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CAL-GREEN NOTES

1. TESTING, ADJUSTING, AND BALANCING; CONTRACTOR SHALL PROVIDE THE FOLLOWING:.
   a. BALANCING AIRFLOW AND WATER FLOW WITHIN DISTRIBUTION SYSTEMS, INCLUDING SUB-MAINS,
   b. BRANCHES, AND TERMINALS, TO INDICATED QUANTITIES ACCORDING TO SPECIFIED TOLERANCES.
   c. ADJUSTING TOTAL HVAC SYSTEMS TO PROVIDE INDICATED QUANTITIES.
   d. MEASURING ELECTRICAL PERFORMANCE OF HVAC EQUIPMENT.
   e. SETTING QUANTITATIVE PERFORMANCE OF HVAC EQUIPMENT.
   f. VERIFYING THAT AUTOMATIC CONTROL DEVICES ARE FUNCTIONING PROPERLY.
   g. MEASURING SOUND AND VIBRATION.
   h. REPORTING RESULTS OF ACTIVITIES AND PROCEDURES SPECIFIED IN THIS SECTION.

2. AIR BALANCE SHALL BE IN ACCORDANCE WITH ONE OF THE FOLLOWING METHODS:
   a. AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE
   b. ACCA MANUAL B
   c. ASHRAE 111
   d. NEBB PROCEDURE STANDARDS FOR TESTING BALANCING OF ENVIRONMENTAL SYSTEMS
   e. SMACNA HVAC SYSTEMS TESTING, ADJUSTING, AND BALANCING.

2. ALL DUCT AND OTHER RELATED AIR DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, OR SHEET METAL UNTIL THE FINAL STARTUP OF THE HEATING, COOLING AND VENTILATING EQUIPMENT.

3. IF THE NEW HVAC SYSTEMS IS USED DURING CONSTRUCTION, USE AIR FILTERS WITH MERV OF 8. REPLACE ALL FILTERS IMMEDIATELY PRIOR TO OCCUPANCY.

4. AN AIR FILTER WITH A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8 OR HIGHER SHALL BE INSTALLED IN THE MECHANICAL SYSTEM FOR OUTSIDE AND RETURN AIR PRIOR TO OCCUPANCY.

AIR CONDITIONING SYMBOLS AND ABBREVIATIONS

SYMBOLS	ABBR	DESCRIPTION	ABBR/SYMBOL	DESCRIPTION	ABBR/SYMBOL	DESCRIPTION
	F.D.	AUTOMATIC FIRE DAMPER	GA	GAUGE	WB	WATER BULB
	C.S.F.D.	COMBINATION SMOKE FIRE DAMPER	AC	AIR CONDITIONING	WG	WATER GAGE
	APV	AIR PROPORTIONING VANE	B.H.P	BREAK HORSEPOWER	■	PERFORATED RETURN REGISTER
	F.C.	FLEXIBLE DUCT CONNECTION	B.O.D	BOTTOM OF DUCT ELEVATION	■	PERFORATED SUPPLY DIFFUSER
	TH	THROAT AND SIZE	O.C	ON CENTER	⊠	SUPPLY DIFFUSER
	TV	TURNING VANES	COMP.	COMPRESSOR		RETURN REGISTER
	MVD OR VD	MANUAL VOLUME DAMPER WITH INDIVIDUAL BLADE QUADRANTS	COND.	CONDENSER (ING)		CEILING EXHAUST REGISTER
			DB	DRY BULB		ROOF EXHAUST FAN
20 x 12		DUCT SIZE NOTATION FIRST DIMENSION IS FOR NEAR SIDE	DISH.	DISCHARGE		EXIST. SUPPLY DIFFUSER
			EXT	EXTERNAL		EXIST RETURN REGISTER
	OBD	OPPOSED BLADE DAMPER	EVAP	EVAPORATOR (ING) (IVE)		EXIST. CEILING EXHAUST REGISTER
	PBD	PARALLEL BLADE DAMPER	FT.IN	SQUARE FEET CUBIC INCH		EXIST. ROOF EXHAUST FAN
	-MO	-MOTOR OPERATED	OPNG	OPENING		EXIST. MANUAL VOLUME DAMPER
12/20	-HO	-HAND OPERATED (QUADRANT)	FPM	FEET PER MINUTE		EXIST. SMOKE DETECTOR
16/15	BFT	BOTTOM FLAT TRANSITION	HP	HORSEPOWER		NEW SUPPLY/ RETURN/ EXHAUST/ MAKE-UP/ GREASE/ OSA AIR DUCT
TFT	TFT	TOP FLAT TRANSITION	INSUL	INSULATE INSULATION		EXISTING SUPPLY/ RETURN/ EXHAUST/ MAKE-UP/ GREASE/ OSA AIR DUCT
20 x 12	LINE	PLENUM OR DUCT LINER	MBH	THOUSAND BTU PER HOUR		DUCT (ROUND)
	FLEX	FLEXIBLE DUCT	NIC	NOT IN CONTRACT		DUCT (RECTANGULAR)
		EXHAUST DUCT SECTION	CD	CEILING DIFFUSER		HATCH (WORK TO BE REMOVED)
		RETURN DUCT SECTION	CR	CEILING REGISTER	CFM	CUBIC FEET / MINUTE (CFM)
		SUPPLY DUCT SECTION	CG	CEILING GRILLE	△	DIFERENCE BETWEEN
	EXH	EXHAUST	TR	TOP REGISTER	(R)	RELOCATED
	OSA	OUTSIDE AIR FLOW	BR	BOTTOM REGISTER	(E)	EXISTING
	RA	RETURN AIR	RH	RELATIVE HUMIDITY	(N)	NEW
	SA	SUPPLY AIR	REQ'D	REQUIRED	EXIST.	EXISTING
	UC	UNDERCUT DOOR	S.P	STATIC PRESSURE		(MZD) MOTORIZED ZONE DAMPER
	D.LVR	DOOR LOUVER WITH CROSS	T.S	TIP SPEED		SUPPLY AIR DUCT UP
	TR	TRANSFER AIR FLOW	TYP	TYPICAL FOR		RETURN AIR DUCT UP
	P.O.C	POINT OF CONNECTION	(T)	THERMOSTAT		EXHAUST AIR DUCT UP SUPPLY AIR DUCT DOWN
⊗		POINT OF DISCONNECTION	(E)	BY ELECTRICAL CONTRACTOR		RETURN AIR DUCT DOWN
Ø		DIAMETER OR ROUND	(M)	BY MECHANICAL CONTRACTOR		EXHAUST AIR DUCT DOWN
	S.D.	DUCT SMOKE DETECTOR	(S)	SENSOR		EQUIPMENT DESIGNATION
	B.D.D.	BACKDRAFT DAMPER	(CMS)	CARBON MONOXIDE SENSOR		FLEXIBLE CONNECTION
	UTR	UP THRU ROOF	(CO2)(DCVS)	DEMAND CONTROL VENTILATION SENSOR	O.V	OUTLET VELOCITY (FPM)
		ROUND SUPPLY DIFFUSER		WALL LINEAR FLOWBAR		CEILING LINEAR FLOWBAR
		(E) ROUND SUPPLY DIFFUSER		(E) WALL LINEAR FLOWBAR		(E) CEILING LINEAR FLOWBAR
				INLINE FAN (BELT DRIVEN)		INLINE FAN (DIRECT DRIVE)

DUCT SIZING CHART

(LOW PRESSURE DUCTWORK)

CFM	ROUND DUCT (INCHES)	RECTANGULAR DUCT (INCHES) W IS DUCT WIDTH W x 4	W x 6	W x 8	W x 10	W x 12	W x 14
UP TO 75	6	8	6	X	X	X	X
76 TO 125	7	10	8	X	X	X	X
126 TO 175	8	16	10	8	X	X	X
176 TO 275	9	X	12	10	X	X	X
276 TO 375	10	X	16	12	10	X	X
376 TO 600	12	X	X	16	12	X	X
601 TO 850	14	X	X	22	16	14	X
851 TO 1250	16	X	X	30	24	18	16
1251 TO 1800	18	X	X	40	28	24	18
1801 TO 2400	20	X	X	X	36	28	24
2401 TO 2900	22	X	X	X	46	36	30
2901 TO 3800	24	X	X	X	X	46	36

CONDENSATE WASTE SIZING

EQUIPMENT CAPACITY IN		MINIMUM CONDENSATE PIPE DIAMETER	
Tons of Refrigeration	(kW)	Inches	(mm)
UP to 20	(Up to 70.34)	3/4"	(20)
21 - 40	(73.85 - 140.67)	1"	(25)
41 - 90	(144.19 - 316.6)	1-1/4"	(32)
91 - 125	(320.03 - 439.6)	1-1/2"	(40)
126 - 250	(443.12 - 879.2)	2"	(90)

THE SIZE OF CONDENSATE WASTE PIPES MAY BE FOR ONE UNIT OR A COMBINATION OF UNITS, OR AS RECOMMENDED BY THE MANUFACTURER. THE CAPACITY OF WASTE PIPES ASSUMES A 1/8 INCH PER FOOT (10.5 mm/m) OR ONE PERCENT SLOPE, WITH THE PIPE RUNNING THREE-QUARTERS (3/4) FULL AT THE FOLLOWING CONDITIONS:

Outside Air - 20%		Room Air - 80%	
DB	WB	DB	WB
90°F (32°C)	73°F (23°C)	75°F (24°C)	62.5°F (17°C)

NEW ROOF TOP UNIT SCHEDULE

SYMBOL	SERVICE	LOCATION	MANUFACT. AND MODEL	HEATING CAPACITY BTU/HR INTPUT	HEATING OUTPUT	AFUE %	COOLING CAPACITY BTU/HR TH	COOLING SH	INDOOR FAN CFM	ESP	BHP	ELECTRIC DATA V	PH	HZ	UNIT FLA	COMPRESSOR COMP RLA (1)	RLA (2)	FAN FLA (1)	FLA (2)	FLA (3)	FLA (4)	ELEC. DATA V	PH/HZ	COMBUSTION FAN MOTOR FLA	UNIT FLA	WEIGHT LBS	EER/SEER	MCA	MOCP	POWER EXHAUST (460-3-60) HP	FLA	MCA	MOCP	TON	REMARKS
RTU 1	1ST FLOOR	ROOF	CARRIER 48FCDA06-A2A6 0A0A0	60,000	48,000	81.0	59,300	44,730	2,000	0.5"	--	460	3	60	1.9	7.8	–	0.8	–	–	–	460	3/60	0.25	10.75	1085	–/14.0	13	20	1	2.5	3.1	5.6	5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 2	2ND FLOOR	ROOF	CARRIER 48TCDD20-A2A6 0A0G0	176,000/ 220,000	142,000/ 178,000	81.0	219,800	167,600	7,000	0.8"	--	460	3	60	6.4	14.7	14.7	0.9	0.9	0.9	–	460	3/60	0.3	38.8	3421	10.8/–	42.2	50	2	4.0	5.0	9.0	17.5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 3	2ND FLOOR	ROOF	CARRIER 48TCDD17-A2A6 0A0G0	176,000/ 220,000	142,000/ 178,000	81.0	201,600	135,300	6,000	0.8"	--	460	3	60	4.9	14.7	14.7	0.9	0.9	0.9	–	460	3/60	0.3	37.3	3330	10.8/–	40.7	50	2	4.0	5.0	9.0	15	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 4	1ST FLOOR	ROOF	CARRIER 48TCDD12-A2A6 0A0G0	120,000/ 180,000	98,000/ 148,000	82.0	124,100	96,200	4,000	0.8"	--	460	3	60	5.3	7.7	7.7	0.8	0.8	–	–	460	3/60	0.25	22.55	1702	11.1/–	24	30	2	4.0	6.0	9.0	10	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 5	1ST FLOOR	ROOF	CARRIER 48TCDD24-A2A6 0A0G0	176,000/ 220,000	142,000/ 178,000	81.0	256,100	192,600	8,000	0.8"	--	460	3	60	8.6	18.6	14.7	0.9	0.9	0.9	0.9	460	3/60	0.3	45.8	3571	9.8/–	50.2	60	4	6.6	10.8	19.4	20	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 6	2ND FLOOR	ROOF	CARRIER 48TCDD17-A2A5 0A0G0	176,000/ 220,000	142,000/ 178,000	81.0	201,600	135,300	6,000	0.8"	--	460	3	60	4.9	14.7	14.7	0.9	0.9	0.9	–	460	3/60	0.3	37.3	3330	10.8/–	40.7	50	2	4.0	5.0	9.0	15	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 7	2ND FLOOR	ROOF	CARRIER 48TCDD20-A2A6 0A0G0	176,000/ 220,000	142,000/ 178,000	81.0	219,800	167,600	7,000	0.8"	--	460	3	60	6.4	14.7	14.7	0.9	0.9	0.9	–	460	3/60	0.3	38.8	3421	10.8/–	42.2	50	2	4.0	5.0	9.0	17.5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 8	1ST FLOOR	ROOF	CARRIER 48TCDD08-A2A5 0A0G0	125,000	103,000	82.0	90,100	68,900	3,000	0.8"	--	460	3	60	4.2	6.1	6.1	0.8	0.8	–	–	460	3/60	0.25	18.25	1597	11.0/–	20	25	1	2.6	3.1	6.6	7.5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 9	1ST FLOOR	ROOF	CARRIER 48TCDD14-A3A6 0A0G0	120,000/ 180,000	98,000/ 148,000	82.0	148,670	105,370	5,000	0.8"	--	460	3	60	6.4	8.2	10.6	3.1	–	–	–	460	3/60	0.25	28.55	1929	10.8/–	31	40	3	6.4	6.8	12.2	12.5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 10	1ST FLOOR	ROOF	CARRIER 48TCDD08-A2A5 0A0G0	125,000	103,000	82.0	90,100	68,900	3,000	0.8"	--	460	3	60	4.2	6.1	6.1	0.8	0.8	–	–	460	3/60	0.25	18.25	1597	11.0/–	20	25	1	2.6	3.1	6.6	7.5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.
RTU 11	1ST FLOOR	ROOF	CARRIER 48FCDA06-A2A6 0A0A0	60,000	48,000	81.0	59,300	44,730	2,000	0.5"	--	460	3	60	1.9	7.8	–	0.8	–	–	–	460	3/60	0.25	10.75	1085	–/14.0	13	20	1	2.5	3.1	5.6	5	PROVIDE OCCUPANT CONTROLLED SMART T'STAT (OCST), SMOKE DETECTOR IN SUPPLY PLENUM, COMPLETE ECONOMIZER SYSTEM, POWER EXHAUST AND VIBRATION ROOF CURB.

NOTES: 1.) VERIFY POWER REQUIREMENTS BEFORE ORDERING UNITS 2.) AN AIR FILTER WITH A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8 OR HIGHER SHALL BE INSTALLED IN THE MECHANICAL SYSTEM FOR OUTSIDE AND RETURN AIR PRIOR TO OCCUPANCY. 3.) POWER EXHAUST REQUIRES A SEPARATE POWER DISCONNECT FROM THE UNIT.

SPLIT SYSTEM FAN COIL UNIT SCHEDULE (COOLING ONLY)

SYMBOL	UNIT TYPE (INDOOR / OUTDOOR)	SERVICE	LOCATION	MANUFACT. AND MODEL	COOLING CAPACITY BTU/HR TH	SH	INDOOR UNIT FAN CFM (4) SETTTINGS 1	2	3	4	ELECTRIC DATA V	PH	HZ	MCA	OUTDOOR UNIT COMP RLA	FAN FLA	ELEC. DATA V	PH/HZ	MCA	MOCP	WEIGHT LBS	EER/SEER	TONS	REMARKS
FC A	INDOOR	AV ROOM 144	WALL	CARRIER 40MAQB18B--3	–	–	310	450	650	680	208	1	60	0.3	–	–	–	–/–	–	–	25	–/--	1.5	SET T'STAT AT 68°F. PROVIDE CONDENSATE REMOVABLE PUMP, OCCUPANT CONTROLLED SMART T'STAT (OCST)
CU A	OUTDOOR	AV ROOM 144	ROOF	CARRIER 38MAQB18R--3	17,000	13,600	–	–	–	–	–	–	–	–	12.3	–	208	1/60	18	25	118	12.5/20	–	--
FC B	INDOOR	SERVER ROOM 219	WALL	CARRIER 40MAQB24B--3	–	–	520	620	780	870	208	1	60	0.4	–	–	–	–/–	–	–	41	–/--	2	SET T'STAT AT 68°F. PROVIDE CONDENSATE REMOVABLE PUMP, OCCUPANT CONTROLLED SMART T'STAT (OCST)
CU B	OUTDOOR	SERVER ROOM 219	ROOF	CARRIER 38MAQB24R--3	24,000	19,200	–	–	–	–	–	–	–	–	14	–	208	1/60	20	30	140	13.0/20.5	–	--
FC C	INDOOR	AV/ SERVER 137	WALL	CARRIER 40MAQB30B--3	–	–	520	620	780	870	208	1	60	0.4	–	–	–	–/–	–	–	41	–/--	2.5	SET T'STAT AT 68°F. PROVIDE CONDENSATE REMOVABLE PUMP, OCCUPANT CONTROLLED SMART T'STAT (OCST)
CU C	OUTDOOR	AV/ SERVER 137	ROOF	CARRIER 38MAQB30R--3	30,000	24,000	–	–	–	–	–	–	–	–	15	–	208	1/60	20	30	140	11.5/19.8	–	--
FC D	INDOOR	ELEVATOR MACHINE ROOM 143	WALL	CARRIER 40MAQB18B--3	–	–	310	450	650	680	208	1	60	0.3	–	–	–	–/–	–	–	25	–/--	1.5	SET T'STAT AT 68°F. PROVIDE CONDENSATE REMOVABLE PUMP, OCCUPANT CONTROLLED SMART T'STAT (OCST)
CU D	OUTDOOR	ELEVATOR MACHINE ROOM 143	ROOF	CARRIER 38MAQB18R--3	17,000	13,600	–	–	–	–	–	–	–	–	12.3	–	208	1/60	18	25	118	12.5/20	–	--

NOTES: 1.) VERIFY POWER REQUIREMENTS BEFORE ORDERING UNITS 2.) AN AIR FILTER WITH A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8 OR HIGHER SHALL BE INSTALLED IN THE MECHANICAL SYSTEM FOR OUTSIDE AND RETURN AIR PRIOR TO OCCUPANCY. 3.) PROVIDE LITTLE GIANT MODEL SCS-5 CONDENSATE OVER FLOW SAFETY SWITCH FOR ALL FAN COILS.

EXHAUST FAN SCHEDULE

SYMBOL	SERVICE	LOCATION	MANUFACTURER AND MODEL	FAN DATA CFM	E.S.P. IN.W.G.	R.P.M.	DRIVE	MOTOR DATA HP	WATT	VOLTS	PHASE	HZ	WEIGHT LBS	REMARKS
EF 1	RESTROOM 115, 116, 118, 120	CEILING (INLINE)	GREENHECK SQ-100-VG	600	0.375"	1107	DIRECT	1/4	–	120	1	60	47	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH TIME CLOCK.
EF 2, 3, 4, 5	RESTROOM 129, 103, 111, 125	CEILING	GREENHECK SP-A50-90-VG	75	0.375"	1050	DIRECT	–	12	120	1	60	12	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH TIME CLOCK.
EF 6, 7	RESTROOM 104, 130	CEILING	GREENHECK SP-A1050-VG	375	0.375"	940	DIRECT	–	240	120	1	60	49	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH TIME CLOCK.
EF 8	RESTROOM 204, 205, 206	CEILING (INLINE)	GREENHECK SQ-160-VG	1,750	0.375"	823	DIRECT	3/4	–	120	1	60	136	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH TIME CLOCK.
EF 9	ELECTRICAL 136	CEILING	GREENHECK SP-A510-VG	350	0.375"	1063	DIRECT	–	155	120	1	60	31	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH LINE VOLT T'STAT SET AT 85°F.
EF 10	ELECTRICAL 218	CEILING	GREENHECK SP-A290	250	0.375"	1050	DIRECT	–	81	120	1	60	24	PROVIDE BACK DRAFT DAMPER. INTERLOCK WITH LINE VOLT T'STAT SET AT 85°F.

NOTE: VERIFY POWER REQUIREMENTS BEFORE ORDERING UNITS

SHEET INDEX

SCOPE OF PROJECT

SCOPE OF WORK CONSISTS OF BUT NOT LIMITED TO, INSTALLATION OF PACKAGED GAS/ELECTRIC UNITS, SPLIT SYSTEM VRF HEAT PUMP, EXHAUST FANS, DIFFUSERS, AND T'STATS, & ZONING CONTROLS.

APPLICABLE CODES

THIS PROJECT SHALL COMPLY WITH THE 2016 CALIFORNIA BUILDING CODE (CBC), 2016 CALIFORNIA MECHANICAL CODE (CMC), 2016 CALIFORNIA PLUMBING (CPC), 2016 CALIFORNIA ENERGY CODE, AND 2016 CALIFORNIA GREEN BUILDING CODE (CGBC).

CONTROL LEGEND

———	LINE VOLTAGE WIRING UNDER ELECTRICAL SECTION.
— — —	LOW VOLTAGE WIRING UNDER THIS SECTION.
(E)	ITEMS FURNISHED AND INSTALLED UNDER ELECTRICAL SECTION.

NOTE ALL CONDUIT UNDER ELECTRICAL SECTION.

DIAGRAMS SHOWN ARE SCHEMATIC AND INTEDED TO SHOW SEQUENCE OF OPERATION ONLY. CONTRACTOR TO PROVIDE ALL ITEMS AND WIRING REQUIRED FOR PROPER OPERATION AND COMPLIANCE WITH CODE, VERIFY THE EXACT REQUIREMENTS WITH EQUIPMENT MANUFACTURER.

CITY APPROVAL STAMP SECTION

DUCT SMOKE DETECTOR SCHEDULE

SYMBOL	MANUAFACTURE & MODEL	VELOCITY MIN.	VELOCITY MAX.	POWER	REMARKS
SD 1	SYSTEM SENSOR INNOVAIR FLEX-D4120 OR APPROVED EQUAL	100	4,000	24 VAC / DC OR 120 VAC	CSFM LISTING 3242-1653:020*

*COORDINATE POWER REQUIREMENTS W / ELECTRICAL.

NOTE: DO NOT FINALIZE BID ESTIMATE PRIOR TO PLAN CHECK APPROVAL.

SPEC GROUP, INC.
CONSULTING MECHANICAL ENGINEERS
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TEL. (818) 783-6965
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REVISIONS

DATE/DELTA	REMARKS

LANCASTER BAPTIST CHURCH

NORTH AUDITORIUM "KID CITY" IMPROVEMENTS

4020 LANCASTER BLVD. LANCASTER, CALIFORNIA

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REGISTERED PROFESSIONAL ENGINEER
SIAMAK GARESTANI
No. 26426
EXP. 9-30-19
MECHANICAL
STATE OF CALIFORNIA

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SHEET TITLE:

HVAC LEGEND, NOTES, & SCHEDULES

SUB DATE

BID DATE

DATE: 05/08/2019
DRAWN BY: R.C./J.S.
JOB NO: 18-169
CHECKED BY: S.G

SHEET NUMBER:
M1.0

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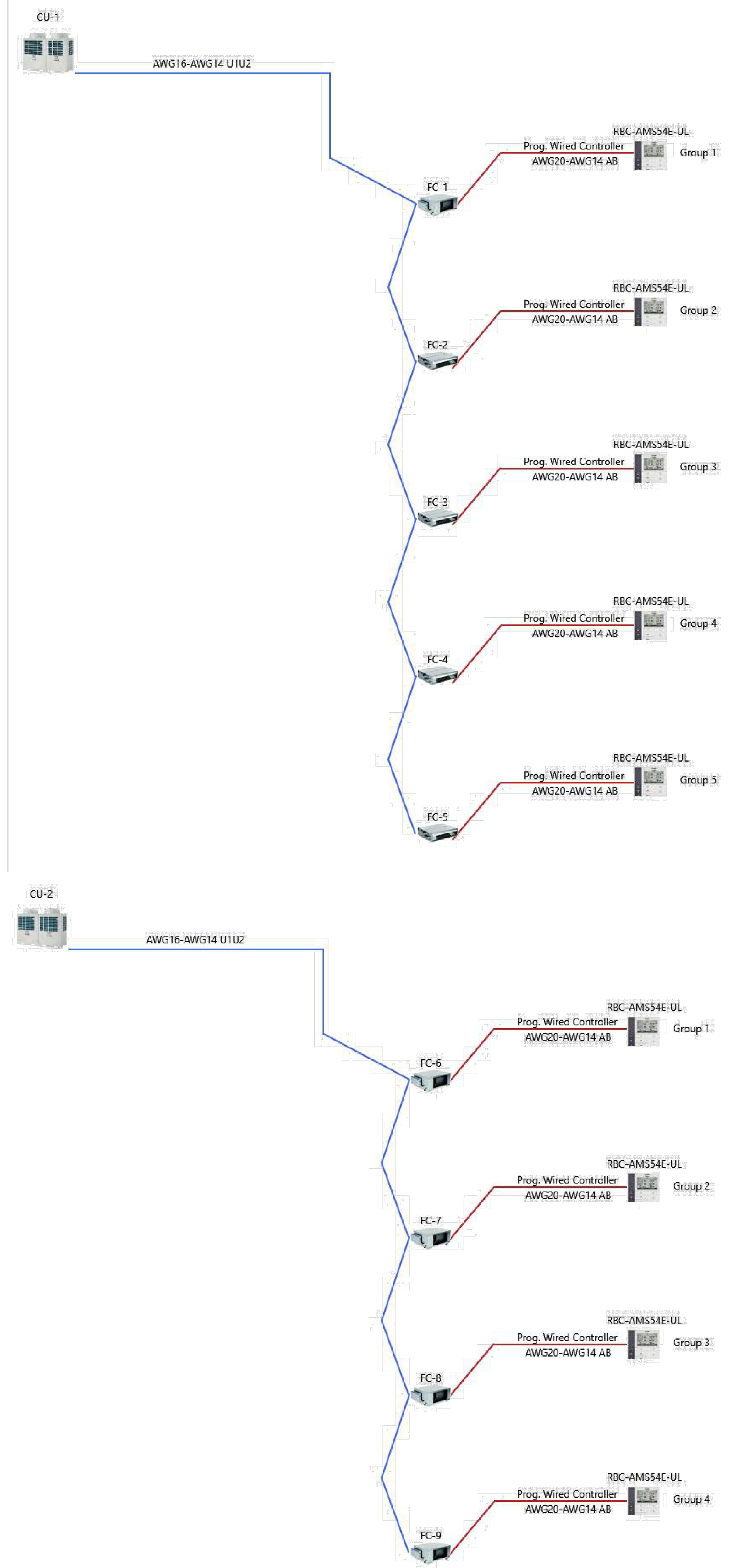


INDOOR UNIT SCHEDULE

System Tag	Room Name	Tag Reference	Address	Model	Type	Nominal Cooling Capacity (BTU/h)	Nominal Heating Capacity (BTU/h)	Refrig Pipe Dimensions (inch)	Project Cooling Design Entering Temp DB/WB (°F)	Project Heating Design Entering Temp DB (°F)	Corrected Capacity: Cooling Total Capacity (BTU/h)	Corrected Capacity: Cooling Sensible Capacity (BTU/h)	Corrected Capacity: Heating Capacity (BTU/h)	Estimated Cooling Coil LAT (°F)	Estimated Heating Coil LAT (°F)	Voltage / Phase	MCA / MOCP	Selected Fan Speed	Rated Airflow at Selected Fan Speed (cfm)	Max Fan ESP Setting (IN WG)	Sound Pressure Per Fan Speed (H/M/L) (dBA)	Zone Remote Controller 1	Zone Remote Controller 2	ERV (DI/DO) Interface Model Number	Notes / Options
CU-1		FC-1		MMD-AP0726HP-UL	High Static Pressure Duct Type	72,000.0	81,000.0	7/8 / 1/2	80.0 / 67.0	70.0	60,718.7	50,640.4	52,900.8	54.6	96.0	208/230V / 1-phase	5.7 / 15	Med	1883	0.2/0.6/1.0	44/40/36	RBC-AMS54E-UL			1, 2, 3
CU-1		FC-2		MMD-AP0364BH2UL-1	Medium Static Pressure Duct Type	36,000.0	40,000.0	5/8 / 3/8	80.0 / 67.0	70.0	30,359.3	23,074.2	26,123.9	55.5	97.2	208/230V / 1-phase	2.3 / 15	Med	890	0.15/0.25/0.46	41/39/37	RBC-AMS54E-UL			1, 2, 3
CU-1		FC-3		MMD-AP0364BH2UL-1	Medium Static Pressure Duct Type	36,000.0	40,000.0	5/8 / 3/8	80.0 / 67.0	70.0	30,359.3	23,074.2	26,123.9	55.5	97.2	208/230V / 1-phase	2.3 / 15	Med	890	0.15/0.25/0.46	41/39/37	RBC-AMS54E-UL			1, 2, 3
CU-1		FC-4		MMD-AP0244BH2UL-1	Medium Static Pressure Duct Type	24,000.0	27,000.0	5/8 / 3/8	80.0 / 67.0	70.0	20,238.4	14,571.2	17,633.6	55.2	99.5	208/230V / 1-phase	1.8 / 15	Med	555	0.15/0.25/0.46	37/35/34	RBC-AMS54E-UL			1, 2, 3
CU-1		FC-5		MMD-AP0484BH2UL-1	Medium Static Pressure Duct Type	48,000.0	54,000.0	5/8 / 3/8	80.0 / 67.0	70.0	40,473.2	27,930.9	35,267.2	54.9	101.1	208/230V / 1-phase	2.8 / 15	Med	1050	0.15/0.25/0.46	42/40/38	RBC-AMS54E-UL			1, 2, 3
CU-2		FC-6		MMD-AP0726HP-UL	High Static Pressure Duct Type	72,000.0	81,000.0	7/8 / 1/2	80.0 / 67.0	70.0	58,099.2	48,455.7	49,652.6	55.7	94.4	208/230V / 1-phase	5.7 / 15	Med	1883	0.2/0.6/1.0	44/40/36	RBC-AMS54E-UL			1, 2, 3
CU-2		FC-7		MMD-AP0726HP-UL	High Static Pressure Duct Type	72,000.0	81,000.0	7/8 / 1/2	80.0 / 67.0	70.0	58,099.2	48,455.7	49,652.6	55.7	94.4	208/230V / 1-phase	5.7 / 15	Med	1883	0.2/0.6/1.0	44/40/36	RBC-AMS54E-UL			1, 2, 3
CU-2		FC-8		MMD-AP0726HP-UL	High Static Pressure Duct Type	72,000.0	81,000.0	7/8 / 1/2	80.0 / 67.0	70.0	58,099.2	48,455.7	49,652.6	55.7	94.4	208/230V / 1-phase	5.7 / 15	Med	1883	0.2/0.6/1.0	44/40/36	RBC-AMS54E-UL			1, 2, 3
CU-2		FC-9		MMD-AP0726HP-UL	High Static Pressure Duct Type	72,000.0	81,000.0	7/8 / 1/2	80.0 / 67.0	70.0	58,099.2	48,455.7	49,652.6	55.7	94.4	208/230V / 1-phase	5.7 / 15	Med	1883	0.2/0.6/1.0	44/40/36	RBC-AMS54E-UL			1, 2, 3

Notes & Options:
1 Nominal cooling capacities are based on indoor air temperature of 80°F DB / 67°F WB, outdoor air temperature of 95°F (DB)
2 Nominal heating capacities are based on indoor air temperature of 70°F DB, outdoor air temperature of 47°F DB / 43°F WB
3 LATs estimated using formula for sensible capacity = (1.08 Btu/(hr cfm °F)) x cfm x deltaT

OUTDOOR UNIT SCHEDULE

System Tag	Tag Reference	Model Number	Modules	Nominal Cooling Capacity (BTU/h)	Nominal Heating Capacity (BTU/h)	System Connected Capacity	Main Refrigerant Pipe Dims (inch)	Preliminary Added Field Charge (lb)	Sound Pressure (dBA)	Project Design Cooling Outdoor Temp DB (°F)	Project Design Heating Outdoor Temp WB (°F)	Corrected Cooling Total Capacity (BTU/h)	Corrected Heating Capacity (BTU/h)	Voltage / Phase	MCA	RFS [or MOCP]	Cooling Efficiency IEER[or SEER]/EER	Heating COP @ 47°F [or HSPF]	Notes / Options
CU-1	CU-1	MMY-AP192S6HT6P-UL	120 + 72	192,000.0	216,000.0	112.5%	1 1/8 / 5/8	16.7	62.5 / 63.5	104.0	27.7	182,148.8	158,049.4	460V / 3-phase 4-wire	23 + 12.9	30 + 20	23.85 / 12.45	3.9	1, 2, 3, 4, 5
CU-2	CU-2	MMY-AP240S6HT6P-UL	120 + 120	240,000.0	270,000.0	120.0%	1 3/8 / 3/4	29.8	64 / 65	104.0	27.7	232,396.8	198,610.3	460V / 3-phase 4-wire	23 + 23	30 + 30	22.7 / 11.95	3.8	1, 2, 3, 4, 5

Notes & Options:
1 Nominal cooling capacities are based on indoor air temperature of 80°F DB / 67°F WB, outdoor air temperature of 95°F (DB)
2 Nominal heating capacities are based on indoor air temperature of 70°F DB, outdoor air temperature of 47°F DB / 43°F WB
3 VRF Efficiency values for EER, IEER, and COP are for mixed ducted and non-ducted indoor units based on AHRI 1230 test method.
4 Ductless and Single-Phase VRF Heat Pump Efficiency values for EER, SEER, and HSPF are for mixed ducted and non-ducted indoor units based on AHRI 210/240 test method.
5 Preliminary Additional Field Charge is calculated based on software inputs; Final Additional Field Charge must be calculated based on final "as-built" piping dimensions.

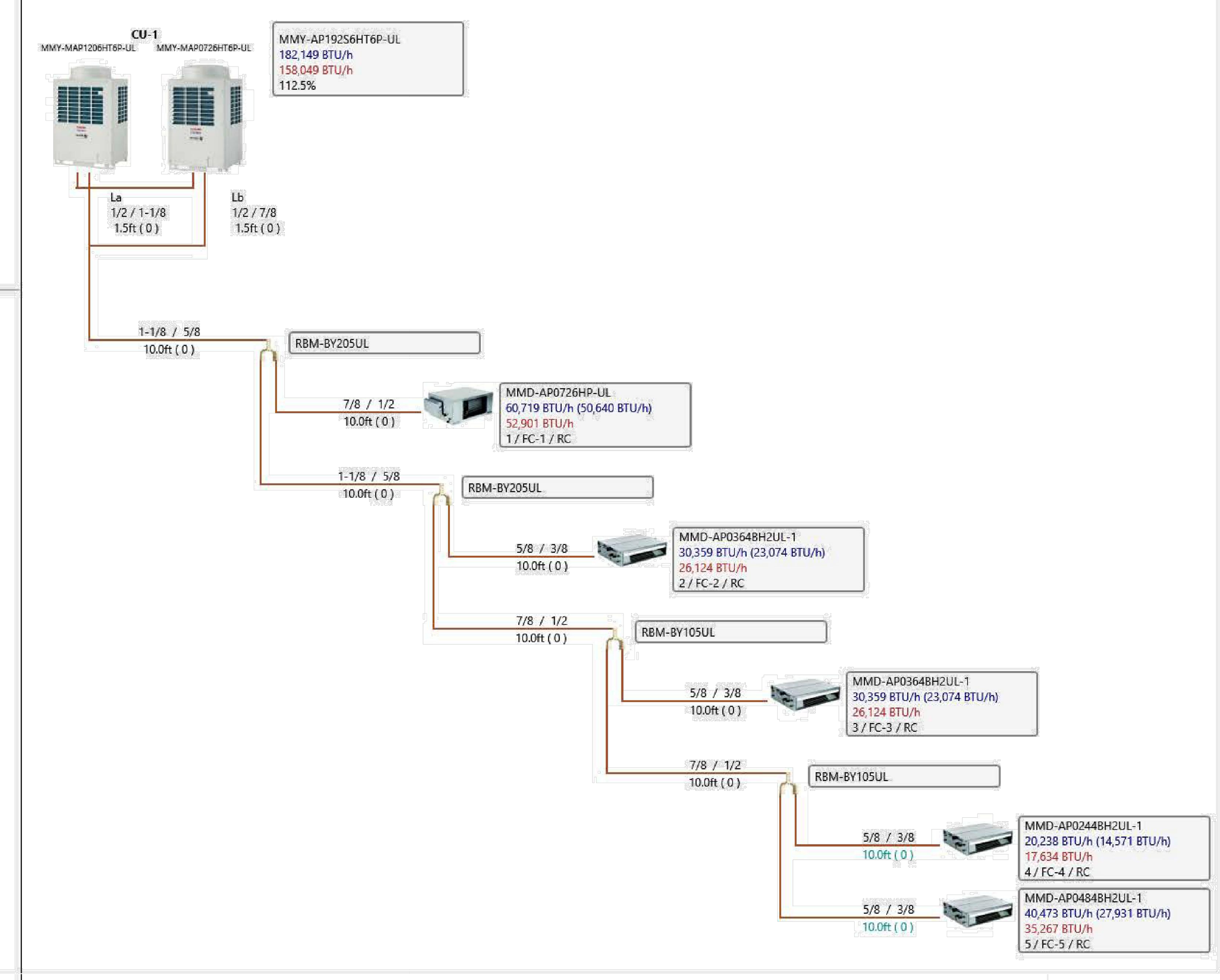
Indoor Units: 5 / 1 to 34
Capacity: 216 / 96 to 259.2 (112.5%)

Total Pipe Length: 93.0 / 3281.0 feet
Furthest Actual: 51.5 / 623.0 feet
Furthest Equiv.: 51.5 / 771.0 feet
After 1st Branch Actual: 40.0 / 295.0 feet
After 1st Branch Equiv.: 40.0 / 295.0 feet
Max Height Between IDU/IDU: 0.0 / 131.0 feet
Max Height Between IDU/ODU (Above): 0.0 / 230.0 feet
Max Height Between IDU/ODU (Below): 0.0 / 131.0 feet

Correction Factors
Outdoor Unit Capacity: 0.95 0.73
Piping Length: 1.00 1.00
Altitude: 0.99 0.99
Defrosting: - 0.88

Additional Refrigerant: 16.7 lb
Total Refrigerant Amount: 67.5 lb

Design Temperatures (°F)
Cooling:
Indoor DB 80.0 Humidity 51.8% Indoor WB 67.0
Outdoor DB 104.0
Heating:
Indoor DB 70.0
Outdoor DB 30.0 Humidity 75.0% Outdoor WB 27.7



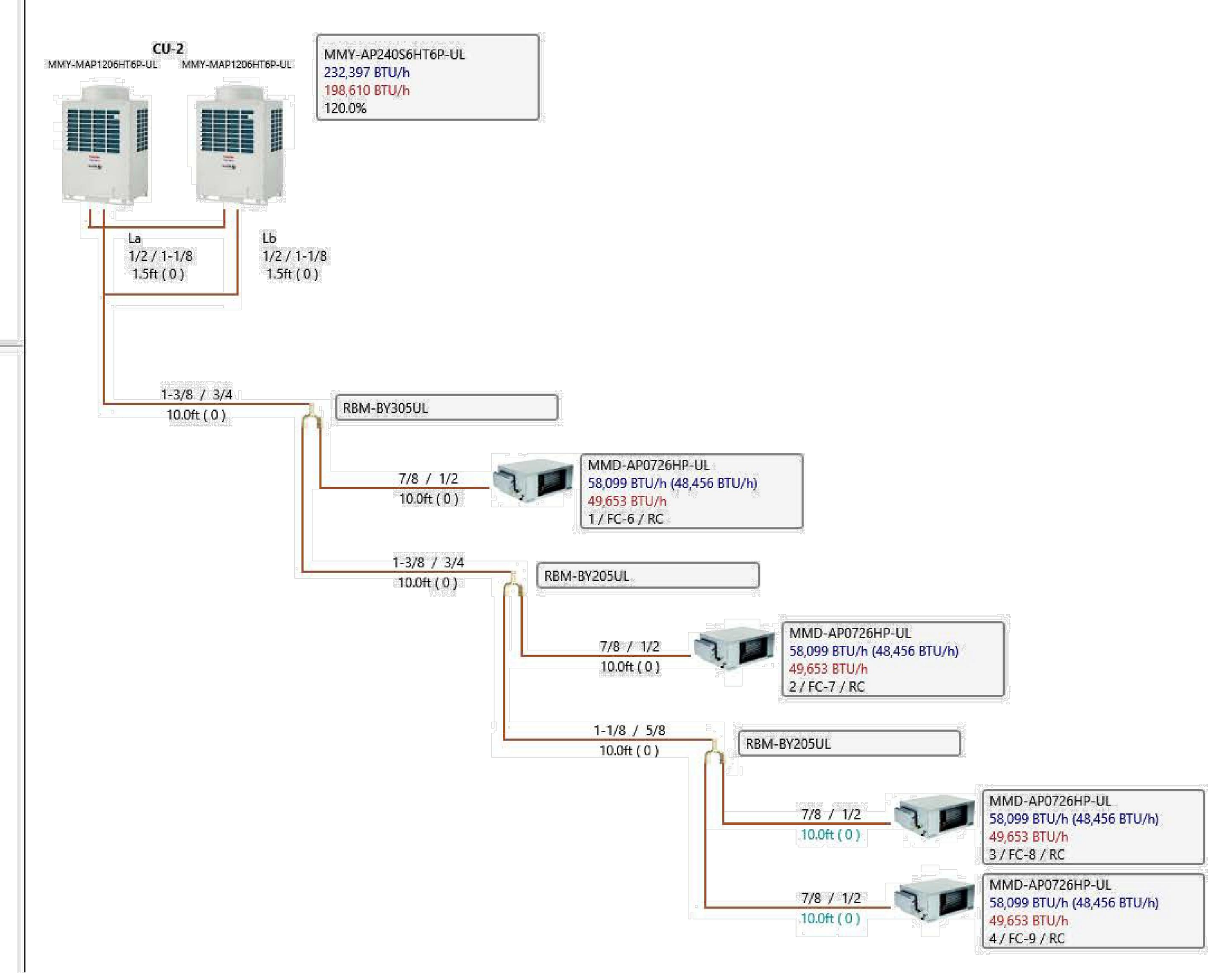
Indoor Units: 4 / 1 to 42
Capacity: 288 / 120 to 324 (120.0%)

Total Pipe Length: 73.0 / 3281.0 feet
Furthest Actual: 41.5 / 623.0 feet
Furthest Equiv.: 41.5 / 771.0 feet
After 1st Branch Actual: 30.0 / 295.0 feet
After 1st Branch Equiv.: 30.0 / 295.0 feet
Max Height Between IDU/IDU: 0.0 / 131.0 feet
Max Height Between IDU/ODU (Above): 0.0 / 230.0 feet
Max Height Between IDU/ODU (Below): 0.0 / 131.0 feet

Correction Factors
Outdoor Unit Capacity: 0.97 0.74
Piping Length: 1.00 1.00
Altitude: 0.99 0.99
Defrosting: - 0.88

Additional Refrigerant: 29.8 lb
Total Refrigerant Amount: 80.6 lb

Design Temperatures (°F)
Cooling:
Indoor DB 80.0 Humidity 51.8% Indoor WB 67.0
Outdoor DB 104.0
Heating:
Indoor DB 70.0
Outdoor DB 30.0 Humidity 75.0% Outdoor WB 27.7



SMMSe / SHRMe VRF Controls and Accessories
RBC-AMS54E-UL – Wired Remote Controller

TOSHIBA
Carrier

Submittal Data

Job Data ______________ Location ______________
Buyer ______________ Buyer PO # ______________ Carrier # ______________
Unit Number ______________ Model Number ______________
Performance Data Certified By ______________ Date ______________

SMMSe / SHRMe VRF Wired Remote Controller Features

- Group control up to 8 indoor units
- Mode of operation
- Fan speed control
- ON/OFF
- Set temperature range limit
- Dual set point (HR only)
- Schedule weekly timer
- Clock setting
- Temperature display in 1ºF
- Individual louver control
- Back lit
- Multiple languages
- DN code setting
- Compatible with Toshiba Carrier VRF and RAV systems

SPEC GROUP, INC.
CONSULTING MECHANICAL ENGINEERS
6345 BALBOA BLVD., SUITE #288
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ENCINO, CA 91316
TEL. (818) 783-6965
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REVISIONS

DATE/DELTA	REMARKS

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NORTH AUDITORIUM "KID CITY" IMPROVEMENTS
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MECHANICAL
STATE OF CALIFORNIA

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SHEET TITLE:
HVAC SCHEDULES, WIRING, & PIPING SPEC'S

SUB DATE
BID DATE
DATE: 05/08/2019
DRAWN BY: R.C./J.S.
JOB NO: 18-169
CHECKED BY: S.G

SHEET NUMBER:
M1.1

DIFFUSER, REGISTER AND GRILLE SCHEDULE

TAG	SYMBOL	MANUFACTURE AND MODEL	NECK SIZE	POSITION	CFM RANGE	REMARKS
S1 | CFM		TITUS TMS (LAY-IN)	6"ø	CEILING	0–100	1 2 3 4 5 6 7 8 9 A C D
			8"ø		101–180	
			10"ø		181–250	
			12"ø		251–450	
			14"ø		451–700	
R1 | CFM		TITUS PAR (LAY-IN)	6"ø	CEILING	0–170	1 2 3 4 5 6 7 8 9 A B C D
			8"ø		171–270	
			10"ø		271–340	
			12"ø		341–520	
E2 | CFM			14"ø		521–670	
			16"ø		671–780	
			18X18		781–1100	
			22X22		1001–1700	
			22X46		1701–3600	
S2 | CFM		TITUS TDC (GYPBOARD / HARDLID)	6X6	CEILING	0–100	1 2 3 4 5 6 7 8 9 A C D
			9X9		101–225	
			12X12		226–400	
			15X15		401–625	
			18X18		626–900	
			21X21		901–1225	
			24X24		1226–1600	
R2 | CFM		TITUS 50F (GYPBOARD / HARDLID)	6X6	CEILING	0–75	1 2 3 4 5 6 7 8 9 A C D
			8X8		76–150	
			10X10		151–250	
			12X12		251–350	
			14X14		351–475	
			16X16		476–650	
			18X18		651–850	
E1 | CFM			20X20		851–1025	
			22X22		1026–1275	
			24X24		1276–1600	
			28X28		1601–2500	
			30X30		2501–2900	
			32X32		2901–3375	
			34X34		3376–3825	

REMARKS:

A. MODEL NUMBERS ARE TITUS UNLESS OTHERWISE NOTED.
B. PROVIDE 24x24 MODULE FOR ALL DIFFUSERS INSTALLED IN LAY-IN CEILINGS.
C. FRAME ALL AIR DEVICES FOR APPROPRIATE CEILING TYPE.
D. PROVIDE ALUMINUM FRAME FOR HARD CEILINGS IN TOILETS, JANITOR'S CLOSET AND LOCK-UP ROOM.

1. DUCTS CONNECTING THE DIFFUSERS SHALL BE FULL SIZE OF NECK DIAMETER.
2. MAXIMUM NOISE CRITERION RATING LESS THAN 30.
3. BAKED ENAMEL FINISH, COLOR TO BE WHITE OR BY ARCHITECTURAL SPECIFICATIONS.
4. DIFFUSERS SHALL BE 4-WAY BLOW UNLESS OTHERWISE INDICATED ON PLANS.
5. MOUNTING FRAME TYPE SHALL BE COORDINATED WITH CEILING CONSTRUCTION TYPE, COORDINATE WITH ARCHITECT.
6. NECK DIAMETER SHALL BE PER MANUFACTURE.
7. DEVICE SHALL BE PAINTED BY PAINTING CONTRACTOR TO MATCH ADJACENT CEILING SURFACES PER ARCHITECTURAL SPECIFICATIONS.
8. WITH DIRECTIONAL BLADES.
9. PROVIDE SUBMITTAL FOR ARCHITECT'S / ENGINEER REVIEW AND APPROVAL.

R = RETURN S = SUPPLY E = EXHAUST

ROUND DIFFUSER SCHEDULE

TAG	SYMBOL	MANUFACTURE AND MODEL	NECK SIZE	CEILING OPENING	OUTSIDE DIAMETER	POSITION	CFM RANGE
S3 | CFM		TITUS TMRA	6"ø	12"ø	13 1/2"ø	CEILING (EXPOSED)	0–100
			8"ø	16"ø	18"ø		101–200
			10"ø	20"ø	22 1/2"ø		201–320
			12"ø	24"ø	27"ø		321–470
			14"ø	28"ø	31 1/2"ø		471–620
			16"ø	32"ø	36"ø		621–820
			18"ø	36"ø	40 1/2"ø		821–1020
			20"ø	40"ø	45"ø		1021–1280

NOTES:

A. MODEL NUMBERS ARE TITUS UNLESS OTHERWISE NOTED.
B. PROVIDE 24x24 MODULE FOR ALL DIFFUSERS INSTALLED IN LAY-IN CEILINGS.
C. FRAME ALL AIR DEVICES FOR APPROPRIATE CEILING TYPE.

1. DUCTS CONNECTING THE DIFFUSERS SHALL BE FULL SIZE OF NECK DIAMETER.
2. MAXIMUM NOISE CRITERION RATING LESS THAN 30.
3. BAKED ENAMEL FINISH, COLOR TO BE WHITE OR BY ARCHITECTURAL SPECIFICATIONS.
4. DIFFUSERS SHALL BE 4-WAY BLOW UNLESS OTHERWISE INDICATED ON PLANS.
5. MOUNTING FRAME TYPE SHALL BE COORDINATED WITH CEILING CONSTRUCTION TYPE, COORDINATE WITH ARCHITECT.
6. NECK DIAMETER SHALL BE PER MANUFACTURE.
7. DEVICE SHALL BE PAINTED BY PAINTING CONTRACTOR TO MATCH ADJACENT CEILING SURFACES PER ARCHITECTURAL SPECIFICATIONS.
8. WITH DIRECTIONAL BLADES.
9. PROVIDE SUBMITTAL FOR ARCHITECT'S / ENGINEER REVIEW AND APPROVAL.

S = SUPPLY

DIFFUSER, REGISTER AND GRILLE SCHEDULE

TAG	SYMBOL	MANUAFACTURE AND MODEL	DUCT SIZE	POSITION	CFM RANGE	REMARKS
R3 | CFM	SIDE VIEW AT WALL; TOP VIEW AT WALL	TITUS 350RL	6X6	WALL / SURFACE MOUNT/ EXPOSED DUCT	0–75	1 2 3 4 5 6 7 8 9 A B C
			8X6		76–100	
			10X6 OR 8X8		101–125	
			12X6		126–150	
			14X6		151–175	
			12X8 OR 10X10		176–225	
			18X6		226–250	
			20X6		251–275	
			22X6		276–300	
			24X6 OR 12X12		301–350	
			30X6 OR 18X10		351–425	
			14X14 OR 18X12		426–525	
			30X8 OR 24X10		526–575	
			42X6, 18X14, 16X16		576–625	
			24X12 OR18X16		626–725	
			18X18		726–825	
			24X14		826–850	
E3 | CFM	TOP VIEW CEILING (EXHAUST); TOP VIEW CEILING (RETURN)		30X12		851–900	
			24X16		901–975	
			20X20		976–1025	
			36X12		1026–1100	
			30X16 OR 24X20		1101–1225	
			22X22		1126–1250	
			42X12 OR 36X14		1251–1275	
			24X22		1276–1350	
			30X18		1351–1400	
			48X12 OR 24X24		1401–1500	
			36X18		1501–1675	
			36X20 OR 30X24		1676–1875	
			42X18		1876–1975	
			28X28		1976–2050	
			42X20 OR 30X28		2051–2200	
			48X18 OR 36X24		2201–2250	
			30X30		2251–2375	
			42X24 OR 36X28		2376–2650	

REMARKS:

A. MODEL NUMBERS ARE TITUS UNLESS OTHERWISE NOTED.
B. FRAME ALL AIR DEVICES FOR APPROPRIATE CEILING TYPE.
C. PROVIDE ALUMINUM FRAME FOR HARD CEILINGS IN TOILETS, JANITOR'S CLOSET AND LOCK-UP ROOM.

1. DUCTS CONNECTING THE DIFFUSERS SHALL BE FULL SIZE OF NECK DIAMETER.
2. MAXIMUM NOISE CRITERION RATING LESS THAN 30.
3. BAKED ENAMEL FINISH, COLOR TO BE WHITE OR BY ARCHITECTURAL SPECIFICATIONS.

4. DIFFUSERS SHALL BE 4-WAY BLOW UNLESS OTHERWISE INDICATED ON PLANS.
5. MOUNTING FRAME TYPE SHALL BE COORDINATED WITH CEILING CONSTRUCTION TYPE, COORDINATE WITH ARCHITECT.
6. NECK DIAMETER SHALL BE PER MANUFACTURE.
7. DEVICE SHALL BE PAINTED BY PAINTING CONTRACTOR TO MATCH ADJACENT CEILING SURFACES PER ARCHITECTURAL SPECIFICATIONS.
8. WITH DIRECTIONAL BLADES.
9. PROVIDE SUBMITTAL FOR ARCHITECT'S / ENGINEER REVIEW AND APPROVAL.

MANDATORY MEASUREMENTS (NOT ALL MAY APPLY)

ADMINISTRATIVE REQUIREMENTS:

A. THE PERSON WITH OVERALL RESPONSIBILITY FOR CONSTRUCTION OR THE PERSON RESPONSIBLE FOR THE INSTALLATION OF REGULATED FEATURES, MATERIALS, COMPONENTS OR MANUFACTURED DEVICES SHALL POST OR MAKE AVAILABLE WITH THE BUILDING PERMIT(S) ISSUED FOR THE BUILDING, THE REQUIRED INSTALLATION CERTIFICATE(S) FOR FEATURES, MATERIALS, COMPONENTS OR MANUFACTURED DEVICES REGULATED BY THE APPLIANCE EFFICIENCY REGULATIONS OR PART 6. SUCH INSTALLATION CERTIFICATE(S) SHALL BE MADE AVAILABLE TO THE ENFORCEMENT AGENCY FOR ALL APPROPRIATE INSPECTIONS. THESE CERTIFICATES SHALL:

i) IDENTIFY FEATURES, MATERIALS, COMPONENTS OR MANUFACTURED DEVISES REQUIRED TO VERIFY COMPLIANCE WITH THE APPLIANCE EFFICIENCY REGULATIONS AND PART 6.
ii) INCLUDE A STATEMENT INDICATING THAT THE FEATURES, MATERIALS, COMPONENTS OR MANUFACTURED DEVISE CONFORM TO THE APPLIANCE EFFICIENCY REGULATIONS AND PART 6 AND THE REQUIREMENTS FOR SUCH FEATURES, MATERIALS, COMPONENTS OR MANUFACTURED DEVICES GIVEN IN THE PLANS AND SPECIFICATIONS APPROVED BY THE LOCAL ENFORCEMENT AGENCY.
iii) STATE THE NUMBER OF THE BUILDING PERMIT UNDER WHICH THE CONSTRUCTION OR INSTALLATION WAS PERFORMED.

SEC. 10-103 (A) 3A

B. WITHIN 90 DAYS AFTER ISSUANCE OF CERTIFICATE OF OCCUPANCY RECORD DRAWINGS SHALL BE PROVIDED TO THE OWNER. IF A BUILDING DESIGN FEATURE, MATERIAL, COMPONENT OR MANUFACTURED DEVICE IS CHANGED BEFORE FINAL CONSTRUCTION AND INSTALLATION, SUCH THAT THE BUILDING MANY NO LONGER COMPLY WITH PART 6, THE BUILDING MUST BE BROUGHT INTO COMPLIANCE, AND SO INDICATED ON AMENDED PLANS AND CERTIFICATE OF COMPLIANCE(S) THAT SHALL BE SUBMITTED FOR APPROVAL.
SEC. 10-103 (A) 2B

C. THE BUILDER SHALL PROVIDE THE BUILDING OWNER OR THE PERSON(S)RESPONSIBLE FOR BUILDING MAINTENANCE (IN CASE OF MULTI-TENANT OR CENTRALLY OPERATED BUILDINGS) AT OCCUPANCY THE FOLLOWING:

1. OPERATING INFORMATION: THE APPROPRIATE CERTIFICATE(S) OF COMPLIANCE AND A LIST OF THE FEATURES, MATERIALS, COMPONENTS AND MANUFACTURED DEVICES INSTALLED IN THE BUILDING AND INSTRUCTIONS ON HOW TO OPERATE THEM EFFICIENTLY.
2. MAINTENANCE INFORMATION: REQUIRED ROUTINE MAINTENANCE ACTIONS SHALL BE CLEARLY STATED AND INCORPORATED ON A READILY ACCESSIBLE LABEL. THE LABEL MAY BE LIMITED TO IDENTIFYING THE OPERATION AND MAINTENANCE MANUAL.
3. VENTILATION INFORMATION: A DESCRIPTION OF THE QUANTITIES OF OUTDOOR AND RECIRCULATED AIR THAT THE VENTILATION SYSTEMS ARE DESIGNED TO PROVIDE EACH AREA.
SEC. 10-103 (B) 2, 3 & 4

MANDATORY MEASURES:

A. MANUFACTURED FENESTRATION PRODUCTS AND EXTERIOR DOORS SHALL:

1. HAVE A CLEARLY VISIBLE TEMPORARY LABEL MEETING THE REQUIREMENTS OF SEC. 10-111 (a) 1, NOT TO BE REMOVED BEFORE INSPECTION BY THE ENFORCEMENT AGENCY, LISTING THE CERTIFIED U-FACTOR, THE SOLAR HEAT GAINS COEFFICIENT (SHGC) AND VISIBLE TRANSMITTANCE (VT) CERTIFYING THAT THE AIR LEAKAGE REQUIREMENTS OF SEC. 116 (a) 1 ARE MET FOR EACH PRODUCT LINE; AND
2. HAVE A PERMANENT LABEL MEETING THE REQUIREMENTS OF SEC. 10-111 (A) 2 IF THE PRODUCT IS RATED USING NFRC PROCEDURES.
SEC. 110.6 (A)

B. FIELD-FABRICATED FENESTRATION AND FIELD-FABRICATED EXTERIOR DOORS SHALL BE CAULKED BETWEEN THE FENESTRATION PRODUCTS OR EXTERIOR DOOR AND THE BUILDING, AND SHALL BE WEATHER STRIPPED. EXCEPTION: UNFRAMED GLASS DOORS AND FIRE DOORS.
SEC. 110.6 (B)

C. JOINTS, PENETRATIONS AND OTHER OPENINGS IN THE BUILDING ENVELOPE THAT ARE POTENTIAL SOURCES OF AIR LEAKAGE SHALL BE CAULKED, GASKETED, WEATHER STRIPPED OR OTHERWISE SEALED TO LIMIT INFILTRATION AND EXFILTRATION.
SEC. 110.7

D. ALL INSULATING MATERIAL SHALL BE INSTALLED IN COMPLIANCE WITH THE FLAME SPREAD RATING AND SMOKE DENSITY REQUIREMENTS OF THE CBC
SEC. 110.8 (C)

E. NO MECHANICAL EQUIPMENT NOR PLUMBING VENTS SHALL BE LOCATED WITHIN THE DESIGNED "SOLAR ZONE" AREAS
SEC. 110.10 (B) 1-B

F. ANY ROOFING PRODUCT USED AS A COOL ROOF SHALL BE CERTIFIED AND LABELED IN ACCORDANCE WITH THE REQUIREMENTS OF SEC. 10-113 BY THE COOL ROOF RATING COUNCIL (CRRC) AND MEET CONDITIONS SET IN SEC. 110.8 (I)
SEC. 110.8 (I)

G. ALL UNITARY SYSTEMS NOT CONTROLLED BY EMCS SHALL HAVE SETBACK THERMOSTATS; CAPABLE TO PROGRAM TEMPERATURE SETPOINTS FOR AT LEAST FOUR PERIODS WITHIN 24 HR PERIOD.
SEC. 110.2 (2) (C)

H. HEAT PUMPS WITH SUPPLEMENTARY ELECTRIC RESISTANCE HEATERS SHALL HAVE CONTROLS:

1. THAT PREVENT SUPPLEMENTARY HEATER OPERATION WHEN THE HEATING LOAD CAN BE MET BY THE HEAT PUMP ALONE; AND

2. CUT-ON TEMPERATURE FOR COMPRESSION HEATING IS HIGHER THAN THE CUT-ON TEMPERATURE FOR SUPPLEMENTARY HEATING, CUT-OFF TEMPERATURE COMPRESSION HEATING IS HIGHER THAN THE CUT-OFF TEMPERATURE FOR SUPPLEMENTARY HEATING.
SEC. 110.2 (B)

I. THE LESSER OF THE MINIMUM RATE OF OUTDOOR AIR REQUIRED BY SEC. 120.1 (B) 2, OR THREE COMPLETE AIR CHANGES SHALL BE SUPPLIED TO THE ENTIRE BUILDING DURING THE ONE-HOUR PERIOD IMMEDIATELY BEFORE THE BUILDING IS NORMALLY OCCUPIED.
SEC. 120.1 (C) 2

J. ALL MECHANICAL VENTILATION AND SPACE-CONDITIONING SYSTEMS SHALL BE INSTALLED WITH DUCTWORK, DAMPERS, AND CONTROLS, TO ALLOW OUTSIDE AIR AIR RATES TO BE OPERATED AT THE LARGER OF (1) THE MINIMUM LEVELS SPECIFIED IN SECTION 120.1 (B) OR (2) THE RATE REQUIRED FOR MAKE-UP OF EXHAUST SYSTEMS THAT ARE REQUIRED FOR AN EXEMPT OR COVERED PROCESS FOR CONTROL OF ORDERS, OR FOR THE REMOVAL OF CONTAMINANTS WITHIN THE SPACE. ALL VARIABLE AIR VOLUME SPACE-CONDITIONING SYSTEMS SHALL INCLUDE CONTROLS TO MAINTAIN MEASURED OUTSIDE AIR VENTILATION RATES WITHIN 10 PERCENT IF THE REQUIRED OUTSIDE AIR VENTILATION RATE AT BOTH AND REDUCED SUPPLY AIRFLOW CONDITIONS.
SEC. 120.1 (E)

K. DIRECT DIGITAL CONTROLS TO THE ZONE SHALL BE PROVIDED AS SPECIFIED BY TABLE 120.2-A FOR DDC APPLICATIONS AND QUALIFICATIONS FOR NEWLY CONSTRUCTED BUILDINGS, ADDITIONS, OR ALTERATIONS.
SEC. 120.2 (J)

L. HOTEL/MOTEL GUEST ROOM THERMOSTATS SHALL HAVE NUMERIC TEMPERATURE SET POINTS IN °F AND °C AND SET POINT STOPS ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL SUCH THAT GUEST ROOM OCCUPANTS CANNOT ADJUST THE SETPOINT MORE THAN ±5 °F (±3 °C)
SEC. 120.2 (C)

M. THE THERMOSTATIC CONTROLS FOR HVAC SYSTEMS SHALL MEET THE FOLLOWING REQUIREMENTS AS APPLICABLE:
a. EACH SPACE CONDITIONING ZONE SHALL BE CONTROLLED BY THE INDIVIDUAL THERMOSTATIC CONTROL THAT RESPONDS TO TEMPERATURE WITHIN THE ZONE AND MEETS THE APPLICABLE REQUIREMENTS OF SECTION (B).
b. EACH THERMOSTATIC CONTROL REQUIRED BY SECTION (A) SHALL BE CAPABLE OF BEING SET LOCALLY OR REMOTELY BY ADJUSTMENT OR SELECTION OF SENSORS TO CONTROL:
1. COMFORT HEATING DOWN 55 °F OR LOWER. COMFORT COOLING UP TO 85 °F OR LOWER.
2. BOTH HEATING AND COOLING, THE THERMOSTATIC CONTROLS SHALL BE CAPABLE OF PROVIDING A TEMPERATURE RANGE OR DEAD BAND OF AT LEAST 5 °F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS SHUT OFF OR REDUCED TO A MINIMUM.
SEC. 120.2 (A) & (B)

N. OUTDOOR AIR SUPPLY AND EXHAUST EQUIPMENT SHALL BE INSTALLED WITH DAMPERS THAT AUTOMATICALLY CLOSE UPON FAN SHUTDOWN.
SEC. 120.2 (F)

O. SPACE CONDITIONING SYSTEMS WITH DDC ZONE CONTROLS SHALL HAVE OPTIMUM START/ STOP CONTROLS. MINIMUM CONTROLS SHOULD FUNCTION THE DIFFERENCE(S) BETWEEN SPACE TEMPERATURE(S) AND OCCUPIED SET POINT(S), THE OUTDOOR AIR TEMPERATURE(S), AND THE AMOUNT OF THE TIME PRIOR TO THE SCHEDULE OCCUPANCY.
SEC. 120.2 (K)

P. ALL AIR DISTRIBUTION SYSTEM DUCTS AND PLENUMS, INCLUDING, BUT NOT LIMITED TO, BUILDING CAVITIES, MECHANICAL CLOSETS, AIR-HANDLER BOXES AND SUPPORT PLATFORMS USED AS DUCTS OR PLENUMS, SHALL BE INSTALLED, SEALED AND INSULATED TO MEET THE REQUIREMENTS OF THE 2016 CALIFORNIA MECHANICAL CODE AND ANSI/SMACNA -006.2006 HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE. SUPPLY-AIR DUCTS CONVEYING HEATED OR COOLED AIR SHALL BE INSULATED TO A MINIMUM INSTALLED LEVEL OF R-4.2 (R-8 IN UNCONDITIONED SPACE), UNLESS DUCTS ARE IN CONDITIONED PLACES.
SEC. 120.4 (A)

Q. MAXIMUM LENGTH OF FLEXIBLE DUCT AND CONNECTORS SHALL NOT BE MORE THAN 5 FEET. FLEXIBLE DUCTS SHALL NOT BE USED IN LIEU OF RIGID ELBOWS.
SEC. 603.4.1

R. EACH SPACE-CONDITIONING SYSTEM SHALL BE INSTALLED WITH CONTROLS THAT COMPLY WITH THE FOLLOWING:
1. CAPABLE OF AUTOMATICALLY SHUTTING OFF THE SYSTEM DURING PERIODS OF NON-USE AND SHALL HAVE:
1. AN AUTOMATIC TIME SWITCH CONTROL DEVICE COMPLYING WITH SEC. 110.9, WITH AN ACCESSIBLE MANUAL OVERRIDE THAT ALLOWS OPERATION OF THE SYSTEM FOR UP TO 4 HOURS: OR
2. AN OCCUPANCY SENSOR; OR
3. A FOUR-HOUR TIMER THAT CAN BE MANUALLY OPERATED.

EXCEPTION: MECHANICAL SYSTEMS SERVING RETAIL STORES AND ASSOCIATED MALLS, RESTAURANTS, GROCERY STORES, CHURCHES AND THEATERS EQUIPPED WITH 7-DAY PROGRAMMABLE TIMERS.

2. AUTOMATICALLY RESTART AND TEMPORARILY OPERATE THE SYSTEM AS REQUIRED TO MAINTAIN:
1. A SETBACK HEATING THERMOSTAT SETPOINT, IF THE SYSTEM PROVIDES MECHANICAL HEATING.
EXCEPTION: AREA WITH THE DESIGN WINTER OUTDOOR TEMPERATURE OF GREATER OF 32 °F.
2. A SETUP COOLING THERMOSTAT SETPOINT, IF THE SYSTEM PROVIDES MECHANICAL COOLING.
EXCEPTION: AREA WITH THE DESIGN SUMMER OUTDOOR TEMPERATURE OF LESS THAN 100 °F.

3. MULTIPURPOSE ROOM LESS THAN 1000 FT²., CLASSROOMS GREATER THAN 750 FT². AND CONFERENCE, CONVENTION, AUDITORIUM AND MEETING CENTER ROOMS GREATER THAN 750 FT². THAT DO NOT HAVE PROCESSES OR OPERATIONS THAT GENERATE DUSTS, FUMES, VAPORS OR GASSES SHALL BE EQUIPPED WITH OCCUPANT SENSOR(S) TO ACCOMPLISH THE FOLLOWING DURING OCCUPIED PERIODS:
1. AUTOMATICALLY SETUP THE OPERATING COOLING TEMPERATURE SET POINT BY 2 °F OR MORE AND SETBACK THE OPERATING HEATING TEMPERATURE SET POINT BY 2 °F OR MORE; AND
2. AUTOMATICALLY RESET THE MINIMUM REQUIRED VENTILATION RATE WITH AN OCCUPANT SENSOR VENTILATION CONTROL DEVICE ACCORDING TO SECTION 120.1(C)5.
EXCEPTION TO SECTIONS 120.2(E)3: IF DEMAND CONTROL VENTILATION IS IMPLEMENTED AS REQUIRED BY SECTION 120.1(C)3 AND 120.1(4).
SEC. 120.2(E)

S. THE PIPING FOR ALL SPACE CONDITIONING AND SERVICE WATER HEATING SYSTEMS SHALL BE INSULATED IN ACCORDANCE WITH TABLE 120.3-A.
SEC. 120.3

T. SERVICE WATER HEATER SYSTEMS AND EQUIPMENT SHALL MEET THE APPLICABLE REQUIREMENTS OF THE APPLIANCE EFFICIENCY REGULATIONS AS REQUIRED BY SEC. 110.1
SEC. 110.3 (B)

U. SERVICE HOT WATER SYSTEMS WITH CIRCULATING PUMPS OR WITH ELECTRICAL HEAT TRACE SYSTEMS SHALL BE CAPABLE OF AUTOMATICALLY TURNING OFF THE SYSTEM.
SEC. 110.3 (C) 2

V. INSTANTANEOUS WATER HEATERS WITH AN INPUT RATING GREATER THAN 6.8 KBTUH/HR (2 kW) SHALL HAVE ISOLATION VALVES ON BOTH COLD WATER SUPPLY AND HOT PIPE LEAVING THE WATER HEATER. HOSE BIBS OR OTHER FITTINGS SHALL BE INSTALLED ON EACH VALVE FOR FLUSHING THE WATER HEATER WHEN THE VALVES ARE CLOSED.
SEC. 110.3 (C)3

W. LAVATORIES IN PUBLIC RESTROOMS SHALL HAVE CONTROLS THAT LIMIT THE WATER SUPPLY TEMPERATURES TO 110 F.
SEC. 110.3 (C)3

CHAPTER 6 (DUCT SYSTEMS)

602.1 GENERAL. SUPPLY AIR, RETURN AIR, AND OUTSIDE AIR FOR HEATING, COOLING, OR EVAPORATIVE COOLING DUCT SYSTEMS CONSTRUCTED OF METAL SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS- METAL AND FLEXIBLE OR UL 181.

602.2 COMBUSTIBLES WITHIN DUCTS OR PLENUMS. MATERIALS EXPOSED WITHIN DUCTS OR PLENUMS SHALL BE NONCOMBUSTIBLE OR SHALL HAVE A FLAME SPREAD INDEX NOT TO EXCEED 25 AND A SMOKE DEVELOPED INDEX NOT TO EXCEED 50, WHERE TESTED AS A COMPOSITE PRODUCT IN ACCORDANCE WITH ASTM E84 OR UL 723.

EXCEPTIONS:
1. RETURN-AIR AND OUTSIDE-AIR DUCTS, PLENUMS, OR CONCEALED SPACES THAT SERVE A DWELLING UNIT SHALL BE PERMITTED TO BE OF COMBUSTIBLE CONSTRUCTION.
2. AIR FILTERS IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 311.2.
3. WATER EVAPORATION MEDIA IN AN EVAPORATIVE COOLER. CHARCOAL FILTERS WHERE PROTECTED WITH AN APPROVED FIRE SUPPRESSION SYSTEM.
4. PRODUCTS LISTED AND LABELED FOR INSTALLATION WITHIN PLENUMS IN ACCORDANCE WITH SECTION 602.2.1 THROUGH SECTION 602.2.4.
5. SMOKE DETECTORS.
6. DUCT INSULATION, COVERINGS, AND LININGS AND OTHER SUPPLE-MENTARY MATERIALS INSTALLED IN ACCORDANCE WITH SECTION 604.0.
7. MATERIALS IN A HAZARDOUS FABRICATION AREA INCLUDING THE AREAS ABOVE AND BELOW THE FABRICATION AREA SHARING A COMMON AIR RECIRCULATION PATH WITH THE FABRICATION AREA.

602.3 METAL. DUCTS, PLENUMS, OR FITTINGS OF METAL SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS-METAL AND FLEXIBLE.

602.4 EXISTING METAL DUCTS. EXISTING METAL DUCTS SHALL BE PERMITTED TO BE USED WHERE COOLING COILS ARE ADDED TO A HEATING SYSTEM, PROVIDED THE FIRST 10 FEET (3048 MM) OF THE DUCT OR PLENUM MEASURED FROM THE COOLING COIL DISCHARGE ARE CONSTRUCTED OF METAL OF THE GAUGE THICKNESS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS-METAL AND FLEXIBLE. EXISTING METAL DUCTS COMPLETELY ENCLOSED IN INACCESSIBLE CONCEALED AREAS ARE NOT REQUIRED TO BE REPLACED. ACCESSIBLE DUCTS SHALL BE INSULATED IN ACCORDANCE WITH SECTION 604.0. FOR THE PURPOSE OF THIS SECTION, DUCTS SHALL BE CONSID-EREDMACCESSIBLE WHERE THE ACCESS SPACE IS 30 INCHES (762 MM) OR MORE IN HEIGHT.

602.5 GYPSUM. WHERE GYPSUM PRODUCTS ARE EXPOSED IN DUCTS OR PLENUMS, THE AIR TEMPERATURE SHALL BE RESTRICTED TO A RANGE FROM 50°F (10°C) TO L25°F (52°C), AND MOISTURE CONTENT SHALL BE CONTROLLED SO THAT THE MATERIAL IS NOT ADVERSELY AFFECTED. FOR THE PURPOSE OF THIS SECTION, GYPSUM PRODUCTS SHALL NOT BE EXPOSED IN DUCTS SERVING AS SUPPLY FROM EVAPORATIVE COOLERS, AND IN OTHER AIR-HANDLING SYSTEMS REGULATED BY THIS CHAPTER WHERE THE TEMPERATURE OF THE GYPSUM PRODUCT WILL BE BELOW THE DEW POINT TEMPERATURE.

602.6 FACTORY-MADE AIR DUCTS. FACTORY-MADE AIR DUCTS SHALL BE APPROVED FOR THE USE INTENDED OR SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF UL 181. EACH PORTION OF A FACTORY-MADE AIR DUCT SYSTEM SHALL BE IDENTIFIED BY THE MANUFACTURER WITH A LABEL OR OTHER IDENTIFICATION INDICATING COMPLIANCE WITH ITS CLASS DESIGNATION.

603.1 GENERAL. THE PRESSURE CLASSIFICATION OF DUCTS SHALL BE NOT LESS THAN THE DESIGN OPERATING PRESSURE OF THE AIR DISTRIBUTION IN WHICH THE DUCT IS UTILIZED.

603.2 UNDER FLOOR OR CRAWL SPACE. AIR DUCTS INSTALLED UNDER A FLOOR IN A CRAWL SPACE SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING:
1. SHALL NOT PREVENT ACCESS TO AN AREA OF THE CRAWL SPACE.
2. WHERE IT IS REQUIRED TO MOVE UNDER DUCTS FOR ACCESS TO AREAS OF THE CRAWL SPACE, A VERTICAL CLEARANCE OF NOT LESS THAN 18 INCHES (457 MM) SHALL BE PROVIDED.

603.3 METAL DUCTS. DUCTS SHALL BE SUPPORTED AT EACH CHANGE OF DIRECTION AND IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS- METAL AND FLEXIBLE. RISER DUCTS SHALL BE HELD IN PLACE BY MEANS OF METAL STRAPS OR ANGLES AND CHANNELS TO SECURE THE RISER TO THE STRUCTURE.

METAL DUCTS SHALL BE INSTALLED WITH NOT LESS THAN 4 INCHES (102 MM) SEPARATION FROM EARTH. DUCTS SHALL BE INSTALLED IN A BUILDING WITH CLEARANCES THAT WILL RETAIN THE FULL THICKNESS OF FIREPROOFING ON STRUCTURAL MEMBERS.

603.3.1 RECTANGULAR DUCTS. SUPPORTS FOR RECTANGULAR DUCTS SHALL BE INSTALLED ON TWO OPPOSITE SIDES OF EACH DUCT AND SHALL BE RIVETED. BOLTED, OR METAL SCREWED TO EACH SIDE OF THE DUCT AT INTERVALS SPECIFIED.

603.3.2 HORIZONTAL ROUND DUCTS: HORIZONTAL ROUND DUCTS. HORIZONTAL ROUND DUCTS NOT MORE THAN 40 INCHES (I016 MM) IN DIAMETER WHERE SUSPENDED FROM ABOVE SHALL BE SUPPORTED WITH ONE HANGER PER INTERVAL AND IN ACCORDANCE WITH SECTION 603.3.2.1 THROUGH SECTION 603.3.2.3.

603.3.2.1 TIGHT-FITTING AROUND THE PERIMETER. DUCTS SHALL BE EQUIPPED WITH TIGHT-FITTING CIRCULAR BANDS EXTENDING AROUND THE ENTIRE PERIMETER OF THE DUCT AT EACH SPECIFIED SUPPORT INTERVAL.

603.3.2.2 SIZE OF CIRCULAR BANDS. CIRCULAR BANDS SHALL BE NOT LESS THAN 1 INCH (25.4 MM) WIDE NOR LESS THAN EQUIVALENT TO THE GAUGE OF THE DUCT MATERIAL IT SUPPORTS.
EXCEPTION: DUCTS NOT MORE THAN 10 INCHES (254 MM) IN DIAMETER SHALL BE PERMITTED TO BE SUPPORTED BY NO. 18 GAUGE GALVANIZED STEEL WIRE.

603.3.2.3 CONNECTION. EACH CIRCULAR BAND SHALL BE PROVIDED WITH MEANS OF CONNECTING TO THE SUSPENDING SUPPORT.

603.4 FACTORY-MADE AIR DUCTS AND CONNECTORS. FACTORY-MADE AIR DUCTS AND CONNECTORS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181 AND INSTALLED IN ACCORDANCE WITH THE TERMS OF THEIR LISTING, THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. AND SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.

FACTORY-MADE AIR DUCTS SHALL NOT BE USED FOR VERTICAL RISERS IN AIR-DUCT SYSTEMS SERVING MORE THAN TWO STORIES AND SHALL NOT PENETRATE A FIRE-RESISTANCE-RATED ASSEMBLY OR CONSTRUCTION.

FACTORY-MADE AIR DUCTS SHALL BE INSTALLED WITH NOT LESS THAN 4 INCHES (I02 MM) OF SEPARATION FROM EARTH. EXCEPT WHERE INSTALLED AS A LINER INSIDE OF CONCRETE, TILE, OR METAL PIPE AND 1 SHALL BE PROTECTED FROM PHYSICAL DAMAGE.

THE TEMPERATURE OF THE AIR TO BE CONVEYED IN A DUCT SHALL NOT EXCEED 250°F (121 °C).

603.3.3 EARTHQUAKE LOADS. DUCTS LOCATED IN STRUCTURES THAT ARE INSTALLED IN AREAS CLASSIFIED AS SEISMIC DESIGN 1 CATEGORY C, D, E, OR F SHALL BE IN ACCORDANCE WITH THE BUILDING CODE.

603.4.1 LENGTH LIMITATION. FACTORY-MADE FLEXIBLE AIR DUCTS AND CONNECTORS SHALL BE NOT MORE THAN 5 FEET (1524 MM) IN LENGTH AND SHALL NOT BE USED IN LIEU OF RIGID ELBOWS OR FITTINGS.
EXCEPTION: RESIDENTIAL OCCUPANCIES.

603.5 FLEXIBLE AIR DUCTS AND CONNECTORS. FLEXIBLE AIR DUCTS AND CONNECTORS SHALL COMPLY WITH UL 181, AND SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND SMACNA HVAC DUCT CONSTRUCTION STANDARDS-METAL AND FLEXIBLE. FLEXIBLE AIR DUCTS SHALL NOT PENETRATE A FIRE-RESISTANCE-RATED ASSEMBLY OR CONSTRUCTION. FLEXIBLE , AIR CONNECTOR LENGTHS SHALL BE NOT MORE THAN 5 FEET (1524 MM) AND SHALL NOT PENETRATE A WALL, FLOOR, OR CEILING. THE TEMPERATURE OF THE AIR TO BE CONVEYED IN A FLEXIBLE AIR DUCT OR CONNECTOR SHALL NOT EXCEED 250°F (121°C).

603.6 PLASTIC DUCTS. PLASTIC AIR DUCTS AND FITTINGS SHALL BE PEM1ITTED WHERE INSTALLED UNDERGROUND AND LISTED FOR SUCH USE.

603.7 PROTECTION OF DUCTS. DUCTS INSTALLED IN LOCATIONS WHERE THEY ARE EXPOSED TO MECHANICAL DAMAGE BY VEHICLES OR FROM OTHER CAUSES SHALL BE PROTECTED BY APPROVED BARRIERS.

603.8 SUPPORT OF DUCTS. INSTALLERS SHALL PROVIDE THE MANUFACTURER'S FIELD FABRICATION AND INSTALLATION INSTRUCTIONS.

FACTORY-MADE AIR DUCTS THAT ARE IN ACCORDANCE WITH UL 181 SHALL BE SUPPORTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. OTHER DUCTS SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE.

603.10 JOINTS AND SEAMS OF DUCTS. JOINTS AND SEAMS FOR DUCT SYSTEMS SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE. JOINTS OF DUCT SYSTEMS SHALL BE MADE SUBSTANTIALLY AIRTIGHT BY MEANS OF TAPES, MASTICS, GASKETING, OR OTHER MEANS. CRIMP JOINTS FOR ROUND DUCTS SHALL HAVE A CONTACT LAP OF NOT LESS THAN 1 1/2 INCHES (38 MM) AND SHALL BE MECHANICALLY FASTENED BY MEANS OF NOT LESS THAN THREE SHEET-METAL SCREWS EQUALLY SPACED AROUND THE JOINT, OR AN EQUIVALENT FASTENING METHOD.

JOINTS AND SEAMS AND REINFORCEMENTS FOR FACTORY-MADE AIR DUCTS AND PLENUMS SHALL COMPLY WITH THE CONDITIONS OF PRIOR APPROVAL IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS THAT SHALL ACCOMPANY THE PRODUCT. CLOSURE SYSTEMS FOR RIGID AIR DUCTS AND PLENUMS SHALL BE LISTED IN ACCORDANCE WITH UL 181 A. CLOSURE SYSTEMS FOR FLEXIBLE AIR DUCTS SHALL BE LISTED IN ACCORDANCE WITH UL 181B.

603.11 CROSS CONTAMINATION. EXHAUST DUCTS AND VENTING SYSTEMS UNDER POSITIVE PRESSURE SHALL NOT EXTEND INTO OR PASS THROUGH DUCTS OR PLENUMS.

603.12 UNDERGROUND. INSTALLATION. DUCTS INSTALLED UNDERGROUND SHALL BE APPROVED FOR THE INSTALLATION AND SHALL HAVE A SLOPE OF NOT LESS THAN INCH PER FOOT (10.4 MM/M). DUCTS, PLENUMS, AND FITTINGS SHALL BE PERMITTED TO BE CONSTRUCTED OF CONCRETE, CLAY, OR CERAMICS WHERE INSTALLED IN THE GROUND OR IN A CONCRETE SLAB, PROVIDED THE JOINTS ARE TIGHTLY SEALED. METAL DUCTS WHERE INSTALLED IN OR UNDER A CONCRETE SLAB SHALL BE ENCASED IN NOT LESS THAN 2 INCHES (51 MM) OF CONCRETE.

604.1 GENERAL. AIR DUCTS CONVEYING AIR AT TEMPERATURES EXCEEDING 140°F (60°C) SHALL BE INSULATED TO MAINTAIN AN INSULATION SURFACE TEMPERATURE OF NOT MORE THAN 140°F (60°C). FACTORY-MADE AIR DUCTS AND INSULATIONS INTENDED FOR INSTALLATION ON THE EXTERIOR OF DUCTS SHALL BE LEGIBLY PRINTED WITH THE NAME OF THE MANUFACTURER, THE THERMAL RESISTANCE (R) VALUE AT INSTALLED THICKNESS, FLAME-SPREAD INDEX AND SMOKE DEVELOPED INDEX OF THE COMPOSITE MATERIAL. INTERNAL DUCT LINERS AND INSULATION SHALL BE INSTALLED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE.

EXCEPTIONS:
1. FACTORY-INSTALLED PLENUMS, CASINGS, OR DUCTWORK FURNISHED AS A PART OF HVAC EQUIPMENT TESTED AND RATED IN ACCORDANCE WITH APPROVED ENERGY EFFICIENCY STANDARDS.
2. DUCTS OR PLENUMS LOCATED IN CONDITIONED SPACES WHERE HEAT GAIN OR HEAT LOSS WILL NOT INCREASE ENERGY USE.
3. FOR RUNOUTS LESS THAN 10 FEET (3048 MM) IN LENGTH TO AIR TERMINALS OR AIR OUTLETS, THE RATED R VALUE OF INSULATION NEED NOT EXCEED R-3.5.
4. BACKS OF AIR OUTLETS AND OUTLET PLENUMS EXPOSED TO UNCONDITIONED OR INDIRECTLY CONDITIONED SPACES WITH FACE AREAS EXCEEDING 5 SQUARE FEET (0.5 M²) NEED NOT EXCEED R-2; THOSE 5 SQUARE FEET (0.5 M²) OR SMALLER NEED NOT BE INSULATED.
5. DUCTS AND PLENUMS USED EXCLUSIVELY FOR EVAPORATIVE COOLING SYSTEMS.

604.1.1 WITHIN DUCTS OR PLENUMS. MATERIALS INSTALLED WITHIN DUCTS AND PLENUMS FOR INSULATING, SOUND DEADENING, OR OTHER PURPOSES SHALL HAVE A MOLD, HUMIDITY, AND EROSION-RESISTANT SURFACE WHERE TESTED IN ACCORDANCE WITH UL L R I. DUCT LINERS IN SYSTEMS OPERATING WITH AIR VELOCITIES EXCEEDING 2000 FEET PER MINUTE (10.16M/S) SHALL BE FASTENED WITH BOTH ADHESIVE AND MECHANICAL FASTENERS, AND EXPOSED EDGES SHALL HAVE APPROVED TREATMENT TO WITHSTAND THE OPERATING VELOCITY. WHERE THE INTERNAL INSULATION IS CAPABLE OF BEING IN CONTACT WITH CONDENSATES OR OTHER LIQUIDS, THE MATERIAL SHALL BE WATER-RESISTANT.

604.1.2 DUCT COVERINGS AND LINING. INSULATION APPLIED TO THE SURFACE OF DUCTS, INCLUDING DUCT COVERINGS, LININGS, TAPES, AND ADHESIVES, LOCATED IN BUILDINGS SHALL HAVE A FLAME-SPREAD INDEX NOT TO EXCEED 25 AND A SMOKE DEVELOPED INDEX NOT TO EXCEED 50, WHERE TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723. THE SPECIMEN PREPARATION AND MOUNTING PROCEDURES OF ASTM E2231 SHALL BE USED. AIR DUCT COVERINGS AND LININGS SHALL NOT FLAME, GLOW, SMOLDER, OR SMOKE WHERE TESTED IN ACCORDANCE WITH ASTM C411 AT THE TEMPERATURE TO WHICH THEY ARE EXPOSED IN SERVICE. IN NO CASE SHALL THE TEST TEMPERATURE BE LESS THAN 250°F (121°C). COVERINGS SHALL NOT PENETRATE A FIRE-RESISTANCE-RATED ASSEMBLY.

DUCT SUPPORT - METAL DUCTS. HORIZONTAL DUCTS SHALL HAVE A SUPPORT WITH 2 FT. OF EACH ELBOW AND WITH 4 FT. OF EACH BRANCH INTERSECTION. SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.

GENERAL NOTES

DUCTWORK:
1. INSTALLATION OF DUCTWORK SHALL BE COORDINATED WITH OTHER TRADES. DUCTS INSTALLED IN LOCATIONS WHERE THEY ARE SUBJECT TO PHYSICAL DAMAGE SHALL BE PROTECTED BY SUITABLE GUARDS.
2. ALL AIR CONDITIONING DUCTS TO COMPLY WITH 2016 OF THE CALIFORNIA MECHANICAL CODE. ALL TRANSVERSE JOINTS TO BE SUBSTANTIALLY AIRTIGHT WITH TAPE, MASTIC, GASKETING OR OTHER MEANS; ALL LOW PRESSURE DUCTWORK SIZED EQUAL TO OR LESS THAN 0.1" W.G./100 FT. ALL DUCTS FOR VENTILATION INCLUDING GARAGE VENTILATION SYSTEM TO COMPLY WITH 2016 CALIFORNIA MECHANICAL CODE.
3. DUCT SUPPORTS AND ANCHORAGE SHALL COMPLY PER ANSI/ SMACNA 006-2006 HVAC DUCT CONSTRUCTION STANDARDS.
4. MANUAL VOLUME DAMPERS TO BE INSTALLED IN ALL BRANCH TAKE-OFFS. ALL DAMPERS TO HAVE LOCKING QUADRANTS.
5. DUCT SIZES SHOWN ARE NET SIZES REQUIRED. LINED DUCTS SHALL BE INCREASED IN SIZE TO ACCOMMODATE LINING WITHOUT LOSS OF AREA.
6. PROVIDE MASTIC OR DUCT TAPE JOINT SEALANT TO SEAL TRANSVERSE JOINTS ON AIR SUPPLY DUCTS INSTALLED IN LOCATIONS WHERE AIR LEAKAGE THROUGH THE JOINTS WOULD BE NON-BENEFICIAL TO THE OCCUPIED AREA TEMPERATURE REQUIREMENTS. AND, SEAL LONGITUDINAL JOINTS ON LOW-PRESSURE SUPPLY DUCTS WHERE INTERNAL STATIC PRESSURE EXCEED 0.75" OF WATER PRESSURE.
7. FLEX DUCT SHALL BE ATTACHED TO ALL REGISTERS, GRILLS, COLLARS AND FITTINGS ACCORDING TO ITS LISTINGS. I.E. A MINIMUM OF TWO WRAPS OF UL 181 TAPE AND A PANDUIT STRAP ON THE INSIDE LINER AND A MINIMUM OF TWO WRAP OF UL 181 TAPE OR A PANDUIT STRAP OR BOTH ON THE OUTSIDE COVER.
8. ALL FLEX DUCT SPLICES SHALL BE SLEEVED.
9. ALL AFD SPLICES SHALL BE SLEEVED.
10. PROVIDE DUCT LINING TO SUPPLY DUCT OF EACH AC UNIT FOR MINIMUM OF 10 FT. DUCT LINING TO BE EQUAL TO JOHNS-MANVILLE, 1" THICK x 1-1/2 PCF DENSITY DUCT LINER. DUCTWORK TO BE INCREASED IN EACH DIMENSION TO INCORPORATE THICKNESS OF LINING.
11. VOLUME DAMPERS IN ALL BRANCH DUCTS.
12. PROVIDE GALVANIZED SHEET METAL DUCTS FABRICATED AND INSTALLED PER CMC 2016 EDITION.
13. ALL EXPOSED SHEET METAL DUCTS SHALL BE LINED.

AIR DEVICES:
1. ARROWS AT CEILING DIFFUSERS INDICATE THE AIR THROW PATTERN.
2. COORDINATE WITH ARCHITECTURAL DRAWINGS AND REFLECTED CEILING PLANS FOR EXACT LOCATION OF ALL DIFFUSERS AND REGISTERS AND LOUVERS.
3. SUPPLY DIFFUSERS AND REGISTERS TO BE TITUS OR APPROVED EQUAL WITH KEY OPERATED OPPOSED BLADE DAMPER UNIT.
4. RETURN AND EXHAUST AIR REGISTERS TO BE TITUS OR APPROVED EQUAL WITH KEY OPERATED OPPOSED BLADE DAMPER UNIT.
5. ALL REGISTERS AND GRILLS INSTALLED IN T-BAR CEILINGS SHALL BE ATTACHED AT EACH CORNER TO THE MAIN RUNNERS WITH APPROVED CLIPS OR SM SCREWS.

INSULATION:
1. MINERAL FIBER INSULATION SHALL BE INSTALLED IN JOINT SPACES WHENEVER A PLUMBING PIPE OR DUCT PENETRATES A FLOOR-CEILING ASSEMBLY OR WHERE SUCH PIPE OR DUCT PASSES THROUGH THE PLANE OF FLOOR-CEILING ASSEMBLY FROM WITHIN A WALL. THE INSULATION SHALL BE INSTALLED TO A POINT 12" BEYOND THE PIPE OR DUCT.
2. COMBUSTION AIR, KITCHEN AND BATHROOM EXHAUST DUCTS WITHIN SOUND SEPARATION ASSEMBLIES SHALL BE WRAPPED WITH INSULATION.
3. CEILING CONCEALED SUPPLY AND RETURN DUCTS TO BE COVERED ALL SIDES WITH INSULATION PER CEC STANDARDS; THE INSULATION TO BE CERTIFIED BY CALIFORNIA ENERGY COMMISSION; (JOHN MANSVILLE IS ACCEPTED) WHEN DUCTWORK PENETRATE INSULATED WALLS OR ROOF, THE HOLE MUST BE SEALED WITH AN APPROVED POLY SEAL MATERIAL.
4. INSULATION INSTALLER SHALL POST IN A CONSPICUOUS LOCATION IN THE BUILDING A CERTIFICATE SIGNED BY THE INSTALLER AND BUILDER STATING THAT THE INSULATION CONFORMS WITH THE REQUIREMENTS OF TITLE 24, AND THAT THE MATERIAL INSTALLED CONFORMS.
5. ALL INSULATION MATERIALS SHALL BE CERTIFIED BY THE MANUFACTURER AS COMPLYING WITH THE CALIFORNIA QUALITY STANDARD FOR INSULATION MATERIAL.
6. INSULATION APPLIED TO THE EXTERIOR SURFACE OF DUCTS LOCATED IN THE BUILDINGS SHALL HAVE A FLAME SPREAD OF NOT MORE THAN 25 AND A SMOKE-DENSITY NOT EXCEEDING 50 PER CBC 2016.

PIPING:
1. PROVIDE A 3/4" MINIMUM CONDENSATE DRAIN FROM EACH AC UNIT TO AN APPROVED DISPOSAL AREA. CONDENSATE WATER SHALL NOT DRAIN OVER A PUBLIC WAY. THE DRAIN SHALL HAVE A SLOPE OF NOT LESS THAN 1/8 INCH PER FOOT AND SHALL BE OF APPROVED CORROSION-RESISTANT PIPE. (THIS WORK IS UNDER PLUMBING SECTION, REFER TO PLUMBING DRAWINGS).
2. FOR COOLING EQUIPMENT LOCATED IN AN ATTIC OR FURRED SPACE, AN ADDITIONAL WATER-TIGHT PAN OF CORROSION-RESISTANT METAL SHALL BE INSTALLED BENEATH THE COOLING COIL TO CATCH THE OVERFLOW CONDENSATE DUE TO CLOGGED PRIMARY CONDENSATE DRAIN. THE ADDITIONAL PAN SHALL BE PROVIDED WITH A DRAIN PIPE, 3/4 INCH NOMINAL PIPE SIZE, DISCHARGING AT A POINT WHICH CAN BE READILY OBSERVED. (THIS WORK IS UNDER PLUMBING SECTION REFER TO PLUMBING DRAWINGS).

CODE:
1. MOUNT WALL MOUNTED THERMOSTATS 4'-0" ABOVE FINISHED FLOOR.
2. EACH SINGLE SYSTEM WITH ONE OR MORE AIR CONDITIONING UNITS PROVIDING HEATING OR COOLING IN EXCESS OF 2000 CFM OR AIR SERVING MORE THAN ONE OCCUPANCY, SHALL HAVE SMOKE DETECTORS (PRODUCT OF COMBUSTION) AND SHALL BE INSTALLED IN THE MAIN SUPPLY DUCT DOWNSTREAM OF THE FILTERS. ACTIVATION OF THE SMOKE SHALL CAUSE THE UNIT TO SHUT DOWN AND ACTIVATE THE FIRE ALARM SYSTEM. (WHERE FIRE DETECTION & ALARM SYSTEMS ARE PROVIDED) (2016 CMC, 608). IF THERE ARE A NUMBER OF AIR CONDITIONING UNITS SERVING ONE AREA, OR THERE IS A COMMON RETURN AIR PLENUM FOR A NUMBER OF AIR CONDITIONING UNITS, ALL SMOKE DETECTORS MUST BE INTERCONNECTED TO SHUT-OFF ALL EQUIPMENT EVEN WHEN SMOKE IS DETECTED BY ONLY ONE SMOKE DETECTOR. DUCT VELOCITY AND PRESSURE DIFFERENTIAL MAY HAVE TO BE VERIFIED FOR EACH DUCT SMOKE DETECTOR LOCATION IN ACCORDANCE WITH U.L. LISTING. AUTOMATIC SHUTOFFS NEED NOT BE INSTALLED WHEN ALL ROOMS HAVE DIRECT EXIT TO THE EXTERIOR OF THE BUILDING.

3. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF ALL APPLICABLE CODES, LAWS, ORDINANCES AND REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION. THIS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS, ADDITIONAL PLAN CHECK FEES, INSPECTIONS, ETC. AND FURNISH SIGNED, CERTIFIED AND ACCEPTABLE COPIES TO THE OWNER FOR HIS RECORD.
4. CONTRACTOR SHALL PROVIDE FIRE DAMPERS AT FIRE RATED PENETRATIONS.
5. DUCTS OPENING INTO CORRIDOR SHALL HAVE INSTALLED A COMBINATION FIRE/SMOKE DAMPER CONFORMING TO CBC STANDARD WITH A MINIMUM LEAKAGE CLASSIFICATION OF II AND ELEVATED TEMPERATURE RATINGS SHALL NOT BE LESS THAN 250 DEGREE FAHRENHEIT.
6. DUCT VELOCITY AND PRESSURE DIFFERENTIAL SHALL BE VERIFIED FOR EACH DUCT SMOKE DETECTOR LOCATION IN ACCORDANCE WITH U.L. LISTING. DUCT SMOKE DETECTORS SHALL BE MAGNEHELIC TESTED TO THE LISTED SPECIFICATIONS IN THE PRESENCE OF THE CITY BUILDING INSPECTOR PRIOR TO FINAL APPROVAL.
7. ACCESS TO INSPECT, SERVICE, REPAIR AND REPLACEMENT WITHOUT REMOVING PERMANENT CONSTRUCTION TO ALL EQUIPMENT SHALL BE PROVIDED. UNLESS OTHERWISE SPECIFIED, NOT LESS THAN 30 INCHES OF WORKING SPACE AND PLATFORM SHALL BE PROVIDED.
8. TOILET ROOMS WITHOUT WINDOWS OR WINDOW AREA LESS THAN 5% OF TOILET FLOOR AREA, SHALL HAVE A MECHANICALLY OPERATED EXHAUST SYSTEM CAPABLE OF PROVIDING A MINIMUM EXHAUST RATES PER 2016 CMC. TOILET EXHAUST DUCTS SHALL BE DIRECTLY CONNECTED TO THE OUTSIDE AND SHALL BE OF SMOOTH, NON-ABSORBENT AND NON-COMBUSTIBLE SURFACE MATERIAL.
9. ALL OSA INTAKES MUST BE 10 FEET MINIMUM AWAY FROM ALL PLUMBING OR APPLIANCE VENTS (OR 3'-0" MINIMUM BELOW APPLIANCE VENTS). OSA INLETS SHALL BE COVERED WITH SCREEN HAVING 1/4" OPENING.
10. ENVIRONMENTAL EXHAUST, SUCH AS BATHROOM, DRYER VENT, ETC. SHALL TERMINATE AT LEAST 3 FEET FROM PROPERTY LINE, ANY OPERABLE WINDOW, AND 10 FEET AWAY FROM ANY FRESH AIR INTAKE. PRODUCT CONVEYING EXHAUST, SUCH AS GARAGE VENTILATION, COMMERCIAL KITCHEN HOOD, ETC. SHALL TERMINATE AT LEAST 10 FEET FROM PROPERTY LINE, OPENINGS INTO THE BUILDING, FRESH AIR INTAKE OPENING, ABOVE ADJOINING GRADE, AND 3 FEET FROM EXTERIOR WALL OR ROOF.
11. ALL PENETRATIONS IN FIRE WALLS AND FLOOR-AND ROOF-CEILING ASSEMBLIES REQUIRING PROTECTED OPENING SHALL BE FIRE-STOPPED PROVIDE FIRE STOPPING SPECIFICATIONS INCLUDING MANUFACTURER AND REPORT OF APPROVED TESTING AGENCY. PER 2016 CBC.
12. ALL PENETRATIONS OR OPENINGS IN CONSTRUCTION ASSEMBLIES FOR PIPING, HEATING, VENTILATING OR EXHAUST DUCTS SHALL BE SEALED, LINED, INSULATED OR OTHERWISE TREATED TO MAINTAIN THE REQUIRED RATINGS.
13. ALL RIGID DUCTS, PIPES, AND APPLIANCE VENTS LOCATED IN SOUND ASSEMBLIES SHALL BE ISOLATED FROM THE BUILDING CONSTRUCTION BY MEANS OF RESILIENT SLEEVES, MOUNTS, OR MINIMUM 1/4" THICK APPROVED RESILIENT MATERIAL. (EXCEPTION: GAS PIPING NEED NOT BE LINED).
14. CLOTHES DRYER & TOILET EXHAUST DUCTS MUST BE OF METAL.
15. ALL GAS FIRED HEATING EQUIPMENT SHALL BE "IID" (PILOT-LESS) TYPE.
16. PROVIDE A 6" CLEARANCE ON FRONT, SIDES AND BACK OF THE FURNACE OR BY MANUFACTURES SPECIFICATIONS.
17. SEAL THE CEILING MOUNTED EXHAUST FAN HOUSING TO THE CEILING MEMBRANE. USE U.L. APPROVED FIRE STOPPING SEALANT.
18. THIS PROJECT SHALL COMPLY WITH 2016 CBC, CMC, CPC, CEC, CGBC ALONG WITH THE 2016 T-24 ENERGY STANDARDS.
19. WHEN MORE THAN ONE HEATING, COOLING, VENTILATING OR REFRIGERATING SYSTEM IS INSTALLED ON THE ROOF OF A BUILDING OR WITHIN A BUILDING, IT SHALL BE PERMANENTLY IDENTIFIED AS TO THE AREA OR SPACE SERVED BY THE EQUIPMENT.
20. AIR BALANCE SHALL BE PERFORMED BY A CERTIFIED (NEBB) OR (AABC) AIR BALANCE PROFESSIONAL TO THE SPECIFICATIONS STATED ON THE PLANS. A COPY OF THE CERTIFIED REPORT SHALL BE PRESENTED TO THE CITIES BUILDING INSPECTOR PRIOR TO THE FINAL APPROVAL.
21. GUARDS SHALL BE PROVIDED WHERE APPLIANCES, EQUIPMENT, FANS, ROOF HATCH OPENINGS OR OTHER COMPONENTS THAT REQUIRE SERVICE ARE LOCATED WITHIN 10 FEET OF A EDGE OR OPEN SIDE IS LOCATED MORE THAN 30 INCHES ABOVE THE FLOOR, ROOF, OR GRADE BELOW. CBC 1015.3 AND 1015.6

ENERGY:
1. BACK-DRAFT DAMPERS FOR ALL EXHAUST AND FAN SYSTEMS SHALL BE PROVIDED. EXCEPTION: NO BACK-DRAFT DAMPERS IN GREASE DUCTS.
2. ALL WATER HEATING AND AIR CONDITIONING EQUIPMENT, SHOWER HEADS AND FAUCETS SHALL BE C.E.C. CERTIFIED.
3. AUTOMATIC TEMPERATURE CONTROL DEVICE FOR REGULATION OF SPACE TEMPERATURE SHALL BE EQUIPPED WITH NIGHT SET BACK AND HAVE THE ABILITY TO OPERATE THE HEATING AND THE COOLING IN SEQUENCE. CONTROL SHALL BE ADJUSTABLE TO PROVIDE A RANGE OF UP TO 10 DEGREES F BETWEEN FULL HEATING AND FULL COOLING AND HAVE A CAPABILITY OF TERMINATING ALL HEATING AT A TEMPERATURE NO MORE THAN 70 DEGREES F AND COOLING AT A TEMPERATURE NO LESS THAN 78 DEGREES F.
4. AT LEAST ONE AUTOMATIC SPACE TEMPERATURE CONTROL DEVICE (THERMOSTAT) SHALL BE PROVIDED FOR EACH ZONE AND/OR EACH SEPARATE HVAC SYSTEM. (NOT MORE THAN ONE FLOOR OF BUILDING SHALL BE INCLUDED).
5. ALL AIR CONDITIONING UNITS TO BE FURNISHED WITH MAINTENANCE MANUALS, SCHEDULES AND TAGS.
6. ALL AIR CONDITIONING UNITS TO BE EQUIPPED WITH A READILY ACCESSIBLE MANUALLY ADJUSTABLE AUTOMATIC MEANS OF REDUCING THE ENERGY USED FOR HVAC DURING PERIOD OF NON USE OR ALTERNATE USE OF THE BUILDING SPACE OR ZONES SERVED BY THE SYSTEM, SUCH AS A TIME CLOCK OR TIME SWITCH.
7. EACH MECHANICAL OR GRAVITY VENTILATING UNIT, EXCEPT ATTIC VENTILATORS SHALL BE EQUIPPED WITH AN AUTOMATIC TYPE NORMALLY CLOSED OUTSIDE AIR DAMPER TO SERVE AS A MEANS OF PROVIDING AIR VOLUME REDUCTION AND/OR SHUT-OFF WHEN VENTILATION IS NOT REQUIRED. (DOES NOT APPLY TO COMBUSTION AIR OPENINGS).

QUALITY CONTROL:
1. PROVIDE AS BUILT DRAWINGS AND SUBMIT COPIES TO THE OWNER.
2. CONTRACTOR SHOULD SUBMIT SHOP DRAWINGS. EQUIPMENT HANGERS, ANCHOR BOLTS AND METHODS OF INSTALLATION MUST HAVE CITY APPROVAL AND MAY BE SUPPLIED BY HILTI OR EQUAL.
3. IT IS THE SPECIFIC INTENT OF THIS DESIGN CONDITIONS THAT THE ENTIRE SYSTEM INCLUDING EQUIPMENT, DUCTWORK, AIR OUTLETS/INLETS AND ALL OTHER PARTS BE NOISELESS AND FREE OF VIBRATION TRANSMISSION. PROVIDE AND INSTALL VIBRATION ISOLATORS OR DAMPERS, SOUND INSULATION PADS, FLEXIBLE CONNECTORS AND SIMILAR MATERIAL AS REQUIRED. INSTALL VOLUME DAMPERS ON ALL DUCTS AS FAR AS POSSIBLE FROM AIR INLET/OUTLET. MAKE THE NECESSARY NOISE OR VIBRATION CORRECTIONS BY INSTALLING THESE ITEMS AT NO COST TO THE OWNER.
4. THE DRAWINGS ARE IN PART DIAGRAMMATIC AND ARE INTENDED TO CONVEY THE SCOPE OF THE WORK; THEY INDICATE THE GENERAL ARRANGEMENT AND APPROXIMATE SIZES OF EQUIPMENT, DUCTWORK, PIPING, OUTLETS, ETC. FOLLOW THE DRAWINGS AS CLOSELY AS PRACTICAL IN LAYING OUT THE WORK, BE GUIDED BY THE CONDITIONS AT THE JOB AND CONSULT THE CONSTRUCTION DRAWINGS OF THE OTHER TRADES TO BECOME FAMILIAR WITH ALL CONDITIONS AFFECTING THE WORK.
5. UPON COMPLETION OF AND AFTER CLEANING OF SYSTEM AND EQUIPMENT, CAREFULLY ADJUST FOR NORMAL OPERATION OF THE AUTOMATIC PARTS OF HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.
6. EQUIPMENT AND DUCTWORK EXPOSED TO WEATHER MUST BE WEATHERPROOFED.
7. ROOF MOUNTED EQUIPMENT SHALL BE LABELED AS TO THE SPACE IT SERVES. (WHEN MORE THAN ONE HEATING OR COOLING UNIT SERVES DIFFERENT OCCUPANTS.)
8. CONTRACTOR SHALL BALANCE AIR SYSTEM TO THE CFM CAPACITY AS SHOWN ON FLOOR PLAN.
9. ALL NECESSARY EQUIPMENT CURBS, RUNNERS, PLATFORMS, ROOFING, PATCHING, CUTTING, RATING SHAFTS, FURRING, FLASHING AND PAINTING SHALL BE BY THE GENERAL CONTRACTOR.
10. ALL NECESSARY DRAINS, GAS, CONDENSATE DRAINS WITH TRAPS, MAKE-UP WATER, INCLUDING FINAL CONNECTIONS SHALL BE BY THE PLUMBING CONTRACTOR.
11. FURNISHING AND INSTALLATION OF ALL LINE VOLT. WIRING, ALL LOW AND LINE VOLT CONDUITS AND AUXILIARIES FOR MECHANICAL SYSTEMS SHALL BE BY THE ELECTRICAL CONTRACTOR. THE CONDUIT FOR LOW VOLTAGE WIRING OF MECHANICAL SYSTEM EXPOSED TO THE WEATHER SHALL BE APPROVED FOR EXTERIOR USE AND BE BY THE ELECTRICAL CONTRACTOR.
12. ALL COMBINATION SMOKE/ FIRE DAMPERS SHALL INTERLOCKED FOR GLOBAL SHUTDOWN WITH ALL DUCT SMOKE DETECTORS, SMOKE AREA DETECTORS, ALL AIR HANDLING EQUIPMENT AND THE ALARM SYSTEM IF PROVIDED.
13. ALL DUCT DETECTORS SHALL BE MAGNEHELIC TESTED TO THE MANUFACTURERS SPECIFICATIONS IN THE PRESENCE OF THE CITIES BUILDING INSPECTOR PRIOR TO THE FINAL APPROVAL.
14. ALL EXTERIOR MOUNTED DUCT DETECTORS SHALL BE RATED AT 150 DEGREES F. OR HIGHER AND BE MOUNTED IN A NEMA RATED ENCLOSURE OF 3-R OR HIGHER.
15. ALL ROOFTOP EQUIPMENT REQUIRES EXTERNAL DISCONNECTS.
16. ALL EQUIPMENT SHALL BE LABELED OR LISTED BY A RECOGNIZED APPROVAL AGENCY.
17. A RETURN AIR PLENUMS ARE NOT PERMITTED ON THIS JOB WITHOUT PLAN CHECK APPROVAL.
18. ALL APPLIANCES DESIGNED TO BE FIXED IN POSITION SHALL BE SECURELY FASTENED IN PLACE PER BUILDING CODE REQUIREMENTS.
19. MATERIALS EXPOSED WITHIN DUCTS OR PLENUMS SHALL HAVE FLAME-SPREAD INDEX NOT GREATER THAN 25 AND A SMOKE-DEVELOPED INDEX NOT GREATER THAN 50, WHERE TESTED AS A COMPOSITE PRODUCT IN ACCORDANCE WITH ASTM E84 OR UL723.
20. NO ANALYSIS HAS BEEN MADE WITH REGARD TO SOURCES OR POTENTIAL SOURCES OF INDOOR OR OUTDOOR AIR CONTAMINANTS OR LEVELS OF CONTAMINATION.
21. IT IS THE RESPONSIBILITY OF THE GENERAL AND MECHANICAL CONTRACTOR TO INFORM THE TENANT'S REPRESENTATIVE, LANDLORD AND TENANT'S ARCHITECT IF ANY SOURCE OR POTENTIAL SOURCE OF INDOOR AIR CONTAMINATION IS IDENTIFIED.
22. PRIOR TO ENCLOSING SPACES SUCH AS PLUMBING CHASES, AIR SHAFTS AND RETURN AIR PLENUMS CLEAN ALL AREAS THOROUGHLY. THE CONTRACTOR SHALL GUARANTEE THAT THE PLENUM CHAMBER USED FOR RECIRCULATING OF AIR WILL BE OF TIGHT CONSTRUCTION AND THAT ALL SOURCES OF CONTAMINATION FROM TRAPS, SOIL STACKS, DOWNSPOUTS, VENTS, EXHAUST DISCHARGES AND OTHER SOURCES WILL BE ENCLOSED SO THAT NO CONTAMINATED AIR WILL BE RECIRCULATED.
23. PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES SHUT OFF THE HVAC SYSTEM, BLOCK OFF AIR GRILLS, DIFFUSERS AND OTHER OPENINGS OUTSIDE THE IMMEDIATE CONSTRUCTION AREA. OPENINGS TO ADJACENT TENANT SPACES SHALL BE COVERED WITH FILTER MEDIA TO PREVENT DUST AND OTHER AIRBORNE CONTAMINANTS FROM PASSING TO ADJOINING SPACES.
24. CONTRACTORS TO INSTALL TEMPORARY EXHAUST SYSTEM TO VENTILATE CONSTRUCTION SITE AND KEEP SITE UNDER SLIGHT NEGATIVE PRESSURE DURING ALL HOURS OF CONSTRUCTION, EVEN IF AFTER NORMAL BUSINESS HOURS.
25. CONTRACTORS TO INSTALL TEMPORARY BARRIERS TO PROTECT ADJACENT SPACES FROM DUST, PARTICULATES, VAPORS AND NOISE. WHERE TEMPORARY BARRIERS ARE INSTALLED ALWAYS MAINTAIN FIRE EXITS AND EXIST WAYS.
26. WHERE RETURN AIR PLENUM IS USED AS PART OF THE SYSTEM; PROVIDE FOLLOWING: RETURN AIR BOOT FOR PRIVATE OFFICES, CONFERENCE ROOMS, AND ALL AREAS THAT HAVE FULL HEIGHT WALLS. PIPES, CONDUITS, TUBING'S, INSULATION, ALL CABLES, WIRES, AND EQUIPMENT INSTALLED IN RETURN AIR PLENUM SHALL COMPLY WITH BUILDING CODE, MECHANICAL CODE, AND FIRE CODE REQUIREMENTS.
27. ALL EXHAUST PIPES IN RETURN AIR PLENUM SHALL BE NEGATIVE PRESSURE OR ENCLOSED TO PREVENT LEAKAGE IN TO RETURN AIR PLENUM.
28. PROVIDE TEST AND BALANCE REPORT PERFORMED BY CERTIFIED INDEPENDENT TEST AND BALANCE CONTRACTOR.

EXISTING EQUIPMENT:
1. PRESSURE WASH INDOOR AND OUTDOOR COILS AFTER ALL DUST PRODUCING CONSTRUCTION WORK IS COMPLETED.
2. FURNISH AND INSTALL NEW DRIVE BELT.
3. CLEAN CONDENSATE PAN AND DRAIN LINES.
4. CHECK AND RECORD ALL CURRENTS DRAWN BY MOTORS AND COMPRESSORS AND ALL OPERATING PRESSURES.
5. FULL DIAGNOSTIC CHECK OF ALL EQUIPMENT AND REPORT ANY DEFICIENCIES.
6. LUBRICATE ALL BEARINGS.
7. FURNISH AND INSTALL NEW 2" AIR FILTERS.
8. ALL UNUSED DUCTWORK AND EQUIPMENT SHALL BE REMOVED FROM SITE.

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SHEET TITLE:

HVAC NOTES & SCHEDULES

SUB DATE

BID DATE

DATE: 05/08/2019
DRAWN BY: R.C./J.S.
JOB NO: 18-169
CHECKED BY: S.G

SHEET NUMBER:
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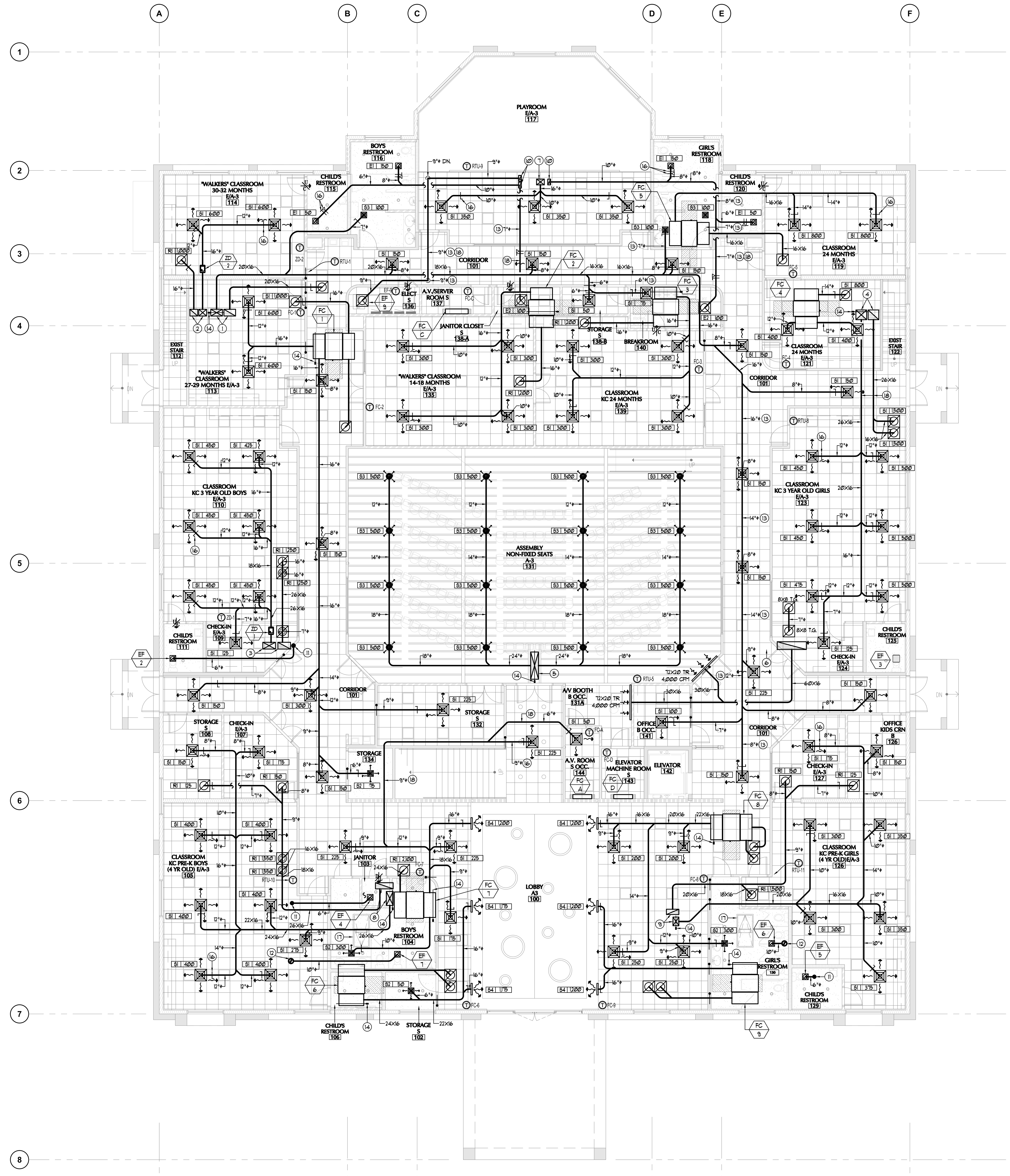
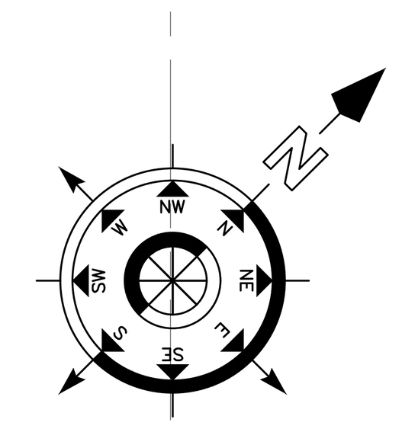


HVAC NEW 1ST FLOOR PLAN

SCALE: 1/8"=1'-0" (A)



FLOOR PLAN NOTES

A. ALL APPLIANCES AND PLUMBING VENTS AND DISCHARGE OUTLET OF EXHAUST FAN SHALL BE AT LEAST 10' IN HORIZONTAL DIRECTION OR 3' ABOVE THE O.S.A INTAKES FOR HVAC UNITS.

B. PROVIDE MANUAL VOLUME DAMPERS FOR ALL SUPPLY, RETURN, EXHAUST, AND MAKE-UP TAKE-OFFS.

C. ALL CONCEALED DUCT WORK SHALL BE INSULATED WITH R-42 (MIN.).

D. PROVIDE BEAM BOXES WHERE REQUIRED.

KEYED CONSTRUCTION NOTES

1. 24X12 SUPPLY & RETURN DUCTS UP.
2. 16X14 SUPPLY & RETURN DUCTS UP.
3. 26X14 SUPPLY & RETURN DUCTS UP.
4. 22X20 SUPPLY & RETURN DUCTS UP.
5. 56X16 SUPPLY DUCT UP.
6. 60X16 RETURN DUCT UP.
7. 12X12 SUPPLY DUCT UP.
8. SUPPLY & RETURN DUCT UP THRU. ROOF TO RTU-10.
9. SUPPLY & RETURN DUCT UP THRU. ROOF TO RTU-11.
10. 12X6 EXHAUST DUCT UP.
11. 6"ø EXHAUST DUCT UP THRU. ROOF TO ROOF CAP.
12. 10"ø EXHAUST DUCT UP THRU. ROOF TO ROOF CAP.
13. RUN DUCT BETWEEN STRUCTURAL TRUSS.
14. SMOKE DETECTOR IN SUPPLY PLENUM.
15. MANUAL VOLUME DAMPER. (TYPICAL)
16. MANUAL VOLUME DAMPER & BACK DRAFT DAMPER. (TYPICAL)
17. ROOF ACCESS.
18. GAUGE 26 OR HEAVIER.

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HVAC NEW 1ST FLOOR PLAN

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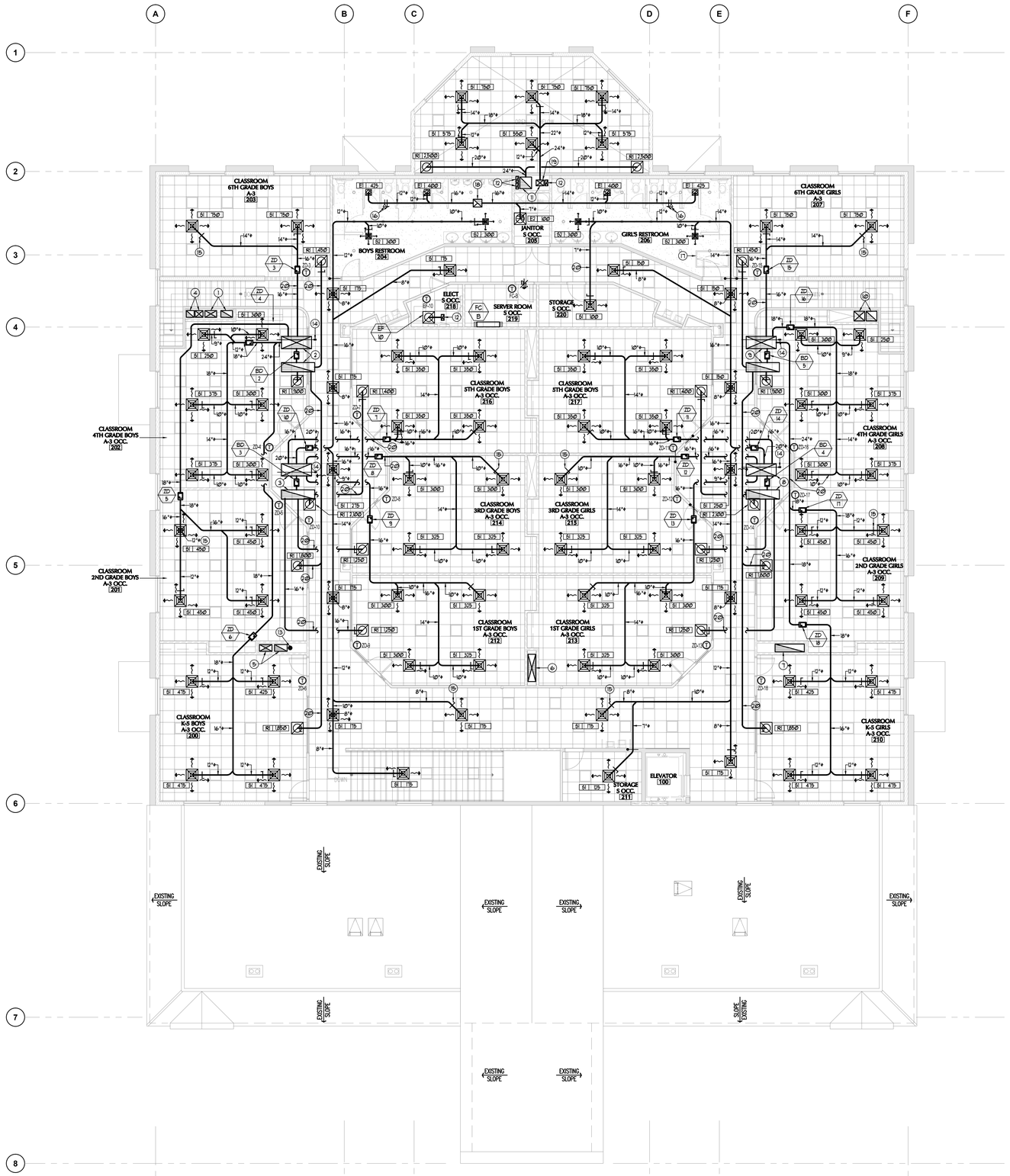

HVAC NEW 2ND FLOOR PLAN — SCALE: 1/8"=1'-0" (A)

FLOOR PLAN NOTES

A. ALL APPLIANCES AND PLUMBING VENTS AND DISCHARGE OUTLET OF EXHAUST FAN SHALL BE AT LEAST 10' IN HORIZONTAL DIRECTION OR 3' ABOVE THE O.S.A. INTAKES FOR HVAC UNITS.

B. PROVIDE MANUAL VOLUME DAMPERS FOR ALL SUPPLY, RETURN, EXHAUST, AND MAKE-UP TAKE-OFFS.

C. ALL CONCEALED DUCT WORK SHALL BE INSULATED WITH R-42 (MIN.).

D. PROVIDE BEAM BOXES WHERE REQUIRED.

KEYED CONSTRUCTION NOTES

1. 24X12 SUPPLY & RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-1.
2. NEW SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-2.
3. NEW SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-3.
4. 16X14 SUPPLY & RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-4.
5. 26X14 SUPPLY & RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-4.
6. 56X16 SUPPLY DUCT (LINED) UP THRU ROOF TO NEW NEW RTU-5.
7. 60X16 RETURN DUCT (LINED) UP THRU ROOF TO NEW NEW RTU-5.
8. SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW NEW RTU-6.
9. SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-7.
10. 20X22 SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-8.
11. 24X24 SUPPLY AND RETURN DUCTS (LINED) UP THRU ROOF TO NEW RTU-9.
12. 12X6 EXHAUST DUCT UP.
13. 6"ø EXHAUST DUCT UP THRU ROOF TO ROOF CAP.
14. SMOKE DETECTOR IN SUPPLY PLENUM.
15. MANUAL VOLUME DAMPER. (TYPICAL)
16. MANUAL VOLUME DAMPER & BACK DRAFT DAMPER. (TYPICAL)
17. ROOF ACCESS.
18. 18X16 EXHAUST DUCT UP.
19. 16X12 SUPPLY DUCT DOWN.
20. GAUGE 26 OR HEAVIER.

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HVAC NEW 2ND FLOOR PLAN

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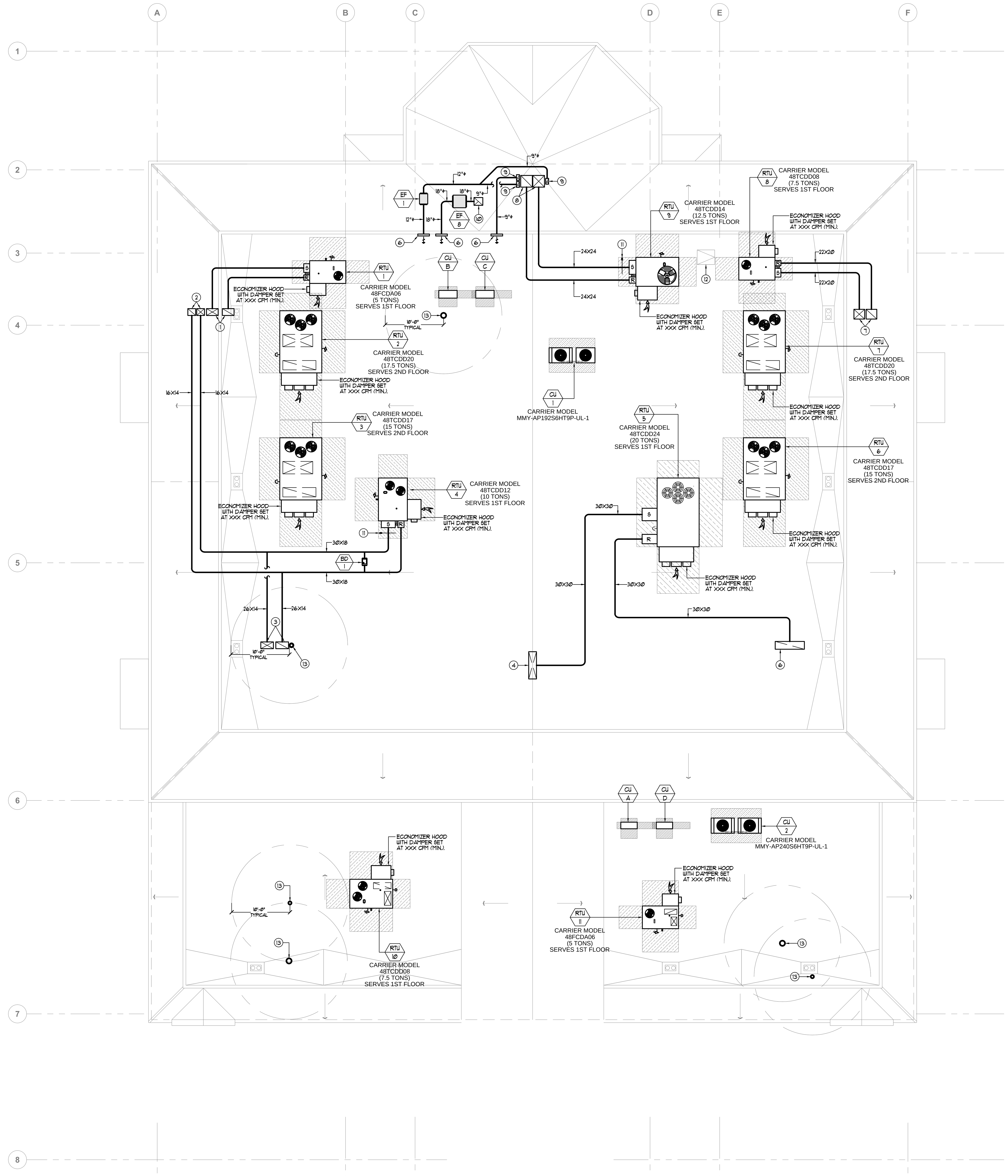
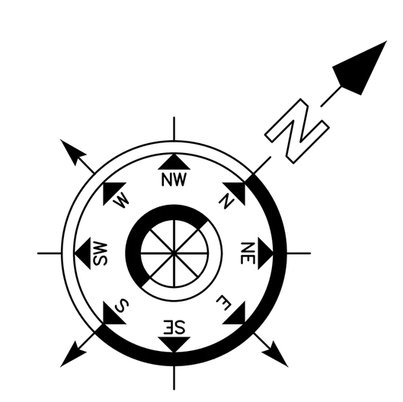


HVAC ROOF PLAN

SCALE: 1/8"=1'-0" (A)



ROOF NOTES

A. ALL APPLIANCES AND PLUMBING VENTS AND DISCHARGE OUTLET OF EXHAUST FAN SHALL BE AT LEAST 10' IN HORIZONTAL DIRECTION OR 3' ABOVE THE O.S.A INTAKES FOR HVAC UNITS.

B. EACH PLUMBING VENT SHALL TERMINATE NOT LESS THAN TEN (10) FEET FROM, OR NOT LESS THAN THREE (3) FEET ABOVE , ANY OPERABLE WINDOW, DOOR, OPENING, AIR INTAKE, OR VENT SHAFT, OR NOT LESS THAN THREE (3) FEET IN EVERY DIRECTION FROM ANY LOT LINE, ALLEY AND STREET EXCEPTED. CPC SECTION 906.2

D. GUARDS SHALL BE PROVIDED WHERE APPLIANCES, EQUIPMENT, FANS, ROOF HATCH OPENINGS OR OTHER COMPONENTS THAT REQUIRE SERVICE ARE LOCATED WITHIN 10 FEET OF A EDGE OR OPEN SIDE IS LOCATED MORE THAN 30 INCHES ABOVE THE FLOOR, ROOF, OR GRADE BELOW. CBC 1013.6

KEYED CONSTRUCTION NOTES

1. 24X12 SUPPLY & RETURN DUCTS DN.
2. 16X14 SUPPLY & RETURN DUCTS DN.
3. 26X12 SUPPLY & RETURN DUCTS DN.
4. 56X16 SUPPLY DUCT DN.
5. 60X16 RETURN DUCT DN.
6. EXHAUST WALL CAP.
7. 20X22 SUPPLY AND RETURN DN.
8. 24X24 SUPPLY AND RETURN DUCTS DN.
9. 12X6 EXHAUST DN.
10. 18X16 EXHAUST DUCT DN.
11. SMOKE DETECTOR IN SUPPLY PLENUM.
12. ROOF ACCESS.
13. EXHAUST ROOF CAP.

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SHEET TITLE:

HVAC ROOF PLAN

SUB DATE

BID DATE

DATE: 05/08/2019
DRAWN BY: R.C./J.S.
JOB NO: 18-169
CHECKED BY: S.G

SHEET NUMBER:
M2.3

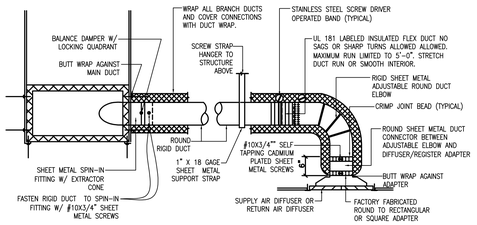
5/8/2019 7:42:09 PM

NOTES:
A. SUPPLY AIR, RETURN AIR, AND OUTSIDE AIR FOR HEATING, COOLING, OR EVAPORATIVE COOLING DUCT SYSTEMS CONSTRUCTED OF METAL SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS–METAL AND FLEXIBLE OR UL 181, CMC SECTION 602.1

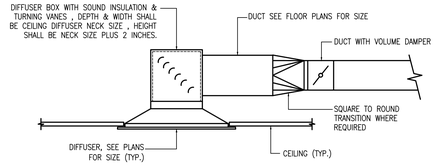
B. FACTORY–MADE FLEXIBLE AIR DUCTS AND CONNECTORS SHALL BE NOT MORE THAN 5 FEET IN LENGTH AND SHALL NOT BE USED IN LIEU OF RIGID ELBOWS OR FITTINGS. (EXCEPTION: RESIDENTIAL OCCUPANCIES) CMC SECTION 603.4.1

C. PROVIDE SUPPORT ON ALL BRANCH DUCT RUNOUTS. MINIMUM OF TWO SUPPORTS ON BRANCH DUCTS OVER 6'–0" IN LENGTH.

D. USE SPIN–IN FITTING WITHOUT EXTRACTOR CONE AND BALANCING DAMPER FOR RETURN AIR APPLICATIONS.

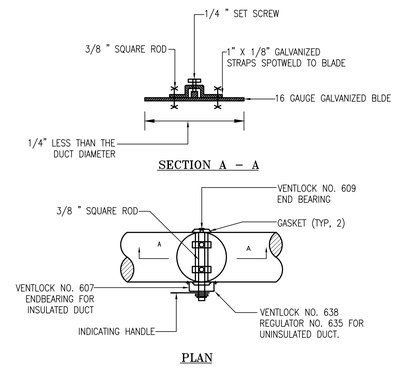


CEILING DIFFUSER DETAIL — SCALE: NONE — A

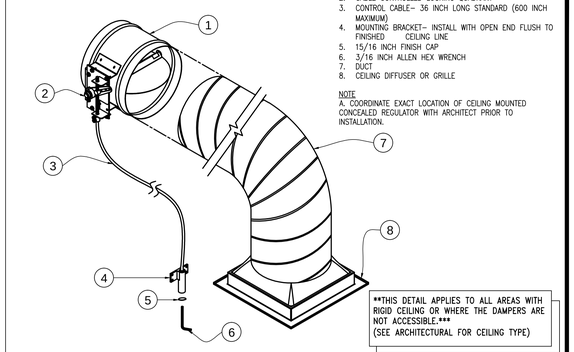


1. USE LOW HEIGHT INSTALLATION WHERE INSUFFICIENT CLEARANCE EXISTS.
2. EXHAUST AIR REGISTERS SIMILAR WITH RIGID DUCT.

CEILING DIFFUSER DETAIL (SHEET METAL DUCT) — SCALE: NONE — B



ROUND VOLUME DAMPER DETAIL FOR LOW PRESSURE DUCTS — SCALE: NONE — C

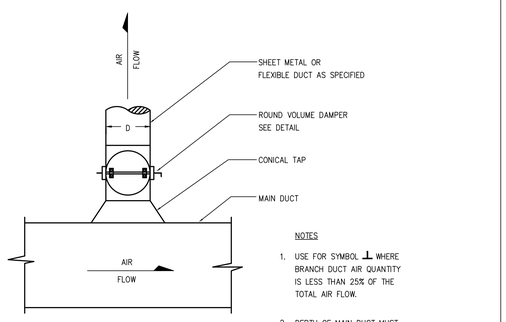


1. POTTORFF RCS–10R ROUND REMOTE CABLE OPERATED BALANCING DAMPER.
2. CABLE CONTROLLED LOCKING QUADRANT
3. CONTROL CABLE– 36 INCH LONG STANDARD (600 INCH MAXIMUM)
4. MOUNTING BRACKET– INSTALL WITH OPEN END FLUSH TO FINISHED CEILING LINE
5. 15/16 INCH FINISH CAP
6. 3/16 INCH ALLEN HEX WRENCH
7. DUCT
8. CEILING DIFFUSER OR GRILLE

NOTE
A. COORDINATE EXACT LOCATION OF CEILING MOUNTED CONCEALED REGULATOR WITH ARCHITECT PRIOR TO INSTALLATION.

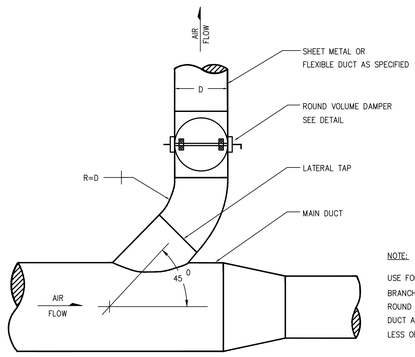
THIS DETAIL APPLIES TO ALL AREAS WITH RIGID CEILING OR WHERE THE DAMPERS ARE NOT ACCESSIBLE.*
(SEE ARCHITECTURAL FOR CEILING TYPE)

MODEL RCS-10R REMOTE CABLE OPERATED BALANCING DAMPER (WHERE REQUIRED) — SCALE: NONE — D



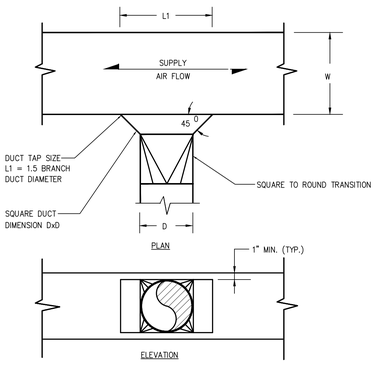
NOTES
1. USE FOR SYMBOL ⊥ WHERE BRANCH DUCT AIR QUANTITY IS LESS THAN 25% OF THE TOTAL AIR FLOW.
2. DEPTH OF MAIN DUCT MUST BE 2" LARGER THAN CONICAL DIAMETER.

CIRCULAR DUCT CONICAL TAP WITH VOLUME DAMPER — SCALE: NONE — E

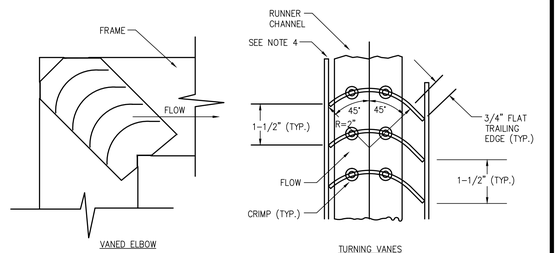


NOTE:
USE FOR SYMBOL ⊥ WHERE BRANCH DUCT IS ROUND FROM ROUND MAIN AND BRANCH DUCT AIR QUANTITY IS 50% OR LESS OF TOTAL AIR FLOW.

CIRCULAR DUCT LATERAL TAP WITH VOLUME DAMPER — SCALE: NONE — F

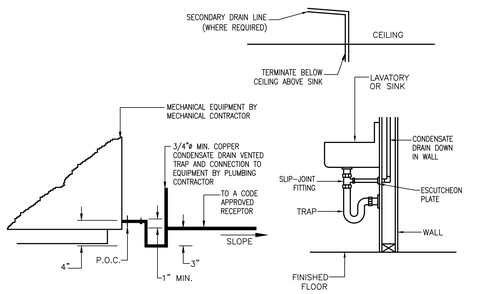


RECTANGULAR DUCT SQUARE TO ROUND TAP — SCALE: NONE — G



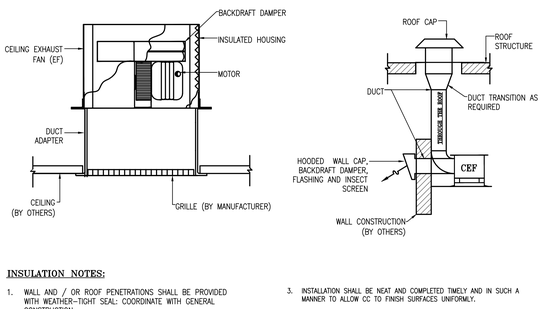
NOTES:
1. MAXIMUM UNSUPPORTED VANE LENGTH 36"
2. VANES AND FRAMES – 24 GAUGE
3. DUCT INLET AND OUTLET DIMENSIONS TO BE EQUAL
4. FOR HIGH VELOCITY APPLICATIONS PROVIDE 18 GAUGE CHANNEL AND TACK WELD VANE EDGES TO CHANNEL, TYPICAL BOTH ENDS
5. FRAMES AND CHANNELS – BOLTED OR TACK WELDED TO ELBOW
6. NOT PERMITTED FOR GREASE DUCTS

SINGLE-THICKNESS TURNING VANES FOR SQUARE ELBOW — SCALE: NONE — H



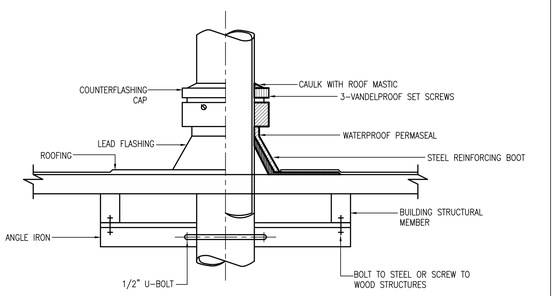
NOTE: WHEN A COOLING COIL OR COOLING UNIT IS LOCATED IN AN ATTIC OR FURRED SPACE WHERE DAMAGE MAY RESULT FROM CONDENSATE OVERFLOW, AN ADDITIONAL WATER–TIGHT PAN OF CORROSION–RESISTANT METAL SHALL BE INSTALLED BENEATH THE COOLING COIL OR UNIT TOP TO CATCH THE OVERFLOW CONDENSATE DUE TO A CLOGGED PRIMARY CONDENSATE DRAIN, OR ONE PAN DRAIN MAY BE PROVIDED IN LIEU OF THE SECONDARY DRAIN PAN. AN ADDITIONAL PAN OR THE STANDING OVERFLOW SHALL BE PROVIDED WITH A DRAIN PIPE, MINIMUM 3/4" NOMINAL PIPE SIZE, DISCHARGING AT A POINT WHICH CAN BE READILY OBSERVED.

CONDENSATE DRAIN CONNECTION — SCALE: NONE — I

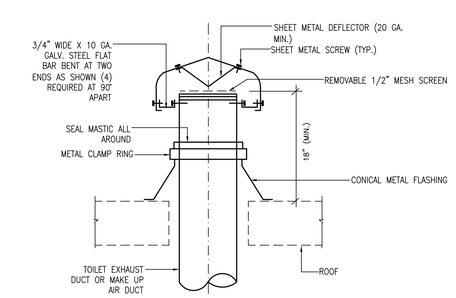


INSULATION NOTES:
1. WALL AND / OR ROOF PENETRATIONS SHALL BE PROVIDED WITH WEATHER–TIGHT SEAL: COORDINATE WITH GENERAL CONSTRUCTION.
2. INSTALL MINIMUM 16 GAUGE SHEET STEEL SUPPORTS TO RIGIDLY ATTACH FAN HOUSING TO STRUCTURE: FIELD VERIFY EXACT REQUIREMENTS. ENSURE ADEQUATE VIBRATION ISOLATION.
3. INSTALLATION SHALL BE NEAT AND COMPLETED TIMELY AND IN SUCH A MANNER TO ALLOW CC TO FINISH SURFACES UNIFORMLY.
4. ALL ELECTRICAL WIRING AND CONNECTIONS SHALL BE BY ELECTRICAL CONTRACTOR.

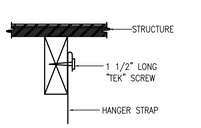
CEILING EXHAUST FAN — SCALE: NONE — J



DUCT THRU ROOF DETAIL — SCALE: NONE — K



ROOF CAP DETAIL — SCALE: NONE — L

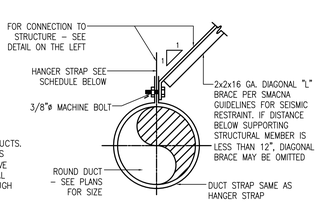


603.2 HORIZONTAL ROUND DUCTS: HORIZONTAL ROUND DUCTS. HORIZONTAL ROUND DUCTS NOT MORE THAN 40 INCHES (1016 MM) IN DIAMETER WHERE SUSPENDED FROM ABOVE SHALL BE SUPPORTED WITH ONE HANGER PER INTERVAL AND IN ACCORDANCE WITH SECTION 603.3.2.1 THROUGH SECTION 603.3.2.3.

603.2.1 TIGHT–FITTING AROUND THE PERIMETER. DUCTS SHALL BE EQUIPPED WITH TIGHT–FITTING CIRCULAR BANDS EXTENDING AROUND THE ENTIRE PERIMETER OF THE DUCT AT EACH SPECIFIED SUPPORT INTERVAL.

603.2.2 SIZE OF CIRCULAR BANDS. CIRCULAR BANDS SHALL BE NOT LESS THAN 1 INCH (25.4 MM) WIDE NOR LESS THAN EQUIVALENT TO THE GAUGE OF THE DUCT MATERIAL IT SUPPORTS.
EXCEPTION: DUCTS NOT MORE THAN 10 INCHES (254 MM) IN DIAMETER SHALL BE PERMITTED TO BE SUPPORTED BY NO. 18 GAUGE GALVANIZED STEEL WIRE.

DUCT SUPPORT - METAL DUCTS. HORIZONTAL DUCTS SHALL HAVE A SUPPORT WITH 2 FT. OF EACH ELBOW AND WITH 4 FT. OF EACH BRANCH INTERSECTION. SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE.

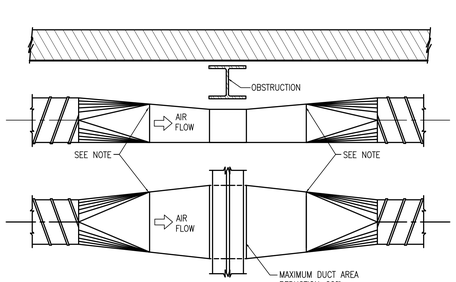


NOTE:
HORIZONTAL ROUND DUCTS SHALL BE BRACED AND GAUYED TO PREVENT LATERAL OR HORIZONTAL SWING.

HANGER STRAP SCHEDULE

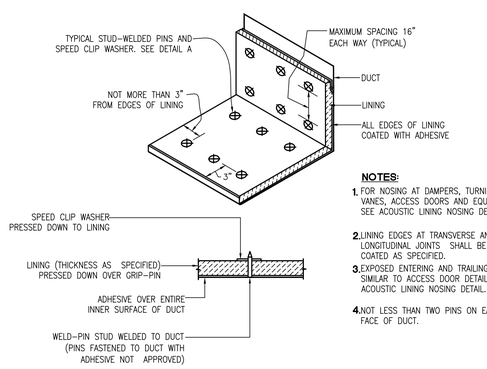
DUCT SIZE	STRAP SIZE	MAX. LOAD EA. HANGER	MAX. SPACING
UP THRU 10"	1" x 22 GA.	260 LBS	10'–0"
11" TO 18"	1" x 22 GA.	260 LBS	10'–0"
19" TO 24"	1" x 22 GA.	260 LBS	10'–0"

ROUND AIR DISTRIBUTION SUPPORT DETAIL — SCALE: NONE — M



NOTE:
1.) 1:7 SLOPE IS RECOMMENDED FOR HIGH VELOCITY, 1:4 SLOPE FOR LOW VELOCITY.
2.) FOR SUPPLY, RETURN, MAKE–UP, OSA, AND EXHAUST AIR DUCTS ONLY.
3.) NOT TO BE USED FOR GREASE DUCTS.

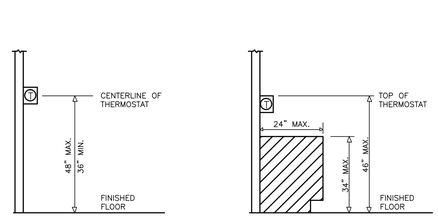
BEAM BOX DETAIL (WHERE APPLICABLE) — SCALE: NONE — N



NOTES:
1. FOR NOSING AT DAMPERS, TURNING VANES, ACCESS DOORS AND EQUIPMENT, SEE ACOUSTIC LINING NOSING DETAIL.
2. LINING EDGES AT TRANSVERSE AND LONGITUDINAL JOINTS SHALL BE COATED AS SPECIFIED.
3. EXPOSED ENTERING AND TRAILING EDGES SIMILAR TO ACCESS DOOR DETAIL. SEE ACOUSTIC LINING NOSING DETAIL.
4. NOT LESS THAN TWO PINS ON EACH FACE OF DUCT.

DETAIL A

ACCOUSTIC LINING INSTALLATION DETAIL — SCALE: NONE — O



THERMOSTAT MOUNTING — SCALE: NONE — P

REVISIONS

DATE/DELTA	REMARKS

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SHEET TITLE:

HVAC DETAILS

SUB DATE

BID DATE

DATE: 05/08/2019
DRAWN BY: R.C./J.S.
JOB NO: 18-169
CHECKED BY: S.G

SHEET NUMBER:

M3.0

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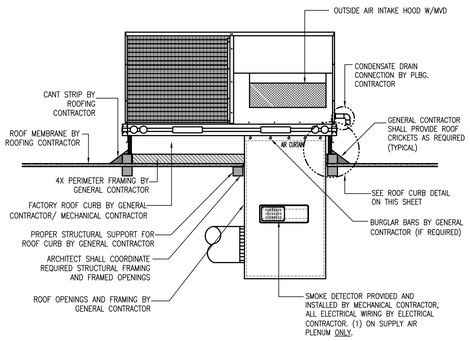
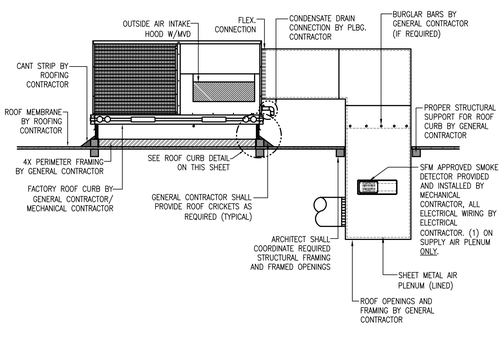
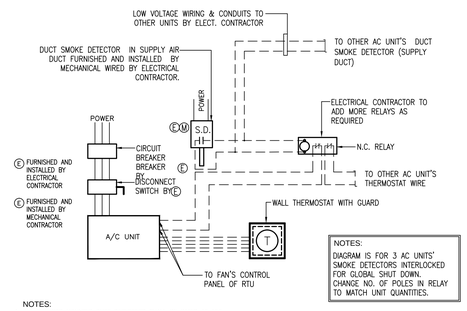


PACKAGED ROOFTOP UNIT ELEVATION DETAIL — SCALE: NONE — A

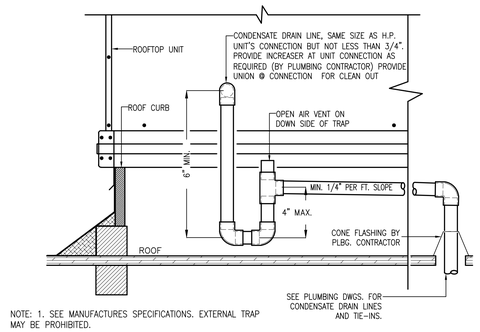


PACKAGED ROOFTOP UNIT ELEVATION DETAIL — SCALE: NONE — B



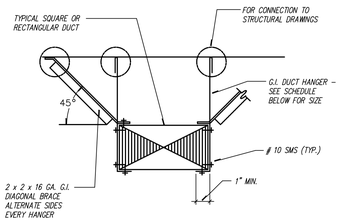
NOTES:
1. ALL EXTERIOR MOUNTED DUCT DETECTORS SHALL BE RATED AT 150 DEGREES F. OR HIGHER AND BE MOUNTED IN A NEMA RATED ENCLOSURE OF 3-R OR HIGHER.
2. ALL ROOFTOP EQUIPMENT REQUIRES EXTERNAL DISCONNECTS.

ROOFTOP UNIT WIRING DIAGRAM — SCALE: NONE — C



NOTE: 1. SEE MANUFACTURES SPECIFICATIONS. EXTERNAL TRAP MAY BE PROHIBITED.

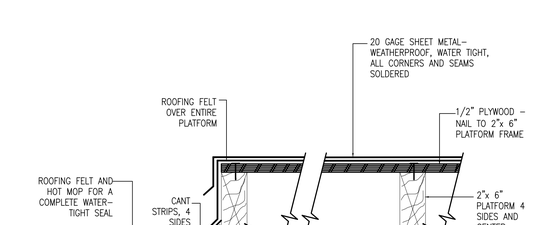
ROOFTOP UNIT CONDENSATE DRAIN TRAP DETAIL — SCALE: NONE — D



NOTE:
WHERE DUCT IS 6 SF. OR LARGER IN CROSS SECTIONAL AREA – USE 2 1/2 x 2 1/2 x 16 GA. VERTICAL ANGLE IN PLACE OF HANGER AT SEISMIC BRACE.

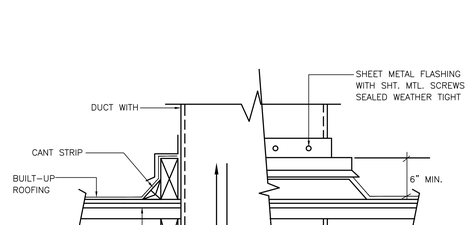
MAX. HALF OF DUCT PERIMETER	MAX. LOAD EACH HANGER	HANGER SIZE	HANGER SPACING
P/2 = 30"	260 LBS	1" x 22 GA.	10'-0" O/C
P/2 = 72"	420 LBS	1" x 18 GA.	10'-0" O/C
P/2 = 96"	700 LBS	1" x 16 GA.	10'-0" O/C
P/2 = 120"	1100 LBS	1 1/2" x 16 GA.	10'-0" O/C

RECTANGULAR DUCT SUPPORT DETAIL & CONNECTION TO STRUCTURE — SCALE: NONE — E

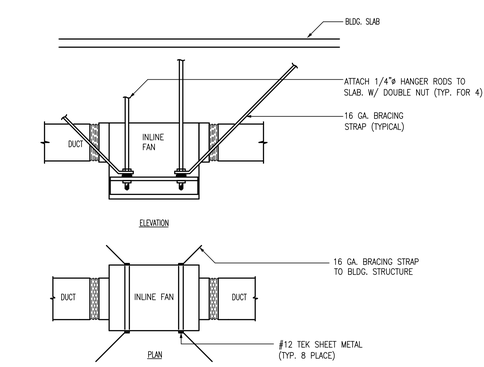


NOTE: COORDINATE INSTALLATION WITH ARCHITECTURAL DRAWINGS AND DETAILS.

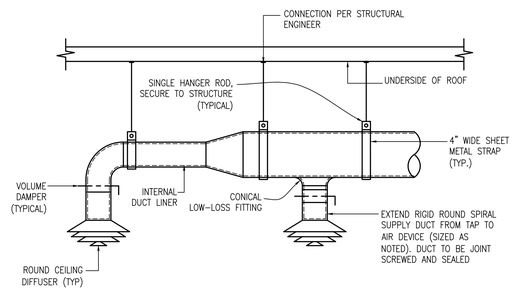
SECTION PLATFORM DETAIL — SCALE: NONE — F



DUCT THRU ROOF DETAIL — SCALE: NONE — G

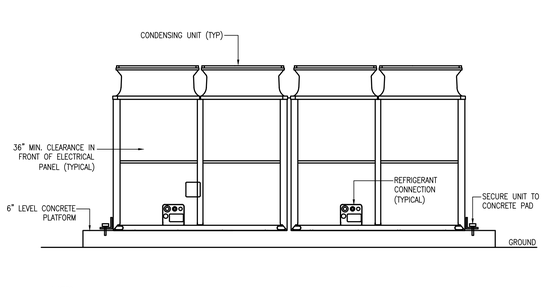


INLINE FAN DETAIL — SCALE: NONE — H



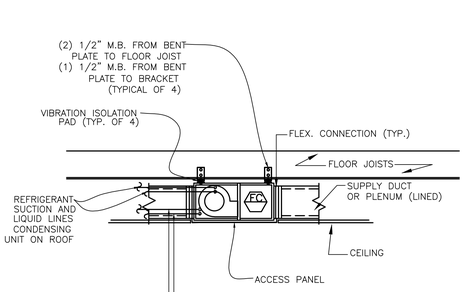
NOTES:
1. LOCATE BOTTOM OF DIFFUSER AT SAME LEVEL AS LIGHTS.
2. VERIFY PAINT COLOR OF ALL EXPOSED DUCTWORK AND AIR DISTRIBUTION EQUIPMENT WITH ARCHITECT.
3. ALL EXPOSED DUCTWORK SHALL BE SPIRAL LOCKSEAM DUCTS AND FITTINGS WITHOUT ANY FLEXIBLE CONNECTION TO ROUND CEILING DIFFUSER.
4. EXPOSED DUCTWORK TO BE INTERNALLY LINED.

EXPOSED DUCT DETAIL — SCALE: NONE — I



NOTES:
1. 35-7/16" MINIMUM UNIT CLEARANCE BETWEEN UNITS AT FACE TO FACE POSITION
2. CLEARANCE TO SIDES AND BACK SHALL BE PER MANUFACTURES RECOMMENDATIONS.
3. 36" MINIMUM SERVICE REQUIREMENT AT ELECTRICAL CONTROL PANEL.
4. PIPING SHALL BE PER MANUFACTURER.
5. AIR FLOW CLEARANCES PER MANUFACTURER.

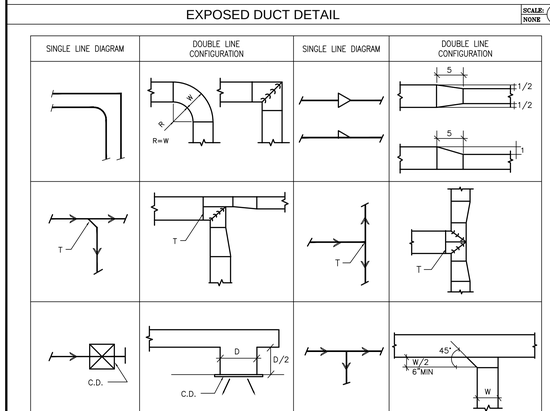
CONDENSING UNIT MOUNTING DETAIL — SCALE: NONE — J



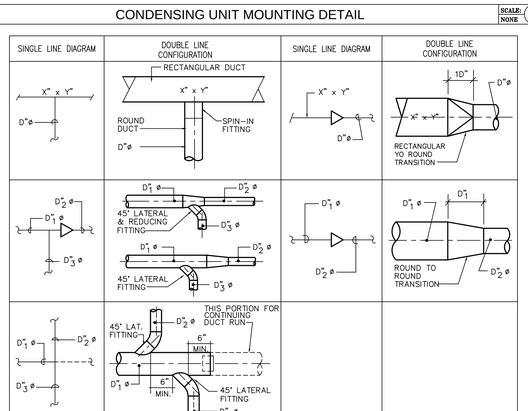
FAN COIL UNIT ELEVATION DETAIL (FIRST COMPANY)

FAN COIL UNIT ELEVATION DETAIL (CARRIER VRF FAN COIL) — SCALE: NONE — K

ROOF CAP DETAIL — SCALE: NONE — L



RECTANGULAR DUCTWORK DETAIL — SCALE: NONE — M



ROUND LOW PRESSURE DUCTWORK DETAIL — SCALE: NONE — N

ACCOUSTIC LINING INSTALLATION DETAIL — SCALE: NONE — O

THERMOSTAT MOUNTING — SCALE: NONE — P

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HVAC DETAILS

SUB DATE

BID DATE

DATE:	05/08/2019
DRAWN BY:	R.C./J.S.
JOB NO:	18-169
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