FOR LIQUID SERVICE FOR NPS 2 - 3, PERFORATION SHALL BE 0.045"
7. FOR LIQUID SERVICE FOR NPS 4 - 12, PERFORATION SHALL BE 0.125"
8. PRESSURE TAPS: PROVIDE WITH INLET AND OUTLET PRESSURE PLUGS.
9. CWP RATING: 125 PSIG.

G. PUMP SUCTION DIFFUSERS:

1. MANUFACTURERS:

a. THE METRAFLEX COMPANY SUCTION DIFFUSER FLEX.
b. OR ENGINEER APPROVED EQUAL.

2. STAINLESS HOSE, FLEXIBLE BRAID, INTEGRAL ROTATIONAL VANES, 90° REDUCING ELBOW AND FLANGED CONNECTION.

a. FLEXIBLE HOSE SECTION TO BE 304 STAINLESS STEEL, CLOSE PITCH, ANNULAR CORRUGATED HOSE WITH A TYPE 304 BRAIDED OUTER COVERING.
b. END CONNECTIONS TO BE ANSI CLASS 150 CARBON STEEL PLATE FLANGES.
c. OVERALL LENGTH TO ALLOW FOR A MINIMUM OF 6" INTERMITTENT FLEXING.

3. CONNECTORS SHALL BE LOCATED UPSTREAM OF THE INLET ELBOW, AND INCORPORATE SPECIALLY DESIGNED STATIONARY VANES THAT IMPART A ROTATIONAL MOTION AS THE FLUID ENTERS THE ELBOW. VANES TO BE CAPABLE OF COUNTERACTING ELBOW INDUCED TURBULENCE, ENABLING THE FLUID TO NEGOTIATE THE TURN UNIFORMLY, AND EXIT WITH A FLAT VELOCITY PROFILE.

H. PUMP DISCHARGE CONNECTIONS:

1. MANUFACTURERS:

a. THE METRAFLEX COMPANY VANE FLEX.
b. OR ENGINEER APPROVED EQUAL.

2. STAINLESS HOSE, FLEXIBLE BRAID, INTEGRAL STRAIGHTENING VANES AND FLANGED CONNECTION.

a. FLEXIBLE HOSE SECTION TO BE 304 STAINLESS STEEL, CLOSE PITCH, ANNULAR CORRUGATED HOSE WITH A TYPE 304 BRAIDED OUTER COVERING.
b. END CONNECTIONS TO BE ANSI CLASS 150 CARBON STEEL PLATE FLANGES.
c. OVERALL LENGTH TO ALLOW FOR A MINIMUM OF 6" INTERMITTENT FLEXING.

I. CONNECTORS SHALL INCORPORATE INTERNAL FLOW STRAIGHTENING VANES TO REDUCE TURBULENCE PRIOR TO THE BALANCING VALVE. VANES TO BE CAPABLE OF REDUCING DISCHARGE TURBULENCE EQUAL TO 5-10 PIPE DIAMETERS OF STRAIGHT PIPE, WHILE ALLOWING FULL RATED MOVEMENT OF THE CONNECTOR.

2.10 HYDRONIC PUMPS

A. CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

1. MANUFACTURERS:

a. ITT CORPORATION; BELL & GOSSETT.

2. DESCRIPTION: FACTORY-ASSEMBLED AND TESTED, CENTRIFUGAL, OVERHUNG-IMPELLER, CLOSE-COUPLED, IN-LINE PUMP AS DEFINED IN HI 1.1-1.2 AND HI 1.3; DESIGNED FOR INSTALLATION WITH PUMP AND MOTOR SHAFTS MOUNTED HORIZONTALLY OR VERTICALLY.
3. PUMP CONSTRUCTION:

a. CASING: RADIALLY SPLIT, CAST IRON, WITH THREADED GAGE TAPPINGS AT INLET AND OUTLET, REPLACEABLE BRONZE WEAR RINGS, AND THREADED COMPANION-FLANGE CONNECTIONS.
b. IMPELLER: ASTM B 584, CAST BRONZE; STATICALLY AND DYNAMICALLY BALANCED, KEYED TO SHAFT, AND SECURED WITH A LOCKING CAP SCREW. FOR CONSTANT-SPEED PUMPS, TRIM IMPELLER TO MATCH SPECIFIED PERFORMANCE.
c. PUMP SHAFT: STEEL, WITH COPPER-ALLOY SHAFT SLEEVE.
d. SEAL: PACKING SEAL CONSISTING OF STUFFING BOX WITH A MINIMUM OF FOUR RINGS OF GRAPHITE-IMPREGNATED BRAIDED YARN WITH BRONZE LANTERN RING BETWEEN CENTER TWO GRAPHITE RINGS, AND BRONZE PACKING GLAND.
e. PUMP BEARINGS: PERMANENTLY LUBRICATED BALL BEARINGS.

4. MOTOR: SINGLE SPEED AND RIGIDLY MOUNTED TO PUMP CASING.

a. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
b. COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, AND EFFICIENCY REQUIREMENTS FOR MOTORS SPECIFIED IN SECTION 230513 "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT."
c. CAPACITIES AND CHARACTERISTICS: SHOWN IN PUMP SCHEDULE ON DRAWINGS.

2.11 WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

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Project Title

NOCCCD - ANAHEIM BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
IVAN THOMAS
No. M30691
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

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SPECIFICATIONS

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M004

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A. FILTERED HOUSEING.

1. MANUFACTURERS:

   a. HARMSCO HUR.

2. ELECTROPOLISHED FINISH
3. STAINLESS STEEL STANDPIPE
4. O-RING HOUSING SEAL WITH SWING-BOLT CLOSURE
5. PRESSURE: 150 PSI
6. TEMPERATURE: 250F

2.12 FLUE GAS VENTING SYSTEM

A. DOUBLE WALL INSULATED STAINLESS STEEL VENT

1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

   a. JEREMIAS MODEL DWKL.
   b. METAL-FAB.
   c. SELKIRK CORPORATION.

2. DESCRIPTION: DOUBLE WALL INSULATED STAINLESS STEEL VENT TESTED ACCORDING TO UL 1738 STANDARDS AND RATED FOR 1200 DEG F CONTINUOUSLY.
3. INNER LINER: ASTM 444 STAINLESS STEEL
4. INSULATION: 1-1/4" THICK CERAMIC FIBER INSULATION
5. OUTER JACKET: ASTM 304 STAINLESS STEEL
6. ACCESSORIES:

   a. FITTINGS: TEES, ELBOWS, INCREASERS, DRAFT-HOOD CONNECTORS, METAL CAPS WITH BIRD BARRIERS, ADJUSTABLE ROOF FLASHINGS, STORM COLLARS, SUPPORT ASSEMBLIES, THIMBLES, FIRESTOP SPACERS, AND FASTENERS; FABRICATED FROM SIMILAR OR COMPATIBLE MATERIALS AND DESIGNS.
   b. SEALANT: MANUFACTURER'S STANDARD HIGH-TEMPERATURE SEALANT.
   c. INSULATING FILL: MANUFACTURER'S STANDARD HIGH-TEMPERATURE INSULATION FILL MATERIAL IN ANNULAR SPACE SURROUNDING CHIMNEY LINER INCLUDING HIGH-TEMPERATURE, CERAMIC-FIBER INSULATION.

2.13 CONDENSING BOILERS

A. FIRE-TUBE CONDENSING BOILERS

1. MANUFACTURERS:

   a. LOCHINVAR

2. DESCRIPTION:

   a. FACTORY-FABRICATED, ASSEMBLED, AND TESTED, FORCED-DRAFT FIRE-TUBE CONDENSING BOILER WITH A SEALED PRESSURE TIGHT HEAT EXCHANGER, BUILT ON A STEEL BASE.
   b. BOILER SHALL BE MEDIUM TO HIGH-MASS, WITH INSULATED JACKET, FLUE-GAS VENT, COMBUSTION-AIR INTAKE CONNECTIONS, WATER SUPPLY, RETURN, AND CONDENSATE DRAIN CONNECTIONS, AND CONTROLS.
   c. BOILER DESIGN AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH SECTION IV OF THE ASME CODE FOR HOT WATER HEATING BOILERS WITH A MINIMUM WORKING PRESSURE OF 100 PSIG.

3. HEAT EXCHANGER:

   a. STAINLESS-STEEL TUBES AND TUBE SHEETS AND CORROSION-RESISTANT COMBUSTION CHAMBER.
   b. SINGLE-PASS, COUNTER-FLOW ARRANGEMENT.

4. PRESSURE VESSEL:

   a. STAINLESS STEEL WITH WELDED HEADS AND TUBE CONNECTIONS.
   b. WATER VOLUME SHALL BE NO LESS THAN 50 GALLONS PER 1,000 MBH INPUT.
   c. BURNER: NATURAL GAS, FORCED DRAFT DRAWING FROM GAS PREMIXING VALVE.
   d. BLOWER: VARIABLE SPEED CENTRIFUGAL FAN TO OPERATE DURING EACH BURNER FIRING SEQUENCE AND TO PRE-PURGE AND POST-PURGE THE COMBUSTION CHAMBER.

      1) MOTORS: COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, AND EFFICIENCY REQUIREMENTS FOR MOTORS.

         a) MOTOR SIZES: MINIMUM SIZE AS INDICATED; IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.

5. GAS TRAIN:

   a. THE GAS TRAIN SHALL MEET THE REQUIREMENTS OF CSA/UL AND ASME CSD-1 AND SHALL INCLUDE:

      1) MINIMUM 10:1 BURNER MODULATION.
      2) LOW AND HIGH GAS PRESSURE INTERLOCK, MANUAL RESET.
      3) UPSTREAM AND DOWNSTREAM MANUAL TEST COCKS.
      4) BALL TYPE MANUAL SHUTOFF VALVE UPSTREAM OF THE MAIN GAS VALVE.
      5) UNIBODY DOUBLE SAFETY GAS VALVE ASSEMBLY.
      6) GAS PRESSURE REGULATOR.
      7) UNION CONNECTION TO PERMIT BURNER SERVICING.

6. IGNITION: DIRECT SPARK OR HOT SURFACE IGNITION WITH 100 PERCENT MAIN-VALVE SHUTOFF WITH ELECTRONIC FLAME SUPERVISION.
7. CASING:

   a. JACKET: SHEET METAL, WITH SNAP-IN OR INTERLOCKING CLOSURES.
   b. CONTROL COMPARTMENT ENCLOSURES: NEMA 250, TYPE 1A.
   c. FINISH: BAKED-ENAMEL OR POWDER-COATED PROTECTIVE FINISH.
   d. INSULATION: MINIMUM 2-INCH THICK, MINERAL-FIBER OR POLYURETHANE-FOAM INSULATION SURROUNDING THE HEAT EXCHANGER.
   e. COMBUSTION-AIR CONNECTIONS: INLET AND VENT DUCT COLLARS.

8. CAPACITIES AND CHARACTERISTICS: SEE SCHEDULES ON PLANS
9. ACCESSORIES

   a. FACTORY SUPPLIED AUTOMATIC ISOLATION VALVE, PIPED AND WIRED TO INDIVIDUAL BOILERS BY CONTRACTOR.

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Consultant

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BOILER REPLACEMENT

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PLUMBING SPECIFICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. FURNISH ALL LABOR, MATERIALS, SERVICES, TESTING, TRANSPORTATION AND EQUIPMENT NECESSARY FOR THE COMPLETION OF ALL PLUMBING, PIPING AS INDICATED ON DRAWINGS AND SPECIFIED HEREIN. WORK MATERIALS AND EQUIPMENT NOT INDICATED OR SPECIFIED WHICH IS NECESSARY FOR THE COMPLETE AND PROPER OPERATION OF THE WORK OF THIS SECTION IN ACCORDANCE WITH THE TRUE INTENT AND MEANING OF THE CONTRACT DOCUMENTS SHALL BE PROVIDED AND INCORPORATED AT NO ADDITIONAL COST TO THE OWNER.

1.02 QUALITY ASSURANCE

A. CODE REQUIREMENTS: ALL WORK COVERED BY THIS SECTION SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE FOLLOWING REGULATIONS:

1. 2019 CALIFORNIA PLUMBING CODE.
2. 2019 CALIFORNIA FIRE CODE.
3. 2019 CALIFORNIA MECHANICAL CODE.
4. NATIONAL FIRE PROTECTION ASSOCIATION.
5. ANY OTHER LEGALLY CONSTITUTED BODY HAVING JURISDICTION THEREOF.

B. NOTHING IN THE SPECIFICATIONS OR DRAWINGS SHALL BE CONSTRUED TO PERMIT DEVIATION FROM THE REQUIREMENTS OF GOVERNING CODES UNLESS APPROVAL FOR SAID DEVIATION HAS BEEN OBTAINED FROM THE LEGALLY CONSTITUTED AUTHORITIES HAVING JURISDICTION AND FROM THE OWNER'S REPRESENTATIVE.

1.03 DRAWINGS

A. BECAUSE OF THE SMALL SCALE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS AND ACCESSORIES WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE CONDITIONS SURROUNDING INSTALLATION THEIR WORK. PROVIDE NECESSARY PIPING, FITTINGS, VALVES, TRAPS, AND OTHER DEVICES REQUIRED FOR COMPLETE INSTALLATION.

B. THE GENERAL ARRANGEMENT INDICATED ON THE DRAWINGS SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. COORDINATE WITH THE ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL DRAWINGS PRIOR TO INSTALLATION OF PIPING FIXTURES AND EQUIPMENT TO VERIFY ADEQUATE SPACE AVAILABLE FOR INSTALLATION OF THE WORK SHOWN. IN THE EVENT A FIELD CONDITION ARISES WHICH MAKES IT IMPOSSIBLE TO INSTALL THE WORK AS INDICATED, SUBMIT, IN WRITING, THE PROPOSED DEPARTURES TO THE PROJECT ENGINEER FOR ACCEPTANCE AND NOTICE TO PROCEED.

C. SPECIAL NOTE: SHOULD THE CONTRACTOR MAKE CHANGES IN THE INSTALLATION DIFFERING FROM WHAT IS INDICATED ON THE CONTRACT DRAWINGS AND NOT NECESSITATED DUE TO FIELD CONDITIONS AS INDICATED HEREIN ABOVE, THE CONTRACTOR SHALL BE REQUIRED TO RE-INSTALL THE WORK TO COMPLY WITH WHAT HAS BEEN INDICATED ON THE CONTRACT DRAWINGS. SHOULD IT BE IMPOSSIBLE TO RE-INSTALL THE WORK AND THE INSTALLATION IS IN ACCORDANCE WITH ALL GOVERNING AUTHORITIES, THE PROJECT ENGINEER MAY PERMIT THE INSTALLATION TO REMAIN. HOWEVER, ALL COSTS INCURRED TO REVISE THE CONTRACT DRAWINGS BY THE ENGINEER FOR RESUBMITTAL TO THE BUILDING DEPARTMENT INDICATING THE AS-INSTALLED CONDITION SHALL BECOME THE RESPONSIBILITY OF THE CONTRACTOR.

D. IN CASE OF DIFFERENCE BETWEEN SPECIFICATIONS AND DRAWINGS, THE CONTRACTOR SHALL DETERMINE COST EFFECTIVE ALTERNATE AND AFTER AWARD OF CONTRACT, SHALL SECURE DIRECTION FROM THE PROJECT ENGINEER.

1.04 PERMITS, INSPECTIONS AND LICENSES

A. ALL PERMITS, INSPECTIONS AND LICENSES REQUIRED BY THE LEGALLY CONSTITUTED AUTHORITIES FOR INSTALLATION OF THE WORK ACCORDING TO THE PLANS AND SPECIFICATIONS SHALL BE OBTAINED AND PAID AS A PART OF THE WORK OF THIS SECTION.

1.05 EXAMINATION OF PREMISES

A. BEFORE BIDDING ON THIS WORK, CONTRACTORS SHALL MAKE A CAREFUL EXAMINATION OF THE PREMISES AND SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH THE REQUIREMENTS OF THE CONTRACT. BY THE ACT OF SUBMITTING A PROPOSAL FOR THE WORK INCLUDED IN THIS CONTRACT, THE CONTRACTOR SHALL BE DEEMED TO HAVE MADE SUCH STUDY AND EXAMINATION, AND IS FAMILIAR WITH AND ACCEPTS ALL CONDITIONS OF THE SITE.

1.06 PROTECTION

A. ALL WORK, EQUIPMENT AND MATERIALS SHALL BE PROTECTED AT ALL TIMES. CONTRACTOR SHALL CORRECT ALL DAMAGE CAUSED EITHER DIRECTLY OR INDIRECTLY BY THEIR WORKMEN. CONTRACTOR SHALL ALSO PROTECT THEIR WORK FROM DAMAGE. CONTRACTOR SHALL CLOSE ALL PIPE OPENINGS WITH CAPS OR PLUGS DURING INSTALLATION. CONTRACTOR SHALL PROTECT EQUIPMENT AND MATERIALS AGAINST DIRT, WATER, CHEMICAL AND MECHANICAL INJURY. UPON COMPLETION, ALL WORK SHALL BE THOROUGHLY CLEANED AND DELIVERED IN A NEW CONDITION.

B. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ALL DAMAGE TO EQUIPMENT AND MATERIALS UNTIL THEY HAVE RECEIVED WRITTEN NOTICE OF ACCEPTANCE FROM PROJECT ENGINEER.

1.07 SUBMITTAL DATA

A. FURNISH ALL SUBMITTALS AT ONE TIME, PRIOR TO ANY INSTALLATION, WITHIN THE TIME NOTED BELOW, ELECTRONIC COPIES OF VALID SUBMITTAL DATA ON ALL FIXTURES, MATERIAL, EQUIPMENT AND DEVICES. EACH SUBMITTED ITEM SHALL BE INDEXED AND REFERENCED TO CONTRACT DOCUMENTS AND TO PUT IDENTIFICATION NUMBERS ON FIXTURES AND EQUIPMENT SCHEDULES.

B. MANUFACTURERS SUBMITTAL LITERATURE AND SHOP DRAWINGS ARE REQUIRED ON ALL ITEMS TO ENSURE THE LATEST AND MOST COMPLETE MANUFACTURER'S DATA IS AVAILABLE FOR REVIEW. REQUIREMENTS OF THE SUBMITTALS AND ENGINEER'S SUBMITTAL NOTES ARE A PART OF THE WORK OF THIS DIVISION EXCEPT THAT ENGINEER'S NOTES MAY NOT BE USED AS A MEANS OF INCREASING THE SCOPE OF WORK OF THIS DIVISION.

C. SUBMITTALS WILL BE CHECKED FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT BUT THE REVIEW DOES NOT GUARANTEE QUANTITIES SHOWN AND DOES NOT SUPERSEDE REQUIREMENTS OF THIS DIVISION TO PROPERLY INSTALL WORK.

D. A LIST OF NAMES IS NOT A VALID SUBMITTAL. TO BE VALID, ALL SUBMITTALS MUST:

1. BE SENT ELECTRONICALLY TO THE PROJECT ENGINEER WITHIN THIRTY-FIVE (35) DAYS OF AWARD OF THE CONTRACT. CORRECTIONS OR CHANGES IN SUBMITTALS RETURNED AS INADEQUATE OR INCOMPLETE SHALL BE ACCOMPLISHED WITHIN THIS TIME LIMIT.
2. INCLUDE ALL PERTINENT CONSTRUCTION, INSTALLATION, PERFORMANCE AND TECHNICAL DATA.
3. HAVE ALL COPIES MARKED TO INDICATE CLEARLY THE INDIVIDUAL ITEMS BEING SUBMITTED.
4. HAVE EACH ITEM CROSS-REFERENCED TO THE CORRESPONDING SPECIFIED ITEM AND BE MARKED TO SHOW HOW DIFFERENCES WILL BE ACCOMMODATED.
5. CONTAIN CALCULATIONS AND OTHER DETAILED DATA JUSTIFYING HOW THE ITEM WAS SELECTED FOR PROPOSAL. DATA MUST BE COMPLETED ENOUGH TO PERMIT DETAILED COMPARISON OF EVERY SIGNIFICANT CHARACTERISTIC FOR WHICH THE SPECIFIED ITEM WAS ANALYZED DURING DESIGN.
6. INCLUDE, FOR EVERY ITEM WHICH DIFFERS IN SIZE, CONFIGURATION, CONNECTIONS, SERVICE, ACCESSIBILITY OR ANY OTHER SIGNIFICANT WAY, A DRAWING TO THE SAME (OR LARGER) SCALE AS TO THE PERTINENT PORTIONS OF THE CONTRACT DRAWINGS. IN THIS DRAWING SHOW A COMPLETE LAYOUT OF THE SYSTEM EXCEPT THAT WHICH IS IDENTICAL TO THE CONTRACT DRAWINGS, UNLESS THE UNCHANGED PORTIONS MUST BE SHOWN TO INDICATE SUCH THINGS AS CLEARANCES. THIS DRAWING, TOGETHER WITH THE CONTRACT DESIGN DRAWINGS MUST SHOW THE COMPLETE SYSTEM AS REVISED TO ACCOMMODATE THE PROPOSED ALTERNATE.

1.08 UNINSPECTED WORK

A. CONTRACTOR SHALL NOT ALLOW OR CAUSE ANY OF THEIR WORK TO BE COVERED UP BEFORE IT HAS BEEN DULY INSPECTED, TESTED AND APPROVED BY THE PROJECT ENGINEER OR ANY OTHER AUTHORIZED INSPECTORS HAVING LEGAL JURISDICTION. IF CONTRACTOR FAILS TO OBSERVE THE ABOVE, THEY SHALL UNCOVER THE WORK AND, AFTER IT HAS BEEN INSPECTED, TESTED AND APPROVED, RECOVER IT AT THEIR OWN EXPENSE.

1.09 SUBSTITUTIONS

A. THE CONTRACTOR ASSUMES FULL RESPONSIBILITY THAT ALTERNATE ITEMS AND PROCEDURES WILL MEET THE JOB REQUIREMENTS AND IS RESPONSIBLE FOR COST OF REDESIGN AND OF MODIFICATIONS TO THIS AND OTHER PARTS OF WORK CAUSED BY ALTERNATE ITEMS FURNISHED UNDER WORK IN THIS SECTION. IN VIEW OF THESE RESPONSIBILITIES, IT IS THE PURPOSE OF THESE SPECIFICATIONS TO ESTABLISH PROCEDURES WHICH ENSURE THAT THE CONTRACTOR HAS CONSIDERED ALL THE RAMIFICATIONS OF PROPOSED ALTERNATES BEFORE SUBMITTING THEM FOR REVIEW. SUBMITTALS WHICH DO NOT COMPLY WITH THE REQUIREMENTS OF THESE SPECIFICATIONS OR WHICH INDICATE PROPOSED ALTERNATES WERE SELECTED WITHOUT PROPER REGARD TO THE REQUIREMENTS OF THE JOB, WILL NOT BE APPROVED. NO MORE THAN ONE PROPOSED ALTERNATE WILL BE CONSIDERED FOR EACH ITEM.

B. ALTERNATE ITEMS INSTALLED WITHOUT ENGINEER'S APPROVAL WILL BE REPLACED WITH SPECIFIED ITEMS AT CONTRACTOR'S EXPENSE.

C. PROVIDE OR PERFORM TESTS REQUIRED BY ENGINEER FOR PURPOSE OF JUDGING ACCEPTABILITY OF PROPOSED SUBSTITUTIONS.

D. THIS CONTRACTOR IS RESPONSIBLE TO PROVIDE SUFFICIENT INFORMATION TO ALLOW THE ENGINEER TO ANALYZE ANY PROPOSED ALTERNATE. IF INADEQUATE INFORMATION IS PROVIDED, THE PROPOSAL WILL NOT BE APPROVED AND RESUBMITTAL WILL NOT BE ALLOWED.

E. THE PROJECT ENGINEER SHALL BE THE SOLE JUDGE AS TO THE QUALITY AND SUITABILITY OF PROPOSED ALTERNATE EQUIPMENT, FIXTURES OR MATERIALS AND DECISIONS OF THE PROJECT ENGINEER SHALL BE FINAL AND CONCLUSIVE.

1.10 RECORD DRAWINGS

A. CONTRACTOR SHALL PROVIDE AND KEEP UP-TO-DATE A COMPLETE "AS-BUILT" DRAWING SET WHICH SHALL SHOW EVERY CHANGE FROM THE ORIGINAL DRAWINGS AND THE EXACT "AS-BUILT" LOCATIONS AND SIZES OF THE WORK PROVIDED UNDER THIS SECTION OF THE SPECIFICATIONS. THIS SET SHALL INCLUDE LOCATIONS, DIMENSIONS, DEPTH OF BURIED PIPING, CLEANOUTS, SHUT-OFF VALVES, SEWER INVERT LOCATIONS, PLUGGED WYES, TEES, ETC. ON COMPLETION OF THE WORK, THE CONTRACTOR SHALL INCORPORATE ALL AS-BUILT INFORMATION IN AUTOCAD FORMAT.

1.11 GUARANTEES

A. CONTRACTOR SHALL GUARANTEE ALL PLUMBING AND PIPING SYSTEMS UNCONDITIONALLY FOR A PERIOD OF ONE (1) YEAR AFTER FINAL ACCEPTANCE. IF, DURING THIS PERIOD, ANY MATERIALS, EQUIPMENT, OR ANY PART OF THE SYSTEMS FAIL TO FUNCTION PROPERLY, THE CONTRACTOR SHALL MAKE GOOD THE DEFECTS PROMPTLY AND WITHOUT ANY EXPENSE TO THE OWNER.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE TO ANY PART OF THE PREMISES CAUSED BY LEAKS IN PIPELINES OR EQUIPMENT FURNISHED AND INSTALLED UNDER THIS SECTION FOR A PERIOD OF ONE (1) YEAR AFTER DATE OF ACCEPTANCE OF HIS WORK.

C. ALL EQUIPMENT AND FIXTURES SHALL CARRY MANUFACTURER'S WARRANTY AGAINST DEFECTIVE PARTS OR POOR WORKMANSHIP AND SHALL NOT BE LESS THAN ONE (1) YEAR. SEE SPECIFIC EQUIPMENT SPECIFICATIONS FOR EXTENDED WARRANTY REQUIREMENTS.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT (SEE DRAWING SCHEDULES FOR ADDITIONAL INFORMATION)

A. GENERAL: ALL MATERIALS, AS SPECIFIED OR REQUIRED IN THE WORK, SHALL BE NEW, FREE FROM DEFECTS AND IMPERFECTIONS.

B. PIPE AND FITTINGS: (SEE PIPE SCHEDULE ON THE DRAWINGS)

C. VALVES:

1. GENERAL:

a. PIPING SYSTEMS SHALL BE SUPPLIED WITH VALVES ARRANGED SO AS TO GIVE COMPLETE AND REGULATING CONTROL OF PIPING SYSTEMS THROUGHOUT THE BUILDING, AND LOCATES SO ALL PARTS ARE EASILY ACCESSIBLE AND MAINTAINED.
b. VALVE DESIGN: RISING STEM OR OUTSIDE SCREW AND YOKE STEMS. NON-RISING STEM VALVES MAY BE USED WHERE SPACE CONDITIONS PREVENT FULL EXTENSION OF RISING STEMS.
c. SIZES: SAME SIZE AS UPSTREAM PIPE, UNLESS OTHERWISE INDICATED.
d. OPERATORS:
   1) LEVER HANDLES ON QUARTER-TURN VALVES, THREE INCH AND SMALLER EXCEPT FOR PLUG VALVES. PROVIDE PLUG VALVES WITH SQUARE HEADS AND OPERATING WRENCH.
e. EXTENDED STEMS: WHERE INSULATION IS INDICATED OR SPECIFIED, PROVIDE EXTENDED STEMS ARRANGED TO RECEIVE INSULATION.
f. END CONNECTION: 2 INCHES AND UNDER SHALL BE THREADED, 2-1/2 INCHES AND LARGER SHALL BE FLANGED OR FULL LUG STYLE.

8. MANUFACTURER SHALL BE NIBCO OR APPROVED EQUAL.

9. PROVIDE CLASS 150 VALVES MEETING THE VALVE SPECIFICATIONS WHERE CLASS 125 VALVES ARE SPECIFIED BUT ARE NOT AVAILABLE.

10. BALL VALVES:

a. BALL VALVES, 2 INCHES AND SMALLER: RATED FOR 150 PSI SATURATED STEAM PRESSURE, 600 PSI WOG PRESSURE; TWO OR THREE-PIECE CONSTRUCTION; WITH BRONZE BODY AND SINGLE REDUCE BORE OR BETTER, CHROME PLATED SOLID BRASS BALL, "TEFLON" SEATS AND SEALS, SEPARATE ADJUSTABLE PACKING GLAND AND NUT, BLOWOUT-PROOF STEM AND VINYL COVERED STEEL HANDLE.

D. DIELECTRIC UNION ISOLATORS: WHERE INCOMPATIBLE MATERIALS COME IN CONTACT, ISOLATE FROM EACH OTHER WITH MATERIAL BEST SUITED FOR THE CHARACTERISTICS OF MATERIALS TO BE ISOLATED. DIELECTRIC UNION ISOLATOR FOR CONNECTION PIPING OR NON-COMPATIBLE MATERIALS SHALL BE OF STANDARD COMMERCIAL DESIGN WITH THREADED CONNECTIONS.

E. PIPE SUPPORTS: UNLESS OTHERWISE INDICATED ON THE DRAWINGS, SHALL BE AS FOLLOWS:

1. PROVIDE MISCELLANEOUS IRON WORK INCLUDING ANGLES, CHANNELS, ETC., REQUIRED TO APPROPRIATELY SUPPORT THE VARIOUS PIPING SYSTEMS. HANGER SPACING AND LOCATION SHALL CONFORM TO CALIFORNIA PLUMBING CODE REQUIREMENTS.

2. ALL HORIZONTAL RUNS OF PIPING WITHIN THE BUILDING, EXCEPT FOR COPPER WATER SUPPLY STUB-OUTS AT FIXTURES AND COPPER SUPPLY HEADERS WITHIN WALLS, TO BE SUPPORTED FROM THE STRUCTURAL FRAMING WITH STEEL RODS AND SPLIT RING HANGERS: B-LINE, GRINNELL COMPANY, TOLCO, OR APPROVED EQUAL. COPPER STUB-OUTS AND COPPER HEADERS WITHIN WALLS TO BE SUPPORTED FROM THE WALL FRAMING OR DWV WITH HOLDRITE PIPE HANGERS AND SUPPORTS AS SPECIFIED AT ITEM I.E., BELOW. STEEL RODS SHALL BE SECURED TO OVERHEAD FRAMING WITH SIDE BEAM CONNECTORS. WHERE NECESSARY, INSTALL ANGLE IRON BETWEEN FRAMING TO ACCOMMODATE HANGER RODS. WHERE SEVERAL PIPES ARE RUNNING TOGETHER, UNISTRUT, B-LINE, OR POWERSTRUT CHANNELS WITH CLAMPS MAY BE USED IN LIEU OF INDIVIDUAL PIPE HANGERS, AND SUPPORTED FROM STRUCTURE AS HEREIN SPECIFIED. SUBMIT TEST DATA FOR TYPE OF HANGER SUPPORTS TO BE PROVIDED. FOR SUPPORT CONDITIONS OTHER THAN SPECIFIED HEREIN, THE CONTRACTOR SHALL SUBMIT METHOD OF SUPPORT FOR APPROVAL PRIOR TO ANY INSTALLATION.

3. HORIZONTAL PIPING HANGERS AND SUPPORTS:

GENERAL: PROVIDE FACTORY FABRICATED HORIZONTAL HANGERS AND SUPPORTS COMPLYING WITH ONE OF THE FOLLOWING MSS TYPES LISTED TO SUIT HORIZONTAL PIPING SYSTEMS, IN ACCORDANCE WITH MSS SP-69, IAPMO PS 42, AND MANUFACTURER'S PUBLISHED INFORMATION. SELECT SIZE OF HANGERS AND SUPPORTS TO EXACTLY FIT PIPE SIZE FOR BARE PIPING, AND TO EXACTLY FIT AROUND PIPING INSULATION WITH SADDLE OR SHIELD FOR INSULATED PIPING. PROVIDE COPPER-PLATED HANGERS AND SUPPORTS FOR COPPER-PIPING SYSTEMS.

1) ADJUSTABLE STEEL CLEVIS HANGERS: (MSS TYPE 1) B-LINE B 3100
2) ADJUSTABLE SWIVEL PIPE RINGS: (MSS TYPE 5) B-LINE B 3690
3) SPLIT RING: (MSS TYPE 11)
4) PIPE ALIGNMENT AND SUPPORT BRACKETS: (PER IAPMO PS 42) HOLDRITE PRODUCTS (SEE SECTION O.9.)

4. HANGER-ROD ATTACHMENTS:

a. GENERAL: PROVIDE FACTORY FABRICATED HANGER-ROD ATTACHMENTS B-LINE, TOLCO OR APPROVED EQUAL, SELECTED BY INSTALLER TO SUIT HORIZONTAL-PIPING HANGERS AND BUILDING ATTACHMENTS, IN ACCORDANCE WITH MSS SP-58 AND MANUFACTURER'S PUBLISHED PRODUCT INFORMATION. SELECT SIZE OF HANGER-ROD ATTACHMENT TO SUIT HANGER RODS. PROVIDE COPPER-PLATED HANGER-ROD ATTACHMENTS FOR COPPER-PIPING SYSTEMS.

b. SIDE BEAM EYE SOCKET, TOLCO FIG. #57 FOR ROD SIZES 3/8" DIA. AND TOLCO FIG. #25-30-251 FOR ROD SIZES 1/2" DIA.

5. BUILDING ATTACHMENTS:

a. GENERAL: PROVIDE FACTORY FABRICATED BUILDING ATTACHMENTS, SELECTED BY INSTALLER TO SUIT BUILDING STRUCTURAL FRAMING CONDITIONS, IN ACCORDANCE WITH MSS SP-69 AND MANUFACTURER'S PUBLISHED PRODUCT INFORMATION. SELECT SIZE OF BUILDING ATTACHMENTS TO SUIT HANGER RODS. PROVIDE COPPER-PLATED BUILDING ATTACHMENTS FOR COPPER-PIPING SYSTEMS.

6. HANGER RODS AND SPACING SHALL CONFORM TO CPC TABLE 3-2.

7. HANGERS AND SUPPORTS SHALL BE ADEQUATE TO MAINTAIN ALIGNMENT AND PREVENT SAGGING AND SHALL BE PLACED WITHIN 18 INCHES OF JOINT. SUPPORT SHALL BE PROVIDED AT EACH HORIZONTAL BRANCH CONNECTION.

9. PROVIDE LATERAL BRACING AS MANUFACTURED BY B-LINE OR APPROVED EQUAL FOR ALL PIPING TO PREVENT SWAYING OR MOVEMENT IN ACCORDANCE WITH SMACNA "GUIDELINES FOR SEISMIC RESTRAINTS OF PIPING SYSTEMS". PIPING SMALLER THAN INDICATED IN THE GUIDELINES SHALL BE PROVIDED WITH BRACING AS SPECIFIED FOR THE SMALLEST SIZE INDICATED. THE ENTIRE WATER DISTRIBUTION SYSTEM SHALL BE PROPERLY BRACED AND WILL NOT MOVE DUE TO THE ACTION OF QUICK CLOSING OF VALVES.

10. MISCELLANEOUS SUPPORTS, WALL BRACKETS, ETC. PROVIDE WHERE REQUIRED IN ACCORDANCE WITH THE BEST STANDARD PRACTICES OF THE TRADE. SUBMIT SHOP DRAWINGS FOR ALL FABRICATED SUPPORTS.

11. ISOLATORS. ALL PIPING WHICH IS NOT ISOLATED FROM CONTACT WITH THE BUILDING BY ITS INSULATION, EXCEPT FOR COPPER WATER SUPPLY STUB-OUTS AT FIXTURES AND COPPER SUPPLY HEADERS WITHIN WALLS, SHALL BE INSTALLED WITH A MANUFACTURED TYPE ISOLATOR. ISOLATORS SHALL BE B-LINE VIBRA CLAMP AND CUSHION, SUPER STRUT, STONEMAN, "TRISOLATOR", OR APPROVED EQUAL. PIPING SHALL BE INSTALLED AND SUPPORTED IN A MANNER TO PROVIDE FOR EXPANSION WITHOUT STRAINS. GUIDES SHALL BE PROPERLY INSTALLED TO ENSURE THIS REQUIREMENT.

12. SHIELDS:

a. GENERAL: PROVIDE SHIELDS AT PIPING HANGERS AND SUPPORTS, FACTORY-FABRICATED, FOR ALL INSULATED PIPING AS MANUFACTURED BY PIPESHIELDS INCORPORATED OR APPROVED EQUAL. SIZE SHIELDS FOR EXACT FIT TO MATE WITH PIPE INSULATION.

b. PROTECTION SHIELDS: MSS TYPE 40; PROVIDE HIGH DENSITY INSERT OF SAME THICKNESS OF INSULATION OR EQUAL 100-PSI AVERAGE COMPRESSIVE STRENGTH, WATERPROOFED CALCIUM SILICATE, ENCASED WITH A SHEET METAL SHIELD. INSERT AND SHIELD SHALL COVER ENTIRE CIRCUMFERENCE OF THE PIPE AND SHALL BE OF LENGTH INDICATED BY MANUFACTURER FOR PIPE SIZE AND THICKNESS OF INSULATION.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. LOCATIONS AND ACCESSIBILITY: INSTALL EQUIPMENT FOR EASE OF MAINTENANCE AND REPAIR. IF CHANGES IN THE INDICATED LOCATIONS OR ARRANGEMENTS ARE MADE BY THE CONTRACTOR, THEY SHALL BE MADE WITHOUT ADDITIONAL CHARGES.

B. OPENINGS: FURNISH INFORMATION TO THE OTHER TRADES ON SIZE AND LOCATION OF OPENINGS WHICH ARE REQUIRED IN WALLS, SLABS, ROOF, FOR PIPING AND EQUIPMENT AT THE PROPER TIMES.

C. CLOSING-IN OF UNINSPECTED WORK: DO NOT ALLOW OR CAUSE ANY OF THE WORK TO BE COVERED UP OR ENCLOSED UNTIL IT HAS BEEN INSPECTED, TESTED, AND ACCEPTED BY THE INSPECTOR. ANY WORK ENCLOSED OR COVERED PRIOR TO SUCH INSPECTION AND TEST SHALL BE UNCOVERED AND, AFTER IT HAS BEEN INSPECTED, TESTED, AND APPROVED, MAKE ALL REPAIRS WITH SUCH MATERIALS AS MAY BE NECESSARY TO RESTORE ALL WORK, INCLUDING THAT OF OTHER TRADES, TO ITS ORIGINAL AND PROPER CONDITION.

D. PIPING INSTALLATION:

1. ALL PIPING SHALL BE CONCEALED IN FINISHED PORTION OF THE BUILDING EXCEPT WHERE OTHERWISE INDICATED OR DIRECTED AT THE TIME THE WORK IS DONE. ALL PIPING SHALL BE INSTALLED TO CLEAR ALL FRAMING MEMBERS AND BEAMS, EVEN IF DRAWINGS DO NOT INDICATE SAME. CONTRACTOR SHALL CONSTANTLY CHECK THE WORK OF OTHER TRADES SO AS TO PREVENT ANY INTERFERENCE WITH THE INSTALLATION OF THIS WORK.

2. UNIONS SHALL BE INSTALLED ON ONE SIDE OF ALL SCREWED SHUT-OFF VALVES, AT BOTH SIDES OF SCREWED AUTOMATIC VALVES AND ON ALL BY-PASSES, AT ALL EQUIPMENT CONNECTIONS AND ELSEWHERE AS INDICATED OR REQUIRED FOR EASE OF INSTALLATION AND DISMANTLING.

3. CONNECTIONS BETWEEN COPPER TUBING AND EQUIPMENT SHALL BE WITH MUELLER BRASS COMPANY, OR APPROVED EQUAL, BRASS STREAM LINE COPPER TO P.P.S. GROUND JOINT UNIONS.

E. PIPE JOINTS AND CONNECTIONS:

1. COPPER TUBING AND BRASS PIPE WITH THREADLESS FITTINGS:

a. SOLDER JOINTS FOR COPPER SHALL BE MADE WITH 95/5 LEAD FREE SOLDER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS FOR THE SERVICE INTENDED.

b. USE THREADED ADAPTERS ON COPPER TUBING WHERE THREADED CONNECTIONS ARE REQUIRED.

F. FLOOR, WALL AND CEILING PLATES: WHERE PIPES PIERCE FINISHED SURFACES, C.P. BRASS SPLIT FLANGES WITH SET SCREW LOCK SHALL BE PROVIDED.

M. COMPLETION OF INSTALLATION:

1. CLEANING AND FLUSHING: CLEAN ALL EQUIPMENT AND MATERIALS THOROUGHLY. LEAVE SURFACE TO BE PAINTED SMOOTH AND CLEAN, READY FOR PAINTING.

2. CLEAN ALL PIPING, VALVES, TRAPS, WATER HEATERS, FIXTURES AND OTHER DEVICES THOROUGHLY AND FLUSH OR BLOW OUT UNTIL FREE OF SCALE, OIL SILT, SAND, SEDIMENT, PIPE DOPE AND FOREIGN MATTER OF ANY KIND.

3.02 TESTING

A. NO PIPING WORK SHALL BE CONCEALED OR COVERED UNTIL PIPING HAS BEEN TESTED, INSPECTE AND APPROVED BY THE INSPECTOR. ALL PIPING FOR PLUMBING SYSTEMS SHALL BE COMPLETELY INSTALLED AND TESTED AS REQUIRED BY THE CALIFORNIA PLUMBING CODE. TEST PRESSURES AND TIMES INDICATED ARE A MINIMUM ONLY. ALL TESTS SHALL BE AS REQUIRED BY THE GOVERNING AUTHORITY AS WELL.

SCHEDULE OF TEST PRESSURES:

SYSTEM TESTED	GAUGE	TEST	DURATION
GAS	60 POUNDS	AIR	4 HOURS

3.03 OPERATION INSTRUCTION

A. PRIOR TO OCCUPANCY OR PRIOR TO THE DATE OF FINAL INSPECTION, WHICHEVER MAY OCCUR FIRST, THE CONTRACTOR SHALL PREPARE TWO (2) SETS ELECTRONIC AND HARD COPIES OF TYPEWRITTEN INSTRUCTIONS FOR THE OPERATION OF ALL EQUIPMENT, VALVES, ETC., SPECIFIED AND FURNISHED AS A PART OF THE WORK UNDER THIS SECTION, AND SHALL ASSIGN A COMPETENT PERSON, THOROUGHLY FAMILIAR WITH THE JOB, TO DEMONSTRATE AND INSTRUCT A REPRESENTATIVE OF THE OWNER IN THE OPERATION OF THE EQUIPMENT. THE TIME OF SAID DEMONSTRATION AND INSTRUCTIONS SHALL BE ARRANGED WITH THE OWNER'S REPRESENTATIVE APPROXIMATELY ONE (1) WEEK IN ADVANCE. VERBAL INSTRUCTIONS SHALL INCLUDE SHUT-OFF LOCATION OF GAS AND WATER. THE CONTRACTOR SHALL ASSEMBLE ALL OPERATION AND MAINTENANCE DATA SUPPLIED BY THE MANUFACTURERS OF THE VARIOUS PIECES OF EQUIPMENT, ALL KEYS AND SPECIAL WRENCHES REQUIRED TO OPERATE AND SERVICE THE EQUIPMENT (INCLUDING KEYS FOR YARD BOXES, GAS STOPS AND FIXTURE STOPS), AND ALL EQUIPMENT WARRANTIES AND DELIVER SAME TO THE REPRESENTATIVE OF THE OWNER ON DATE OF SAID INSTRUCTIONS.

3.05 PIPE AND EQUIPMENT IDENTIFICATION

A. EACH OPERATING AND SERVICE LINE SHUT-OFF VALVE SHALL BE IDENTIFIED BY A 19 GA. BRASS TAG WITH STAMPED, ENGRAVED TYPE OF SERVICE IDENTIFIED, COMPLETE WITH HOLE AND BRASS CHAIN MOUNTED ON VALVE STEM OR HANDLE. TAG SHALL BE A MINIMUM OF ONE AND ONE-HALF INCH (1-1/2") IN DIAMETER.

B. ALL EQUIPMENT SHALL BE PROVIDED WITH NAME PLATE INDICATING ALL PERTINENT INFORMATION ON IT.

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Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY
COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
IVAN THOMAS
No. M30691
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
Scale	N/A

Sheet Title

SPECIFICATIONS

Sheet Number

M006

P2S No. 0719

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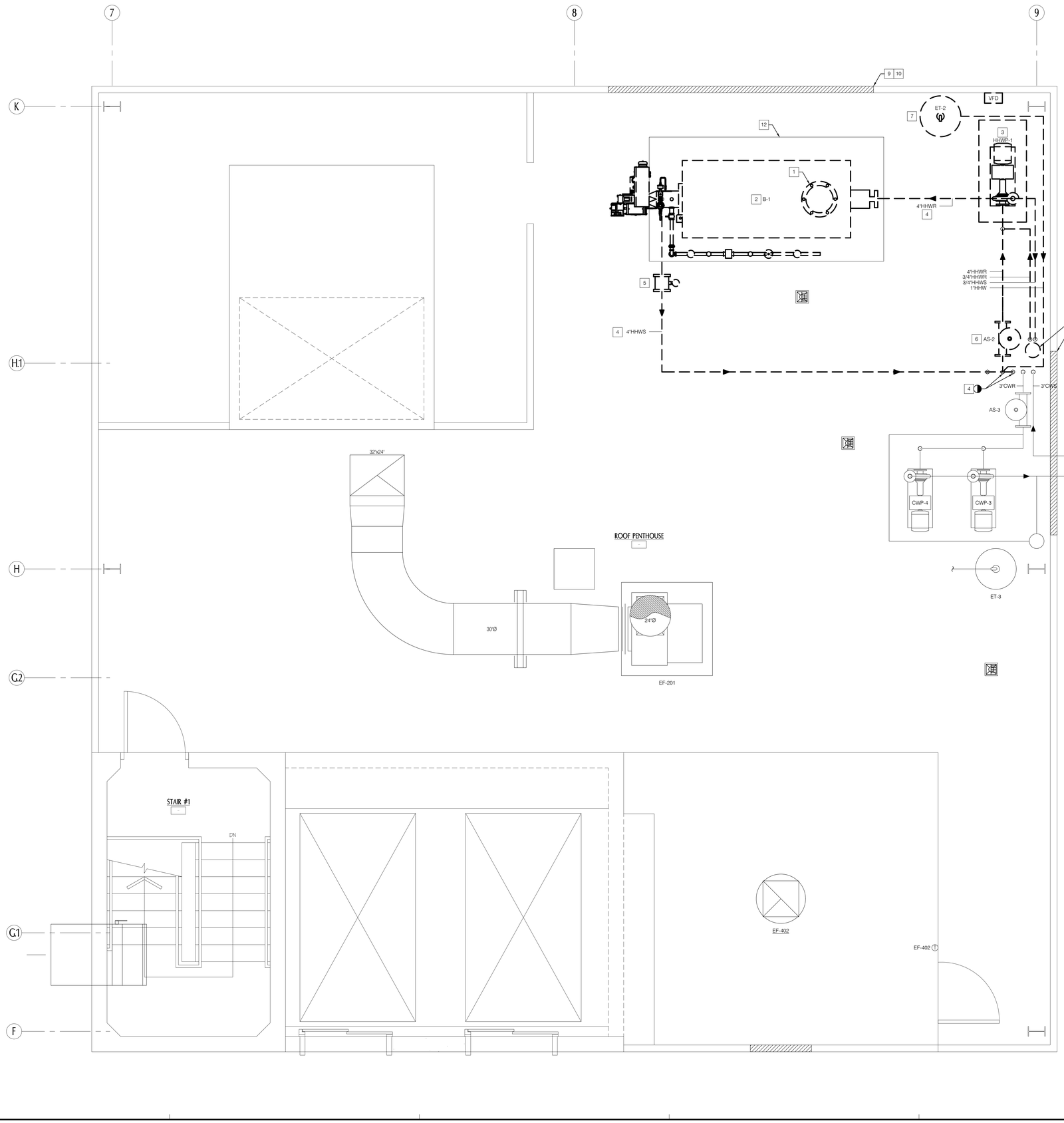


GENERAL NOTES

1. CONTRACTOR SHALL USE ELEVATOR FOR TRANSPORTING ALL MATERIALS AND EQUIPMENT ON AND OFF THE JOB SITE. THE USE OF A CRANE FOR TRANSPORTING MATERIALS AND EQUIPMENT ON AND OFF ROOF IS NOT ACCEPTABLE.
2. ALL ROOF-RELATED WORK SHALL BE DONE BY A SIPLAST CERTIFIED CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL WORK UNDER THIS CONTRACT WITHOUT INVALIDATING ANY EXISTING ROOF WARRANTY.

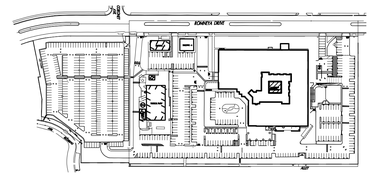
NOTES

1. DISCONNECT AND REMOVE 16'Ø BOILER FLUE AND ALL ASSOCIATED SUPPORTS AND ACCESSORIES IN ITS ENTIRETY. PATCH AND REPAIR ROOF OPENING TO MATCH EXISTING.
2. DISCONNECT AND REMOVE B-1 AND ALL ASSOCIATED ACCESSORIES IN ITS ENTIRETY.
3. DISCONNECT AND REMOVE HHWP-1, VFD, SUPPORTS, AND ACCESSORIES IN ITS ENTIRETY. DISCONNECT AND REMOVE CONCRETE INTERIA PAD AND SPRINGS.
4. DISCONNECT AND REMOVE HEATING HOT WATER SUPPLY AND RETURN PIPING FROM POINT OF DISCONNECT AND REMOVE HEATING HOT WATER PIPING, FITTINGS, INSULATIONS, SUPPORTS, ETC IN ITS ENTIRETY. POINT OF DISCONNECT SHALL OCCUR 6' ABOVE FINISHED FLOOR.
5. DISCONNECT AND REMOVE FLOW METER AND ASSOCIATED CONDUIT, WIRING, ETC IN ITS ENTIRETY.
6. DISCONNECT AND REMOVE AIR SEPARATOR AND ALL ASSOCIATED SUPPORTS AND ACCESSORIES IN ITS ENTIRETY.
7. DISCONNECT AND REMOVE EXPANSION TANK. DISCONNECT AND REMOVE DRAIN PIPING. DISCONNECT AND REMOVE MAKE-UP WATER PIPING BACK TO MAIN. PREPARE MAKE-UP WATER PIPE FOR RECONNECTION.
8. DISCONNECT AND REMOVE POT FEEDER, CORROSION COUPON RACK, AND ALL ASSOCIATED PIPING, SUPPORTS, ACCESSORIES, ETC IN ITS ENTIRETY.
9. 103' X 40" HIGH LOUVER TO REMAIN.
10. 157' X 54" LOW LOUVER TO REMAIN.
11. 108' X 72" LOUVER TO REMAIN.
12. 138' X 73' X 6" HIGH CONCRETE HOUSEKEEPING PAD TO REMAIN.

KEY PLAN

LEGEND

AREA OF WORK



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Project Title

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1830 WEST ROMNEYA DRIVE,
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IAN THOMAS
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1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

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Sheet Title

DEMOLITION
MECHANICAL PLAN

Sheet Number

M101

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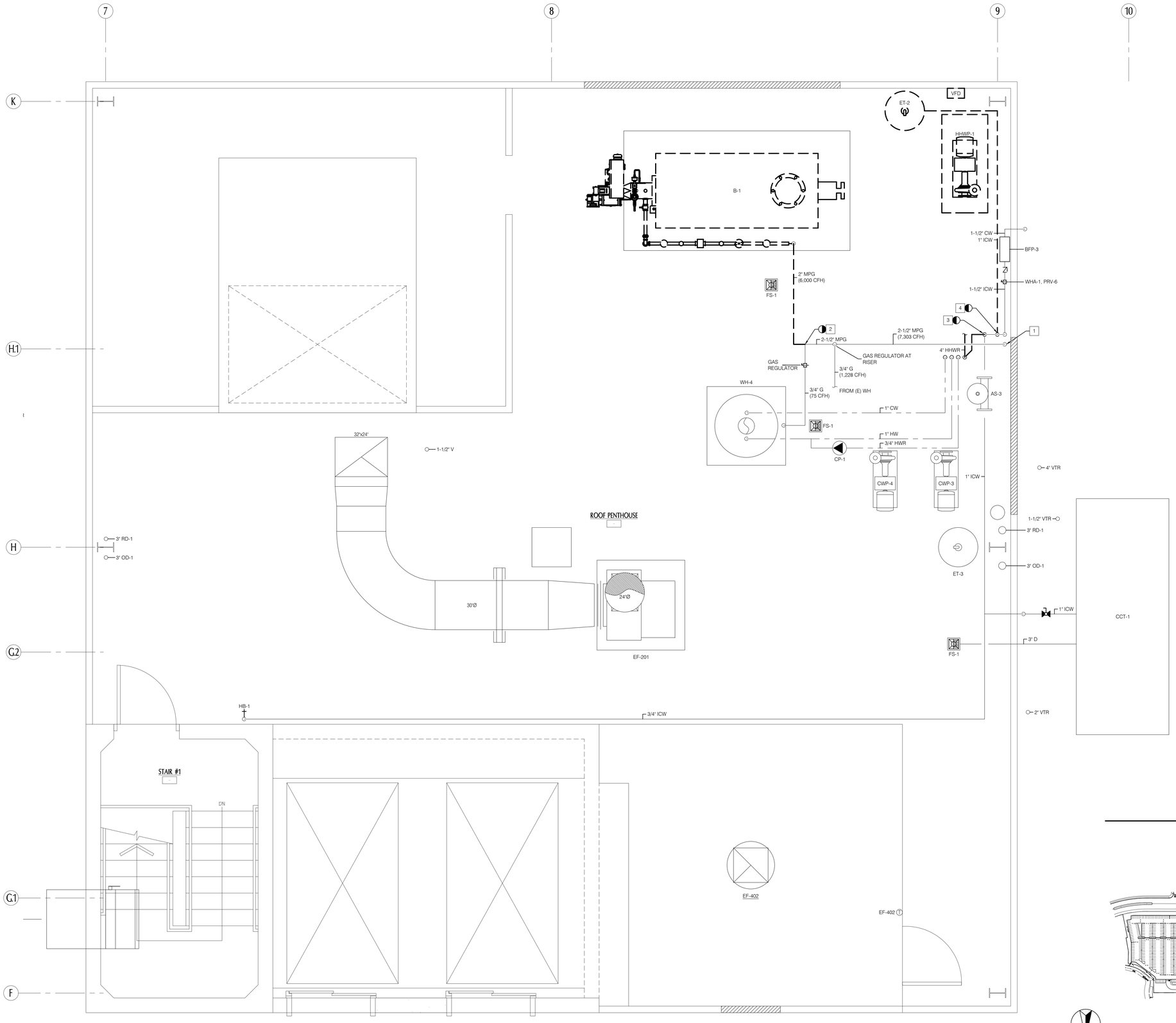
GENERAL NOTES

1. CONTRACTOR SHALL USE ELEVATOR FOR TRANSPORTING ALL MATERIALS AND EQUIPMENT ON AND OFF THE JOB SITE. THE USE OF A CRANE FOR TRANSPORTING MATERIALS AND EQUIPMENT ON AND OFF ROOF IS NOT ACCEPTABLE.
2. ALL ROOF-RELATED WORK SHALL BE DONE BY A SIPLAST CERTIFIED CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL WORK UNDER THIS CONTRACT WITHOUT INVALIDATING ANY EXISTING ROOF WARRANTY.

NOTES

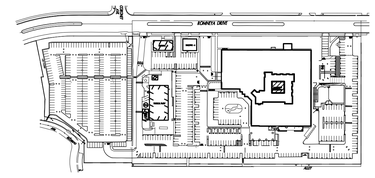
1. 2-1/2" MPG FROM FLOOR BELOW.
2. DISCONNECT AND REMOVE 2" MPG FROM POINT OF DISCONNECT TO B-1. REMOVE ALL ASSOCIATED PIPING, FITTINGS, SUPPORTS AND ACCESSORIES IN ITS ENTIRETY. PREPARE REMAINING PIPE FOR RECONNECTION.
3. DISCONNECT AND REMOVE ICW FROM POINT OF DISCONNECT TO 4" HHWR PIPING. REMOVE ALL ASSOCIATED PIPING, FITTINGS, SUPPORTS AND ACCESSORIES IN ITS ENTIRETY.
4. DISCONNECT AND REMOVE 1" ICW FROM POINT OF DISCONNECT TO ET-2. REMOVE ALL ASSOCIATED PIPING, FITTINGS, SUPPORTS AND ACCESSORIES IN ITS ENTIRETY. PREPARE REMAINING PIPE FOR RECONNECTION.



KEY PLAN

LEGEND

AREA OF WORK



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Sheet Title

DEMOLITION
PLUMBING PLAN

Sheet Number

M102

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FILE PATH & NAME: P:\2019\MECHANICAL\2019-M102.DWG MICHAEL NGUYEN
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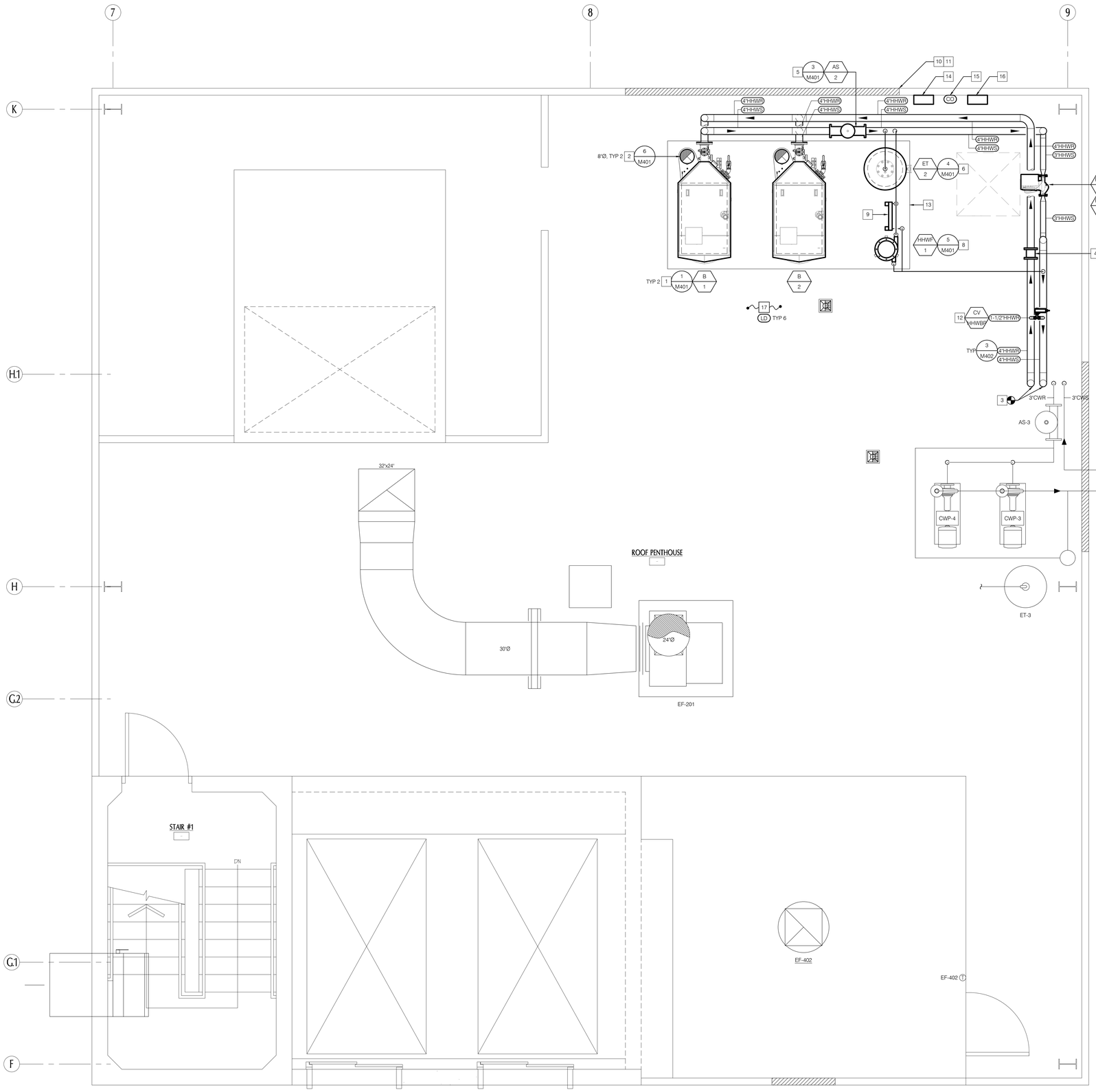


GENERAL NOTES

1. CONTRACTOR SHALL USE ELEVATOR FOR TRANSPORTING ALL MATERIALS AND EQUIPMENT ON AND OFF THE JOB SITE. THE USE OF A CRANE FOR TRANSPORTING MATERIALS AND EQUIPMENT ON AND OFF ROOF IS NOT ACCEPTABLE.
2. ALL ROOF-RELATED WORK SHALL BE DONE BY A SIPLAST CERTIFIED CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL WORK UNDER THIS CONTRACT WITHOUT INVALIDATING ANY EXISTING ROOF WARRANTY.

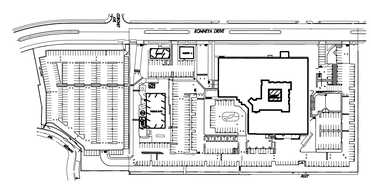
NOTES

1. PROVIDE BOILER, B-1 AND B-2, ON CONCRETE HOUSEKEEPING PAD. SECURE TO PAD. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. INTEGRATE BOILER CONTROLS INTO EXISTING BMS.
2. PROVIDE 8'Ø FLUE DUCT UP THROUGH ROOF. EXTEND FLUE 3'-0" ABOVE HIGHEST POINT OF ROOF WITHIN 10'-0". PROVIDE ROOF FLASHING AND SEAL PIPE PENETRATION WATER TIGHT.
3. PROVIDE 4"Ø HHWS AND HHWR PIPING FROM POINT OF CONNECTION AND ROUTE AS INDICATED. PROVIDE ALL NECESSARY HIGH-PERFORMANCE ISOLATION VALVES, FITTINGS, INSULATION, OFFSETS, SUPPORTS, ACCESSORIES, ETC FOR AN OPERABLE INSTALLATION.
4. PROVIDE IN-LINE ELECTROMAGNETIC FLOW METER EQUAL TO ONICON FT-3104-11112-1111 COMPLETE WITH TEMPERATURE SENSORS AND SYSTEM-10 BTU METER. INTEGRATE INTO EXISTING BMS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
5. PROVIDE AIR SEPARATOR AS-2 AND INSTALL PER MANUFACTURER'S RECOMMENDATIONS. SUPPORT TO STRUCTURE ABOVE.
6. PROVIDE EXPANSION TANK ET-2 AND INSTALL PER MANUFACTURER'S RECOMMENDATIONS. SECURE TO FLOOR WITH MANUFACTURER'S SEISMIC CLIPS. PROVIDE 1" HHW PIPING TO 4" HHWS MAIN.
7. PROVIDE HEATING HOT WATER PUMPS HHWP-1 AND HHWP-2. SECURE TO FLOOR WITH PIPE STAND AND NEOPRENE PAD. INTEGRATE PUMP CONTROLS INTO EXISTING BMS.
8. PROVIDE HEATING HOT WATER FILTER HHWF-1 AND SECURE TO FLOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE 3/4" HHWS AND 3/4" HHWR PIPING FROM HHWF-1 TO HHWS MAINS AS INDICATED.
9. PROVIDE COUPON RACK EQUAL TO J.L. WINGERT CSCR-4-007 COMPLETE CHECK VALVE, NIPPLE, Y STRAINER, ADJUSTABLE FLOW INDICTATOR, 3/PS FLOW CONTROL VALVE. SECURE TO FLOOR. PROVIDE 3/4" HHWS AND 3/4" HHWR PIPING FROM HHWS MAINS AS INDICATED.
10. (E) 103" X 40" HIGH COMBUSTION AIR LOUVER WITHIN 12" FROM TOP OF ENCLOSURE.
11. (E) 157" X 54" LOW COMBUSTION AIR LOVER WITHIN 12" FROM FLOOR.
12. PROVIDE 1-1/2"HW BYPASS PIPING WITH BYPASS CONTROL VALVE CV-HHWBP.
13. EXTEND HOUSEKEEPING PAD AS REQUIRED FOR EQUIPMENT ANCHORAGE. SEE STRUCTURAL DRAWINGS FOR ADDITIONAL REQUIREMENTS.
14. PROVIDE CARBON MONOXIDE DETECTION CONTROLLER EQUAL TO HONEYWELL MODEL VA3010C-DLC-BIP AND INTEGRATE WITH EXISTING BMS. PROVIDE MANUFACTURER'S START-UP.
15. PROVIDE CARBON MONOXIDE SENSOR MOUNTED ON WALL OR COLUMN AT 36" AFF AND CONNECT TO CONTROLLER. SENSOR SHALL BE HONEYWELL E3SM+ESSCO WITH GUARD MODEL E3PT WITH MIN. 50'-0" RADIUS OF COVERAGE.
16. PROVIDE LEAK DETECTION CONTROLLER EQUAL TO TRACETEK TTSIM-1A-120 COMPLETE WITH DIGITRACE PROTONODE BACNET GATEWAY AND NEMA 4 ENCLOSURE. INTEGRATE CONTROLLER WITH EXISTING BMS. PROVIDE MANUFACTURER'S START-UP.
17. PROVIDE (6) SPOT-TYPE LEAK DETECTION PROBE EQUAL TO TRACETEK TT-FLAT PROBE AND CONNECT TO CONTROLLER. CONTRACTOR TO COORDINATE WITH OWNER'S REPRESENTATIVE FOR THE EXACT LOCATIONS. PROVIDE ALL NECESSARY WIRING AND CONDUIT FOR AN OPERABLE INSTALLATION.

KEY PLAN

LEGEND

AREA OF WORK



SCALE: 1/2" = 1'-0"

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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
Thomas
No. M30597
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
Scale	1/2" = 1'-0"

Sheet Title

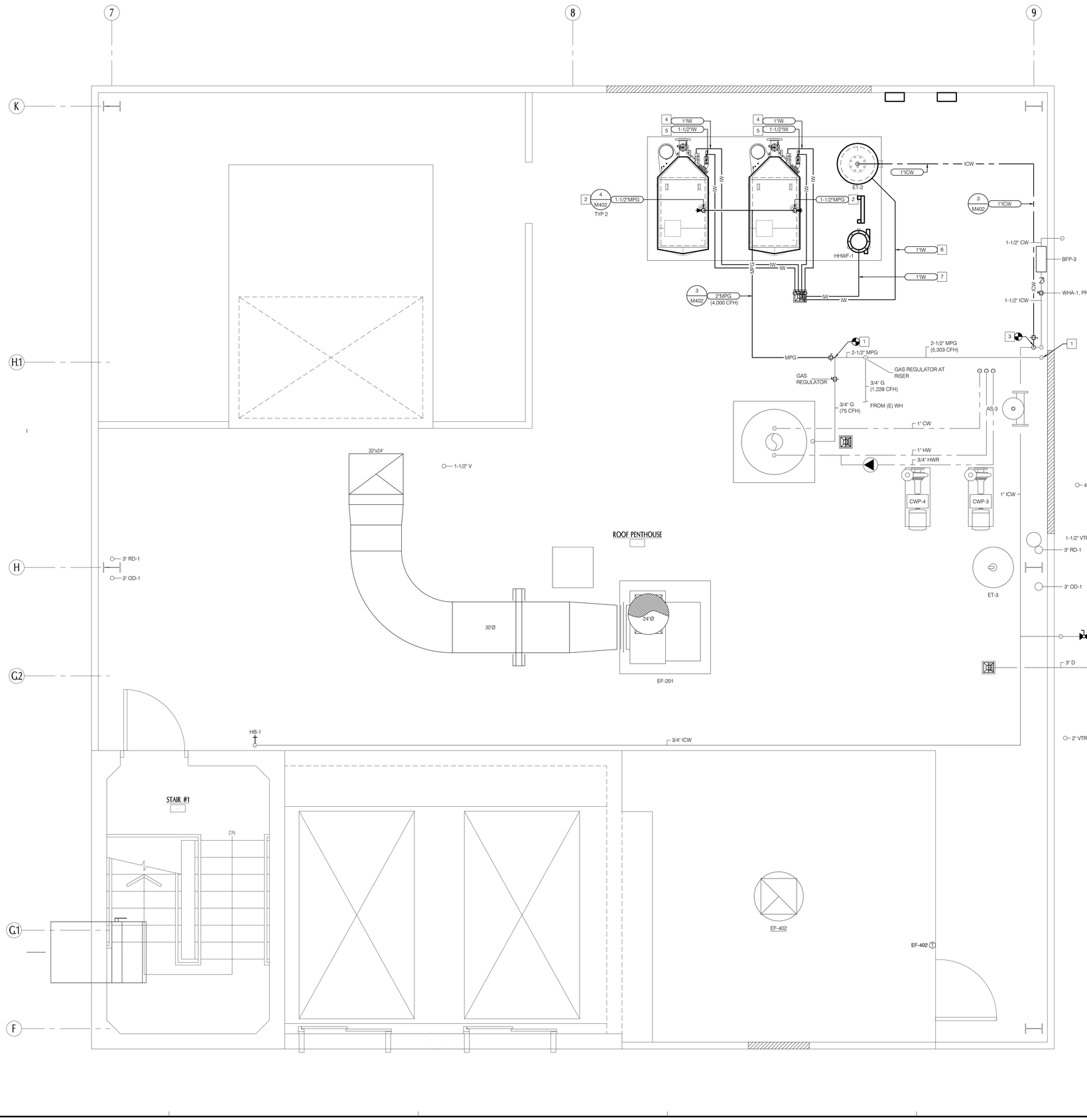
RENOVATION
MECHANICAL PLAN

Sheet Number

M201

P2S No. 0719

FILE PATH & NAME: R:\0719\MECHANICAL\0719-M201.DWG MICHAEL NGUYEN
PLOT: Monday, October 5, 2020 10:41:12 AM



GENERAL NOTES

1. CONTRACTOR SHALL USE ELEVATOR FOR TRANSPORTING ALL MATERIALS AND EQUIPMENT ON AND OFF THE JOB SITE. THE USE OF A CRANE FOR TRANSPORTING MATERIALS AND EQUIPMENT ON AND OFF ROOF IS NOT ACCEPTABLE.
2. ALL ROOF-RELATED WORK SHALL BE DONE BY A SIPLAST CERTIFIED CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL WORK UNDER THIS CONTRACT WITHOUT INVALIDATING ANY EXISTING ROOF WARRANTY.

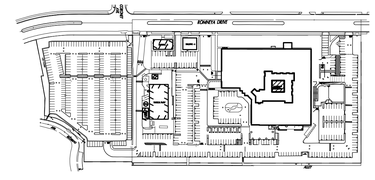
NOTES

1. PROVIDE 2"MPG FROM EXITING 2-1/2"MPG AT HIGH LEVEL AND ROUTE PIPING AS SHOWN TO BOILERS. PROVIDE NATURAL GAS FLOW METER EQUAL TO ONICON F-5820-3115-3009 TO EACH BOILER (TOTAL 2) AND INTEGRATE WITH EXISTING BMS.
2. PROVIDE 1-1/2"MPG DOWN TO BOILER COMPLETE WITH GAS PRESSURE REGULATOR AND SEDIMENT TRAP IN ACCORDANCE CPC 1212.9. PROVIDE GAS REGULATOR PER DETAIL 4/M402. INSTALL PER MANUFACTURERS RECOMMENDATIONS. PROVIDE LINE SIZE GAS REGULATOR VENT PIPE UP THROUGH ROOF COMPLETE WITH FLASHING. EXTEND 4'-0" ABOVE ROOF DECK. TERMINATE WITH GOOSENECK AND STAINLESS STEEL INSECT SCREEN.
3. PROVIDE 1"ICW TO HEATING HOT WATER PIPING FROM EXPANSION TANK COMPLETE WITH SHUT OFF VALVE. FIELD VERIFY EXACT LOCATION AND EXTEND PIPING AS REQUIRED.
4. PROVIDE 1"IW FROM BOILER CONDENSATE DRAIN CONNECTION. ROUTE TO AND SPILL INTO FLOOR SINK WITH APPROVED AIR GAP. PROVIDE NEUTRALIZATION KIT.
5. PROVIDE 1-1/2" IW FROM BOILER DRAIN CONNECTION. ROUTE TO AND SPILL INTO FLOOR SINK WITH APPROVED AIR GAP.
6. PROVIDE 1"IW FROM EXPANSION TANK ET-2. ROUTE TO AND SPILL INTO FLOOR SINK WITH APPROVED AIR GAP.
7. PROVIDE 1"IW FROM HEATING HOT WATER FILTER HHWF-1. ROUTE TO AND SPILL INTO FLOOR SINK WITH APPROVED AIR GAP.

KEY PLAN

LEGEND

AREA OF WORK



SCALE: 1/2" = 1'-0"

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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
MICHAEL N THOMAS
No. M30691
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

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Drawn	MN
Checked	IT
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Sheet Title

RENOVATION
PLUMBING PLAN

Sheet Number

M202

P2S No. 0719

FILE PATH & NAME: P:\2019\M\ECHANICAL\2019-M002.DWG MICHAEL NGUYEN
PLOT: Monday, October 5, 2020 10:41:24 AM

HEATING HOT WATER SEQUENCE OF OPERATION

1. DDC SYSTEM SHALL SCHEDULE, TURN ON AND OFF, MONITOR, TREND AND SEQUENCE ALL HEATING HOT WATER (HHW) SYSTEM COMPONENTS. HHW SYSTEM SHALL BE AVAILABLE FOR 24/7 OPERATION. ALL POINTS SHALL BE ADJUSTABLE.

2. BOILER CONTROL - LEAD LAG
   - A. BOILERS SHALL BE CONFIGURED FOR LEAD/LAG AND AUTOMATIC SWITCH OVER ON A WEEKLY BASIS TO EQUALIZE RUNTIME.
   - B. ON CALL FOR HEATING AND PROOF OF FLOW VIA FLOWRATE METER, THE LEAD BOILER SHALL BE ENABLED.
   - C. BOILER BURNERS SHALL MODULATE THROUGH ITS INTERNAL CONTROLS TO MAINTAIN HEATING HOT WATER SUPPLY TEMPERATURE OF 180°F (ADJUSTABLE)
   - D. IF HHW RETURN TEMPERATURE RISES ABOVE 160°F, THE DDC SYSTEM SHALL RESET HHW SUPPLY WATER TEMPERATURE AND STAGE THE BOILER BURNERS. IF THE RETURN WATER TEMPERATURE IS 175°F FOR ONE MINUTE, THE BOILER SHALL BE DISABLED. THE LEAD BOILER PUMP SHALL BE DISABLED AFTER 3 MINUTES.
   - E. HIGH LIMIT - WHEN HHW SUPPLY TEMPERATURE EXCEEDS OPERATING OR HIGH LIMIT TEMPERATURE, THE BOILER SHALL SHUT DOWN.
   - F. LOW WATER CUT-OFF - IF LOW WATER OR LOW CONDITION OCCUR, THE BOILER SHALL SHUT DOWN.
   - G. IF THE TEMPERATURE DIFFERENCE BETWEEN THE BOILER HHW INLET AND HHW OUTLET EXCEEDS 80°F, THEN BOILER SHALL SHUT DOWN.

3. PUMP CONTROL - LEAD LAG
   - A. HEATING HOT WATER PUMP SHALL BE CONFIGURED FOR LEAD/LAG AND AUTOMATIC SWITCH OVER ON A WEEKLY BASIS TO EQUALIZE RUNTIME.
   - B. ON CALL FOR HEATING, ENABLE LEAD PUMP AND MODULATE PUMP SPEED TO MAINTAIN THE DIFFERENTIAL PRESSURE SETPOINT. INITIALLY SET TO 10 PSI. THE CONTROL LOGIC SHALL BE TUNED TO AVOID HUNTING.
   - C. IF LEAD PUMP IS OPERATING AT OR ABOVE 85% SPEED FOR 5 CONTINUOUS MINUTES OR DURING SWITCH OVER FOR EQUAL RUN TIME, THEN THE LAG PUMP SHALL BE ENABLED AND RAMP UP TO MATCH LEAD PUMP SPEED.
     - i. THE LEAD PUMP SHALL MAINTAIN SETPOINT WHILE LAG PUMP IS RAMPING UP.
     - ii. ONCE THE LEAD AND LAG PUMP SPEEDS ARE WITHIN 5% OF EACH OTHER, THE PUMPS SHALL OPERATE WITH THE SPEED TO MAINTAIN DIFFERENTIAL PRESSURE SETPOINT.
   - D. IF THE LAG PUMP WAS ENABLED FOR EQUAL RUN TIME, 5 CONTINUOUS MINUTES OF OPERATION WITHOUT ISSUE, THE LEAD PUMP SHALL BE MADE LAG, AND THE LAG PUMP SHALL BE MADE LEAD.
     - i. THE NEW LAG PUMP SHALL BE DISABLED WHILE THE NEW LEAD PUMP OPERATES TO MAINTAIN DIFERENTIAL PRESSURE SETPOINT.
   - E. ONCE BOTH PUMPS SPEED IS LESS THAN 25% FOR 5 CONTINUOUS MINUTES, THE LAG PUMP SHALL BE DISABLED WHILE THE LEAD PUMP OPERATES TO MAINTAIN DIFFERENTIAL PRESSURE SETPOINT.
   - F. IF A PUMP FAILS, THE NEXT PUMP SHALL BE ENABLED. AN ALARM SHALL BE SENT TO OPERATOR.
   - G. IF THERE IS NO DEMAND FOR HEATING FOR 2 MINUTES, THE LEAD PUMP SHALL SHUT OFF.

4. BYPASS CONTROL VALVE
   - A. HEATING HOT WATER BYPASS HHWBP-1 WILL MODULATE TO MAINTAIN THE MINIMUM FLOW OF OPERATING BOILERS USING THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE SYSTEM. .

5. BTU METERING
   - A. DDC SYSTEM SHALL MONITOR INSTANTANEOUS HEATING HOT WATER THERMS AND TREND THERM CONSUMPTION USING A BTU METER.

6. GAS METERING
   - A. DDC SYSTEM SHALL MONITOR AND TREND FLOW RATE AND TOTALIZED FLOW TO EACH INDIVIDUAL BOILER (TOTAL 2)

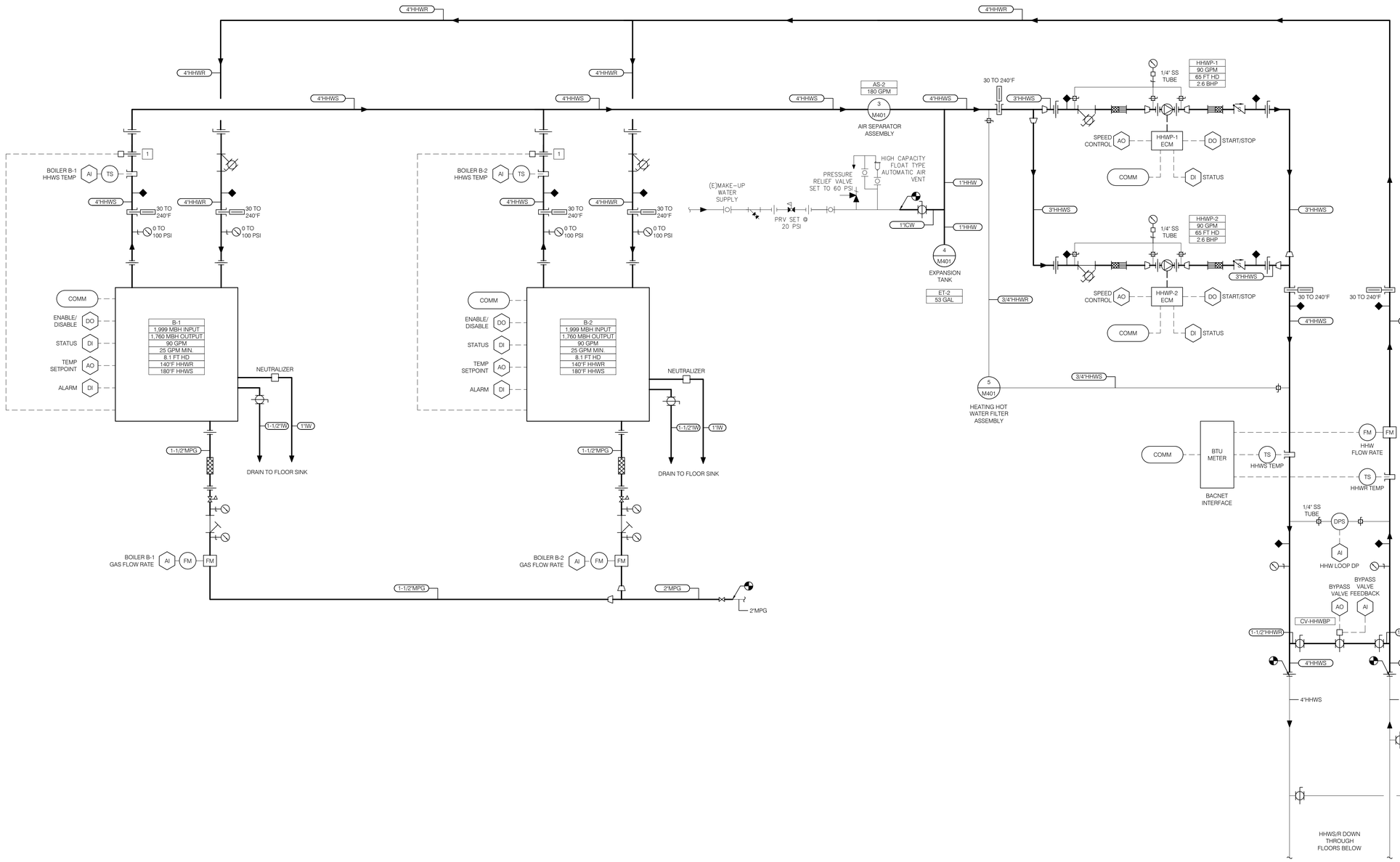
7. CARBON MONOXIDE SENSOR
   - A. DDC SYSTEM SHALL MONITOR AND TREND CARBON MONOXIDE (IN PPM) AND ISSUE THE FOLLOWING NOTIFICATIONS:
     - a. ALARM: GREATER THAN 101 PPM
     - b. WARNING: 51 TO 100 PPM
     - c. NORMAL (NO ALARM): BELOW 50 PPM

8. WATER LEAK DETECTION
   - A. DDC SYSTEM SHALL MONITOR FOR ANY LEAK DETECTION AND ISSUE AN ALARM IF LEAK IS DETECTED.

POINT	DESCRIPTION	TYPE	UNITS
DP	LOOP DIFFERENTIAL PRESSURE	AI	FT
F	B-1 GAS FLOW RATE	AI	CFH
F	B-2 GAS FLOW RATE	AI	CFH
T	B-1 BOILER HEATING HOT WATER SUPPLY TEMPERATURE	AI	°F
T	B-2 BOILER HEATING HOT WATER SUPPLY TEMPERATURE	AI	°F
SS	HHWP-1 START/STOP	DO	-
SS	HHWP-2 START/STOP	DO	-
S	HHWP-1 STATUS	DI	-
S	HHWP-2 STATUS	DI	-
SC	HHWP-1 SPEED CONTROL	AO	HERTZ
SC	HHWP-2 SPEED CONTROL	AO	HERTZ
VA	BYPASS VALVE	AO	VDC
ZI	BYPASS VALVE POSITION	AI	-
ED	B-1 ENABLE/DISABLE	DO	-
ED	B-2 ENABLE/DISABLE	DO	-
S	B-1 BOILER STATUS	DI	-
S	B-2 BOILER STATUS	DI	-
SP	B-1 BOILER TEMPERATURE SETPOINT	AO	°F
SP	B-2 BOILER TEMPERATURE SETPOINT	AO	°F
B-1 COMM	TEMPERATURE, STATUS, ALARMS.	-	-
B-2 COMM	TEMPERATURE, STATUS, ALARMS.	-	-
HHWP-1 COMM	SPEED FEEDBACK, ALARM, kW, kWh, TORQUE, RPM, AMPS, TEMPERATURE.	-	-
HHWP-2 COMM	SPEED FEEDBACK, ALARM, kW, kWh, TORQUE, RPM, AMPS, TEMPERATURE.	-	-
BTU COMM	BTU/HR, GPM, HHWS TEMP, HHWR TEMP	-	-

NOTES

1. MANUFACTURER'S MOTORIZED ISOLATION VALVE. INSTALLED BY CONTRACTOR.



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Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
Thomas
No. M30697
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
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Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
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Sheet Title

HEATING HOT WATER
P&ID

Sheet Number

M301

P2S No. 0719

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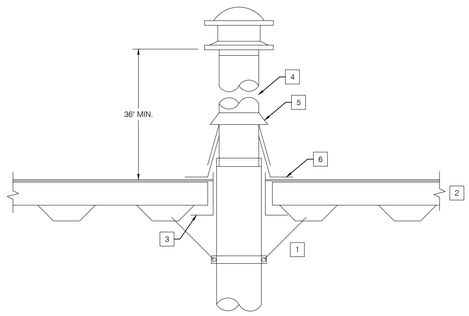
6 FLUE DUCT UP THROUGH ROOF

NO SCALE

NOTES

1. BRACING
2. ROOF DECK WITH RIGID INSULATION
3. ROOF THIMBLE PASSING THROUGH ROOF PENETRATION UP TO FLASHING. VENT WILL PASS THROUGH THIMBLE WITH MINIMUM 1" AIR GAP.
4. FLUE CAP.
5. STORM COLLAR
6. METAL SLEEVE AND FLASHING ASSEMBLY

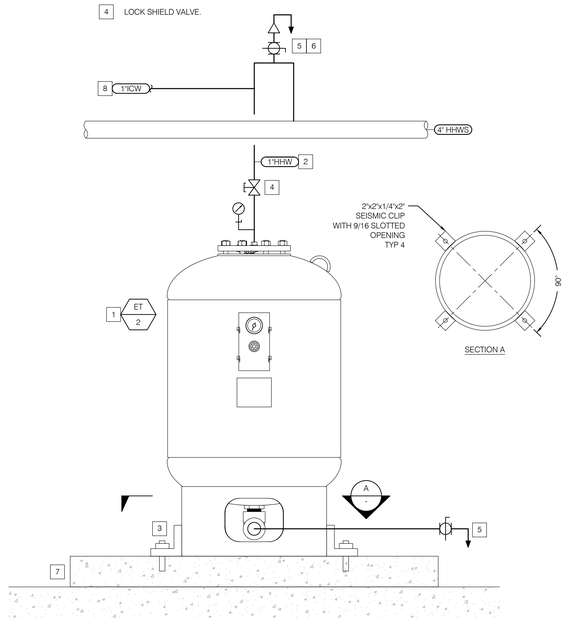


4 EXPANSION TANK

NO SCALE

NOTES

1. CONTRACTOR SHALL INSTALL OWNER-FURNISHED EXPANSION TANK WITH INTEGRAL PRESSURE GAUGE, CALIFORNIA SIGHT GLASS, AND SEISMIC CLIPS. SECURE TO CONCRETE PAD.
2. PROVIDE 1" INTERCONNECTING PIPING FROM EXPANSION TANK TO HHWS PIPE.
3. MANUFACTURER'S SEISMIC CLIPS. REFER TO STRUCTURAL DRAWINGS FOR ANCHORAGE.
4. LOCK SHIELD VALVE.
5. EXTEND LINE-SIZED DRAIN TO FLOOR SINK IN VICINITY.
6. HIGH CAPACITY FLOAT TYPE AUTOMATIC AIR VENT.
7. EXISTING CONCRETE EQUIPMENT PAD.
8. PROVIDE 1" ICW TO 1"HHW PIPING FROM EXPANSION TANK.

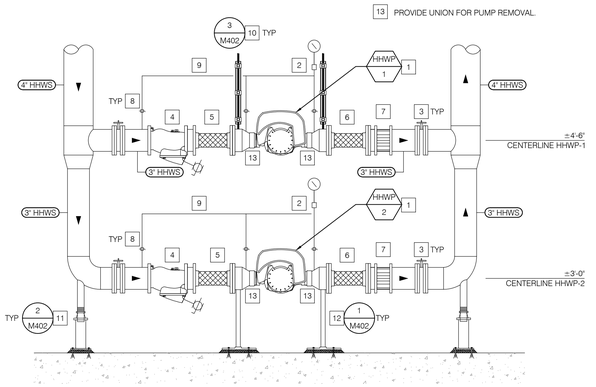


2 PUMPS

NO SCALE

NOTES

1. CONTRACTOR SHALL INSTALL OWNER-FURNISHED VERTICAL IN-LINE PUMP.
2. PROVIDE 1/4" SNUBBER.
3. PROVIDE HIGH PERFORMANCE BUTTERFLY VALVE. MANUFACTURER SHALL BE MILWAUKEE HIGH PERFORMANCE BUTTERFLY VALVE OR EQUAL.
4. PROVIDE Y-STRAINER WITH BALL VALVE AND HOSE CONNECTION. STRAINER SHALL BE METRAFLEX LPD OR EQUAL.
5. PROVIDE BRAIDED STAINLESS STEEL FLEX CONNECTION, STRAIGHTENING VANE, AND REDUCER TO PUMP INLET. MANUFACTURER SHALL BE METRAFLEX SDF SUCTION DIFFUSER FLEX.
6. PROVIDE BRAIDED STAINLESS STEEL FLEX CONNECTION, STRAIGHTENING VANE, AND TRANSITION FITTING FROM PUMP OUTLET. MANUFACTURER SHALL BE METRAFLEX VF VANEFLEX.
7. PROVIDE HIGH PERFORMANCE CHECK VALVE. MANUFACTURER SHALL BE CRANE DUO-CHEK.
8. PROVIDE STAINLESS STEEL BALL VALVE ON 1/4" SCHEDULE 20, 304 STAINLESS STEEL TUBING.
9. PROVIDE 1/4" SCHEDULE 20, 304 STAINLESS STEEL TUBING.
10. PROVIDE SUSPENDED PIPE SUPPORT TO STRUCTURE ABOVE.
11. PROVIDE ELBOW PIPE SUPPORT AND SECURE TO FLOOR SLAB.
12. PROVIDE PIPE SUPPORT AND SECURE TO FLOOR SLAB.
13. PROVIDE UNION FOR PUMP REMOVAL.

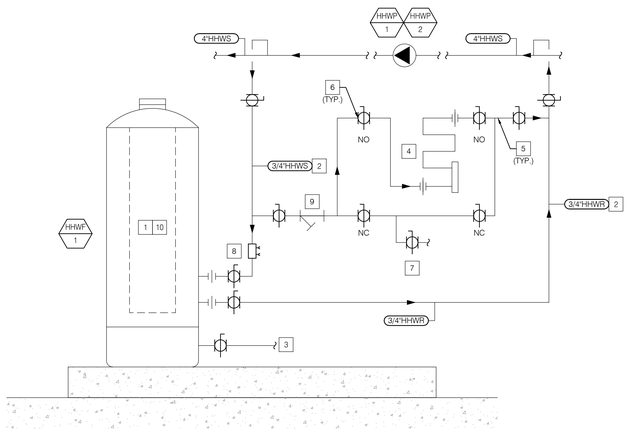


5 HEATING HOT WATER FILTER

NO SCALE

NOTES

1. CONTRACTOR SHALL INSTALL OWNER-FURNISHED HEATING HOT WATER FILTER HHWF-1. SECURE POT FEEDER TO CONCRETE FLOOR WITH THREE (3), 3/8"Ø HILTI KWIK BOLT II (ESR ICC 1917) WITH 2-1/2" EMBEDMENT. POT FEEDER IS APPROXIMATELY 32" TALL, 10"Ø ROUND.
2. PROVIDE 3/4" PIPING FROM MAIN SUPPLY PIPE WITH SHUTOFF VALVES AND UNIONS.
3. PROVIDE 3/4"IW FROM HHWF-1 TO NEAREST FLOOR RECEPTOR.
4. PROVIDE J.L. WINGERT FOUR (4) STATION STAINLESS STEEL CORROSION COUPON RACK WITH FLOW REGULATOR
5. 3/4" SCHEDULE 40 STAINLESS STEEL PIPE AND FITTINGS.
6. 3/4" QUARTER-TURN FULL-PORT BALL VALVE.
7. DRAIN PIPE TO NEAREST FLOOR RECEPTOR.
8. 3/4" BALANCING VALVE EQUAL TO BELL & GOSSETT CIRCUIT SETTER PLUS.
9. Y-STRAINER WITH DRAIN VALVE AND PLUG
10. REMOVABLE FILTER

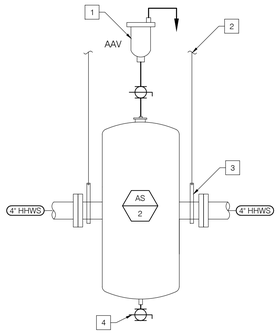


3 AIR SEPARATOR

NO SCALE

NOTES

1. HIGH CAPACITY AUTOMATIC AIR VENT, ROUTE DISCHARGE TO FLOOR SINK.
2. ATTACH TO STRUCTURE.
3. AJUSTABLE RING PIPE HANGER
4. FULL PORT BALL VALVE WITH HOSE END CONNECTION.

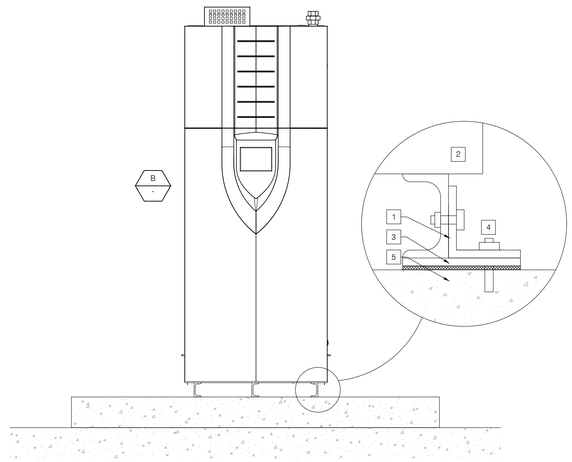


1 BOILER

NO SCALE

NOTES

1. CONTRACTOR SHALL INSTALL OWNER-FURNISHED BOILERS, B-1 AND B-2. BOILERS EQUIPPED WITH MANUFACTURER-PROVIDED MOUNTING BRACKETS. TWO ON EACH LONG SIDES (TOTAL 4 BRACKETS).
2. FACE OF MECHANICAL EQUIPMENT.
3. BEARING PLATE WITH NEOPRENE PAD.
4. REFER TO STRUCTURAL DRAWINGS FOR ANCHORAGE.
5. CONCRETE HOUSEKEEPING PAD.



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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

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REGISTERED PROFESSIONAL ENGINEER
THOMAS
No. M26821
Signed 09/15/2020
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STATE OF CALIFORNIA

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1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

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Sheet Title

DETAILS

Sheet Number

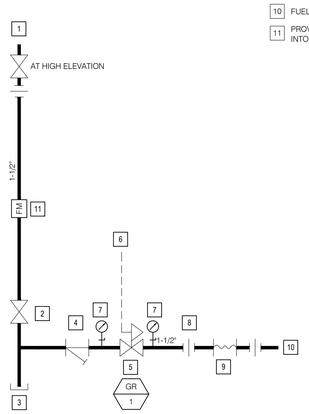
M401

P2S No. 0719

FILE PATH & NAME: R:\2019\MECHANICAL\0719-M401.DWG MICHAEL.NGUYEN
PLOT: Tuesday, September 15, 2020 11:36:29 AM

NOTES

1. 1-1/2"MPG SUPPLY
2. SHUT-OFF VALVE (TYPICAL)
3. SEDIMENT TRAP PER CPC 1212.9
4. FUEL STRAINER (SUPPLIED BY MANUFACTURER, INSTALLED BY CONTRACTOR)
5. GAS PRESSURE REGULATOR
6. PROVIDE LINE SIZE GAS REGULATOR VENT UP THRU ROOF WITH ELBOW DOWN AND INSECT SCREEN.
7. PRESSURE GAUGE
8. UNION (TYPICAL)
9. FLEXIBLE PIPING.
10. FUEL GAS CONNECTION TO BOILER
11. PROVIDE ONICON FLOW METER 5100 AND INTEGRATE INTO BMS.

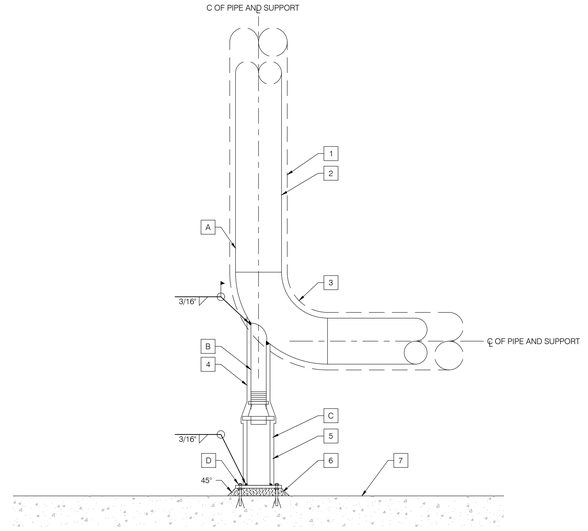


4 GAS SUPPLY TO BOILER
NO SCALE

PIPE A	PIPE B	PIPE C	PLATE D
3"	2"	3"	8" X 8" X 1/2"

NOTES

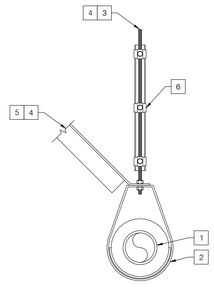
1. INSULATION WHERE REQUIRED
2. SEE PLANS FOR PIPE SIZES
3. LONG RADIUS ELBOWS
4. IF PIPE BEING SUPPORTED IS INSULATED, INSULATE ENTIRE COLUMN WITH 1/2" THICK INSULATION MATCHING INSULATED PIPE INSULATION TYPE. USE MASTIC AND LAGGING TO MAINTAIN CONITNUOS VAPOR BARRIER IF PIPE IS COLD.
5. PIPE SUPPORTS TO BE WELDED, NO THREADED JOINTS EXCEPT FOR ADJUSTMENT NUT. HOT DIP GALVANIZE ENTIRE ASSEMBLY.
6. NON SHRINK GROUT
7. FINISHED FLOOR



2 PIPE SUPPORT - ON GRADE
NO SCALE

NOTES

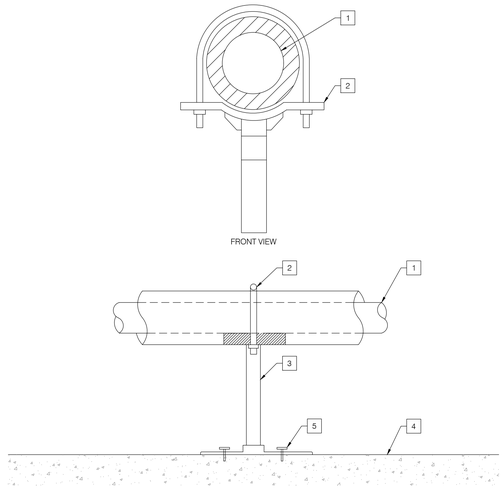
1. SINGLE INSULATED PIPE HANGER DETAIL FOR 4" DIA MAX PIPING. MAX HANGER SPACING 6 FT OC, OR WITHIN 2 FT OF EACH DIRECTION CHANGE.
2. BAND HANGER INSTALLED OUTSIDE INSULATION WITH 6 IN LONG GALVANIZED STEEL PIPE INSULATION SHIELD.
3. 3/8" DIA THREADED ROD.
4. SECURE TO STRUCTURE ABOVE. PROVIDE UNISTRUT M2037 SWIVEL CONNECTION OR EQUIVALENT WHEREVER DIAGONAL BRACING PER NOTE 5 IS NOT PROVIDED.
5. PROVIDE DIAGONAL BRACE WHERE REQUIRED TO PREVENT PIPING FROM IMPACTING ADJACENT BUILDING ELEMENTS DURING SEISMIC EVENT. BRACE SHALL BE MINIMUM L2"X2"X1/4" DIAGONAL ANGLE.
6. THREADED ROD STIFFENER. REQUIRED ONLY WHEN DIAGONAL BRACE IS USED.



3 PIPE SUPPORT - SUSPENDED
NO SCALE

NOTES

1. PIPE AND INSULATION (WHERE APPLICABLE)
2. COOPER B-LINE ADJUSTABLE PIPE SADDLE WITH U-BOLT PART #B3092.
3. COOPER B-LINE 2" DIA SEISMIC BASE STAND PART #B3088ST.
4. CONCRETE FLOOR SLAB.
5. SECURE TO CONCRETE FLOOR SLAB.



1 PIPE SUPPORT- ELBOW
NO SCALE

P2S ENG
Long Beach | Los Angeles
San Diego | San Jose
p2sinc.com

Consultant

Project Title
NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner
NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
IAN THOMAS
No. M30091
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
Scale	N/A

Sheet Title
DETAILS

Sheet Number
M402

P2S No. 0719

FILE PATH & NAME: R:\J0719\MECHANICAL\0719-M402.DWG MICHAEL NGUYEN
PLOT: Tuesday, September 15, 2020 11:36:31 AM

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E

This document is used to demonstrate compliance for mechanical systems that are within the scope of the permit application and are demonstrating compliance using the prescriptive path outlined in , or for alterations.

Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

A. GENERAL INFORMATION

01	Project Location (city)	Anaheim	04	Total Conditioned Floor Area	0
02	Climate Zone	8	05	Total Unconditioned Floor Area	2250
03	Occupancy Types Within Project:		06	# of Stories (Habitable Above Grade)	1

☐ Office (B) ☐ Retail (M) ☐ Non-refrigerated Warehouse (S)
☐ Hotel/ Motel Guest Rooms (R-1) ☐ School (E) ☐ Healthcare Facility (I)
☐ High-Rise Residential (R-2/R-3) ☐ Relocatable Class Bldg (E) ☑ Other (Write In): Mechanical Room

[1] *FOOTNOTES: Climate zone can be determined on the California Energy Commission's website at*

B. PROJECT SCOPE

Table Instructions: Include any mechanical systems that are within the scope of the permit application and are demonstrating compliance using the prescriptive path outlined in , or for alterations.

My project consists of (check all that apply)

01	02	03
Air System(s)	Wet System Components	Dry System Components
☐ Heating Air System	☐ Water Economizer	☐ Air Economizer
☐ Cooling Air System	☑ Pumps	☐ Electric Resistance Heat
Mechanical Controls	☐ Hydronic System Piping	☐ Fan Systems
☐ Mechanical Controls (existing to remain, altered or new)	☐ Cooling Towers	☐ Ductwork (existing to remain, altered or new)
	☐ Chillers	☐ Ventilation
	☑ Boilers	☐ Zonal Systems/ Terminal Boxes

C. COMPLIANCE RESULTS

Table Instructions: If any cell on this table says "DOES NOT COMPLY" or "COMPLIES with Exceptional Conditions" refer to Table D. for guidance.

01		02		03		04		05		06		07		08		09
System Summary , ,	AND	Pumps	AND	Fans/ Economizers ,	AND	System Controls , ,	AND	Ventilation	AND	Terminal Box Controls	AND	Distribution ,	AND	Cooling Towers		**Compliance Results**
(See Table F)		(See Table G)		(See Table H)		(See Table I)		(See Table J)		(See Table K)		(See Table L)		(See Table M)		
Yes	AND	Yes	AND		AND		AND		AND		AND		AND			COMPLIES

Table Continued

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E

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Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

Table Continued

01		02		03		04		05		06		07		08	09
System Summary , ,	AND	Pumps	AND	Fans/ Economizers ,	AND	System Controls , ,	AND	Ventilation	AND	Terminal Box Controls	AND	Distribution ,	AND	Cooling Towers	**Compliance Results**
(See Table F)		(See Table G)		(See Table H)		(See Table I)		(See Table J)		(See Table K)		(See Table L)		(See Table M)	
Mandatory Measures Compliance (See Table Q for Details)															COMPLIES

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

D. EXCEPTIONAL CONDITIONS

This table is auto-filled with uneditable comments because of selections made or data entered in tables throughout the form.

No exceptional conditions apply to this project.

E. ADDITIONAL REMARKS

This table includes remarks made by the permit applicant to the Authority Having Jurisdiction.

F. HVAC SYSTEM SUMMARY (DRY & WET SYSTEMS)

Table Instructions: Complete the following equipment schedules to show compliance with mandatory requirements found in and prescriptive requirements found in , and

Boiler Efficiency and Controls

01	02	03	04	05	06	07	08	09
Name or Item Tag	Equipment Type[1]	Qty	Rated Input Capacity (Btu/h)[2,3]	Rated Efficiency	Minimum Efficiency Required per	Efficiency Unit	Boiler Controls per	
							Isolation Valve	Temperature Reset
B-1,2	Hot water: Gas-Fired	2	> 500,000 to 2,500,000	88			Yes	NA: Variable Flow Controls

Reset | Add Row | Remove Last

[1] *FOOTNOTES: Use NRCC-PLB to document compliance with domestic water heating equipment.*
[2] *Maximum capacity- minimum and maximum ratings as provided for and allowed by the unit's controls*
[3] *Includes oil-fired (residual)*

G. PUMPS

Table Instructions: Complete the following pump schedule to show compliance with Prescriptive hydronic system requirements found in applicable to pumps < 5hp.

01	02	03	04	05	06	07	08
Name or Item Tag	Equipment Type	Qty	HP	Controls per			
				Variable Flow	Hydronic Heat Pump Isolation	VSD on Pumps > 5HP	Differential Pressure Sensor
HHWP-1,2	Primary heating hot water	2	3	Yes	NA: No hydronic heat pump		

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

Reset | Add Row | Remove Last

H. FAN SYSTEMS & AIR ECONOMIZERS

This Section Does Not Apply

I. SYSTEM CONTROLS

This Section Does Not Apply

J. VENTILATION AND INDOOR AIR QUALITY

This Section Does Not Apply

K. TERMINAL BOX CONTROLS

This Section Does Not Apply

L. DISTRIBUTION (DUCTWORK AND PIPING)

This Section Does Not Apply

M. COOLING TOWERS

This Section Does Not Apply

N. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION

Table Instructions: Selections have been made based on information provided in previous tables of this document. If any selection needs ta be changed, please explain why in Table E. Additional Remarks. These documents must be provided to the building inspector during construction and can be found online at

YES	NO	Form/Title	Field Inspector Pass	Field Inspector Fail
◉	○	NRCI-MCH-01-E - Must be submitted for all buildings.	☐	☐

O. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE

Table Instructions: Selections have been made based on information provided in previous tables of this document. If any selection needs to be changed, please explain why in Table E. Additional Remarks. These documents must be provided to the building inspector during construction and can be found online at

YES	NO	Form/Title	Field Inspector Pass	Field Inspector Fail

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

○	◉	NRCA-MCH-02-A Outdoor Air must be submitted for all newly installed HVAC units. *Note: MCH02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap.*	☐	☐
○	◉	NRCA-MCH-03-A Constant Volume Single Zone HVAC NOTE: This form does not automatically move to "Yes". If Constant Volume Single Zone HVAC Systems are included in the scope, permit applicant should move this form to "Yes".	☐	☐
○	◉	NRCA-MCH-04-A Air Distribution Duct Leakage	☐	☐
○	◉	NRCA-MCH-05-A Air Economizer Controls	☐	☐
○	◉	NRCA-MCH-06-A Demand Control Ventilation Systems Acceptance must be submitted for all systems required to employ demand controlled ventilation (refer to §120.1(c)3) can vary outside ventilation flow rates based on maintaining interior carbon dioxide (CO2) concentration setpoints.	☐	☐
○	◉	NRCA-MCH-07-A Supply Fan Variable Flow Controls	☐	☐
◉	○	NRCA-MCH-08-A Valve Leakage Test	☐	☐
◉	○	NRCA-MCH-09-A Supply Water Temperature Reset Controls	☐	☐
◉	○	NRCA-MCH-10-A Hydronic System Variable Flow Controls	☐	☐
○	◉	NRCA-MCH-11-A Automatic Demand Shed Controls	☐	☐
○	◉	NRCA-MCH-12-A FDD for Packaged Direct Expansion Units	☐	☐
○	◉	NRCA-MCH-13-A Automatic FDD for Air Handling Units and Zone Terminal Units Acceptance	☐	☐
○	◉	NRCA-MCH-14-A Distributed Energy Storage DX AC Systems Acceptance *NOTE: This form does not automatically move to "Yes". If Distributed Energy Storage DX AC Systems are included in the scope, permit applicant should move this form to "Yes".*	☐	☐
○	◉	NRCA-MCH-15-A Thermal Energy Storage (TES) System Acceptance *NOTE: This form does not automatically move to "Yes". If Chilled Water Storage, Ice-on-Coil Internal Melt, Ice-on-Coil External Melt, Ice Harvester, Brine, Ice-Slurry, Eutectic Salt, Clathrate Hydrate Slurry (CHS), Cryogenic or Encapsulated (Ice Ball) Systems are included in the scope, permit applicant should move this form to "Yes".*	☐	☐
○	◉	NRCA-MCH-16-A Supply Air Temperature Reset Controls	☐	☐
○	◉	NRCA-MCH-17-A Condenser Water Temperature Reset Controls	☐	☐
○	◉	NRCA-MCH-18 Energy Management Control Systems	☐	☐
○	◉	NRCA-MCH-19 Occupancy Sensor Controls	☐	☐
○	◉	NRCA-MCH-20 Multi-Family Ventilation	☐	☐
○	◉	NRCA-MCH-21 Multi-Family Envelope Leakage	☐	☐

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

P. DECLARATION OF REQUIRED CERTIFICATES OF VERIFICATION

Table Instructions: Selections have been made based on information provided in previous tables of this document. If any selection needs to be changed, please explain why in Table E. Additional Remarks. These documents must be provided to the building inspector during construction. The final documents must be created by a HERS Providers registry, but drafts can be found online at

YES	NO	Form/Title	Field Inspector Pass	Field Inspector Fail
○	◉	NRCV-MCH-04-H Duct Leakage Test *NOTE: Must be completed by a HERS Rater*	☐	☐
○	◉	NRCV-MCH-24 Enclosure Air Leakage Worksheet *NOTE: Must be completed by a HERS Rater*	☐	☐
○	◉	NRCV-MCH-27 High-rise Residential *NOTE: Must be completed by a HERS Rater*	☐	☐
○	◉	NRCV-MCH-32 Local Mechanical Exhaust *NOTE: Must be completed by a HERS Rater*	☐	☐

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

Q. MANDATORY MEASURES DOCUMENTATION LOCATION

Table Instructions: Indicate where mandatory measures are documented in the plan set or construction documentation. For any mandatory measures that do not apply, mark

01		02
		Plan sheet or construction document location
Compliance with Mandatory Measures documented through MCH Mandatory Measures Note Block:	Yes	M001

STATE OF CALIFORNIA
Mechanical Systems
NRCC-MCH-E (Created) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-E
Project Name: NOCCCD Anaheim Boiler Replacement	Report Page:
Project Address: 1830 West Romneya Drive, Anaheim, CA 92801-1819	Date Prepared: 2020-07-06

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name:	Michael Nguyen	Documentation Author Signature:	
Company:	P2S Inc.	Signature Date:	07/06/2020
Address:	5000 E. Spring St., 8th floor	CEA/ HERS Certification Identification (if applicable):	
City/State/Zip:	Long Beach, CA 90815	Phone:	(562) 497-2999

RESPONSIBLE PERSON'S DECLARATION STATEMENT

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer)
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval wit this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name:	Ivan Thomas	Responsible Designer Signature:	
Company :	P2S Inc.	Date Signed:	07/06/2020
Address:	5000 E. Spring St., 8th Floor	License:	M30691
City/State/Zip:	Long Beach, CA 90815	Phone:	(562) 497-2999

P2S ENG
Long Beach | Los Angeles
San Diego | San Jose
p2sinc.com

Consultant

Project Title

NOCCCD - ANAHEIM BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
Thomas
No. M30691
Signed 09/15/2020
MECHANICAL
STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed	MN
Drawn	MN
Checked	IT
Approved	IT
Date	09/15/2020
Submittal	ISSUE FOR BID
Scale	N/A

Sheet Title

TITLE 24 COMPLIANCE FORMS

Sheet Number

M501

P2S No. 0719

FILE PATH & NAME: P:\2019\MECHANICAL\2019-M501.DWG MICHAEL NGUYEN
PLOT: Tuesday, September 15, 2020 11:36:42 AM

LEGEND

SYMBOL	DESCRIPTION
-	NOTE CALLOUT
- / -	DETAIL CALLOUT - NUMBER ON TOP DENOTES DETAIL NUMBER - NUMBER ON BOTTOM DENOTES SHEET DETAIL IS SHOWN
- / -	MECHANICAL EQUIPMENT CALLOUT, SEE MECHANICAL PLANS FOR EXACT LOCATION AND REQUIREMENTS
- / -	SECTION CALLOUT
-	FEEDER CALLOUT
-	EXISTING FEEDER CALLOUT
	NEW LINEWORK
	EXISTING LINEWORK
	DEMOLISHED LINEWORK
	CONDUIT CONCEALED IN WALL OR ABOVE CEILING
	CONDUIT EXPOSED
	CONDUIT CONCEALED UNDERGROUND OR BELOW FLOOR
	CONDUIT EMERGENCY
W W	MULTI-CHANNEL RACEWAY
	CONDUIT TURNED UP
	CONDUIT CAPPED
A-1	BRANCH CIRCUIT HOMERUN TO PANELBOARD AND CIRCUITS AS INDICATED
	3/4" CONDUIT, TICK MARKS INDICATE QUANTITY OF #12 AWG WIRES (UNLESS NOTED OTHERWISE, NO MARKS INDICATES 2#12 & 1#12 GND WIRES) - SMALL MARK DENOTES HOT WIRE - LARGE MARK DENOTES NEUTRAL WIRE - DIAGONAL DENOTES GROUND WIRE
G	GENERATOR
	SWITCH
	CIRCUIT BREAKER
	2-WAY SWITCH, TRANSFER SWITCH
	FUSE
	TRANSFORMER
	GROUND CONNECTION
	MOTOR - SINGLE PHASE FRACTIONAL OR INTEGRAL HORSEPOWER
M	METER
ECM	ELECTRONIC CIRCUIT MONITOR
	480V DRAWOUT BREAKER
VFD	VARIABLE FREQUENCY DRIVE
	PANEL
	FUSED DISCONNECT SWITCH
	NON-FUSED DISCONNECT SWITCH
	COMBINATION STARTER/DISCONNECT SWITCH
S M	SWITCH MOTOR RATED
	SPLICE
	TERMINATION
	EXISTING TERMINATION
52	MEDIUM VOLTAGE - AIR CIRCUIT BREAKER DRAWOUT BREAKER
	MEDIUM VOLTAGE FUSED DISCONNECT SWITCH
	MEDIUM VOLTAGE MODULAR SPLICE
	MEDIUM VOLTAGE EXISTING MODULAR SPLICE
X y	2X4 LIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
	2X4 EMERGENCY LIGHT FIXTURE FED FROM GENERATOR/ INVERTER/ BATTERY BACKUP
X y	2X2 LIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
	2X2 EMERGENCY LIGHT FIXTURE FED FROM GENERATOR/ INVERTER/ BATTERY BACKUP
X y	LINEAR LIGHT FIXTURE, DIMENSIONS PER PLANS - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
	EMERGENCY LINEAR LIGHT FIXTURE, DIMENSIONS PER PLANS - LIGHT FIXTURE FED FROM GENERATOR/ INVERTER/ BATTERY BACKUP
X y	LINEAR PENDANT LIGHT FIXTURE, DIMENSIONS PER PLANS - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	TRACK LIGHTING - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	UNDERCABINET / COVE FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	LED STRIP LIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.

SYMBOL	DESCRIPTION
X y	DOWNLIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	EMERGENCY DOWNLIGHT FIXTURE FED FROM GENERATOR/ INVERTER/ BATTERY BACKUP
X y	PENDANT LUMINAIRE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	WALLWASH LIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
X y	WALL MOUNTED LIGHT FIXTURE - UPPER CASE LETTER INDICATES LIGHT FIXTURE CALLOUT. LOWER CASE LETTER INDICATES LIGHTING CONTROL ZONE.
	EMERGENCY WALL MOUNTED LIGHT FIXTURE FED FROM GENERATOR/ INVERTER/ BATTERY BACKUP
	BOLLARD LUMINAIRE
	POST TOP LUMINAIRE
	POLE MOUNTED LUMINAIRE, SINGLE HEAD
	POLE MOUNTED LUMINAIRE, DOUBLE HEAD
	POLE MOUNTED LUMINAIRE, TRIPLE HEAD
	POLE MOUNTED LUMINAIRE, QUAD HEAD
	IN GRADE LUMINAIRE
	PATHWAY LUMINAIRE
	LANDSCAPE FIXTURE
	EXIT LIGHT FIXTURE WITH DIRECTIONAL ARROWS AS INDICATED. SHADED SIDE DENOTES NUMBER OF FACES
J	JUNCTION BOX
PC	PHOTOCELL FOR EXTERIOR APPLICATIONS
DS	DAYLIGHT SENSOR - CEILING MOUNTED
R	RELAY
ER	EMERGENCY RELAY UL 924 COMPLIANT
M	MOTION SENSOR - CEILING MOUNTED
M	MOTION SENSOR - CORNER OR WALL MOUNTED
M	MOTION SENSOR WITH AISLE/CORRIDOR LENS - CEILING MOUNTED
MD	COMBINATION MOTION AND DAYLIGHT SENSOR
N	LIGHTING CONTROL NETWORK DEVICE
TM	DIGITAL TIMER SWITCH
MS	MOTION SENSOR SWITCH
LV	LOW VOLTAGE SWITCH
DM	DIMMER MASTER SWITCH
D	DIGITAL DIMMING SWITCH
G	GRAPHICAL TOUCH SCREEN - LIGHTING CONTROL STATION
T	THERMOSTAT WITH A 3/4" CONDUIT TO ACCESSIBLE CEILING SPACE
J	MODULAR FURNITURE - BASE POWER WHIP FEED CONNECTION
J	MODULAR FURNITURE - FLOOR BOX FEED CONNECTION
J	MODULAR FURNITURE - POWER POLE FEED CONNECTION
	LIGHTING CONTROL PANEL - SURFACE MOUNTED
	PANELBOARD - RECESSED MOUNTED
	PANELBOARD - SURFACE MOUNTED
	DISTRIBUTION PANEL/ BOARD
S	SINGLE POLE SWITCH, DEVICE SHALL BE MOUNTED +48" MAX AND +36" MIN FROM THE CENTER OF DEVICE:
S 3	SWITCH 3-WAY (48" AFF MAXIMUM)
S T	TIMER SWITCH (48" AFF MAXIMUM)
S ab	DUAL SWITCH (48" AFF MAXIMUM)
	PUSHBUTTON SWITCH

RECESSED ON WALL — G=GFCI, WP=WEATHER PROOF
SURFACE — G=GFCI, WP=WEATHER PROOF
FLOOR OR CEILING — C=CEILING

SYMBOL	DESCRIPTION
	20A, 125V DUPLEX RECEPTACLE MOUNTED +15" AFF, UNLESS OTHERWISE NOTED
	20A, 125V QUAD RECEPTACLE MOUNTED +15" AFF, UNLESS OTHERWISE NOTED
	20A, 125V DUPLEX RECEPTACLE RECEPTACLE ON DEDICATED CIRCUIT
	20A, 125V CONTROLLED DUPLEX RECEPTACLE
	20A, 125V QUAD RECEPTACLE (HALF) CONTROLLED RECEPTACLE
	SPECIAL RECEPTACLE REFER TO DRAWINGS FOR NEMA CONFIGURATION
J	JUNCTION BOX

RECESSED POKE-THROUGH
RECESSED POKE-THROUGH - POWER/TEL/DATA
RECESSED FLOOR BOX - POWER/TEL/DATA

SYMBOL	DESCRIPTION
	20A, 125V DUPLEX RECEPTACLE FIRE RATED TYPE
	20A, 125V QUAD RECEPTACLE FIRE RATED TYPE

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
1/C	SINGLE CONDUCTOR
&	AND
@	AT
A OR AMP	AMPERES
ABV	ABOVE
A.C.	ASPHALT CONCRETE
AF	AMPERE FUSE RATING
AFC	AVAILABLE FAULT CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISH GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
APPROX.	APPROXIMATE
ARCH.	ARCHITECT; ARCHITECTURAL
AS	AMPERE SWITCH RATING
ASCC	AVAILABLE SHORT CIRCUIT CURRENT
ATC	AIR TERMINAL CHAMBER
ATO	AUTOMATIC THROW-OVER (SWITCH)
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BAT	BATTERY
BEL	BELOW
BKBD	BACKBOARD
BKR	BREAKER
BLDG	BUILDING
B.S.	BARE STRANDED
C	CONDUIT
CB	CIRCUIT BREAKER
CC	CONSTANT CURRENT
CEC	CALIFORNIA ELECTRICAL CODE
CF	CUBIC FEET
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
C.O.	CONDUIT ONLY WITH PULL WIRE
COL	COLUMN
CP	COMMUNICATION PROCESSOR
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CSFD	COMBINATION SMOKE FIRE DAMPER
CT	CURRENT TRANSFORMER
CW	COLD WATER
CU	COPPER
DIAG	DIAGRAM
DIST.	DISTANCE
DL	DAMP LOCATION LISTING
DM	DIGITAL METER
DMM	DIGITAL METER MODULE
DP	DISTRIBUTION PANEL
DIST.	DISTANCE
DWG	DRAWING
DWP	DEPARTMENT OF WATER & POWER
EA	EACH
ECM	ELECTRONIC CIRCUIT MONITOR
ELEC.	ELECTRICAL
EM	EMERGENCY
EMH	ELECTRICAL MANHOLE
EMT	ELECTRICAL METALLIC TUBING
EPO	EMERGENCY POWER OFF
EPR	ETHYLENE PROPYLENE RUBBER
EQUIP	EQUIPMENT
ER	EXISTING TO BE REMOVED
ERR	EXISTING TO BE RELOCATED AND - RECONNECTED
EXIST/(E)	EXISTING
EXP	EXPLOSION PROOF
FA	FIRE ALARM
FFE	FINISHED FLOOR ELEVATION
FIN.	FINISH
FIP.	FIELD INTERFACE PANEL
FIXT	FIXTURE
FLA	FULL LOAD AMPS
FLR	FLOOR
FLUOR	FLUORESCENT
FT	FEET
FACP	FIRE ALARM CONTROL PANEL
FATC	FIRE ALARM TERMINAL CABINET
FMC	FLEXIBLE METAL CONDUIT
FO	FIBER OBTIC
FTG	FOOTING
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
GG	GREEN GROUND
GND	GROUND
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HT	HEIGHT
HTR	HEATER
HZ	HERTZ
ICON	INTEGRATED COMMUNICATIONS OPTICAL - NETWORK
IE	INVERT ELEVATION
IED	INTELLIGENT ELECTRONIC DEVICES
IMC	INTERMEDIATE METAL CONDUIT
ISC	SHORT CIRCUIT CURRENT
INCAND	INCADESCENT
J, JB, J-BOX	JUNCTION BOX
KCMIL	THOUSAND CIRCULAR MILS
KV	KILOVOLT

ABBREVIATION	DESCRIPTION
KVA	KILOVOLT-AMPERES
KW	KILOWATT
LF	LINEAR FEET
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
LGST	LARGEST
LIS	LOAD INTERRUPTER SWITCH
LOC.	LOCATION
LOTO	LOCK-OUT & TAG-OUT
LSI	LONG TERM, SHORT TERM, INSTANTANEOUS
LTG	LIGHTING
LV	LOW VOLTAGE
M	METER
MAX	MAXIMUM
MCA	MAXIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFGR, MFR	MANUFACTURER
MH	MANHOLE
MI.	MECHANICAL INTERLOCK
MRCT	MULTI-RATIO CURRENT TRANSFORMER
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
MTTB	MAIN TELEPHONE TERMINAL BOARD
MV	MEDIUM VOLTAGE
N	NORTH
NAC	NOTIFICATION APPLIANCE CIRCUIT
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT- 24HRS ON
NO.	NUMBER
OC	ON CENTER
OCPD	OVERCURRENT PROTECTIVE DEVICE
OD	OUTSIDE DIAMETER
OE	OVERHEAD ELECTRICAL
OFC	OIL FUSED CUTOUT
OH	OVERHEAD
OL	OIL LEVER SWITCH
P	POLE
PAC	PROGRAMMABLE AUTOMATION CONTROLLER
PB	PULL BOX
PC	PHOTOCELL
PCB	POLYCHLORINATED BIPHENYL
PDS	PRESSURE DIFFERENTIAL SWITCH
PF	POWER FACTOR
PH OR Ø	PHASE
PILC	PAPER INSULATED, LEAD COVER
PIV	POST INDICATING VALVE
PL	PLATE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
POC	POINT OF CONNECTION
PREF.	PREFERRED
PRI.	PRIMARY
PVC	POLY-VINYL CHLORIDE
PWR	POWER
REC/RECEPT	RECEPTACLE
REQ'D	REQUIRED
RGS	RIGID GALVANIZED STEEL
RMC	RIGID METAL CONDUIT
RPBP	REDUCED PRESSURE BACK FLOW PREVENTER
RM	ROOM
RTAC	REAL TIME AUTOMATION CONTROLLER
SCCR	SHORT CIRCUIT CURRENT RATING
SCE	SOUTHERN CALIFORNIA EDISON
SF	SQUARE FEET
SHT	SHEET
SIG.	SIGNAL
SP	SPARE
SPECS	SPECIFICATIONS
ST	STREET
STD	STANDARD
STP	SHIELDED TWISTED PAIR
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SWST	SWITCHING STATION
TB	TERMINAL BLOCK
TEL./TELE	TELEPHONE
TMH	TELEPHONE MANHOLE
T.O.D.	TOP OF DUCTBANK
T.O.M.	TOP OF MANHOLE
TPS	TWISTED SHIELDED PAIR
TRANSF,XFMR	TRANSFORMER
TS	TAMPER SWITCH
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VA	VOLT-AMPERES
VB	VIBRATION SWITCH
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS
W/	WITH
W/O	WITHOUT
WCR	WITHSTAND CLOSE-ON RATING
WP	WEATHERPROOF
Z	IMPEDANCE

IN THE EVENT ABBREVIATIONS NOT MENTIONED HEREIN ARE USED, REFERENCE WILL BE MADE TO ANSI Y1.1, MILITARY STANDARD ABBREVIATIONS, AND OTHER STANDARD INDUSTRY CONVENTIONS.

GENERAL NOTES

1. ALL WORK SHALL COMPLY WITH THE LATEST EDITION OF THE CALIFORNIA ELECTRICAL CODE AND ALL OTHER APPLICABLE FEDERAL AND STATE. WHERE THE CONSTRUCTION DOCUMENTS INDICATE MORE RESTRICTIVE REQUIREMENTS, THE CONSTRUCTION DOCUMENTS SHALL GOVERN BUT THE CONSTRUCTION DOCUMENTS SHALL NOT BE INTERPRETED AS AUTHORITY TO VIOLATE ANY CODE OR REGULATION.
2. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND SHALL BEAR THE UNDERWRITERS' LABEL (UL) AND SHALL BE INSTALLED IN THE MANNER FOR WHICH THEY ARE DESIGNED AND APPROVED.
3. THE CONTRACTOR SHALL NOT BORE, NOTCH OR IN ANY WAY CUT INTO ANY STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM THE ARCHITECT OR STRUCTURAL ENGINEER.
4. MECHANICAL, ELECTRICAL AND PLUMBING EQUIPMENT ANCHORAGE NOTES:

   ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IS INDICATED, THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCES AND DISPLACEMENT REQUIREMENTS.

   A. ALL PERMANENT EQUIPMENT AND COMPONENTS.

   B. TEMPORARY OR MOVABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER.

   C. MOVABLE EQUIPMENT WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS ARE REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.

   THE ATTACHMENT OF THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENT SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT NEED NOT BE DETAILED ON THE PLANS. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT.

   A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVE A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORTS THE COMPONENT.

   B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

   FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD AND THE STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE REQUIREMENTS.
5. PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTES:

   PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN LATEST SECTIONS OF CBC AND ASCE.

   THE BRACING AND ATTACHMENTS TO THE STRUCTURE SHALL BE DETAILED ON THE APPROVED DRAWINGS OR THEY SHALL COMPLY WITH ONE OF THE OSHPD PRE-APPROVALS (OPA #) AS MODIFIED TO SATISFY ANCHORAGE REQUIREMENTS OF ACI 318, APPENDIX D.

   COPIES OF THE MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF HANGING AND BRACING OF THE PIPE, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS.

   THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.

SHEET INDEX

SHEET	DESCRIPTION
E001	GENERAL NOTES, LEGEND, ABBREVIATIONS AND SHEET INDEX
E002	PANEL SCHEDULES & SPECIFICATIONS
E101	DEMOLITION POWER PLAN
E201	RENOVATION POWER PLAN

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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

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REGISTERED PROFESSIONAL ENGINEER — No. E16124 — Signed 09/15/2020 — ELECTRICAL — STATE OF CALIFORNIA

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
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GENERAL NOTES, LEGEND, ABBREVIATIONS AND SHEET INDEX

Sheet Number

E001

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SPECIFICATIONS

PART 1 - GENERAL

1.1 SCOPE

A. WORK INCLUDES BUT IS NOT NECESSARILY LIMITED TO THE FOLLOWING:

1. LABOR, MATERIALS, SERVICES, EQUIPMENT, AND APPLIANCES REQUIRED FOR COMPLETION OF TASKS AS INDICATED ON DRAWINGS AS INHERENTLY NECESSARY TO PROVIDE COMPLETE AND OPERATIONAL ELECTRICAL SYSTEM INCLUDING:

a. INCIDENTAL ITEMS NOT INDICATED ON THE DRAWINGS NOR MENTIONED IN THE SPECIFICATIONS THAT BELONG TO THE WORK DESCRIBED, OR ARE REQUIRED TO PROVIDE COMPLETE AND OPERABLE SYSTEMS, AS THOUGH CALLED OUT HERE IN EVERY DETAIL;

b. CLEANING, CUTTING, PATCHING, REPAIRING AND PAINTING;

c. TESTING AND COMMISSIONING;

1.2 SUBMITTALS

A. SUBMIT SHOP DRAWINGS AND PRODUCT DATA GROUPED AND REFERENCED BY THE SPECIFICATION TECHNICAL SECTION NUMBER IN ONE COMPLETE SUBMITTAL PACKAGE.

B. SHOP DRAWINGS:

1. INCLUDE INSTALLATION DETAILS OF EQUIPMENT INDICATING PROPOSED LOCATION, LAYOUT AND ARRANGEMENT, ACCESSORIES, PIPING, AND OTHER ITEMS THAT MUST BE SHOWN TO ASSURE A COORDINATED INSTALLATION.

2. INDICATE ADEQUATE CLEARANCE FOR OPERATION, MAINTENANCE, AND REPLACEMENT OF OPERATING EQUIPMENT DEVICES.

C. MANUFACTURERS DATA: FOR EACH MANUFACTURED ITEM, PROVIDE CURRENT MANUFACTURERS DESCRIPTIVE LITERATURE OF CATALOGED PRODUCTS, CERTIFIED EQUIPMENT DRAWINGS, DIAGRAMS, PERFORMANCE AND CHARACTERISTIC CURVES IF APPLICABLE, AND CATALOG CUTS.

1.3 PROJECT RECORD DOCUMENTS

A. ALL CHANGES, DEVIATIONS AND INFORMATION RECORDED ON THE "PROJECT RECORD DRAWINGS" SET DURING CONSTRUCTION SHALL BE REDRAFTED USING THE LATEST VERSION OF AUTOCAD, WHERE APPLICABLE.

B. SUBMIT COMPLETED SHOP DRAWINGS TO THE OWNER PRIOR TO COMPLETION IN DIGITAL FORMAT.

C. CONTRACTOR HAND-MARKED OR DRAFTED REDLINED "PROJECT RECORD DRAWINGS" WILL NOT BE ACCEPTED.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. CONDUCTOR MATERIAL: ELECTRICAL GRADE, SOFT DRAWN ANNEALED COPPER.

B. CONDUCTOR INSULATION: THWN-2.

C. PROVIDE SEPARATE NEUTRAL WITH EACH BRANCH CIRCUIT SERVING OUTLETS. USE COLOR SPIRAL TO MATCH ASSOCIATED PHASE.

2.2 RACEWAY AND BOXES

A. ELECTRICAL METAL TUBING (EMT): STEEL WITH COMPRESSION-TYPE FITTINGS.

B. INTERMEDIATE METAL CONDUIT (IMC): STEEL WITH THREADED STEEL FITTINGS.

C. LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC): STEEL INTERLOCKING ARMOR WITH POLYVINYL CHLORIDE (PVC) OUTER SHEATHING. CONDUIT SHALL BE LISTED FOR USE AS AN EQUIPMENT GROUNDING PATHWAY.

D. METAL WIREWAYS: SHEET METAL WITH SCREW COVER AND ENAMEL FINISH, TYPE 1 INDOORS OR 3R OTHERWISE.

E. BOXES AND ENCLOSURES: STEEL, MINIMUM DIMENSIONS 4 INCHES SQUARE BY 2-1/8 INCHES DEEP.

2.3 WIRING DEVICES

A. GFCI RECEPTACLES

1. NEMA 5-20, WEATHER RESISTANT, BACK-WIRED, FEED-THROUGH TYPE.

2. SELF-TEST WITH INDICATOR LIGHT.

B. WEATHERPROOF COVERS

1. HINGED VERTICAL MOUNT, CAST ALUMINUM, WHILE-IN-USE TYPE, LOCKABLE.

2. 1-AND 2-GANG COVERS WHERE APPLICABLE.

2.4 DISCONNECT SWITCHES

A. DISCONNECT SWITCHES SHALL BE HEAVY DUTY, NEMA 1, 480 VOLT, FUSIBLE OR NON-FUSIBLE TYPE AS INDICATED ON THE DRAWING, RATED FOR LOAD SERVED AND QUANTITY OR POLES AS REQUIRED. FUSES SHALL BE BUSSMAN TYPE FRS-R (277/480V) OR FRN-R (120/208V).

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS AND CABLES

A. ALL CONDUCTORS AND CABLES SHALL BE INSTALLED IN A RACEWAY.

B. WIRING AT OUTLETS: INSTALL CONDUCTOR AT EACH OUTLET WITH AT LEAST 6 INCHES OF SLACK.

3.2 RACEWAY APPLICATION

A. APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS OTHERWISE INDICATED:

1. EXPOSED, NOT SUBJECT TO PHYSICAL DAMAGE: EMT.

2. EXPOSED, NOT SUBJECT TO SEVERE PHYSICAL DAMAGE: EMT

3. CONNECTION TO TRANSFORMERS: LFMC.

4. DAMP OR WET LOCATIONS: IMC.

5. BOXES AND ENCLOSURES: NEMA 250, TYPE 1, EXCEPT USE NEMA 250, TYPE 4 STAINLESS STEEL IN INSTITUTIONAL AND COMMERCIAL KITCHENS AND DAMP OR WET LOCATIONS.

C. MINIMUM RACEWAY SIZE: 3/4-INCH TRADE SIZE.

D. FLEXIBLE CONDUIT CONNECTIONS: USE A MAXIMUM OF 72 INCHES.

E. RACEWAY FITTINGS: COMPATIBLE WITH RACEWAYS AND SUITABLE FOR USE AND LOCATION.

1. IMC: USE THREADED RIGID STEEL CONDUIT FITTINGS.

2. EMT: USE COMPRESSION, STEEL FITTINGS.

3. LFMC: USE ONLY FITTINGS LISTED FOR USE WITH FLEXIBLE CONDUIT.

4. INSTALL SURFACE RACEWAYS ONLY WHERE INDICATED ON DRAWINGS.

F. MOUNT BOXES AT HEIGHTS INDICATED ON DRAWINGS. IF MOUNTING HEIGHTS OF BOXES ARE NOT INDIVIDUALLY INDICATED, GIVE PRIORITY TO ADA REQUIREMENTS. INSTALL BOXES WITH HEIGHT MEASURED TO TOP OF BOX UNLESS OTHERWISE INDICATED.

G. FASTEN JUNCTION AND PULL BOXES TO STANCHION. DO NOT SUPPORT BOXES BY CONDUITS.

3.3 DISCONNECT SWITCHES SHALL BE LOCATED AS REQUIRED TO PROVIDE CODE REQUIRED CLEARANCES AND ACCESS.

3.4 COLOR AND LEGEND REQUIREMENTS

A. RACEWAYS AND BOXES CARRYING CIRCUITS AT 600 V OR LESS:

1. BLACK LETTERS ON A WHITE FIELD.

2. LEGEND: INDICATE VOLTAGE AND SYSTEM OR SERVICE TYPE.

B. COLOR-CODING FOR PHASE- AND VOLTAGE-LEVEL IDENTIFICATION, 600 V OR LESS: USE COLORS LISTED BELOW FOR FEEDER AND BRANCH-CIRCUIT CONDUCTORS.

1. COLOR SHALL BE FACTORY APPLIED.

2. COLORS FOR 208/120-V CIRCUITS:

a. PHASE A: BLACK.

b. PHASE B: RED.

c. PHASE C: BLUE.

3. COLORS FOR 480/277-V CIRCUITS:

c. PHASE A: BROWN.

d. PHASE B: ORANGE.

e. PHASE C: YELLOW.

4. COLOR FOR NEUTRAL: WHITE.

5. COLOR FOR EQUIPMENT GROUNDS: GREEN.

E. EQUIPMENT IDENTIFICATION LABELS:

1. BLACK LETTERS ON A WHITE FIELD FOR EQUIPMENT CONNECTED TO NORMAL POWER AND WHITE LETTERS ON A RED FIELD FOR EQUIPMENT CONNECTED TO EMERGENCY POWER.

D. IDENTIFICATION SCHEDULE

1. IDENTIFY CONDUCTORS, CABLES, AND TERMINALS IN ENCLOSURES AND AT JUNCTIONS, TERMINALS, PULL POINTS, AND LOCATIONS OF HIGH VISIBILITY. IDENTIFY BY SYSTEM AND CIRCUIT DESIGNATION.

2. LABELS FOR OUTDOOR CABINETS, BOXES, AND ENCLOSURES FOR POWER AND LIGHTING: METAL-BACKED, BUTYRATE WARNING SIGNS.

3. PANELBOARDS: TYPEWRITTEN DIRECTORY OF CIRCUITS IN THE LOCATION PROVIDED BY PANELBOARD MANUFACTURER.

PANEL: PH (EXISTING)

LOCATION : ROOF PENTHOUSE
FLOOR : ROOF
ENCLOSURE : NEMA 1
MOUNTING : SURFACE

VOLTAGE/PHASE : 480/277V, 3Ø, 4W
BUS TYPE : COPPER
BUS AMPS : 225A
MAIN BREAKER : 150A

FED FROM : X
MINIMUM BUS BRACING : 18KAIC
MANUF : SQUARE D
TYPE : NF

LOADS	SEE NOTE	*	OUTLETS LTG	REC	MISC	VOLT-AMPS A	B	C	CKT	BKR/ POLE	A	B	C	BKR/ POLE	CKT	VOLT-AMPS A	B	C	*	OUTLETS LTG	REC	MISC	SEE NOTE	LOADS
HHWP-1	3				1	1275			1	20/3	* -	-	-	30/3	2									TRANSFORMER "PT"
-					-		1275		3	-	* -	-	-	-	4									-
-					-			1275	5	-	- - *	-	-	-	6									-
HHWP-2	3				1	1275			7	20/3	* -	-	-	20/1	8									SPARE
-					-		1275		9	-	- *	-	-	20/1	10									SPARE
-					-			1275	11	-	- - *	-	-	20/1	12									SPARE
SPARE									13	20/1	* -	-	-	20/1	14									SPARE
SPARE									15	20/1	- *	-	-	20/1	16									SPARE
SPARE									17	20/1	- - *	-	-	20/1	18									SPARE
SPARE									19	20/1	* -	-	-	20/1	20									SPARE
SPARE									21	20/1	- *	-	-	20/1	22									SPARE
SPARE									23	20/1	- - *	-	-	20/1	24									SPARE
SPARE									25	20/1	* -	-	-	20/1	26									SPARE
SPARE									27	20/1	- *	-	-	100/2	28									SPARE
SPARE									29	20/1	- - *	-	-	-	30									-

TOTAL ØA = 2,550 VOLT-AMPS
TOTAL ØB = 2,550 VOLT-AMPS
TOTAL ØC = 2,550 VOLT-AMPS
"LCL" = 0 VOLT-AMPS

TOTAL PANEL = 7,650 VA @ 480V, 3Ø = 9.2 AMPS

NOTES:
1. ALL CIRCUITS BREAKERS WITH MULTI-CIRCUIT HOMERUNS SHALL BE PROVIDED WITH APPROVED HANDLE TIES PER N.E.C. REQUIREMENTS.
2. ALL SPARE BREAKERS SHALL BE TURNED "OFF".
3. REUSE EXISTING BREAKERS TO POWER NEW PUMPS.

PANEL: PL (EXISTING)

LOCATION : ROOF PENTHOUSE
FLOOR : ROOF
ENCLOSURE : NEMA 1
MOUNTING : SURFACE

VOLTAGE/PHASE : 208Y/120, 3Ø, 4W
BUS TYPE : COPPER
BUS AMPS : 100A
MAIN BREAKER : 100A

FED FROM :
MINIMUM BUS BRACING : 10 KAIC
MANUF : SQUARE D
TYPE : NQOD

LOADS	SEE NOTE	*	OUTLETS LTG	REC	MISC	VOLT-AMPS A	B	C	CKT	BKR/ POLE	A	B	C	BKR/ POLE	CKT	VOLT-AMPS A	B	C	*	OUTLETS LTG	REC	MISC	SEE NOTE	LOADS
RECEPT									1	20/1	* -	-	-	15/1	2									LIGHTS
RECEPT									3	20/1	- *	-	-	20/1	4									RECEPTACLE
RECEPT									5	20/1	- - *	-	-	20/1	6									RECEPTACLE
RECEPT									7	20/1	* -	-	-	20/1	8									LIGHT BEACON
RECEPT									9	20/1	- *	-	-	20/1	10									LIGHTS
RECEPT									11	20/1	- - *	-	-	20/1	12									SPARE
W.H. CIRC.PUMP									13	20/1	* -	-	-	20/1	14									SPARE
BOILER B-1	3				1		1920		15	20/1	- *	-	-	20/1	16									CT CHEM.PUMP
BOILER B-2	3				1			1920	17	20/1	- - *	-	-	20/1	18									EX. LOAD
(--space--)									19		* -	-	-	20/1	20	100						2	3	CONTROLLERS
(--space--)									21		- *	-	-	20/1	22									SPARE
(--space--)									23		- - *	-	-	20/1	24									ELEV SHUNT
(--space--)									25		* -	-	-	60/2	26									ELEC.MIN SPLIT AC
(--space--)									27		- *	-	-	-	28									-
(--space--)									29		- - *	-	-		30									(--space--)

TOTAL ØA = 100 VOLT-AMPS
TOTAL ØB = 1,920 VOLT-AMPS
TOTAL ØC = 1,920 VOLT-AMPS
LCL = 0 VOLT-AMPS

TOTAL PANEL = 3,940 VA @ 208V, 3Ø = 10.9 AMPS

NOTES:
1. ALL CIRCUITS BREAKERS WITH MULTI-CIRCUIT HOMERUNS SHALL BE PROVIDED WITH APPROVED HANDLE TIES PER N.E.C. REQUIREMENTS.
2. ALL SPARE BREAKERS SHALL BE TURNED "OFF"
3. USE EXISTING SPARE BREAKER TO POWER NEW LOAD.

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BOILER REPLACEMENT

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Revisions

Number	Description	Date
1	90% CD Review	07/17/20
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PANEL SCHEDULES & SPECIFICATIONS

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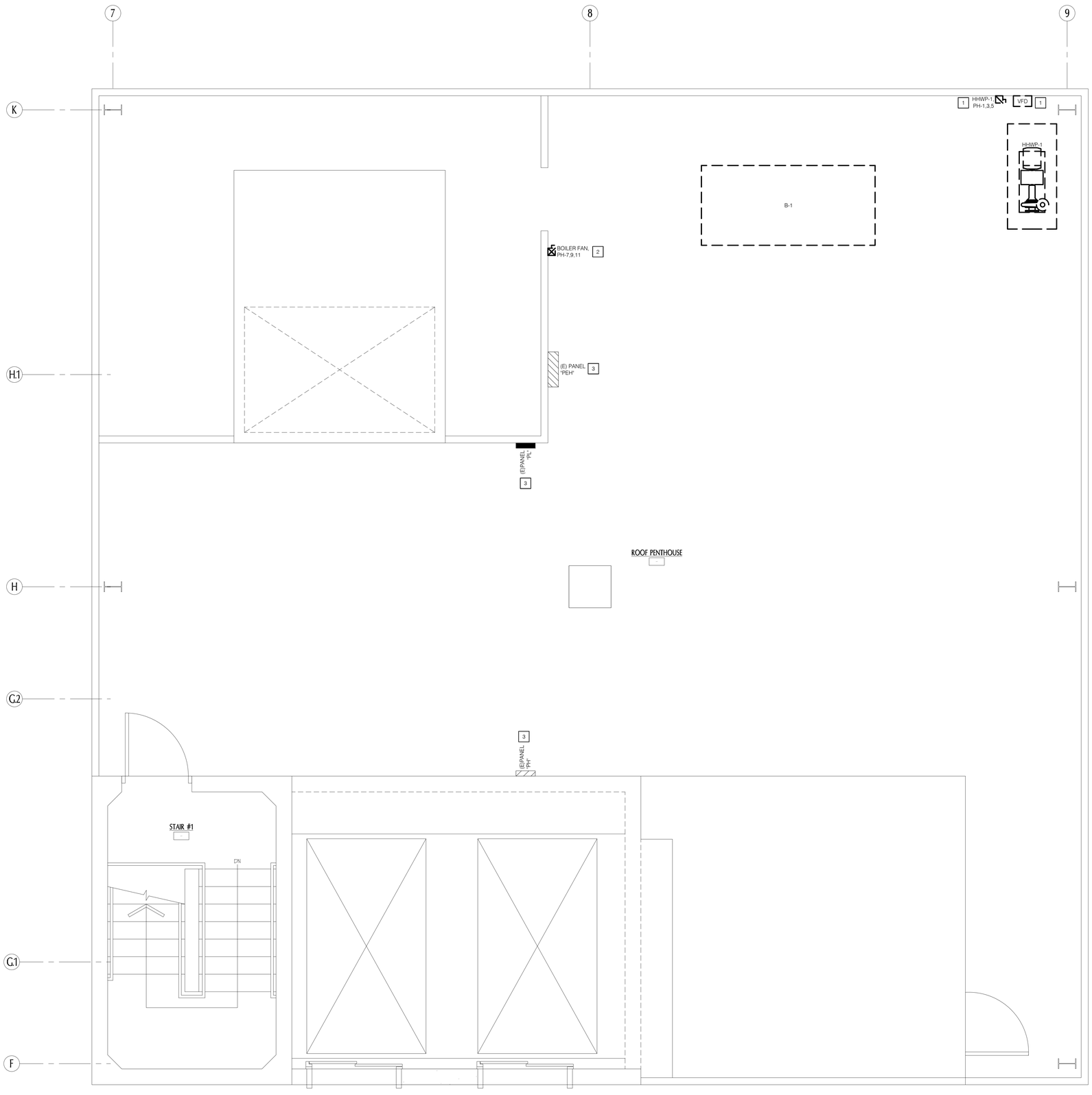
FILE PATH & NAME: P:\2019\ELECTRICAL\0719.E002.DWG MICHAEL.NGUYEN
PLOT: Tuesday, September 15, 2020 11:46:05 AM



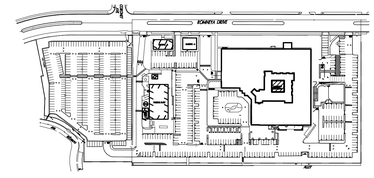
NOTES

1. DISCONNECT AND REMOVE EXISTING POWER CONNECTION TO HHWP-1 INCLUDING VFD, DISCONNECT SWITCH, CONDUIT AND WIRES BACK TO THE SOURCE. TURN THE BREAKER OFF AND LABEL AS SPARE.
2. DISCONNECT AND REMOVE EXISTING POWER CONNECTION TO BOILER B-1 INCLUDING COMBINATION STARTER, CONDUIT AND WIRES BACK TO THE SOURCE. TURN THE BREAKER OFF AND LABEL AS SPARE.
3. EXISTING PANEL BOARD SHALL REMAIN.

KEY PLAN

LEGEND

AREA OF WORK



SCALE: 1/2" = 1'-0"

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Consultant

Project Title

NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

REGISTERED PROFESSIONAL ENGINEER
ELECTRICAL
STATE OF CALIFORNIA
Expires:09/15/2020

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	Issue For Bid	09/15/20

Designed -
Drawn -
Checked -
Approved -

Date 09/15/2020

Submittal ISSUE FOR BID

Scale 1/2" = 1'-0"

Sheet Title

DEMOLITION
POWER PLAN

Sheet Number

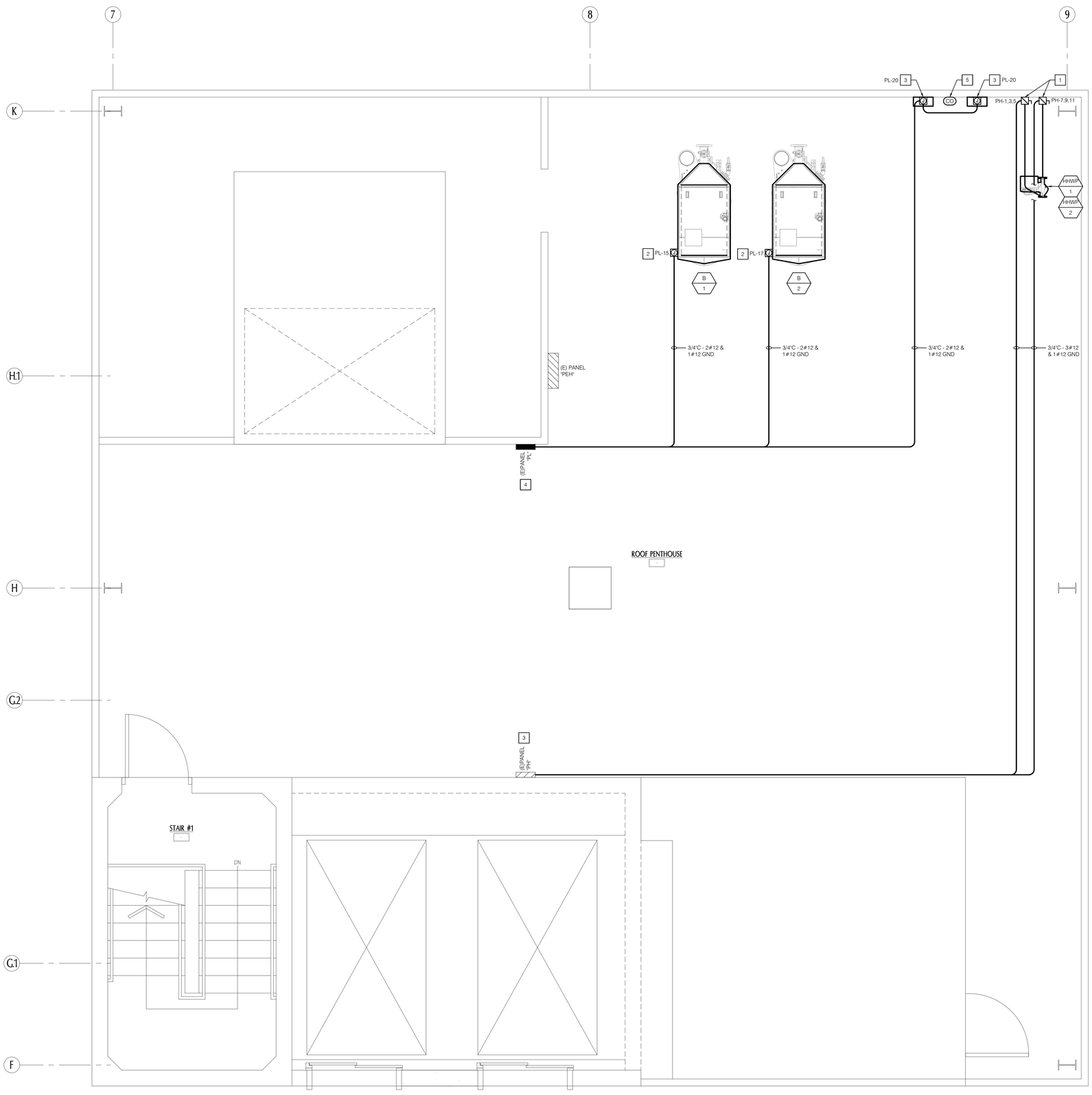
E101

P2S No. 0719

FILE PATH & NAME: P:\2019\ELECTRICAL\0719-E101.DWG MICHAEL NGUYEN
PLOT: Tuesday, September 15, 2020 11:46:29 AM

NOTES

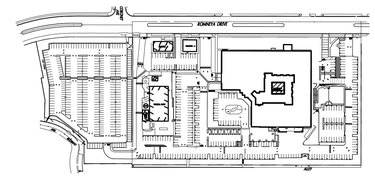
1. PROVIDE 30A, 480V, 3Ø, HEAVY DUTY, FUSIBLE DISCONNECT SWITCH IN A NEMA 1 ENCLOSURE, SQUARE D CAT #H361. VERIFY EXACT FUSE SIZE REQUIRED WITH EQUIPMENT MANUFACTURER.
2. PROVIDE 20A, 120V POWER CONNECTION TO THE BOILER. COORDINATE WITH MECHANICAL FOR EXACT LOCATION AND CONNECTION REQUIREMENTS.
3. PROVIDE 20A, 120V CIRCUIT TO THE LOCATION OF CONTROLLERS. COORDINATE WITH MECHANICAL FOR EXACT LOCATION AND CONNECTION REQUIREMENTS.
4. SEE PANEL SCHEDULE ON SHEET 002 FOR WORK TO BE DONE.
5. PROVIDE 3/4" CONDUIT TO THE LOCATION OF CO DETECTOR. COORDINATE WITH MECHANICAL FOR EXACT ROUTING.



KEY PLAN

LEGEND

AREA OF WORK



SCALE: 1/2" = 1'-0"

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Consultant

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BOILER REPLACEMENT

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1830 WEST ROMNEYA DRIVE,
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Drawn	-
Checked	-
Approved	-
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Submittal	ISSUE FOR BID
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Sheet Title

RENOVATION
POWER PLAN

Sheet Number

E201

P2S No. 0719

FILE PATH & NAME: P:\2019\ELECTRICAL\0719-E201.DWG MICHAEL NGUYEN
PLOT: Tuesday, September 15, 2020 11:46:40 AM

010000 - GENERAL REQUIREMENTS

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS, PROJECT BOUNDARIES AND EXISTING CONDITIONS AT THE SITE PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL CROSS-CHECK DETAILS AND DIMENSIONS SHOWN ON THE STRUCTURAL DRAWINGS WITH RELATED REQUIREMENTS ON OTHER CONSTRUCTION DOCUMENTS.
2. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE STRUCTURAL ENGINEER OF RECORD (SEOR) OF ANY CONFLICTS BETWEEN THE STRUCTURAL DRAWINGS AND OTHER CONSTRUCTION DOCUMENTS OR EXISTING CONDITIONS. THE CONTRACTOR SHALL NOT ORDER MATERIAL, FABRICATE ELEMENTS, OR CONSTRUCT ANY PORTION OF STRUCTURE THAT IS IN CONFLICT UNTIL RESOLUTION IS MADE.
3. WHEN DIMENSIONS ARE UNCLEAR, REQUEST CLARIFICATION FROM THE SEOR AND ARCHITECT. DO NOT SCALE DRAWINGS. UNLESS NOTED OTHERWISE, PLAN DIMENSIONS INDICATE CENTERLINE OF BEAMS AND COLUMNS, LIGHT-FRAMED WALLS ARE DIMENSIONED TO FACE OF STUDS, AND FOOTINGS ARE CENTERED UNDER THE ELEMENTS THEY SUPPORT.
4. WHERE INFORMATION IS CONFLICTING WITHIN THE STRUCTURAL DOCUMENTS, SPECIFIC DETAILS SHALL GOVERN OVER TYPICAL DETAILS, WHICH HAVE PRECEDENCE OVER THESE NOTES, WHICH IN TURN OVERRULE PROJECT SPECIFICATIONS.
5. DETAILS NOTED AS TYPICAL ON STRUCTURAL SHEETS SHALL APPLY IN ALL CASES UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. WHERE NO DETAIL IS INDICATED, CONSTRUCTION SHALL BE OF THE SAME NATURE AS FOR SIMILAR CASES OF CONSTRUCTION ON THIS PROJECT.
6. THE ARCHITECT AND SEOR SHALL INTERPRET THE CONSTRUCTION DOCUMENTS IN CASE OF POSSIBLE CONFLICT OR DISCREPANCY BETWEEN STRUCTURAL AND OTHER DISCIPLINES.
7. THE CONTRACTOR SHALL PROVIDE ALL NEW (N) MATERIALS TO PERFORM THE WORK INDICATED ON STRUCTURAL DOCUMENTS UNLESS NOTED AS EXISTING (E) OR SUPPLIED BY OTHERS. WRITTEN APPROVAL FROM THE SEOR SHALL BE OBTAINED PRIOR TO THE SUBSTITUTION OF ANY MATERIAL OR PRODUCT SPECIFIED ON THE STRUCTURAL DOCUMENTS.
8. STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE, UNLESS OTHERWISE SHOWN THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION OR NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE DESIGN OF TEMPORARY ERECTION AIDS, FORMWORK, SCAFFOLDING, SAFETY MEASURES, SHORING OF ANY PORTION OF WORK, AND PROTECTION OF ADJACENT PROPERTIES. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES. VISITS TO THE SITE BY THE SEOR SHALL NOT INCLUDE OBSERVATION OR INSPECTION OF THE ABOVE ITEMS AND DO NOT IN ANY WAY RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITIES FOR THE ABOVE.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH THE PERTINENT SECTIONS OF THE "CONSTRUCTION SAFETY ORDERS" ISSUED BY THE STATE OF CALIFORNIA, LATEST EDITION, AND ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJECT. THE SEOR AND THE OWNER DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONTRACTOR'S FAILURE TO COMPLY WITH THESE.
10. ALL STRUCTURAL FRAMING SHALL BE ERECTED PLUMB AND TRUE TO LINE. TEMPORARY BRACING SHALL BE INSTALLED AND LEFT IN PLACE UNTIL ADEQUATE STRUCTURE IS CONSTRUCTED FOR STABILITY.
11. CONSTRUCTION MATERIALS AND ERECTION LOADS SHALL BE DISTRIBUTED WHEN PLACED ON THE STRUCTURE SUCH THAT THEY DO NOT EXCEED DESIGN LIVE LOADS OR RESULT IN AN UNBALANCED CONDITION. MAXIMUM PERMANENT EQUIPMENT WEIGHTS, POSTED LOAD LIMITS OR OTHER RESTRICTIONS NOTED ON THE STRUCTURAL DRAWINGS SHALL NOT BE EXCEEDED WITHOUT PRIOR WRITTEN APPROVAL BY THE SEOR. UNLESS SPECIFICALLY STATED, THE STRUCTURE IS NOT DESIGNED TO SUPPORT TRAFFIC FROM CRANES OR OTHER HEAVY CONSTRUCTION VEHICLES.
12. FLOOR, ROOF AND WALL OPENINGS, SLEEVES, INSERTS, EMBEDS, CONDUITS AND OTHER DISCIPLINE REQUIREMENTS MUST BE COORDINATED BEFORE THE CONTRACTOR PROCEEDS WITH CONSTRUCTION. THE EXACT DEPTH, EXTENT, AND LOCATION OF ALL FLOOR OR ROOF DEPRESSIONS, SLOPES, CURBS, PADS, TRENCHES, DRAINS AND OTHER FEATURES SHALL BE COORDINATED WITH THE CONSTRUCTION DOCUMENTS. THE STRUCTURAL DRAWINGS DO NOT NECESSARILY INDICATE ALL OF THESE ITEMS.
13. CORE DRILLING OF CONCRETE OR MASONRY IS NOT PERMITTED WITHOUT PRIOR APPROVAL BY THE SEOR. CORES, WHERE APPROVED SHALL NOT CUT REINFORCEMENT. THE CONTRACTOR SHALL PRESENT ALL CORES TO THE INSPECTOR OF RECORD (IOR) FOR VERIFICATION.
14. STRUCTURAL DRAWINGS INDICATE THE APPROXIMATE LOCATION OF EQUIPMENT AND THEIR SECONDARY FRAMING SUPPORTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WORK BETWEEN SUBCONTRACTORS AND CRAFTS IN ORDER TO PROVIDE NECESSARY DIMENSIONS IN A TIMELY MANNER TO ALL PARTIES AND DETAILERS INVOLVED.
15. PROVIDE A SHIM SPACE AT HEADERS AND JAMBS TO ALLOW FOR SETTLEMENT AND MOVEMENT 15. OF FRAMING. INSTALL WINDOWS, DOORS AND OTHER INSET ITEMS IN WALLS AFTER BUILDING LOADS ARE FULLY APPLIED.
16. EXPANSION AND SEPARATION JOINT DIMENSIONS SHOWN INDICATE THE CLEAR DISTANCE 16. REQUIRED. COMPONENTS COVERING OR CROSSING SUCH JOINTS MUST ACCOMMODATE THE JOINT FULLY CLOSING OR OPENING TO TWICE THE DIMENSION SHOWN, AS WELL AS RELATIVE LATERAL MOVEMENT ALONG THE JOINT. ALL PIPES, DUCTS, CONDUIT, ETC., CROSSING SUCH JOINTS SHALL HAVE FLEXIBLE LINES WITH ADEQUATE RANGE OF MOTION.

STRUCTURAL DESIGN CRITERIA

CODES: DESIGN IS BASED ON THE 2019 CALIFORNIA BUILDING CODE

LIVE LOADS (REDUCIBLE, UNO):
ROOF, UNIFORM........20 PSF
TYPICAL FLOOR, UNIFORM + PARTITION ALLOWANCE........80 PSF + 20 PSF = 100 PSF
CORRIDOR & EXIT STAIRS........100 PSF (UNREDUCIBLE)

WIND LOADS:
RISK CATEGORY........II
EXPOSURE........C
ULTIMATE DESIGN WIDE SPEED, Vult........95 MPH
INTERNAL PRESSURE COEFFICIENT, G Cpi........± 0.18

EARTHQUAKE LOADS:
RISK CATEGORY........II
SEISMIC IMPORTANCE FACTOR, Ie........1.0
SITE CLASSIFICATION........D - DEFAULT
SPECTRAL ACCEL PARAMETERS (USGS '08)........Ss = 1.512, S1 = 0.533
DESIGN SPECTRAL ACCEL PARAMETERS........Sds = 1.210, Sd1 = 0.629
SEISMIC DESIGN CATEGORY........D
SEISMIC FORCE RESISTING SYSTEM(S): .... NON-STRUCTURAL COMPONETS

033000 – STRUCTURAL CONCRETE

1. CONCRETE SHALL BE MIXED, PLACED AND CURED IN ACCORDANCE WITH ACI 318 AND ACI 301 LATEST EDITION AND THE CONSTRUCTION DOCUMENTS.
2. CONCRETE MIXING OPERATIONS SHALL CONFORM TO ASTM C94. QUANTITIES OF MATERIALS SHALL BE CERTIFIED BY A LICENSED WEIGHT-MASTER.
3. RETAIN AN APPROVED TESTING LABORATORY, ACCEPTABLE TO THE OWNER, TO PREPARE CONCRETE MIX DESIGNS ACCORDING TO GOVERNING CODE AND THE CONSTRUCTION DOCUMENTS. ALL CONCRETE MIXES SHALL BE STAMPED AND SEALED BY A LICENSED CALIFORNIA CIVIL ENGINEER AND SUBMITTED TO THE SEOR FOR REVIEW PRIOR TO CONCRETE PLACEMENT. NEW MIX DESIGNS ARE REQUIRED WHEN THERE IS A CHANGE IN MATERIALS BEING USED. MIX DESIGNS SHALL CLEARLY STATE THE INTENDED LOCATION FOR USE.
4. CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS AS INDICATED ON THE CONCRETE SCHEDULE. ALL CONCRETE TEST REPORTS SHALL BE SUBMITTED TO THE SEOR WITHIN 7 DAYS AFTER TESTING.
5. AGGREGATE SHALL BE HARDROCK FOR NORMAL WEIGHT CONCRETE (NWC) CONFORMING TO ASTM C33. THE UNIT WEIGHT OF NWC SHALL HAVE AN AIR-DRY EQUILIBRIUM DENSITY OF 145 ± 5 PCF. THE UNIT WEIGHT OF NWC SHALL BE CONFIRMED BY THE MIX DESIGN AND DOES NOT REQUIRE TESTING UNLESS NOTED OTHERWISE.
6. AGGREGATE FOR SAND LIGHT WEIGHT CONCRETE (LWC) SHALL CONFORM TO ASTM C330. UNIT WEIGHT OF LWC SHALL NOT EXCEED 115 PCF MEASURED AIR-DRY EQUILIBRIUM DENSITY PER ASTM C567, OR 110 PCF MEASURED OVEN-DRY. THE UNIT WEIGHT OF LWC SHALL BE LAB TESTED FOR EACH MIX DESIGN AND AGGREGATE SOURCE.
7. COARSE AGGREGATE WITH A MAXIMUM SIZE OF 1/2 INCH OR LESS SHALL BE CRUSHED STONE.
8. PORTLAND CEMENT TYPE SHALL BE AS SPECIFIED IN THE CONCRETE SCHEDULE AND CONFORM TO ASTM C150, LOW ALKALI.
9. FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618 CLASS F MAY BE USED AS A PARTIAL SUBSTITUTION FOR PORTLAND CEMENT UP TO A MAXIMUM OF 25% TOTAL CEMENTITIOUS MATERIAL BY WEIGHT WHEN THE MIX DESIGN IS PROPORTIONED BY FIELD EXPERIENCE OR TRIAL MIXTURES.
10. WATER USED IN MIX SHALL BE POTABLE OR NONPOTABLE RECLAIMED/RECYCLED, CONFORMING TO ASTM C1602. PRIOR TO MIXING, FREE MOISTURE CONTENT OF AGGREGATES SHALL BE MEASURED, RECORDED, AND MIX WATER QUANTITY ADJUSTED ACCORDINGLY. MIX WATER AND FREE MOISTURE ON AGGREGATES SHALL NOT CONTAIN CHLORIDES OR ANY OTHER DELETERIOUS OR ODOROUS COMPOUNDS.
11. ADMIXTURES, WHERE USED FOR WATER REDUCTION AND SETTING TIME MODIFICATION SHALL CONFORM TO ASTM C494, SUPERPLASTICIZER SHALL CONFORM TO ASTM C1017.
12. SHRINKAGE REDUCING ADMIXTURES SHALL CONFORM TO ASTM C494, AND WHERE USED SHALL BE GRACO ECLIPSE, EUCLID EUCON SRA, SIKA CONTROL, OR APPROVED EQUAL. SPECIFIED MAXIMUM SHRINKAGE RATES SHALL BE LAB TESTED PER ASTM C157 FOR EACH MIX DESIGN AND AGGREGATE SOURCE.
13. WHERE SPECIFIED, AIR CONTENT SHALL BE SAMPLED AT THE POINT OF DISCHARGE AND FIELD TESTED PER ASTM C231, PRESSURE METHOD.
14. UNLESS OTHERWISE SPECIFIED, CONCRETE SHALL HAVE A MAXIMUM SLUMP OF 5 INCHES WITHOUT ADMIXTURES, AND A MAXIMUM OF 8 INCHES WHERE WATER REDUCTION OR SUPERPLASTICIZER ADMIXTURES ARE USED. SLUMP SHALL BE MEASURED PER ASTM C143 AT THE POINT OF DELIVERY WITH TOLERANCES PER ASTM C94. SELF CONSOLIDATING CONCRETE SHALL HAVE A MAXIMUM SPREAD OF 26 INCHES AS MEASURED PER ASTM C1611.
15. FOR LIGHT WEIGHT CONCRETE SLABS AND FILL OVER DECK, MAXIMUM AIR CONTENT SHALL BE 3 PERCENT AND MAXIMUM SLUMP SHALL BE 5 INCHES, MEASURED WITH ADMIXTURES.
16. USE PLACEMENT AND FINISHING PROCEDURES THAT PREVENT DELAMINATION, BLISTERING OR OTHER SURFACE DEFECTS.
17. NONSHRINK OR DRYPACK GROUT SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 5000 PSI, AND SHALL BE MASTERFLOW 713, EUCON NS GROUT, SIKA GROUT 212, OR APPROVED EQUAL. FOR THICK GROUT LAYERS AND LARGE VOLUME PLACEMENTS FOLLOW MANUFACTURER'S GUIDELINES, WHICH MAY INCLUDE THE ADDITION OF WASHED COARSE AGGREGATE AND POUR SEQUENCING. UNDER BASE PLATES LARGER THAN 6 SQUARE FEET, USE MASTERFLOW 928 OR OTHER APPROVED HI-FLOW GROUT.
18. THE USE OF CONSTRUCTION JOINTS (CJ) AT LOCATIONS NOT SHOWN ON THE PLANS AND DETAILS SHALL BE APPROVED BY THE SEOR PRIOR TO PLACEMENT OF CONCRETE. CJ'S SHALL BE USED WHENEVER CONCRETE PLACEMENT IS INTERRUPTED FOR MORE THAN 30 MINUTES. HORIZONTAL/FLAT CJ'S MAY BE UNFORMED, VERTICAL CJ'S SHALL BE FULLY FORMED WITH SHEAR KEYS. CJ'S SHALL BE CLEANED, LAITANCE REMOVED, AND ROUGHENED TO AN AMPLITUDE OF 1/4 INCH BY REMOVING THE ENTIRE SURFACE TO EXPOSE CLEAN AGGREGATE SOLIDLY EMBEDDED IN THE MORTAR MATRIX. IMMEDIATELY BEFORE NEW CONCRETE IS PLACED CJ'S SHALL BE WETTED AND STANDING WATER REMOVED.
19. PIPES, DUCTS OR CONDUIT SHALL NOT BE PLACED IN STRUCTURAL CONCRETE UNLESS SPECIFICALLY DETAILED ON THE STRUCTURAL DRAWINGS. PROVIDE SLEEVES FOR ALL PIPES THROUGH CONCRETE WALLS AND FOOTINGS.
20. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR ALL MOULDS, REVEALS, GROOVES, CHAMFERS, DRIPS, ORNAMENTS AND OTHER FINISH REQUIREMENTS. UNLESS OTHERWISE NOTED, EXPOSED CORNERS OF SLABS, BEAMS, WALLS, COLUMNS, ETC. SHALL BE FORMED WITH 3/4 INCH CHAMFER STRIPS OR 1/2 INCH RADIUS TOOLED EDGE.
21. ALL DOWELS, ANCHORS AND OTHER EMBEDMENTS TO BE SET IN CONCRETE OR GROUT SHALL BE SECURED IN POSITION PRIOR TO PLACEMENT, NO WET SETTING, STABBING, RODDING OR OTHER MOVEMENT OF EMBEDDED ITEMS SHALL BE ALLOWED. THE CONTRACTOR SHALL COORDINATE WITH CONTRACT DOCUMENTS AND DISCIPLINES ITEMS SUCH AS; REINFORCEMENT, ANCHORS, INSERTS, HANGERS, NOSING, GUARDS, ELECTRICAL GROUNDS, INTEGRAL FRAMES, ETC.
22. CONCRETE AND GROUT MAINTAINED BETWEEN 50 TO 90 DEGREES FAHRENHEIT AND IN A MOIST, WIND SHELTERED CONDITION FOR A MINIMUM OF 7 DAYS AFTER PLACEMENT DOES NOT REQUIRE A WRITTEN PROTECTION PLAN. WHERE REQUIRED BY WEATHER AND SITE CONDITIONS, THE CONTRACTOR SHALL FOLLOW AN APPROVED COLD- OR HOT-WEATHER PROTECTION PLAN COMPLYING WITH ACI 306.1 / 301.
23. PRIOR TO ERECTING ANY ELEMENTS THAT LOAD THE FOUNDATION, CONCRETE MUST REACH AN UNCONFINED COMPRESSION STRENGTH OF 2000 PSI MINIMUM AS DETERMINED BY CYLINDER TESTING, AND MUST BE ALLOWED TO CURE FOR A MINIMUM OF 3 DAYS.
24. REVIEW MANUFACTURER REQUIREMENTS FOR OVERLAYMENTS, FINISHES AND FLOORING SYSTEMS TO BE APPLIED TO CONCRETE AS THESE MAY BE MORE RESTRICTIVE.
25. STYROFOAM VOID FILLER SHALL BE A DOW BUILDING SOLUTIONS PRODUCT "BLUE BOARD" TYPE OR APPROVED EQUAL WITH PROPERTIES APPROPRIATE FOR THE CONDITIONS OF USE.

STRUCTURAL CONCRETE SCHEDULE

	1	2	3	4	5	6
LOCATION	CEMENT	TYPE	STRENGTH	W/C RATIO	AGG SIZE	SHRINKAGE
HOUSEKEEPING PAD	II	NWC	4500	0.50	1"	0.05%

CONCRETE SCHEDULE NOTES:

1. PORTLAND CEMENT TYPE.
2. INDICATES NORMAL WEIGHT CONCRETE (NWC). OR SAND LIGHT WEIGHT CONCRETE (LWC).
3. MINIMUM 28-DAY CYLINDER COMPRESSIVE STRENGTH IN PSI.
4. MAXIMUM WATER TO CEMENTITIOUS MATERIAL RATIO, INCLUDING FREE MOISTURE ON AGGREGATES. * 0.45 MAXIMUM W/C RATIO REQUIRED FOR CONCRETE RECEIVING ADHESIVE FINISHES.
5. MAXIMUM AGGREGATE SIZE, SEE ACI 318 FOR ADDITIONAL REQUIREMENTS INCLUDING GRADATION
6. MAXIMUM SHRINKAGE AT 28 DAYS.

032000 – REINFORCING STEEL

1. PLACING TOLERANCES AND BAR SUPPORTS SHALL CONFORM TO THE "MANUAL OF STANDARD PRACTICE" FOR REINFORCED CONCRETE CONSTRUCTION, BY CONCRETE REINFORCING STEEL INSTITUTE (CRSI).
2. ALL REINFORCING BAR (REBAR) STEEL SHALL BE DEFORMED ROUND BARS CONFORMING TO ASTM A615 OR ASTM A706, GRADE 60.
3. WELDED WIRE FABRIC (WWF) SHALL CONFORM TO ASTM A1064. ADJACENT WWF SHEETS SHALL BE LAPPED 12 INCHES MINIMUM.
4. PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING IN POSITIONS INDICATED. CHAIRS OR BOLSTERS WHICH BEAR AGAINST FORMS FOR EXPOSED SURFACES SHALL BE GREY COLORED PLASTIC COATED STEEL OR STAINLESS STEEL.
5. REINFORCING BARS SHALL BE KEPT CLEAN AND FREE OF OIL, GREASE AND LOOSE RUST OR MILL SCALE.
6. BEND REINFORCING BARS COLD. BARS PARTIALLY EMBEDDED IN CONCRETE SHALL NOT BE FIELD BENT.
7. ALL REINFORCING SHALL BE CONTINUOUS UNLESS NOTED OTHERWISE, WITH CONTACT LAP SPLICES PER THE TYPICAL DETAILS OR AS SHOWN.
8. PROVISION FOR LAP SPLICES OR DOWELS SHALL BE PROVIDED ACROSS ALL CONSTRUCTION JOINTS AND SHALL BE THE SAME GRADE, SIZE AND SPACING AS REINFORCING CONTINUING BEYOND UNLESS NOTED OTHERWISE. IN LIEU OF SPLICES OR DOWELS, THE CONTRACTOR MAY SUBMIT FOR SEOR APPROVAL THE LOCATION AND MANUFACTURER DATA OF FORMSAVERS OR COUPLERS PRIOR TO THEIR USE.
9. ALL BENDS WITHIN HOOKS, STIRRUPS, HOOPS AND CROSS-TIES SHALL ENGAGE A LONGITUDINAL BAR, PROVIDE A #5 CONTINUOUS BAR WHERE ONE IS NOT SPECIFICALLY DETAILED.
10. CLEARANCE BETWEEN PARALLEL BARS, OR BARS AND CONSTRUCTION JOINTS SHALL BE NOT LESS THAN THE SMALLER OF 1 INCH, 1 BAR DIAMETER, OR THE MAXIMUM AGGREGATE SIZE. UNLESS NOTED OTHERWISE, BARS IN PARALLEL LAYERS SHALL BE PLACED IN ALIGNMENT WITH ONE ANOTHER.
11. MAINTAIN A MINIMUM COVER FROM FACE OF CONCRETE TO EDGE OF REINFORCING PER THE MINIMUM CONCRETE COVER OF REINFORCEMENT SCHEDULE OR AS DETAILED. PROVIDE THE LARGEST COVER REQUIRED FOR ALL APPLICABLE CONDITIONS AND BAR SIZES. WHERE #3 STIRRUPS OR TIES ARE USED, ENSURE THAT THE COVER FOR LONGITUDINAL BARS IS ADEQUATE
12. THE FOLLOWING REINFORCEMENT SHALL CONFORM TO ASTM S706

A. REINFORCEMENT TO BE WELDED
B. LONGITUNDINAL COLUMN AND BEAM REINFORCEMENT IN DESIGNATED MOMENT FRAMES
C. VERTICAL REINFORCEMENT AT INTERSECTIONS AND ENDS OF DESIGNATED CONCRETE SHEAR WALLS ENCLOSED IN TIES

MINIMUM CONCRETE COVER OF REINFORCEMENT SCHEDULE

CONDITION	MIN.COVER
INTERIOR RAISED SLABS AND INTERIOR WALL FACES	1"
INTERIOR COLUMNS AND BEAMS	1 1/2"
OTHER INTERIOR CONCRETE, #11 BARS AND SMALLER	3/4"
FORMED AND EXPOSED TO SOIL OR WEATHER, #6 BARS AND LARGER: #5 BARS AND SMALLER:	2" 1 1/2"
CAST AGAINST AND PERMANENTLY EXPOSED TO SOIL	3"
STRUCTURAL SLAB-ON-GRADE, FROM BOTTOM OF SLAB: FROM TOP OF SLAB:	 2" 1 1/2"

050500 – POST INSTALLED ANCHORS

UNLESS OTHERWISE NOTED ON THE DRAWINGS, THE FOLLOWING APPLIES TO ALL POST INSTALLED ANCHORAGE INTO HARDENED CONCRETE OR MASONRY WHICH INCLUDES TYPES SUCH AS EXPANSION, WEDGE, SLEEVE, ADHESIVE/EPOXY, SHOT-PIN, SCREW AND UNDERCUT.

1. INSTALL PER THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) EXCEPT AS OTHERWISE STATED IN THE SPECIFIED PRODUCT REPORTS. USE INSTALLATION PROCEDURES FOR CRACKED CONCRETE CONDITIONS. DO NOT USE CORE DRILL BITS FOR ANCHOR HOLES WITHOUT PRIOR SEOR APPROVAL. COPIES OF INSTALLATION INSTRUCTIONS SHALL BE MAINTAINED ON SITE.
2. PROVIDE GALVANIZED CARBON STEEL ANCHORS AT DRY INTERIOR LOCATIONS AND STAINLESS STEEL TYPE 304 OR 316 AT EXTERIOR / DAMP INTERIOR LOCATIONS. DOWELS TO RECEIVE CONCRETE COVER MAY BE PLAIN CARBON STEEL. ANCHORS SHALL BE CLEAN AND FREE OF DEBONDING SUBSTANCES.
3. UNLESS OTHERWISE NOTED, THE SPECIFIED EMBEDMENT REFERS TO THE FINAL INSTALLED EFFECTIVE " AS DEFINED IN THE PRODUCT REPORT. MINIMUM ANCHOR HOLE DEPTH FOR INSTALLATION hef MAY BE DEEPER. FOR EXPANSION ANCHORS PROVIDE A MINIMUM ANCHOR HOLE DEPTH PER THE MPII, BUT NOT LESS THAN THE SPECIFIED EMBEDMENT + THE SMALLER OF 1.5x DIAM OR 1 INCH. WHERE EMBEDMENT IS NOT SPECIFIED, PROVIDE AN EMBEDMENT DEPTH OF THE SMALLER OF 8 TIMES THE ANCHOR DIAMETER AND 2/3 THE THICKNESS OF THE MEMBER THE ANCHOR IS PLACED INTO.
4. MAINTAIN A MINIMUM OF 2 INCHES FROM EXISTING REINFORCEMENT, CONDUIT, POST TENSIONING (WHERE OCCURS), ETC. PRIOR TO DRILLING, CORING OR SHOOTING PINS INTO EXISTING CONCRETE OR MASONRY USE NON DESTRUCTIVE TESTING TO LOCATE SUCH ITEMS. FOR INSTALL TION DEEPER THAN 3 INCHES USE GROUND PENETRATING RADAR OR X-RAY METHODS.
5. IF THE SPECIFIED ANCHOR EMBEDMENT DEPTH, SPACING OR EDGE DISTANCE CANNOT BE PROVIDED, NOTIFY THE SEOR AND IOR.
6. PATCH ABANDONED HOLES AND SPALLS USING NON-SHRINK GROUT AND REPAIR FINISHES AS REQUIRED. ANCHORS PENETRATING THROUGH WATER PROOFING OR VAPOR MEMBRANES SHALL BE SEALED OR FLASHED.
7. INSTALL IN DRY CONCRETE OR MASONRY HAVING A MINIMUM AGE OF 21 DAYS UNLESS SPECIFICALLY APPROVED BY THE SEOR.
8. ADHESIVE/EPOXY ANCHORS ON THIS PROJECT ARE NOT DESIGNED TO SUPPORT, OR INTENDED TO RESIST SUSTAINED TENSION LOADS.
9. INSTALLERS PLACING OVERHEAD ADHESIVE ANCHORS SHALL BE CERTIFIED BY ACI OR APPROVED EQUIVALENT.
10. DO NOT PLACE POST INSTALLED ANCHORS IN CMU WITHIN 1 1/2" OF HEAD JOINTS OR INTO UNGROUTED CELLS UNLESS SPECIFICALLY INDICATED ON THE STRUCTURAL DOCUMENTS.

017000 - EXISTING CONDITIONS

1. SEE ORIGINAL DRAWINGS FOR EXISTING BUILDING INFORMATION NOT SHOWN OR NOTED.
2. SEE PROJECT REPORTS AND ARCHITECTURAL DRAWINGS FOR HAZARDOUS MATERIALS (LEAD, ASBESTOS, ETC.) ABATEMENT REQUIREMENTS.
3. WHERE EXISTING CONDITIONS VARY SIGNIFICANTLY FROM THOSE SHOWN ON THESE DRAWINGS, THE SEOR SHALL BE NOTIFIED PRIOR TO CONTINUED CONSTRUCTION RELATED TO SUBJECT CONDITIONS.
4. EXISTING CONCRETE SURFACES TO BE IN CONTACT WITH NEW CONCRETE SHALL BE ROUGHENED AS FOR TYPICAL CONSTRUCTION JOINTS, AND AN ASTM C1059 COMPLIANT BONDING AGENT SHALL BE APPLIED PRIOR TO PLACING NEW CONCRETE.
5. DO NOT CUT OR DAMAGE EXISTING CONCRETE OR MASONRY REINFORCEMENT EXCEPT AS CLEARLY INDICATED. MAINTAIN AT LEAST 2 INCHES CLEAR TO EXISTING REINFORCEMENT, CONDUIT AND OTHER EMBEDDED ITEMS FROM CUTS, CORES, DRILL HOLES, SHOTPINS, ETC. IN AREAS OF WORK, MARK LOCATIONS OF SUCH ITEMS USING NONDESTRUCTIVE METHODS SUCH AS GROUND PENETRATING RADAR OR X-RAY.
6. THE GENERAL CONTRACTOR SHALL COORDINATE THE SPECIFIC LOCATION OF REPLACEMENT MECHANICAL EQUIPMENT WITH THE STRUCTURAL FRAMING. IF NEW EQUIPMENT DEVIATES IN WEIGHT, SIZE OR LOCATION FROM EXISTING EQUIPMENT BEING REPLACED, SEOR APPROVAL MUST BE OBTAINED PRIOR TO INSTALLATION OF THE UNITS.
7. EXISTING STRUCTURAL MEMBERS SUPPORTING NEW EQUIPMENT SHALL BE INSPECTED FOR DAMAGE AND DETERIORATION PRIOR TO INSTALLATION OF THE UNITS. NOTIFY THE SEOR OF SUCH CONDITIONS AND DO NOT INSTALL UNITS UNTIL THE CONDITIONS ARE ADDRESSED.
8. DURING THE COURSE OF WORK, NOTIFY THE SEOR OF EXISTING STRUCTURAL DETERIORATION, APPARENT DISTRESS, WATER INTRUSION, OR COMPROMISED MEMBERS THAT ARE DISCOVERED.
9. REPAIR FIREPROOFING, WATERPROOFING AND FINISHES AS REQUIRED WHERE DISTURBED BY STRUCTURAL WORK. SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
10. EXISTING WOOD MEMBER SIZES MAY BE FULL-SIZE OR NONSTANDARD RELATIVE TO CURRENT PRACTICE. PROVIDE FULL-SIZE CURED, OR CUT NEW STRUCTURAL WOOD TO MATCH WHERE INDICATED. DO NOT FUR OUT TO MAKE UP GAPS BETWEEN NEW STRUCTURAL MEMBERS OR SHEATHING UNLESS SPECIFICALLY DETAILED OR NOTED.

SPECIAL INSPECTIONS SCHEDULE

NON-STRUCTURAL COMPONENTS

PERIODIC	ERECTION AND FASTENING OF EXTERIOR CLADDING, INTERIOR AND EXTERIOR PERIODIC: NONBEARING WALLS, AND INTERIOR AND EXTERIOR VENEER GREATER 30' HEIGHTS, EXTERIOR WALLS GREATER THAN 5 PSF, AND INTERIOR WALLS MORE THAN 15 PSF
PERIODIC:	ANCHORAGE OF ELECTRICAL EQUIPMENT
PERIODIC:	ANCHORAGE OF SUSPENDED CEILING SYSTEMS
PERIODIC:	ANCHORAGE OF HVAC DUCTWORK THAT WILL CONTAIN HAZARDOUS MATERIALS
PERIODIC:	ANCHORAGE OF PIPING SYSTEMS AND MECHANICAL UNITS CONTAINING
PERIODIC:	FLAMMABLE, COMBUSTIBLE OR HIGHLY TOXIC MATERIALS
PERIODIC:	ANCHORAGE OF ACCESS FLOORS AND ANCHORAGE OF STORAGE RACKS 8 FEET PERIODIC: OR GREATER IN HEIGHT
PERIODIC:	FLEXIBLE CONNECTIONS OF UTILITIES CROSSING EXPANSION OR SEISMIC JOINTS

013200 - STRUCTURAL OBSERVATIONS

1. VISUAL OBSERVATIONS WILL BE PERFORMED AT THE DISCRETION OF THE OWNER, ARCHITECT, SEOR, AND AS REQUIRED BY THE BUILDING OFFICIAL IN ACCORDANCE WITH THE BUILDING CODE. VISUAL OBSERVATIONS SHALL NOT BE CONSIDERED AS A SUBSTITUTE FOR THE SPECIAL INSPECTION REQUIREMENTS.
2. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY THE SEOR AS TO WHEN EACH MAJOR PHASE OF CONSTRUCTION WILL BE READY FOR OBSERVATION A MINIMUM OF FIVE (5) WORKING DAYS IN ADVANCE.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ITEMS LISTED IN THE SCHEDULE ARE VISIBLE FOR OBSERVATION WHEN THE SEOR IS ON SITE AND FOR ANY SCHEDULING DELAYS DUE TO NONCOMPLIANT ITEMS FOUND DURING THE OBSERVATION.
4. AT THE CONCLUSION OF THE WORK INCLUDED IN THE PERMIT, THE STRUCTURAL OBSERVER SHALL SUBMIT TO THE BUILDING OFFICIAL A WRITTEN STATEMENT THAT THE SITE VISITS HAVE BEEN MADE AND IDENTIFY ANY REPORTED DEFICIENCIES THAT, TO THE BEST OF THE STRUCTURAL OBSERVERS KNOWLEDGE, HAVE NOT BEEN RESOLVED.

STRUCTURAL OBSERVATION SCHEDULE

ITEM/CONSTRUCTION STAGE	WHEN
NONE REQUIRED FOR THIS MINOR ALTERATION	N/A

016000 – PRODUCT SPECIFICATION

1. THE STRUCTURAL PRODUCT SCHEDULE INDICATES BASIS-OF-DESIGN MANUFACTURERS AND PRODUCTS FOR USE ON THIS PROJECT. WHERE STRUCTURAL PRODUCTS ARE NOT EXPLICITLY NAMED IN THE CONSTRUCTION DOCUMENTS, PROVIDE A LISTED PRODUCT.
2. PRODUCTS SHALL BE INSTALLED PER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AS AMENDED BY THE REFERENCED PRODUCT ACCEPTANCE REPORTS (ICC, IAPMO, ETC.) FOR THE INTENDED USE.
3. AT CONTRACTOR'S OPTION, SUBSTITUTION REQUESTS MAY BE MADE FOR LIKE PRODUCTS WHICH DEMONSTRATE QUALITIES THAT EQUAL OR EXCEED THOSE OF SPECIFIED PRODUCTS.

TYPE	PRODUCT	ICC / IAPMO	LARR
EXPANSION ANCHOR TO CONCRETE	HILTI KWIK BOLT TZ	ESR-1917	25701
	DEWALT/POWERS-STUD+ SD2	ESR-2502	25831
	SIMPSON STRONG-BOLT 2	ESR-3037	25891
ADHESIVE ANCHOR TO CONCRETE	HILTI HIT-HY 200	ESR-3187	25964
	HILTI HIT-RE 500-V3	ESR-3814	26028
	DEWALT/POWERS AC200+	ESR-4027	-
	DEWALT/POWERS PURE110+	ESR-3298	26035
	SIMPSON AT-XP	ER-0263	25960
	SIMPSON SET-XP	ESR-2508	25744

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Project Title
NOCCCD - ANAHEIM
BOILER REPLACEMENT

Owner
NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT
ANAHEIM CAMPUS
1830 WEST ROMNEYA DRIVE,
ANAHEIM, CA 92801-1819

FOR BRANDOW & JOHNSTON
REGISTERED PROFESSIONAL ENGINEER
HOWARD K. LAM
No. 2717
STRUCTURAL
STATE OF CALIFORNIA
DATE: 09–15–2020

Revisions

Number	Description	Date
1	90% CD Review	07/17/20
2	ISSUE FOR BID	09/15/20

Designed	RU
Drawn	JY
Checked	HL
Approved	HL
Date	09/15/2020
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Scale	None

Sheet Title
GENERAL NOTES

Sheet Number
S001

P2S No. 0719

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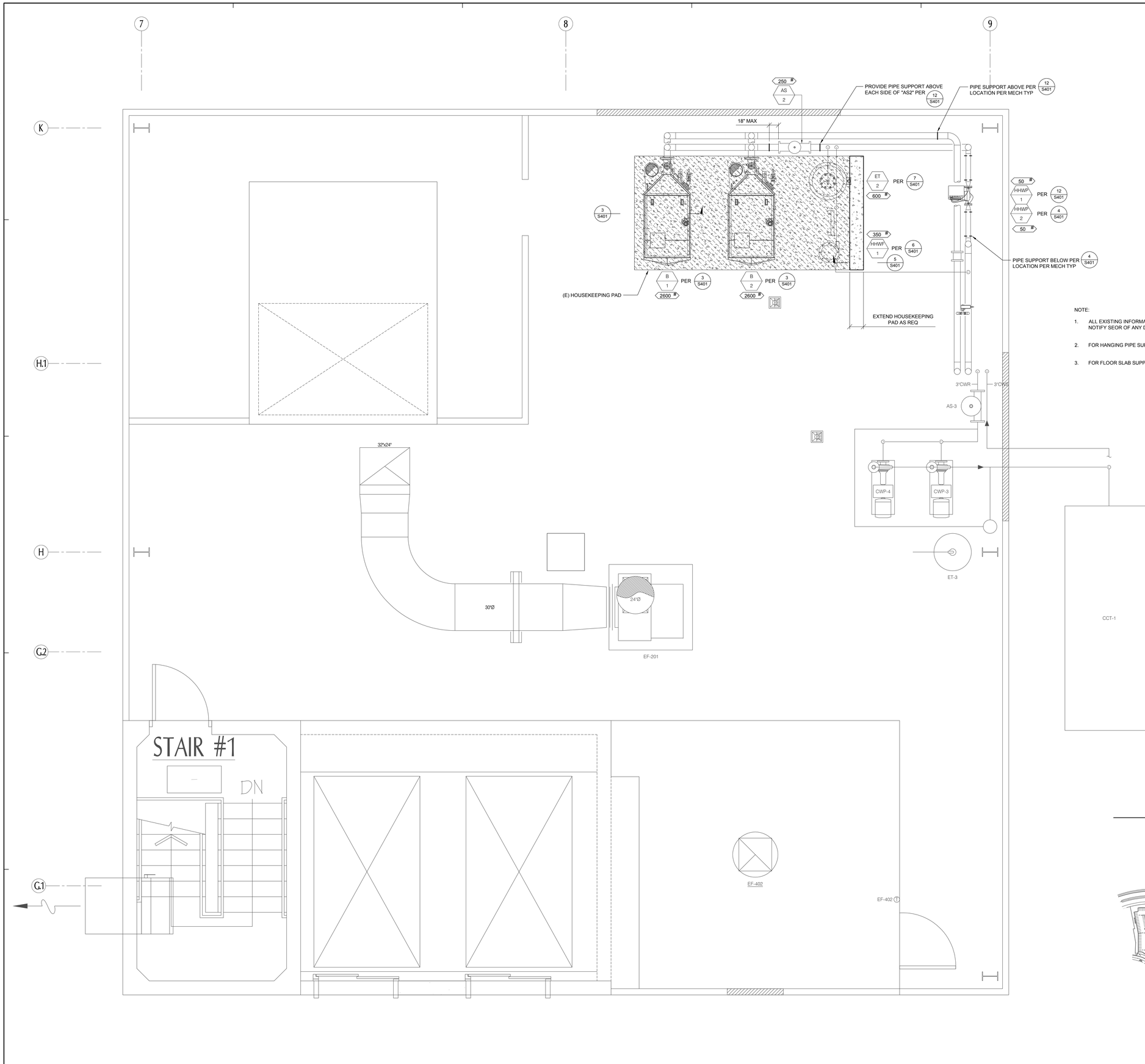


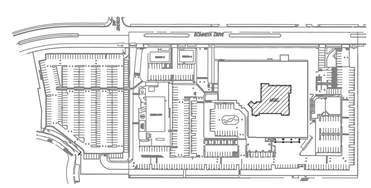
NOTE:

1. ALL EXISTING INFORMATION TAKEN FROM VISUAL OBSERVATION. CONTRACTOR NOTIFY SEOR OF ANY DISCREPANCIES.
2. FOR HANGING PIPE SUPPORT SEE 12 S401
3. FOR FLOOR SLAB SUPPORTED PIPE SUPPORT SEE 4 S401

KEY PLAN

LEGEND

AREA OF WORK



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NOT TO SCALE

ENLARGED PLAN

4

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Sheet Title

ENLARGED PLAN

Sheet Number

S201

P2S No. 0719

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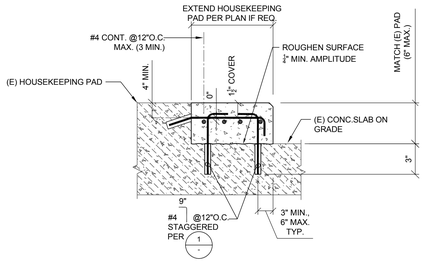


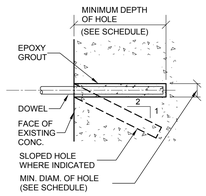
NOTE:

1. MIN. 6" EDGE DISTANCE AT ALL UNITS UNLESS NOTED OTHERWISE

(E) SLAB EXTENSION | 5

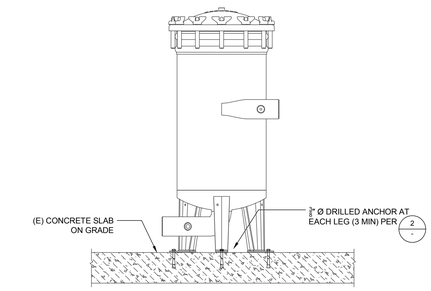
PROCEDURE:

1. DRILL HOLE OF PROPER DIAMETER AND DEPTH USING A CARBIDE TIPPED DRILL OR CORING BIT. AVOID ANY EXISTING REINFORCING STEEL BY RELOCATING HOLE SLIGHTLY.
2. CLEAN HOLE THOROUGHLY BY VACUUM OR AIR PRESSURE.
3. MAKE SURE THAT HOLE IS DRY AND CLEAN BEFORE GROUTING.
4. PLACE EPOXY GROUT IN HOLE WITH CAULKING GUN OR SIMILAR EQUIPMENT. STARTING AT BOTTOM, FILL HOLE APPROX. 2/3 FULL.
5. COAT DOWEL WITH SAME EPOXY GROUT AND INSERT INTO HOLE, FORCING MATERIAL AROUND THE SIDES OF THE BAR AND COMPLETELY FILLING ALL VOIDS.
6. PROVIDE SUPPORT FOR DOWEL BY TYING TO REBAR OR OTHER ELEMENT UNTIL GROUT HAS CURED.
7. EPOXY GROUT SHALL BE: HILTI 'RE 500 SD' (ESR# 2322) SIMPSON 'SET-XP' (ESR# 2508)
8. SPECIAL INSPECTION REQUIRED.



BOLT SIZE	BAR SIZE	MIN. DIA.	MIN. DEPTH
⅜"	#3	¾"	3½"
½"	#4	⅞"	4"
⅝"	#5	1"	5"
¾"	#6	1"	6½"

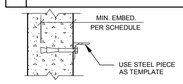
TYPICAL EPOXY | 1



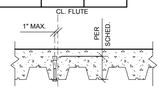
HEATING HOT WATER FEEDER | 6

DRILLED ANCHOR SCHEDULE

	BOLT DIAMETER	⅜"	½"	⅝"	¾"	⅞"
CONCRETE	MIN. EMBEDMENT (U.N.O.)	-	2"	3½"	3½"	3½"
	TORQUE WRENCH (FT-LB)	-	25	40	60	110
MASONRY	MIN. EMBEDMENT (U.N.O.)	1½"	1½"	2½"	2½"	3½"
	TORQUE WRENCH (FT-LB)	4	15	25	65	120



CONCRETE OR MASONRY

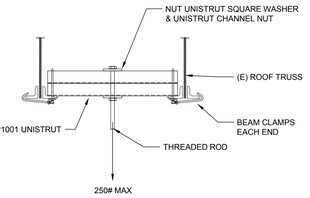


UNDERSIDE OF DECK

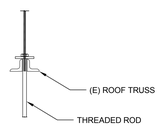
DRILLED ANCHOR NOTES:

1. ANCHORS SHALL BE USED ONLY WHERE DETAILED.
2. ACCEPTABLE CONCRETE ANCHORS: HILTI "KWIK BOLT TZ" (ESR #1917) POWER STUD (ESR #2502) ACCEPTABLE MASONRY ANCHORS: * HILTI "KWIK BOLT 3" (ESR 1385) SIMPSON STRONG BOLT 2 (ESR 0240)
3. SPECIAL INSPECTION REQUIRED.
4. DO NOT CUT ANY EXISTING REINFORCING DURING INSTALLATION.
5. MINIMUM REQUIRED STRENGTH IS 3000 PSI FOR CONCRETE AND 1500 PSI FOR MASONRY.
6. ANCHORS MAY BE INSTALLED IN CRACKED CONCRETE.

TYPICAL DRILLED ANCHOR | 2

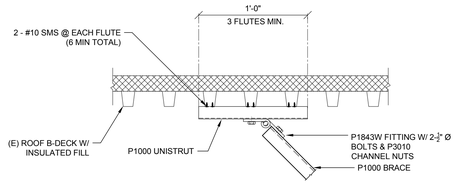


OPTION "A"

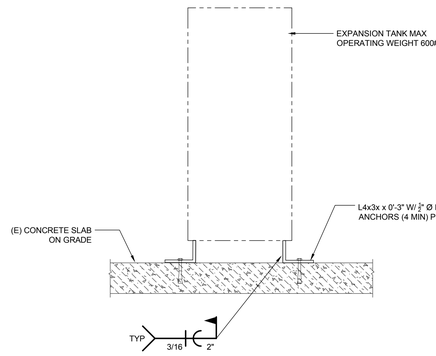


OPTION "B"

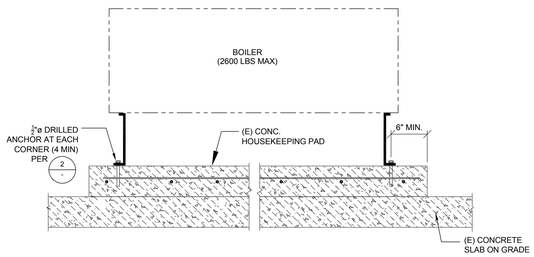
THREADED ROD TO STRUCTURE ATTACHMENT | 15



BRACE ATTACHMENT TO STRUCTURE | 11



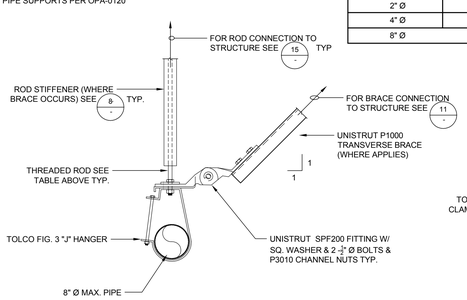
EXPANSION TANK | 7



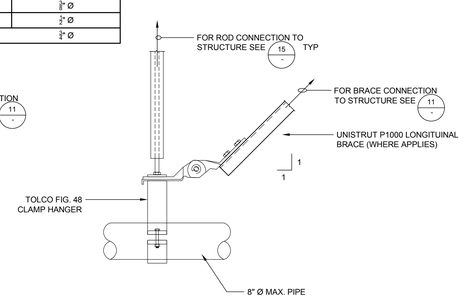
BOILER SUPPORT | 3

NOTE:
SPACING OF PIPE SUPPORTS PER OPA-0120

SCHEDULE	
PIPE SIZE	THREADED ROD SIZE
2" Ø	⅜" Ø
4" Ø	½" Ø
6" Ø	¾" Ø



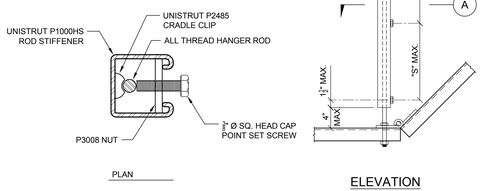
TYPICAL PIPE HANGER WITH TRANSVERSE BRACE



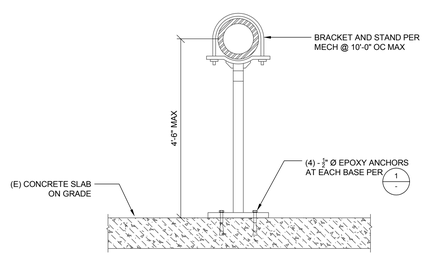
TYPICAL PIPE HANGER WITH LONGITUNDINAL BRACE

TYPICAL PIPE SUPPORT DETAILS | 12

SCHEDULE	
THREADED ROD SIZE	"S"
⅜" Ø	10"
½" Ø	15"
¾" Ø	20"



TYPICAL ROD STIFFENER | 8



PIPE SUPPORT | 4

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Scale	None

Sheet Title

DETAILS

Sheet Number

S401

P2S No. 0719

ELEVATION NAME: G:\JOBS\A-D\ANA PDS 1\DOCCO AC BOILER\PLANS\WGS\SHEETS\401.DWG REGAVE URB2TONOO
PLOT: Tuesday, September 15, 2020 10:28:36 AM