



HOT WATER HEATING BOILER SCHEDULE														
UNIT TAG	LOCATION	MAKE	MODEL NUMBER	SERVICE	INPUT MBH	OUTPUT MBH	HEATING WATER COIL				ELECTRICAL		WEIGHT (LBS.)	NOTES
							GPM	LWT(°F)	EW(°F)	ΔP (FT)	VOLT/PH/HZ	FLA		
B-1	MECH RM 123	PATTERSON-KELLEY	MACH C1050	HOT WATER HEATING SYSTEM	1050	987	66	180	150	5	120/1/60	6.0	1000	1. BOILER SHALL BE LOW-NOX, SCAQMD COMPLIANT, HOT WATER BOILER COMPLETE WITH NURO CONTROL UNIT. 2. CONNECT BOILER CONTROLS TO BMS. 3. PROVIDE CONDENSATE NEUTRALIZING KIT. 4. PROVIDE CPVC SCHEDULE 80 FOR VENTING SYSTEM COMPLETE WITH ROOF CAP AND DRAFT CONTROL AS REQUIRED. 5. PROVIDE SEISMIC CLIPS FOR ANCHORING TO CONCRETE PAD. 6. PROVIDE REQUIRED RELAYS AND CONTROLS TO OPERATE BOILER PUMP.

PUMP SCHEDULE												
UNIT TAG	MAKE	MODEL NUMBER	SERVICE	TYPE	GPM	HEAD, FT	RPM	MAX. WORKING PRESSURE, PSI	ELECTRICAL		OPERATING WEIGHT (LBS.)	NOTES
									HP	VOLT/PH/HZ		
HWP-1	TACO	KV1507	HOT WATER HEATING	VERTICAL, INLINE	66	40	1750	150	1.5	208/3/60	125	1. HWP-1: PROVIDED WITH TEFC PREMIUM EFFICIENCY MOTORS AND PUMP STANDS; PROVIDE SUCTION DIFFUSERS WITH STRAINERS (OR Y-STRAINERS) CHECK VALVES, SHUTOFF VALVES, PRESSURE GAGES, AND FLEX CONNECTIONS. 2. HWP-1: PROVIDE VFD (ABB); CONTROLLED AND MONITORED THRU CENTRAL HHW CONTROL SYSTEM. 3. BP-1: INTERLOCK WITH BOILER CONTROLLER.
BP-1	TACO	1900 SERIES	BOILER	INLINE	66	15	1750	150	0.5	120/1/60	90	

COMBINATION AIR AND DIRT SEPARATOR SCHEDULE									
UNIT TAG	LOCATION	MAKE	MODEL NUMBER	SERVICE	TYPE	GPM	INLET/OUTLET SIZE (IN.)	DRY WEIGHT (LBS.)	NOTES
AS-1	MECH RM 123	SPIROTHERM	VON400FA	HEATING HOT WATER	COALESCING TYPE COMBINATION AIR AND DIRT SEPARATOR	70	4/4	240	FLANGE CONNECTION ASME CONSTRUCTION COMPLETE WITH COPPER COALESCING MEDIUM, BRASS VENT HEAD, DRAIN VALVE, AND REMOVABLE LOWER HEAD.

EXPANSION TANK SCHEDULE											
UNIT TAG	LOCATION	MAKE	MODEL NUMBER	SERVICE	TYPE	TANK VOLUME (GAL)	ACCEPTANCE VOLUME (GAL)	SIZE INCHES		OPERATING WEIGHT (LBS.)	NOTES
								DIA.	HEIGHT		
ET-1	MECH RM 123	WESSELS	NIA50	HEATING HOT WATER	BLADDER	13	13	14	24	175	PRE-CHARGED STEEL EXPANSION TANK W/ REPLACEABLE HEAVY-DUTY BUTYL BLADDER; TANK SHALL BE ASME RATED.

CHEMICAL POT FEEDER SCHEDULE									
UNIT TAG	LOCATION	MAKE	MODEL NUMBER	SERVICE	CAPACITY (GAL)	MAX. PRESSURE (PSI)	MAX. TEMPERATURE (°F)	OPERATING WEIGHT (LBS.)	NOTES
CPF-1	MECH RM 123	JL WINGERT	DB-5HD	HOT WATER HEATING SYSTEM	6	200	200	50	COMPLETE WITH INLET, OUTLET, DRAIN VALVE, AND FILL PORT, ISOLATION VALVES, INTERNAL & EXTERNAL EPOXY COATING, PRESSURE GAGE, AND AIR RELEASE VALVE

NEW HOT WATER HEATING COIL SCHEDULE																					
					MAX. SUPPLY AIR	MIN. SUPPLY AIR	MIN. OUTSIDE AIR (1)	DCV MIN. OUTSIDE AIR (2)	HEATING HOT WATER COIL								FINS				
UNIT TAG	MAKE	TYPE	UNIT SERVED	LOCATION	CFM	CFM	CFM	CFM	CAPACITY	EAT	LAT	APD	FLOW	EWT	LWT	WPD	LENGT H	HEIGHT	WEIGHT (LBS.)	NOTES	
HVHC-1	SFI	CASED COIL	HV-1	ROOF	3,700	2,500	650	NA	160,000	65	105	0.1	11	180	150	1.5	30	30	90	1. NORMAL MODE: MINIMUM OUTSIDE AIR CFM WHEN RETURN AIR CO2 LEVEL IS ABOVE 900 PPM. 2. DEMAND-CONTROL VENTILATION MODE: MINIMUM OUTSIDE AIR CFM WHEN RETURN AIR CO2 LEVEL IS BELOW 900 PPM. 3. HOT WATER HEATING COILS SHALL BE INSULATED AND CASED. 4. CAPACITIES OF COILS WERE BASED ON CAPACITIES OF EXISTING GAS-FIRED FURNACE 5. FINS LENGTH AND HEIGHT ARE SHOWN FOR REFERENCE ONLY; CONTRACTOR SHALL DETERMINE THE ACTUAL SIZE OF COILS THAT WILL MEET THE PERFORMANCE ABOVE AND THAT CAN BE ACCOMMODATED IN EXISTING CONDITIONS, EITHER MATCH AREA OF (E) HV UNITS OR MODIFY (E) CABINETS, PROVIDE DUCT TRANSITIONS AND OFFSETS AS REQUIRED.	
HVHC-2	SFI	CASED COIL	HV-2	ROOF	4,100	3,000	750	NA	180,000	65	105	0.1	12	180	150	1.5	31	30	90		
SFHC-1	SFI	CASED COIL	SF-1	MECH RM 106	10,000	5,000	3,200	1,150	160,000	65	80	0.2	11	180	150	1.5	70	36	125		
SFHC-2	SFI	CASED COIL	SF-2	MECH RM 106	12,500	7,000	5,000	1,150	200,000	64	80	0.2	13	180	150	1.5	78	39	150		
SFHC-3	SFI	CASED COIL	SF-3	MECH RM 123	4,500	2,500	1,800	600	60,000	65	80	0.2	4	180	150	1.5	45	24	75		
SFHC-4	SFI	CASED COIL	SF-4	ROOF	4,000	2,000	1,400	500	60,000	65	80	0.2	4	180	150	1.5	45	24	75		

EXISTING GAS-FIRED FURNACE SCHEDULE (UNITS TO BE REMOVED)												
					SUPPLY AIR	PRESSURE DROP	FURNACE CAPACITY		WEIGHT (LBS.)	HOT WATER HEATING COIL REPLACEMENT	NOTES	
							INPUT	OUTPUT				
UNIT TAG	MAKE	MODEL	AREA SERVED	LOCATION	CFM	IN WG	BTU/HR	BTU/HR				
DF-1	REZNOR	HX-200	STUDENT DINING 107	MECHANICAL ROOM 106	4,930	0.45	200,000	160,000	250	SFHC-1		
DF-2	REZNOR	HX-250	STUDENT DINING 108	MECHANICAL ROOM 106	6,975	0.5	250,000	200,000	300	SFHC-2		
DF-3	REZNOR	HX-75	FOOD SERVICE 118	MECHANICAL ROOM 123	1,950	0.3	75,000	60,000	200	SFHC-3		
DF-4	REZNOR	HX-75	FACULTY DINING 130	ROOF	1,950	0.3	75,000	60,000	200	SFHC-4		

NEW HEATING-VENTILATING UNIT SCHEDULE																		
UNIT TAG	MAKE	MODEL	AREA SERVED	MIN. OUTSIDE AIR	SUPPLY FAN					HEATING HOT WATER COIL						ELECTRICAL	WEIGHT (LBS.)	NOTES
					CFM	CFM	ESP (IN)	HP	MAX. RPM	CAPACITY	EAT	LAT	FLOW	EWT	LWT	WPD		
HV-3	MAGIC AIRE	BMB30H	PREP 115	1000	3000	0.75	1.5	1800	160,000	57	105	11	180	150	3.4	208/3/60	500	1. CAPACITY BASED ON EXISTING HEATING VENTILATING UNIT HV-3. 2. UNIT SHALL BE MODULAR CONSTRUCTION, HORIZONTAL, COMPLETE WITH SUPPLY FAN, MOTOR, HOT WATER HEATING COIL, MERV 8 FILTERS 3. MOTOR SHALL BE PREMIUM EFFICIENCY AND DRIVE ASSEMBLY SHALL BE SUITABLE FOR VARIABLE DRIVE OPERATION; VFD SHALL BE ABB ACH550 SERIES. 4. PROVIDE BASE RAIL STEEL FRAME SUPPORT COMPLETE WITH SPRING ISOLATORS AND SEISMIC RESTRAINTS. 5. CONTRACTOR SHALL VERIFY THAT UNIT SHALL FIT IN EXISTING CONDITION PRIOR TO PURCHASE.

UNIT TAG	MAKE	MODEL	AREA SERVED	LOCATION	MIN. OUTSIDE AIR	SUPPLY FAN					FURNACE CAPACITY		ELECTRICAL	WEIGHT (LBS.)	UNIT REPLACEMENT	NOTES
						CFM	CFM	ESP (IN)	HP	MAX. RPM	BTU/HR	BTU/HR				
HV-1	REZNOR	HREB-200	WEIGHT LIFTING 101	ROOF	400	3700	0.75	3	1800	200,000	160,000	240/3/60	600	-	-	
HV-2	REZNOR	HREB-225	WRESTLING 103	ROOF	500	4100	0.75	3	1800	225,000	180,000	240/3/60	600	-	-	
HV-3	REZNOR	HXE-200	PREP 115	MECH RM 123	1000	3000	0.75	1.5	1800	200,000	160,000	240/3/60	400	HV-3	-	

UNIT TAG	SERVICE	LOCATION	AREA SERVED	MAKE	MODEL NUMBER	TYPE	CFM	ESP (IN. W.C.)	RPM	HP	VOLT/PH/HZ	OPERATING WEIGHT (LBS.)	NOTES
EF-4	EXHAUST FAN (SEQUENCE W/ HV-1)	ROOF	WEIGHT LIFTING	LOREN COOK	270HLC-B	CENTRIFUGAL, ROOF-MOUNTED, LOW PROFILE	6,000	1/4	525	3/4	208/3/60	370	1. PROVIDE PREMIUM EFFICIENCY MOTORS COMPATIBLE WITH VARIABLE FREQUENCY DRIVES. 2. PROVIDE VFD FOR ALL SUPPLY AND EXHAUST FANS; VFD SHALL BE ABB ACH550 SERIES; CONNECT VFD TO BMS. 3. PROVIDE CURB ADAPTERS, REDUCERS AND INCREASERS, AS REQUIRED TO ACCOMMODATE INSTALLATION OF (N) EXHAUST FANS TO (E) ROOF CURBS; CURB ADAPTERS SHALL BE L-ARDEN OR EQUAL.
EF-5	EXHAUST FAN (SEQUENCE W/ HV-2)	ROOF	WRESTLING	LOREN COOK	210HLC-B	CENTRIFUGAL, ROOF-MOUNTED, LOW PROFILE	4,900	1/4	849	3/4	208/3/60	260	
EF-6	EXHAUST FAN (SEQUENCE W/ HV-2)	ROOF	WRESTLING	LOREN COOK	210HLC-B	CENTRIFUGAL, ROOF-MOUNTED, LOW PROFILE	4,900	1/4	849	3/4	208/3/60	260	
EF-26	EXHAUST FAN (SEQUENCE W/ SF-4)	ROOF	FACULTY DINING	LOREN COOK	210HLC-B	CENTRIFUGAL, ROOF-MOUNTED, LOW PROFILE	3800	1/4	695	1/2	208/3/60	260	

UNIT TAG	SERVICE	LOCATION	AREA SERVED	MAKE	MODEL NUMBER	TYPE	CFM	ESP (IN. W.C.)	RPM	HP	VOLT/PH/HZ	OPERATING WEIGHT (LBS.)	NOTES
SF-1	SUPPLY FAN	MECHANICAL ROOM 106	STUDENT DINING 107	REZNOR	BF	CABINET, BELT DRIVE	10,000	1.5	970	7.5	240/3/60	650	1. MODIFY ALL FAN CABINETS AS REQUIRED TO ACCOMMODATE INSTALLATION OF NEW HOT WATER HEATING COILS. 2. CLEAN ALL UNIT AND FAN ASSEMBLY. 3. REPLACE ALL FILTERS, MOTORS, DRIVES AND BELTS; NEW MOTORS SHALL BE PREMIUM EFFICIENCY AND SUITABLE FOR VARIABLE SPEED OPERATION. 4. PROVIDE VFD FOR ALL SUPPLY AND EXHAUST FANS; VFD SHALL BE ABB ACH550 SERIES; CONNECT VFD TO BMS. 5. PROVIDE (N) DAMPERS AND ACTUATORS ON (E) OUTSIDE AIR, RETURN AND EXHAUST DUCTS AND ADJUST/BALANCE AS REQUIRED TO INDICATED OUTSIDE AIR CFM. 6. (N) MOTORS SHALL BE BALDOR (OR EQUAL), 208V/3P/60HZ COMPATIBLE WITH VFD.
SF-2	SUPPLY FAN	MECHANICAL ROOM 106	STUDENT DINING 108	AIRFAN	219	CABINET, BELT DRIVE	12,500	1.5	686	7.5	240/3/60	955	
SF-3	SUPPLY FAN	MECHANICAL ROOM 123	FOOD SERVICE 118	AIRFAN	118	RBH	4,500	1.5	722	3	240/3/60	500	
SF-4	SUPPLY FAN	ROOF	FACULTY DINING 130	REZNOR	RBH	CABINET, BELT DRIVE	4,000	1.5	1100	3	240/3/60	350	
EF-4	EXHAUST FAN (SEQUENCE W/ HV-1)	ROOF	WEIGHT LIFTING	EXITAIRE	S-3012	ROOF-MOUNTED	6,000	1/4	425	3/4	240/1/60	450	
EF-5	EXHAUST FAN (SEQUENCE W/ HV-2)	ROOF	WRESTLING	EXITAIRE	S-2414	ROOF-MOUNTED	4,900	1/4	650	3/4	240/1/60	350	
EF-6	EXHAUST FAN (SEQUENCE W/ HV-2)	ROOF	WRESTLING	EXITAIRE	S-2414	ROOF-MOUNTED	4,900	1/4	650	3/4	240/1/60	350	
EF-9	EXHAUST FAN (SEQUENCE W/ SF-1)	ROOF	STUDENT DINING 107	PACE	U-27AF	UTILITY, BELT DRIVE	7,575	3/8	1800	1.5	240/3/60	650	
EF-11	EXHAUST FAN (SEQUENCE W/ SF-2)	ROOF	STUDENT DINING 108	PACE	U-33AF	UTILITY, BELT DRIVE	10,600	3/8	1700	5	240/3/60	990	
EF-19	EXHAUST FAN (SEQUENCE W/ SF-3)	ROOF	FOOD SERVICE 118	PACE	U-22AF	UTILITY, BELT DRIVE	4150	3/8	1500	3/4	240/1/60	400	
EF-26	EXHAUST FAN (SEQUENCE W/ SF-4)	ROOF	FACULTY DINING	EXITAIRE	S-2413	ROOF-MOUNTED	3800	1/4	550	1/2	120/1/60	275	

REV	DATE	DESCRIPTION	BY
	11/28/16		

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REPLACEMENT AND REPAIR  
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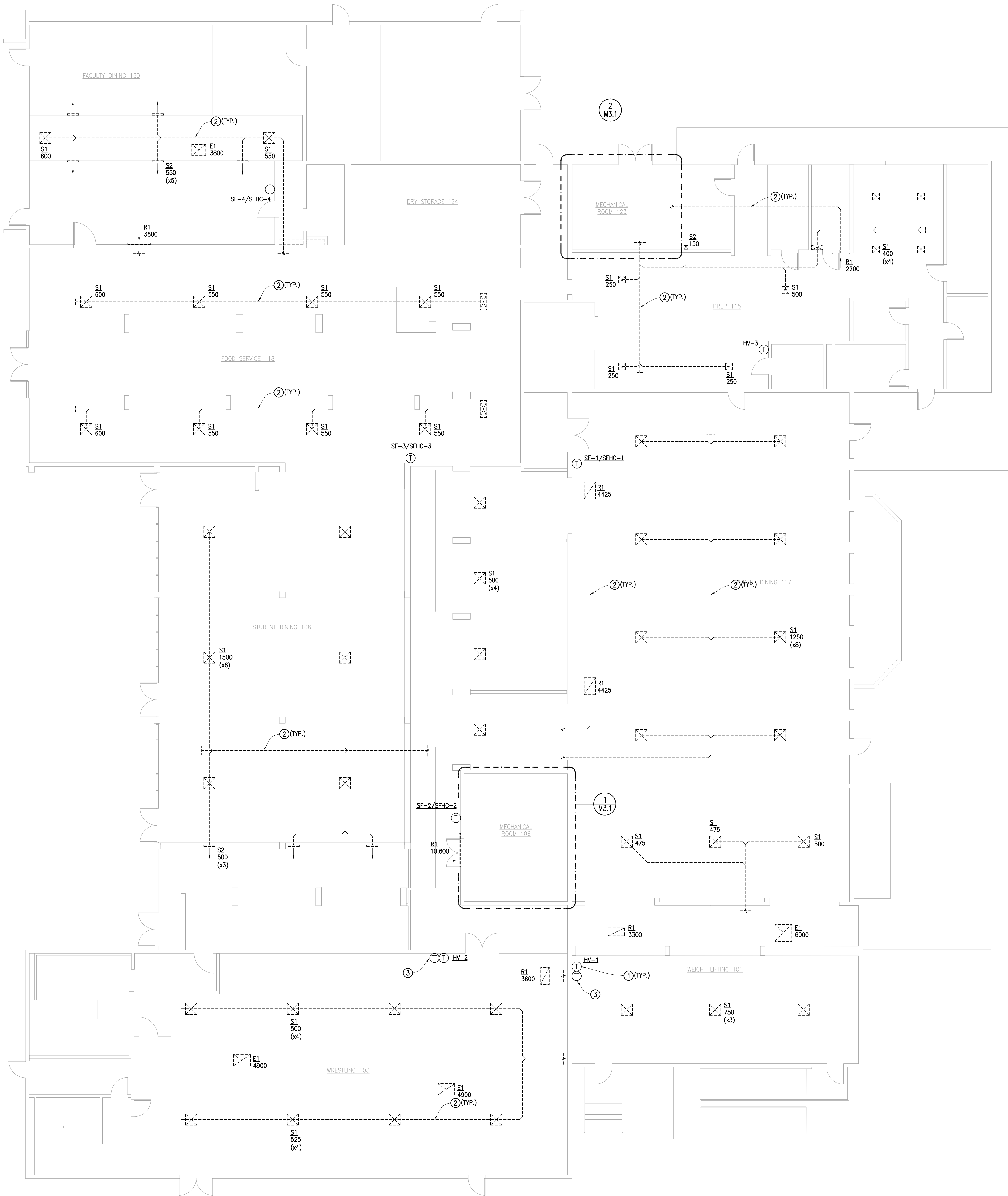
TORRANCE UNIFIED SCHOOL DISTRICT  
2335 PLAZA DEL AMO  
TORRANCE, CALIFORNIA 90501

MECHANICAL EQUIPMENT  
SCHEDULES

DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	

M0.2  
25





KEYNOTES

- 1 PLACE (N) DISTRICT-STANDARD FLAT-PLATE TEMPERATURE SENSORS W/ TIMED OVERRIDE BUTTON IN THE SAME PLACE AS THE (E) THERMOSTAT BEING REPLACED; REUSED (E) CONDUITS AND JBOX AS REQUIRED; PROVIDE (N) CONTROL WIRING FROM DDC UNIT CONTROLLERS TO ALL DEVICES; (N)
- 2 CLEAN ALL SUPPLY AND RETURN DUCTS FROM DIFFUSERS/REGISTERS UP TO EQPT ON ROOF AND IN MECHANICAL ROOMS; CLEAN DUCTS AND APPLY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- 3 PROVIDE MANUAL OVERRIDE SPRING-WOUND TIMER ADJACENT TO TEMPERATURE SENSORS FOR EF-4, 5 AND 6.

GENERAL NOTES

1. CONTRACTOR SHALL FIELD VERIFY (E) CONDITIONS PRIOR TO START OF WORK.
2. EQUIPMENT, DUCTS, PIPES, ETC. ARE SHOWN FOR REFERENCE ONLY; CONTRACTOR SHALL VERIFY EXACT LOCATIONS IN THE FIELD.
3. REWORK (E) OPENINGS, SUPPORTS, STRUCTURE, ETC. TO ACCOMMODATE (N) SYSTEM INSTALLATION.
4. REMOVE AND DISPOSE OF ALL (E) EQPT., DUCTS, CONTROLS, ETC. (NOT SHOWN) THAT ARE NOT BEING USED OR THAT WERE ABANDONED; CONTRACTOR TO VERIFY AND COORDINATE WITH DISTRICT'S REPRESENTATIVE PRIOR TO DEMOLITION.
5. TEMPORARY REMOVE (E) DOORS AND FRAMES TO ACCOMMODATE (N) EQPT THROUGH (E) DOOR OPENINGS AND REINSTALL TO ORIGINAL CONDITIONS AS REQUIRED.
6. (E) DUCTS, DIFFUSERS, REGISTERS, THERMOSTATS, ETC. SHOWN WERE BASED ON AS-BUILT DRAWINGS DATED 5/11/1991; CONTRACTOR SHALL VERIFY ALL ITEMS IN THE FIELD.
7. CONTRACTOR SHALL BALANCE THE ENTIRE AIR DISTRIBUTION SYSTEMS AS SHOWN; ADJUST (E) DAMPERS (NOT SHOWN) AS REQUIRED.

REV	DATE	DESCRIPTION	BY
	11/28/16	BID SET	

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REPLACEMENT AND REPAIR  
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2335 PLAZA DEL AMO  
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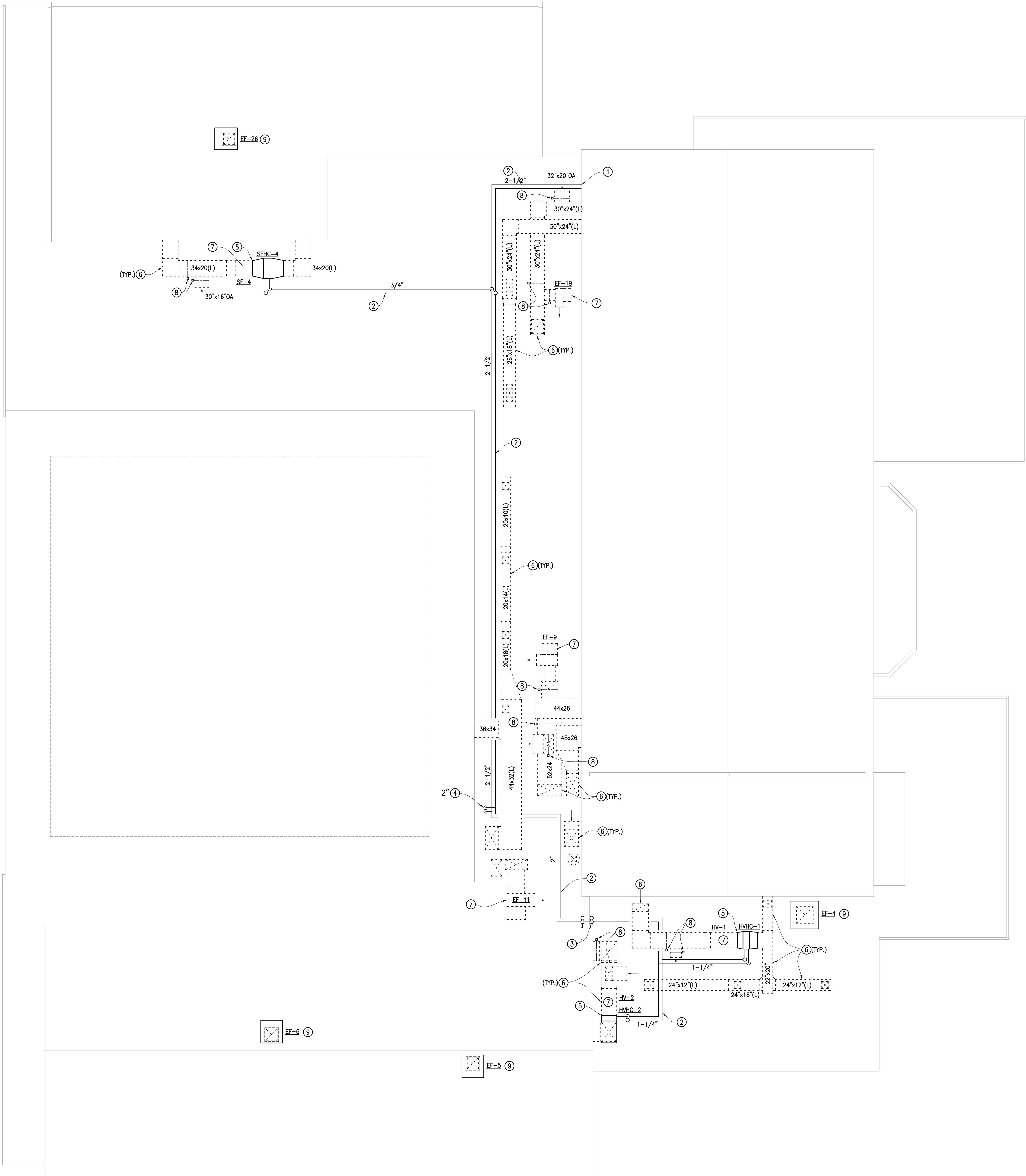
BUILDING F  
FIRST FLOOR  
MECHANICAL PLAN

DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	

M2.1

BUILDING F – FIRST FLOOR MECHANICAL PLAN

SCALE	1
1/8"=1'-0"	



KEYNOTES

- ROUTE (N) HHW PIPES THRU (E) CONCRETE WALL; ROUTE TO (E) WALL OPENING OR CORE (N) HOLES; REWORK (E) OPENING, IF ANY, TO ACCOMMODATE (N) PIPE INSTALLATION; VERIFY AND COORDINATE EXACT ROUTING IN THE FIELD; SEAL WALL PENETRATIONS.
- ROUTE HHW PIPES ABOVE ROOF; HHW PIPES SHALL BE COPPER TYPE L W/ BRAZED JOINTS, INSULATED AND JACKETED (ALUMINUM); VERIFY AND COORDINATE EXACT PIPE ROUTING IN THE FIELD.
- PROVIDE MANUAL AIR VENTS AT ALL HIGH POINTS IN PIPING AND AT CONNECTIONS TO HHW COILS (TYP.)
- HHW PIPES DOWN THRU ROOF TO MECHANICAL ROOM 106 AND CONNECT TO HHW COILS: SFHC-1 AND SFHC-2, WATERPROOF/SEAL ROOF PIPE PENETRATIONS; COORDINATE W/ DISTRICT FOR EXACT REQUIREMENTS ON ROOF PENETRATION.
- PROVIDE FLEXIBLE CONNECTION AT SUPPLY FAN AND/OR HEATING-VENTILATING UNIT CONNECTIONS; REWORK (E) SUPPLY FAN OPENING TO MATCH HEATING COIL CONNECTION.
- CLEAN ALL (E) SUPPLY AND EXHAUST DUCTS ABOVE ROOF DOWN TO UNITS, DIFFUSERS AND REGISTERS; CLEAN DUCTS AND APPLY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- CLEAN ALL (E) UNITS AND FAN ASSEMBLY; REPLACE ALL FILTERS, MOTORS, DRIVES AND BELTS; (N) MOTORS SHALL BE PREMIUM EFFICIENCY AND SUITABLE FOR VARIABLE SPEED OPERATION; PROVIDE VFD TO SUPPLY AND EXHAUST FANS; VFD SHALL BE ABB (ACH550 SERIES); CONNECT VFD TO BMS; PROVIDE (N) DAMPERS AND ACTUATORS ON (E) OUTSIDE AIR AND RETURN DUCTS AND ADJUST/BALANCE AS REQUIRED TO INDICATED OUTSIDE AIR CFM.
- PROVIDE (N) DAMPERS AND ACTUATORS ON (E) RETURN, OUTSIDE AIR AND EXHAUST DUCTS; ALL ACTUATORS AND OTHER CONTROL DEVICES SHALL BE PROTECTED IN WEATHER-PROOF NEMA 4X ENCLOSURES.
- REMOVE AND DISPOSE OF (E) EXHAUST FANS; PROVIDE (N) FANS AND REWORK (E) ROOF CURB TO ACCOMMODATE (N) FAN INSTALLATIONS; PROVIDE CURB ADAPTER (REDUCER OR INCREASER) AS REQUIRED TO MOUNT (N) UNIT OVER (E) CURB.

GENERAL NOTES

- CONTRACTOR SHALL FIELD VERIFY (E) CONDITIONS PRIOR TO START OF WORK.
- EQUIPMENT, DUCTS, PIPES, ETC. ARE SHOWN FOR REFERENCE ONLY; CONTRACTOR SHALL VERIFY EXACT LOCATIONS IN THE FIELD.
- REWORK (E) OPENINGS, SUPPORTS, STRUCTURE, ETC. TO ACCOMMODATE (N) SYSTEM INSTALLATION.
- REMOVE AND DISPOSE OF ALL (E) EQPT., DUCTS, CONTROLS, ETC. (NOT SHOWN) THAT ARE NOT BEING USED OR THAT WERE ABANDONED; CONTRACTOR TO VERIFY AND COORDINATE WITH DISTRICT'S REPRESENTATIVE PRIOR TO DEMOLITION.
- TEMPORARY REMOVE (E) DOORS AND FRAMES TO ACCOMMODATE (N) EQPT THROUGH (E) DOOR OPENINGS AND REINSTALL TO ORIGINAL CONDITIONS AS REQUIRED.
- (E) DUCT SMOKE DETECTORS TO REMAIN.
- ALL (E) SUPPLY AND RETURN DUCTS ABOVE ROOF ARE LINED.
- CLEAN SUPPLY AND RETURN DUCTS AND APPLY/SPRAY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF SUPPORTS AND ATTACHMENT TO STRUCTURES SIGNED BY STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL.

REV	DATE	DESCRIPTION	BY
	11/28/16		

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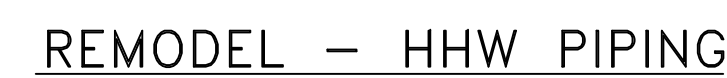
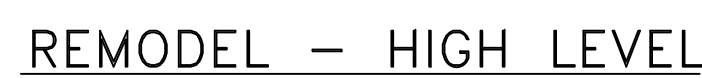
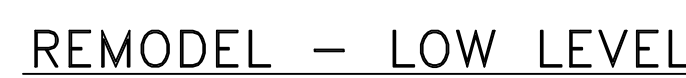
BUILDING F  
ROOF MECHANICAL PLAN

DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	

M2.2

BUILDING F – ROOF MECHANICAL PLAN

SCALE	1/8"=1'-0"
1	



- 1) REMOVE AND DISPOSE OF (E) GAS FURNACE (HATCHED); REMOVE ASSOCIATED SECTION OF DUCT TO ACCOMMODATE (N) HOT WATER HEATING COIL INSTALLATION; REMOVE SECTION OF GAS PIPE (NOT SHOWN) AND CAP PIPE TO NEAREST ACTIVE TEE; VERIFY (E) INSTALLATION IN THE FIELD; REMOVE (E) FLUE VENT.
- 2) SUPPLY FAN AND ASSOCIATED SUPPLY AND RETURN DUCTS TO REMAIN; CLEAN DUCTS AND APPLY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- 3) (E) SUPPLY DUCT UP TO ROOF TO REMAIN; CLEAN DUCTS AND APPLY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- 4) (E) RETURN DUCT UP THRU ROOF TO REMAIN; CLEAN DUCTS AND APPLY DP2510 COATING TO LINER; REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- 5) REMOVE AND DISPOSE OF (E) HEATING-VENTILATING UNIT (HATCHED); REMOVE ASSOCIATED SECTION OF DUCT TO ACCOMMODATE (N) BOILER AND PUMP INSTALLATION; REMOVE SECTION OF GAS PIPE (NOT SHOWN) AND CAP PIPE TO NEAREST ACTIVE TEE; VERIFY (E) INSTALLATION IN THE FIELD; REMOVE (E) FLUE VENT.
- 6) (E) OUTSIDE AIR DUCT AND LOUVER TO REMAIN.
- 7) (E) WATER HEATER TO REMAIN.
- 8) PROVIDE (N) CASED HOT WATER HEATING COIL; PROVIDE (N) LINED SUPPLY AND RETURN DUCTS INCLUDING OFFSETS AND TRANSITIONS; PROVIDE HHW PIPES AND VALVES.
- 9) PROVIDE FLEXIBLE CONNECTION AT SUPPLY FAN; REWORK (E) SUPPLY FAN OPENING TO MATCH HEATING COIL CONNECTION.
- 10) PROVIDE LINED DUCT TRANSITION AND ELBOW AS REQUIRED TO CONNECT TO (E) SUPPLY DUCT.
- 11) PROVIDE STRUCTURAL FRAME TO SUPPORT (N) HEATING-VENTILATING UNIT HV-3 OVER (E) SUPPLY FAN SF-3; ANCHOR STRUCTURAL FRAME TO (E) CONCRETE HOUSEKEEPING PAD.
- 12) PROVIDE LINED DUCT TRANSITION AND ELBOW AS REQUIRED TO CONNECT TO (E) RETURN AND OUTSIDE AIR DUCTS.
- 13) PROVIDE FLEXIBLE CONNECTION AT SUPPLY AND RETURN CONNECTIONS.
- 14) PROVIDE STEEL FRAME SUPPORT UNDERNEATH HV-3 COMPLETE W/ VIBRATION SPRING ISOLATORS AND SEISMIC RESTRAINTS.
- 15) ANCHOR BOILER TO (E) CONCRETE PAD; EXTEND PAT RELIEF VALVE FULL SIZE DRAIN PIPE (COPPER TYPE M) TO SPILL OVER (E) FLOOR SINK IN MECH RM; EXTEND FULL SIZE P.V.C DRAIN PIPE (NOT SHOWN) FROM BOILER AND VENT FOR CONDENSATE AND SPILL OVER (E) FLOOR SINK; PROVIDE NEUTRALIZING KIT.
- 16) REMOVE AND REPLACE (E) DAMPERS IN (E) RETURN, OUTSIDE AIR AND EXHAUST DUCTS; PROVIDE (N) ACTUATORS AND CONTROLS.
- 17) ROUTE (N) HHW PIPES FROM (E) CONCRETE WALL; ROUTE TO (E) WALL OPENING OR COPE (N) HOLES; REWORK (E) OPENING, IF ANY, TO ACCOMMODATE (N) PIPE INSTALLATION; VERIFY AND COORDINATE EXIST ROUTING IN THE FIELD.
- 18) (E) CONCRETE HOUSEKEEPING PAD TO REMAIN.
- 19) PROVIDE 1" CW COPPER TYPE L, SOLDERED JOINTS, MAKE-UP WATER LINE TO HEATING HOT WATER SYSTEM AND CONNECT TO (E) WATER MAIN IN MECH ROOM; PROVIDE LEAD-FREE REDUCED-PRESSURE TYPE BACKFLOW PREVENTER AND PRESSURE REDUCING ASSEMBLY; VERIFY AND COORDINATE EXIST POC IN THE FIELD; EXTEND FULL SIZE DRAIN LINE FROM BACKFLOW PREVENTER TO SPILL OVER (E) FLOOR SINK.
- 20) PROVIDE 2-1/2" CPVC PIPE AND CONNECT TO (E) 3" LOW PRESSURE GAS MAIN/RISER INSIDE THE MECH ROOM; PIPES SHALL BE BLACK STEEL SCHEDULE 40 WITH THREADED AND WELDED JOINTS; VERIFY AND COORDINATE EXIST POC IN THE FIELD.
- 21) EXTEND 8" VENT FROM BOILER UP THRU ROOF; PASS THROUGH (E) VENT OPENING FROM (E) WATER HEATER; PROVIDE REQUIRED VENT CAP AND DRAFT COUPLER FOR PROPER VENT OPERATION; FOLLOW BOILER MFR RECOMMENDATIONS FOR PROPER EQUIPMENT VENT INSTALLATION; VENT MATERIAL SHALL BE POLYPROPYLENE, LISTED TO UL636; SUITABLE FOR CONDENSING TYPE; POSITIVE VENT APPLICATION, CATEGORY M; REWORK (E) ROOF OPENING AS REQUIRED AND RE-SEAL TOUR OPENING.

- 22 ANCHOR EXPANSION TANK ET-1 TO CONCRETE PAD.
- 23 (E) 60"x75" COMBUSTION AIR LOUVER TO REMAIN.
- 24 (E) OUTSIDE AIR DUCT UP THRU ROOF TO REMAIN.
- 25 PROVIDE (N) DAMPERS AND ACTUATORS.
- 26 CLEAN ALL (E) UNITS AND FAN ASSEMBLY; REPLACE ALL FILTERS, MOTORS, DRIVE BELTS; (N) MOTORS SHALL BE PREMIUM EFFICIENCY AND SUITABLE FOR VARIABLE SPEED OPERATION; PROVIDE (N) ACTUATORS ON (E) OUTSIDE AIR RETURN DAMPERS AND ADJUST/BALANCE AS REQUIRED TO INDICATED OUTSIDE AIR CMF; CLEAN DUCTS AND PLenum ASSEMBLY AND APPLY DP2510 COATING TO LINER REPAIR AND/OR REPLACE DAMAGED LINER AS REQUIRED.
- 27 PROVIDE VFD FOR ALL SUPPLY AND EXHAUST FANS; VFD SHALL BE ABB (ACH550 SERIES); CONNECT VFD TO BMS.
- 28 PROVIDE 36" CLEARANCE IN FRONT OF VFD.
- 29 PROVIDE 36" MIN. FRONT AND 24" MIN. SIDE SERVICE CLEARANCE FOR BOILER.
- 30 REROUTE WATER HEATER VENT THRU ROOF USING THE (E) VENT FROM GAS-FURNACE TO BE REMOVED; PROVIDE ADAPTER FITTINGS (REDUCER OR INCREASER) AS REQUIRED.
- 31 PROVIDE ANGLE BAR OR CHANNEL STEEL FRAME ASSEMBLY TO SUPPORT VFD OFF THE FLOOR.
- 32 SUPPORT PIPES AND BOILER PUMP INDEPENDENT OF BOILER CONNECTIONS.



1. CONTRACTOR SHALL FIELD VERIFY (E) CONDITIONS PRIOR TO START OF WORK.
2. EQUIPMENT, DUCTS, PIPES, ETC. ARE SHOWN FOR REFERENCE ONLY; CONTRACTOR SHALL VERIFY EXACT LOCATIONS IN THE FIELD.
3. REWORK (E) OPENINGS, SUPPORTS, STRUCTURE, ETC. TO ACCOMMODATE (N) SYSTEM INSTALLATION.
4. REMOVE AND DISPOSE OF ALL (E) EQUIP., DUCTS, & CONTROLS, ETC. (NOT SHOW) THAT ARE NOT BEING USED OR THAT WERE ABANDONED; CONTRACTOR TO VERIFY AND COORDINATE WITH DISTRICT'S REPRESENTATIVE PRIOR TO DEMOLITION.
5. TEMPORARY REMOVE (E) DOORS AND FRAMES TO ACCOMMODATE (N) EQUIP. THROUGH (E) DOOR OPENINGS AND REINSTALL TO ORIGINAL CONDITIONS AS REQUIRED.
6. (E) DUCT SMOKE DETECTORS TO REMAIN.
7. FOLLOW MANUFACTURERS' (BOILER, PUMPS, AHU, HV) RECOMMENDATION FOR PROPER EQUIPMENT INSTALLATION AND OPERATION; PROVIDE ALL REQUIRED ACCESSORIES AND CONTROLS, SENSORS, DEVICES, VALVES, ETC.
8. CLEAN SURFACE AND RETURN DUCTS AND APPLY DP2510 COATING TO LNER; REPAIR AND/OR REPLACE DAMAGED LNER AS REQUIRED.
9. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF SUPPORTS AND ATTACHMENT TO STRUCTURES SIGNED BY STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL.
10. BOILER VENT SHALL BE POLYPROPYLENE, LISTED UNDER ULCS636 FOR CONDENSING TYPE BOILER.

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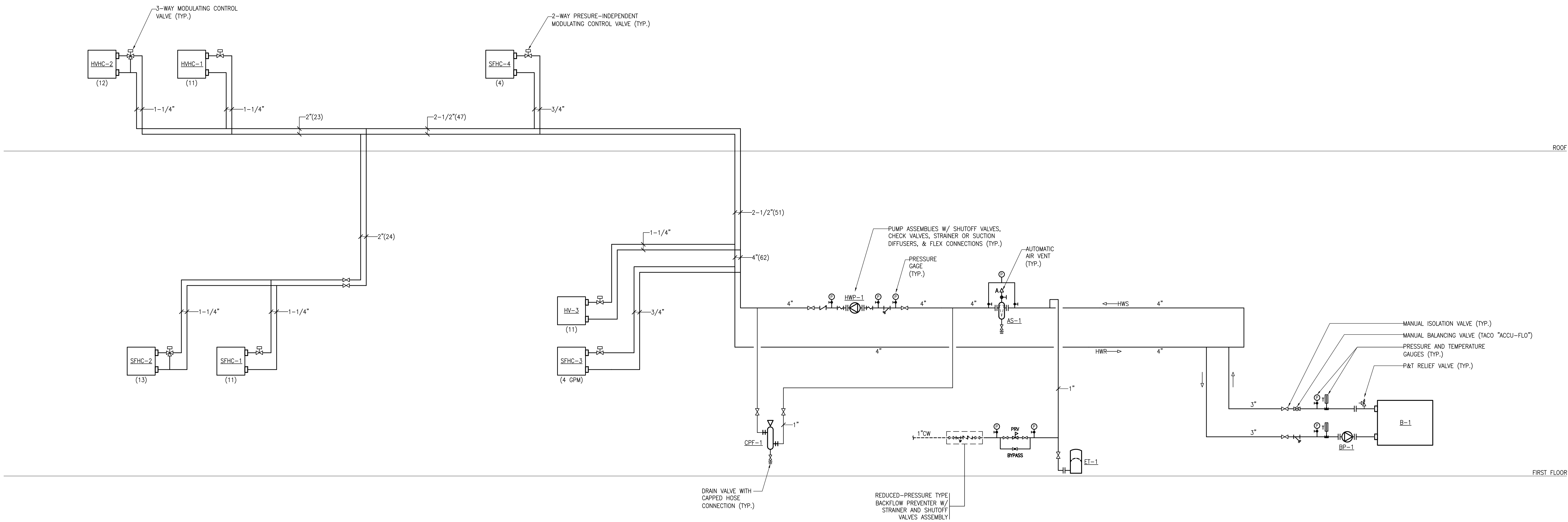


REPLACEMENT AND REPAIR  
OF HEAT VENT UNITS  
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3620 W 132nd ST.,  
TORRANCE, CA 90504

TORRANCE UNIFIED SCHOOL DISTRICT  
2335 PLAZA DEL AMO  
TORRANCE, CALIFORNIA 90501

BUILDING F  
MECHANICAL ROOM  
ENLARGED PLANS

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PROJECT	16016
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HHW PIPE RISER  
SCHEMATIC DIAGRAMS

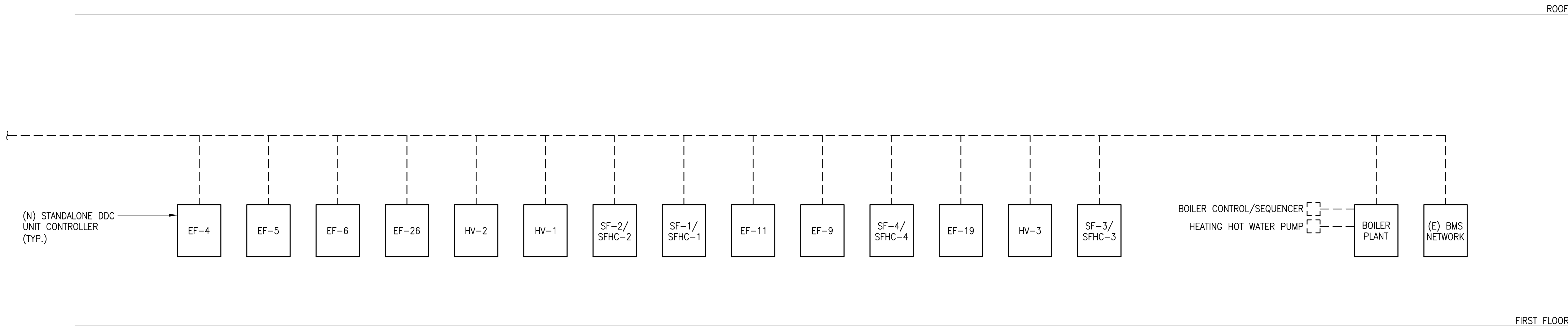
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SCOPE OF WORK	
1.	CONTRACTOR SHALL INSTALL, PROGRAM AND COMMISSION ALL DISTRICT FURNISHED CONTROLLERS, SENSORS, AND OTHER DEVICES; CONNECT AND INTERFACE ALL CONTROLLERS TO EXISTING BUILDING CONTROL NETWORK.
2.	CONTRACTOR SHALL PROVIDE ALL CONTROL WIRING AND CONDUITS, BETWEEN EQUIPMENT, CONTROLLERS, SENSORS AND OTHER DEVICES, AS REQUIRED FOR PROPER SYSTEM OPERATION, BOTH LINE VOLTAGE AND LOW VOLTAGE.
3.	DISTRICT SHALL FURNISH ALL CONTROLLERS, ACTUATORS, SENSORS, TRANSFORMERS AND OTHER DEVICES.

GENERAL NOTES	
1.	CONTROL POINTS AND SCHEMATIC ARE NOT COMPLETE, DIAGRAMMATIC AND FOR REFERENCE ONLY. CONTRACTOR SHALL INCLUDE ALL REQUIRED CONTROL POINTS AND DEVICES FOR SAFE AND PROPER SYSTEM OPERATION.
2.	ALL AIR CONDITIONING UNIT, EQUIPMENT AND OTHER DEVICES SHALL BE WIRED FOR IN ACCORDANCE TO MANUFACTURER RECOMMENDATIONS.
3.	ALL BMS LOW VOLTAGE WIRING, INCLUDING FINAL CONNECTIONS TO CONTROL DEVICES AND EQUIPMENT, SHALL BE AS INDICATED ON THE MECHANICAL DRAWINGS OR SPECIFIED IN THE MECHANICAL SECTIONS OF THE SPECIFICATIONS. ALL LOW VOLTAGE WIRING SHALL BE INSTALLED IN CONDUIT, UNLESS OTHERWISE PERMITTED TO RUN IN PLENUM IN CONCEALED SPACES WHICH REQUIRES THAT WIRING SHALL BE PLENUM RATED. THE BMS LOW VOLTAGE WIRING SHALL BE PART OF THE TEMPERATURE CONTROL WORK. VERIFY WITH DISTRICT'S REPRESENTATIVE.
4.	ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH 2013 CALIFORNIA ELECTRICAL CODE, 2013 CALIFORNIA MECHANICAL CODE, 2013 CALIFORNIA BUILDING CODE AND ALL APPLICABLE CODES AND REGULATIONS OF ALL GOVERNING BODIES HAVING JURISDICTION.
5.	CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF ALL EXISTING EQUIPMENT IN THE FIELD.
6.	CONTRACTOR SHALL REFER TO EQUIPMENT MANUFACTURER RECOMMENDATION FOR PROPER CONTROL WIRING REQUIREMENTS AND INSTALLATION. CONTRACTOR SHALL CONTACT AND COORDINATE WITH EXISTING EQUIPMENT MANUFACTURER'S REPRESENTATIVE.
7.	UNLESS INDICATED OTHERWISE, PROVIDE ALL ACCESSORY CONTROL DEVICES SUCH AS TIME CLOCKS, CONTROL TRANSFORMERS, TRANSMITTERS, SENSORS AND RELAYS IN LOCATION AS NOTED ON PLANS OR LOCATION SHALL BE IN ACCORDANCE WITH CODES AND REQUIREMENTS.
8.	PROVIDE ALL NECESSARY HARDWARE AND SOFTWARE INCLUDING, BUT NOT LIMITED TO, CONTACTS, SENSORS, DEVICES, INSTRUMENTATIONS, WIRING AD CONDUITS TO ACCOMPLISH THE FOLLOWING CONTROL AND CONTROL SEQUENCE FOR THE HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS, UNLESS OTHERWISE NOTED ON THE DRAWINGS AND SPECIFIED ELSEWHERE.
9.	ALL EQUIPMENT AND DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SHALL COMPLY WITH ABOVE MENTIONED CODES.
10.	CONTROL DIAGRAM IS DIAGRAMMATIC AND SHALL NOT REPRESENTS THE NUMBER OF WIRES, DEVICES AND CONTROL POINTS; WIRING CONFIGURATION SHALL BE PER BMS/DDC MANUFACTURER'S RECOMMENDATION.
11.	CONTRACTOR SHALL VERIFY THAT ALL EXISTING EQPT AND DEVICES TO BE CONTROLLED AND MONITORED ARE WORKING AND IN PROPER CONDITION. INFORM THE DISTRICT'S REPRESENTATIVE IF THERE ARE ANY DEVICES THAT ARE FOUND TO BE NOT IN GOOD CONDITION OR NOT WORKING.
12.	CONTRACTOR SHALL FIELD VERIFY THE EXISTING BUILDING SYSTEM CONDITION AND VERIFY THE ACTUAL NUMBER OF EXISTING HVAC EQUIPMENT AND DEVICES TO BE PROVIDED WITH CONTROLS AND/OR CONNECTED TO BMS PRIOR TO START OF WORK.
13.	ALL CONTROL SETPOINTS SHALL BE ADJUSTABLE.
14.	CONTROLS SHALL BE DIRECT DIGITAL CONTROL (DDC), UNLESS OTHERWISE NOTES. ACTUATORS FOR VALVES, DAMPERS AND TERMINAL CONTROLLERS SHALL BE ELECTRIC/ELECTRONIC CONTROL. ALL FAN OPERATIONS (STATUS) SHALL BE MONITORED AND ALARMED BY CENTRAL CONTROL STATION.
15.	ALL FANS AND PUMPS STATUS SHALL BE MONITORED BY THE CORRESPONDING CURRENT SENSORS OR DIFFERENTIAL PRESSURE TRANSMITTERS AS INDICATED.
16.	PROVIDE TIME DELAY PROGRAM FOR ALL FAN AND PUMP MOTORS AND EQUIPMENT THAT SHALL BE BROUGHT ONLINE ONE AT A TIME TO PREVENT POWER SURGE.
17.	ALL MOTORIZED ACTUATORS, VFD AND SIMILAR DEVICES LOCATED OUTDOORS SHALL BE RATED FOR OUTDOOR APPLICATION OR ENCLOSED/PROTECTED WITH WEATHER-PROOF COVER.
18.	REMOVE ALL ABANDONED CONTROLS, WIRING AND DEVICES THAT WILL NOT BE REUSED.

ABBREVIATIONS AND LEGEND			
AHU	AIR HANDLING UNIT		CONTACT
ADJ	ADJUSTABLE		CURRENT TRANSMITTER
AI	ANALOG INPUT		CARBON DIOXIDE SENSOR/TRANSMITTER
AO	ANALOG OUTPUT		DIFFERENTIAL PRESSURE SENSOR/TRANSMITTER
AV	ANALOG VALUE		EQUIPMENT TAG
B	BOILER		FAN
BI	BINARY INPUT		FLOW MEASUREMENT
BO	BINARY OUTPUT		HUMIDITY SENSOR/TRANSMITTER
BV	BINARY VALUE		MOTOR/ACTUATOR
CC	COOLING COIL		SMOKE DETECTOR, DUCT
CH	CHILLER		STATIC PRESSURE SENSOR/TRANSMITTER
CHWP	CHILLED WATER PUMP		TEMPERATURE SENSOR, THERMOSTAT
CHWR	CHILLED WATER RETURN		
CHWS	CHILLED WATER SUPPLY		
CO2	CARBON DIOXIDE		
CT	CURRENT TRANSMITTER		
DI	DIGITAL INPUT		
DO	DIGITAL OUTPUT		
DV	DIGITAL VALUE		
EA	EXHAUST AIR		
EF	EXHAUST FAN		
F	FAHRENHEIT		
FCU	FAN COIL UNIT		
FM	FLOW MEASURING STATION/SENSOR		
FS	FLOW SWITCH/SENSOR		
H	HUMIDITY		
HC	HEATING COIL		
HWP	HEATING HOT WATER PUMP		
HWR	HEATING HOT WATER RETURN		
HWS	HEATING HOT WATER SUPPLY		
M	MOTOR		
OA	OUTSIDE AIR		
RA	RETURN AIR		
SD	SMOKE DETECTOR, DUCT		
SP	STATIC PRESSURE		
T	TEMPERATURE SENSOR / THERMOSTAT		
VAV	VARIABLE AIR VOLUME TERMINAL UNIT		
VFD	VARIABLE FREQUENCY DRIVE		



OVERALL SYSTEM ARCHITECTURE

DESCRIPTION		BY
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REV		

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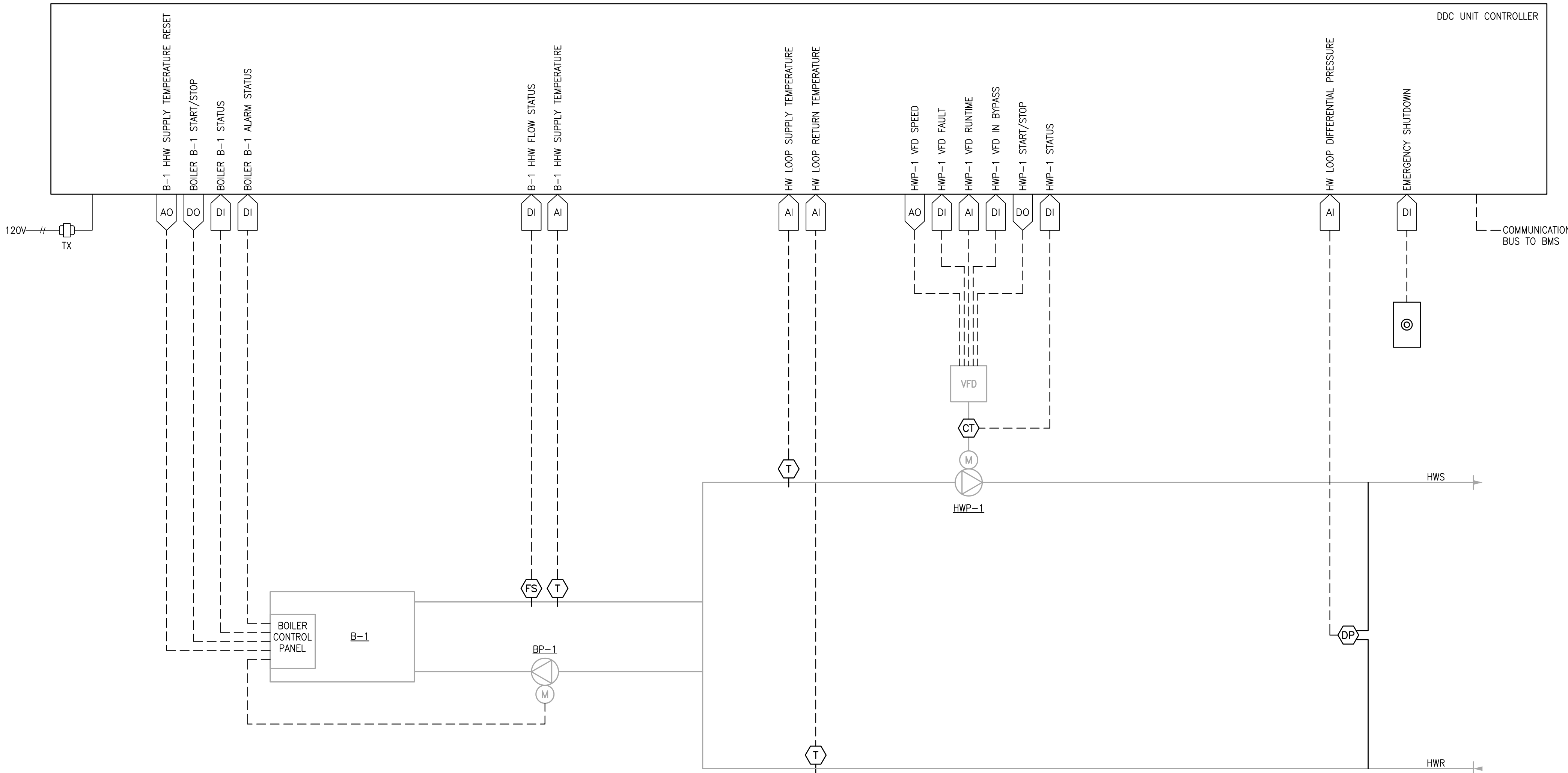
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LEGEND, NOTES, AND  
OVERALL SYSTEM ARCHITECTURE

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HHW SYSTEM SEQUENCE OF OPERATION	
A. BOILER SYSTEM — RUN CONDITIONS:	
1. THE BOILER SYSTEM SHALL BE ENABLED TO RUN WHENEVER A DEFINABLE NUMBER OF HOT WATER COILS NEED HEATING AND OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).	
2. TO PREVENT SHORT CYCLING, BOILERS SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.	
3. BOILERS SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.	
4. THE BOILER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJ.).	
B. BOILER SAFETIES:	
1. THE FOLLOWING SAFETIES SHALL BE MONITORED:	
a. BOILER ALARM.	
b. WATER FLOW.	
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:	
a. BOILER ALARM.	
b. NO WATER FLOW ALARM.	
D. HOT WATER PUMP:	
1. THE HOT WATER PUMP SHALL RUN ANYTIME THE BOILER IS CALLED TO RUN AND SHALL HAVE A USER DEFINABLE DELAY (ADJ.) ON STOP.	
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:	
a. HOT WATER PUMP FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.	
b. HOT WATER PUMP RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.	
c. HOT WATER PUMP RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.	
d. VFD FAULT	
E. BOILER OPERATION:	
1. BOILER SHALL OPERATE BASED ON ITS OWN CONTROL SEQUENCE MAINTAINING HOT WATER SUPPLY TEMPERATURE SETPOINT.	
3. ALARMS SHALL BE PROVIDED FOR BOILER AS FOLLOWS:	
a. BOILERS B-1	
a.1 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.	
a.2 RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.	
a.3 RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.	
F. HOT WATER SUPPLY TEMPERATURE SETPOINT RESET:	
1. THE DESIGN HEATING HOT WATER TEMPERATURE IS 180F-150F (ADJ.).	
2. THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON HEATING REQUIREMENTS	
3. AS THE BUILDING HOT WATER VALVES OPEN BEYOND A USER DEFINABLE THRESHOLD (90% OPEN, TYP.), THE SETPOINT SHALL RESET TO A HIGHER VALUE (ADJ.). ONCE THE HOT WATER COILS ARE SATISFIED (VALVES CLOSING) THEN THE SETPOINT SHALL GRADUALLY LOWER OVER TIME TO REDUCE HEATING ENERGY USED.	
G. HOT WATER TEMPERATURE MONITORING:	
1. THE FOLLOWING TEMPERATURES SHALL BE MONITORED:	
a. LOOP HOT WATER SUPPLY.	
b. LOOP HOT WATER RETURN.	
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:	
a. HIGH LOOP HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).	
b. LOW LOOP HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).	
H. BOILERS HOT WATER TEMPERATURE MONITORING:	
1. THE FOLLOWING TEMPERATURES SHALL BE MONITORED:	
a. BOILER HOT WATER SUPPLY.	
b. BOILER HOT WATER RETURN.	
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:	
a. HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).	
I. HOT WATER DIFFERENTIAL PRESSURE CONTROL:	
1. THE CONTROLLER SHALL MEASURE HOT WATER DIFFERENTIAL PRESSURE AND MODULATE THE HOT WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS HOT WATER DIFFERENTIAL PRESSURE SETPOINT.	
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:	
• HIGH HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT.	
• LOW HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.	

I/O POINTLIST											
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS						
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	SHOW ON GRAPHIC	
LOOP HOT WATER RETURN TEMP	X							X		X	
BOILER B-1 HOT WATER SUPPLY TEMP	X							X		X	
LOOP HOT WATER SUPPLY TEMP SETPOINT RESET		X						X		X	
BOILER B-1 ALARM STATUS			X					X	X	X	
BOILER B-1 NO WATER FLOW			X					X	X	X	
HOT WATER PUMP HWP-1 STATUS			X					X		X	
BOILER B-1 STATUS			X					X		X	
HOT WATER PUMP HWP-1 START/STOP				X				X	X	X	
BOILERS ENABLE				X					X	X	
OUTSIDE AIR TEMP					X					X	
HOT WATER PUMP HWP-1 FAILURE									X		
HOT WATER PUMP HWP-1 RUNNING IN HAND									X		
HOT WATER PUMP HWP-1 RUNTIME EXCEEDED									X		
BOILER B-1 FAILURE									X		
BOILER B-1 RUNNING IN HAND									X		
BOILER B-1 RUNTIME EXCEEDED									X		
HIGH HOT WATER SUPPLY TEMP									X		
LOW HOT WATER SUPPLY TEMP									X		
BOILER B-1 HIGH HOT WATER SUPPLY TEMP									X		
BOILER B-1 LOW HOT WATER SUPPLY TEMP									X		



HEATING HOT WATER CONTROL DIAGRAM

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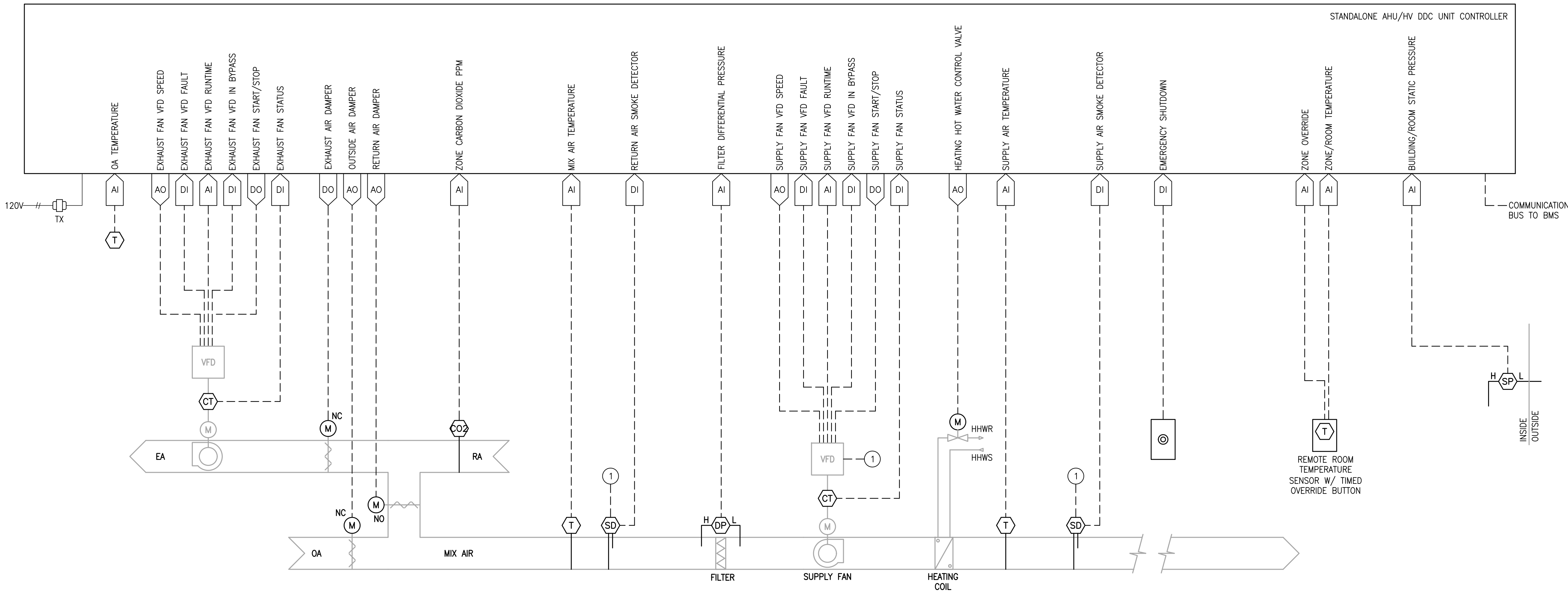
HEATING HOT WATER  
CONTROL DIAGRAMS AND  
SEQUENCE OF OPERATION

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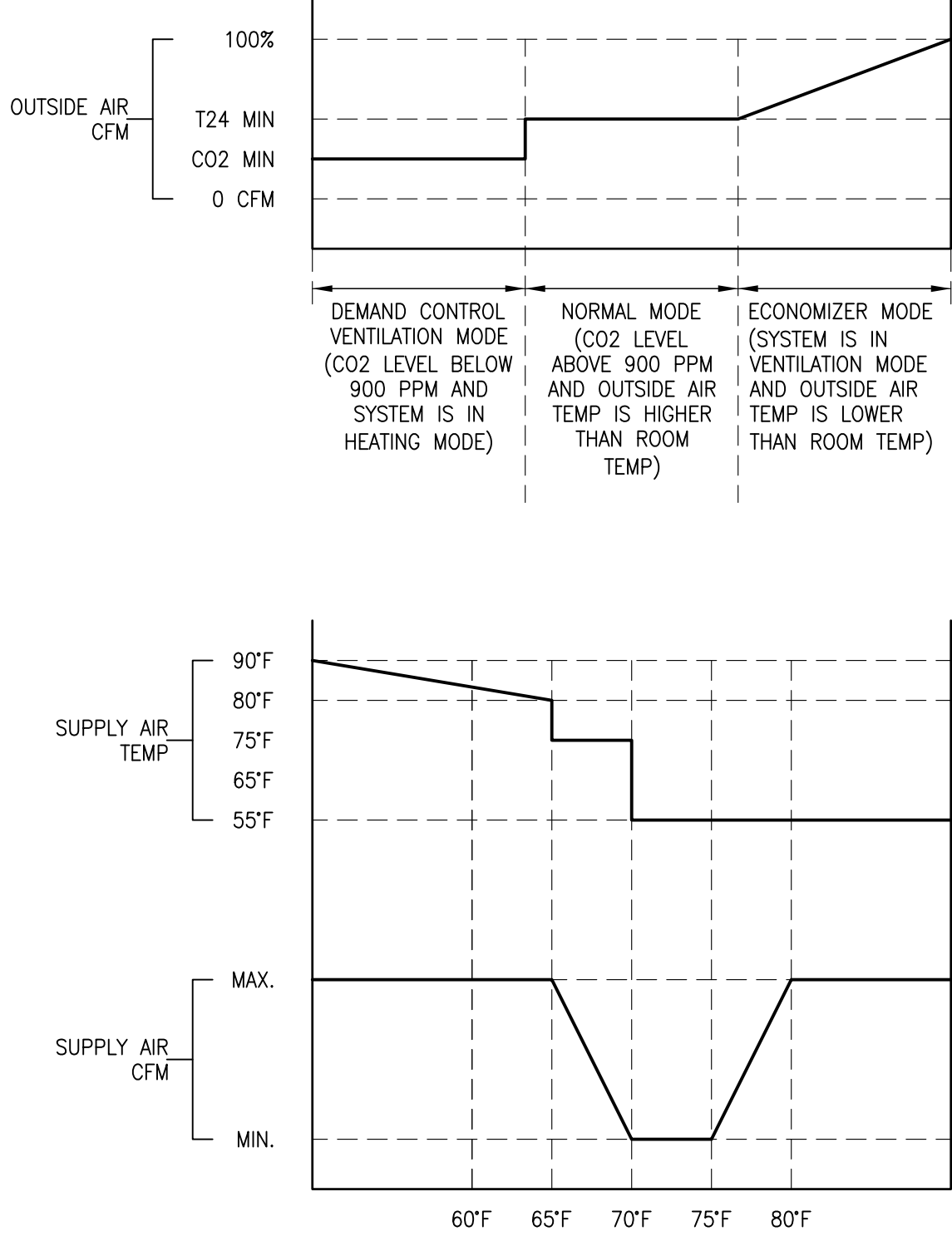


VAV HEATING-VENTILATING SEQUENCE OF OPERATION		
<p>1. <b>RUN CONDITIONS – SCHEDULED:</b> THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:</p> <p>A. OCCUPIED MODE: THE UNIT SHALL MAINTAIN</p> <ul style="list-style-type: none"><li>• A 74°F (ADJ.) COOLING SETPOINT</li><li>• A 70°F (ADJ.) HEATING SETPOINT.</li></ul> <p>B. UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN</p> <ul style="list-style-type: none"><li>• A 85°F (ADJ.) COOLING SETPOINT.</li><li>• A 55°F (ADJ.) HEATING SETPOINT.</li></ul> <p>C. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).</li><li>• LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).</li></ul> <p>2. <b>ZONE SETPOINT ADJUST:</b> THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.</p> <p>3. <b>ZONE OPTIMAL START:</b> THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START-UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.</p> <p>4. <b>ZONE UNOCCUPIED OVERRIDE:</b> A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.</p> <p>5. <b>EMERGENCY SHUTDOWN:</b> THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.</p> <p>6. <b>SUPPLY AIR SMOKE DETECTION:</b> THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SUPPLY AIR SMOKE DETECTOR STATUS.</p> <p>7. <b>SUPPLY FAN:</b></p> <p>A. THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.</p> <p>B. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.</li><li>• SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.</li><li>• SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).</li></ul> <p>8. <b>ZONE TEMPERATURE CONTROL:</b> THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND SHALL MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN ZONE TEMPERATURE SETPOINT. THE FAN SPEED SHALL INCREASE AS THE ZONE TEMPERATURE RISES ABOVE COOLING SETPOINT, OR AS THE ZONE TEMPERATURE DROPS BELOW HEATING SETPOINT. THE SUPPLY FAN VFD SPEED SHALL NOT DROP BELOW 30% (ADJ.).</p> <p>9. <b>HEATING COIL VALVE:</b></p> <p>A. THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.</p> <p>B. THE HEATING SHALL BE ENABLED WHENEVER:</p> <ul style="list-style-type: none"><li>• OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).</li></ul>	<ul style="list-style-type: none"><li>• AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.</li><li>• AND THE SUPPLY FAN STATUS IS ON.</li><li>• AND THE COOLING IS NOT ACTIVE.</li></ul> <p>10. <b>ECONOMIZER:</b></p> <p>A. THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2°F LESS THAN THE ZONE COOLING SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN WHENEVER OCCUPIED.</p> <p>B. THE ECONOMIZER SHALL BE ENABLED WHENEVER:</p> <ul style="list-style-type: none"><li>• OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).</li><li>• AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE ROOM/ZONE AIR TEMPERATURE.</li><li>• AND THE SUPPLY FAN STATUS IS ON.</li></ul> <p>C. THE ECONOMIZER SHALL CLOSE WHENEVER:</p> <ul style="list-style-type: none"><li>• MIXED AIR TEMPERATURE DROPS FROM 45°F TO 40°F (ADJ.).</li><li>• OR ON LOSS OF SUPPLY FAN STATUS.</li><li>• OR THE FREEZESTAT (IF PRESENT) IS ON.</li></ul> <p>D. THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START UP IS AVAILABLE, THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED.</p> <p>11. <b>MINIMUM OUTSIDE AIR VENTILATION – CARBON DIOXIDE (CO2) CONTROL:</b> WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 LEVELS AND MODULATE THE OUTSIDE AIR DAMPERS OPEN ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A CO2 SETPOINT OF 900 PPM (ADJ.).</p> <p>A. OUTSIDE AIR DAMPER SHALL HAVE TWO MINIMUM POSITIONS – NORMAL MODE AND DCV/CO2 MODE. CONTRACTOR SHALL BALANCE THE AIR SYSTEM AND DETERMINE THE DAMPER POSITION FOR EACH MINIMUM SETPOINTS.</p> <p>B. UPON RISE OF RETURN AIR CO2 LEVEL TO 900 PPM, SUPPLY FAN SHALL RAMP UP TO MAXIMUM CFM W/ OUTSIDE AIR DAMPER POSITION AT MINIMUM DCV/CO2 MODE.</p> <p>C. FURTHER RISE OF RETURN AIR CO2 LEVEL TO 950 PPM, OUTSIDE AIR DAMPER SHALL MODULATE OPEN TO NORMAL MODE (MINIMUM T24 POSITION.).</p> <p>D. UPON DROP OF RETURN AIR CO2 LEVEL TO 700 PPM, OUTSIDE AIR DAMPER SHALL MODULATE CLOSE TO DCV/CO2 MODE.</p> <p>E. FURTHER DROP OF RETURN AIR CO2 LEVEL TO 600 PPM, SUPPLY FAN SHALL MODULATE TO MAINTAIN ZONE TEMPERATURE.</p> <p>12. <b>MIXED AIR TEMPERATURE:</b></p> <p>A. THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT).</p> <p>B. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).</li><li>• LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).</li></ul> <p>13. <b>RETURN AIR CARBON DIOXIDE (CO2) CONCENTRATION MONITORING:</b></p> <p>A. THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 LEVELS.</p> <p>B. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION: IF THE RETURN AIR CO2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE OCCUPIED MODE.</li></ul>	<p>14. <b>RETURN AIR TEMPERATURE:</b></p> <p>A. THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT).</p> <p>B. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).</li><li>• LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).</li></ul> <p>15. <b>SUPPLY AIR TEMPERATURE:</b></p> <p>A. THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.</p> <p>B. ALARMS SHALL BE PROVIDED AS FOLLOWS:</p> <ul style="list-style-type: none"><li>• HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).</li><li>• LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).</li></ul> <p>16. <b>EXHAUST FAN:</b> EXHAUST FAN SHALL OPERATE TOGETHER WITH CORRESPONDING SUPPLY FAN OR HEATING VENTILATING UNIT. EXHAUST FAN SHALL MODULATE SPEED TO MAINTAIN ROOM STATIC DIFFERENTIAL PRESSURE. REFER TO SEPARATE EXHAUST FAN SEQUENCE OF OPERATION.</p>

I/O POINTLIST											
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS				SHOW ON GRAPHIC		
	AI	AO	DI	DO	AV	DV	SCHED	TREND			
SCHEDULE							X				
ZONE TEMP	X							X		X	
ZONE SETPOINT ADJUST	X									X	
BUILDING STATIC PRESSURE	X							X		X	
SUPPLY AIR TEMP	X							X		X	
MIXED AIR TEMP	X							X		X	
RETURN AIR CARBON DIOXIDE PPM	X							X		X	
SUPPLY FAN VFD SPEED		X						X		X	
HEATING VALVE		X						X		X	
RETURN AIR DAMPER		X						X		X	
OUTSIDE AIR DAMPER		X						X		X	
EXHAUST AIR DAMPER				X				X		X	
ZONE OVERRIDE		X						X		X	
SUPPLY AIR SMOKE DETECTOR		X						X	X	X	
SUPPLY FAN VFD FAULT		X						X		X	
SUPPLY FAN STATUS			X					X		X	
SUPPLY FAN START/STOP			X					X		X	
EXHAUST FAN VFD FAULT		X							X	X	
EXHAUST FAN STATUS			X					X		X	
EXHAUST FAN START/STOP				X				X		X	
ECONOMIZER ZONE TEMP SETPOINT					X			X		X	
RETURN AIR CARBON DIOXIDE PPM SETPOINT					X			X		X	
SUPPLY AIR TEMP SETPOINT					X			X		X	
HEATING MIXED AIR TEMP SETPOINT					X			X		X	
OUTSIDE AIR TEMP SETPOINT					X			X		X	
EMERGENCY SHUTDOWN						X			X	X	
SUPPLY FAN FAILURE									X		
SUPPLY FAN IN HAND									X		
SUPPLY FAN RUNTIME EXCEEDED									X		
HIGH BUILDING STATIC PRESSURE									X		
HIGH ZONE TEMP									X		
LOW ZONE TEMP									X		
HIGH SUPPLY AIR TEMP									X		
LOW SUPPLY AIR TEMP									X		
HIGH MIXED AIR TEMP									X		
LOW MIXED AIR TEMP									X		
HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION									X		



CONTROL DIAGRAM  
SF-1/EF-9, SF-2/EF-11, SF-3/EF-19



① DUCT SMOKE DETECTOR (IF AVAILABLE):  
CONNECT TO FIRE ALARM SYSTEM; CONTRACTOR  
SHALL DETERMINE EXACT REQUIREMENTS BASED  
ON FIRE ALARM SYSTEM; SHUTDOWN SIGNAL  
FROM FULL COVERAGE SMOKE DETECTION SYSTEM  
CAN BE USED IN LIEU OF DUCT SMOKE  
DETECTOR.

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REPLACEMENT AND REPAIR  
OF HEAT VENT UNITS  
BLDG F  
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TORRANCE UNIFIED SCHOOL DISTRICT  
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HEATING-VENTILATING UNIT  
AND EXHAUST FAN CONTROL  
DIAGRAMS AND  
SEQUENCE OF OPERATION

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- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE SUPPLY FAN STATUS IS ON.
- AND THE COOLING IS NOT ACTIVE.

10. ECONOMIZER:

- A. THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2°F LESS THAN THE ZONE COOLING SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN WHENEVER OCCUPIED.
- B. THE ECONOMIZER SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
  - AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE ROOM/ZONE AIR TEMPERATURE.
  - AND THE SUPPLY FAN STATUS IS ON.
- C. THE ECONOMIZER SHALL CLOSE WHENEVER:
- MIXED AIR TEMPERATURE DROPS FROM 45°F TO 40°F (ADJ.).
  - OR ON LOSS OF SUPPLY FAN STATUS.
  - OR THE FREEZE/STAB (IF PRESENT) IS ON.
- D. THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START UP IS AVAILABLE, THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED.

11. MINIMUM OUTSIDE AIR VENTILATION – CARBON DIOXIDE (CO2) CONTROL:  
WHEN IN THE OCCUPIED MODE, THE CONTRACTOR SHALL MEASURE THE RETURN AIR CO2 LEVELS AND MODULATE THE OUTSIDE AIR DAMPERS, OPEN ON RISING CO2 CONCENTRATIONS, MAINTAINING NORMAL DAMPER OPERATION TO MAINTAIN A CO2 SETPOINT OF 900 PPM (Adj.).
- A. OUTSIDE AIR DAMPER SHALL HAVE TWO MINIMUM POSITIONS – NORMAL MODE AND DOV/CO2 MODE. CONTRACTOR SHALL BALANCE THE AIR SYSTEM AND DETERMINE THE DAMPER POSITION FOR EACH MINIMUM SETPOINTS.
- B. UPON RISE OF RETURN AIR CO2 LEVEL TO 900 PPM, SUPPLY FAN SHALL RAMP UP TO MAXIMUM CFM AND OUTSIDE AIR DAMPER POSITION AT MINIMUM DOV/CO2 MODE.
- C. FURTHER RISE OF RETURN AIR CO2 LEVEL TO 850 PPM, OUTSIDE AIR DAMPER SHALL MODULATE OPEN TO NORMAL MODE (MINIMUM T24 POSITION).
- D. UPON DROP OF RETURN AIR CO2 LEVEL TO 700 PPM, OUTSIDE AIR DAMPER SHALL MODULATE CLOSE TO DOV/CO2 MODE.
- E. FURTHER DROP OF RETURN AIR CO2 LEVEL TO 600 PPM, SUPPLY FAN SHALL MODULATE TO MAINTAIN ZONE TEMPERATURE.

12. MIXED AIR TEMPERATURE:

- A. THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT).
- B. ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).
  - LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

13. RETURN AIR CARBON DIOXIDE (CO2) CONCENTRATION MONITORING:

- A. THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 LEVELS.
- B. ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION: IF THE RETURN AIR CO2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE OCCUPIED MODE.

- 14.
- RETURN AIR TEMPERATURE:

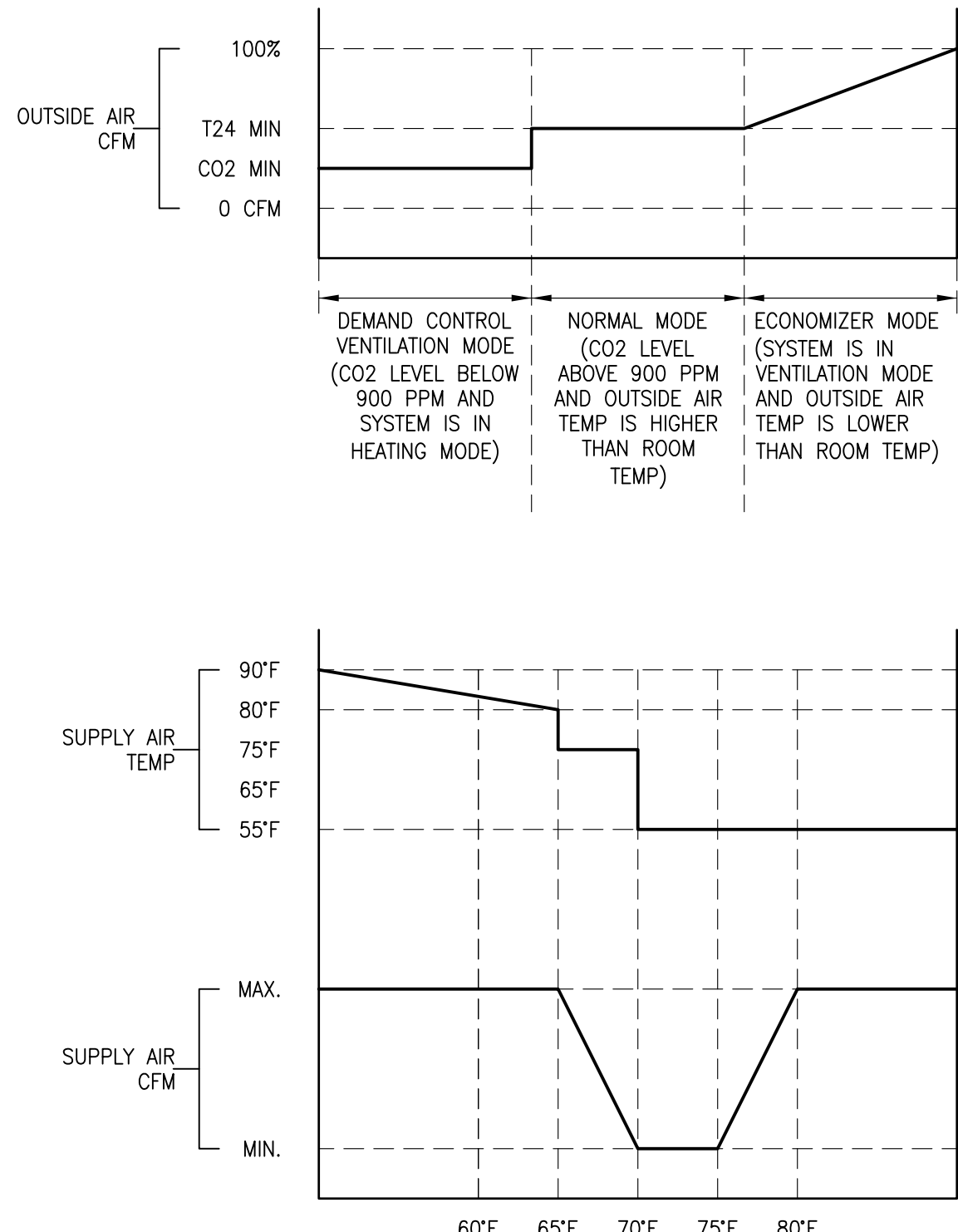
- A. THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT).
- B. ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).
  - LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

15. SUPPLY AIR TEMPERATURE:

- A. THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.
- B. ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
  - LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

16. EXHAUST FAN:

EXHAUST FAN SHALL OPERATE TOGETHER WITH CORRESPONDING SUPPLY FAN OR HEATING VENTILATING UNIT. EXHAUST FAN SHALL MODULATE SPEED TO MAINTAIN ROOM STATIC DIFFERENTIAL PRESSURE. REFER TO SEPARATE EXHAUST FAN SEQUENCE OF OPERATION.

[illegible]

1 DUCT SMOKE DETECTOR (IF AVAILABLE);  
CONNECT TO FIRE ALARM SYSTEM; CONTRACTOR  
SHALL DETERMINE EXACT REQUIREMENTS BASED  
ON FIRE ALARM SYSTEM; SHUTDOWN SIGNAL  
FROM FULL COVERAGE SMOKE DETECTION SYSTEM  
CAN BE USED IN LIEU OF DUCT SMOKE  
DETECTOR.

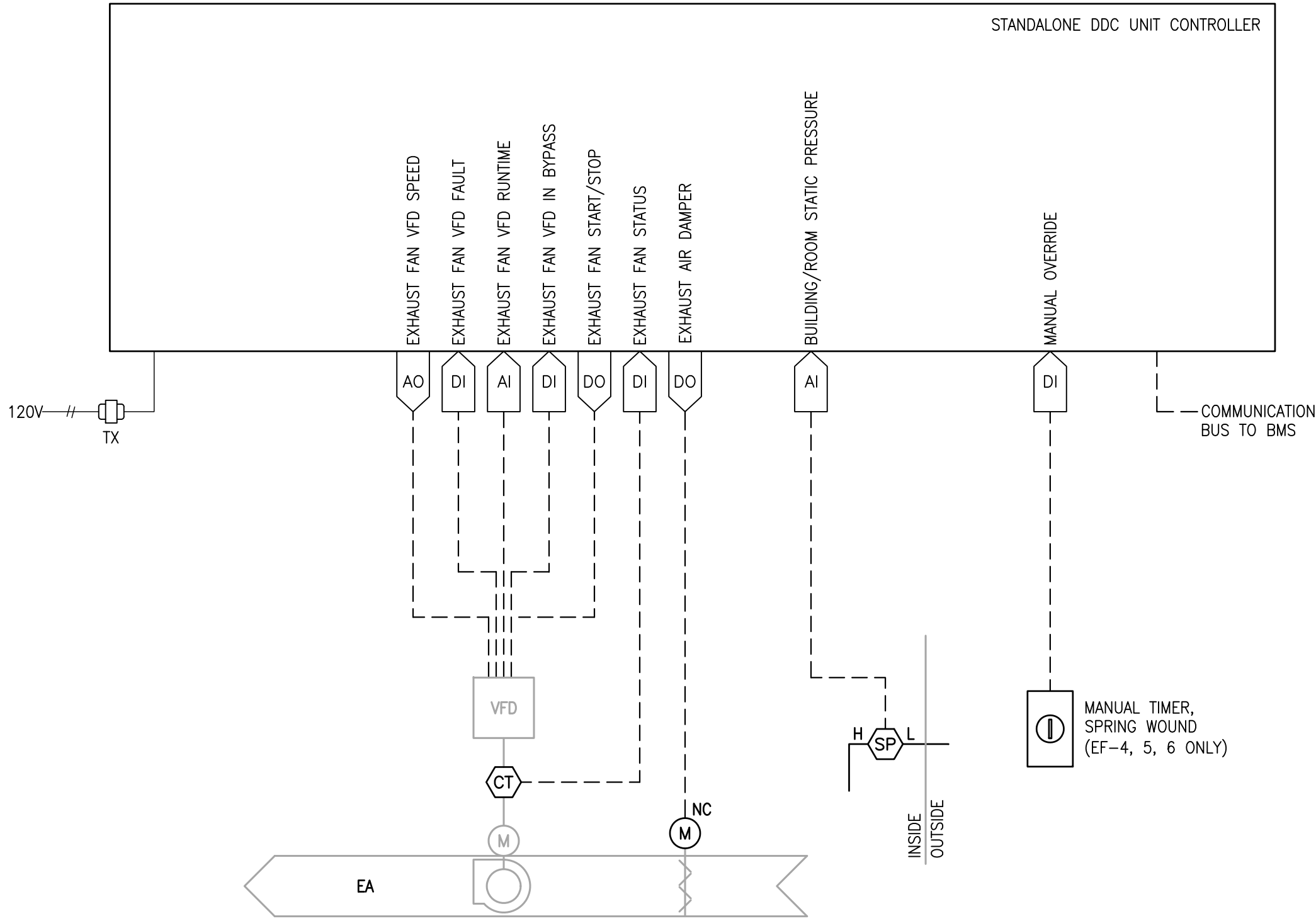
NOTES:

1. INTERLOCK HV-3 ECONOMIZER MODE WITH (E) EF-15.
2. INTERLOCK HV-3 WITH OTHER (E) EXHAUST FANS IN PREP ROOM (EF-13, 14, 17, 21).

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EXHAUST FAN SEQUENCE OF OPERATION					
1. <u>RUN CONDITIONS – SCHEDULED:</u> THE FAN SHALL RUN ACCORDING TO A USER DEFINABLE SCHEDULE.					
2. <u>FAN:</u> THE FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.					
3. <u>RUN CONDITIONS</u> THE EXHAUST FAN SHALL BE INTERLOCKED TO RUN WHENEVER CORRESPONDING AHU, HV OR SUPPLY FAN RUNS, UNLESS SHUTDOWN ON SAFETIES.					
4. <u>BUILDING STATIC PRESSURE CONTROL</u>  A. THE EXHAUST DAMPER SHALL OPEN AND THE EXHAUST FAN SHALL RUN WHEN COMMANDED ON. B. THE CONTROLLER SHALL MEASURE BUILDING STATIC PRESSURE AND MODULATE THE EXHAUST FAN VFD SPEED TO MAINTAIN A BUILDING STATIC PRESSURE SETPOINT OF 0.05IN H2O (ADJ.). THE EXHAUST FAN VFD SPEED SHALL NOT DROP BELOW 20% (ADJ.).					
5. <u>FAN STATUS:</u>  A. THE CONTROLLER SHALL MONITOR THE FAN STATUS. B. ALARMS SHALL BE PROVIDED AS FOLLOWS: a. FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. b. FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. c. FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).					

I/O POINTLIST										
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS					SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	
BUILDING STATIC PRESSURE	X							X		X
FAN VFD SPEED		X						X		X
FAN VFD FAULT			X						X	X
FAN STATUS			X					X		X
FAN START/STOP				X				X		X
BUILDING STATIC PRESSURE SETPOINT					X			X		X
HIGH BUILDING STATIC PRESSURE									X	
LOW BUILDING STATIC PRESSURE									X	
FAN FAILURE									X	
FAN IN HAND									X	
FAN RUNTIME EXCEEDED									X	



CONTROL DIAGRAM  
EF-4, 5, 6, 9, 11, 19, 26

- NOTES:
- INTERLOCK BOTH EF-9 AND EF-10 W/ SF-1.
  - INTERLOCK BOTH EF-5 AND EF-6 W/ HV-1. EF-5 AND EF-6 SHALL MODULATE UP AND DOWN AT SAME SPEED.
  - EF-4, 5, 6: ACTIVATION OF MANUAL TIMER SWITCH SHALL INCREASE THE ROOM STATIC PRESSURE SETPOINT TO 0.10 IN H2O (ADJ.) TO INCREASE ROOM VENTILATION RATE.

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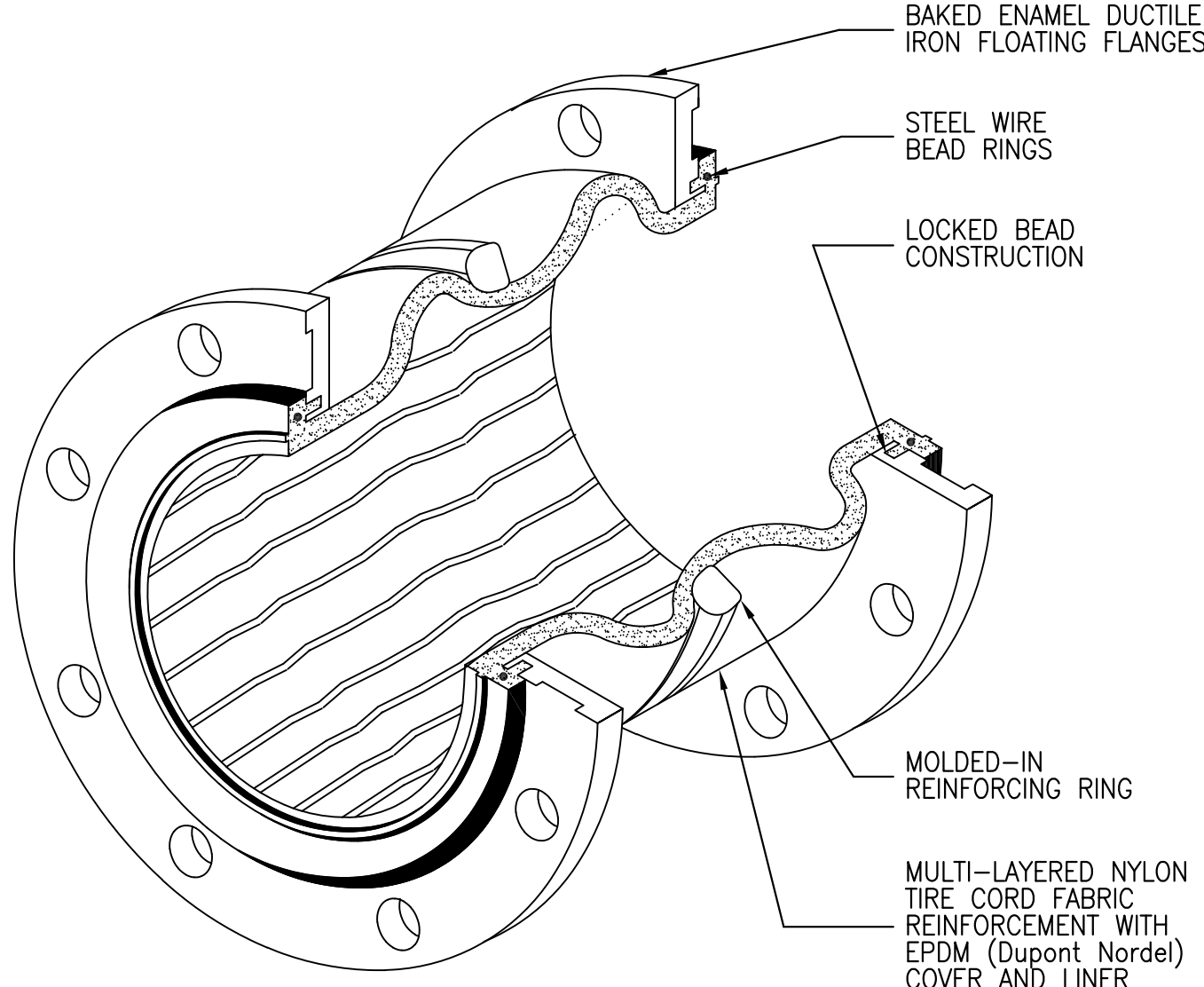
REPLACEMENT AND REPAIR  
OF HEAT VENT UNITS  
BLDG F  
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TORRANCE, CALIFORNIA 90501

EXHAUST FAN CONTROL  
DIAGRAMS AND  
SEQUENCE OF OPERATION

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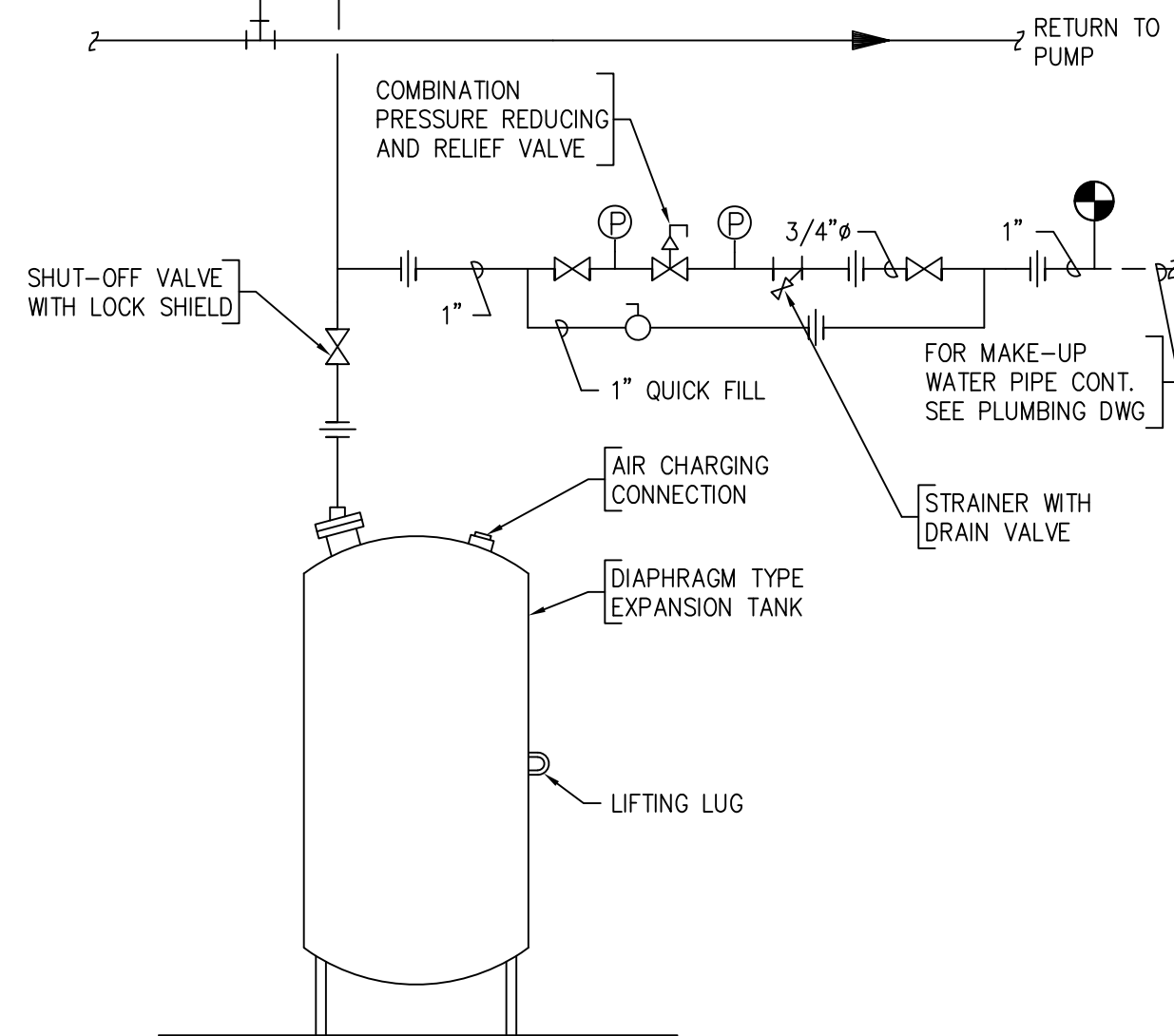




FLEXIBLE PIPE CONNECTOR

SCALE  
NTS

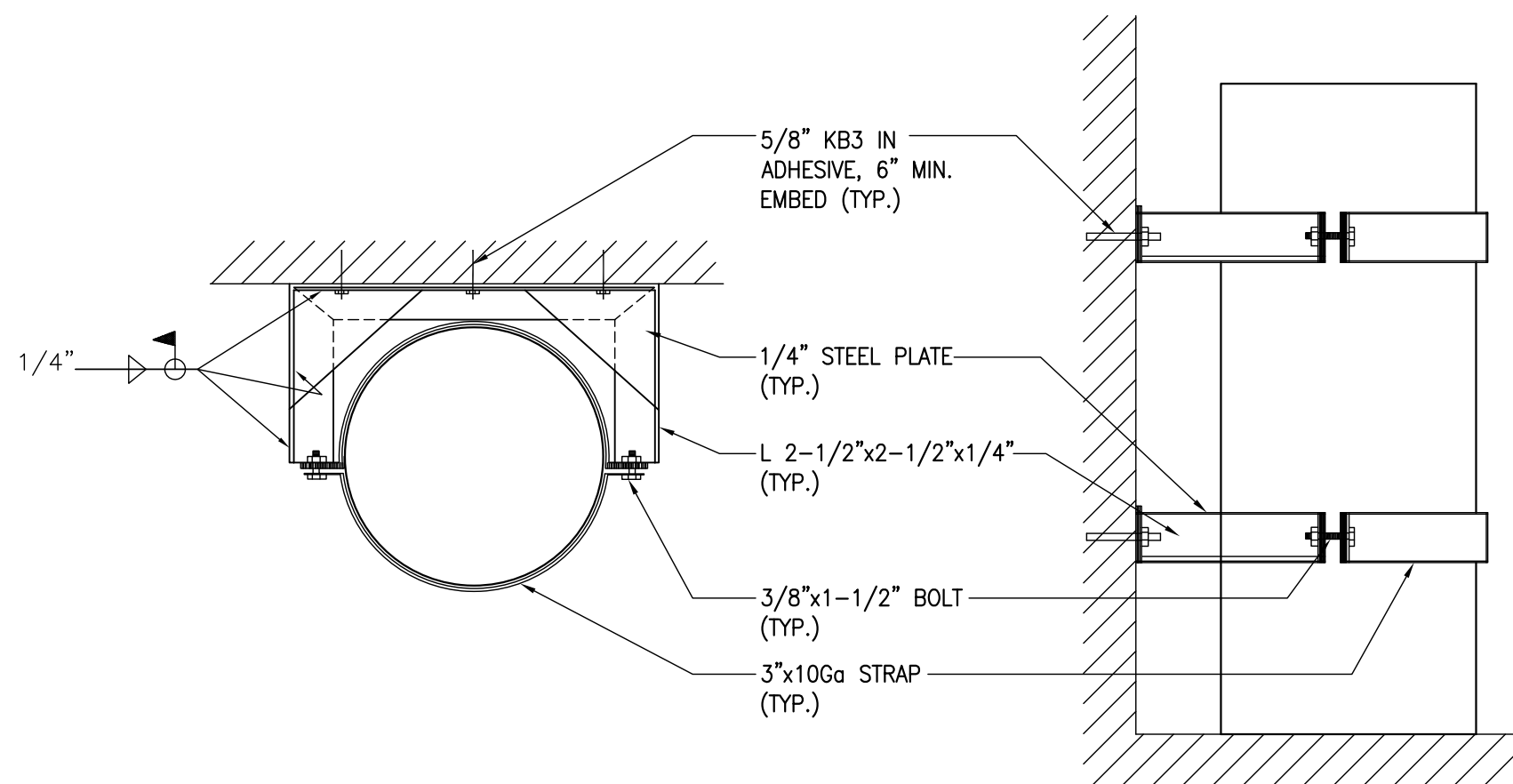
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EXPANSION TANK DETAIL

SCALE  
NTS

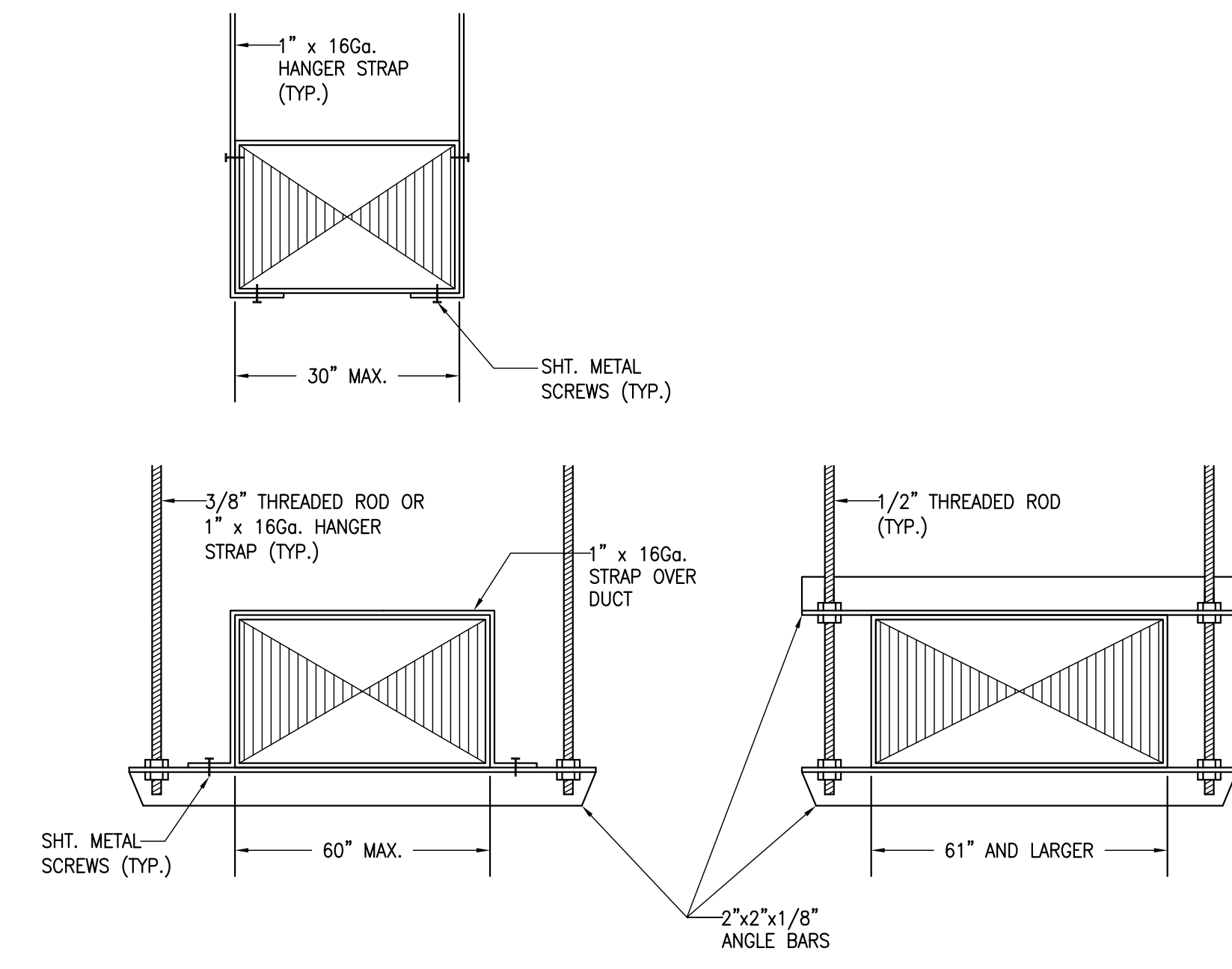
9



VERTICAL EXPANSION TANK RESTRAINTS

SCALE  
NTS

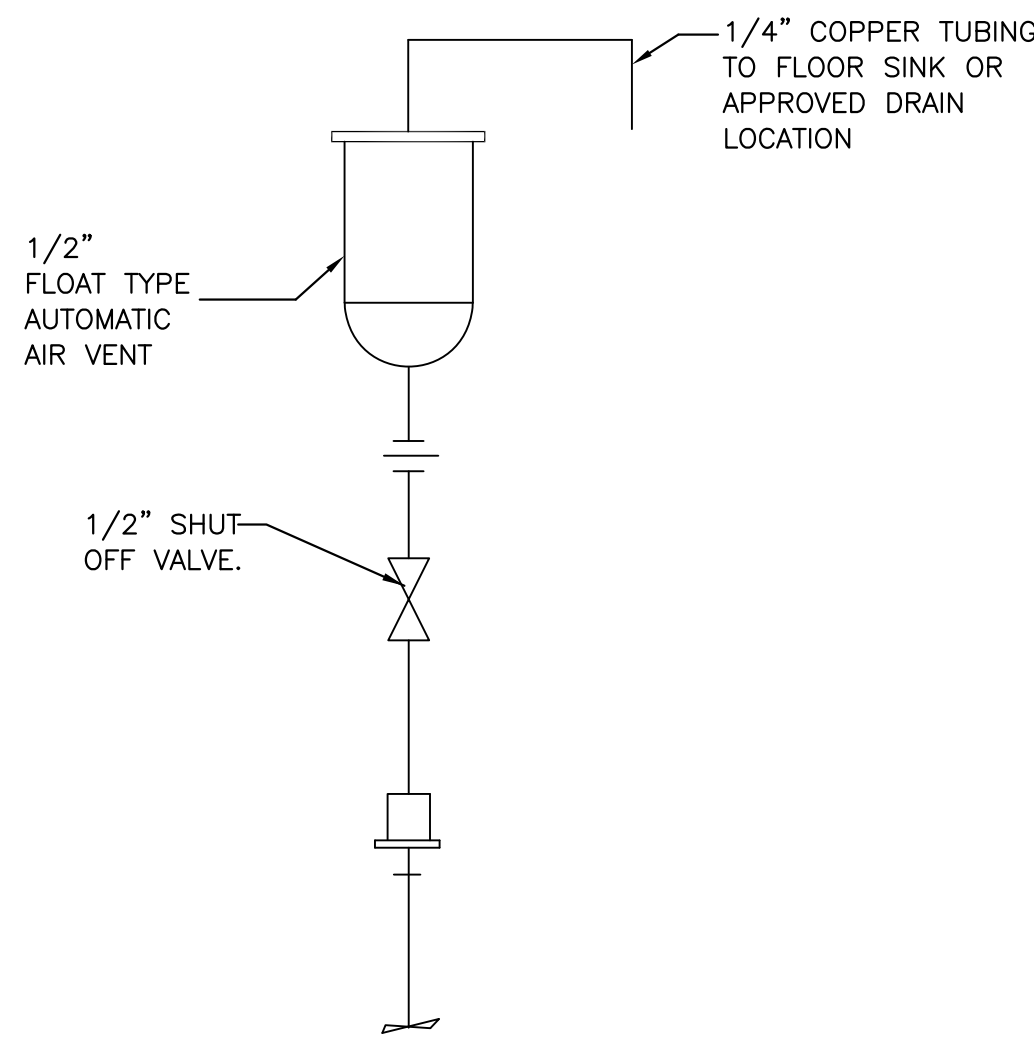
6



MINIMUM HANGER SIZE FOR RECTANGULAR DUCT

SCALE  
NTS

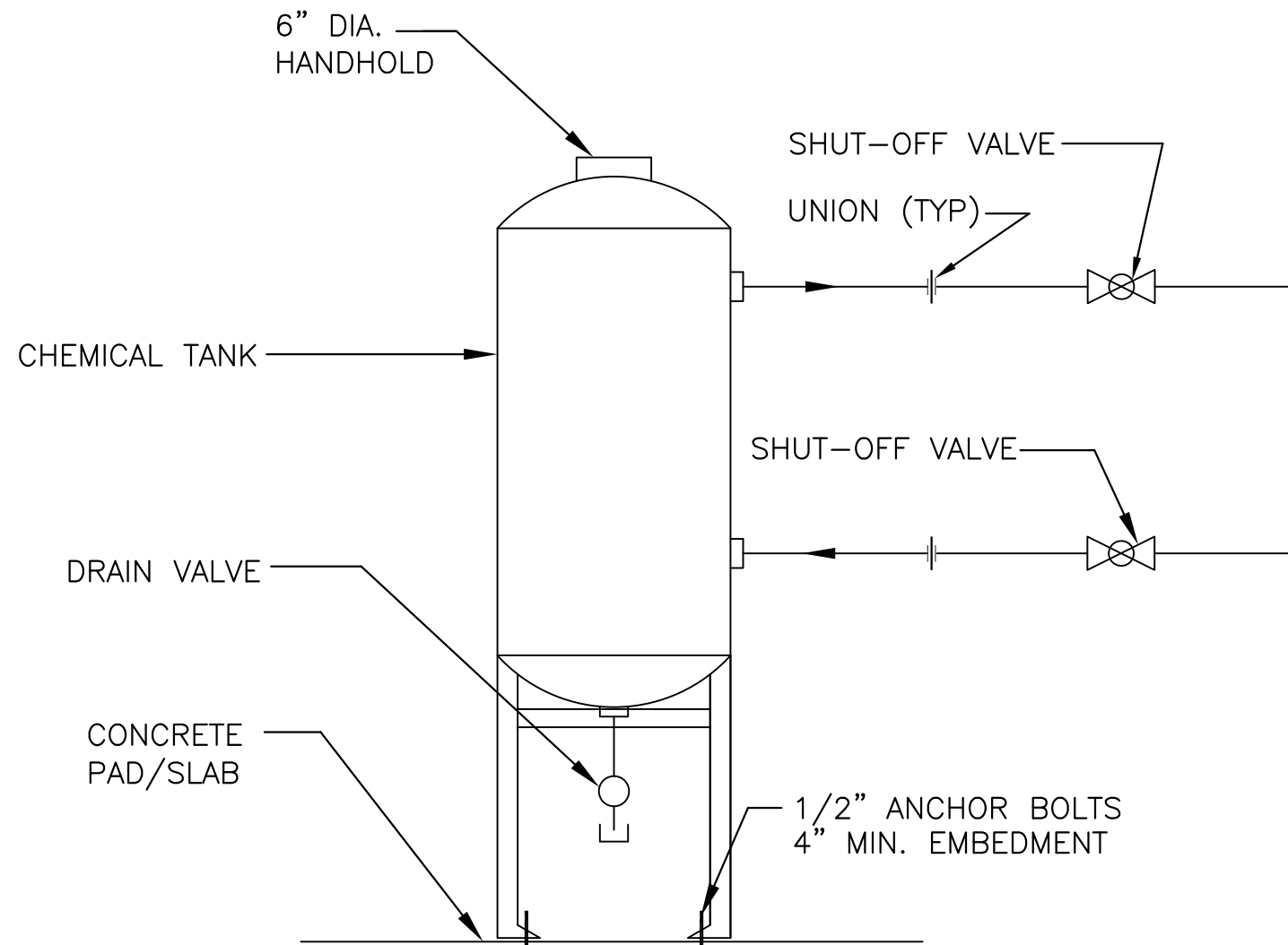
3



AUTOMATIC AIR VENT ASSEMBLY

SCALE  
NTS

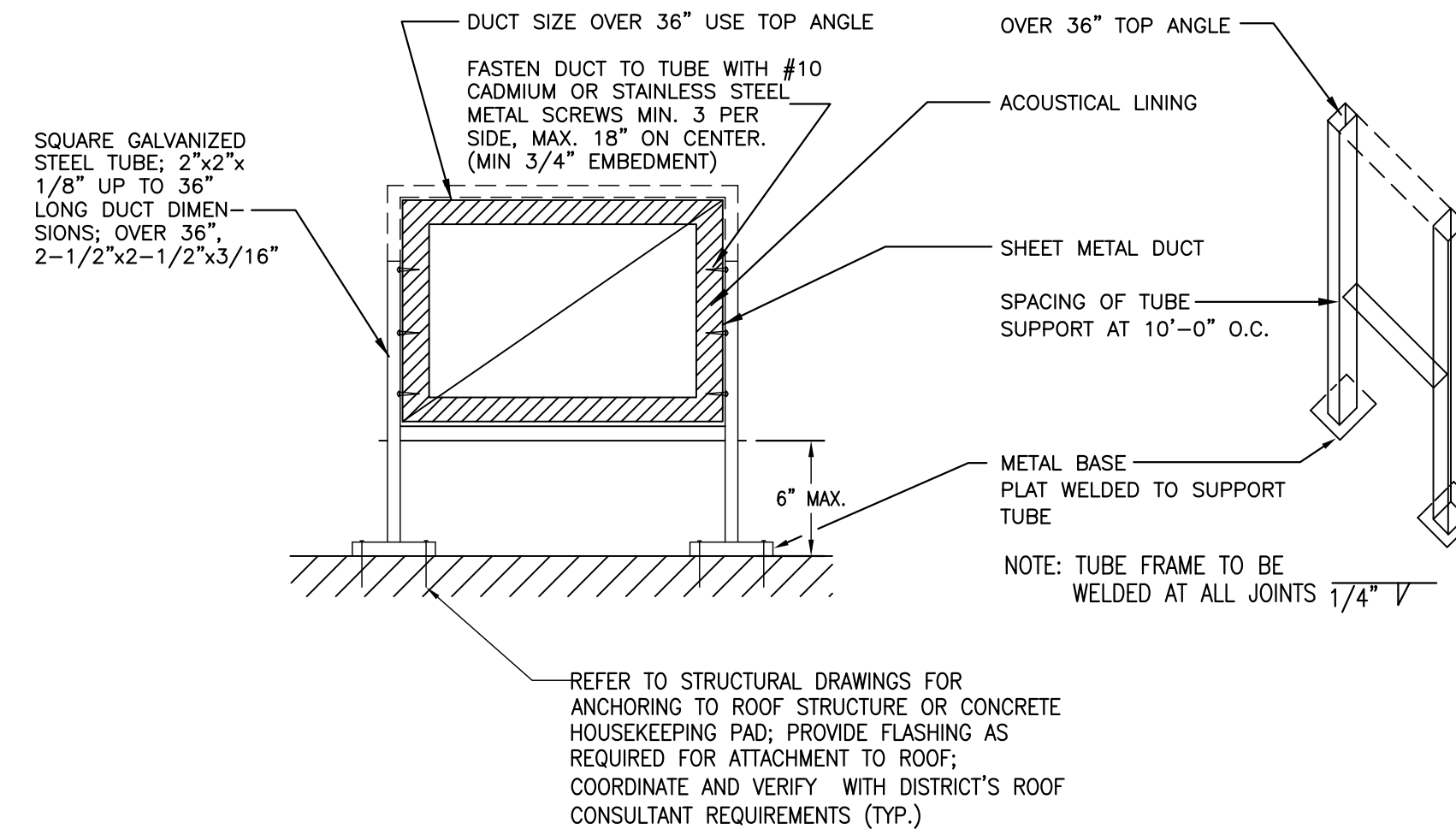
11



CHEMICAL POT FEEDER

SCALE  
NTS

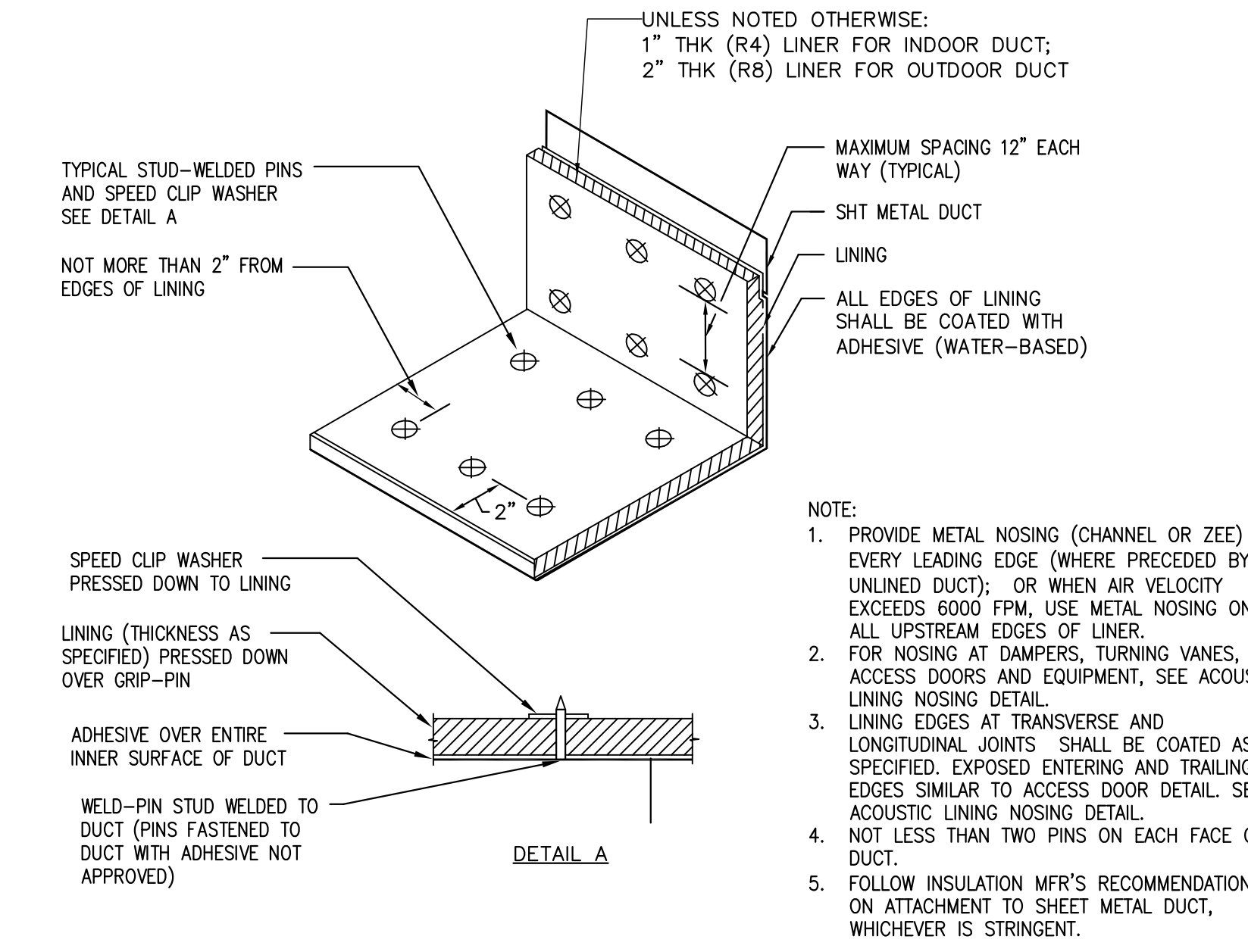
8



DUCT SUPPORT STAND

SCALE  
NTS

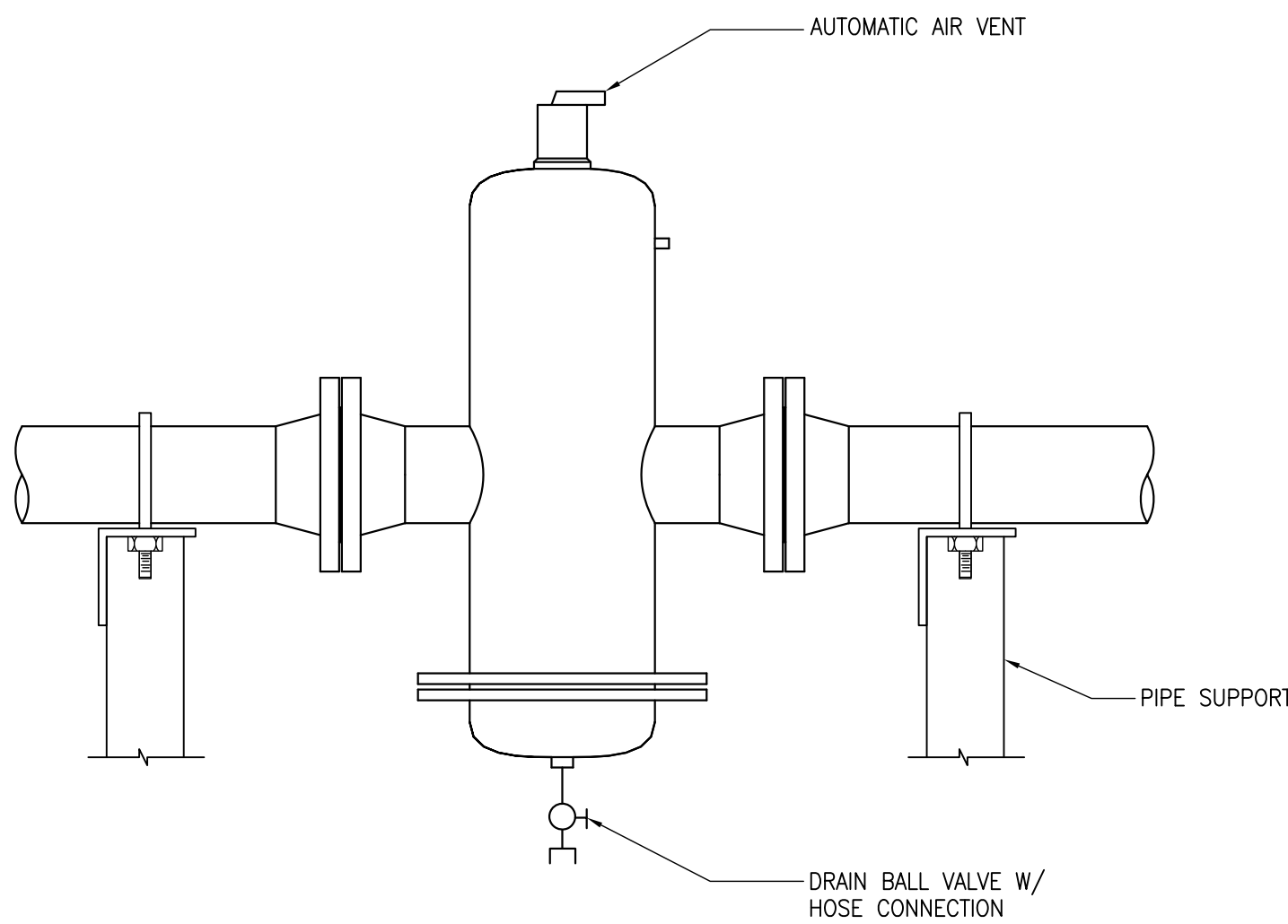
5



DUCT LINER

SCALE  
NTS

2

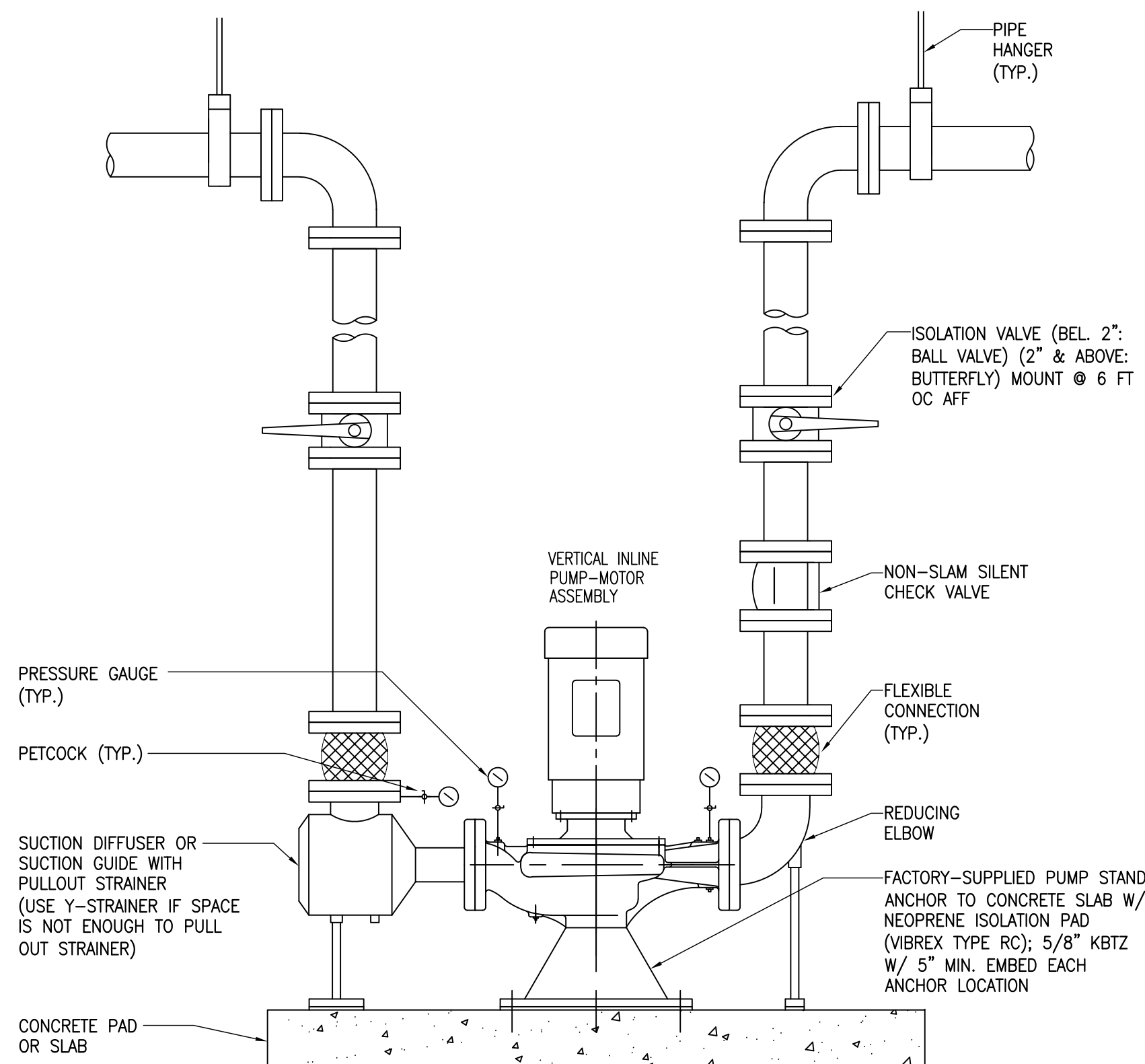


- NOTES:
- UNIT SHALL BE MOUNTED IN A STRAIGHT RUN OF HORIZONTAL PIPING IN A PERFECTLY UPRIGHT POSITION TO ALLOW THE VENT TO OPERATE FREELY.
  - THE PIPING NORMALLY SUPPORTS THE WEIGHT OF THE SPIROVENT UNITS UP TO AND INCLUDING 12" SUPPORT LESS RECOMMENDED FOR UNITS 14" AND LARGER. VERIFY WITH MANUFACTURER FOR EXACT REQUIREMENTS.
  - STRAIGHT RUN OF PIPES BEFORE AND AFTER THE UNIT ARE NOT REQUIRED.
  - DO NOT PIPE MAKE-UP WATER LINE NEAR THE VENT HEAD ASSEMBLY AS IT WILL IMPEDE PROPER OPERATION.
  - PROVIDE MANUFACTURER'S REQUIRED BOTTOM CLEARANCE FOR HEAD AND MEDIUM REMOVABLE.

COMBINATION AIR/DIRT SEPARATOR

SCALE  
NTS

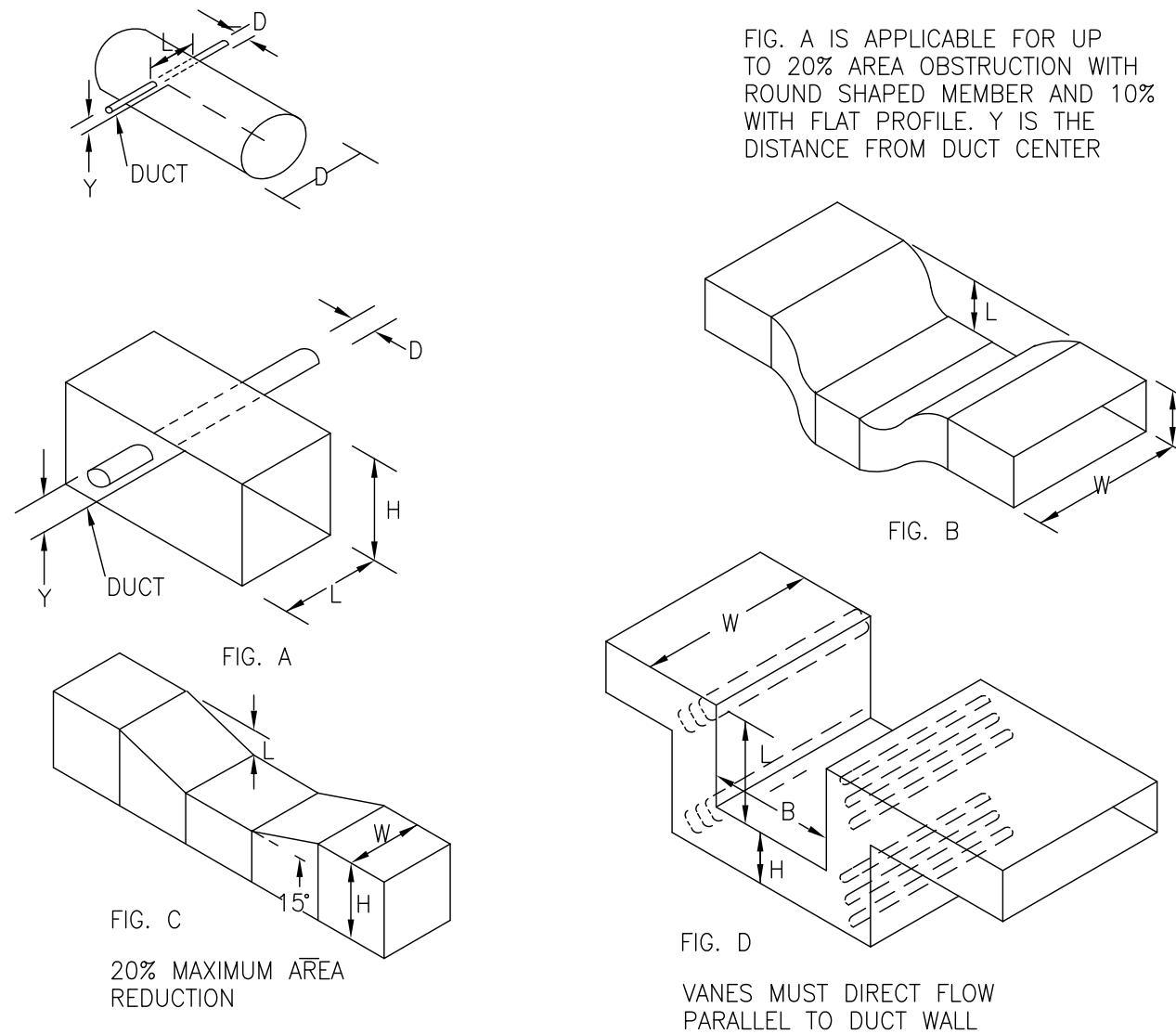
10



VERTICAL INLINE PUMP DETAIL

SCALE  
NTS

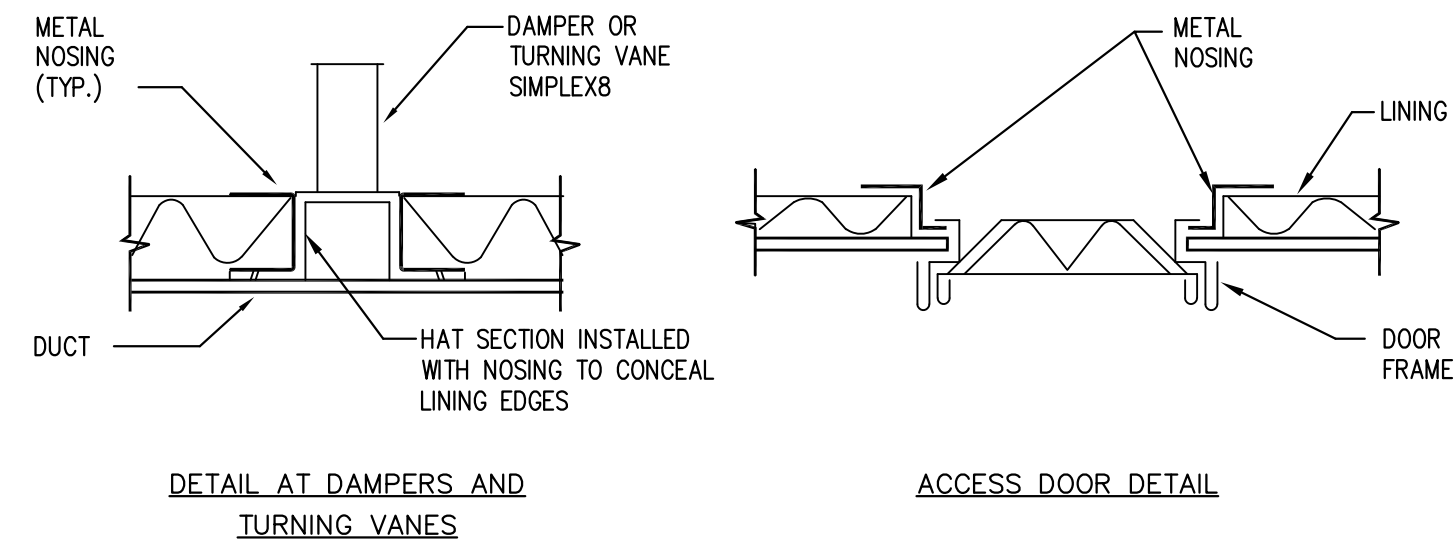
7



DUCT OBSTRUCTION OFFSET DETAIL

SCALE  
NTS

4



ACOUSTIC LINING NOSING DETAIL

SCALE  
NTS

1

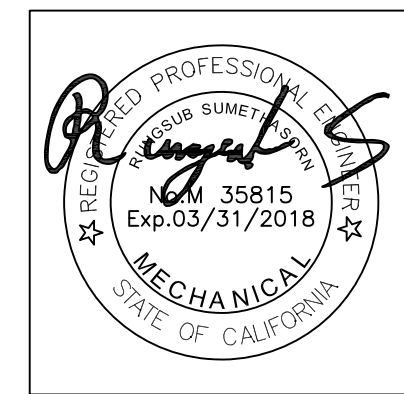
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			MECHANICAL ROOM 123 SECTION – HV-3/SF-3	SCALE NTS	3
			VFD STAND ON CONCRETE PAD	SCALE NTS	4
			BOILER MOUNTING ON CONCRETE PAD	SCALE NTS	1

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CHECKED	XX
SHEET	M7.3



## ELECTRICAL NOTES

NOTE: THIS DOCUMENT FORMS A PART OF THE SPECIFICATIONS AND SHALL BE CONSIDERED THE SAME AS IF ATTACHED THERETO.

- IT IS THE INTENT OF THESE PLANS AND SPECIFICATIONS THAT A COMPLETE AND WORKABLE STAND BY EMERGENCY SYSTEM INSTALLATION BE PROVIDED FOR THE EQUIPMENT DESCRIBED OR SHOWN AS BEING IN THIS CONTRACT. FURNISHING LABORS AND MATERIALS FOR THE ABOVE DESCRIBED EQUIPMENT SHALL BE PROVIDED AS A FASHION COMPLYING WITH ALL APPLICABLE CODES, INCLUDING ITEMS REQUIRED BUT NOT NECESSARILY SHOWN, SUCH AS COUPLINGS, HANGERS, BRACKETS, CLAMPS, BOXES, CONNECTORS, AND HARDWARE.
2. BEFORE SUBMITTING THE BID PROPOSAL, VISIT THE JOB SITE AND FULLY ACQUAINT WITH THE JOB CONDITIONS, VERIFY EXISTING FIELD CONDITIONS, ELECTRICAL SERVICE REQUIREMENT, INCLUDING NECESSARY PULL BOXES, SIZE AND NUMBER OF CONDUITS AND CONDUCTORS, PANELS, DISCONNECT SWITCHES, CABLES ETC., WHETHER SHOWN ON DRAWING OR NOT, AND PROVIDE FOR PROVIDING A COMPLETE AND OPERABLE FIRE ALARM SYSTEM, WITHOUT ADDITIONAL COST TO THE DISTRICT.
3. EXAMINE ALL CONTRACT DOCUMENTS AND VERIFY ALL DIMENSIONS AND CONDITIONS, SUCH AS CABINETS, BEAMS, FURRING, DROD SWINGS, DUCTS, PIPES, CEILINGS AND BRING ANY DISCREPANCIES TO THE ATTENTION OF THE DISTRICT PRIOR TO COMMENCING, ANY WORK-DEVICES, CONTROLS, SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATING, SERVICING, AND REPAIRING.
4. THE DRAWINGS ARE DIAGRAMATIC IN NATURE AND INDICATE THE LOCATION OF DEVICES AND EQUIPMENT AND THE APPROXIMATE DIRECTION OF FLOW OF CURRENT AND LAYOUT OF PROPOSED EQUIPMENT, AND THOUGH NOT NECESSARILY INDICATING THE ACTUAL DIMENSIONS, THE DRAWINGS SHALL BE FOLLOWED AS CLOSELY AS PROPER COORDINATION WITH THE EXISTING FIELD CONDITIONS AND SPACE WILL PERMIT. SIMPLY INSTALLATION WHEREVER THE DRAWINGS SUBMITTAL DOES NOT SHOW, BUT FOR TECHNICAL REASONS, THE DRAWINGS DO NOT SHOW NECESSARY OFFSETS, BENDS, PULL BOXES AND OBSTRUCTIONS, THE DRAWINGS ARE NOT INTENDED TO BE COORDINATE AND THE CONTRACTOR SHALL REFER TO THE GENERAL CONSTRUCTION DRAWINGS FOR DIMENSIONS. FIELD CONDITIONS WITH EXISTING CONDITIONS.
5. ARRANGE FOR INSPECTION WITH DISTRICT TESTS IN CONNECTION THEREWITH, COMPLY WITH CODES. BEFORE THE WORK IS ACCEPTED, PRESENT TO THE DISTRICT SIGNIFICANT CERTIFICATE OF FINAL INSPECTION.
6. THE ELECTRICAL MECHANICAL WORK SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE PREVAILING LATEST CALIFORNIA ELECTRICAL CODE, REGULATION AND ORDINANCES, AND AUTHORITIES HAVING JURISDICTION.
7. ERECT AND MAINTAIN SUITABLE BARRIERS, PROTECTIVE DEVICES, LIGHTS AND WARNING SIGNS WHERE REQUIRED FOR THE PROTECTION OF THE PUBLIC AND EMPLOYEES.
8. UNLESS OTHERWISE SHOWN OR SPECIFIED, CONDUIT SHALL BE CONCEALED IN WALLS OR ABOVE FINISHED CEILING, WHERE ACCESSIBLE TO THE UNFINISHED AREA, AND LAID OUT OF UNFINISHED SERVICE AREAS.
9. A CONCEALED CONDUIT SHALL BE RUN IN AS DIRECT A LINE AS POSSIBLE. BENDS SHALL BE OF LONG SWEEP TYPE
10. EXPOSED CONDUIT SHALL BE RUN PARALLEL TO, OR AT RIGHT ANGLES WITH THE LINES OF THE BUILDING BEND SHALL BE FREE FROM DENTS OR FLATTENING, CONDUIT SHALL BE SUPPORTED AND SECURELY FASTENED.
11. CONDUIT SHALL BE SUBMITTED TO THE DISTRICT SYSTEMS ENGINEER FOR APPROVAL. PULLING OF CONDUIT SHALL BE INSTALLED ENTIRELY FREE FROM OTHER PIPING, VALVES OR OTHER MECHANICAL EQUIPMENT, AND SHALL NOT BE INSTALLED WITHIN 6 INCHES OF HOT WATER OR STEAM PIPING OR HEATING FLUES.
12. IF POCKETS OR TRAPS IN ALL CONDUIT RUNS WHERE MOISTURE MAY COLLECT SHALL BE AVOIDED WHERE DIPS ARE UNAVOIDABLE
13. ALL CONDUIT SHALL BE INSTALLED IN SUCH A MANNER AS TO PROVIDE A MEANS OF REMOVAL.
14. THE CONDUIT SYSTEM AND CONDUCTING WIRE ENCLOSURES SHALL BE SECURELY BONDED TOGETHER SO THAT FOR EVERY CONDUCTING COMPONENT IS PROVIDED WITH A LOW RESISTANCE PATH TO GROUND.
15. THE LOCKING MECHANISM OF THE CONDUIT COUPLING CONDUIT AT A BOX OR CABINET UNLESS A THREADED HUB IS PROVIDED AS PART OF THE BOX OR CABINET.
16. RUNNING THREADS SHALL NOT BE USED ON CONDUIT FOR CONNECTION AT COUPLINGS, WHERE 2 LENGTHS OF CONDUIT MUST BE COUPLED TOGETHER, AND IT IS IMPOSSIBLE TO SCREW BOTH LENGTHS INTO AN ORDINARY COUPLING, THE END OF COUPLING MUST BE USED IN ORDER TO PROVIDE A RIGID JOINT THAT WILL BE BOTH MECHANICALLY AND ELECTRICALLY EFFECTIVE.
17. COUPLING AND CONNECTORS USED ON ELECTRIC METALLIC TUBING SHALL BE COMPRESSION TYPE, COMPRESSION.
18. CONDUIT SHALL BE PROTECTED BY RUBBER BUSHINGS OR EQUIVALENT DEVICES WHICH SHALL PROTECT THE ENCLOSED WIRES FROM ABRASION AT THE ENDS.
19. CONDUIT SIZES SHALL BE MINIMUM OF 3/4" UNLESS OTHERWISE NOTED AND IN ACCORDANCE WITH THE MINIMUM REQUIREMENTS OF THE "E.C.C."
20. PROTECT SLEEVES, AND COUPLINGS REQUIRED FOR THE INSTALLATION OF CONDUIT, SLEEVES SHALL PROJECT 2" ABOVE FLOOR.
21. FLEXIBLE CONDUIT SHALL BE PROVIDED TO CONNECT MOTORS ON SLIDING BASES, TO CONTROLS, AND TO VIBRATING EQUIPMENT.
22. PROTECT CONDUIT FROM DAMAGE AND THE ENTRANCE OF WATER AND FOREIGN MATTER DURING THE CONSTRUCTION PERIOD. WATERIGHT STOPPERS OR CAPS SHALL BE INSTALLED IMMEDIATELY AFTER THE CONDUIT IS LAPPED, REMOVED, REMOVED.
23. THOROUGHLY CLEAN THE INSIDE OF CONDUITS TO ASCERTAIN FOREIGN MATERIALS ARE REMOVED BEFORE PULLING WIRE OR CABLE.
24. PROVIDE AND INSTALL HANGERS, SUPPORTS AND FASTENERS AS REQUIRED.
25. A INSTALLATION OF HANGERS AND SUPPORTS SHALL BE MADE TO THE STRUCTURAL STEEL, MASONRY AND POURED CONCRETE. HANGERS AND SUPPORTS SHALL NOT BE INSTALLED TO PRE-CAST CONCRETE, METAL DECKS, STEEL BRACING OR BRIDGE PLATES.
26. FASTENERS FOR SUPPORTS AND HANGERS SHALL BE MADE WITH BEAM CLAMPS, U-BOLTS, STUD WELDING OR OTHER APPROVED DEVICES. FASTENERS FOR CONDUITS AND HANGERS TO CONCRETE SHALL BE MADE WITH ONE PIECE, MALLEABLE IRON OR WROUGHT STEEL INSERTS WITH LONG RADIAL NECKS AND KEYHOLE SLOTS FOR THE CONCRETE. REMOVED FROM THE CONCRETE BY THE EXPANSION SLEEVES WITH INSIDE THREADS AND EXPANSION PLUGS, OR WITH OTHER APPROVED TYPE DEVICES.
27. INSTALLATION SHALL BE SUCH SO AS TO SUPPORT CONDUIT WITHOUT SAGGING AND SHALL BE CLEAR OF THE WORK OF OTHER CONTRACTORS.
28. SPACING OF SUPPORTS FOR EXPOSED HORIZONTAL CONDUIT RUNS SHALL BE AS FOLLOWS.

SIZE OF CONDUIT (INCHES)	NUMBER OF CONDUITS IN RUN	LOCATION	MAXIMUM SUPPORT SPACING (FEET)
3/4	1 OR 2	ON A FLAT CEILING OR WALL	5
3/4	1 OR 2	WHERE IT IS DIFFICULT TO PROVIDE SUPPORTS EXCEPT AT INTERVALS FIXED BY BUILDING CONSTRUCTION	7
3/4	3 OR MORE	ANY LOCATION	7
1 & LARGER	1 OR 2	ON A FLAT CEILING OR WALL	6
1 & LARGER	1 OR 2	WHERE IT IS DIFFICULT TO PROVIDE SUPPORTS EXCEPT AT INTERVALS FIXED BY BUILDING CONSTRUCTION	7
1 & LARGER	3 OR MORE	ANY LOCATION	10

E) SPACING OF SUPPORTS FOR EXPOSED VERTICAL CONDUIT RUNS SHALL BE AS FOLLOWS.

SIZE OF CONDUIT (INCHES)	MAXIMUM SUPPORT SPACING (FEET)
3/4	7
1 AND 1¼	8
1½ AND LARGER	10

F) ELECTRICAL ENCLOSURES SHALL BE WEATHERPROOF WHEN EXPOSED TO OUTDOORS OR WET AREAS.

1. EXACT LOCATION OF EQUIPMENT AND OUTLETS SHALL BE VERIFIED IN FIELD. COORDINATE INSTALLATION OF ELECTRICAL SYSTEM WITH EXISTING BUILDING STRUCTURES. PRIOR TO COMPLETION OF AFFECTED WORK, CONTRACTOR SHALL INSTRUCT THE DISTRICT ON THE USE AND MAINTENANCE OF THE INSTALLED SYSTEM.
11. SIZE OUTLET BOXES IN CONFORMITY WITH CODE FOR NUMBER AND GAUGE OF CONDUCTORS THEREIN. EXCEPT WHERE NOTED TO BE LARGER, MINIMUM BOX SIZE SHALL BE 4" SQUARE BY 2 1/8" DEEP. JUNCTION BOXES SHALL BE LABELED WITH RESPECTIVE CIRCUIT NUMBERS.
12. OUTLET BOXES SHALL BE FLUSH WITH THE FINISHED SURFACE OF WALLS AND CEILINGS OF COMBUSTIBLE MATERIALS.
13. OPENINGS IN BOXES, CONDUIT BODIES AND FITTINGS SHALL BE ADEQUATELY CLOSED.
14. SURFACE MOUNTED BOXES AND CABINETS MOUNTED IN WET AND DAMP LOCATIONS SHALL BE WEATHERPROOF AND SHALL HAVE AT LEAST 1/4 INCH AIR SPACE BETWEEN THE BOX AND MOUNTING SURFACE.
15. ENTRANCE TO ROOMS AND OTHER GUARDED LOCATIONS THAT CONTAIN LIVE PARTS SHALL BE MARKED WITH A CONSPICUOUS WARNING SIGN FORBIDDING UNQUALIFIED PERSONS TO ENTER.
16. CUT FLOORS, CEILINGS AND WALLS AS REQUIRED FOR INSTALLATION OF ELECTRICAL WORK. APPROVED PENETRATION THROUGH CONCRETE WALLS OR CEILINGS SHALL BE PROVIDED BY MEANS OF SLEEVES OR CORE DRILLING. CONTRACTOR SHALL COORDINATE WITH DISTRICT. ALL WORK SHALL BE PATCHED AND REPAIRED AS DIRECTED BY DISTRICT.
17. AFTER AWARD OF THE CONTRACT, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL, SIX (6) PRINTS OF ALL REQUIRED SHOP DRAWINGS, BROCHURES AND OTHER SATISFACTORY DESCRIPTIONS INDICATING MANUFACTURER, CATALOG NUMBER, DIMENSIONS AND PERFORMANCE OF THE EQUIPMENT.
18. USE "THIN" COPPER WIRES OR EQUAL FOR ALL BRANCH CIRCUIT WIRING WITH A SEPARATE GREEN GROUNDING CONDUCTOR. SIZE PER CEC 250-122.
19. EQUIPMENT SHALL BE LISTED BY A RECOGNIZED TESTING LABORATORY.
20. THE NON-CURRENT CARRYING METALLIC PARTS OF ALL ELECTRICAL EQUIPMENT AND ENCLOSURES, INCLUDING CONDUITS, SUPPORTS, CABINETS, AND ASSOCIATED EQUIPMENT, WHICH ARE INSTALLED OR CONNECTED UNDER THIS CONTRACT, SHALL BE PROPERLY GROUNDED BY CONNECTION TO THE GROUNDING SYSTEM, REGARDLESS OF WHETHER OR NOT THESE CONNECTIONS ARE SHOWN ON THE DRAWINGS.
  - A) THE GROUNDING INSTALLATION SHALL HAVE PROVISIONS FOR BOTH SYSTEM AND EQUIPMENT GROUNDS AS DEFINED BY THE "CEC" THESE GROUNDING SYSTEMS ARE TO BE EFFECTIVELY INSULATED FROM EACH OTHER EXCEPT AT THE SERVICE CONNECTION.
  - B) GROUNDING SHALL BE DONE IN ACCORDANCE WITH THE PROVISIONS OF "CEC" AND THE "NESC". LOCAL REQUIREMENTS OF THE INSPECTION AUTHORITY HAVING JURISDICTION SHALL GOVERN IN ALL MATTERS OF INTERPRETATION.
  - C) IF THE SERVICE IS USED FOR GROUNDING MEANT, IT SHALL BE ASCERTAINED THAT THE WATER PIPING IS ELECTRICALLY CONTINUOUS AT JOINTS AND IS OF CONDUCTING MATERIAL. WATER PIPING WITH SWEATED JOINTS IN ELECTRICAL PATH SHALL BE USED FOR GROUNDING BOND.
  - D) WHERE GROUND CABLES ENTER AND LEAVE FERROUS CONDUITS, THEY SHALL BE MECHANICALLY CONNECTED TO THE END OF THE CONDUIT, OR THE CABLE PASSES THROUGH FERROUS FLOORING OR FRAMING, CONNECTION SHALL BE MADE TO SUCH METAL.
21. THE CONTRACTOR SHALL KEEP ALL PARTS OF THE BUILDING AND SITE FREE FROM ANY ACCUMULATIONS OF RUBBISH OR WASTE MATERIALS CAUSED BY HIS WORKMEN, AND SHALL REMOVE SUCH ACCUMULATIONS FROM THE BUILDING, SITE AND PROPERTY. JOB SITE SHALL BE CLEANED AT THE END OF EACH WORKING DAY.
22. THOROUGHLY CLEAN ALL PARTS OF THE EQUIPMENT AND MATERIAL INSTALLED UNDER THIS SECTION. SURFACES OF EXPOSED CONDUIT SHALL BE CLEANED OF CEMENT, PLASTER, DIRT, RUST, GREASE, AND OTHER FOREIGN MATERIAL, AND BE LEFT IN A WORKMANLIKE MANNER, AVAILABLE TO THE CONTRACTOR AND ACCEPTABLE FOR PAINTING.
  - A) EQUIPMENT FURNISHED WITHOUT SHOP APPLIED FINISH SHALL BE FIELD PAINTED.
  - B) CONCEALED SURFACES OF METAL RACKS, FRAMES, AND BOXES SHALL BE PAINTED BEFORE MOUNTING.
  - C) AFTER TESTS HAVE BEEN COMPLETED, CLEAN ALL EQUIPMENT WITH SOAP AND WATER, LEAVING EVERYTHING IN WORKING ORDER AT THE COMPLETION OF THE WORK.
23. A) WIRING AND CONNECTIONS SHALL BE TESTED FOR CONTINUITY, GROUNDS, SHORT CIRCUITS, AND OTHER DEFECTS BEFORE ANY EQUIPMENT OR FIXTURES ARE CONNECTED THERETO. CABLES SHALL BE CHECKED FOR CONTINUITY, SHORTS, INSULATION RESISTANCE AND PROPER PHASING.
- B) CONTRACTOR SHALL TERMINATE ALL CABLES & WIRES WITH TERMINAL LUGS (SUPPLIED BY CONTRACTOR)

24. INSULATION SHALL BE TESTED BEFORE AND AFTER INSTALLATION, AND BEFORE ENERGIZING.
- A) RUBBER INSULATION SHALL BE TESTED FOR ACCEPTANCE BY APPLYING DIRECT CURRENT POTENTIAL NOT OVER TIMES THE RATIO OF DIRECT CURRENT TO 60% OF EQUIVALENT "RMS" ALTERNATING CURRENT FACTORY TEST VOLTAGE FOR 5 MINUTES.
- B) VARNISHED CAMBRIC, PAPER, AND OTHER INSULATION SHALL BE TESTED IN THE MANNER DIRECTED BY AND UP TO THE LIMITS RECOMMENDED BY THE MANUFACTURER.
- C) INSULATION RESISTANCE SHALL BE TESTED BY MEGGER OF NOT LESS THAN 600 VOLTS OUTPUT FOR CIRCUITS 480 VOLTS OR LESS. ANY CIRCUIT SHOWING AN INSULATION RESISTANCE OF LESS THAN 1 MΩ SHALL BE INVESTIGATED AND THE WEEK POINT CORRECTED. CORRECT OR REPLACE ANY CIRCUIT DEFECTIVE OR GROUNDING AND MAKE WIRE-BY-WIRE TEST.
25. THE ENTIRE SYSTEM SHALL BE PLACED IN PROPER OPERATING CONDITION.
- A) ALL CHANGES SHALL BE MADE THAT ARE NECESSARY FOR ADJUSTING, SETTING AND BALANCING.
- B) GROUND TESTS SHALL BE MADE WITH THE 3 ELECTRODE "AC" OR "DC" VOLTAGE DROP METHOD TO ESTABLISH INITIAL READING FOR RECORDS, AND TO ASCERTAIN THAT THEY MEET DESIGN AND CODE REQUIREMENTS.
- C) CONTROL CIRCUITS SHALL BE CHECKED OUT FOR PROPER
26. SEISMIC ANCHORAGE NOTE:
- INSTRUCTIONS
- ALL EQUIPMENT/COMPONENTS DIRECTLY SUPPORTED ON THE GROUND OR ROOF WITH W<sub>D</sub> EXCEEDING 400 LBS., EQUIPMENT WEIGHING MORE THAN 20 LBS. SUPPORTED FROM A ROOF FLOOR OR HUNG FROM A WALL SHALL HAVE ITS CORRESPONDING STRUCTURAL CALCULATIONS AND ANCHORAGE DETAILS(S) SHOWN ON THE PLANS.
- ALL EXPANSION ANCHOR BOLTS SHALL HAVE ICC, ESR # 1385 (CONCRETE/CMU), AND TESTED PER SEC. 1911A AND 1912A OF CBC-2007.
- THE SEISMIC ANCHORAGE OF MECHANICAL AND ELECTRICAL EQUIPMENT SHALL CONFORM TO ASC7-05 SECTION 13.3.1 AND TABLE 13.6-1 ANCHORAGE DETAILS FOR ROOF/FLOOR MOUNTED EQUIPMENT SHALL BE SHOWN ON PLANS.
27. ALL WORK SHOULD CONFORM TO LATEST EDITION TITLE 24, CALIFORNIA CODE REGULATION (CCR).
28. CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY ADDENDA OR CHANGE ORDERS APPROVED BY DISTRICT.
29. AN INSPECTOR WHO IS SPECIALLY QUALIFIED IN MECHANICAL AND ELECTRICAL WORK WILL BE REQUIRED FOR THIS PROJECT.
30. THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS IS THAT THE WORK OF THE ALTERATION, REHABILITATION OR REPAIR OR RECONSTRUCTION IS TO BE IN ACCORDANCE WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS. A) ANY EXISTING CONDITIONS SUCH AS DETERIORATION OR NON-COMPLYING CONSTRUCTION BE DISCOVERED WHICH IS NOT COVERED BY THE CONTRACT DOCUMENTS WHERE IN THE FINISHED WORK WILL NOT COMPLY WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS, A CHANGE ORDER OR A SEPARATE SET OF PLANS AND SPECIFICATIONS, DETAILING AND THE REQUIRED WORK SHALL BE SUBMITTED TO AND APPROVED BY THE ENGINEER BEFORE PROCEEDING WITH THE WORK. SECTION 4-317(C), CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE (PART 1 TITLE 24, CCR).
31. CUTTING, BORING, NOTCHING FOR ALL FRAMING MEMBERS SHALL BE DONE WITH PRIOR APPROVAL OF ENGINEER.

## GENERAL NOTES

1. THE FOLLOWING GENERAL NOTES ARE APPLICABLE AS STATED BELOW, EXCEPT WHERE SPECIFICALLY INDICATED AND NOTED OTHERWISE ON THE DRAWINGS OR IN THE SPECIFICATIONS.
2. RISER DIAGRAMS, ELEVATIONS, SCHEMATICS AND DETAILS SHOWN HEREIN ARE CONCEPTUAL AND ILLUSTRATE THE FUNCTIONAL RELATIONSHIPS BETWEEN SYSTEM COMPONENTS AND THE DESIGN INTENT OF THE PROJECT.
3. REFERENCE EQUIPMENT SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING EQUIPMENT AND MATERIALS USED ON THE PROJECT.
4. MINIMUM CONDUIT SIZE SHALL BE 3/4 " UNLESS OTHERWISE NOTED.
5. PENETRATION(S) TO ANY FIRE RATED ASSEMBLY SHALL BE FIRE STOPPED WITH APPROVED U.L. LISTED FIRE STOP MATERIAL. INSTALLATION AND APPLICATION, PER MANUFACTURERS INSTRUCTIONS.
6. DEVICE LOCATIONS AS NOTED ON PLANS ARE NEW AND CONCEPTUAL. CONTRACTOR SHALL LOCATE DEVICES AS SITE CONDITIONS REQUIRE AND AS APPROVED BY THE DISTRICT.
7. REFERENCE SPECIFICATIONS FOR ADDITIONAL SYSTEM REQUIREMENTS AND SCOPE OF WORK.
8. PROVIDE FIRE RATED SEALANT AS REQUIRED AT FIRE RATED LOCATIONS. PAINT TO MATCH ADJACENT COLOR OR PROVIDE ADDITIONAL NON-RATED SEALANT FOR COLOR TO MATCH ADJACENT SURFACE.
















## DEMOLITION NOTES

1. CONTRACTOR TO REMOVE ALL EXISTING DEVICES AND EQUIPMENT WITH ASSOCIATED WIRING IN THE WAY OF SCOPE OF NEW WORK. CONTRACTOR TO VERIFY WITH DISTRICT AND DISPOSE ALL REMOVED DEVICES AND EQUIPMENT AS DIRECTED. CONTRACTOR TO FIELD VERIFY (E) DEVICES ABOVE CEILING SPACES AND REMOVE COMPLETELY.
2. CHECK PANEL SCHEDULE IDENTIFICATION FOR VALIDITY. RE-IDENTIFY ANY OR ALL CHANGES IN PANEL ON PANEL SCHEDULE CARD (INCLUDING EXISTING CIRCUITRY). WHILE PANEL COVER IS REMOVED, TURN OFF ANY SPARE BREAKERS AND VERIFY SPARES AS INDICATED ON PANEL SCHEDULE CARD.
3. PROVIDE BLANK COVER PLATES TO REMOVED DEVICES, STAINLESS STEEL OR AS SELECTED BY DISTRICT. TYPICAL U.O.N.
4. PROVIDE CIRCUIT IDENTIFICATION TO EXISTING DEVICES WHICH WILL REMAIN AFTER NEW WORK.
5. DEMOLITION DEVICES/EQUIPMENT SHOWN ARE OBTAINED FROM INSPECTION OF THE PROJECT SITE. CONTRACTOR SHALL FIELD VERIFY EXISTING DEVICES AT WALL/CEILING/ATTIC SPACES/DUCT (SUPPLY/RETURN) AND REMOVE AS PART OF THE DEMOLITION WORK.
6. WHEN CEILING SUSPENSION SYSTEMS, EQUIPMENT'S SUPPORT SYSTEM, LIGHTING FIXTURES, J-BOXES, OR OTHER ITEMS MUST BE REMOVED TO PERFORM THE WORK, THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAINTING OR REPLACING ANY BROKEN OR DAMAGED ITEMS, INCLUDING PATCHING WALLS AND PAINTING AS REQUIRED, TO BRING THE AREA TO ITS ORIGINAL CONDITION. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY BROKEN/DAMAGED CEILING TILES DURING CONSTRUCTION. CONTRACTOR TO DOCUMENT EXISTING CONDITIONS WITH DIGITAL PHOTOS PRIOR TO START OF WORK. FAILURE TO MAINTAIN EXISTING CONDITIONS CONTRACTOR ASSUMES TOTAL RESPONSIBILITY OF REPLACING DAMAGED CEILING TILES. REPLACED CEILING TILES SHALL MATCH EXISTING BY COLOR/TYPE/STYLE.

## ELECTRICAL SYMBOLS LIST

SYMBOLS REPRESENT EQUIPMENT AND OUTLET BOXES TO WHICH CONDUIT AND WIRE IS RUN FOR CONNECTION TO FIXTURES AND DEVICES.

## GENERAL DESCRIPTION

- |                                                                                     |                                                                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|  | CEILING MOUNTED JUNCTION BOX, WITH COVER (4" SQUARE, DEEP, WITH PLASTER RING)                     |
|  | DOUBLE DUPLEX RECEPTACLE, FLUSH IN WALL, GROUNDING TYPE (20 AMP, 120 VOLT, COVER PLATE SPECIFIED) |
|  | SINGLE DUPLEX RECEPTACLE, FLUSH IN WALL, GROUNDING TYPE (20 AMP, 120 VOLT, COVER PLATE SPECIFIED) |
|  | DUPLEX RECEPTACLE, WITH GROUND FAULT INTERRUPTER (20 AMP, 120 VOLT, 3W)                           |
|  | ELECTRICAL WALL MOUNTED PANEL                                                                     |
|  | ELECTRICAL FLUSH WALL MOUNTED PANEL                                                               |
|  | SWITCH, FLUSH IN WALL, TOGGLE, SINGLE-POLE +42" AFF (SUBSCRIPT DENOTES UNIT CONTROLLED)           |
|  | SWITCH, FLUSH IN WALL, TOGGLE, THREE WAY +42" AFF (CONNECT TO MATCHING SWITCH FOR 3-WAY USE)      |
|  | SWITCH, FLUSH IN WALL, KEY OPERATED                                                               |
|  | SWITCH, FLUSH IN WALL, MOMENTARY CONTACT, S.P.S.T.                                                |
|  | METER                                                                                             |
|  | NON-FUSED DISCONNECT SWITCH, MANUAL, EXO, H.P. RATED                                              |
|  | STARTER                                                                                           |
|  | CIRCUIT BREAKER OF POLES, VOLTS, TRIP-AMPS NOTED (CONFIRM INTERRUPTING CAPACITY NEEDED)           |
|  | GROUND BOX                                                                                        |



CONDUIT FOR CIRCUIT

- C<sub>0</sub> CONDUIT STUB-UP WITH COUPLING FLUSH IN FLOOR (TO PERMIT FUTURE REMOVAL)
- CONDUIT CONCEALED IN OR UNDER FLOOR; OR UNDERGROUND  
(CONFIRM DEPTH; GRADE TO DRAIN INTO PULL BOXES)
- BRANCH CIRCUIT WITH GREEN INSOLATED GROUND CONDUCTOR, SAME SIZE WIRE
- ## 3/4" CONDUIT WITH 2#12 WIRES AND 1#12 GND.
- ### 3/4" CONDUIT WITH 3#12 WIRES AND 1#12 GND.
- #### 3/4" CONDUIT WITH 4#12 WIRES AND 1#12 GND.
- ##### 3/4" CONDUIT WITH 5#12 WIRES AND 1#12 GND.
- ##### 3/4" CONDUIT WITH 6#12 WIRES AND 1#12 GND.
- #10 NUMBER INDICATES GAUGE OF WIRE IN CODE SIZED CONDUIT.
- ALL WIRING TO BE CU.  
THRU INSULATION &  
GROUND PER NEC  
250-122 CONCEALED IN  
WALL OR CEILING

NUMBER INDICATES GAUGE OF WIRE IN CODE SIZED CONDUIT

- |                                                                                         |                                                                                               |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| CO.                                                                                     | CONDUIT—ONLY WITH #12 NW COPPER PULL-WIRE (3/4" MINIMUM SIZE, UNLESS NOT OTHERWISE SPECIFIED) |
| A-1.3                                                                                   | HOW RUN TO CIRCUITS: #1 & #2 IN PANEL #7 (CROSSMARKS INDICATE NUMBER OF WIRES)                |
| — — —                                                                                   | GROUND CONNECTION WITH ACCESSIBLE CLAMP (TO COLD WATER PIPE OR DRIVEN GROUND ROD)             |
| — — —                                                                                   | STUB CONDUIT                                                                                  |
| ●                                                                                       | CONDUIT DROPPING DOWN FROM RUN (IF CONDUIT IS USED, KEEP COVER ACCESSIBLE)                    |
| — — —                                                                                   | CONDUIT RISING UP FROM RUN (IF CONDUIT IS USED, KEEP COVER ACCESSIBLE)                        |
| — — —                                                                                   | END OF LINE FIRE ALARM WIRE                                                                   |
| REFER TO SPECIFICATION SECTION 16130, PANELS AND BOXES FOR PERMITTED TYPES OF RACEWAYS. |                                                                                               |

## GENERAL SYMBOLS

- 
 NUMBERED NOTE FOR SHEET WHERE SHOWN  

 DETAIL DESIGNATION FOR ITEM & DRAWING NUMBER

## ABBREVIATION

- |                                       |                                 |                                                                                                                                                                                                |
|---------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AF - ABOVE FINISH FLOOR               | MH - MOUNTING HEIGHT            | UON - UNLESS OTHERWISE NOTED.                                                                                                                                                                  |
| CO - CONDUIT ONLY                     | MT - (TO BOTTOM OF FIXTURE)     | V - VOLTAGE.                                                                                                                                                                                   |
| CD - DISTRIBUTION PANEL.              | MC - MOMENTARY CONTACT ACTION.  | W - WEATHERPROOF CONSTRUCTION                                                                                                                                                                  |
| EM - EMERGENCY.                       | (N) - NEW                       | WT - WEATHERIGHT CONSTRUCTION.                                                                                                                                                                 |
| EX - EXHAUST FAN                      | NEC - NATIONAL ELECTRICAL CODE. | WBE - WHITE BAKED ENAMEL.                                                                                                                                                                      |
| EX - EXISTING                         | NL - NIGHT LIGHT                | WPC - WHITE POLYESTER LAMINATE                                                                                                                                                                 |
| (EX) - EXISTING DEVICE TO BE REPLACED | NTC - NOT IN CONTRACT           | (X) - EXISTING FIRE ALARM                                                                                                                                                                      |
| REPLACED                              | NTS - NOT TO SCALE              | DEVICE/EQUIPMENT TO BE REMOVED EXISTING DEVICE                                                                                                                                                 |
| FL - FIRE ALARM.                      | OF - OWNER FURNISHED.           | MOUNTING BOX AND WIRING MAY BE REUSED AS JUNCTION MAY BE POSSIBLE. ELECTRICAL CONSTRUCTION TO PROVIDE J-BOX COVER PLATE AND HANGING STRAPS TO COMPLY WITH GFCI. (X) - REMOVE RELOCATE AS SHOWN |
| GP - GROUND.                          | ONCI - CONTRACTOR INSTALLED     | (+X) -Y" - MOUNTING HEIGHT (TO CENTER)                                                                                                                                                         |
| HP - HORSEPOWER RATING                | PB - PANEL BOARD                | SSD - METAL BOX 4-11/16" DEEP                                                                                                                                                                  |
| HDX - HOX BOX                         | PE - PHOTO ELECTRIC CELL        | SQUARE (X) 2-1/8" DEEP                                                                                                                                                                         |
| KA - KILO AMPERES.                    | (R) - RELOCATE                  |                                                                                                                                                                                                |
| KW - KILOWATT.                        | SA - SATIN ALUMINUM.            |                                                                                                                                                                                                |
| KV - KILO-VOLT AMPS.                  | SC - SATIN STAINLESS STEEL      |                                                                                                                                                                                                |
| LTL - LIGHTING.                       | T - TELEPHONE.                  |                                                                                                                                                                                                |
| LGC - LONG CONTINUOUS LOAD            | TSC - TIME SWITCH CONTROL.      |                                                                                                                                                                                                |
| LU - LUGS ONLY                        | TR - TRANSFORMER                |                                                                                                                                                                                                |
| LV - LOW VOLTAGE.                     | TL - TWIST-LOCK CONSTRUCTION    |                                                                                                                                                                                                |
|                                       | TRNC - TRANSFORMER              |                                                                                                                                                                                                |
|                                       | TTB - TELEPHONE TERMINAL BOARD. |                                                                                                                                                                                                |
|                                       | TY - TYPICAL                    |                                                                                                                                                                                                |

LIST OF CALIFORNIA CODE OF REGULATIONS (C.C.R.)

APPLICABLE CODES AS OF JANUARY 1, 2014

TITLE 19 C.C.R., PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS.  
TITLE 24 C.C.R., PART1 2013 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE  
TITLE 24 C.C.R., PART2 2013 CALIFORNIA BUILDING CODE (CALIFORNIA BUILDING CODE COUNCIL)  
(2012 INTERNATIONAL BUILDING CODE OF THE INTERNATIONAL CODE COUNCIL, WITH CALIFORNIA AMENDMENTS)  
TITLE 24 C.C.R., PART3 2013 CALIFORNIA ELECTRICAL CODE (CEC)  
TITLE 24 C.C.R., PART4 2013 CALIFORNIA FIRE CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, (NFPA)  
TITLE 24 C.C.R., PART4 2013 CALIFORNIA MECHANICAL CODE (CMC)  
(2012 UNIFORM MECHANICAL CODE OF THE INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS, (IAPMO))  
TITLE 24 C.C.R., PART5 2013 CALIFORNIA PLUMBING CODE (CPC)  
TITLE 24 C.C.R., PART6 2012 UNIFORM PLUMBING CODE OF THE INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS, (IAPMO)  
TITLE 24 C.C.R., PART6 2013 CALIFORNIA ENERGY CODE  
TITLE 24 C.C.R., PART7 2013 SAFETY CODE FOR ELEVATORS AND ESCALATORS (ASME A17.1-2004)  
TITLE 24 C.C.R., PART8 2013 CALIFORNIA HISTORICAL BUILDING CODE  
TITLE 24 C.C.R., PART9 2013 CALIFORNIA FIRE CODE (CFC)  
(2012 INTERNATIONAL FIRE CODE OF THE INTERNATIONAL CODE COUNCIL)  
TITLE 24 C.C.R., PART10 2013 CALIFORNIA EXISTING BUILDING CODE  
(2012 INTERNATIONAL EXISTING BUILDING CODE OF THE INTERNATIONAL CODE COUNCIL, WITH AMENDMENTS)  
TITLE 24 C.C.R., PART11 2013 CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGREEN CODE)  
TITLE 24 C.C.R., PART12 2013 CALIFORNIA REFERENCED STANDARDS CODE  
2007 ASME A17.1(UW/A17/LCSA B444-08 ABEND) SAFETY CODE FOR ELEVATORS AND ESCALATORS

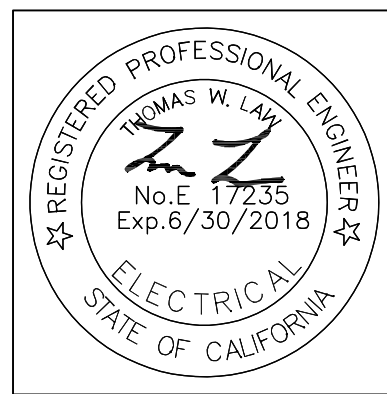
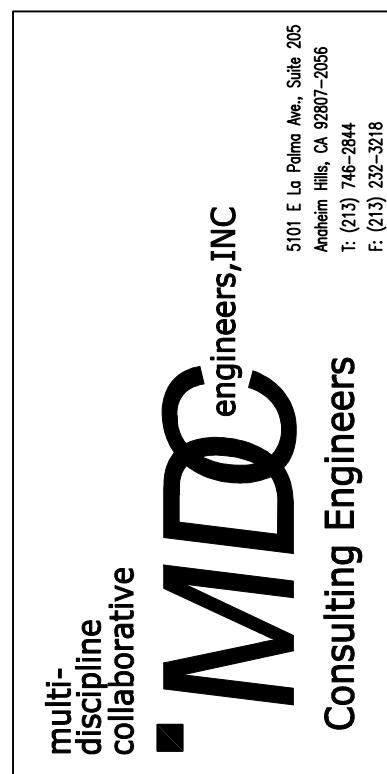
## PARTIAL LIST OF APPLICABLE STANDARDS

2013 CALIFORNIA BUILDING CODE (FOR SFM) REFERENCED STANDARDS CHAPTER 35		
NFPA 13	INSTALLATION OF SPRINKLER SYSTEMS	2013 EDITION
NFPA 14	STANDPIPE SYSTEMS	2013 EDITION
NFPA 17	DRY CHEMICAL EXTINGUISHING SYSTEMS	2013 EDITION
NFPA 17A	WET CHEMICAL SYSTEMS	2013 EDITION
NFPA 20	STATIONARY PUMPS	2013 EDITION
NFPA 22	WATER TANKS OF PRIVATE FIRE PROTECTION	2013 EDITION
NFPA 24	PRIVATE FIRE MAINS	2013 EDITION
NFPA 72	NATIONAL FIRE ALARM CODE	2013 EDITION
NFPA 80	FIRE DOORS AND OTHER OPENING PROTECTIVES	2013 EDITION
NFPA 92	STANDARD FOR SMOKE CONTROL SYSTEMS	2013 EDITION
NFPA 253	CRITICAL RADIANT FLUX OF FLOOR COVERING SYSTEMS	2006 EDITION
NFPA 2001	CLEAN AGENT FIRE EXTINGUISHING SYSTEMS	2012 EDITION
ICC 300	GLASSERS, FOLDING AND TELESCOPIC SEATING, AND GRAND STANDS	2012 EDITION
UL 300	FIRE TESTING OF FIRE EXTINGUISHING SYSTEMS FOR PROTECTION	2003 EDITION
UL 464	AUDIBLE SIGNAL APPLIANCES	2003 EDITION
UL 521	HEAT DETECTORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS	1999 EDITION

# SHEET INDEX

E0.1	ELECTRICAL GENERAL NOTES, AND SYMBOL LIST
E2.1	BUILDING F FIRST FLOOR ELECTRICAL PLAN
E2.2	BUILDING F ROOF ELECTRICAL PLAN
E3.1	BUILDING F MECHANICAL ROOM ELECTRICAL ENLARGE PLAN

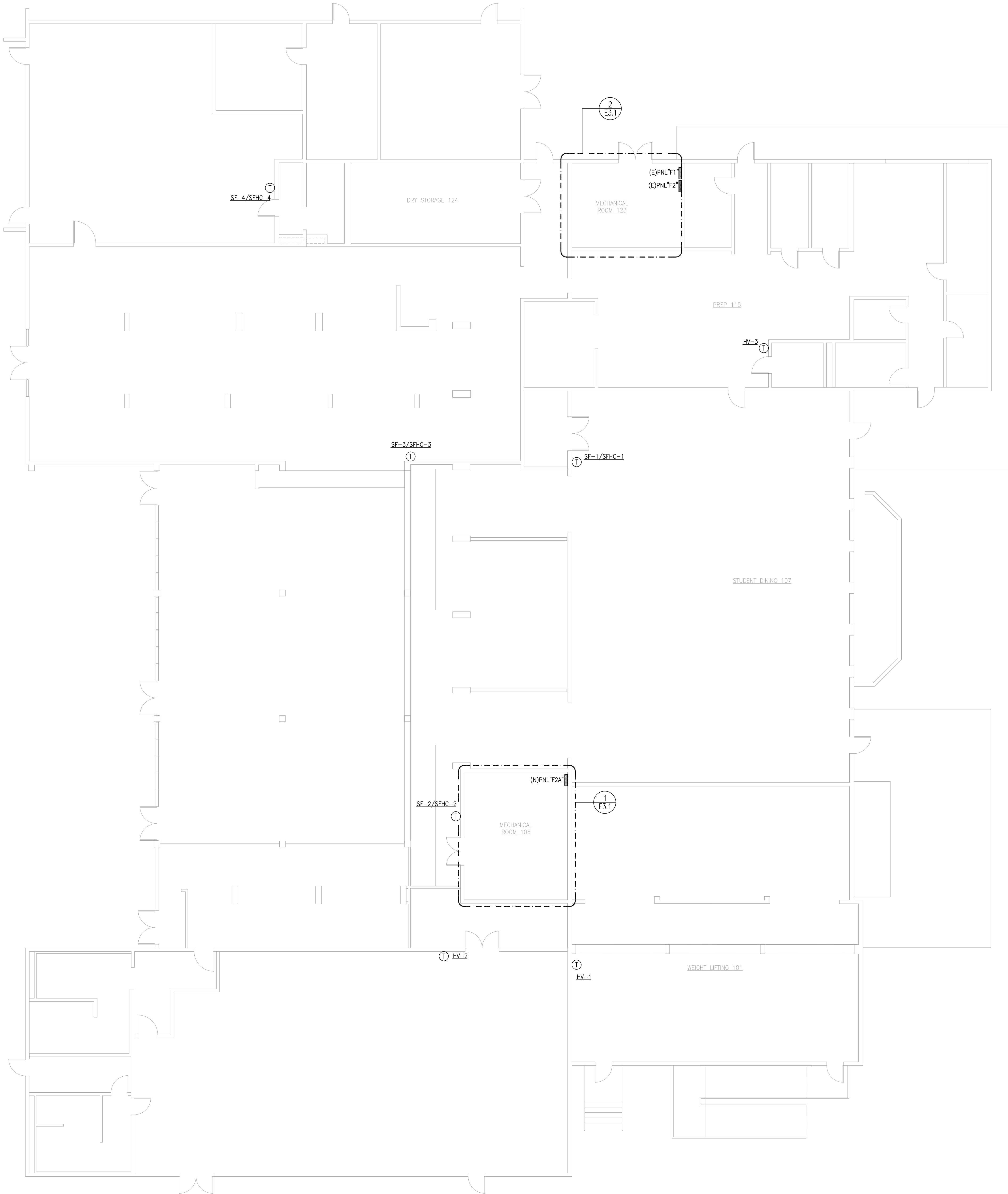
REV	DATE	DESCRIPTION	BY
	11/28/16	BID SET	



REPLACEMENT AND REPAIR  
OF HEAT VENT UNITS  
BLDG F  
NORTH HIGH SCHOOL  
3620 W. 182nd ST.,  
Torrance, CA 90504

TORRANCE UNIFIED SCHOOL DISTRICT  
2335 PLAZA DEL AMO  
TORRANCE, CALIFORNIA 90501

ELECTRICAL GENERAL NOTES AND SYMBOL LIST	
DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	E0.1



GENERAL NOTES

1. REFER TO MECHANICAL DEMOLITION PLANS FOR REMOVAL/REPLACEMENT OF EXISTING HV UNITS, AND EXHAUST FANS. DISCONNECT AND REMOVE EXISTING BRANCH CIRCUIT WIRING, INCLUDING CONDUITS, WIRING, CONTROLS AND DISCONNECT SWITCHES. PROVIDE NEW BRANCH CIRCUIT WIRING FROM BRANCH CIRCUIT PANELS (VIA NEW VFDs), PROVIDE NON-FUSIBLE DISCONNECTS SWITCHES AT EACH ROOF UNIT, FOR LOCAL DISCONNECT. PROVIDE CONTROL CONDUIT WITH WIRING FOR ALL CONTROL WIRING PER MECHANICAL CONTROL WIRING DIAGRAMS.
2. ALL INTERLOCKS BETWEEN HV UNITS AND FANS SHALL BE PROVIDED THROUGH THE DDC UNIT CONTROLLERS. REFER TO MECHANICAL WIRING DIAGRAMS.

REV	DATE	DESCRIPTION	BY
	11/28/16		

multi-discipline collaborative

**MDC**engineers,INC

Consulting Engineers

3037 E. La Brea Ave., Suite 205  
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REPLACEMENT AND REPAIR  
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3620 W 182nd ST  
TORRANCE, CA 90504

TORRANCE UNIFIED SCHOOL DISTRICT  
2335 PLAZA DEL AMO  
TORRANCE, CALIFORNIA 90501

BUILDING F  
FIRST FLOOR  
ELECTRICAL PLAN

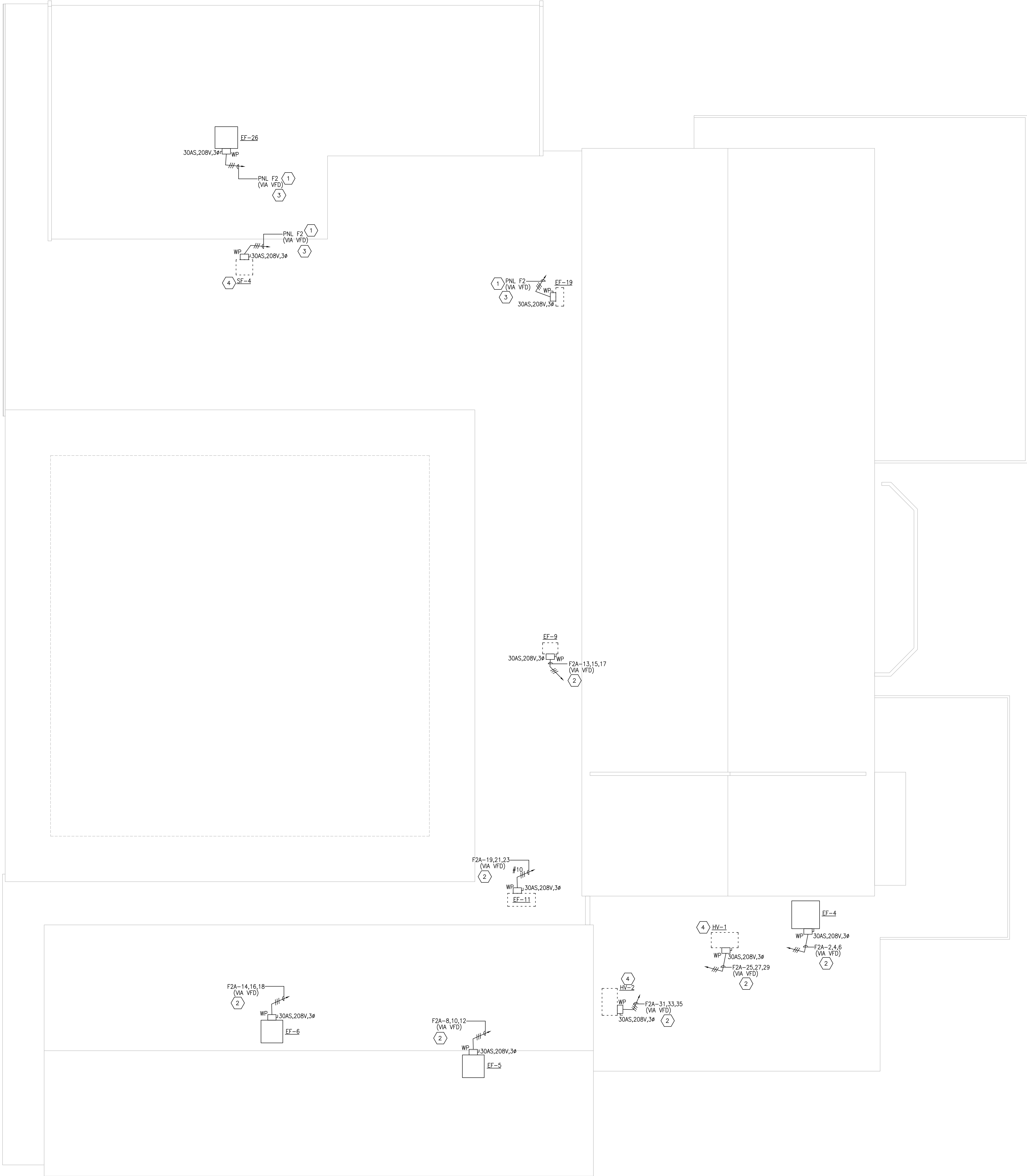
DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	1

E2.1

BUILDING F – FIRST FLOOR MECHANICAL PLAN

SCALE  
1/8"=1'-0"

1

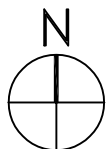


REFERENCE NOTES

1. PROVIDE CONNECTION (AS INDICATED) TO PANEL "F2" VIA CORRESPONDING VFD IN MECH ROOM 123. REPLACE (C)BREAKER WITH NEW 208V,15A,3P BREAKER (FURNISHED BY SCHOOL DISTRICT), AND PROVIDE FINAL CONNECTION AS REQUIRED. NEW BREAKER TO MATCH EXISTING BY TYPE, STYLE, AND AIC RATING.
2. SEE DETAIL 1/E3.1 FOR VFD LOCATION.
3. SEE DETAIL 2/E3.1 FOR VFD LOCATION.
4. REMOVE/SALVAGE AND RECONNECT (E)HVAC SHUTDOWN DEVICES AT REPLACED EQUIPMENT(S); (PER CMC 606-AUTOMATIC SHUTDOWN). COORDINATE (E)CONDITIONS AND NEW EQUIPMENT INSTALLED BY MECHANICAL CONTRACTOR. REPROGRAM FACP AFTER CONNECTING FIRE ALARM SHUTDOWN DEVICES, AND TEST.

GENERAL NOTES

1. PROVIDE CONDUIT RUNS ON ROOF WITH GALVANIZED RIGID CONDUIT, CONDUITS ROUTED ALONG WITH MECHANICAL PIPING ON DURABLOK SUPPORTS. SEE MECHANICAL DETAIL 5/M7.2
2. REFER TO MECHANICAL DEMOLITION PLANS FOR REMOVAL/REPLACEMENT OF EXISTING HV UNITS, AND EXHAUST FANS. DISCONNECT AND REMOVE EXISTING BRANCH CIRCUIT WIRING, INCLUDING CONDUITS, WIRING, CONTROLS AND DISCONNECT SWITCHES. PROVIDE NEW BRANCH CIRCUIT WIRING FROM BRANCH CIRCUIT PANELS (VIA NEW VFDs), PROVIDE NON-FUSIBLE DISCONNECTS SWITCHES AT EACH ROOF UNIT, FOR LOCAL DISCONNECT. PROVIDE CONTROL CONDUIT WITH WIRING FOR ALL CONTROL WIRING PER MECHANICAL CONTROL WIRING DIAGRAMS.
3. ALL INTERLOCKS BETWEEN HV UNITS AND FANS SHALL BE PROVIDED THROUGH THE DDC UNIT CONTROLLERS. REFER TO MECHANICAL WIRING DIAGRAMS.



BUILDING F – ROOF MECHANICAL PLAN

SCALE	1
1/8"=1'-0"	

REV	DATE	DESCRIPTION	BY
	11/28/16		



REPLACEMENT AND REPAIR  
OF HEAT VENT UNITS  
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3620 W 182nd ST  
TORRANCE, CA 90504

TORRANCE UNIFIED SCHOOL DISTRICT  
2335 PLAZA DEL AMO  
TORRANCE, CALIFORNIA 90501

BUILDING F  
ROOF ELECTRICAL PLAN

DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	E2.2





- ### PARTIAL SINGLE LINE DIAGRAM

## PANEL SCHEDULE

DATE	11/28/2016
PROJECT	16016
DRAWN	XX
CHECKED	XX
SHEET	E3.1



1. DOOR DETAILS ILLUSTRATE FUNCTIONAL RELATIONSHIPS, ACTUAL ARCHITECTURAL CONDITIONS (DIRECTION OF SWING, HAND OF DOOR) MAY VARY AND SHALL BE FIELD VERIFIED.
2. ALL NEW WORK SHALL BE PAINTED, INCLUDING (BUT NOT LIMITED TO) GYPSUM BOARD, EXPOSED CONDUITS AND CLIPS, EXPOSED FRAMING AND STRUCTURAL MEMBERS, ETC.
3. PAINTING, PATCHING, AND FINISHES FOR ALL DEVICES LOCATED IN EXISTING AREAS SHALL MATCH EXISTING FINISHES AND MUST BE APPROVED AND COORDINATED WITH THE DISTRICT. THE PAINT SYSTEM SHALL BE MINIMUM OF 1 PRIMER COAT, 1 INTERMEDIATE COAT AND 1 FINISH COAT.
4. CONTRACTOR SHALL PATCH WALL, FLOOR, CEILING AND ANY AFFECTED WORK TO MATCH EXISTING AS REQUIRED.
5. FIRE RATED WALL ASSEMBLY SHALL COMPLY WITH THE MOST CURRENT CBC AND UL'S REQUIREMENTS. GYPSUM BOARD SHALL BE 5/8" TYPE-X, FINISH LEVEL: LEVEL 5 (GYPSUM ASSOCIATION), INSTALL PER UL'S AND MANUFACTURER'S RECOMMENDATIONS.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT DIMENSIONS IN FIELD PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF THE FIELD CONDITION IS DIFFERENT FROM THE SITUATION DEPICTED IN THE CONTRACT DOCUMENTS.
7. CONSTRUCTION SHALL BE ACCORDING TO THE INDUSTRY STANDARD OF EACH TRADE OR OTHERWISE DETAILED OR SPECIFIED IN THE CONTRACT DOCUMENTS (WHICHEVER IS MORE STRINGENT). THE ENGINEER HAS THE FINAL AUTHORITY TO INTERPRET THE DOCUMENTS.
8. WORKMANSHIP AND MATERIALS SHALL CONFORM TO MOST CURRENT UNIFORM BUILDING CODE (UBC) STANDARDS, SPECIFICATIONS AND DETAILS FOR CONSTRUCTION AS FURNISHED BY THE CONTRACT DRAWINGS. WORKMANSHIP AND MATERIALS NOT IN CONFORMANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS ARE SUBJECT TO REMOVAL AND/OR REPLACEMENT AT CONTRACTOR'S EXPENSE.
9. CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION AND SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES OR INCONSISTENCIES.
10. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE ALL EXISTING UTILITIES IN THE SITE AND TO PROTECT THEM FROM ANY DAMAGE. ANY REPAIR AND REPLACEMENT DUE TO THE PERFORMANCE OF THIS WORK SHALL BE AT CONTRACTOR'S OWN EXPENSE.
11. THE CONTRACT STRUCTURAL DRAWINGS REPRESENT THE FINISHED STRUCTURE AND DOES NOT INDICATE THE METHOD OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL NECESSARY BRACING AND SHORING TO PROTECT THE STRUCTURE DURING ALL PHASES OF CONSTRUCTION.
12. ALL WORK SHALL CONFORM TO THE REQUIREMENT AND STANDARD OF THE 2010 EDITION OF THE C.B.C. BUILDING CODE AND ANY OTHER REGULATING AGENCIES WHO HAVE AUTHORITY OVER ANY PORTION OF THE WORK.
13. ANY A.S.T.M. DESIGNATIONS INDICATED ON THE DRAWINGS SHALL BE THE LATEST REVISIONS.
14. SPECIFIC NOTES, DETAILS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
15. CONTRACTOR SHALL VERIFY ALL THE EXISTING BUILDING CONDITION, NOT LIMITED TO ALL THE EXISTING MEMBER SIZES, BRACING DIRECTIONS AND THE EXISTING FOUNDATION. IF ANY DISCREPANCIES OR INCONSISTENCIES ARE FOUND DURING CONSTRUCTION, ENGINEER SHALL BE NOTIFIED IMMEDIATELY. ENGINEER SHALL RE-DESIGN TO RECTIFY THE DISCREPANCIES AND THERE ARE NO ADDITIONAL COST TO OWNER.

1. ALL STEEL CHANNELS AND PLATES SHALL BE GALVANIZED AND CONFORM TO ASTM A36
2. ALL STEEL PIPE COLUMNS SHALL CONFORM TO ASTM A53, GRADE B
3. UNFINISHED BOLTS SHALL CONFORM TO ASTM A307
4. ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS AND CONFORM TO THE AMERICAN WELDING SOCIETY SPECIFICATIONS.
5. ALL FIELD WELDING SHALL BE CONTINUOUSLY INSPECTED BY AN APPROVED WELDING INSPECTOR ENGAGED BY THE DISTRICT.
6. ELECTRODES SHALL BE E70XX

1. ALL CONCRETE SHALL CONFORM TO THE LATEST EDITION OF THE CALIFORNIA BUILDING CODE(CBC)
2. CONCRETE SHALL BE DESIGNED AND TESTED AS OUTLINED IN THE C.B.C. LATEST EDITION.
3. ALL CEMENT SHALL CONFORM TO A.S.T.M.(C-150), TYPE I OR II.
4. FINE AND COARSE AGGREGATE SHALL CONFORM TO A.S.T.M. (C-33) FOR STANDARD WEIGHT CONCRETE.
5. ALL AGGREGATE SHALL BE COMPARABLE TO "SAN GABRIEL V.L.M." AGGREGATE. THE SHRINKAGE SHALL BE PER A.S.T.M. (C-157) WITH THE AVERAGE DRYING SHRINKAGE AT (28 DAYS) OF DRYING NOT EXCEEDING 0.04%
6. CONCRETE SLAB SHALL BE CURED BY KEEPING CONTINUOUSLY WET FOR (3 DAYS) OR BY AN APPROVED CURING COMPOUND.
7. REFER TO MECHANICAL, ELECTRICAL, AND PLUMBING DRAWING FOR MISCELLANEOUS ITEMS TO BE CAST INTO CONCRETE AND FLOOR DEPRESSIONS, ETC.
8. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSION STRENGTH OF 2500 PSI AT 28 DAYS, UNLESS OTHERWISE NOTED.
9. PROVIDE EXTERIOR SLAB CONTROL JOINTS AT MAXIMUM 10 FT. ON CENTER, EACH WAY.

1. REINFORCING STEEL SHALL BE DEFORMED BARS OF INTERMEDIATE GRADE CONFORMING TO A.S.T.M. SPECIFICATION A615 GRADE 40 BARS #4 AND SMALLER.
2. REINFORCEMENT MARKED CONTINUOUS MAY BE SPLICED BY LAPPING 40 BAR DIAMETERS IN CONCRETE, WITH A 24 INCH MINIMUM LAP EACH CASE.
3. PROVIDE SPACER BARS, SPREADERS, CHAIRS, BLOCKS, ETC., AS REQUIRED TO SECURELY HOLD STEEL IN PLACE.

