LEGEND

SYMBOL	ABBREV.	DESCRIPTION	SYMBOL	ABBREV.	DESCRIPTION
		EQUIPMENT NUMBER		TG	
		NEW SQUARE OR RECTANGULAR DUCT		TR	TOP REGISTER
	AC.LN.	NEW DUCT WITH ACOUSTIC LINER (IN ADDITION TO WHERE SPECIFIED)		BR	BOTTOM REGISTER
		NEW ROUND DUCT		BG	BOTTOM GRILLE
		NEW FLEXIBLE ROUND DUCT		CG	CEILING GRILLE
(OR DN)		DUCT SLOPE DIRECTION (REFER TO AIRFLOW DIRECTION)		CFM	CUBIC FEET OF AIR PER MINUTE
		DUCT DROP DOWN WITH AN ELBOW		E. OR EXH.	EXHAUST
		DUCT TRANSITION		O.S.A.	OUTSIDE AIR
		RADIUS ELBOW (# FIG. 2-2)		R. OR RET.	RETURN
		RECTANGULAR/SQUARE DUCT THROAT ELBOW WITH VANES (# FIG. 2-2)		S. OR SUPP.	SUPPLY
OR		SQUARE 45° ENTRY BRANCH CONNECTION (# FIG. 2-8)		TH.	THROAT
OR		ROUND DUCT WYE FITTING (# FIG. 3-5)		ABV	ABOVE
OR		RECTANGULAR DUCT PARALLEL FLOW BRANCH (# FIG. 2-7)		BHP	BRAKE HORSEPOWER
OR TH		THROAT SIZE ON RECTANGULAR DUCT SPLIT		BLDG	BUILDING
OR		DUCT TAKE-OFF FROM BOTTOM		BSMT	BASEMENT
OR		DUCT TAKE-OFF FROM TOP		BTU	BRITISH THERMAL UNIT
	M	NEW MOTORIZED DAMPER		CD	CEILING DIFFUSER
		AIR EXTRACTOR		CFM	CUBIC FOOT PER MINUTE
	CR	CEILING REGISTER (RETURN OR OUTSIDE)		(E)	EXISTING
		RETURN REGISTER WITH RETURN BOOT THE DUCT OPENING IN THE DIRECTION OF ARROW.		EA	EACH
	CD	CEILING DIFFUSER (SUPPLY AIR)		FS	FLOW SWITCH
	CR	CEILING REGISTER (EXHAUST AIR)		FT	FEET OR FOOT
		SUPPLY AIR DUCT SECTION		GC	GENERAL CONTRACTOR
		RETURN OR OUTSIDE AIR DUCT SECTION		IN	INCHES
		EXHAUST AIR DUCT SECTION		LF	LINEAR FEET
		SUPPLY AIR DUCT UP THRU FLOOR OR ROOF		MAX	MAXIMUM
		RETURN OR OUTSIDE AIR DUCT UP THRU FLOOR OR ROOF		MIN	MINIMUM
		EXHAUST AIR DUCT UP THRU FLOOR OR ROOF		MBH	THOUSAND BTU PER HOUR
2	LVR.	DOOR LOUVER AND SQUARE FOOT FREE AREA		MC	MECHANICAL CONTRACTOR
	AFF	ABOVE FINISH FLOOR		NIC	NOT IN CONTRACT
	GALV.	GALVANIZED		PD	PRESSURE DROP
	G.I.	GALVANIZED IRON		SPEC	SPECIFICATION
	S.P.	STATIC PRESSURE		TEFC	TOTALLY ENCLOSED FAN COOLED
ø	DIA.	ROUND (DIAMETER)		(E)	EXISTING
	TG	TOP GRILLE		(N)	NEW
	P.O.C.	POINT OF CONNECTION	X		NOTE CALLOUT
	P.O.D.	POINT OF DISSCONNECT			
	FD	FIRE DAMPER			

1. REFERS TO "SMACNA" HVAC DUCT CONSTRUCTION STANDARDS ANSI/SMACNA 006-2019 HVAC DUCT CONSTRUCTION STANDARDS
2. SYMBOLS AND ABBREVIATIONS ARE SHOWN FOR REFERENCE; NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED.

SEISMIC ANCHORAGE NOTES

A. ALL MECHANICAL EQUIPMENT SHALL BE BRACED OR ANCHORED TO RESIST A HORIZONTAL FORCE ACTING IN ANY DIRECTION AND A SIMULTANEOUS VERTICAL FORCE= USE 1/3 x THE HORIZONTAL FORCE, DEFINED IN CBC 2022, SECTION 1614A.1.13 AND ASCE 7-05 SECTIONS 13.3, 13.4 & 13.6 AND OSHPD CAN 1,

THE ABOVE VALUES ARE FOR AN IMPORTANCE FACTOR Ip = 1.0 AND SEISMIC ZONE, Z = 4

IN ANY CASE ALL SEISMIC ANCHORAGE OF ALL MECHANICAL EQUIPMENT MUST MEET ALL REQUIREMENTS OF CBC 2022,

ANCHORAGE OF ALL EQUIPMENT TO BE INSTALLED, AS A PART OF THIS PROJECT SHALL BE DETAILED ON THE STRUCTURAL AND MECHANICAL PLANS, EXCEPT FOR THE FOLLOWING:

1. EQUIPMENT WEIGHING LESS THAN 400 POUNDS SUPPORTED DIRECTLY ON THE FLOOR OR ROOF.
2. FURNITURE REQUIRED TO BE ATTACHED IN ACCORDANCE WITH PART 2, TITLE 24, C.C.R.
3. TEMPORARY OR MOVABLE EQUIPMENT.
4. EQUIPMENT WEIGHING LESS THAN 20 POUNDS SUPPORTED BY VIBRATION ISOLATORS.
5. EQUIPMENT WEIGHING LESS THAN 20 POUNDS SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

SOME OF THE ITEMS IN THE CATEGORIES LISTED ABOVE MUST BE SUPPORTED AND ANCHORED TO RESIST THE FORCES PRESCRIBED BY SECTION 1632A AND THE ANCHORAGE SHALL BE APPROVED BY THE APPROPRIATE DESIGN PROFESSIONAL OF RECORD AND DSA AS A PART OF FIELD REVIEWS/OBSERVATIONS. THE INSPECTOR OF RECORD SHALL ASSURE THAT THE ABOVE REQUIREMENTS ARE ENFORCED. ANY CHANGE TO THE EQUIPMENT (DIMENSIONS, CENTER OF GRAVITY, WEIGHT, MOUNTING TYPE OR LOCATION) WILL REQUIRE REVIEW AND APPROVAL BY DSA. (TYPICAL FOR ALL EQUIPMENT)

B. NO BRACING IS REQUIRED IF THE TOP OF THE DUCT OR PIPE IS SUSPENDED 12 INCHES OR LESS FROM THE SUPPORTING STRUCTURAL MEMBER.

C. WALLS, INCLUDING DRYWALL PARTITIONS, MAY REPLACE REQUIRED TRANSVERSE OR VERTICAL BRACING FOR DUCTWORK OR PIPING.

D. ATTACHMENT TO STRUCTURAL MEMBERS SHALL USE DEVICES INCLUDED IN FEDERAL SPECIFICATION WW-H-171 (MSS SP-58) OR BE BOLTED/WELDED AS APPROVED BY RESIDENT ENGINEER. BRACES SHALL BE CONNECTED TO THE HANGERS/SUPPORTS FOR DUCTS, PIPING AND SUSPENDED EQUIPMENT.

E. LATERAL SEISMIC FORCE SHALL BE CONSIDERED TO ACT CONCURRENTLY WITH THE DEAD LOAD. THE SLENDERNESS RATIO (l/r) OF BRACES SHALL NOT EXCEED 200, WHERE (l) IS THE LENGTH OF THE BRACE AND (r) IS THE LEAST RADIUS OF GYRATION, BOTH IN INCHES.

F. SWAY BRACING METHODS SHOWN IN NFPA 13 FOR SPRINKLER PIPING MAY BE USED IN LIEU OF DETAILS SHOWN ON THE DRAWINGS FOR PIPING AND DUCTWORK.

G. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL SHOWING ALL DUCTS AND PIPE BRACING INCLUDING DETAILS SHOWING ATTACHMENT TO STRUCTURE.

SEISMIC BRACING OF MECHANICAL SYSTEMS:

H. DUCTWORK

1. BRACE ALL RECTANGULAR DUCTS OF 6 SQ. FT. CROSS SECTIONAL AREA AND LARGER. BRACE ALL ROUND/OVAL DUCTS 28 INCHES IN DIAMETER AND LARGER.
2. TRANSVERSE AND VERTICAL BRACING SHALL OCCUR AT 30 FOOT INTERVALS, MAXIMUM. LONGITUDINAL BRACING SHALL OCCUR AT 60 FOOT INTERVALS, MAXIMUM.
3. BRACING OF ALL DUCTS, PIPES AND ANY OTHER SYSTEMS SHALL MEET CURRENT CBC 2022 AND TITLE 24 REQUIREMENTS. SYSTEMS SHALL BE BRACED USING THE CURRENT OSHPD PRE-APPROVAL SYSTEM.
4. PRE-APPROVAL SYSTEMS SHALL BE USED SUCH AS UNISTRUT (OPA-0120), MASON (OPA-0349), ISAT (OPA-0485) OR B-LINE (OPA 0114).
5. INDEPENDENTLY ENGINEERED SYSTEMS MAY ALSO BE UTILIZED IF DESIGNED AND STAMPED BY A LICENSED CALIFORNIA STRUCTURAL ENGINEER.
6. SHOP DRAWINGS SHOWING ALL BRACING LOCATIONS AND DETAILS OF CONNECTIONS ARE REQUIRED FOR ALL SYSTEMS INCLUDING PRE-APPROVED SYSTEMS.
7. CONTRACTOR SHALL SUBMIT SEISMIC ANCHORAGE DRAWINGS FOR DUCTING, PIPING ETC. FOR DSA REVIEW PRIOR TO INSTALLATION.

I. PIPING

1. BRACE ALL PIPES 2-1/2 INCHES DIAMETER AND LARGER. PIPING INSIDE MECH. ROOMS WITH SIZES 1-1/4, 1-1/2 AND 2 INCH SHALL BE BRACED.
2. TRANSVERSE AND VERTICAL BRACING SHALL OCCUR AT 30 FOOT INTERVALS, MAXIMUM. LONGITUDINAL BRACING SHALL OCCUR AT 60 FOOT INTERVALS, MAXIMUM.
3. AT PIPE RISERS, WHEREVER POSSIBLE, SUPPORT THE WEIGHT OF THE RISER AT A POINT OR POINTS ABOVE THE CENTER OF GRAVITY OF THE RISER.
4. DO NOT FASTEN ONE RIGID PIPING SYSTEM TO TWO DISSIMILAR PARTS OF THE BUILDING THAT MAY RESPOND IN A DIFFERENT MODE DURING AN EARTHQUAKE; FOR EXAMPLE, A WALL AND A ROOF.
5. DO NOT USE BRANCH LINES TO BRACE MAIN LINES.

J. CONTRACTOR TO PROVIDE COMPLETE SEISMIC ANCHORAGE AND BRACING FOR ALL MECHANICAL EQUIPMENT WEIGHING OVER 400 POUNDS THAT IS DIRECTLY MOUNTED ON THE FLOOR OR ROOF AND ALL MECHANICAL EQUIPMENT WEIGHING OVER 20 POUNDS THAT IS SUSPENDED FROM THE FLOOR, ROOF, WALL OR SUPPORTED BY VIBRATION ISOLATORS AS SHOWN ON THE EQUIPMENT ANCHORAGE DRAWINGS.

K. REFER TO STRUCTURAL DRAWINGS FOR CONCRETE ANCHOR TYPE AND INSTALLATION REQUIREMENTS.

L. ALL PIPING AND CONDUIT CROSSING BUILDING SEISMIC SEPARATIONS SHALL BE PROVIDED WITH APPROVED FLEXIBLE CONNECTORS.

M. SHOP DRAWINGS SHOWING ALL BRACING LOCATIONS AND DETAILS OF CONNECTIONS ARE REQUIRED FOR ALL SYSTEMS INCLUDING PRE-APPROVED SYSTEM.

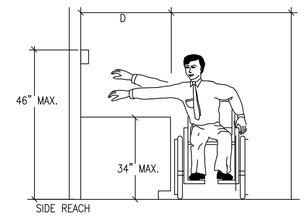
N. CONTRACTOR SHALL SUBMIT SEISMIC ANCHORAGE DRAWINGS & CALCULATIONS FOR DUCTING, PIPING ETC. FOR STRUCTURAL ENGINEER OF RECORD TO REVIEW PRIOR TO INSTALLATION.

O. A COPY OF THE BRACING SYSTEMS INSTALLATION MANUAL SHALL BE ON THE JOB SITE PRIOR TO STARTING THE INSTALLATION OF THE HANGERS AND/OR BRACES. SUBMIT APPLICABLE DETAILS FOR REVIEW AND APPROVAL.

P. ALL ANCHORAGE, SUPPORT AND SEISMIC RESTRAINT WORK TO BE IN ACCORDANCE WITH THE APPROVED TIO PROGRAM.

GENERAL NOTES

1. ALL DUCTWORK AND CEILING PENETRATION SHALL BE COORDINATED WITH EXISTING STRUCTURAL JOISTS AND BEAMS. PROVIDE OFFSETS IN PIPES AND DUCTS TO AVOID CUTTING OF BEAMS AND JOISTS.
2. MATERIALS EXPOSED WITHIN DUCTS OR PLENUMS SHALL HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE DEVELOPED RATING OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH NFPA 90A.
3. SYMBOL AND ABBREVIATION LISTS ARE COMPOSITE. ALL SYMBOLS AND ABBREVIATIONS MIGHT NOT BE USED ON THIS PROJECT.
4. MAINTAIN CLEAR ACCESS TO SERVICE EQUIPMENT AND OTHER ACCESSORIES REQUIRING SERVICE, VISUAL INSPECTION OR HAND OPERATION. WHERE INDICATED OR REQUIRED, PROVIDE ACCESS PANELS OF THE TYPE SELECTED TO SUIT MATERIALS IN WHICH INSTALLED.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH LATEST APPLICABLE CODES AND REGULATIONS PER CALIFORNIA AND OTHER AUTHORITIES HAVING JURISDICTION.
6. THE MECHANICAL DRAWINGS ARE DIAGRAMMATIC AND SHOULD NOT BE SCALED TO ESTABLISH LOCATION OF WORK. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND MAKE ADJUSTMENTS TO DIMENSIONS AS NECESSARY TO COMPLETE THE WORK.
7. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND SHALL ARRANGE FOR ALL INSPECTIONS AS REQUIRED.
8. CONTRACTOR SHALL THOROUGHLY EXAMINE PREMISES AND OBSERVE ALL CONDITIONS AND CIRCUMSTANCES UNDER WHICH THE WORK SHALL BE PERFORMED. NO ALLOWANCES WILL BE MADE FOR ERRORS OR NEGLIGENCE IN THIS RESPECT.
9. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE IMPORTANCE OF PROPER SCHEDULING AND PHASING OF THE WORK SO AS TO CAUSE MINIMUM DISTURBANCE TO THE ACTIVITIES ON THE SITE
10. CONTRACTOR SHALL PERFORM WORK ONLY AFTER COORDINATION WITH ALL TRADES
11. CLEAN UP ALL WASTE AND DEBRIS AT THE END OF EACH WORKING DAY AND AT THE COMPLETE OF THE JOB.
13. THE CONTRACTOR SHALL NOT CORE DRILL CONCRETE SLABS WITHOUT THE KNOWLEDGE AND WRITTEN CONSENT OF THE STRUCTURAL ENGINEER AND THE BUILDING OWNER.
14. ALL SPECIFIED EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
15. PROVIDE ONE YEAR WARRANTY FOR ALL WORKMANSHIP AND MATERIALS AFTER THE DATE OF FINAL ACCEPTANCE.
16. PRIOR TO STARTING WORK, SUBMIT SHOP DRAWINGS FOR ALL MECHANICAL EQUIPMENT & DUCTWORK PER SPECIFICATIONS.
17. UPON COMPLETION OF WORK, THE CONTRACTOR SHALL HAVE ALL AIR SYSTEMS BALANCED TO INDICATED AIR FLOW QUANTITIES BY A CERTIFIED AABC BALANCING CONTRACTOR. PROVIDE POST-CONSTRUCTION AIR BALANCE REPORT.
18. CONTRACTOR SHALL MOUNT AND CONNECT EACH ITEM OF EQUIPMENT IN STRICT ACCORDANCE WITH MANUFACTURE'S RECOMMENDATION.
19. ALL DUCTWORK SHALL BE GALVANIZED STEEL PER SMACNA GUIDELINES.
20. MAXIMUM LENGTH OF RUN OF FLEXIBLE DUCT SHALL NOT EXCEED 5FT.
21. ALL OPENINGS IN WALLS, CEILINGS, AND FLOORS RESULTING FROM DUCT DEMOLITION SHALL BE CLOSED AND FINISHED TO MATCH THE SURROUNDING.
22. RUN ALL DUCTWORK AND PIPING AS HIGH AS POSSIBLE UNLESS OTHERWISE NOTED. PIPING SHALL BE ABOVE DUCTWORK.
23. CONTRACTOR SHALL PROVIDE EXTERNAL TRAPS FOR CONDENSATE DRAIN LINES FOR ALL COOLING COILS.
24 ALL SUPPLY & RETURN DUCTWORK ABOVE CEILING SHALL BE INSULATED PER TITLE-24 REQUIREMENTS.
25 CONTRACTOR SHALL FURNISH AND INSTALL DUCT AND PIPE SUPPORT AND BRACING PER SMACNA REQUIREMENT.
26 ANY EQUIPMENT, DUCTWORK, OR PIPING INSTALLED MORE THAN 1 FT FROM THE LOCATION SHOWN ON THE DRAWINGS SHALL BE CLEARLY DOCUMENTED ON THE FIELD. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS THAT CLEARLY SHOW THE LOCATION OF THE THE EQUIPMENT BEFORE THAN COMPLETION OF THE PROJECT. ALL EXPENSE RELATING TO VERIFY THE AS-BUILT DRAWINGS BY THE DISTRICT OR ITS REPRESENTATIVE(S) DUE TO INACCURATE OR INCOMPLETE RECORD SHALL BE BORN BY THE CONTRACTOR.
27 ALL MECHANICAL WORK SHALL COMPLY WITH TITLE-24 AND CMC-2019
28. NOTE THE CRITICAL SPACE AVAILABLE ABOVE CEILINGS. PROVIDE TRANSITION PIECES AT CROSSOVERS, UNDER BEAMS, OVER/UNDER PIPES, AS REQUIRE ACCOMMODATE DUCTS WITHIN SPACE AVAILABLE, PROVIDING EQUIVALENT DUCT SIZE TO THE DIMENSION SHOWN. COORDINATE CLOSELY WITH OTHER SECTIONS TO REDUCE NECESSITY OF TRANSITIONS TO A MINIMUM. NO ADDITIONAL COSTS WILL BE PAID FOR ANY REQUIRED TRANSITIONS OR OTHER SPECIAL CHANGE SHAPE PIECES.
29. ALL PENETRATION OF FIRE-RESISTIVE SHALL BE PROTECTED ACCORDING TO 2019 CALIFORNIA BUILDING CODE AND SHALL REQUIRE A REVISED PLAN REVIEW.
30. THERMOSTAT HEIGHT (SEE BELOW).



SIDE REACH
FIGURE 11B-5D

PLAN CHECK NOTES

A. ALL MECHANICAL EQUIPMENT AND SYSTEMS INSTALLED AS PART OF PROJECT SHALL COMPLY WITH ALL REQUIREMENTS OF THE 2022 CALIFORNIA MECHANICAL CODE AND THE 2022 CALIFORNIA BUILDING CODE, 2022 CALIFORNIA GREEN BUILDING STANDARDS CODE AND THE 2022 CALIFORNIA BUILDING ENERGY STANDARDS.

B. ALL DUCTWORK FOR HEATING AND COOLING SYSTEM OR EVAPORATIVE COOLING SYSTEM SHALL BE CONDUCTED THROUGH DUCT SYSTEMS CONSTRUCTED OF METAL AS SET FORTH IN THE SMACNA HVAC DUCT CONSTRUCTION STANDARD - METAL AND FLEXIBLE. FACTORY MADE AIR DUCTS SHALL BE APPROVED FOR THE USE INTENDED OR SHALL COMPLY WITH 2022 CMC REFERENCED STANDARDS CHAPTER 17. (CMC 602.1)

C. SIZING OF THE GAS FIRED CATAGORY 1 APPLIANCE VENTING SYSYTEMS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CMC SECTION 803 AND CMC VENTING TABLES 803.1.3 AS APPLICABLE TO THE TYPE OF INSTALLATION.

D. EQUIPMENT AND APPLIANCES SHALL BE ACCESSIBLE FOR SERVICE, INSPECTION REPAIR AND REPLACEMENT WITHOUT REMOVING PERMANENT CONSTRUCTION. SUFFICIENT CLEARANCE SHALL BE MAINTAINED TO PERMIT CLEANING, REPLACEMENT OF FILTERS, BLOWERS, MOTORS CONTROLS AND LUBRICATION OF MOVING PARTS. 30 INCHES OF CLEARANCE IN DEPTH WIDTH AND HEIGHT SHALL BE PROVIDED TO SERVICE THE APPLIANCE OR EQUIPMENT. (CMC 304.1)

E. OUTSIDE AIR FOR A HEATING AND COOLING SYSTEM SHALL NOT BE TAKEN FROM CLOSER THAN 10FT FROM AN APPLIANCE VENT OUTLET, VENT OPENING OF A PLUMBING SYSTEM, OR THE DISCHARGE OUTLET OF EXHAUST FAN, UNLESS THE OUTLET IS 3FT ABOVE THE OUTSIDE AIR INLET (CMC 314.3)

F. ENVIRONMENTAL EXHAUST DUCTS SHALL TERMINATE OUTSIDE THE BUILDING AND SHALL BE EQUIPPED WITH A BACK DRAFT DAMPER OR MOTORIZED DAMPER THAT AUTOMATICALLY SHUTS WHEN THE SYSTEM OR SPACES SERVED ARE NOT IN USE.

G. EXHAUST OUTLETS SHALL TERMINATE NO LESS THAT 3 FEET FROM PROPERTY LINE, 3 FEET FROM OPENINGS INTO THE BUILDING, 10 FEET FROM A FORCED AIR INLET, AND SHALL NOT DISCHARGE ONTO A PUBLIC WALKWAY.

H. EXHAUST OUTLETS FRO PRODUCT CONVEYING SYSTEMS SHALL TERMINATE NO LESS THAN 10 FEET FROM PROPERTY LINE 3 FEET FROM EXTERIOR ROOF/WALL, 10 FEET FROM OPENINGS INTO THE BUILDING AND 10 FEET ABOVE GRADE.

PROVIDE LEAKAGE TEST FOR PROVIDING VENTILATION INTO APARTMENTS BASED ON EXHAUST ONLY PER TITLE-24 SEC 150.0.1. (O)E.ii

CONTRACTOR TO REFER TO STRUCTURAL DRAWINGS FOR DETERMINATION OF STRUCTURAL FRAMING, ROOF AND FLOOR DECK CONSTRUCTION. USE APPROPRIATE DETAILS FROM MECHANICAL DETAILS SHEETS TO SUPPORT, ANCHOR AND OR BRACE THE HVAC EQUIPMENT.

ALL SUPPLY AND RETURN AIR DUCTS SHALL BE INSULATED WITH A MINIMUM OF R-8 INSULATION

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06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

GENERAL NOTES AND ABBREVIATIONS

08 / SHEET NUMBER

M100

OUTDOOR CONDENSING UNIT SCHEDULE

MARK NO.	MANUFACTURER & MODEL NO.	LOCATION	SERVICE	OUTDOOR FAN @ 95 DEG.F AMBIENT (TONS)	HEATING CAPACITY (MBH)	COOLING CAPACITY (MBH)	ELECTRICAL DATA					TOTAL OPERATING WEIGHT (LBS.)	EER	IEER/SEER	COP	REFRIGERANT WEIGHT (LBS)	REFRIGERANT	REMARKS
							V/PH/HZ	FLA	HP	MCA	FUSE							
CU 1-1	MITSUBISHI MXZ-SM48NAM2	ROOF	FC1-1 FC1-2	4	50	48	208/230/1/60	–	–	36	64	360	10.5	/16.0	2.2	19.01	410A	①②③
CU 1-2	MITSUBISHI MXZ-SM60NAM2	ROOF	FC1-3 FC1-4	5	66	60	208/230/1/60	–	–	36	40	360	10.6	/17.0	3.4	20.06	410A	①②③
CU 2-1	MITSUBISHI MXZ-SM60NAM2	ROOF	FC2-1 FC2-2	5	66	60	208/230/1/60	–	–	36	40	360	10.6	/17.0	3.4	19.80	410A	①②③
CU 2-2	MITSUBISHI MXZ-SM60NAM2	GROUND	FC2-3	5	66	60	208/230/1/60	–	–	36	40	360	10.6	/17.0	3.4	17.76	410A	①②③

① INSTALLATION WIRING AND PIPING SHALL BE PER MANUFACTURER'S INSTRUCTIONS ② PROVIDE VIBRATION ISLOATION NEOPEREN PADS
③ CONTRACTOR SHALL VERIFY REFRIGERANT PIPING LENGTH AND SIZE REFRIGERANT PIPING PER MANUFACTURER'S INSTRUCTIONS

DUCTED FAN COIL SCHEDULE

MARK NO.	MANUFACTURER & MODEL NO.	LOCATION	SERVICE	NOMINAL CAPACITY (TONS)	COOLING CAPACITIES							HEATING PERFORMANCE			ELECTRICAL DATA					MIN. OSA. (CFM)	REF.	FILTER	TOTAL OPERATING WEIGHT (LBS.)	REMARKS
					EVAPORATOR				SENSIBLE (MBH)	TOTAL (MBH)	ESP (IN.)	CFM													
					ENT (DB °F)	ENT (WB °F)	LVG (DB °F)	LVG (WB °F)					ENT	LVG	NET HEATING CAPACITY (MBH)	V/PH/HZ	WATTS	MCA	FLA	FUSE SIZE					
FC 1-1	MITSUBISHI PEFY-P12NMAU-E4	CEILING	PRIMARY BEDROOM 102	1	80.0	67	57.0	56.0	9	12	0.8	370	55.6	88.0	13.5	208/230/1/60	–	2.13	–	15	75	R410A	2" MERV 13	60	①②③④⑤
FC 1-2	MITSUBISHI PEFY-P30NMAU-E4	CEILING	LOUNGE 103 WALK-IN 104 BATH1 105	2.5	80.0	67	57.0	56.0	22.5	30	0.8	620	55.6	88.0	34	208/230/1/60	–	2.88	–	15	230	R410A	2" MERV 13	80	①②③④⑤
FC 1-3	MITSUBISHI PEFY-P30NMAU-E4	CEILING	GUEST BED 106 BATH 2 107 HALL 100	2.5	80.0	67	57.0	56.0	22.5	30	0.8	845	55.6	88.0	34	208/230/1/60	–	2.88	–	15	110	R410A	2" MERV 13	80	①②③④⑤
FC 1-4	MITSUBISHI PVFY-P24NMAU-E4	CEILING	GUEST BED 109 BATH 3 110 COFFEE 106	2.0	80.0	67	57.0	56.0	18.0	24	0.8	645	55.6	88.0	27	208/230/1/60	–	2.88	–	15	115	R410A	2" MERV 13	80	①②③④⑤
FC 2-1	MITSUBISHI PVFY-P12NMAU-E1	FLOOR	LIVING ROOM	1	80.0	67	57.0	56.0	9	12	0.8	300	55.6	88.0	13.5	208/230/1/60	–	3.0	–	15	75	R410A	2" MERV 13	85	①②③④
FC 2-2	MITSUBISHI PVFY-P48NMAU-E1	FLOOR	KITCHEN DINING	4	80.0	67	57.0	56.0	36	48	0.8	1400	55.6	88.0	54	208/230/1/60	–	5.63	–	15	170	R410A	2" MERV 13	300	①②③④
FC 2-3	MITSUBISHI PEFY-P48NMAU-E4	CEILING	GUEST BED 202 BATH 4 110 HALL 206	4	80.0	67	57.0	56.0	35	48	0.8	1304	55.6	88.0	54	208/230/1/60	–	4.38	–	15	115	R410A	2" MERV 13	170	①②③④⑤

① ALL UNITS TO BE TIED TO THERMOSTAT ② PROVIDE FACTORY SUPPLIED CONDENSATE DRAIN PUMPS 120V/1ø/60Hz/INTERLOCK WITH FAN COIL UNIT. ③INSTALLATION OF WIRING, ROUTING AND SIZING OF THE REFRIGERANT PIPING PER MANUFACTURER'S INSTRUCTION
④ PROVIDE LIQUID SENSOR IN THE DRAIN PAN OF THE PVFY FAN COIL UNITS. THIS SENSOR IS CONNECTED TO THE CONTROL OF THE FAN COIL UNIT TO SHUT DOWN THE UNIT IN THE EVENT OF OVERFLOW OF THE CONDENSATE IN THE DRAIN PAN.
⑤ WITH FBM SERIES FILTER BOX

EXHAUST FAN SCHEDULE

UNIT NO.	MANUFACTURER MODEL	LOCATION SHT REF	SERVICE	TYPE	CFM	ESP (IN. W.C.)	RPM	DRIVE	POWER DATA			RAD. SOUND DATA			WEIGHT (LBS.)	REMARKS
									VOLT/PH/HZ	HP	WATTS	LWA	dBA	SONES		
EF 1	GREENHECK GB-097-6	SEE PLAN	BATH 1 105	ROOF	260	0.4	1528	DIRECT	115/1/60	1/6	–	–	–	8.5	70	①②④
EF 2	GREENHECK SP-A0511W	SEE PLAN	BATH 2 107	CLG	110	0.3	880	DIRECT	115/1/60	–	21	–	–	2.0	10	①②
EF 3	GREENHECK GB-097-4	SEE PLAN	BATH 3 113	ROOF	115	0.3	957	DIRECT	115/1/60	1/4	–	–	–	3.3	70	①②④
EF 4	GREENHECK SP-A0511W	SEE PLAN	BATH 5	CLG	60	0.4	817	DIRECT	115/1/60	–	16	–	–	2.0	12	①②
EF 5	GREENHECK GB-097-4	SEE PLAN	BATH 4 203	ROOF	115	0.4	1063	BELT	115/1/60	1/4	–	–	–	4.1	70	①②④
EF 6	GREENHECK GB-097-4	SEE PLAN	WHOLE HOUSE VENTILATION	ROOF	200	0.4	1321	BELT	115/1/60	1/4	–	–	–	6.5	70	①②③④

① PROVIDE PREMIUM EFFICIENCY MOTOR ② ENERGIZE WITH WALL SWITCH ③ RUN CONTINEOUSLY ④ PROVIDE FACTORY ROOF CURB

① CEILING DIFFUSER SCHEDULE

MARK OR SYMBOL	DESCRIPTION	NECK SIZE①	FACE③ DIMENSION	CFM RANGE	MAX TOTAL P.D. (IN W.C.)	MAX. NC	MAX THROW @ 50 FPM (FT)				REMARKS
							1-WAY	2-WAY	3-WAY	4-WAY	
ONE-WAY DISCHARGE TWO-WAY DISCHARGE THREE-WAY DISCHARGE FOUR-WAY DISCHARGE	CD -1	8"X8"	13"X13"	101-180	0.10	20	25	19	18	12	①UNLESS OTHERWISE NOTED ON DRAWINGS. ②COORDINATE WITH ARCHIT. DRAWINGS FOR CEILING GRID AND BORDER TYPE. ③APPLICABLE FOR GYP BOARD CEILING ONLY. FOR T-BAR CEILING, FACE DIMENSION SHALL BE 24"X24". ④PROVIDE DUCT TO NECK TRANSITION AS REQUIRED. ⑤ALL CEILING DIFFUSERS (CD) ARE KRUEGER MODEL 1240P OR EQUAL ⑥ALL DUCT MOUNTED DIFFUSERS (DD) 2-WAY, 45 DEG THROW WITH VOLUME DAMPER KRUEGER MODEL SDMGDR OR EQUAL ⑥ALL SIDEWALL REGISTERS (SWR) DOUBLE DEFLECTION 3/4" BLADE SPACING, KRUEGER MODEL 880 OR EQUAL
	CD -2	10"X10"	15"X15"	181-280	0.10	20	31	24	22	15	
	CD -3	12"X12"	17"X17"	281-400	0.10	20	37	28	23	18	
	CD -4	14"X14"	19"X19"	401-450	0.10	20	39	30	28	19	
	CD -5	16"X16"	20"X20"	451-700	0.10	22	36	25	25	21	
	CD -6	18"X18"	22"X22"	701-1100	0.10	30	51	41	31	25	
	DD -1	10"X4"	–	63-104	0.064	15	–	15	–	–	
	DD -2	14"X6"	–	100-190	0.052	12	–	12	–	–	
	DD -3	36"X8"	–	260-480	0.025	–	–	18	–	–	
	DD -4	20"X8"	–	190-290	0.029	–	–	14	–	–	
	SWR -1	8"X8"	–	150-278	0.066	20	–	14	–	–	
	SWR -2	12"X12"	–	260-480	0.089	19	–	18	–	–	
	SWR -3	12"X6"	–	160-270	0.125	21	–	14	–	–	

LINEAR DIFFUSER SCHEDULE

DESCRIPTION	INLET (IN)	SLOT WIDTH (IN)	NUMBER OF SLOTS	SLOT LENGTH (FT)	CFM RANGE CFM	MAX THROW @ 50 FPM (FT)		MAX TOTAL P.D. (IN W.C.)	MAX. NC	REMARKS
						1-WAY	2-WAY			
LD -1	12	3	2	4	150-790	40	–	0.183	30	TITUS FLOWBAR MODEL FL-30
LD -2	8	2	1.5	4	240-380	28	–	0.081	22	TITUS FLOWBAR MODEL FL-15
LD -3	8	2	1.0	4	160-300	25	–	0.063	18	TITUS FLOWBAR MODEL FL-15

LINEAR RETURN DIFFUSER SCHEDULE

DESCRIPTION	INLET (IN)	SLOT WIDTH (IN)	NUMBER OF SLOTS	SLOT LENGTH (FT)	CFM RANGE CFM	MAX TOTAL P.D. (IN W.C.)	MAX. NC	REMARKS
LRD -1	12	3	2	4	150-790	0.183	30	TITUS FLOWBAR MODEL FL-30
LRD -2	8	2	1.5	4	240-380	0.081	22	TITUS FLOWBAR MODEL FL-15
LRD -3	8	2	1.0	4	160-300	0.063	18	TITUS FLOWBAR MODEL FL-15

② CEILING RETURN/EXHAUST/TRANSFER GRILLE SCHEDULE

DESCRIPTION	NECK SIZE ①	RETURN/EXHAUST			TRANSFER	REMARKS
		CFM RANGE	MAX NEG STATIC P.D. (IN W.C.)	MAX NC	CFM RANGE	
RG-1/EX-1	8" x 8"	91-160	0.05	25	< 80	①UNLESS OTHERWISE NOTED ON DRAWINGS. ②COORDINATE WITH ARCHITECTURAL DRAWINGS FOR CEILING TYPE. ③ALL DAMPERS, EQUALIZING GRIDS, DUCT SURFACES, AND OTHER ACCESSORIES VISIBLE THROUGH AIR OUTLETS SHALL BE FLAT BLACK FINISH. ④ALL CEILING RETURN GRILLES (RG/EX) ARE KRUEGER MODEL 1190 OR EQUAL EXCEPT RG-9/EX-9 ⑤ALL WALL MOUNTED RETURN GRILLES (SRG) ARE KRUEGER MODEL AFCS85 WITH 30° DEFLECTION OR EQUAL ⑤RG-9/EX-9 SHALL BE KRUEGER MODEL 6790 OR EQUAL ⑥OPERATING ROOM RA GRILLE (ORG) ARE PERFORATED GRILLE KRUEGER MODEL S80P OR EQUAL
RG-2/EX-2	10" x 10"	161-260	0.05	25	81-130	
RG-3/EX-3	12" x 12"	261-350	0.05	25	131-190	
RG-4/EX-4	14" x 14"	351-420	0.05	25	191-270	
RG-5/EX-5	16" x 16"	421-480	0.05	25	271-350	
RG-6/EX-6	18" x 18"	481-700	0.05	25	351-450	
RG-7/EX-7	20" x 20"	833-1111	0.05	25	451-560	
RG-8/EX-8	22" x 22"	1000-1400	0.05	25	–	
RG-9/EX-9	24" x 48"	1600-2400	0.006	13	–	
SRG-1/SEG-1	18"x10"	454-555	0.038	21	–	
SRG-2/SEG-2	10"X6"	93-140	0.085	23	–	
SRG-3/SEG-3	30" X 16"	1115-1640	0.055	23	–	
SRG-4/SEG-4	42" X 30"	2800-3400	0.033	22	–	
ORG-1	10"x24"	523-728	0.033	22	–	

Whole House Ventilation Calculations

From Title-24 Section 150.0(o)
Ventilation Rate 0.03 CFM/Sqft
Ventilation = 0.03(Area) + 7.5(#BedRoom + 1)

Unit	Area (Sqft	#Bedroom	Req Vent. (CFM)	EF (CFM)	EF > Req Vent
1	3715	4	148.95	200	YES

CLOTHES DRYER EXHAUST POWERED VENTILATOR

UNIT NO.	MANUFACTURER MODEL	SERVICE	CFM	V/PH/HZ	WATTS	AMPS	REMARKS
DF 1	FANTECH DEDPV-705	CLOTHES DRYER	105	115/1/60	70	0.75	①②③

① UL LISTED ② FANTECH LINT TRAP MODEL DBLT 4W ③ FANTECH EXTERNAL LOUVER MODEL HS 4W

01 / ARCHITECT

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04 / KEY PLAN N ↑

05 / PROJECT NAME / ADDRESS

TORRANCE HILL HOUSE
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06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

SCHEDULES

08 / SHEET NUMBER

M101

HEATING, VENTILATING & AIR CONDITIONING
PART 1: GENERAL

1.1 DESCRIPTION

A. THE REQUIREMENTS OF THE GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, SPECIAL CONDITIONS AND DIVISION I APPLY TO THIS SECTION.

1.2 SCOPE

A. THE WORK COVERED BY THIS SECTION CONSISTS OF FURNISHING ALL LABOR AND MATERIALS FOR A COMPLETE AND OPERABLE HVAC SYSTEM FOR THE BUILDING.

1.3 WORK INCLUDED

A. WORK IN THIS SECTION: PRINCIPAL ITEMS INCLUDE:

1. THE SUPPLY AND RETURN AIR SYSTEMS
2. TEST AND BALANCE

1.4 WORK SPECIFIED ELSEWHERE

1. ELECTRICAL WORK, EXCEPT AS NOTED
B. THE BIDDER SHALL SUBMIT WITH HIS PROPOSAL A COMPLETE LIST OF ALL SUBCONTRACTORS, TOGETHER WITH EACH ITEM OF EQUIPMENT WHICH HE PROPOSES TO INSTALL. AFTER A CONTRACTOR HAS BEEN SELECTED, A LIST OF SUBCONTRACTORS AND EQUIPMENT WILL BE APPROVED BY THE ARCHITECT AND THE OWNER AND NO SUBSTITUTIONS WILL BE ALLOWED.

1.5 GENERAL REQUIREMENTS

A. BIDS SHALL BE SUBMITTED STRICTLY IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. SHOULD THE BIDDER CONSIDER SUBSTITUTIONS ADVANTAGEOUS TO THE OWNER'S INTEREST, THE PROPOSED SUBSTITUTIONS SHALL BE INCLUDED IN AN ALTERNATE TO THE BASE BID AND THE PRICE DIFFERENCE INDICATED FOR EACH SEPARATE LINE ITEM.

1. ANY SUBSTITUTIONS CHANGING THE DESIGN CONCEPTS SHALL INCLUDE COSTS OF CHANGES REQUIRED IN ELECTRICAL WORK, STRUCTURAL WORK, ARCHITECTURAL WORK AND COMPENSATION FOR ENGINEERING AND ARCHITECTURAL REDESIGN TIME.

1.6 SITE INSPECTION

A. BEFORE SUBMITTING BIDS, EACH BIDDER SHALL FAMILIARIZE HIMSELF/HERSELF WITH THE CONDITIONS AT THE SITE UNDER WHICH HE WILL BE REQUIRED TO OPERATE IN PERFORMING HIS/HER PART OF THE CONTRACT. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY TO THE CONTRACTOR FOR ANY ERROR THROUGH NEGLIGENCE IN OBSERVING THE SITE CONDITIONS.

1.7 ORDINANCES, REGULATIONS AND CODES

A. INSTALLATION SHALL COMPLY WITH ALL OF THE LATEST APPLICABLE ORDINANCES, REGULATIONS AND CODES OF ANY GOVERNMENTAL AGENCY HAVING JURISDICTION, INCLUDING THE STATE FIRE MARSHALL, DIVISION OF INDUSTRIAL SAFETY, OSHA, NATIONAL AND CALIFORNIA ELECTRIC CODE, THE GOVERNING PLUMBING AND MECHANICAL CODES AND CEC TITLES 8 AND 24.

B. NOTHING IN THESE DRAWINGS AND SPECIFICATIONS IS TO BE CONSIDERED TO PERMIT WORK IN VIOLATION THEREOF. LOCAL CODES ARE TO BE CONSTRUED AS MINIMUM REQUIREMENTS.

C. NO EXTRAS WILL BE PAID FOR FURNISHING ITEMS REQUIRED BY THE LOCAL CODES BUT NOT SPECIFIED OR SHOWN ON DRAWINGS.

D. RULING AND INTERPRETATIONS OF THE ENFORCING AGENCIES SHALL BE CONSIDERED AS PART OF THE CODES.

E. THE RESPONSIBILITY OF THE ENGINEER TO CONDUCT CONSTRUCTION REVIEWS OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES IN, ON OR NEAR THE CONSTRUCTION SITE.

F. ALL VENTILATING, REFRIGERATION AND ELECTRICAL EQUIPMENT AND APPLIANCES ARE REQUIRED TO BE APPROVED BY UL OR OTHER NATIONALLY RECOGNIZED TESTING AGENCY AND INSTALLED PER THE TESTING AGENCY'S SPECIFICATIONS.

1.8 PERMITS, FEES AND INSPECTIONS

A. OBTAIN AND PAY FOR ALL NECESSARY PERMITS, FEES, ASSESSMENTS AND COMPLEMENTARY DRAWINGS REQUIRED BY AND LEGALLY CONSTITUTED PUBLIC AUTHORITIES HAVING JURISDICTION. ARRANGE AND PAY FOR ANY REQUIRED INSPECTIONS AND/OR EXAMINATIONS. DELIVER CERTIFICATES OF SUCH INSPECTION TO THE ENGINEER. THE OWNER WILL PAY FOR THE PLAN CHECK FEE.

1.9 DRAWINGS AND SPECIFICATIONS

A. THE ENGINEER;S DECISION WILL BE FINAL ON INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

B. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY. AND WORK CALLED FOR ON THE DRAWINGS AND NOT MENTIONED IN THE SPECIFICATION OR VICE VERSA, SHALL BE PERFORMED AS THOUGH FULLY SET FORTH ON BOTH.

C. SHOULD THERE APPEAR AN ERROR OR DISCREPANCY IN OR BETWEEN THE DRAWINGS AND SPECIFICATIONS, THE CONTRACTOR SHALL REFER THE MATTER TO THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. SHOULD THE CONTRACTOR PROCEED WITH THE WORK WITHOUT SO REFERRING THE MATTER, HE/SHE DOES SO ON HIS/HER OWN RESPONSIBILITY AND AT HIS/HER OWN EXPENSE.

1.10 SUBMITTALS

A. BEFORE STARTING WORK, SUBMIT DIMENSIONED SHOP DRAWINGS AND ITEMIZED PRODUCT AND EQUIPMENT DATA, COMPLETE IN ALL DETAILS. ALL ITEMS SHALL BE SUBMITTED AT THE SAME TIME.

B. COPIES RETURNED TO THE CONTRACTOR WILL MARKED "NO EXCEPTIONS TAKEN" OR WILL CALL FOR RESUBMITTAL. THE CONTRACTOR SHALL MAKE ALL CORRECTIONS NOTED, RESUBMIT IF INDICATED AND SHALL SECURE THE ARCHITECT'S APPROVAL BEFORE COMMENCING THE WORK INVOLVED.

C. SUBMITTALS SHALL INCLUDE BUT NOT NECESSARILY BE LIMITED TO THE FOLLOWING:

1. AIR INLETS AND OUTLETS
2. DUCTWORK, INSULATION AND ACCESSORIES.
3. DUCT LAYOUT SHOP DRAWING, INCLUDING DUCT SIZES, DUCT ELEVATIONS, COORDINATION

D. IN THE EVENT THAT THE CONTRACTOR INSTALLS EQUIPMENT OR MATERIALS IN A MANNER NOT ACCEPTABLE TO THE ARCHITECT WITHOUT HAVING FIRST SUBMITTED SHOP DRAWINGS AND EQUIPMENT FOR APPROVAL, ANY CHANGES WHICH ARE REQUIRED SHALL BE MADE AT THE CONTRACTOR'S EXPENSE.

1.11 RECORD DRAWINGS

A. RECORD SET DURING THE WORK: AT SITE, MAINTAIN AT LEAST ONE SET OF DRAWINGS AS A FIELD RECORD SET. ALSO MAINTAIN AT LEAST ONE COPY OF ALL ADDENDA, MODIFICATIONS, APPROVED SUBMITTALS, CORRESPONDENCE AND TRANSMITTALS AT SITE. KEEP DRAWINGS AND DATA IN GOOD ORDER AND READILY AVAILABLE TO ARCHITECT, OWNER AND THEIR REPRESENTATIVES. CLEARLY AND CORRECTLY MARK RECORD DRAWINGS TO SHOW ALL CHANGES MADE DURING THE CONSTRUCTION PROCESS AT THE TIME THE CHANGED WORK WAS INSTALLED. PRIOR TO ENGINEER'S INSPECTION FOR SUBSTANTIAL COMPLETION, SUBMIT BOTH THE FIELD RECORDS SET AND FINAL REPORT DRAWINGS TO THE ENGINEER FOR REVIEW, AND MAKE SUCH REVISIONS AS MAY BE NECESSARY FOR FINAL RECORD DRAWING TO BE TRUE, COMPLETE AND ACCURATE RECORD OF WORK AS APPROVED BY THE ENGINEER. THE CHANGES WILL BE INCORPORATED BY THE ENGINEER INTO THE ORIGINAL DOCUMENTS AND FORWARDED TO THE OWNER IN AN AUTOCAD FORMAT OF THEIR CHOOSING,

1.12 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. EXCEPT AS OTHERWISE SPECIFIED, ALL EQUIPMENT AND MATERIALS USED IN THE INSTALLATION SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED. ALL ARTICLES PROVIDED FOR THE SAME GENERAL PURPOSE OR USE SHALL BE OF THE SAME MAKE. WORKMANSHIP SHALL BE OF THE BEST QUALITY AND NONE BUT COMPETENT MECHANICS SKILLED IN THEIR TRADES SHALL BE EMPLOYED. CONTRACTOR SHALL FURNISH THE SERVICES OF AN EXPERIENCED MECHANICAL SUPERINTENDENT WHO SHALL BE CONSTANTLY IN CHARGE OF THE WORK, TOGETHER WITH ALL NECESSARY JOURNEYMEN, HELPERS AND LABORERS REQUIRED.

1.13 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. IMMEDIATELY AFTER AWARD OF THE CONTRACT AND APPROVAL OF SUBITTALS BY THE ENGINEER, THE CONTRACTOR SHALL ARRANGE FOR THE PURCHASE AND DELIVERY OF ALL EQUIPMENT AND MATERIALS REQUIRED, IN AMPLE QUANTITIES AND AT THE PROPER TIME, HE/SHE SHALL DELIVER TO THE ARCHITECT A COMPLETE LIST OF EQUIPMENT AND MATERIALS ORDERED GIVING DESCRIPTIONS, PLATE NUMBERS, BROCHURES, NAME OF THE WHOLESALERS, DATE OF THE ORDERS AND APPROXIMATE DELIVERY DATES.

1.14 LOCATIONS AND ACCESSIBILITY

A. INSTALL EQUIPMENT TO BE READILY ACCESSIBLE FOR MAINTENANCE AND REPAIRS. INSTALL PIPING, DUCTS AND CONDUIT IN SUCH A MANNER AS TO PRESERVE HEADROOM, AVOID OBSTRUCTIONS AND KEEP OPENINGS AND PASSAGEWAYS CLEAR.

B. IF CHANGES IN THE INDICATED LOCATIONS OR ARRANGEMENTS ARE REQUIRED, THEY SHALL BE MADE BY THE CONTRACTOR WITHOUT ADDITIONAL CHARGES, PROVIDED THAT THE CHANGE IS ORDERED BEFORE THE WORK IS INSTALLED AND NO EXTRA LABOR OR MATERIALS ARE REQUIRED. CONTRACTOR SHALL SUBMIT AN ESTIMATE OF THE COST OR CREDIT FOR REQUIRED CHANGES AND SHALL PROCEED WITH WORK ONLY UPON THE WRITTEN AUTHORITY OF THE ARCHITECT.

1.15 COOPERATION WITH OTHER TRADES

A. CONTRACTOR SHALL COOPERATE WITH OTHER TRADES IN THE INTEREST OF OBTAINING THE MOST PRACTICAL OVERALL ARRANGEMENT OF EQUIPMENT, PIPING, CONDUIT, AND DUCTS, AND MAINTAIN MAXIMUM HEADROOM AND ACCESSIBILITY.

B. NO EXTRAS WILL BE ALLOWED FOR CHANGES MADE NECESSARY BY INTERFERENCE WITH WORK OF OTHER TRADES, UNLESS APPROVED AHEAD OF TIME. AREAS OF LIMITED CLEARANCES SHALL BE LAID OUT TO 3/4" = 1'-0" SCALE WITH ALL DUCTS, PIPES, CONDUITS, BEAMS, ETC. SHOWN AND SHALL BE SIGNED BY THE GENERAL CONTRACTOR'S SUPERINTENDENT ON THE JOB.

1.16 PROTECTION OF EQUIPMENT AND MATERIALS

A. PROVIDE ADEQUATE STORAGE FACILITIES FOR ALL EQUIPMENT AND MATERIALS ON SITE AND MAKE PROVISIONS TO PROTECT SUCH MATERIALS AND EQUIPMENT FROM DAMAGE.

1.17 CLOSING-IN UNINSPECTED WORK

A. CONTRACTOR SHALL NOT ALLOW OR CAUSE ANY WORK TO BE COVERED UP OR ENCLOSED UNTIL IT HAS OPERATED FOR THE OWNER'S BENEFICIAL USE PREVIOUS TO THE FINAL COMPLETION AND ACCEPTANCE BEEN INSPECTED, TESTED AND APPROVED BY THE ENGINEER AND LOCAL INSPECTOR. SHOULD ANY OF HIS/HER WORK BE COVERED UP OR ENCLOSED BEFORE SUCH INSPECTION AND TEST, HE/SHE SHALL AT HIS/HER OWN EXPENSE, UNCOVER WORK AND AFTER IT HAS BEEN INSPECTED, TESTED AND APPROVED, MAKE ALL REPAIRS WITH SUCH MATERIALS AS MAY BE NECESSARY TO RESTORE ALL HIS/HER WORK AND THAT OF OTHER TRADES TO ITS ORIGINAL AND PROPER CONDITION.

1.18 OPENINGS

A. FURNISH INFORMATION TO THE OTHER TRADES ON SIZE AND LOCATION OF OPENINGS WHICH ARE REQUIRED IN WALLS, SLABS, ETC. FOR PIPING, DUCTS AND EQUIPMENT AT THE PROPER TIME. ANY ADDITIONAL OPENINGS OR CHANGES TO EXISTING ONES SHALL BE PROVIDED AS DIRECTED BY THE ARCHITECT.

1.19 EQUIPMENT LABELS

A. EQUIPMENT PROVIDED UNDER THIS SECTION SHALL BE PROVIDED WITH THE MANUFACTURER'S METAL IDENTIFICATION LABELS ATTACHED TO EACH INDIVIDUAL PIECE OF EQUIPMENT SHOWING COMPLETE PERFORMANCE CHARACTERISTICS, SIZE, MODEL AND SERIAL NUMBERS.

1.20 PRELIMINARY OPERATION

A. SHOULD THE OWNER DEMAND THAT ANY POTIONS OF THE PLANT, APPARATUS OR EQUIPMENT BE OPERATED FOR THE OWNERS BENEFICIAL USE PREVIOUS TO THE FINAL COMPLETION AND ACCEPTANCE OF THE WORK, THE CONTRACTOR SHALL CONSENT. SUCH OPERATIONS SHALL BE UNDER THE SUPERVISION AND DIRECTION OF THE CONTRACTOR BUT ALL THE EXPENSE THEREOF WILL BE PAID BY THE OWNER, SEPARATE AND DISTINCT FROM ANY MONEY PAID ON ACCOUNT OF THE CONTRACT. SUCH PRELIMINARY OPERATION OR PAYMENT SHALL NOT BE CONSTRUED AS AN ACCEPTANCE OF ANY OF THE WORK OF THIS CONTRACT.

1.21 ELECTRICAL WORK

A. FURNISH ALL CONTROLS, SUPPLY INSTRUCTIONS TO THE ELECTRICAL CONTRACTOR FOR MAKING THE LINE AND LOW VOLTAGE ELECTRICAL CONNECTIONS, AND BE RESPONSIBLE FOR THE OPERATION OF THE EQUIPMENT FURNISHED UNDER THIS SECTION OF THE WORK.

B. MECHANICAL SUBCONTRACTOR SHALL FURNISH LOW VOLTAGE CONDUIT AND WIRING.

PART 2: PRODUCTS

1.0 SHEET METAL WORK

A. GALVANIZED STEEL DUCT, GAUGES AND CONSTRUCTION SHALL BE ACCORDANCE WITH SMACNA STANDARDS.

B. STRAP HANGER SHALL BE A MINIMUM OF 1", #18 GAUGE GALVANIZED STEEL ATTACHED TO THE BOTTOM OF DUCTS AT 8'-0" O.C. AND AS REQUIRED BY CMC AND SMACNA GUIDELINES.

C. ELBOWS SHALL HAVE AN INSIDE RADIUS EQUAL TO 1/2 DUCT WIDTH, SQUARE THROAT ELBOWS SHALL HAVE TURNING VANES, BEADED AT THE EDGES AND SECURELY RIVETED TO THE CHEEKS OF THE ELL TO PREVENT RATTLING. VANE SPACING SHALL BE 4" OR LESS, BASED UPON THE DUCT DIMENSION.

D. PROVIDE DUCTMATE AND DUCTMATE, JR., WITH ALL REQUIRED MATERIAL INCLUDING METAL CLEATS, CORNER BOLTS AND NUTS, ANGLES, CLIPS AND GASKETS, ALL INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND SUPERVISION.

E. TAPE THE CLIPS, SNAPLOCK SEAMS AND JOINTS OR CONNECTIONS OF THE METAL SUPPLY, RETURN AND EXHAUST DUCTS, AND THE GRILLE AND DIFFUSER CONNECTIONS WITH 4" WIDE STRIPS WITH POLYMERICS DP 1020 WATER BASE SEALANT.

F. QUADRANT VOLUME DAMPER BLADES IN FITTINGS SHALL BE TWO GAUGES HEAVIER THAN THE FITTINGS.

G. INSTALL HEAVY OPPOSED BLADE QUADRANT VOLUME DAMPERS AT ALL MAIN SUPPLY, RETURN AND EXHAUST DUCT BRANCH CONNECTIONS OR AS INDICATED ON THE DRAWINGS. HEAVY VOLUME DAMPERS SHALL BE POTTORFF SERIES CD 42 WITH PRE MOUNTED QUADRANT, OR APPROVED EQUAL.

H. DUCT HANGERS SHALL BE ATTACHED TO HORIZONTAL SLABS WITH STEEL ANGLE CLIPS SECURED WITH INSERTS, STRAPPED TO VERTICAL WALLS, BOLTED TO BEAMS AND JOISTS, AS PER SMACNA GUIDELINE, OR AS APPROVED BY THE ARCHITECT.

I. ROUND DUCTS SHALL BE CONTINUOUS SPIRAL SEAM PIPE TYPE WITH FACTORY SLIP FITTINGS AND COUPLINGS, SECURED WITH SHEET METAL SCREWS OR DRIVE RIVETS. GAGE OF ROUND DUCTS PER CMC.

J. FLEXIBLE DUCTS; GLASSFLES, GLEN-FLEX, OR CASCO, SHALL CONSISTS OF AN EXTERIOR REINFORCED LAMINATED VAPOR BARRIER. 1-1/2" INCH THICK FIBERGLASS INSULATION (K=.25 @ 75°F), ENCAPSULATED SPRING STEEL WIRE HELIX AND IMPERVIOUS, SMOOTH NON-PERFORATED INTERIOR VINYL LINER. INDIVIDUAL LENGTHS OF FLEXIBLE DUCTS SHALL CONTAIN FACTORY FABRICATED STEEL CONNECTION COLLARS. FLEXIBLE FIBERGLASS DUCT SHALL MEET THE REQUIREMENTS OF NFPA NO 90A/90B AND UL 181.

1.1 INSULATION

A. DUCT INSULATION SHALL BE 2" THICK FLEXIBLE FIBERGLASS INSULATION, ASTM C612, WITH ASTM C921 TYPE 1 VAPOR BARRIER JACKET. OWENS-CORNING FIBERGLASS ALL SERVICE WRAP INSULATION, TYPE 75 OR EQUIVALENT.

B. FLAME/SMOKE RATINGS: PROVIDE COMPOSITE MECHANICAL INSULATION (INSULATION, JACKETS, COVERINGS, SEALERS, MASTICS AND ADHESIVES) WITH FLAME SPREAD INDEX OF 25 OR LESS, AND SMOKE DEVELOPED INDEX OF 50 OR LESS, IN ACCORDANCE WITH UBC STANDARD NO. 42-1.

C. PIPING INSULATION MATERIALS: INSULATE HOT AND CHILLED WATER PIPES WITH FIBERGLASS (MINERAL FIBER) PIPING INSULATION, ASTM C547, CLASS 1 UNLESS OTHERWISE INDICATED. MANVILLE PRODUCTS CORP. MICRO LOK, OWENS-CORNING FIBERGLASS CORP., ASJ/SL-II OR EQUIVALENT. (1/2 INCH THICK INSULATION FOR STEAM SUPPLY AND CONDENSATE RETURN PIPE).

1. JACKETS FOR PIPING INSULATION: ASTM C921, TYPE 1 (VAPOR BARRIER) FOR PIPING WITH TEMPERATURES BELOW AMBIENT. TYPE I MAY BE USED FOR ALL PIPING AT INSTALLERS OPTION.

2. ENCASE PIPE FITTING INSULATION WITH ONE-PIECE PREMOLDED PVC FITTING COVERS, FASTENED PER MANUFACTURER'S RECOMMENDATIONS. ZESTON PVC INSULATED FITTING COVERS OR EQUIVALENT.

3. ENCASE EXTERIOR PIPING INSULATION WITH ALUMINUM JACKET WITH WEATHER PROOF CONSTRUCTION, UNJACKETED FIBERGLASS INSULATION MEETING ASTM C547 CLASS I, MAY BE USED AT CONTRACTOR'S OPTION.

4. INSTALL SADDLES OR SHIELDS UNDER PIPE HANGERS. PROVIDE HIGH DENSITY INSULATION OF THE SAME THICKNESS WHERE SADDLES OR PROTECTION SHIELDS ARE LOCATED.

1.2 PIPE SLEEVES AND PLATES

A. FOR SLEEVES INSTALLED IN FIRE RATED WALLS AND FLOORS, THE SPACE SHALL BE FIRE STOPPED WITH A UL APPROVED SYSTEM. ALL PIPES PASSING THROUGH FINISHED CEILING OR WALL SHALL BE PROVIDED WITH CHROME PLATED BRASS SPLIT FLANGES AND SET SCREWS.

1.3 HYDRONIC SPECIALTIES

A. NOT USED.

1.4 GRILLES AND DIFFUSERS

A. CEILING DIFFUSER SHALL BE TITUS MCD OR EQUAL. PROVIDE FILLER PANEL WHEN INSTALLED IN T-BAR CEILING AND FRAME TYPE 1 FOR SURFACE MOUNT. PANEL TYPE TO MATCH CEILING CONSTRUCTION.

B. CEILING RETURN AND EXHAUST AIR GRILLES SHALL BE TITUS 50FF OR EQUAL. PROVIDE FILLER PANEL WITH INSTALLED IN T-BAR CEILING, PANEL TYPE TO MATCH CEILING CONSTRUCTION.

C. CEILING DIFFUSERS AND GRILLES SHALL BE POWDER COATED FINISH.

1.5 DAMPERS

A. MANUFACTURED BY RUSKIN, POTTORFF OR ENGINEER'S APPROVED EQUAL. FIRE DAMPERS SHALL BE INSTALLED IN ALL DUCTS WHERE THEY PENETRATE A FIRE-RATED WALL.

B. PROVIDE A VOLUME CONTROL DAMPER FOR EACH GRILLE AND DIFFUSER AND IN ALL OTHER LOCATIONS NECESSARY TO PROPERLY BALANCE THE SYSTEM.

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04 / KEY PLAN

N ↑

05 / PROJECT NAME / ADDRESS

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06 / REVISIONS

NO.	DATE	DESCRIPTION

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SPECIFICATIONS

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M102

C. QUADRANTS ON INSULATED DUCTS SHALL BE MOUNTED ON SHEET METAL BRACKETS, SET FLUSH WITH THE INSULATION.

D. COMBINATION FIRE/SMOKE DAMPER – REFER TO DETAIL. 2.10 CONTROLS TESTING AND BALANCING PART 1 – GENERAL

1.6 HANGERS AND SUPPORTS

A. HOLD PIPING IN PLACE BY APPROVED HANGERS, SUPPORTS AND ANCHORS DESIGNED TO SUPPORT WEIGHT OF PIPE, INSULATION AND CONTENTS. ARRANGE HANGERS TO PREVENT TRANSMISSION OF VIBRATION FROM PIPING TO BUILDING STRUCTURE AND ALLOW FOR EXPANSION AND CONTRACTION IN HANGERS AND SUPPORTS. CLEARANCES FOR APPLICATION OF SPECIFIED INSULATION WITHOUT CUTTING PIPELINE COVERING OR FITTING COVERING IN INSTALLATION OF PIPE HANGERS AND FITTINGS SHALL BE PROVIDED. UNINSULATED COPPER OR BRASS PIPE OR TUBING SHALL BE ISOLATED FROM FERROUS HANGERS OR SUPPORTS AS INDICATED HEREIN. WHERE CONCEALED PIPING MAY BE SUPPORTED FROM STRUCTURAL FLOOR, FURNISH AND INSTALL ANGLE MEMBERS TO SPAN JOISTS OR DISTRIBUTE LOAD IF ADDITIONAL MEMBERS ARE REQUIRED. ALL HANGERS, PIPE SUPPORTS, ETC., THAT ARE EXPOSED TO THE WEATHER SHALL BE MADE OF GALVANIZED STEEL. THIS SECTION DOES NOT APPLY TO FIRE PROTECTION SYSTEMS.

1.7 CONTROLS

A. PROVIDE COMPLETE TEMPERATURE CONTROL AND DDC CONTROL SYSTEM SHALL BE INSTALLED BY TRAINED MECHANICS REGULARLY EMPLOYED FOR THIS PURPOSE BY THE CONTROL INSTRUMENT MANUFACTURER. THE ENTIRE INSTALLATION, INCLUDING SUCH RELATED WORK WHICH MAY BE UNDER THE SCOPE OF OTHER SECTIONS, SHALL BE UNDER THE DIRECT SUPERVISION OF THE TEMPERATURE CONTROL MANUFACTURER.

B. ALL CONTROL WIRING SHALL BE INSTALLED IN CONDUITS. CONTROL WIRING & CONDUIT SHALL BE BY MECHANICAL CONTRACTOR.

TESTING AND BALANCING

PART 3 – EXECUTION
3.1 DESCRIPTION

A. THIS SECTION COVERS TESTING AND BALANCING MECHANICAL AIR SYSTEMS BY AN AIR BALANCE AGENCY (HEREAFTER REFERRED TO AS THE AGENCY IN THIS SECTION) DIRECTLY EMPLOYED BY THE GENERAL CONTRACTOR.

B. WORK IN THIS SECTION: PRINCIPAL ITEMS INCLUDE:

1. COORDINATE THE WORK IN THIS SECTION WITH RELATED TRADES.

2. PERFORM AIR PRE–READING TO ALL AIR INLETS AND OUTLETS IN AREA OF WORK. RESULT OF AIR PRE–READING SHALL BE SUBMITTED TO THE ARCHITECT IN A TABULATED REPORT FORM.

3. BALANCE ALL VAV BOXES AND AIR INLETS AND OUTLETS IN THE AREA OF WORK INCLUDING OUTLETS AND INLETS OUTSIDE AREA OF WORK BUT SERVED BY THE MIXING BOXES.

4. FURNISH A TYPEWRITTEN REPORT TO THE ARCHITECT.

5. ACCEPTABLE TESTING AND BALANCING AGENCY: MATRIX AIR BALANCE, INC. OR KAISER APPROVED BALANCING AGENCY.

3.2 QUALITY ASSURANCE

A. QUALIFICATIONS OF AGENCY: TOTAL SYSTEMS AIR BALANCE SHALL BE PERFORMED BY AN INDEPENDENT AGENCY CERTIFIED BY THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), WHICH SPECIALIZES IN AND WHOSE BUSINESS IS DEDICATED TO THE TESTING, ADJUSTING, AND VERIFICATION OF HVAC SYSTEM PERFORMANCE. WORK OF THIS SECTION SHALL CONFORM TO AABC SPECIFICATIONS. REFERRED TO IN CHAPTERS 17 THROUGH 26 OF THE AABC NATIONAL STANDARDS OR APPROVED EQUIVALENT AND OTHER CRITERIA SET FORTH IN THIS SECTION.

B. INFORMATION FURNISHED TO AGENCY: AGENCY SHALL BE FURNISHED WITH FOLLOWING INFORMATION AND DATA:

1. PRELIMINARY: WITHIN 14 DAYS AFTER SELECTION AND APPROVAL:

A. DRAWINGS OF THE WORK.

B. SPECIFICATION COVERING ALL WORK TO BE TESTED AND BALANCED.

C. WRITTEN CONSENT.

3.3 SUBMITTALS

A. CONFORM TO REQUIREMENTS HEREIN.

B. PRELIMINARY SUBMITTALS: WITHIN 30 DAYS AFTER RECEIPT OF ABOVE PRELIMINARY INFORMATION AND DATA, THE AGENCY SHALL SUBMIT THE FOLLOWING THROUGH THE GENERAL CONTRACTOR:

1. AGENDA: SUBMIT 3 SETS OF COMPLETE AGENDA INCLUDING DRAWINGS OF THE ENTIRE HVAC SYSTEM TO BE BALANCED.

2. PRE CONSTRUCTION PLAN CHECK AND CONSTRUCTION REVIEW REPORTS: SUBMIT 3 SETS AS DEFINED IN AABC NATIONAL STANDARDS, LATEST EDITION (CHAPTER 25) INCLUDING REPORTS:

A. DEMONSTRATING COMPLETE UNDERSTANDING OF THE DESIGN INTENT BY THE TEST AND BALANCE AGENCY.

B. IDENTIFYING POTENTIAL PROBLEMS IN PERFORMING TESTING AND BALANCING WORK.

C. GUARANTEE: SUBMIT 3 SETS OF AABC NATIONAL PROJECT PERFORMANCE GUARANTY.

D. CERTIFICATIONS: SUBMIT THE CERTIFICATES FROM MECHANICAL SUBCONTRACTOR AS SPECIFIED HEREINAFTER. REPORTS, TEST REPORTS, AND INFORMATION: SUBMIT AS SPECIFIED HEREINAFTER.

TEST AND BALANCING

PART 3 – EXECUTION

3.1 REQUIRED TESTING AND BALANCING SERVICES: CHAPTERS REFERRED TO BELOW ARE DETAILED IN THE "NATIONAL STANDARDS MANUAL OF ASSOCIATED AIR BALANCE COUNCIL" INCLUDING, BUT NOT LIMITED TO, THOSE MENTIONED HEREIN.

A. PRE CONSTRUCTION SERVICES INCLUDE:

1. PRELIMINARY PLAN REVIEW AND REPORT – CHAPTER 26.

B. PERFORMANCE TESTING AND BALANCING OF AIR CONDITIONING SYSTEMS INCLUDE:

1. SUPPLY AIR SYSTEMS – GENERAL, CHAPTER 16

2. LOW PRESSURE AIR SYSTEMS – CHAPTER 17.

3. RETURN AND EXHAUST AIR SYSTEMS – CHAPTER 19.

3.2 WORK BY DIVISION 15

A. PREPARATION: BEFORE ANY TESTING OR BALANCING OPERATIONS ARE STARTED, DIVISION 15 SHALL CHECK DAMPER OPERATION TO INSURE FREE OPERATION AND ACTIVATION BY CORRECT BALANCING, IS OPERATIONAL AND COMPLETE.

B. CERTIFICATION: DIVISION 15 SHALL CERTIFY IN WRITING THAT THE SYSTEM HAD BEEN PRELIMINARY TESTED AND READY FOR FINAL TESTING BY THE TEST AND BALANCING AGENCY.

3.3 REPORTS:

A. SUBMIT ALL DATA REPORTS IN TYPEWRITTEN FORM.

3.4 FINAL DRAWINGS:

A. THE AGENCY SHALL PREPARE A COMPLETE SET OF FULL SCALE DRAWINGS SHOWING ACTUAL DUCT RUNS AND OUTLET/INLET LOCATIONS. DRAWINGS SHALL BE KEYED TO AND SUBMITTED WITH AIR BALANCE REPORT; THE CONTRACT MECHANICAL DRAWINGS ARE NOT ACCEPTABLE FOR THIS PURPOSE.

END OF SECTION

ALLOWABLE QUANTITY OF REFRIGERANT CALCULATIONS

REFRIGERANT R-410A, ALLOWABLE REFIGERANT PER CMC TABLE 1102.2 26 LBS/1000C.FT

SYSTEM	REGRIGERANT IN SYSTEM (LBS)	FAN COIL	ROOMS SERVED	AREA SERVED (SQ.FT)	CEILING HEIGHT (FT)	ROOM VOLUME (C.FT)	ALLOWABLE REFRIGERANT IN ROOM (LBS)	ALLOWABLE REFIGERANT IS HIGHER THAN REFIGERANT IN SYSTEM
CU 1-1	19.01	FC 1-1	PRIMARY BED 102	371	10	3710	96.46	YES
		FC 1-2	BATH 1 105	152	10	1520	39.52	YES
		FC 1-2	WALK-IN CLOSET 104	142	10	1420	36.92	YES
		FC 1-2	LOUNGE 105	137	10	1370	35.62	YES

REFRIGERANT R-410A, ALLOWABLE REFIGERANT PER CMC TABLE 1102.2 26 LBS/1000C.FT

SYSTEM	REGRIGERANT IN SYSTEM (LBS)	FAN COIL	ROOMS SERVED	AREA SERVED (SQ.FT)	CEILING HEIGHT (FT)	ROOM VOLUME (C.FT)	ALLOWABLE REFRIGERANT IN ROOM (LBS)	ALLOWABLE REFIGERANT IS HIGHER THAN REFIGERANT IN SYSTEM
CU 1-2	20.06	FC 1-3	HALL 100	274	10	2740	71.24	YES
		FC 1-3	BATH 2 107 AND GUEST 106	399	10	3990	103.74	YES
		FC 1-4	MECHANICAL /STORAGE	158	10	1580	41.08	YES
		FC 1-4	COFFEE BAR 106 AND HALL 100	308	10	3080	80.08	YES
		FC 1-4	BATH 3 110 AND GUEST BED 109	332	10	3320	86.32	YES

REFRIGERANT R-410A, ALLOWABLE REFIGERANT PER CMC TABLE 1102.2 26 LBS/1000C.FT

SYSTEM	REGRIGERANT IN SYSTEM (LBS)	FAN COIL	ROOMS SERVED	AREA SERVED (SQ.FT)	CEILING HEIGHT (FT)	ROOM VOLUME (C.FT)	ALLOWABLE REFRIGERANT IN ROOM (LBS)	ALLOWABLE REFIGERANT IS HIGHER THAN REFIGERANT IN SYSTEM
CU 2-1	19.8	FC 2-1	LIVING DINING AND KITCHEN	933	10	9330	242.58	YES
		FC 2-2	LIVING DINING AND KITCHEN	933	10	9330	242.58	YES

REFRIGERANT R-410A, ALLOWABLE REFIGERANT PER CMC TABLE 1102.2 26 LBS/1000C.FT

SYSTEM	REGRIGERANT IN SYSTEM (LBS)	FAN COIL	ROOMS SERVED	AREA SERVED (SQ.FT)	CEILING HEIGHT (FT)	ROOM VOLUME (C.FT)	ALLOWABLE REFRIGERANT IN ROOM (LBS)	ALLOWABLE REFIGERANT IS HIGHER THAN REFIGERANT IN SYSTEM
CU-2-2	17.76	FC 2-3	HALL 205 BATH 5 204	145	10	1450	37.7	YES
		AC-9	BATH 4 203 AND GUEST BED 202	332	10	3320	86.32	YES

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NO.	DATE	DESCRIPTION

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SPECIFICATIONS &
CALCULATIONS

08 / SHEET NUMBER

M103

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 1 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

GENERAL INFORMATION					
01	**Project Name**	Torrance Hill House			
02	**Run Title**	Title 24 Analysis			
03	**Project Location**	4501 Via Corona			
04	**City**	Torrance	05	**Standards Version**	2022
06	**Zip code**	90505	07	**Software Version**	EnergyPro 9.2
08	**Climate Zone**	6	09	**Front Orientation (deg/ Cardinal)**	180
10	**Building Type**	Single family	11	**Number of Dwelling Units**	1
12	**Project Scope**	Newly Constructed	13	**Number of Bedrooms**	7
14	**Addition Cond. Floor Area (ft^2)**	0	15	**Number of Stories**	2
16	**Existing Cond. Floor Area (ft^2)**	n/a	17	**Fenestration Average U-factor**	0.3
18	**Total Cond. Floor Area (ft^2)**	3549	19	**Glazing Percentage (%)**	36.94%
20	**ADU Bedroom Count**	n/a	21	**ADU Conditioned Floor Area**	n/a
22	**Fuel Type**	All electric	23	**No Dwelling Unit:**	No

COMPLIANCE RESULTS	
01	**Building Complies with Computer Performance**
02	**This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.**
03	**This building incorporates one or more Special Features shown below**

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 2 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

ENERGY DESIGN RATINGS

	Energy Design Ratings			Compliance Margins		
	Source Energy (EDR1)	**Efficiency[1] EDR (EDR2efficiency)**	**Total[2] EDR (EDR2total)**	**Source Energy (EDR1)**	**Efficiency[1] EDR (EDR2efficiency)**	**Total[2] EDR (EDR2total)**
Standard Design	34.6	47.1	32.7			
Proposed Design	27.7	44.6	19.5	6.9	2.5	13.2

RESULT[3]: PASS

[1]Efficiency EDR includes improvements like a better building envelope and more efficient equipment
[2]Total EDR includes efficiency and demand response measures such as photovoltaic (PV) system and batteries
[3]Building complies when source energy, efficiency and total compliance margins are greater than or equal to zero and unmet load hour limits are not exceeded

- Standard Design PV Capacity: 3.69 kWdc
- Proposed PV system downsized to 5.47 kWdc (a factor of 0.547) due to cap of 1 x proposed design electricity use

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 3 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

ENERGY USE SUMMARY

Energy Use	Standard Design Source Energy (EDR1) (kBtu/ft^2 -yr)	Standard Design TDV Energy (EDR2) (kTDV/ft^2 -yr)	Proposed Design Source Energy (EDR1) (kBtu/ft^2 -yr)	Proposed Design TDV Energy (EDR2) (kTDV/ft^2 -yr)	Compliance Margin (EDR1)	Compliance Margin (EDR2)
Space Heating	1.44	6.56	0.95	6.78	0.49	-0.22
Space Cooling	0.17	7.1	0.13	6.32	0.04	0.78
IAQ Ventilation	0.36	3.78	0.36	3.78	0	0
Water Heating	0.91	9.87	0.79	8.97	0.12	0.9
Self Utilization/Flexibility Credit				0		0
Efficiency Compliance Total	**2.88**	**27.31**	**2.23**	**25.85**	**0.65**	**1.46**
Photovoltaics	-1.18	-32.8	-1.82	-50.02		
Battery			0	0		
Flexibility						
Indoor Lighting	0.64	6.4	0.64	6.4		
Appl. & Cooking	1.38	16.99	1.37	16.9		
Plug Loads	2.59	27.09	2.59	27.09		
Outdoor Lighting	0.18	1.68	0.18	1.68		
TOTAL COMPLIANCE	**6.49**	**46.67**	**5.19**	**27.9**		

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 4 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

ENERGY USE INTENSITY

	Standard Design (kBtu/ft^2 - yr)	Proposed Design (kBtu/ft^2 - yr)	Compliance Margin (kBtu/ft^2 - yr)	Margin Percentage
Gross EUI[1]	10.08	9.29	0.79	7.84
Net EUI[2]	4.09	0	4.09	100

Notes
1. Gross EUI is Energy Use Total (not including PV) / Total Building Area.
2. Net EUI is Energy Use Total (including PV) / Total Building Area.

REQUIRED PV SYSTEMS

01	02	03	04	05	06	07	08	09	10	11	12
DC System Size (kWdc)	**Exception**	**Module Type**	**Array Type**	**Power Electronics**	**CFI**	**Azimuth (deg)**	**Tilt Input**	**Array Angle (deg)**	**Tilt: (x in 12)**	**Inverter Eff. (%)**	**Annual Solar Access (%)**
5.47	NA	Standard (14-17%)	Fixed	none	false	180	Degrees	22	4.85	96	100

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- Ducts with high level of insulation
- Cool roof
- Non-standard duct location (any location other than attic)

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TITLE-24

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M104

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

- Indoor air quality ventilation
- Kitchen range hood
- Minimum Airflow
- Verified SEER/SEER2
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM
- Verified HSPF2
- Verified heat pump rated heating capacity
- Duct leakage testing
- Ducts located entirely in conditioned space confirmed by duct leakage testing

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (ft^2)	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
Torrance Hill House	3549	1	7	7	0	1

ZONE INFORMATION

01	02	03	04	05	06	07
Zone Name	Zone Type	HVAC System Name	Zone Floor Area (ft^2)	Avg. Ceiling Height	Water Heating System 1	Status
Pimrary Bed	Conditioned	CU1-11	475	9	DHW Sys 1	New
Lounge 103 Walk In Closet	Conditioned	CU1-11	467	9	DHW Sys 1	New
Guest Bedroom 106 Bath 10	Conditioned	CU1-22	673	9	DHW Sys 1	New
Guest Bedroom 109 Bath 3	Conditioned	CU1-22	524	9	DHW Sys 1	New
Living Room Dining and Ki	Conditioned	CU2-13	371	8	DHW Sys 1	New

ZONE INFORMATION

01	02	03	04	05	06	07
Zone Name	Zone Type	HVAC System Name	Zone Floor Area (ft^2)	Avg. Ceiling Height	Water Heating System 1	Status
Dining and Kitchen	Conditioned	CU2-13	562	8	DHW Sys 1	New
Guest Bed 202 Bath 5 204	Conditioned	CU2-24	477	8	DHW Sys 1	New

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
N WALL	Pimrary Bed	R-21 Wall	0	Back	210	118	90
W WALL	Pimrary Bed	R-21 Wall	270	Left	230	20	90
E WALL	Lounge 103 Walk In Closet	R-21 Wall	90	Right	50	0	90
S WALL	Lounge 103 Walk In Closet	R-21 Wall	180	Front	120	0	90
S WALL 2	Lounge 103 Walk In Closet	R-21 Wall	180	Front	70	0	90
W WALL 2	Lounge 103 Walk In Closet	R-21 Wall	90	Right	240	0	90
N WALL 2	Guest Bedroom 106 Bath 10	R-21 Wall	0	Back	250	98	90
E WALL 2	Guest Bedroom 106 Bath 10	R-21 Wall	90	Right	153	47	90
N WALL 3	Guest Bedroom 106 Bath 10	R-21 Wall	0	Back	70	44	90
S WALL 3	Guest Bedroom 106 Bath 10	R-21 Wall	180	Front	161	159	90
SE WALL	Guest Bedroom 109 Bath 3	R-21 Wall	135	n/a	190	12	90

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
E WALL 3	Guest Bedroom 109 Bath 3	R-21 Wall	90	Right	100	47	90
SE WALL 2	Guest Bedroom 109 Bath 3	R-21 Wall	135	n/a	60	12	90
W WALL 3	Guest Bedroom 109 Bath 3	R-21 Wall	270	Left	40	0	90
E WALL 4	Guest Bedroom 109 Bath 3	R-21 Wall	90	Right	70	0	90
N WALL 4	Living Room Dining and Ki	R-21 Wall	0	Back	273	123	90
W WALL 4	Living Room Dining and Ki	R-21 Wall	270	Left	234	63	90
N WALL 5	Dining and Kitchen	R-21 Wall	0	Back	416	208	90
E WALL 5	Dining and Kitchen	R-21 Wall	90	Right	234	88	90
SE WALL 3	Guest Bec 202 Bath 5 204	R-21 Wall	135	n/a	247	28	90
E WALL 6	Guest Bec 202 Bath 5 204	R-21 Wall	90	Right	130	63	90
SE WALL 4	Guest Bec 202 Bath 5 204	R-21 Wall	135	n/a	78	28	90
W WALL 5	Guest Bec 202 Bath 5 204	R-21 Wall	270	Left	52	0	90
S WALL 4	Guest Bec 202 Bath 5 204	R-21 Wall	180	Front	91	0	90
Interior WALL	Pimrary Bed>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	230	0	n/a
Interior WALL 2	Pimrary Bed>>Pimrary Bed	R-0 Wall	n/a	n/a	210	0	n/a
Interior WALL 3	Pimrary Bed>>Pimrary Bed	R-0 Wall	n/a	n/a	153	0	n/a

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
Interior WALL 4	Pimrary Bed>>Pimrary Bed	R-0 Wall	n/a	n/a	153	0	n/a
Interior WALL 5	Pimrary Bed>>Pimrary Bed	R-0 Wall	n/a	n/a	81	0	n/a
Interior WALL 6	Pimrary Bed>>Pimrary Bed	R-0 Wall	n/a	n/a	81	0	n/a
Interior WALL 7	Lounge 103 Walk In Closet>>Pimrary Bed	R-0 Wall	n/a	n/a	126	0	n/a
Interior WALL 8	Lounge 103 Walk In Closet>>Lounge 103 Walk In Closet	R-0 Wall	n/a	n/a	126	0	n/a
Interior WALL 9	Lounge 103 Walk In Closet>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	96	0	n/a
Interior WALL 10	Lounge 103 Walk In Closet>>Lounge 103 Walk In Closet	R-0 Wall	n/a	n/a	96	0	n/a
Interior WALL 11	Lounge 103 Walk In Closet>>Lounge 103 Walk In Closet	R-0 Wall	n/a	n/a	126	0	n/a
Interior WALL 12	Lounge 103 Walk In Closet>>Lounge 103 Walk In Closet	R-0 Wall	n/a	n/a	121.5	0	n/a
Interior WALL 13	Lounge 103 Walk In Closet>>Lounge 103 Walk In Closet	R-0 Wall	n/a	n/a	240	0	n/a
Interior WALL 14	Lounge 103 Walk In Closet>>Pimrary Bed	R-0 Wall	n/a	n/a	70	0	n/a
Interior WALL 15	Guest Bedroom 106 Bath 10>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	153	0	n/a

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NO.	DATE	DESCRIPTION

07 / SHEET TITLE

TITLE-24

08 / SHEET NUMBER

M105

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
Interior WALL 16	Guest Bedroom 106 Bath 10>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	225	0	n/a
Interior WALL 17	Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	63	0	n/a
Interior WALL 18	Guest Bedroom 106 Bath 10>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	63	0	n/a
Interior WALL 19	Guest Bedroom 106 Bath 10>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	117	0	n/a
Interior WALL 20	Guest Bedroom 106 Bath 10>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	117	0	n/a
Interior WALL 21	Guest Bedroom 106 Bath 10>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	360	0	n/a
Interior WALL 22	Guest Bedroom 106 Bath 10>>Pimrary Bed	R-0 Wall	n/a	n/a	360	0	n/a
Interior WALL 23	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	190	0	n/a
Interior WALL 24	Guest Bedroom 109 Bath 3>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	100	0	n/a
Interior WALL 25	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	60	0	n/a
Interior WALL 26	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	40	0	n/a

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OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
Interior WALL 27	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	63	0	n/a
Interior WALL 28	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	63	0	n/a
Interior WALL 29	Guest Bedroom 109 Bath 3>>Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	54	0	n/a
Interior WALL 30	Guest Bedroom 109 Bath 3>>Guest Bedroom 106 Bath 10	R-0 Wall	n/a	n/a	54	0	n/a
Interior WALL 31	Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	225	0	n/a
Interior WALL 32	Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	225	0	n/a
Interior WALL 33	Guest Bedroom 109 Bath 3	R-0 Wall	n/a	n/a	70	0	n/a
Interior WALL 34	Living Room Dining and Ki>>Pimrary Bed	R-0 Wall	n/a	n/a	273	0	n/a
Interior WALL 35	Living Room Dining and Ki>>Pimrary Bed	R-0 Wall	n/a	n/a	234	0	n/a
Interior WALL 36	Dining and Kitchen>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	234	0	n/a
Interior WALL 37	Dining and Kitchen>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	416	0	n/a
Interior WALL 38	Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	247	0	n/a
Interior WALL 39	Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	130	0	n/a

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OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
Interior WALL 40	Guest Bed 202 Bath 5 204>>Dining and Kitchen	R-0 Wall	n/a	n/a	40	0	n/a
Interior WALL 41	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	40	0	n/a
Interior WALL 42	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	40	0	n/a
Interior WALL 43	Guest Bed 202 Bath 5 204>>Living Room Dining and Ki	R-0 Wall	n/a	n/a	40	0	n/a
Interior WALL 44	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	78	0	n/a
Interior WALL 45	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	52	0	n/a
Interior WALL 46	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	91	0	n/a
Interior WALL 47	Guest Bed 202 Bath 5 204>>Living Room Dining and Ki	R-0 Wall	n/a	n/a	40	0	n/a
Interior WALL 48	Guest Bed 202 Bath 5 204>>Guest Bed 202 Bath 5 204	R-0 Wall	n/a	n/a	40	0	n/a
CEILING	Pimrary Bed	R-19 ceiling	n/a	n/a	104	n/a	n/a
ceiling 2	Lounge 103 Walk In Closet	R-19 ceiling	n/a	n/a	173	n/a	n/a
ceiling 3	Lounge 103 Walk In Closet	R-19 ceiling	n/a	n/a	142	n/a	n/a

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OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)
ceiling 4	Lounge 103 Walk In Closet	R-19 ceiling	n/a	n/a	152	n/a	n/a
CEILING 5	Guest Bedroom 106 Bath 10	R-19 ceiling	n/a	n/a	111	n/a	n/a
floor	Living Room Dining and Ki	R-19 Floor No Crawlspace	n/a	n/a	371	n/a	n/a
floor 2	Dining and Kitchen	R-19 Floor No Crawlspace	n/a	n/a	326	n/a	n/a
floor 3	Dining and Kitchen	R-19 Floor No Crawlspace	n/a	n/a	163	n/a	n/a
floor 4	Dining and Kitchen	R-19 Floor No Crawlspace	n/a	n/a	73	n/a	n/a
floor 5	Dining and Kitchen	R-19 Floor No Crawlspace	n/a	n/a	158	n/a	n/a
floor 6	Guest Bec 202 Bath 5 204	R-19 Floor No Crawlspace	n/a	n/a	256	n/a	n/a
floor 7	Guest Bec 202 Bath 5 204	R-19 Floor No Crawlspace	n/a	n/a	34	n/a	n/a
floor 8	Guest Bec 202 Bath 5 204	R-19 Floor No Crawlspace	n/a	n/a	76	n/a	n/a

OPAQUE SURFACES - CATHEDRAL CEILINGS

01	02	03	04	05	06	07	08	09	10	11
Name	Zone	Construction	Azimuth	Orientation	Area (ft^2)	Skylight Area (ft^2)	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Cool Roof
Roof	Pimrary Bed	R-38 Roof No Attic	0	Back	130	0	0	0.3	0.85	Yes
Roof 2	Guest Bedroom 106 Bath 10	R-38 Roof No Attic	0	Back	160	0	0	0.3	0.85	Yes
Roof 3	Guest Bedroom 106 Bath 10	R-38 Roof No Attic	0	Back	45	0	0	0.3	0.85	Yes
Roof 4	Living Room Dining and Ki	R-38 Roof No Attic	0	Back	371	0	0	0.3	0.85	Yes

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NO.	DATE	DESCRIPTION

07 / SHEET TITLE

TITLE-24

08 / SHEET NUMBER

M106

OPAQUE SURFACES - CATHEDRAL CEILINGS

01 Name	02 Zone	03 Construction	04 Azimuth	05 Orientation	06 Area (ft^2)	07 Skylight Area (ft^2)	08 Roof Rise (x in 12)	09 Roof Reflectance	10 Roof Emittance	11 Cool Roof
Roof 5	Dining and Kitchen	R-38 Roof No Attic	0	Back	562	99	0	0.3	0.85	Yes
Roof 6	Guest Bed 202 Bath 5 204	R-38 Roof No Attic	0	Back	256	0	0	0.3	0.85	Yes
Roof 7	Guest Bed 202 Bath 5 204	R-38 Roof No Attic	0	Back	33	0	0	0.3	0.85	Yes
Roof 8	Guest Bed 202 Bath 5 204	R-38 Roof No Attic	0	Back	76	0	0	0.3	0.85	Yes
Roof 9	Guest Bed 202 Bath 5 204	R-38 Roof No Attic	0	Back	112	54	0	0.3	0.85	Yes

FENESTRATION / GLAZING

01 Name	02 Type	03 Surface	04 Orientation	05 Azimuth	06 Width (ft)	07 Height (ft)	08 Mult.	09 Area (ft^2)	10 U-factor	11 U-factor Source	12 SHGC	13 SHGC Source	14 Exterior Shading
Window	Window	N WALL	Back	0			1	118	0.3	NFRC	0.23	NFRC	Bug Screen
Window 2	Window	W WALL	Left	270			1	20	0.3	NFRC	0.23	NFRC	Bug Screen
Window 3	Window	N WALL 2	Back	0			1	98	0.3	NFRC	0.23	NFRC	Bug Screen
Window 4	Window	E WALL 2	Right	90			1	47	0.3	NFRC	0.23	NFRC	Bug Screen
Window 5	Window	N WALL 3	Back	0			1	44	0.3	NFRC	0.23	NFRC	Bug Screen
Window 6	Window	S WALL 3	Front	180			1	159	0.3	NFRC	0.23	NFRC	Bug Screen
Window 7	Window	SE WALL		135			1	12	0.3	NFRC	0.23	NFRC	Bug Screen
Window 8	Window	E WALL 3	Right	90			1	47	0.3	NFRC	0.23	NFRC	Bug Screen
Window 9	Window	SE WALL 2		135			1	12	0.3	NFRC	0.23	NFRC	Bug Screen

FENESTRATION / GLAZING

01 Name	02 Type	03 Surface	04 Orientation	05 Azimuth	06 Width (ft)	07 Height (ft)	08 Mult.	09 Area (ft^2)	10 U-factor	11 U-factor Source	12 SHGC	13 SHGC Source	14 Exterior Shading
Window 10	Window	N WALL 4	Back	0			1	123	0.3	NFRC	0.23	NFRC	Bug Screen
Window 11	Window	W WALL 4	Left	270			1	63	0.3	NFRC	0.23	NFRC	Bug Screen
Window 12	Window	N WALL 5	Back	0			1	208	0.3	NFRC	0.23	NFRC	Bug Screen
Window 13	Window	E WALL 5	Right	90			1	88	0.3	NFRC	0.23	NFRC	Bug Screen
Window 14	Window	SE WALL 3		135			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
Window 15	Window	E WALL 6	Right	90			1	63	0.3	NFRC	0.23	NFRC	Bug Screen
Window 16	Window	SE WALL 4		135			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
Skylight	Skylight	Roof 5	Back	0			1	99	0.34	NFRC	0.33	NFRC	
Skylight 2	Skylight	Roof 9	Back	0			1	54	0.34	NFRC	0.33	NFRC	

SLAB FLOORS

01 Name	02 Zone	03 Area (ft^2)	04 Perimeter (ft)	05 Edge Insul. R-value and Depth	06 Edge Insul. R-value and Depth	07 Carpeted Fraction	08 Heated
Slab-on-Grade	Pimrary Bed	371	44	none	0	80%	No
Slab-on-Grade 2	Pimrary Bed	104	0.1	none	0	80%	No
Slab-on-Grade 3	Lounge 103 Walk In Closet	173	0.1	none	0	80%	No
Slab-on-Grade 4	Lounge 103 Walk In Closet	142	19	none	0	80%	No

SLAB FLOORS

01 Name	02 Zone	03 Area (ft^2)	04 Perimeter (ft)	05 Edge Insul. R-value and Depth	06 Edge Insul. R-value and Depth	07 Carpeted Fraction	08 Heated
Slab-on-Grade 5	Lounge 103 Walk In Closet	152	31	none	0	80%	No
Slab-on-Grade 6	Guest Bedroom 106 Bath 10	326	42	none	0	80%	No
Slab-on-Grade 7	Guest Bedroom 106 Bath 10	73	0.1	none	0	80%	No
Slab-on-Grade 8	Guest Bedroom 106 Bath 10	274	14	none	0	80%	No
Slab-on-Grade 9	Guest Bedroom 109 Bath 3	256	29	none	0	80%	No
Slab-on-Grade 10	Guest Bedroom 109 Bath 3	76	10	none	0	80%	No
Slab-on-Grade 11	Guest Bedroom 109 Bath 3	34	0.1	none	0	80%	No
Slab-on-Grade 12	Guest Bedroom 109 Bath 3	158	7	none	0	80%	No

OPAQUE SURFACE CONSTRUCTIONS

01 Construction Name	02 Surface Type	03 Construction Type	04 Framing	05 Total Cavity R-value	06 Interior / Exterior Continuous R-value	07 U-factor	08 Assembly Layers
R-21 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	None / None	0.069	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Exterior Finish: 3 Coat Stucco

OPAQUE SURFACE CONSTRUCTIONS

01 Construction Name	02 Surface Type	03 Construction Type	04 Framing	05 Total Cavity R-value	06 Interior / Exterior Continuous R-value	07 U-factor	08 Assembly Layers
R-38 Roof No Attic	Cathedral Ceilings	Wood Framed Ceiling	2x12 @ 16 in. O. C.	R-38	None / None	0.029	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Radiant Barrier Cavity / Frame: R-38 / 2x12 Inside Finish: Gypsum Board
R-0 Wall	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-0	None / None	0.277	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Other Side Finish: Gypsum Board
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O. C.	R-19	None / None	0.049	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6 Ceiling Below Finish: Gypsum Board
R-19 ceiling	Interior Ceiling	Wood Framed Ceiling	2x4 @ 16 in. O. C.	R-19	None / None	0.052	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x4 Ceiling Below Finish: Gypsum Board

BUILDING ENVELOPE - HERS VERIFICATION

01 Quality Insulation Installation (QII)	02 High R-value Spray Foam Insulation	03 Building Envelope Air Leakage	04 CFM50	05 CFM50
Not Required	Not Required	N/A	n/a	n/a

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06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

TITLE-24

08 / SHEET NUMBER

M107

WATER HEATING SYSTEMS

01	02	03	04	05	06	07	08	09
Name	System Type	Distribution Type	Water Heater Name	Number of Units	Solar Heating System	Compact Distribution	HERS Verification	Water Heater Name (#)
DHW Sys 1	Domestic Hot Water (DHW)	Standard	DHW Heater 1	2	n/a	None	n/a	DHW Heater 1 (2)

WATER HEATERS

01	02	03	04	05	06	07	08	09	10	11	12	13
Name	Heating Element Type	Tank Type	# of Units	Tank Vol. (gal)	Heating Efficiency Type	Efficiency	Rated Input Type	Input Rating or Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss or Recovery eff	1st Hr. Rating or Flow Rate	Tank Location
DHW Heater 1	Heat Pump	n/a	2	120	Commercial Product	Commercial Product	n/a	<= 12 kW	n/a	n/a	n/a	Outside

WATER HEATING - HERS VERIFICATION

01	02	03	04	05	06	07
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Shower Drain Water Heat Recovery
DHW Sys 1 - 1/2	Not Required	Not Required	Not Required	None	Not Required	Not Required

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06	07	08	09
Name	System Type	Heating Unit Name	Heating Equipment Count	Cooling Unit Name	Cooling Equipment Count	Fan Name	Distribution Name	Required Thermostat Type
CU1-11	Heat pump heating cooling	Heat Pump System 1	1	Heat Pump System 1	1	HVAC Fan 1	Air Distribution System 1	Setback
CU1-22	Heat pump heating cooling	Heat Pump System 2	1	Heat Pump System 2	1	HVAC Fan 2	Air Distribution System 2	Setback

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06	07	08	09
Name	System Type	Heating Unit Name	Heating Equipment Count	Cooling Unit Name	Cooling Equipment Count	Fan Name	Distribution Name	Required Thermostat Type
CU2-13	Heat pump heating cooling	Heat Pump System 3	1	Heat Pump System 3	1	HVAC Fan 3	Air Distribution System 3	Setback
CU2-24	Heat pump heating cooling	Heat Pump System 4	1	Heat Pump System 4	1	HVAC Fan 4	Air Distribution System 4	Setback

HVAC - HEAT PUMPS

01	02	03	04	05	06	07	08	09	10	11	12	13
			Heating				Cooling					
Name	System Type	Number of Units	Heating Efficiency Type	HSPF/HSPF2/COP	Cap 47	Cap 17	Cooling Efficiency Type	SEER/SEER2	EER/EER2/CEER	Zonally Controlled	Compressor Type	HERS Verification
Heat Pump System 1	Central split HP	1	HSPF2	10.4	50000	43000	EER2SEER2	16	10.6	Zonally Controlled	Multi-speed	Heat Pump System 1-hers-htpump
Heat Pump System 2	Central split HP	1	HSPF2	10.5	66000	62700	EER2SEER2	17	10.6	Zonally Controlled	Multi-speed	Heat Pump System 2-hers-htpump
Heat Pump System 3	Central split HP	1	HSPF2	10.5	66000	62700	EER2SEER2	17	10.6	Zonally Controlled	Multi-speed	Heat Pump System 3-hers-htpump
Heat Pump System 4	Central split HP	1	HSPF2	10.5	66000	62700	EER2SEER2	17	10.6	Zonally Controlled	Multi-speed	Heat Pump System 4-hers-htpump

HVAC HEAT PUMPS - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	Verified Airflow	Airflow Target	Verified EER/EER2	Verified SEER/SEER2	Verified Refrigerant Charge	Verified HSPF/HSPF2	Verified Heating Cap 47	Verified Heating Cap 17
Heat Pump System 1-hers-htpump	Required	350	Not Required	Required	Yes	Yes	Yes	Yes

HVAC HEAT PUMPS - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	Verified Airflow	Airflow Target	Verified EER/EER2	Verified SEER/SEER2	Verified Refrigerant Charge	Verified HSPF/HSPF2	Verified Heating Cap 47	Verified Heating Cap 17
Heat Pump System 2-hers-htpump	Required	350	Not Required	Required	Yes	Yes	Yes	Yes
Heat Pump System 3-hers-htpump	Required	350	Not Required	Required	Yes	Yes	Yes	Yes
Heat Pump System 4-hers-htpump	Required	350	Not Required	Required	Yes	Yes	Yes	Yes

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07	08	09	10	11	12
			Duct Ins. R-value		Duct Location		Surface Area				
Name	Type	Design Type	Supply	Return	Supply	Return	Supply	Return	Bypass Duct	Duct Leakage	HERS Verification
Air Distribution System 1	Conditioned space-entirely	Non-Verified	R-8	R-8	Conditioned Zone	Conditioned Zone	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 1-hers-dist
Air Distribution System 2	Conditioned space-entirely	Non-Verified	R-8	R-8	Conditioned Zone	Conditioned Zone	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 2-hers-dist
Air Distribution System 3	Conditioned space-entirely	Non-Verified	R-8	R-8	Conditioned Zone	Conditioned Zone	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 3-hers-dist
Air Distribution System 4	Conditioned space-entirely	Non-Verified	R-8	R-8	Conditioned Zone	Conditioned Zone	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 4-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	Duct Leakage Verification	Duct Leakage Target (%)	Verified Duct Location	Verified Duct Design	Buried Ducts	Deeply Buried Ducts	Low-leakage Air Handler	Low Leakage Ducts Entirely in Conditioned Space
Air Distribution System 1-hers-dist	Yes	5.0	Required	Not Required	Not Required	Credit not taken	Not Required	No
Air Distribution System 2-hers-dist	Yes	5.0	Required	Not Required	Not Required	Credit not taken	Not Required	No
Air Distribution System 3-hers-dist	Yes	5.0	Required	Not Required	Not Required	Credit not taken	Not Required	No
Air Distribution System 4-hers-dist	Yes	5.0	Required	Not Required	Not Required	Credit not taken	Not Required	No

HVAC - FAN SYSTEMS

01	02	03	04
Name	Type	Fan Power (Watts/CFM)	Name
HVAC Fan 1	HVAC Fan	0.45	HVAC Fan 1-hers-fan
HVAC Fan 2	HVAC Fan	0.45	HVAC Fan 2-hers-fan
HVAC Fan 3	HVAC Fan	0.45	HVAC Fan 3-hers-fan
HVAC Fan 4	HVAC Fan	0.45	HVAC Fan 4-hers-fan

HVAC FAN SYSTEMS - HERS VERIFICATION

01	02	03
Name	Verified Fan Watt Draw	Required Fan Efficacy (Watts/CFM)
HVAC Fan 1-hers-fan	Required	0.45
HVAC Fan 2-hers-fan	Required	0.45

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06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

TITLE-24

08 / SHEET NUMBER

M108

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 21 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

HVAC FAN SYSTEMS - HERS VERIFICATION		
01	02	03
Name	Verified Fan Watt Draw	Required Fan Efficacy (Watts/CFM)
HVAC Fan 3-hers-fan	Required	0.45
HVAC Fan 4-hers-fan	Required	0.45

INDOOR AIR QUALITY (IAQ) FANS								
01	02	03	04	05	06	07	08	09
Dwelling Unit	Airflow (CFM)	Fan Efficacy (W/CFM)	IAQ Fan Type	Includes Heat/Energy Recovery?	IAQ Recovery Effectiveness - SRE/ASRE	Includes Fault Indicator Display?	HERS Verification	Status
SFam IAQVentRpt	162	0.35	Exhaust	No	n/a / n/a	No	Yes	

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01-E**

Project Name: Torrance Hill House **Calculation Date/Time:** 2024-08-26T09:08:22-07:00 **(Page 22 of 22)**

Calculation Description: Title 24 Analysis **Input File Name:** Torrance Hill House_MR.ribd22x

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name: Jamshed Mistry	Documentation Author Signature: Jamshed Mistry
Company: Mistry Engineering Inc	Signature Date: 08/26/2024
Address: 26410 Brooks Circle	CEA/ HERS Certification Identification (If applicable):
City/State/Zip: Stevenson Ranch, CA 91381	Phone: 6618039256

RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California: 1. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design identified on this Certificate of Compliance. 2. I certify that the energy features and performance specifications identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. 3. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and speecifications submitted to the enforcement agency for approval with this building permit application.	
Responsible Designer Name: Jamshed Mistry	Responsible Designer Signature: Jamshed Mistry
Company: Mistry Engineering Inc	Date Signed: 08/26/2024
Address: 26410 Brooks Circle	License:
City/State/Zip: Stevenson Ranch, CA 91381	Phone: 6618039256

Digitally signed by California Home Energy Efficiency Rating Services (CHEERS). This digital signature is provided in order to secure the content of this registered document, and in no way implies Registration Provider responsibility for the accuracy of the information.

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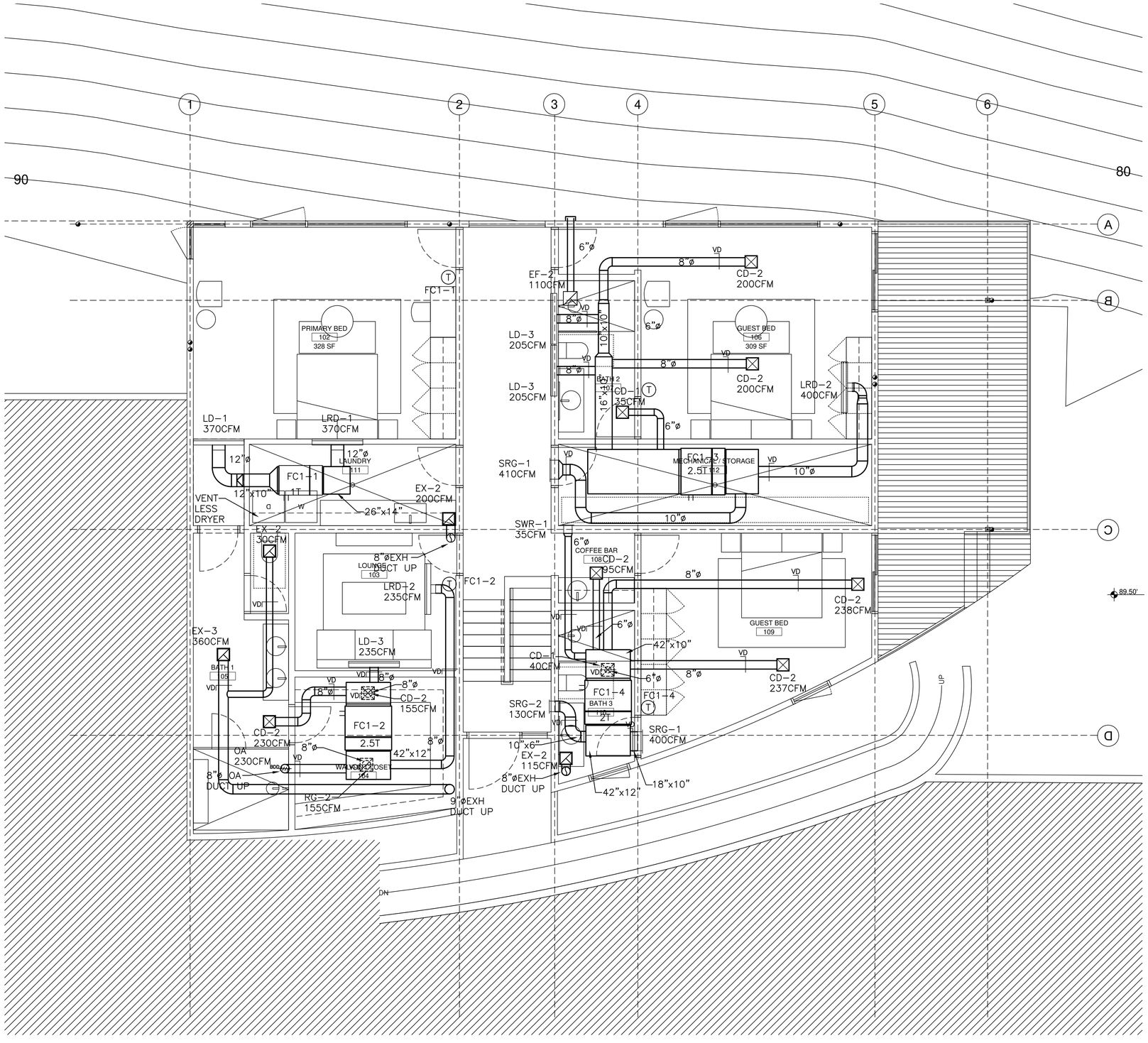
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TITLE-24

08 / SHEET NUMBER

M109



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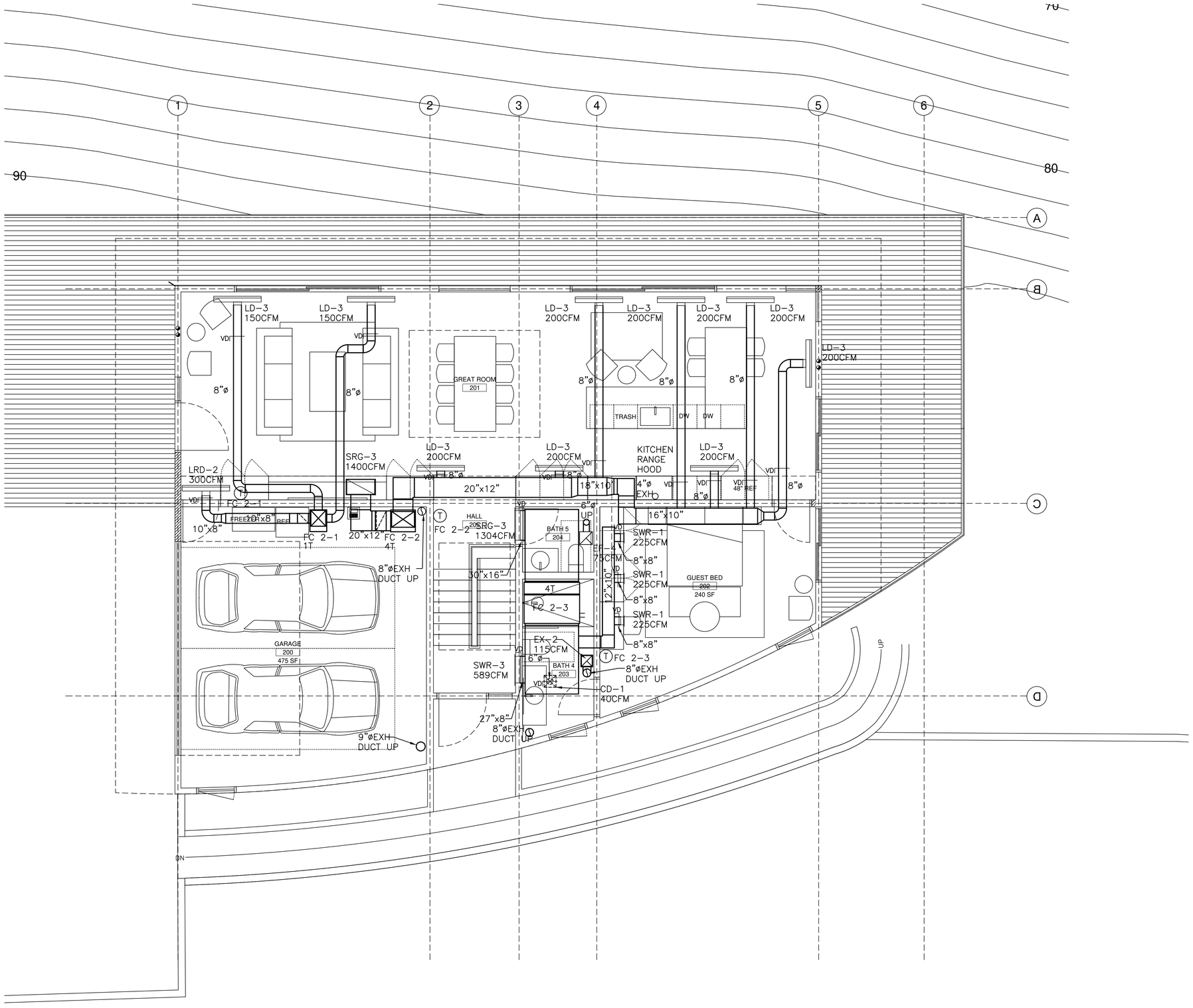
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07 / SHEET TITLE

FIRST FLOOR PLAN

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M200



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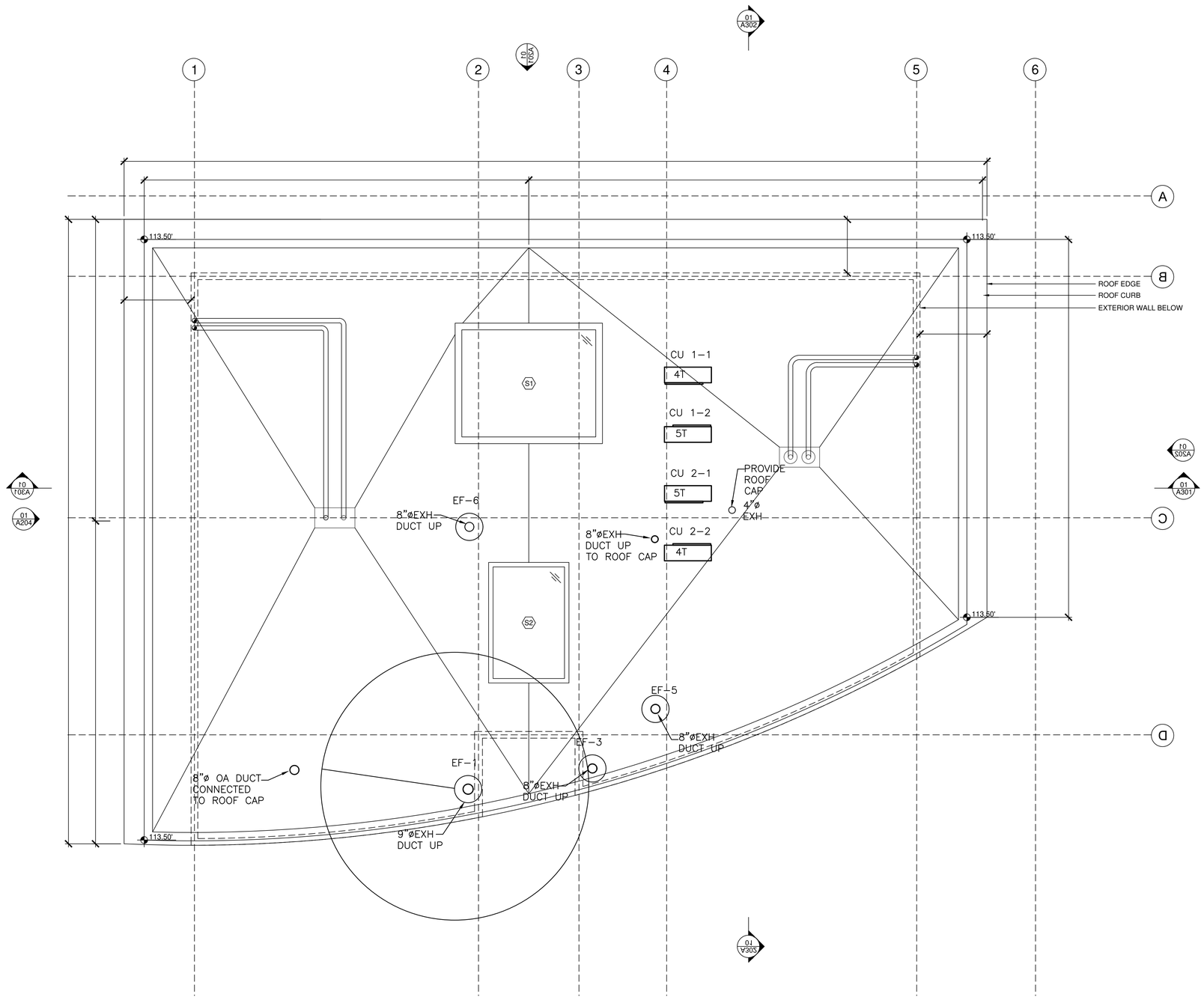
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07 / SHEET TITLE

SECOND FLOOR PLAN

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M201



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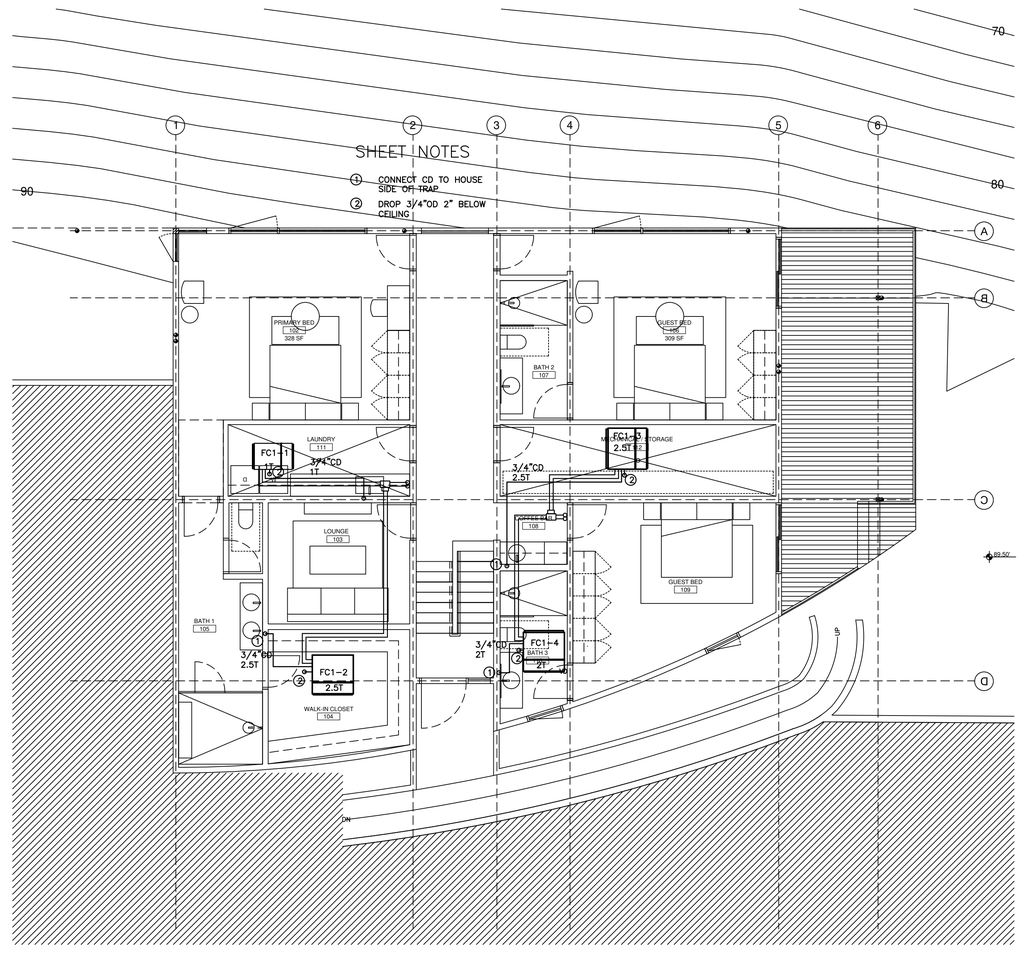
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07 / SHEET TITLE

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08 / SHEET NUMBER

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REFRIGERANT PIPING FIRST FLOOR PLAN

08 / SHEET NUMBER

M203

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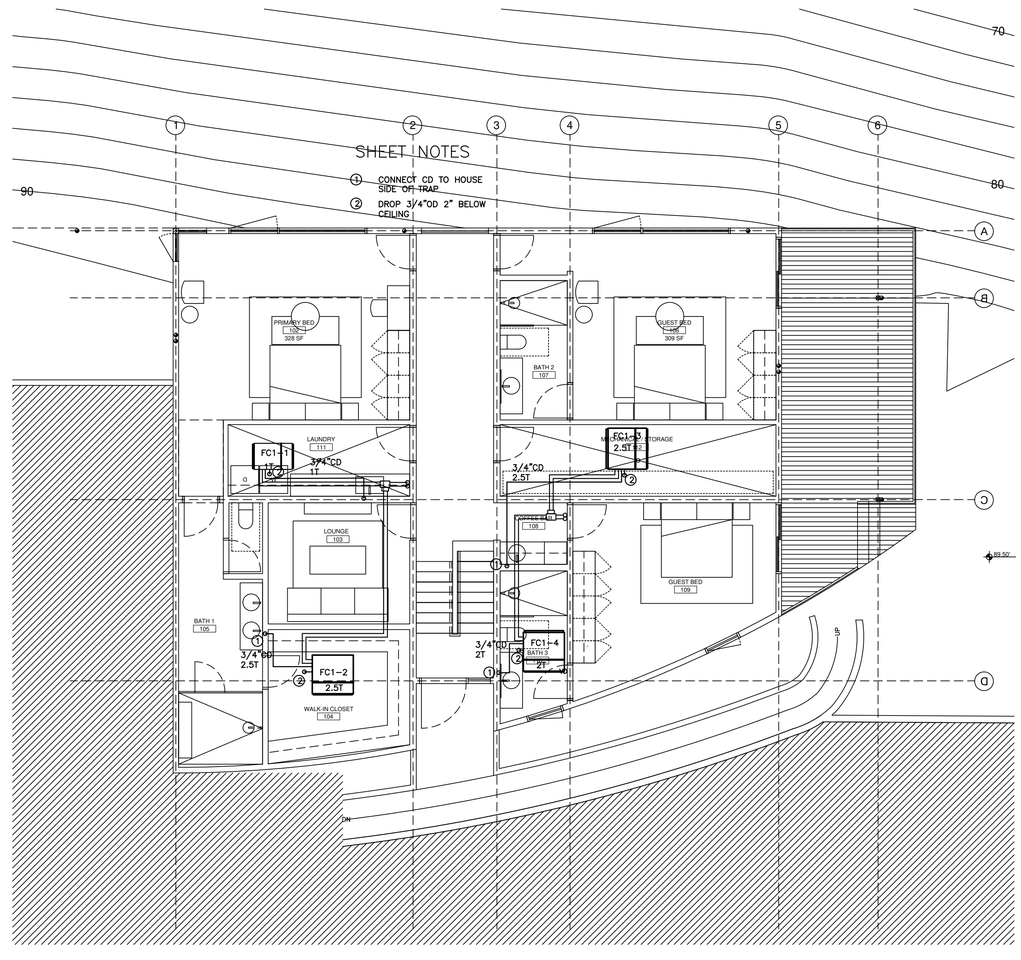
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04 / KEY PLAN

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05 / PROJECT NAME / ADDRESS

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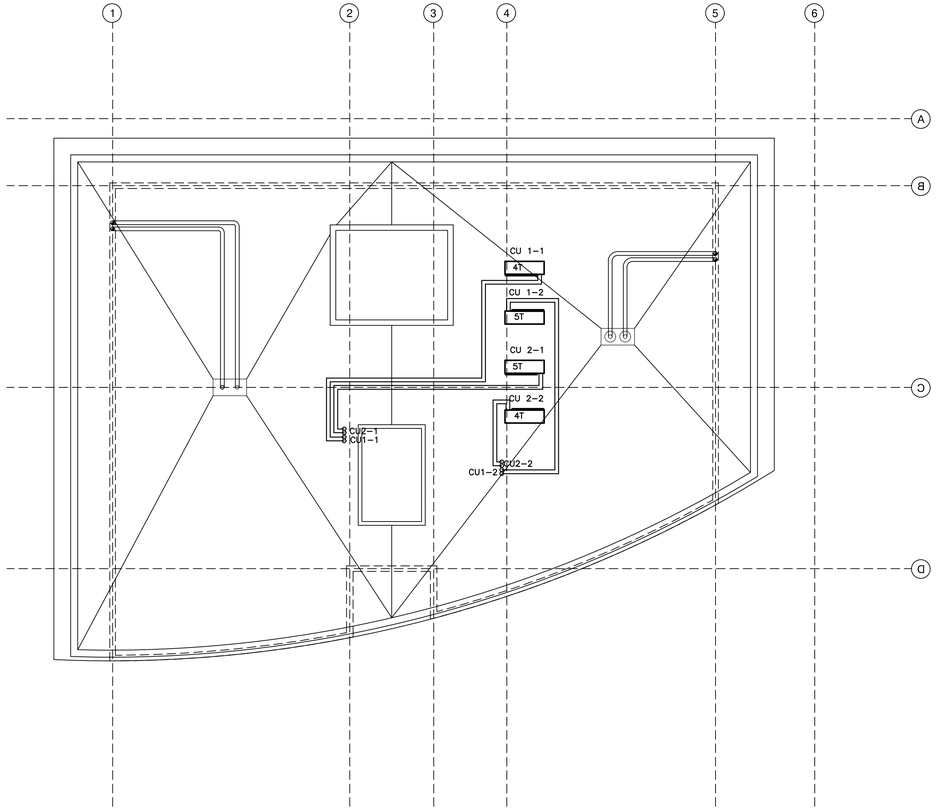
NO.	DATE	DESCRIPTION

07 / SHEET TITLE

REFRIGERANT PIPING SECOND FLOOR PLAN

08 / SHEET NUMBER

M204



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04 / KEY PLAN

N

05 / PROJECT NAME / ADDRESS

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06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

REFRIGERANT PIPING ROOF

08 / SHEET NUMBER

M205

DIAGRAM SYMBOL LEGEND		CONT.No		PAGE	
DISPLAY	DESCRIPTION				
-//-	POWER WIRE				
———	CONTROL WIRE				
———	REF. PIPE				

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-Y62-G-E
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/8 / 5/8
P2	1/4 / 1/2
P3	3/8 / 3/4
SYMBOL	MODEL NAME(S)
CR	PAC-IYSX06NU-J

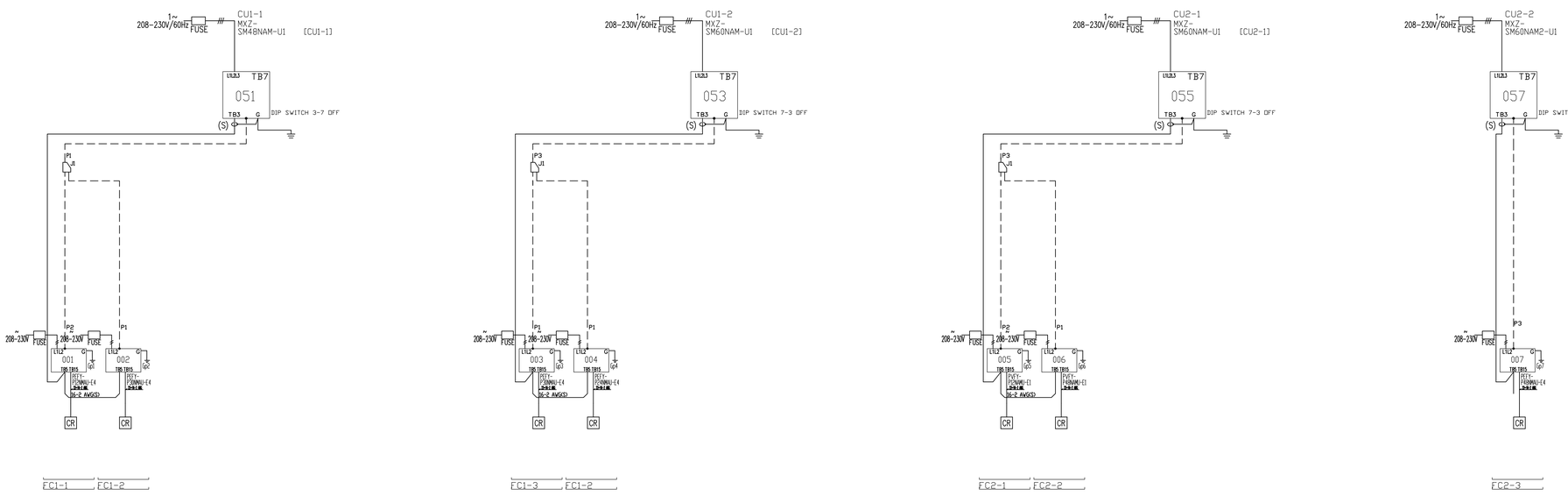
CITY MULTI

SYSTEM SCHEMATIC DWG.

This drawing is schematic in nature. Final routing of piping & wiring shall be determined by the installing contractor and/or designer of record

Additional refrigerant charge is needed depending on the size and length of extended piping. Please refer the amount of pre-charge and the formula of calculation which is mentioned on the data book.

1.25mm²(16 AWG) : 1.25mm²(16 AWG) or more. 0.75mm²(20 AWG) : between 0.5mm²(24 AWG) and 0.75mm²(20 AWG).



Diamond System Builder
sw: 5.5.0.36
ab: 5.5.0.15
8/25/2024
10:40 AM

REMARKS

Comments:

01 / ARCHITECT

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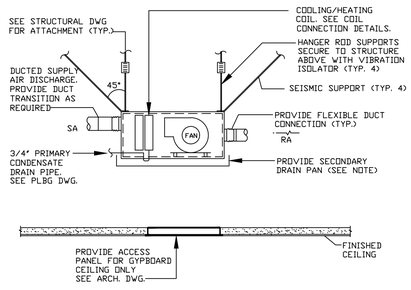
07 / SHEET TITLE

REFRIGERANT PIPING RISER DIAGRAM

08 / SHEET NUMBER

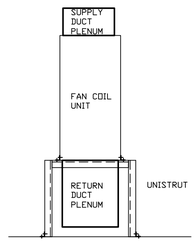
M300

NOTE:
1. 24 GA GALVANIZED SECONDARY DRAIN PAN WITH 2" LIP. ROUTE INDEPENDENT SECONDARY CONDENSATE DRAIN FROM FAN COIL UNIT. DRAIN PAN TO INCLUDE COIL CONNECTION AND VALVE. DRAIN SIZE TO COMPLY WITH CMC.



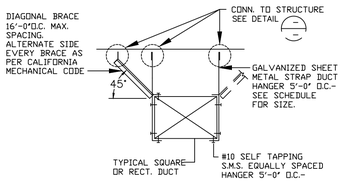
7 FAN COIL UNIT INSTALLATION DETAIL

REF. SCALE: NONE



8 MOUNTING DETAIL OF MULTIPOSITION FAN COIL UNIT

REF. SCALE: NONE

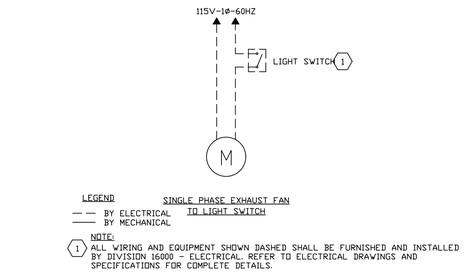


RECTANGULAR DUCT		
MAX. OF DUCT PERIMETER/IN.	STRAP	MAX. LOAD EACH HANGER/LBS.
P/2 =72	1"X 20 GA.	100
P/2 =96	1"X 18 GA.	150
P/2 =192	1"X 16 GA.	300

NOTES:
1. DUCTS OF 6 SF IN CROSS SECTION OR LARGER SHALL BE PROVIDED WITH SUPPORT, DIAGONAL BRACE & LONGITUDINAL BRACE, PER SMACNA SEISMIC RESTRAINT MANUAL GUIDELINES FOR MECHANICAL SYSTEMS 2nd EDITION.

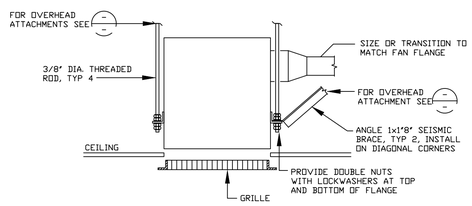
3 DUCT SUPPORT DETAIL

REF. SCALE: NONE



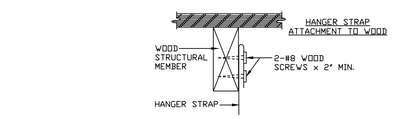
4 TOILET EXHAUST FAN WIRING DETAIL

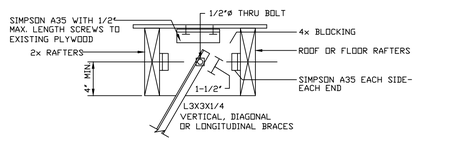
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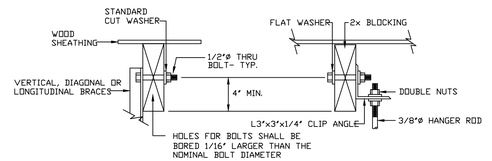


5 CEILING EXHAUST FAN

REF. SCALE: NONE







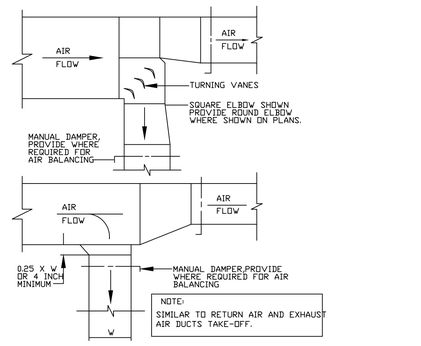
ROD DIAMETER IN INCHES	MAXIMUM SAFE LOAD* WEIGHT IN LBS.	MAX. SAFE FORCE DURING SEISMIC EVENT** WEIGHT IN LBS.
3/8	610	810
1/2	1130	1500

*LOADS ARE BASED ON THE ROOT AREA OF THE THREAD AT STRESS OF 9000 PSI.

**SAFE SEISMIC FORCES ARE DETERMINED BY INCREASING ALLOWABLE SAFE LOADS BY 33 PERCENT.

1 CONNECTION TO WOOD STRUCTURE DETAIL

REF. SCALE: NONE



2 DUCT TAKE-OFF

REF. SCALE: NONE

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04 / KEY PLAN N ↑

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REFRIGERANT PIPING RISER DIAGRAM

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M400

ELECTRICAL SYMBOLS

A B	CEILING MOUNTED LED LIGHT FIXTURE: UPPER LETTER INDICATES TYPE.
B EM	CEILING MOUNTED LED LIGHT FIXTURE: CONNECTED TO EMERGENCY GENERATOR CIRCUIT.
	EXIT SIGN WITH EMERGENCY BATTERY PACK.
J	JUNCTION BOX: MOUNTED IN CELING SPACE OR ON CEILING IF NO CEILING SPACE.
JH	JUNCTION BOX: WALL MOUNT +18" U.N.O.
	DUPLEX RECEPTACLE: 125V., 20 AMP., NEMA 5-20R. +18" U.N.O.
	GROUND FAULT INTERRUPTER TYPE DUPLEX RECEPTACLE: 125V., 15 AMP., NEMA 5-15R, MOUNT IN A 2" DEEP BOX. +18" UNLESS OTHERWISE NOTED. +42" NEAR SINK.
WP	WEATHERPROOF RECEPTACLE ("GFI" TYPE): 125V., 15 AMP., NEMA 5-15R WITH WEATHERPROOF COVER. MOUNT IN A 2" DEEP BOX. +18" A.F.F. TO BOTTOM OF BOX UNLESS OTHERWISE NOTED.
	QUAD RECEPTACLE: 125V., 20 AMP., NEMA 5-20R. +18" U.N.O.
D	DEDICATED RECEPTACLE: 125V., 20 AMP., NEMA 5-20R. +18" U.N.O.
	FLUSH FLOOR MOUNT DUPLEX RECEPTACLE 125V., 20A., NEMA 5-20R ON FULLY ADJUSTABLE, CAST IRON BOX WITH COVER.
E	CEILING EXHAUST FAN.
M	MOTOR.
———	CONDUIT: EXPOSED IN UNFINISHED AREAS; CONCEALED ABOVE CEILING OR IN WALL IN FINISHED AREAS.
— —	CONDUIT: IN OR BELOW FLOOR OR BELOW GRADE.
———	EXISTING CONDUIT WITH WIRES.
A-1,3,5	HOMERUN TO PANEL "A", CIRCUITS 1, 3, 5.
A-1,2/3	HOMERUN TO PANEL "A", CIRCUITS A-1, A-2, & A-3.
———	3/4"C, 2#12 THWN-CU & 1#12G.
———	3/4"C, 4#12 THWN-CU & 1#12G.
———	3/4"C, 6#12 THWN-CU & 1#12G.
—LV—	CONTROL CABLE, CAT-5E DATA CABLE WITH JACK, PLENUM TYPE.
1"C,3#6	OTHER CONDUIT AND WIRE SIZE AS NOTED ON DRAWINGS.
	LIGHTING/POWER PANEL.
	MAIN SERVICE SWITCHBOARD.
C	PANEL DESIGNATION, LETTER IDENTIFIES THE PANEL.
S_{ab}	MULTIPLE SINGLE POLE SWITCHES IN MUTIGANG BOX. NUMBER OF LOWER CASE LETTER INDICATE NUMBER OF SWITCHES.
S	SINGLE POLE SWITCH.
S_2	TWO POLE SWITCH.
S_M	HORSE POWER RATED SWITCH.
S_{Kab}	KEYED SWITCH (2) SINGLE POLE.
	FUSED DISCONNECT SWITCH H.P. RATED WITH CLASS "R" FUSE CLIPS.
H.P.	HORSEPOWER.
C.O.	CONDUIT ONLY WITH #12 PULL WIRE
N.F.	NON-FUSED.
W.P.	WEATHERPROOF.
(E)	EXISTING.
(N)	NEW.
TC	TIME CLOCK.
(R)	RELOCATE.
(XR)	DEMOLITION
(RR)	REMOVE & REINSTALL
	DATA OUTLET: 4" SQUARE BOX WITH 1 GANG RING AND COVER PLATE +18" A.F.F., U.N.O. STUB-UP 3/4"C UP TO CEILING SPACE.
	CEILING MOUNT DATA OUTLET: 4" SQUARE BOX WITH 1 GANG RING AND COVER PLATE
	DUAL TEL/DATA MODULAR JACK: 5" SQUARE BOX WITH 1-GANG RING AND COVER PLATE. +18" A.F.F., U.N.O. STUB-UP 3/4"C. UP TO CEILING SPACE.
	TEL OUTLET: 4" SQUARE BOX WITH 1 GANG RING AND COVER PLATE +18" A.F.F., U.N.O. STUB-UP 3/4"C UP TO CEILING SPACE.
	FLUSH FLOOR MOUNT DATA/TEL OUTLET ON FULLY ADJUSTABLE, CAST IRON BOX WITH COVER.
TV	CABLE T.V. OUTLET, +15" A.F.F. 3/4" C.O. AS NOTED.
SC	CEILING MOUNT SMOKE/CARBON MONOXIDE DETECTOR COMBINATION.
1	REFERENCE KEYED NOTE.
	CEILING MOUNT NORMAL & EMERGENCY DIMMING ROOM CONTROLLER
	CEILING MOUNT POWER PACK.
DT	CEILING MOUNT LIGHTING DAYLIGHTING SENSOR
OS	CEILING MOUNT LIGHTING OCCUPANCY SENSOR
	WALL MOUNT DIGITAL DIMMING SWITCH, +48" A.F.F. U.N.O.
	WALL MOUNT LIGHTING OCCUPANCY SENSOR SWITCH, +48" A.F.F. U.N.O.
KP	WALL MOUNT DIGITAL KEY PAD, +48" A.F.F. U.N.O.

DISCOVERY PHASE - CAREFUL AND THOROUGH SITE AND BUILDING EVALUATION PRIOR TO BID AND START OF WORK

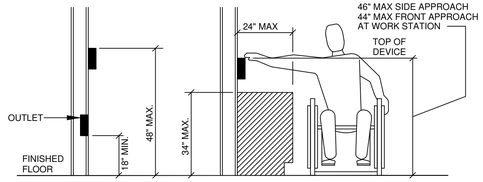
IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO REVIEW THESE CONTRACT DRAWINGS AND PROJECT MANUAL, EITHER FOR ESTIMATING PURPOSES. SUBMISSION OF BID OR PERFORMING CONSTRUCTION TO THOROUGHLY EXAMINE ALL DRAWINGS LISTED ON THE ARCHITECTS DRAWING SHEET INDEX. VISIT THE SITE PRIOR TO BID TO BECOME FAMILIAR AND ACQUAINTED WITH ALL CONDITIONS WHICH MAY AFFECT EXECUTION OF WORK AND (PHYSICALLY/AMP RATINGS/VOLTAGES) CONFIRM/LOCATED ANY PANELBOARD, LIGHTING, SWITCHBOARD, DISTRIBUTION BOARD, CONTROLS, HVAC/REFRIGERATION EQUIPMENT SIZING AND CONDITIONS. THAT ALL SAID AND EXISTING OR NEW AS NOTED ON THE DRAWINGS, MUST BE FORMALLY INFORMED WITH THE OWNER, ARCHITECT OR ENGINEER FOR RECORD OF ANY DISCREPANCIES AS DISCOVERED IN THE FIELD VERSUS CONSTRUCTION DOCUMENTS PRIOR TO START OF WORK TO COVER ALL COST TO BID SET. "DRAWINGS ARE DIAGRAMMATIC ONLY".

IT SHALL BE THE RESPONSIBILITY OF ALL CONTRACTORS (GENERAL CONTRACTORS OR SUB-CONTRACTORS) INCLUDING SUPPLIER OF PRODUCTS, SERVICES AND OR MATERIALS WHO REVIEW THESE CONTRACT DOCUMENTS AND SPECIFICATIONS TO PROVIDE AND INCLUDE ALL ITEMS AND ELECTRICAL CONTROL/COMPONENTS (POWER/LOW VOLTAGE) AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM WITHOUT EXTRA COST TO OWNER.

ELECTRICAL NOTES

1. THE ELECTRICAL DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC IN NATURE, THE DRAWINGS SHOWS THE APPROXIMATE LOCATIONS OF THE EQUIPMENT, HOWEVER, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL THE EQUIPMENT AND ASSOCIATED WIRING IN SUCH A MANNER AS TO CONFORM WITH THE EXISTING STRUCTURE OF THE BUILDING, AVOID ALL OBSTRUCTIONS AND MEET ALL APPLICABLE CODE REQUIREMENTS IN THE CITY OF LOS ANGELES.
2. ALL ELECTRICAL MATERIALS AND EQUIPMENT TO BE USED SHALL BE U.L. LISTED AND LABELED. RECOGNIZED ELECTRICAL TESTING LABORATORY OR APPROVED BY THE CITY OF LOS ANGELES.
3. ANY DEFICIENCY PERTAINING TO WORKMANSHIP FOUND BY THE CITY INSPECTOR SHALL BE CORRECTED WITHOUT ADDITIONAL COST TO THE OWNER.
4. ALL WIRING SHALL BE COPPER, 600V WITH THWN/THHN INSULATION, MINIMUM SIZE SHALL BE #12 UNLESS OTHERWISE NOTED.
5. ALL WIRING SHALL BE IN NON-METALLIC CABLE (GROUNDED), OR ELECTRICAL METALLIC TUBING FLEXIBLE METALLIC, OR APPROVED EQUAL, 1/2" MINIMUM UNLESS OTHERWISE NOTED.
6. THE ELECTRICAL CONTRACTOR SHALL PROVIDE SUPPORT FOR ALL ELECTRICAL EQUIPMENT TO COMPLY WITH THE SEISMIC REQUIREMENTS OF THE UNIFORM BUILDING CODE AND ALL LOCAL ORDINANCES.
7. THE NEW INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
8. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUITS, WIRES, BOXES AND CONVENIENCE RECEPTACLES, AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS FOR A COMPLETE AND OPERATIONAL ELECTRICAL SYSTEM.
9. THE ELECTRICAL CONTRACTOR SHALL NOT BORE, NOTCH OR IN ANY OTHER WAY CUT INTO STRUCTURAL MEMBERS WITHOUT THE WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.
10. THE ELECTRICAL CONTRACTOR SHALL MAKE POWER CONNECTIONS TO ALL MOTORS AND EQUIPMENT FURNISHED BY OTHERS.
11. THE ELECTRICAL CONTRACTOR SHALL FURNISH ALL PERMITS AND PAY ALL FEES.
12. ALL CONDUITS CONNECTIONS TO EQUIPMENT SUBJECT TO VIBRATIONS SHALL BE MADE WITH SEALTIGHT FLEXIBLE CONDUIT PROVIDING SUFFICIENT SLACK TO MINIMIZE VIBRATION.
13. ALL WIRING SHALL BE AS PER EQUIPMENT SUPPLIER, ELECTRICAL CONTRACTOR TO COORDINATE.
14. THE ELECTRICAL CONTRACTOR SHALL REFER TO THE MECHANICAL CONTROL WIRING DIAGRAM AND FURNISH AND INSTALL ALL ITEMS AND DEVICES CALLED FOR IN THE CONTROL DIAGRAM FOR A COMPLETE AND OPERABLE HEATING VENTILATING AND AIR CONDITIONING SYSTEM.
15. ALL SMOKE CARBON MONOXIDE "C.O" DETECTORS WILL BE INTERCONNECTED, SMOKE DETECTORS TYPICALLY COVER 25 FT. DIAMETER OF 12.5 FT. IN EACH DIRECTION. ADJUST SMOKE DETECTOR LOCATION ACCORDINGLY.
16. ALL BRANCH CIRCUIT THAT SUPPLY 125V, SINGLE PHASE, 15 AND 20 AMPERE OUTLET IN ALL AREAS INCLUDING KITCHEN SMALL APPLIANCES SHALL BE PROTECTED BY AN ARC-FAULT CIRCUIT INTERRUPTER, EXCEPT BATH, GARAGE, BASEMENT AND CRAWL SPACE. UNLESS NOTED AS GFCI TYPE PER C.E.C.210.12.
17. FOR GENERAL LIGHTING IN KITCHEN AND BATHROOM HAVE AN EFFICACY OF 69 LUMENS PER WATT.
18. ALL RESIDENTIAL LIGHTING INSTALLED IN ALL AREAS ARE HIGH EFFICACY LUMINAIRES OTHERWISE CONTROLLED BY A DIMMER OR OCCUPANCY SENSORS.
19. VERIFY WALL OR CEILING TYPE PRIOR TO ORDERING OF LIGHT FIXTURES.
20. ALL POWER RECEPTACLES OR OUTLETS ON DWELLING UNITS SHALL BE TAMPER PROOF RESISTANCE UNLESS OTHERWISE NOTED N.E.C.406.11.
21. NO PIPING, DUCTS OR EQUIPMENT FOREIGN TO ELECTRICAL EQUIPMENT SHALL BE PERMITTED TO BE LOCATED WITH THE DEDICATED SPACE ABOVE THE ELECTRICAL EQUIPMENT.
22. ALL APPLIANCES INSTALLED MEETS ENERGY STAR, IF AN ENERGY STAR DESIGNATION IS APPLICABLE FOR THAT APPLIANCE.
23. INTERCONNECTION. (907.2.11.3) WHERE MORE THAN ONE SMOKE ALARM IS REQUIRED TO BE INSTALLED WITHIN AN INDIVIDUAL DWELLING UNIT OR SLEEPING UNIT IN GROUP "R" OCCUPANCIES, THE SMOKE ALARMS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM WILL ACTIVATE ALL OF THE ALARMS IN THE INDIVIDUAL UNIT. PHYSICAL INTERCONNECTION OF SMOKE ALARMS SHALL NOT BE REQUIRED WHERE LISTED WIRELESS ALARMS ARE INSTALLED AND ALL ALARMS SOUND UPON ACTIVATION OF ONE ALARM. THE ALARM SHALL BE CLEARLY AUDIBLE IN ALL BEDROOMS OVER BACKGROUND NOISE LEVELS WITH ALL INTERVENING DOORS CLOSED.
24. OWNER TO SELECT LIGHT FIXTURES, WATTAGE SHOWN ARE F0R LOAD CALCULATIONS AND COMPLIANCE TO CALIFORNIA ENERGY STANDARD.
25. A LABEL STATING "EV CAPABLE" SHALL BE POSTED IN CONSPICUOUS PLACE AT THE SERVICE PANEL OR SUB-PANEL NEXT TO RACEWAY TERMINATION POINT.
26. HIGH EFFICACY LUMINAIRE MUST BE PIN BASED.
27. UNLESS LISTED OTHERWISE, THE AMPACITY OF CONDUCTORS SHALL BE BASED ON TERMINATIONS: NOT TO EXCEED 60C (140F) FOR CONDUCTOR SIZE 14AWG THROUGH 1AWG OR 75C (167F) FOR CONDUCTOR SIZES OVER 1AWG.
28. ALL ELECTRICAL EQUIPMENT SHALL TO BE LISTED AND APPROVED BY THE CITY OF LOS ANGELES RECOGNIZED TESTING LABORATORY. LAMC 93.040
29. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
30. COORDINATE EXACT LOCATION OF ELECTRICAL, TELEPHONE, DATA, CABLE TV AND SECURITY OUTLETS WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
31. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
32. ALL RECEPTACLES WITHIN KITCHEN, LAUNDRY, BUTLER'S PANTRY, BAR AND BATHROOM SHALL BE GFCI TYPE OR GFCI TYPE CIRCUIT BREAKER.
33. ALL RECEPTACLES SHALL BE LISTED AS TAMPER PROOF RESISTANCE FOR 15A AND 20A RECEPTACLES IN DWELLING UNIT, FAMILY, DINING, LIVING, PARLORS, LIBRARIES, DENS, BEDROOM, SUN ROOM, RECREATION ROOM, CLOSETS, HALLWAYS OR SIMILAR ROOM AREAS PER C.E.C. 406.12.
34. A MINIMUM OF 1-20A CIRCUIT FOR BATHROOM OUTLET. SUCH CIRCUIT SHALL HAVE NO OTHER OUTLETS. CIRCUIT MAY SERVE MORE THAN ONE BATHROOM PER N.E.C. 201-11(c)(1).
35. PROPOSED FLOOR PLAN IS FOR CONSTRUCTION. FIELD VERIFY EXISTING CONDITIONS.
36. G.C. TO VERIFY EXISTING CONDITIONS AND NOTIFY ARCHITECT OF DISCREPANCIES.
37. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
38. VERIFY KITCHEN EQUIPMENT LOCATION AND REQUIREMENTS WITH MANUFACTURER AND OWNER'S REPRESENTATIVE PRIOR TO BID AND START OF WORK.
39. VERIFY MOUNTING REQUIREMENTS OF ELECTRICAL EQUIPMENT.
40. THE DRAWINGS ARE INTENDED TO COVER A COMPLETE INSTALLATION OF SYSTEMS. THE OMISSION OF EXPRESSED REFERENCE TO ANY ITEM OF LABOR OR MATERIAL FOR THE PROPER EXECUTION OF THE WORK IN ACCORDANCE WITH PRESENT PRACTICE OF THE TRADE SHALL NOT RELIEVE THE CONTRACTOR FROM PROVIDING SUCH ADDITIONAL LABOR AND MATERIALS.
41. WORK INCLUDES ALL LABOR, MATERIALS, APPLIANCES, TOOLS, EQUIPMENT, FACILITIES, TRANSPORTATION AND SERVICES NECESSARY FOR AND INCIDENTAL TO PERFORMING ALL OPERATIONS IN CONNECTION WITH FURNISHING, DELIVERY, AND INSTALLATION OF ELECTRICAL SYSTEM, COMPLETE, AS SHOW ON THE DRAWINGS AND/OR SPECIFIED HEREIN.
42. BEFORE PROCEEDING WITH WORK CAREFULLY CHECK AND VERIFY ALL DIMENSIONS AND SIZES AND ASSUME ALL RESPONSIBILITY FOR FITTING OF MATERIALS AND EQUIPMENT TO OTHER PARTS OF EQUIPMENT AND TO STRUCTURE. WHERE APPARATUS AND EQUIPMENT HAVE BEEN INDICATED ON DRAWINGS, DIMENSIONS HAVE BEEN TAKEN FROM TYPICAL EQUIPMENT OF CLASS INDICATED. CAREFULLY CHECK DRAWINGS AND SEE EQUIPMENT WILL FIT INTO SPACES PROVIDED.
43. LOCATIONS OF CONDUITS, OUTLETS, APPARATUS AND EQUIPMENT INDICATED ON DRAWINGS ARE APPROXIMATE ONLY AND SHALL BE CHANGED TO MEET ARCHITECTURAL AND STRUCTURAL CONDITIONS AS REQUIRED.
44. ALL EQUIPMENT IS NEW UNLESS OTHERWISE AS NOTED.

TYPICAL MOUNTING HEIGHTS ABOVE FINISHED FLOOR (U.N.O. ON DRAWINGS)



MOUNTING HEIGHTS OVER OBSTRUCTION

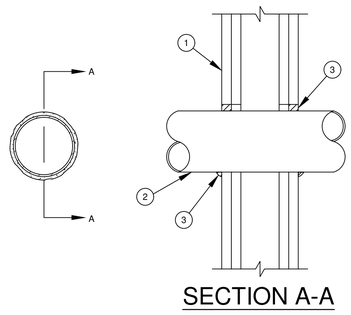
MOUNTING HEIGHTS

SCALE : N.T.S. OUTLETS, INTERCOM, CONTROLS, ETC. EXCEPT FIRE ALARM.

TYPICAL MOUNTING HEIGHTS ABOVE FINISHED FLOOR (UNLESS NOTED OTHERWISE ON DRAWINGS)

+48" TO TOP OF BOX	LIGHT SWITCHES, DIMMER SWITCHES, FIRE ALARM PULL STATION, INTERCOM CALL SWITCH, SPEAKER VOLUME CONTROL, T-STATS, BY-PASS TIMER, WALL TELEPHONE.
+18" TO BOTTOM OF BOX	ALL DUPLEX RECEPTACLES, WALL OUTLET FOR DESK TELEPHONE, COMPUTER OUTLET, UNLESS OTHERWISE NOTED.

NOTE:
PROVIDE 30"Wx27"Hx19"D MIN. TOE/KNEE CLEARANCE FOR FRONT APPROACH OVER OBSTRUCTION.



SECTION A-A

THROUGH - PENETRATION FIRESTOP SYSTEM

System No. W-L-1290
October 14, 2015
F Rating – 1 and 2 Hr (See Item 1)
T Rating – 0 Hr
L Rating at Ambient – Less than 1 CFM/Sq Ft
L Rating at 400 F – Less than 1 CFM/Sq Ft

1. Wall Assembly - The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.
   A. Studs - The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.
   B. Gypsum Board* - Nom 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet organization shall be as specified in the individual U300 or U400 Series Design in the Fire Resistance Directory. Max diam of opening is 5 in.

   The hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrant - One Metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tube to be rigidly supported on both sides of wall assembly. The annular space between the pipe or tube and periphery of the opening shall be min 0 in (point contact) to max 1/2 in. The following types and sizes of metallic pipes, conduit or tube may be used:
   A. Steel Pipe - Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. Iron Pipe - Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or steel conduit.
   D. Copper Tubing - Nom 4 in. diam (or smaller) Type L (or heavier) copper tube.
   E. Copper Pipe - Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
3. Fill, Void or Cavity Material* -Sealant - Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe and wall, a min 1/2 in diam bead of fill material shall be applied at the pipe/wall interface.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP606 Flexible Firestop Sealant

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

SCOPE OF WORK:

NEW HOUSE. INSTALLATION OF NEW 600A SERVICE AND PANELS. PROVIDE POWER TO NEW RECEPTACLES, LIGHTING, AND EQUIPMENT.

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NO.	DATE	DESCRIPTION

07 / SHEET TITLE

ELECTRICAL SYMBOLS NOTES, KEY PLAN, & ABBREV.

08 / SHEET NUMBER

E-1.0

2022 TITLE-24 SECTION 150.0(K)
HIGH LUMINOUS EFFICACY:

TABLE 150.0-A CLASSIFICATION OF HIGH LUMINOUS EFFICACY LIGHT SOURCES

Light sources in this column other that those installed in ceiling recessed downlight luminaires are classified as high luminous efficacy and are **not** required to comply with Reference Joint Appendix JA8.	Light sources in this column are required to comply with Reference Joint Appendix JA8 and shall be certified and marked as required by JA8.
1. LED light sources installed outdoors. 2. Inseparable Solid State Lighting (SSL) luminaires containing colored light sources that are installed to provide decorative lighting. 3. Pin-based linear fluorescent or compact fluorescent light sources using electronic ballasts. 4. High intensity discharge (HID) light sources including pulse start metal halide and high pressure sodium light sources. 5. Luminaires with hardwired high frequency generator and induction lamp. 6. Ceiling Fan Light Kits subject to federal appliance regulations.	7. All light sources installed in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw base sockets regardless of lamp type as specified in Section 150.0(k)1C. 8. Any light source not otherwise listed in this table.

2022 TITLE-24 SECTION 150.0(K)
ENERGY STORAGE:

(s) **Energy Storage Systems (ESS) ready.** All single-family residences that include one or two dwelling units shall meet the following. All electrical components shall be installed in accordance with the *California Electrical Code*:

1. At least one of the following shall be provided:
   A. ESS ready interconnection equipment with a minimum backed-up capacity of 60 amps and a minimum of four ESS-supplied branch circuits, or
   B. A dedicated raceway from the main service to a panelboard (subpanel) that supplies the branch circuits in Section 150.0(s)(2). All branch circuits are permitted to be supplied by the main service panel prior to the installation of an ESS. The trade size of the raceway shall be not less than one inch. The panelboard that supplies the branch circuits (subpanel) must be labeled "Subpanel shall include all backed-up load circuits."
2. A minimum of four branch circuits shall be identified and have their source of supply collocated at a single panelboard suitable to be supplied by the ESS. At least one circuit shall supply the refrigerator, one lighting circuit shall be located near the primary egress, and at least one circuit shall supply a sleeping room receptacle outlet.
3. The main panelboard shall have a minimum busbar rating of 225 amps.
4. Sufficient space shall be reserved to allow future installation of a system isolation equipment/transfer switch within 3 feet of the main panelboard. Raceways shall be installed between the panelboard and the system isolation equipment/transfer switch location to allow the connection of backup power source.

LIGHTING FIXTURE SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER AND CATALOG NUMBER	WATTS
RD	RECESSED LED DOWNLIGHT	OWNER CHOICE	10.5W
RW	RECESSED LED ACCENT	OWNER CHOICE	10.5W
WS	SURFACE MOUNTED SCONCE	OWNER CHOICE	15W
LN	LED LINEAR	OWNER CHOICE	40W

CODES, STANDARDS & GUIDES

PARTIAL LIST OF APPLICABLE CODES AS OF January 1, 2023

2022 California Administrative Code (CAC), Part 1, Title 24 CCR
2022 California Building Code (CBC), Part 2, Title 24 CCR
(2021 International Building Code, Vol. 1 & 2, and 2022 California amendments)
2022 California Electrical Code (CEC), Part 3, Title 24 CCR
(2020 National Electrical Code and 2019 California Amendments)
2022 California Mechanical Code (CMC), Part 4, Title 24 CCR
(2021 IAPMO Uniform Mechanical Code and 2022 California amendments)
2022 California Plumbing Code (CPC), Part 5, Title 24 CCR
(2021 IAPMO Uniform Plumbing Code and 2022 California amendments)
2022 California Energy Code (CEC), Part 6, Title 24 CCR
2022 California Fire Code (CFC), Part 9, Title 24 CCR
(2021 International Fire Code and 2022 California Amendments)
2022 California Existing Building Code (CEBC), Part 10, Title 24 CCR
(2021 International Existing Building Code and 2022 California Amendments)
2022 California Green Building Standards Code (CALGreen), Part 11, Title 24 CCR
2022 California Referenced Standards Code, Part 12, Title 24 CCR
Title 19 CCR, Public Safety, State Fire Marshal Regulations 2016 ASME A17.1/CSA B44-13 Safety Code for Elevators and Escalators
Note: Cal/OSHA Elevator Unit enforces CCR Title 8 and uses the 2004 ASME A17.1 by adoption

2022 TITLE-24 SECTION 150.0(K)
RESIDENTIAL LIGHTING REQTS:

(k) **Residential lighting.**

1. **Luminaire requirements.**
   A. **Luminaire efficacy.** All installed luminaires shall meet the requirements in Table 150.0-A.

   Exception 1 to Section 150.0(k)1A: Integrated device lighting. Lighting integral to exhaust fans, kitchen range hoods, bath vanity mirrors and garage door openers.

   Exception 2 to Section 150.0(k)1A: Navigation lighting such as night lights, step lights, and path lights less than 5 watts.

   Exception 3 to Section 150.0(k)1A: Cabinet lighting. Lighting internal to drawers, cabinetry and linen closets with an efficacy of 45 lumens per watt or greater.

   B. **Screw-based luminaires.** Screw-based luminaires shall contain lamps that comply with Reference Joint Appendix JA8.

   C. **Recessed downlight luminaires in ceilings.** Luminaires recessed into ceilings shall meet all of the following requirements:
      i. Shall not contain screw base lamp sockets; and
      ii. Have a label that certifies the luminaire is airtight with air leakage less than 2.0 cfm at 75 Pascals when tested in accordance with ASTM E283. An exhaust fan housing with integral light shall not be required to be certified airtight; and
      iii. Be sealed with a gasket or caulk between the luminaire housing and ceiling, and have all air leak paths between conditioned and unconditioned spaces sealed with a gasket or caulk, or be installed per manufacturer's instructions to maintain airtightness between the luminaire housing and ceiling; and
      iv. Meet the clearance and installation requirements of California Electrical Code Section 410.116 for recessed luminaires.

   Exception to Sections 150.0(k)1Cii and iii: Recessed luminaires marked for use in fire-rated installations extruded into ceiling space and recessed luminaires installed in noninsulated ceilings.

   D. **Light sources in enclosed or recessed luminaires.** Lamps and other separable light sources that are not compliant with the JA8 elevated temperature requirements, including marking requirements, shall not be installed in enclosed or recessed luminaires.

   E. **Blank electrical boxes.** The number of electrical boxes that are more than 5 feet above the finished floor and do not contain a luminaire or other device shall be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, low voltage wiring or fan speed control.

2. **Indoor lighting controls.**
   A. Lighting shall have readily accessible wall-mounted controls that allow the lighting to be manually turned ON and OFF.

   Exception to Section 150.0(k)2A: Ceiling fans may provide control of integrated lighting via a remote control.

   B. No controls shall bypass a dimmer, occupant sensor or vacancy sensor function where that dimmer or sensor has been installed to comply with Section 150.0(k).

   C. Lighting controls shall comply with the applicable requirements of Section 110.9.

   D. An Energy Management Control System (EMCS) or a multiscene programmable control may be used to comply with dimming, occupancy and lighting control requirements in Section 150.0(k)2 if it provides the functionality of the specified controls in accordance with Section 110.9, and the physical controls specified in Section 150.0(k)2A.

   E. **Automatic-off controls.**
      i. In bathrooms, garages, laundry rooms, utility rooms and walk-in closets, at least one installed luminaire shall be controlled by an occupancy or vacancy sensor providing automatic-off functionality.
      ii. For lighting internal to drawers and cabinetry with opaque fronts or doors, controls that turn the light off when the drawer or door is closed shall be provided.

   F. **Dimming controls**. Lighting in habitable spaces, including but not limited to living rooms, dining rooms, kitchens and bedrooms, shall have readily accessible wall-mounted dimming controls that allow the lighting to be manually adjusted up and down. Forward phase cut dimmers controlling LED light sources in these spaces shall comply with NEMA SSL 7A.

   Exception 1 to Section 150.0(k)2F: Ceiling fans may provide control of integrated lighting via a remote control.

   Exception 2 to Section 150.0(k)2F: Luminaires connected to a circuit with controlled lighting power less than 20 watts or controlled by an occupancy or vacancy sensor providing automatic-off functionality.

   Exception 3 to Section 150.0(k)2F: Navigation lighting such as night lights, step lights, and path lights less than 5 watts, and lighting internal to drawers and cabinetry with opaque fronts or doors or with automatic-off controls.

   G. **Independent controls.** Integrated lighting of exhaust fans shall be controlled independently from the fans. The following shall be controlled separately from ceiling-installed lighting such that one can be turned on without turning on the other:
      i. Undercabinet lighting.
      ii. Undershelf lighting.
      iii. Interior lighting of display cabinets.
      iv. Switched outlets.

3. **Residential outdoor lighting.** In addition to meeting the requirements of Section 150.0(k)1A, luminaires providing residential outdoor lighting shall meet the following requirements, as applicable:
   A. For single-family residential buildings, outdoor lighting permanently mounted to a residential building or to other buildings on the same lot shall meet the requirement in Item i and the requirements in either Item ii or Item iii:
      i. Controlled by a manual ON and OFF control switch that permits the automatic actions of items ii or iii below; and
      ii. Controlled by a photocell and either a motion sensor or an automatic time switch control; or
      iii. Controlled by an astronomical time clock control.

   Controls that override to ON shall not be allowed unless the override automatically returns the automatic control to its normal operation within 6 hours. An energy management control system that provides the specified lighting control functionality and complies with all requirements applicable to the specified controls may be used to meet these requirements.

4. **Internally illuminated address signs.** Internally illuminated address signs shall either:
   A. Comply with Section 140.8; or
   B. Consume no more than 5 watts of power.

5. **Residential garages for eight or more vehicles.** Lighting for residential parking garages for eight or more vehicles shall comply with the applicable requirements for nonresidential garages in Sections 110.9, 130.0, 130.1, 130.4, 140.6 and 141.0.

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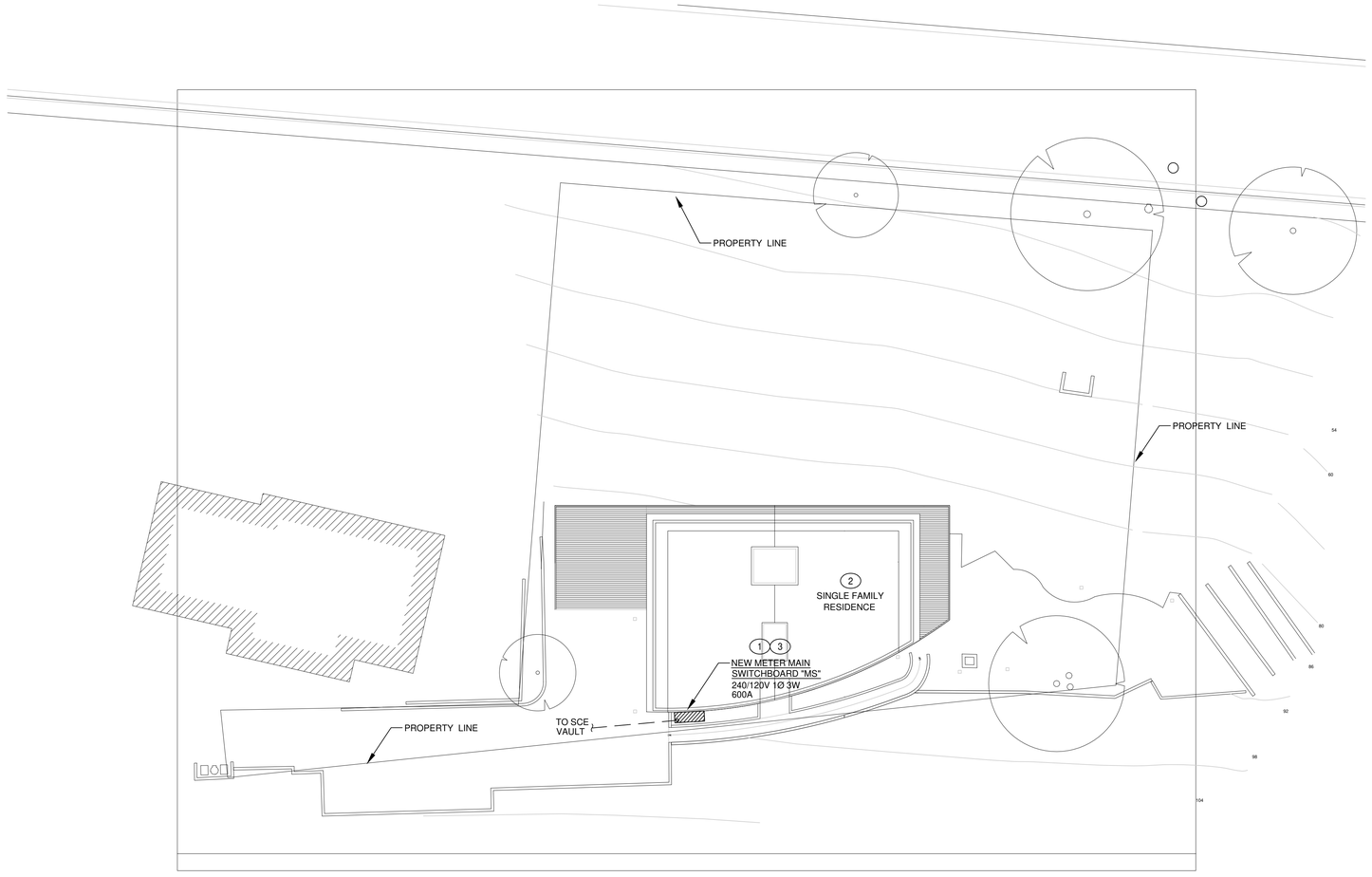
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07 / SHEET TITLE

TITLE-24
GUIDELINES

08 / SHEET NUMBER

E-1.1



1 2 SITE PLAN – ELECTRICAL 1
SCALE: 1/16" = 1'–0"

GENERAL NOTES:

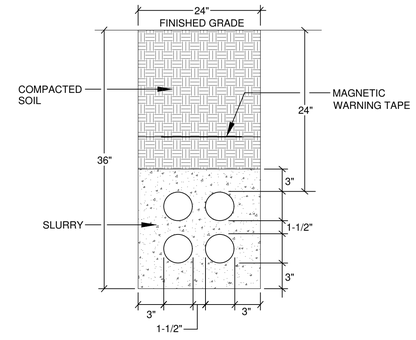
1. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
2. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-8.0 & 9.0 FOR ADDITIONAL INFORMATION.
3. REFER TO ELECTRICAL LEAD SHEET FOR LEGENDS, ABBREVIATIONS, AND GENERAL NOTES.
4. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
5. COORDINATE EXACT LOCATION OF ELECTRICAL, TELEPHONE, DATA, CABLE TV AND SECURITY OUTLETS WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
6. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
7. ROUTE ALL CONDUIT PER FIELD CONDITION.
8. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.
9. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING TRADE PRIOR TO BID AND START OF WORK.

KEY NOTES:

(1) COORDINATE WITH SCE ALL REQUIREMENTS PRIOR TO BID AND START OF WORK.

(2) SEE ENLARGED LIGHTING AND POWER & SYSTEMS PLAN FOR ADDITIONAL INFORMATION.

(3) PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.



1 / E-2.0 CONDUIT DUCT BANK SECTION
N.T.S.

NOTE: DETAILS SHOWS TYPICAL CONDUIT SPACING AND DEPTH ONLY. REFER TO DRAWINGS FOR EXACT QUANTITY AND SIZES OF CONDUITS. IN PAVED AREAS, BACKFILL WITH SLURRY.

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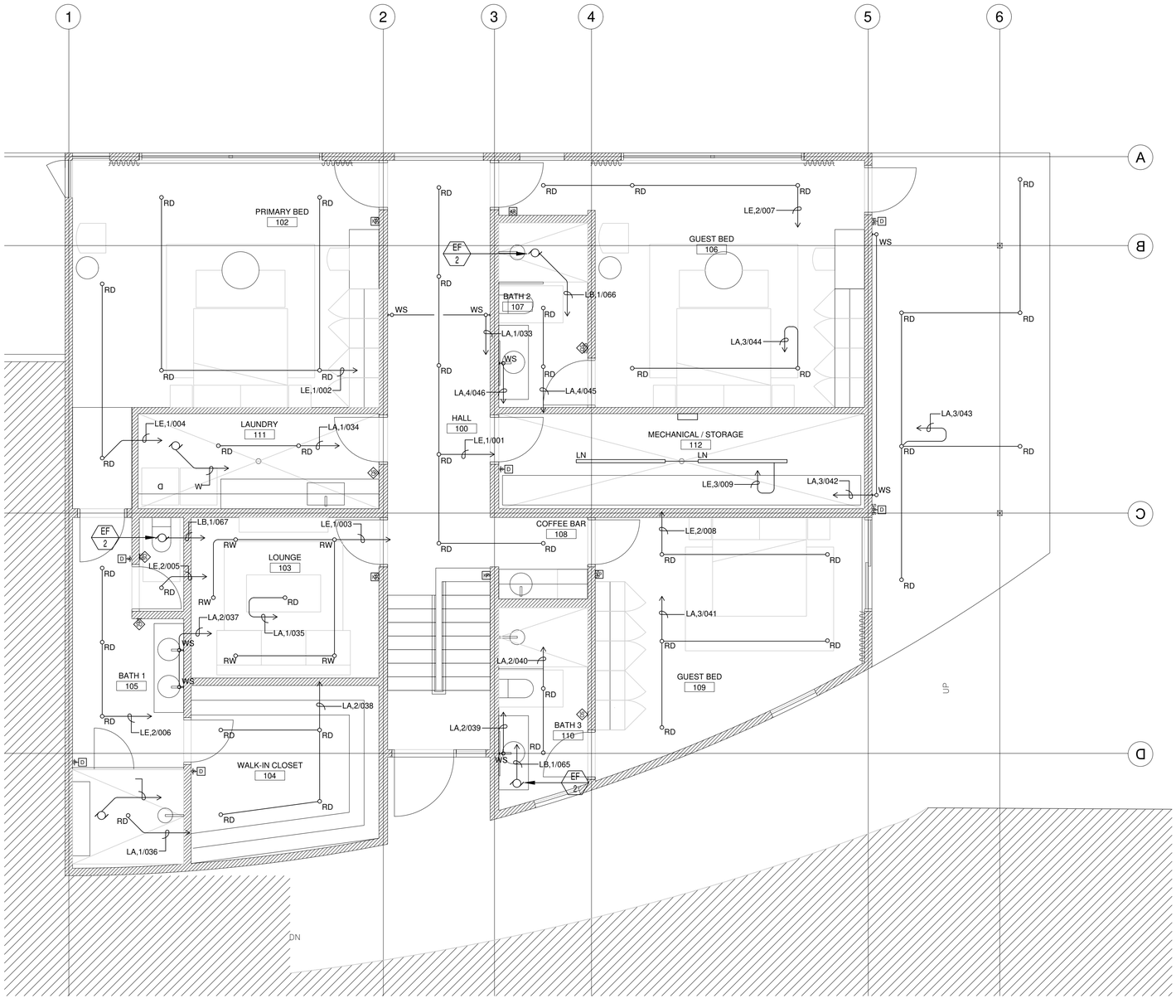
NO.	DATE	DESCRIPTION

07 / SHEET TITLE

SITE PLAN - ELECTRICAL

08 / SHEET NUMBER

E-2.0



FIRST FLOOR PLAN – LIGHTING

SCALE: 1/4" = 1'–0"

GENERAL NOTES:

1. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-11.0, 12.0, & 12.1 FOR ADDITIONAL INFORMATION.
2. REFER TO ELECTRICAL LEAD SHEET FOR LEGENDS, ABBREVIATIONS, AND GENERAL NOTES.
3. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
4. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
5. ROUTE ALL CONDUIT PER FIELD CONDITION.
6. COORDINATE EXACT LOCATION OF LIGHT FIXTURES AND TYPE WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
7. CONTRACTOR SHALL COORDINATE LUTRON HOMEWORKS LIGHTING PANEL MODULES AND LIGHTING CONTROLS WITH LIGHTING CONSULTANT OR OWNER'S REPRESENTATIVE PRIOR TO BID AND START OF WORK.
8. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.
9. ALL LIGHTING AND LIGHTING CONTROLS SHALL COMPLY WITH CA TITLE 24 150.0(k).
10. EXHAUST FANS MUST BE SEPARATELY SWITCHED FROM LIGHTING CIRCUITS

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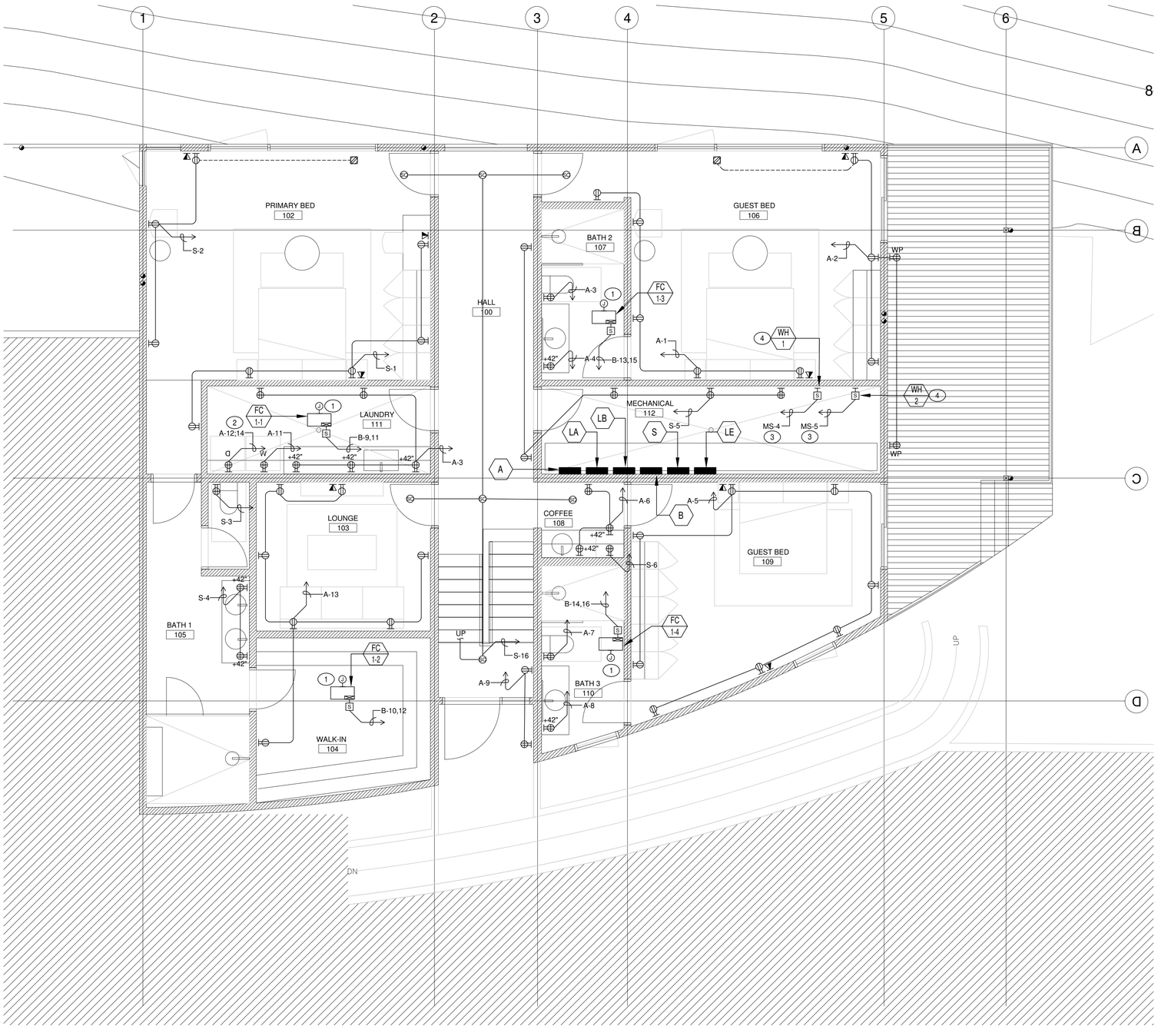
NO.	DATE	DESCRIPTION

07 / SHEET TITLE

FIRST FLOOR PLAN - LIGHTING

08 / SHEET NUMBER

E-3.0



FIRST FLOOR PLAN – POWER & SYSTEMS (1)

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

GENERAL NOTES:

1. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
2. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-11.0, 12.0, & 12.1 FOR ADDITIONAL INFORMATION.
3. REFER TO ELECTRICAL LEAD SHEET FOR LEGENDS, ABBREVIATIONS, AND GENERAL NOTES.
4. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
5. COORDINATE EXACT LOCATION OF ELECTRICAL, TELEPHONE, DATA, CABLE TV AND SECURITY OUTLETS WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
6. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
7. ROUTE ALL CONDUIT PER FIELD CONDITION.
8. VERIFY KITCHEN EQUIPMENT LOCATION AND REQUIREMENTS WITH MANUFACTURER AND OWNER'S REPRESENTATIVE PRIOR TO BID AND START OF WORK.
9. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.
10. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING TRADE PRIOR TO BID AND START OF WORK.
11. ALL RECEPTACLES WITHIN KITCHEN, LAUNDRY, BUTLER'S PANTRY, BAR AND BATHROOM SHALL BE GFCI TYPE OR GFCI TYPE CIRCUIT BREAKER.
12. ALL RECEPTACLES SHALL BE LISTED AS TAMPER PROOF RESISTANCE FOR 15A AND 20A RECEPTACLES IN DWELLING UNIT. FAMILY, DINING, LIVING, PARLORS, LIBRARIES, DENS, BEDROOM, SUN ROOM, RECREATION ROOM, CLOSETS, HALLWAYS OR SIMILAR ROOM AREAS PER C.E.C. 406.12.
13. A MINIMUM OF 1-20A CIRCUIT FOR BATHROOM OUTLET. SUCH CIRCUIT SHALL HAVE NO OTHER OUTLETS. CIRCUIT MAY SERVE MORE THAN ONE BATHROOM PER N.E.C. 201-11(c)(1).

KEYED NOTES:

1. PROVIDE 1/2"C.O. TO CORRESPONDING THERMOSTAT/CONDENSING UNIT. CONTROL WIRING PER MECHANICAL TRADE.
2. 1/2"C. 2#10, 1#10 GRD.
3. 1 1/2"C. 2#1, 1#6 GRD.
4. COORDINATE WITH MANUFACTURER FOR INSTALLATION AND SET UP INSTRUCTIONS PRIOR TO START OF WORK.

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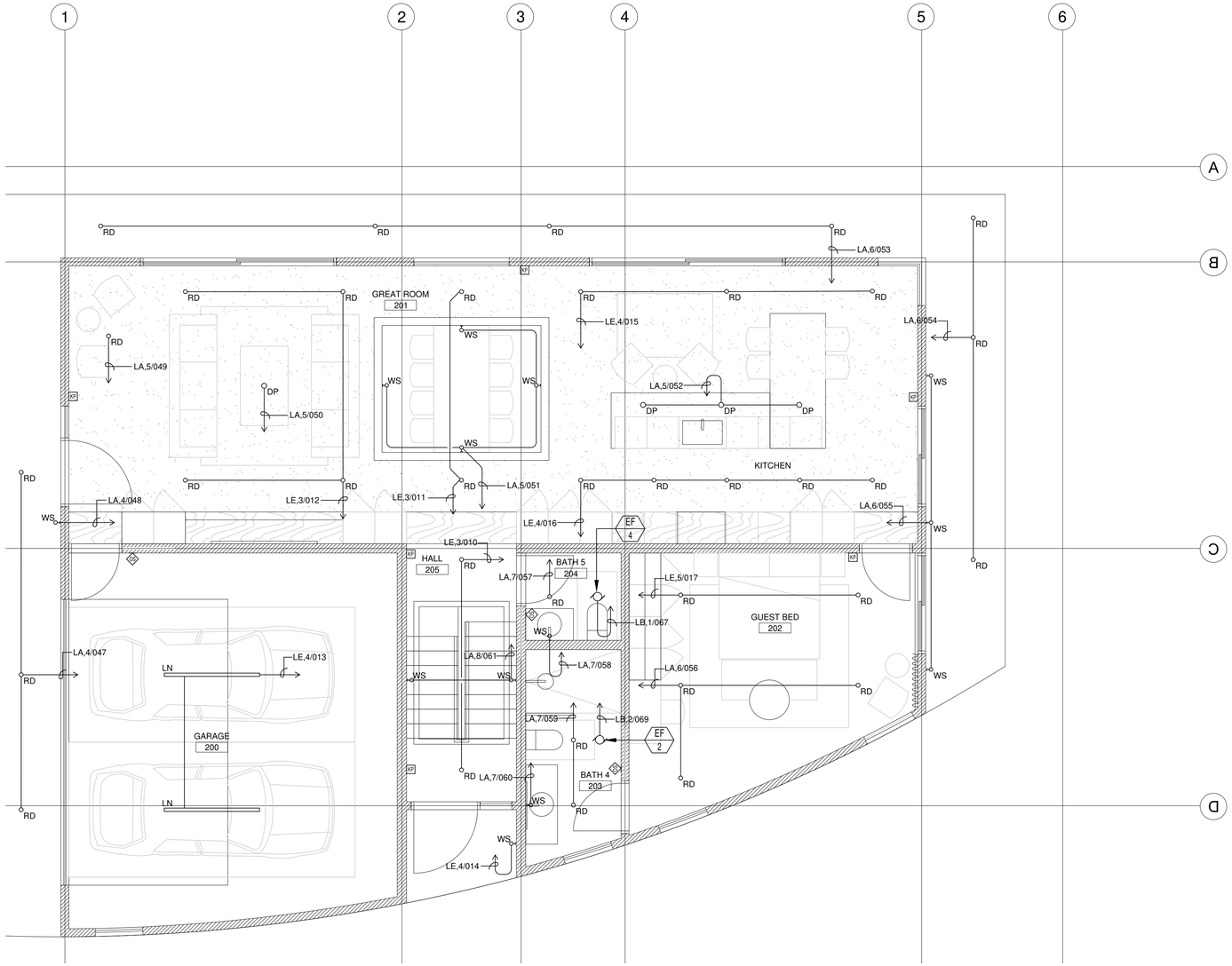
NO.	DATE	DESCRIPTION

07 / SHEET TITLE

FIRST FLOOR PLAN - POWER & SYSTEMS

08 / SHEET NUMBER

E-4.0



SECOND FLOOR PLAN – LIGHTING

SCALE: 1/4" = 1'–0"

GENERAL NOTES:

1. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-11.0, 12.0, & 12.1 FOR ADDITIONAL INFORMATION.
2. REFER TO ELECTRICAL LEAD SHEET FOR LEGENDS, ABBREVIATIONS, AND GENERAL NOTES.
3. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
4. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
5. ROUTE ALL CONDUIT PER FIELD CONDITION.
6. COORDINATE EXACT LOCATION OF LIGHT FIXTURES AND TYPE WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
7. CONTRACTOR SHALL COORDINATE LUTRON HOMEWORKS LIGHTING PANEL MODULES AND LIGHTING CONTROLS WITH LIGHTING CONSULTANT OR OWNER'S REPRESENTATIVE PRIOR TO BID AND START OF WORK.
8. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.
9. ALL LIGHTING AND LIGHTING CONTROLS SHALL COMPLY WITH CA TITLE 24 150.0(k).

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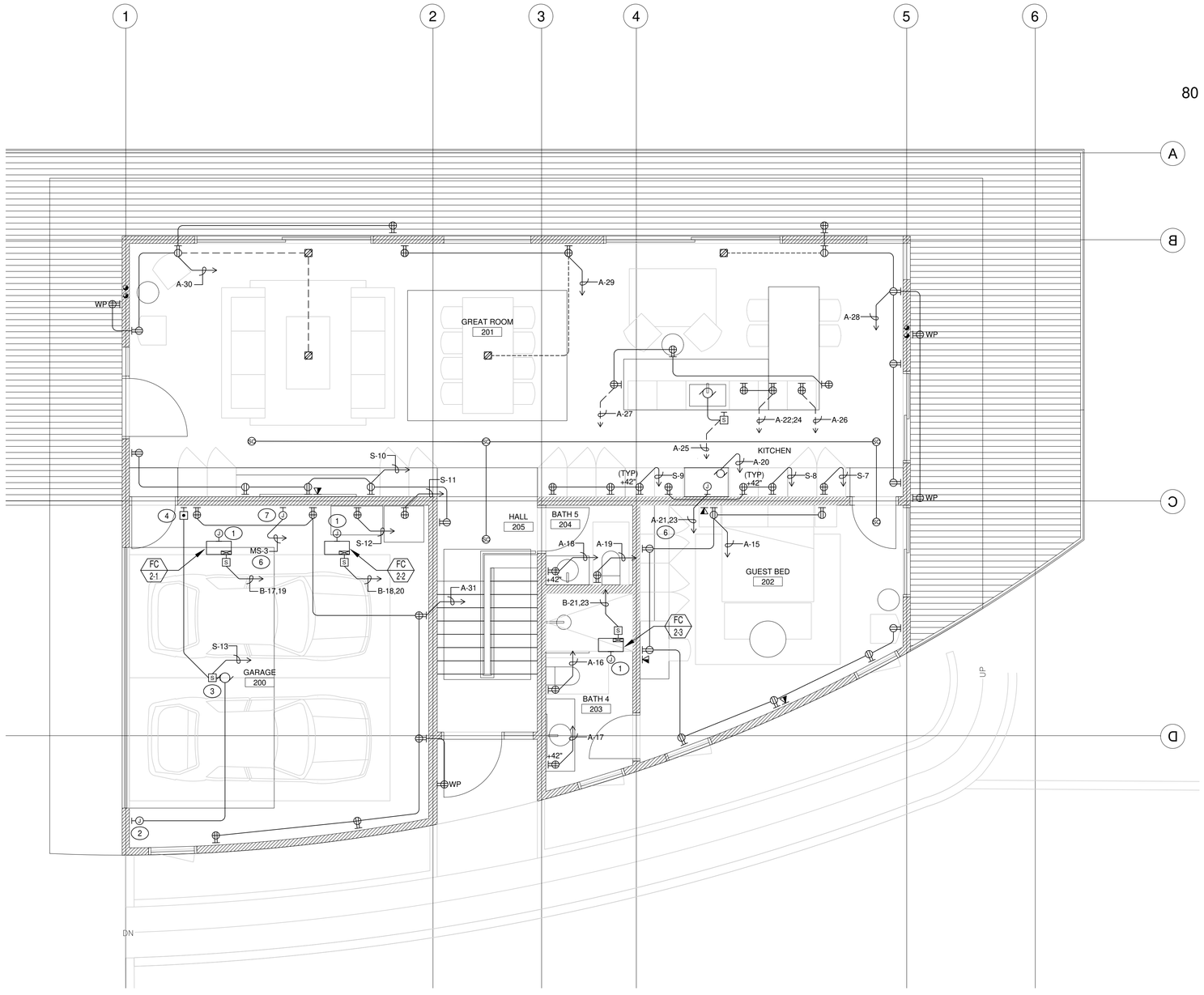
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07 / SHEET TITLE

SECOND FLOOR PLAN
- LIGHTING

08 / SHEET NUMBER

E-5.0



SECOND FLOOR PLAN – POWER & SYSTEMS (1)

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

GENERAL NOTES:

1. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
2. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-11.0, 12.0, & 12.1 FOR ADDITIONAL INFORMATION.
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4. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
5. COORDINATE EXACT LOCATION OF ELECTRICAL, TELEPHONE, DATA, CABLE TV AND SECURITY OUTLETS WITH ARCHITECT/OWNER'S REPRESENTATIVE PER FIELD CONDITIONS PRIOR TO START OF WORK.
6. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
7. ROUTE ALL CONDUIT PER FIELD CONDITION.
8. VERIFY KITCHEN EQUIPMENT LOCATION AND REQUIREMENTS WITH MANUFACTURER AND OWNER'S REPRESENTATIVE PRIOR TO BID AND START OF WORK.
9. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.
10. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING TRADE PRIOR TO BID AND START OF WORK.
11. ALL RECEPTACLES WITHIN KITCHEN, LAUNDRY, BUTLER'S PANTRY, BAR AND BATHROOM SHALL BE GFCI TYPE OR GFCI TYPE CIRCUIT BREAKER.
12. ALL RECEPTACLES SHALL BE LISTED AS TAMPER PROOF RESISTANCE FOR 15A AND 20A RECEPTACLES IN DWELLING UNIT. FAMILY, DINING, LIVING, PARLORS, LIBRARIES, DENS, BEDROOM, SUN ROOM, RECREATION ROOM, CLOSETS, HALLWAYS OR SIMILAR ROOM AREAS PER C.E.C. 406.12.
13. A MINIMUM OF 1-20A CIRCUIT FOR BATHROOM OUTLET. SUCH CIRCUIT SHALL HAVE NO OTHER OUTLETS. CIRCUIT MAY SERVE MORE THAN ONE BATHROOM PER N.E.C. 201-11(c)(1).

KEYED NOTES:

1. PROVIDE 1/2"C.O. TO CORRESPONDING THERMOSTAT/CONDENSING UNIT. CONTROL WIRING PER MECHANICAL TRADE.
2. GARAGE SAFETY SENSOR. COORDINATE WITH SUPPLIER.
3. POWER FOR 1/2 HP 120V 1Ø GARAGE MOTOR. COORDINATE EXACT REQUIREMENTS WITH MANUFACTURER PRIOR TO BID AND START OF WORK.
4. DOOR OPENER FOR GARAGE DOOR, VERIFY EXACT CONTROL REQUIREMENTS WITH MANUFACTURER PRIOR TO BID AND START OF WORK.
5. 1/2"C. 2#10, 1#10 GRD.
6. 3/4"C. 2#6, 1#10 GRD.
7. PROVIDE POWER FOR ELECTRIC CAR CHARGER. COORDINATE WITH MANUFACTURER PRIOR TO START OF WORK.

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04 / KEY PLAN

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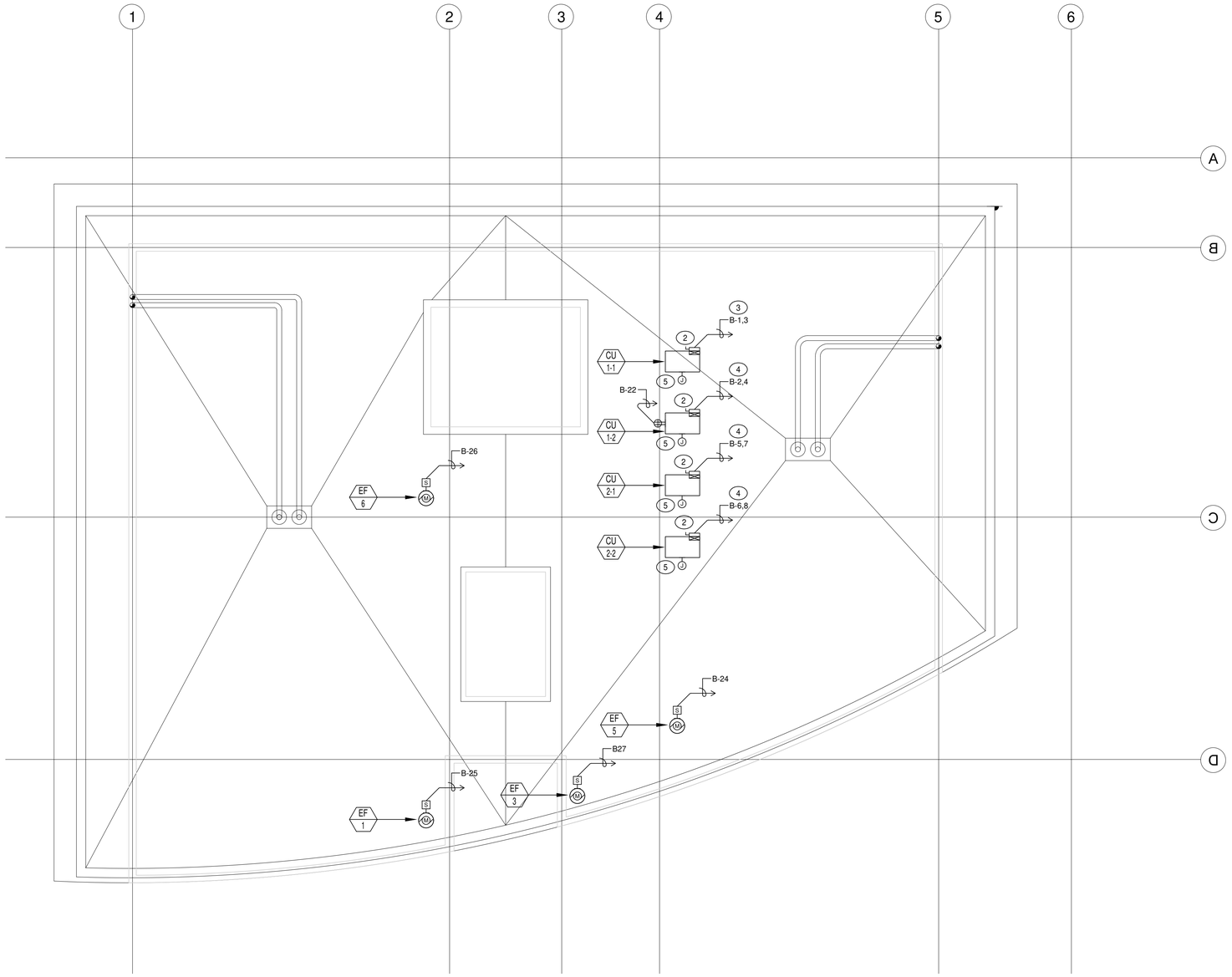
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07 / SHEET TITLE

SECOND FLOOR PLAN
- POWER & SYSTEMS

08 / SHEET NUMBER

E-6.0



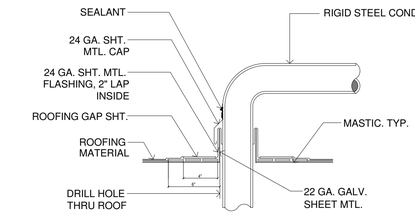
ROOF – POWER PLAN (1)
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

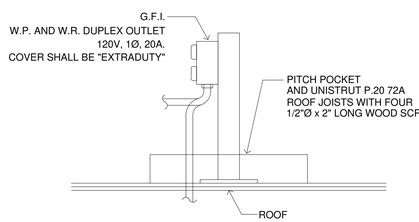
1. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
2. SEE PANEL SCHEDULE AND SINGLE LINE DIAGRAM ON SHEET E-10.0, E-11.0 & 11.1 FOR ADDITIONAL INFORMATION.
3. REFER TO ELECTRICAL LEAD SHEET FOR LEGENDS, ABBREVIATIONS, AND GENERAL NOTES.
4. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
5. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
6. ROUTE ALL CONDUIT PER FIELD CONDITION.
7. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH MECHANICAL TRADE PRIOR TO BID AND START OF WORK.

KEYED NOTES:

1. STUB OUT 2"C.O. WITH PULL STRING BACK TO MAIN SERVICE SWITCHBOARD FOR FUTURE SOLAR INSTALLATION. SOLAR SHALL BE DESIGN BUILT BY OTHERS.
2. 100AS-2P 250 VOLT RATED NON-FUSED DISCONNECT SWITCH IN NEMA 3R ENCLOSURE.
3. 1"C. 2#4, 1#8 GRD.
4. 1 1/4"C. 2#3, 1#8 GRD.
5. PROVIDE 1/2"C.O. TO CORRESPONDING THERMOSTAT/CONDENSING UNIT. CONTROL WIRING PER MECHANICAL TRADE.



ROOF PENETRATION DETAIL (A / E-6.0)
SCALE: N.T.S.



ROOF RECEPTACLE DETAIL (A / E-5.0)
SCALE: N.T.S.

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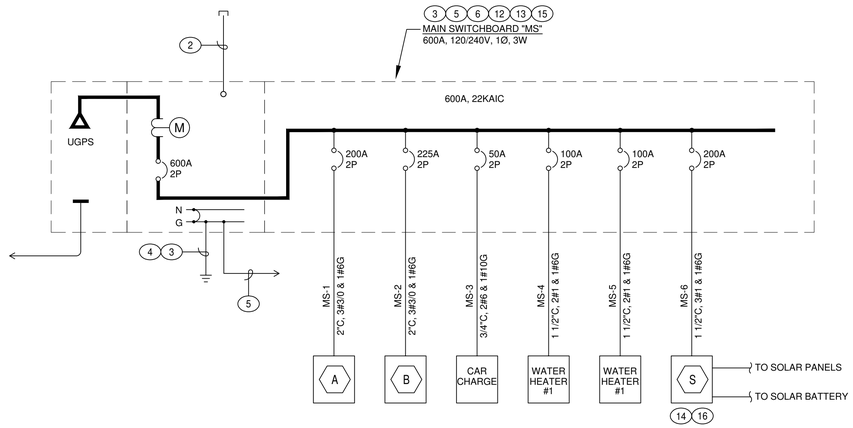
NO.	DATE	DESCRIPTION

07 / SHEET TITLE

ROOF PLAN - ELECTRICAL

08 / SHEET NUMBER

E-7.0



ELECTRICAL SERVICE LOAD CALCULATIONS:

TOTAL FLOOR AREA = 3,500 SQ. FT.

GENERAL LIGHTING CIRCUITS 3,500 SQ. FT. X 3 VA/SQ.FT.		10.5 KVA
(3) APPLIANCE CIRCUITS: 1.5 KVA EA.		4.5 KVA
(1) LAUNDRY CIRCUIT: 1.5 KVA EA.		1.5 KVA
(1) DRYER: 5.0 KVA EA.		5.0 KVA
(1) RANGE: 8.0 KVA EA. @125%		10.0 KVA
(1) RANGE HOOD: 0.5 KVA EA.		0.5 KVA
(3) FRIDGE: 0.8 KVA EA.		2.4 KVA
(1) UNDER FRIDGE: 0.5 KVA EA.		0.5 KVA
(1) GARBAGE DISPOSAL: 0.9 KVA EA.		0.9 KVA
(2) DISHWASHER: 1.0 KVA EA.		2.0 KVA
(1) MICROWAVE 1.0 KVA EA. @ 100%		1.0 KVA
(2) GARAGE/GATE MOTOR: 1.0 KVA EA. @ 125%		2.5 KVA
(5) TOILETS: 0.3 KVA EA. @ 100%		1.5 KVA
(1) EV CHARGER: 8.0 KVA EA. @ 125%		10.0 KVA
(2) WATER HEATER: 22.0 KVA EA. @ 100%		44.0 KVA
(1) CIRCULATING PUMP: 0.5 KVA EA. @ 100%		0.5 KVA
SUBTOTAL CONNECTED LOAD	=	97.3 KVA
(1) CU 1-2: 10.8 KVA EA. LARGEST MOTOR @ 125%		13.5 KVA
(2) CU 2-1,2-2: 10.8 KVA EA. @ 100%		21.6 KVA
(1) CU 1-1: 8.6 KVA EA. @ 100%		8.6 KVA
(7) AC 1-12: 0.6 KVA EA. @ 100%		4.2 KVA
(4) EF 1;3;5;6: 0.8 KVA EA. @ 100%		3.2 KVA
AC CONNECTED LOAD	=	51.1 KVA
1. FIRST 10 KVA OF SUBTOTAL @100%	=	10.0 KVA
2. REMAINDER OF SUBTOTAL @40%	=	34.9 KVA
3. HVAC CONNECTED LOAD @100%	=	51.1 KVA
TOTAL LOAD	=	96.1 KVA
I EQUIV.	=	400.4 AMP
		@240/120V 1Ø, 3W
		USE 400A-2P

GENERAL NOTES:

1. METERING IS PER LADWP REQUIREMENTS AND SPECIFICATIONS.
2. ALL DEVICES/CIRCUIT BREAKERS IN MAIN SERVICE SWITCHBOARD SHALL HAVE INTERRUPTING RATING OF 65,000 AIC MINIMUM.
3. MAIN CIRCUIT BREAKERS SHALL BE 100% FULLY RATED.
4. MAIN SWITCHBOARD IS DESIGNED FOR FRONT ACCESS ONLY.
5. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
6. SEE SITE AND FLOOR PLANS FOR ADDITIONAL INFORMATION.
7. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
8. PANELBOARDS SHALL HAVE AN INTERRUPTING RATING PER LADWP REQUIREMENTS.
9. COORDINATE WITH MANUFACTURER FOR EXACT LOCATION AND REQUIREMENTS PRIOR TO BID AND START OF WORK.
10. SEE DEMO SINGLE LINE DIAGRAM SHEET E-10.0 FOR MORE INFORMATION.
11. SEE EQUIPMENT SPECS SHEET E-10.2 FOR MORE INFORMATION.

KEYED NOTES:

1. LENGTH IS FOR FEEDER CALCULATION ONLY NOT FOR BIDDING PURPOSES.
2. STUB-OUT 2"C.O. WITH PULL STRING ABOVE ROOF, FOR FUTURE SOLAR INSTALLATIONS.
3. PROVIDE 1#3/0 COPPER GROUNDING AND CONDUIT TO (2) NEW COPPER DRIVEN GROUND ROD 6' APART. GROUND RESISTANCE READING NO MORE THAN 25 OHMS. SEE DETAIL THIS SHEET.
4. TO UFER GROUND OR COPPER DRIVEN GROUND ROD SEE DETAIL THIS SHEET.
5. PROVIDE 1#3/0 CU GROUND WIRE BOND TO COLD WATER METAL PIPE WITHIN 5'-0" OF WATER ENTRY LINE.

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NO.	DATE	DESCRIPTION

07 / SHEET TITLE

SINGLE LINE DIAGRAM

08 / SHEET NUMBER

E-8.0

PANEL "LB"

PANEL: PD8-59-F-120 EQUIPMENT: HWI-MI-120 BUS RATING: 125 AMPS

MODULE	MODULE TYPE	ZONE	CIRCUIT	ZONE NAME	INTERFACE	ZONE V.A.	BREAKER	VOLT-AMPS		
							20-1	ØB	ØC	
				MODULE INTERFACE	CONTROL					
					TOTAL WATTAGE					
1	LQSE-45B-120-D	1	065	BATH-3 110 EF	50					
		2	066	BATH-2 107 EF	50					
		3	067	BATH-1 105 EF	50					
		4	068	BATH-5 204 EF	50					
					TOTAL WATTAGE	200	1	200		
2	LQSE-45B-120-D	1	069	BATH-4 203	50					
		2	070	SPARE	0					
		3	071	SPARE	0					
		4	072	SPARE	0					
					TOTAL WATTAGE	50	2		50	
3	LQSE-47S-120-D	1	073	SPARE	0					
		2	074	SPARE	0					
		3	075	SPARE	0					
		4	076	SPARE	0					
					TOTAL WATTAGE	0	3	0		
4	LQSE-47S-120-D	1	077	SPARE	0					
		2	078	SPARE	0					
		3	079	SPARE	0					
		4	080	SPARE	0					
					TOTAL WATTAGE	0	4		0	
					TOTAL V.A. PER PHASE			200	50	
					TOTAL CONNECTED LOAD = 250 x 125% =			V.A.	313	
					VOLT-AMPS @ 120/240V - 1 PHASE - 3 WIRE =			1.3 AMPS		

PANEL "LE"

PANEL: PD8-59-F-120 EQUIPMENT: HWI-MI-120 BUS RATING: 125 AMPS

MODULE	MODULE TYPE	ZONE	CIRCUIT	ZONE NAME	INTERFACE	ZONE V.A.	BREAKER	VOLT-AMPS		
							20-1	ØB	ØC	
				MODULE INTERFACE	CONTROL					
					TOTAL WATTAGE					
1	LQSE-47S-120-D	1	001	HALL 100	128					
		2	002	PRIMARY BED 102	40					
		3	003	LOUNGE 103	15					
		4	004	PRIMARY BED 102	20					
					TOTAL WATTAGE	203	1	203		
2	LQSE-47S-120-D	1	005	BATH 1 WC 105	10					
		2	006	BATH 1 105	15					
		3	007	GUEST 106	10					
		4	008	GUEST 109	10					
					TOTAL WATTAGE	45	2		45	
3	LQSE-47S-120-D	1	009	MECHANICAL 112	256					
		2	010	HALL 205	40					
		3	011	GREAT ROOM 201 CENTER	20					
		4	012	GREAT ROOM 201 LEFT	20					
					TOTAL WATTAGE	336	3	336		
4	LQSE-47S-120-D	1	013	GARAGE 200	10					
		2	014	ENTRANCE	10					
		3	015	GREAT ROOM 200 KITCHEN	30					
		4	016	GREAT ROOM 200 KITCHEN WORK	10					
					TOTAL WATTAGE	60	4		60	
5	LQSE-47S-120-D	1	017	GUEST BED 202	10					
		2	018	BATH	30					
		3	019	BATH	10					
		4	020	GYM	20					
					TOTAL WATTAGE	70	5	70		
6	LQSE-45B-120-D	1	021	GYM	20					
		2	022	GYM	20					
		3	023	MECH ROOM	10					
		4	024	BED	30					
					TOTAL WATTAGE	80	6		80	
7	LQSE-47S-120-D	1	025	BED	10					
		2	026	BED	40					
		3	027	CLOSET	10					
		4	028	SPARE	0					
					TOTAL WATTAGE	60	7	60		
8	LQSE-45B-120-D	1	029	WELLNESS EF-2	50					
		2	030	WELLNESS EF-3	50					
		3	031	BATH EF-4	50					
		4	032	SPARE	0					
					TOTAL WATTAGE	150	8		150	
					TOTAL V.A. PER PHASE			500	500	
					TOTAL CONNECTED LOAD = 1000 x 125% =			V.A.	1250	
					VOLT-AMPS @ 120/240V - 1 PHASE - 3 WIRE =			5.2 AMPS		

PANEL "LA"

PANEL: PD8-59-F-120 EQUIPMENT: HWI-MI-120 BUS RATING: 125 AMPS

MODULE	MODULE TYPE	ZONE	CIRCUIT	ZONE NAME	INTERFACE	ZONE V.A.	BREAKER	VOLT-AMPS		
							20-1	ØB	ØC	
				MODULE INTERFACE	CONTROL					
					TOTAL WATTAGE					
1	LQSE-47S-120-D	1	033	HALL 100	20					
		2	034	LAUNDRY 111	45					
		3	035	LOUNGE 103	10					
		4	036	BATH SHOWER 105	10					
					TOTAL WATTAGE	85	1	85		
2	LQSE-47S-120-D	1	037	BATH 1 105	15					
		2	038	WALK-IN 104	10					
		3	039	BATH 3 110	30					
		4	040	BATH 3 110	10					
					TOTAL WATTAGE	65	2		65	
3	LQSE-47S-120-D	1	041	GUEST BED 109	10					
		2	042	LOWER PATIO SCONCE	10					
		3	043	LOWER PATIO	10					
		4	044	GUEST BED 106	20					
					TOTAL WATTAGE	50	3	50		
4	LQSE-47S-120-D	1	045	BATH 2 107	30					
		2	046	BATH 2 107	30					
		3	047	GARAGE 200	10					
		4	048	GREAT ROOM ENTRANCE	10					
					TOTAL WATTAGE	80	4		80	
5	LQSE-47S-120-D	1	049	GREAT 201 WEST	20					
		2	050	GREAT 201 SITTING	40					
		3	051	GREAT 201 DINING	30					
		4	052	GREAT 201 KITCHEN	10					
					TOTAL WATTAGE	100	5	100		
6	LQSE-47S-120-D	1	053	EXTERIOR PATIO	10					
		2	054	EXTERIOR PATIO EAST	40					
		3	055	EXTERIOR PATIO WALL	10					
		4	056	GUEST BED 202	100					
					TOTAL WATTAGE	160	6		160	
7	LQSE-47S-120-D	1	057	BATH 5	30					
		2	058	BATH 5	10					
		3	059	BATH 4	20					
		4	060	BATH 4	30					
					TOTAL WATTAGE	90	7	90		
8	LQSE-47S-120-D	1	061	ENTRANCE STAIR	50					
		2	062	SPARE	0					
		3	063	SPARE	0					
		4	064	SPARE	0					
					TOTAL WATTAGE	150	8		150	
					TOTAL V.A. PER PHASE			500	500	
					VOLT-AMPS @ 120/240V - 1 PHASE - 3 WIRE =			5.2 AMPS		

PANEL A

120/240 VOLTS
1 PHASE
3 WIRE

MAIN BRK: MLO BUS RATING: 225A
AIC RATING: 22,000A MOUNTING: RECESSED

LOCATION	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LTG	REC	MIS	CIR	BKR		BKR	CIR	MIS	REC	LTG	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LOCATION
GUEST BED REC.	900						1	20-1		20-1	2	1			1080			GUEST ROOM REC. 2 WINDOW
GUEST BATH-2 TOILET		300					3	20-1		20-1	4					180		GUEST BATH 2 REC.
GUEST ROOM REC. 3	1440						5	20-1		20-1	6			1500				COFFEE BAR APPLIANCE
GUEST ROOM 3 TOILET		300					7	20-1		20-1	8					180		GUEST BATH 3 REC.
ENTRANCE REC.	360						9	20-1		20-1	10			900				LAUNDRY REC.
WASHER		1500					11	20-1		30-2	12					2500		DRYER
LOUNGE REC.	1260						13	20-1		-	14			2500				- - -
GUEST BED 4 REC.		1440					15	20-1		20-1	16					300		GUEST BATH 4 TOILET
GUEST BATH-4 REC.	180						17	20-1		20-1	18			180				BATH 5 REC.
BATH 5 TOILET		300					19			20-1	20					500		RANGE HOOD
RANGE	4000						21	50-2		20-1	22			1000				DISHWASHER 1
- - -		4000					23	-		20-1	24					1000		DISHWASHER 2
GARBAGE DISPOSAL	900						25	20-1		20-1	26			1000				MICROWAVE
ISLAND REC.		540					27	20-1		20-1	28					1440		KITCHEN GENERAL REC.
DINING REC.	1500						29	20-1		20-1	30			1080				GREAT ROOM REC.
GARAGE REC.		1080					31	20-1		20-1	32					500		FUTURE CIRCULATING PUMP
PANEL LA	500						33	30-2		30-2	34			200				PANEL LB
- - -		500					35	-		-	36					50		- - -
SPACE							37	20-1		20-1	38							SPACE
SPACE							39	20-1		20-1	40							SPACE
SPACE							41	20-1		20-1	42							SPACE

PH-A= 20480 VA PH-B= 15610 VA PH-C= - - - VA
TOTAL CONNECTED LOAD: 37090 VA OR 154.5 AMPS @ 120/240 VOLTS ~ 1 PHASE
LCL: 9150 VA X 1.25% = 11438 VA
FDL: 27940 VA + 11438 VA (LCL) = 39378 VA OR 164.1 A

PANEL B

120/208 VOLTS
3 PHASE
4 WIRE

MAIN BRK: MLO BUS RATING: 225A
AIC RATING: 22,000A MOUNTING: RECESSED

LOCATION	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LTG	REC	MIS	CIR	BKR		BKR	CIR	MIS	REC	LTG	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LOCATION
CU 1-1	4300						1	70-2		80-2	2	1			5400			CU 1-2
- - -		4300					3				4					5400		- - -
CU 2-1	5400						5	80-2		80-2	6			5400				CU 2-2
- - -		5400					7	-		-	8					5400		- - -
FC 1-1	300						9	15-2		15-2	10			300				FC 1-2
- - -		300					11	-		-	12					300		- - -
FC 1-3	300						13	15-2		15-2	14			300				FC 1-4
- - -		300					15	-		-	16					300		- - -
FC 2-1	300						17	15-2		15-2	18			300				FC 2-2
- - -		300					19	-		-	20					300		- - -
FC 2-3	300						21	15-2		20-1	22			180				ROOF REC.
- - -		300					23	-		20-1	24					750		EF-5
EF-1	750						25	20-1		SPC	26						750	EF-6
EF-3		750					27	20-1		SPC	28							SPARE
SPACE							29	SPC		SPC	30							SPARE
SPACE							31	SPC		SPC	32							SPACE
SPACE							33	SPC		SPC	34							SPACE
SPACE							35	SPC		SPC	36							SPACE
SPACE							37	SPC		SPC	38							SPACE
SPACE							39	SPC		SPC	40							SPACE
SPACE							41	SPC		SPC	42							SPACE

PH-A= 24280 VA PH-B= 24100 VA PH-C= - - - VA
TOTAL CONNECTED LOAD: 48380 VA OR 201.6 AMPS @ 120/240 VOLTS ~ 1 PHASE
LCL: 10900 VA X 1.25% = 13500 VA
FDL: 37580 VA + 13500 VA (LCL) = 51080 VA OR 212.8 A

PANEL S

120/240 VOLTS
1 PHASE
3 WIRE

MAIN BRK: MLO BUS RATING: 125A
AIC RATING: 22,000A MOUNTING: RECESSED

LOCATION	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LTG	REC	MIS	CIR	BKR		BKR	CIR	MIS	REC	LTG	WATTAGE PH-A	WATTAGE PH-B	WATTAGE - - -	LOCATION
PRIMARY BED REC. EAST	900				3		1	20-1		20-1	2		1		720			PRIMARY BED REC. WEST
PRIMARY TOILET		300					3	20-1		20-1	4					540		PRIMARY BATH REC.
MECHANICAL REC.	900						5	20-1		20-1	6			500				COFFEE BAR UC FRIDGE
KITCHEN FRIDGE		800					7	20-1		20-1	8					1500		KITCHEN APPLIANCE RIGHT
KITCHEN APPLIANCE LEFT	1500						9	20-1		20-1	10			900				GREAT ROOM REC.
GARAGE FRIDGE		800					11	20-1		20-1	12					800		GARAGE FREEZER
GARAGE MOTOR	1000						13	20-1		20-1	14			1000				FUTURE GATE MOTOR
PANEL LE		500					15	30-2		20-1	16					400		SMOKE/CO
- - -	500						17	-		20-1	18							SPARE
SPARE							19	20-1		20-1	20							SPARE
SPARE							21	20-1		20-1	22							SPARE
SPARE							23	20-1		20-1	24							SPARE
SPACE							25				26							SPACE
SPACE							27				28							SPACE
SPACE							29				30							SPACE
SPACE							31				32							SPACE
SPACE							33				34							SPACE
SPACE							35				36							SPACE
SPACE							37				38							SPACE
SPACE							39				40							SPACE
SPACE							41				42							SPACE

PH-A= 8420 VA PH-B= 5740 VA PH-C= 6300 VA
TOTAL CONNECTED LOAD: 14160 VA OR 59.0 AMPS @ 120/240 VOLTS ~ 1 PHASE
LCL: 14160 VA X 1.25% = 17700 VA
FDL: - - - VA + 17700 VA (LCL) = 17700 VA OR 65.6 A

01 / ARCHITECT

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04 / KEY PLAN

N

05 / PROJECT NAME / ADDRESS

TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505

06 / REVISIONS

NO.	DATE	DESCRIPTION

07 / SHEET TITLE

PANEL SCHEDULES

08 / SHEET NUMBER

E-9.0

WATER CALCULATIONS

MAX / MINIMUM STREET PRESSURE, USE MIN PRESSURE		65/60
FLOW RATE (GPM)		40
USE WATER PRESSURE		60
LOSS THROUGH (NEW) 1 1/2" METER = 1.7 PSI	1.7	58.3
ELEVATION LOSS (50 FT X 0.43)	21.5	36.8
RESIDUAL PRESSURE REQUIRED AT REMOTE FIXTURE	20.0	16.8
DEVELOPED LENGTH 400'+ (25% FITTING) = 500' PRESS. AVAILABLE FOR PIPING FRICTION LOSS PER 100FT $\frac{16.8}{500'}$ X 100' = 3.36(PSI)		–

FIXTURE COUNT (E) RESIDENCE

NO.	TYPE OF FIXTURE	FIXTURE UNITS PER FIXTURE	TOTAL
4	WC (FT)	2.5	10.0
4	LAVATORY	1.0	4.0
4	SHOWER	2.0	8.0
3	SINK	2.0	6.0
1	CLOTHES WASHER	4.0	4.0
1	DISHWASHER	2.0	2.0
1	HOSE BIB	2.5	2.5
2	HOSE BIB	1.0	2.0
	TOTAL		38.5

TOTAL FU = 38.5FU (FLUSH TANK)
TOTAL FLOW = 24GPM

FIXTURE COUNT ADU

NO.	TYPE OF FIXTURE	FIXTURE UNITS PER FIXTURE	TOTAL
5	WC (FT)	2.5	12.5
6	LAVATORY	1.0	6.0
4	SHOWER	2.0	8.0
3	SINK	2.0	6.0
1	CLOTHES WASHER	4.0	4.0
2	DISHWASHER	2.0	4.0
1	HOSE BIB	2.5	2.5
2	HOSE BIB	1.0	2.0
	TOTAL		45FU

TOTAL FU = 45FU (FLUSH TANK)
TOTAL FLOW = 27GPM

FIXTURE COUNT (E)RESIDENCE & ADU

NO.	TYPE OF FIXTURE	FIXTURE UNITS PER FIXTURE	TOTAL
9	WC (FT)	2.5	22.5
10	LAVATORY	1.0	10.0
8	SHOWER	2.0	16.0
6	SINK	2.0	12.0
2	CLOTHES WASHER	4.0	8.0
3	DISHWASHER	2.0	6.0
2	HOSE BIB	2.5	5.0
4	HOSE BIB	1.0	4.0
	TOTAL		83.5FU

TOTAL FU = 83.5FU (FLUSH TANK)
TOTAL FLOW = 40GPM

PIPE SPECIFICATION

SANITARY SEWER AND VENT PIPING (INSIDE & OUTSIDE OF BUILDING)

1. ABS PLASTIC PIPE WHICH MEETS ASTM D2680 OR ASTM D2661 OR NO HUB CAST IRON SCH 40 MEETS ASTM A888

WATER PIPING (INSIDE & OUTSIDE OF BUILDING)

1. COPPER TUBING, TYPE L HARD DRAWN WITH CAST BRASS OR WROUGHT COPPER FITTINGS.

NOTE:

ALL PIPE AND FITTING SHALL RECIEVE PRIOR APPROVAL OF THE ENGINEER

PLAN CHECK NOTES

1. ALL CLEANOUTS INSTALLED UNDER CONCRETE OR ASPHALT PAVING SHALL BE ACCESSIBLE BY YARD BOXES, OR EXTENDED FLUSH WITH PAVING WITH A "BRASS CAP" OR OTHER APPROVED MATERIAL WHEN SUBJECT TO VEHICULAR TRAFFIC. INSTALL PER SEC. 707.0 & 719.0 OF THE PLUMBING CODE.
2. FLASHING IS REQUIRED AROUND ALL WALL & ROOF OPENINGS.
3. BEFORE ANY DEVICE IS INSTALLED FOR THE PREVENTION OF BACKFLOW OR SPHINAGE, IT SHALL HAVE FIRST BEEN APPROVED BY THE ADMINISTRATIVE AUTHORITY.
4. A FULLWAY VALVE CONTROLLING ALL OUTLETS SHALL BE INSTALLED ON THE DISCHARGE SIDE OF WATER METER AND ON EACH UNMETERD WATER SUPPLY.
5. ALL MATERIALS USED FOR THE INSTALLATION, ALTERATION OR REPAIR OF ANY GAS PIPING SHALL BE APPROVED BY THE ADMINISTRATIVE AUTHORITY.
6. EACH PLUMBING FIXTURE SHALL HAVE AN APPROVED TYPE WATERSEAL TRAP.
7. ALL PLUMBING VENTS SHALL TERMINATE NOT LESS THAN TEN (10) FEET FROM OR ATLEAST THREE (3) FEET ABOVE WINDOW, DOOR OPENING, AIR INTAKE OR VENT SHAFT.
8. THE POTABLE WATER SYSTEM SHALL BE DISINFECTED PRIOR TO USE ACCORDING TO THE METHOD SET IN SECTION 609.9 OF THE PLUMBING CODE.
9. NOT USED.
10. PIPING FOR ALL SPACE CONDITIONING AND SERVICE HEATING SYSTEMS SHALL BE INSULATED IN ACCORDANCE WITH TABLE 1-G.
11. SERVICE WATER HEATING SYSTEMS AND EQUIPMENT SHALL MEET THE APPLICABLE REQUIREMENTS OF TABLE 1-C11 AND SUBJECT TO ALL REQUIREMENTS OF SECTION 11(b).
12. NOT USED.
13. ALL HOSE BIBBS SHALL BE EQUIPPED WITH AN APPROVED NON-REMOVABLE VACUUM BREAKER
14. ALL FIXTURES, EQUIPMENT, PIPING, AND MATERIALS SHALL BE LISTED.
15. ALL PLUMBING FIXTURES SHALL MEET THE FLOW REQUIREMENTS SPECIFIED IN THE LOS ANGELES PLUMBING CODE.
16. ALL FAUCETS IN PUBLIC RESTROOMS SHALL BE SELF-CLOSING OR SELF-CLOSING METERING FAUCETS
17. WATER PIPE AND FITTINGS WITH A LEAD CONTENT EXCEEDS 0.25% SHALL BE PROHIBITED IN SYSTEMS CONVEYING POTABLE WATER.
18. SHOWERS SHALL BE PROVIDED WITH INDIVIDUAL TEMPERING VALVES.

EQUIPMENT ANCHORAGE NOTES

THE ATTACHMENT OF THE FOLLOWING ITEMS SHALL BE DESIGNED TO RESIST THE FORCES PRESCRIBED ABOVE, BUT NEED NOT TO BE DETAILED ON THE PLANS:

A. EQUIPMENT WEIGHING LESS THAN 400 POUNDS SUPPORTED DIRECTLY ON THE ROOF OR FLOOR.

B. TEMPORARY OR MOVABLE EQUIPMENTS.

C. EQUIPMENT WEIGHING LESS THAN 20 POUNDS SUPPORTED BY VIBRATION ISOLATORS.

D. EQUIPMENT WEIGHING LESS THAN 20 POUNDS SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM WALL.

FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAIL ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE MECHANICAL/ELECTRICAL ENGINEER AND THE FIELD REPRESENTATIVE OF THE DIVISION OF THE STATE ARCHITECT.

PIPE SIZING CHART

COPPER TYPE L BASED ON MAX .PD ON 1.3 PSI/100'-0"	MAXIMUM FU ALLOWABLE (HOT & COLD WATER)		
SIZE	FLUSH TANK	HW	FLUSH VALVE
1/2"	0	0	0
3/4"	3	3	0
1"	7	7	0
1 1/4"	13	13	0
1 1/2"	24	24	0
2"	69	69	21
2 1/2"	185	185	82
3"	380	380	245
4"	1018	840	1009

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY EXACT LOCATION OF EXISTING LINES, LATERALS AND WYES BEFORE STARTING. SHOULD IT BE NECESSARY TO RE-ROUTE LINES DUE TO CONDITIONS FOUND ON THE SITE OR IF INDICATED P.O.C. CANNOT BE MADE TO THE LINES AS FOUND, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT BEFORE INSTALLING ANY WORK WHICH MAY BE AFFECTED.
2. OFFSET PIPES AS REQUIRED TO CLEAR MECHANICAL DUCTWORK.
3. FURNISH AND INSTALL A SHUT-OFF VALVE, PLUG COCK OR STOP AT EACH PIECE OF EQUIPMENT FURNISHED BY OTHERS REQUIRING DRAIN, WASTE, WATER, GAS, ETC.
4. SEAL AND FLASH ALL PENETRATIONS THROUGH ROOF WATERTIGHT.
5. PROVIDE AND INSTALL NEW TEES AND WYES AT EACH GAS OR WATER POINT OF CONNECTION.
6. CONTRACTOR SHALL INSTALL SHUT-OFF VALVES ON EACH WATER SUPPLY AT EACH WATER SUPPLY AT EACH PLUMBING FIXTURE.
7. INTERRUPTION OF EXISTING SERVICES: THE CONTRACTOR'S ATTENTION IS CALLED TO THE PRESENCE OF EXISTING, CONDUIT, PIPING, ETC. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR THE PROPER AND APPROVED REPAIR OF ANY AND ALL DAMAGE CAUSED BY HIM OR HIS WORK TO EXISTING BUILDINGS, CONDUIT, PIPING, PLANTS, ETC. THE COMPLETED PROJECT SHALL BE A PROPERLY FUNCTIONING ENTITY THROUGHOUT. FURNISH ALL LABOR AND MATERIALS REQUIRED TO RELOCATE, REMOVE, REINSTALL, RECONNECT, REPLACE, ETC., ANY EXISTING PIPING TO ACCOMMODATE THE WORK. MATERIALS SHALL BE AS SPECIFIED UNLESS OTHERWISE APPROVED IN WRITING BY THE ARCHITECT.
8. MANUFACTURERS AND NUMBERS SHOWN ON EQUIPMENT SCHEDULE HAVE BEEN UTILIZED FOR DESIGN. PROVIDE EQUAL FOR ALTERNATE MANUFACTURER.
9. AS A MINIMUM STANDARD, ALL WORK SHALL COMPLY WITH THE LATEST REQUIREMENTS OF THE UNIFORM PLUMBING CODE 2021 AND PLUMBING REGULATIONS OF THE MALIBU MUNICIPAL CODE.
10. VERIFY ELECTRICAL CHARACTERISTICS WITH ELECTRICAL DRAWINGS PRIOR TO BID AND MATERIAL PURCHASE.
11. SEE PLUMBING FIXTURE INSTALLATION HEIGHT REQUIREMENTS IN THIS DRAWING PRIOR TO START OF WORK.
12. CUTTING, BORING, SAW CUTTING OR DRILLING THROUGH NEW STRUCTURAL ELEMENTS IS NOT TO BE STARTED UNTIL THE DETAILS HAVE BEEN REVIEWED AND APPROVED BY THE ARCHITECT, STRUCTURAL ENGINEER AND THE DSA FIELD ENGINEER IF THE DETAILS DO NOT SHOW OR CONFORM TO THE APPROVED DRAWINGS.
13. ALL URINALS AND SINKS TO HAVE A WALL CLEANOUT.
14. TERMINATE UNDERGROUND PIPING SHALL 6" AFF FOR PURPOSE OF RESPONSIBILITY.
15. COMPLY WITH ALL REFERENCED COMMERCIAL STANDARDS, SPECIFICATION, CODES AND RULES.
16. INSTALL DIELECTRIC FITTINGS BETWEEN FERROUS AND NON-FERROUS MATERIALS.
17. GENERAL, MECHANICAL, PLUMBING AND ELECTRICAL CONTRACTORS SHALL COORDINATE THEIR WORK PRIOR TO INSTALLATION TO PROVIDE FOR PROPER CLEARENCES BETWEEN EQUIPMENT. DUCTWORK, PIPING, JOIST, CELINGS & ETC.
18. SEE MECHANICAL PLANS FOR EXACT LOCATIONS OF MECHANICAL EQUIPMENT. COORDINATE ROUGH IN LOCATIONS OF CONDENSATE DRAINS WITH MECHANICAL CONTRACTOR.
19. ALL HORIZONTAL WASTE, CONDENSATE DRAINS AND STORM DRAIN PIPING SHALL HAVE A MINIMUM SLOPE OF 2% (1/4" PER LINEAR FOOT).
20. PLUMBING CONTRACTOR SHALL PROVIDE AND COORDINATE ALL FINAL PLUMBING CONNECTIONS AND HOOK-UPS TO ALL OWNER FURNISHED APPLIANCES.
21. ALL BURIED PIPING SHALL BE ATLEAST 2 INCHES BELOW THE BOTTOM OF THE GRADE BEAM OR THE BOTTOM OF THE SLAB.
22. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF PLUMBING FIXTURES.
23. ALL CLEANOUT SHALL BE ACCESSIBLE.
24. VALVE SHALL BE LINE SIZE UNLESS OTHERWISE NOTED.
25. PROVIDE ACCESS DOORS TO ALL CONCEALED VALVES, TRAP PRIMERS, WATER HAMMER ARRESTORS, ETC. ALL PANELS SHALL BE STAINLESS STEEL IN WET AREAS. COORDINATE FINISH WITH ARCHITECT, WITH NO ADDITIONAL COST TO OWNER.
26. ALL PIPNG IN FINISHED AREAS SHALL BE RUN CONCEALED, EXPOSED PIPING, WHERE NECESSARY, SHALL BE RUN AS HIGH AS POSSIBLE AND TIGHT TO THE WALL.
27. ALL PIPING PENETRATING WALL, CEILING AND FLOOR SHALL BE ISOLATED FROM BUILDING STRUCTURES WITH RESILIENT SEALS.
28. ALL WATER CLOSETS SHALL HAVE A MAXIMUM FLUSH OF 1.28 GALLONS.
29. INSTALLATION OF PLUMBING FIXTURES SHALL BE PER MANUFACTURER'S INSTRUCTIONS. IN CASE OF DISCREPACIES BETWEEN MANUFACTURER'S INSTRUCTIONS AND FIELD CONDITIONS CONTACT THE ARCHITECT/ENGINEER FOR FOR DIRECTIONS.
30. PLUMBING FIXTURES AND FIXTURE FITTINGS SHALL MEET STANDARD REFERNCED IN GREEN BUILDING CODES
31. ALL EXPOSED GAS PIPING SHALL BE PROTECTED AGAINST CORROSION BY COATING OR WRAPPING WITH AN INERT MATERIAL APPROVED FOR SUCH APPLICATION
32. ALL REQUIRED CLEAN OUTS SHALL BE INSTALLED PER SECTION 707.0 & 719.0 OF THE PLUMBING CODE.

PLUMBING LEGEND

SYMBOL	ABBREV.	DESCRIPTION
—(E)SS—	(E)SS	EXISTING SANITARY SEWER
—(E)CW—	(E)CW	EXISTING STREET WATER
— - —	C.W.	COLD WATER
—CD—	C.D.	CONDENSATE DRAIN
—ED—	E.D.	ELEVATOR DRAIN
— FDC —	F.D.C.	FIRE DEPT. CONN.
— OD—	O.D.	OVERFLOW STORM DRAIN PIPING
—SD—	S.D.	STORM DRAIN
— F —	F	FIRE WATER PIPING
— MPG —	MPG	MEDIUM PRESSURE GAS
— HPG —	HPG	HIGH PRESSURE GAS
—TP—		TRAP PRIMER
	V	SANITARY VENT
	W	WASTE OR SEWER
— – – —		HOT WATER
— – – – —	H.W.R.	HOT WATER RETURN
	F.C.O.	FLOOR CLEANOUT
	C.O.T.G.	CLEANOUT TO GRADE
	S.O.V./Y.B.	SHUT-OFF VALVE IN YARD BOX
	S.O.V.	SHUT OFF VALVE
	S.O.C.	SHUT OFF COCK
	H.B.	HOSE-BIBB
		PIPE-UP OR RISER
		PIPE-DOWN OR DROP
		UNION
	W.C.O./C.O.	WALL CLEANOUT/CLEANOUT
	AP	ACCESS PANEL
	BEL.	BELOW
	C.I.	CAST IRON
	CLG.	CEILING
	CONT.	CONTINUATION
	CONC.	CONCRETE
	CONN.	CONNECT OR CONNECTION
	O.D.	OVERFLOW DRAIN
	(E) OR EXIST.	EXISTING
	FIN.	FINISH
	F.F.E.	FINISH FLOOR ELEVATION
	FLR.	FLOOR
	GR.	GRADE
	HDR.	HEADER
	LOC.	LOCATION
	N.T.S.	NOT TO SCALE
	R.D.	ROOF DRAIN
	TYP.	TYPICAL
	V.T.R.	VENT THRU ROOF
	W/	WITH
	Y.B.	YARD BOX
	W.H.A.	WATER HAMMER ARRESTOR
	BV	BALANCING VALVE
	WTV	WATER TEMPERING VALVE
		DETAIL & SHEET NUMBERS
	P.O.C.	POINT OF CONNECTION
		FLEX CONNECTION
		INDICATES S.D & O.D. RISERS

SHEET INDEX

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P201	SECOND FLOOR WASTE AND VENT FLOOR PLAN
P202	ROOF WASTE AND VENT PLAN
P203	FIRST FLOOR COLD AND HOT WATER FLOOR PLAN
P204	SECOND FLOOR COLD AND HOT WATER FLOOR PLAN
P205	DEMO SITE PLAN
P206	SITE PLAN
P300	RISER DIAGRAMS
P400	DETAIL

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LEGEND, NOTES, CALCULATIONS AND SHEET INDEX

08 / SHEET NUMBER

P100

PLUMBING FIXTURE SCHEDULE

SYMBOL	DESCRIPTION	W	TRAP	V	CW	HW	
WC 1	WATER CLOSET	4"	INT	2"	3/4" TP	–	"KOHLER" FLOOR MOUNTED TANK TYPE ADA COMPLIANT, VITREOUS CHINA VEIL K–28161, 1.28 GPF MODEL WITH TOILET SEAT MODEL K–30780 AND HEAVY DUTY TOILET SEAT
L 1	LAVATORY	2"	INT	2"	1/2"	1/2"	"KOHLER" COUNTER TOP VITREOUS CHINA TYPE ADA COMPLIANT, 4" CENTERS WITH ADA COMPLIANT PENNINGTON K–2196–4. FAUCET "KOHLER" ADA WITH LEVER HANDLE TONE K–27414–4K WITH 1 GPM
WHA 1	WATER HAMMER ARRESTOR	–	–	–	1/2" TP	–	"JAY R SMITH" HYDROTROL. SERIES, W/SOV, ACCESS PANEL
FS 1	FLOOR SINK	4"	4"	2"	1/2" TP	–	"JAY R SMITH" 330–Y04 SQUARE 12"x12" 8" DEEP ENAMELED FLOOR SINK WITH TRAP PRIMER
TP 1	TRAP PRIMER	–	–	–	1/2" TP	–	"MIFAB" MR–500 WITH 1/2" CW CONNECTION, PROVIDE ACCESS PANELS & MULTIPLE DISTRIBUTION UNITS AS REQUIRED
FD 1	FLOOR DRAIN	2"	2"	2"	1/2" TP	–	"JAY R SMITH"2005 ROUND TOP, CAST IRON BODY W/FLASHING & ADJUDSTABLE STRAINER. PROVIDE VALDAL PROOF SCREWS AND 1/2" TRAP PRIMER CONNECTION OR EQUAL
SHD 1	SHOWER DRAIN	2"	2"	2"	–	–	"JAY R SMITH"2005 ROUND TOP, CAST IRON BODY W/FLASHING & ADJUDSTABLE STRAINER. PROVIDE VALDAL PROOF SCREWS OR EQUAL
SH 1	SHOWER	–	–	–	1/2"	1/2"	"KOHLER" SHOWER HEAD 1.75 GPM AWAKEN K–72425–G WITH SHOWER VALVE TRIM WITH K–83034 SERIES RITE–TEMP VALVE WITH CARTRIDGE OR EQUAL
KS 1	KITCHEN SINK	2"	INT	2"	1/2"	1/2"	"KOHLER" UNDER COUNTER SINK ADA COMPLIANT, RIVERBY K–8689–5U. FAUCET "KOHLER" ADA PULL DOWN SINK FAUCET WITH SPRAY K–28268 1.5GPM
S 1	LAUNDRY SINK	2"	INT	2"	1/2"	1/2"	"ELKAY" DROP IN STAINLESS STEEL SINK ADA COMPLIANT, 4"CENTERS, REAR CENTER DRAIN LRADQ252265 . FAUCET "ELKAY ADA FAUCET LK406AT10L2 1.5GPM
S 2	COFFEE BAR SINK	2"	INT	2"	1/2"	1/2"	"KOHLER" UNDERMOUNT SINGLE BOWL BAR SINK ADA COMPLIANT PORTO FINO K–6565 . FAUCET "ELKAY ADA FAUCET EDALYN K–28357 1.5GPM
RD 1	ROOF DRAIN	3"	–	–	–	–	"JAY R SMITH" ROOF DRAIN CAST IRON BODY COMBINED FLASHING AND POLYETHYLENE DOME FIGURE 1010Y OR EQUAL
OD 1	OVERFLOW ROOF DRAIN	3"	–	–	–	–	"JAY R SMITH" OVERFLOW ROOF DRAIN WITH 2" WATER DAM, CAST IRON BODY, COMBINED FLASHING CLAMP AND POLYETHYLENE DOME FIGURE 1080Y OR EQUAL
DS 1	DOWNSPOUT	3"	–	–	–	–	"JAY R SMITH" DOWNSPOUT CAST BRONZE NOZZLE AND FLANGE FIGURE 177OY OR EQUAL

CIRCULATING PUMP SCHEDULE

SYMBOL	DESCRIPTION	HW (GPM)	HEAD (FT)	ELECTRICAL V/PH/HZ	REMARKS
CP 1	CIRCULATING PUMP	1	36	120/1/60 2.1 AMPS	"BELL AND GOSSETT" PERMANENTLY LUBRICATED BRONZE PUMP MODEL PL–36 WITH 1" FLANGE CONNECTION AND 1/6 HP MOTOR

◯INSTALL PER MANUFACTURER'S INSTRUCTIONS

PLUMBING EQUIPMENT SCHEDULE

SYMBOL	DESCRIPTION	CW	HW	ELECTRICAL V/PH/HZ	REMARKS
WH 1	HEAT PUMP HEATER	1 1/2"	1 1/2"	208V/240V/1/60	"AO SMITH" HEAT PUMP WATER HEATER, MODEL CAHP–120 , 22.0KW INPUT 280GPH AT 65°F RISE IN TEMPERATURE, WITH AO SMITH MODEL TW–12 EXPANSION TANK ET–1
WH 1	HEAT PUMP HEATER	1 1/2"	1 1/2"	208V/240V/1/60	"AO SMITH" HEAT PUMP WATER HEATER, MODEL CAHP–120 , 22.0KW INPUT 280GPH AT 65°F RISE IN TEMPERATURE, WITH AO SMITH MODEL TW–12 EXPANSION TANK ET–1

(1) INSTALL PER MANUFACTURE'S INSTRUCTIONS.

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P101

PLUMBING INSULATION

1.1 QUALITY ASSURANCE

A. APPLICATOR: COMPANY SPECIALIZED IN PIPING INSULATION WITH FIVE YEARS MINIMUM EXPERIENCE.

B. MATERIALS: FLAME SPREAD SMOKE DEVELOPED RATING OF 25–50 IN ACCORDANCE WITH ASTM E84.

C. COMPLIANCE: ALL INSULATING MATERIAL SHALL MEET THE MINIMUM REQUIREMENTS OF CALIFORNIA ENERGY COMMISSION'S LATEST ENERGY EFFICIENCY STANDARDS.

2.1 SUBMITTALS

A. SUBMIT UNDER PROVISIONS OF DIVISION 1.

B. INCLUDE PRODUCT DESCRIPTION, LIST OF MATERIALS AND THICKNESS FOR EACH SERVICE, AND LOCATIONS.

C. SUBMIT MANUFACTURERS INSTALLATION INSTRUCTIONS.

D. PROVIDING WORK UNDER THIS SECTION SHALL BE COMPANY LICENSED BY THE STATE AS AN INSULATION CONTRACTOR.

2.2 APPROVED MANUFACTURERS

A. WATER PIPING INSULATION:

1. KNAUF FIBERGLASS.

2. OWENS–CORNING FIBERGLAS.

3. JOHNS MANSVILLE.

2.3 INSULATION

A. MATERIAL: ONE–PIECE MOLDED GLASS FIBER WITH FACTORY APPLIED FIRE RETARDANT JACKET WITH 4" WIDE LONGITUDINAL LAP. SERVICE UP TO 850 DEGREES F. JOHN MANVILLE "MICRO–LOK."

B. MATERIAL – FLEXIBLE FOAMED PIPE INSULATION.

2.4 JACKETS

A. INTERIOR APPLICATION – VAPOR BARRIER JACKETS: KRAFT REINFORCED FOIL VAPOR BARRIER WITH SELF–SEALING ADHESIVE JOINTS.

B. EXTERIOR APPLICATIONS – ALUMINUM VAPOR BARRIER JACKETS: ASTM B209; 0.020 INCH THICK; SMOOTH FINISH

2.5 ACCESSORIES

A. INSULATION BANDS: 3/4 INCH WIDE; 0.015–INCH THICK GALVANIZED STEEL.

B. METAL JACKET BANDS: 3/8 INC WIDE; 0.015–INCH THICK ALUMINUM.

C. INSULATING CEMENT: ASTM C195; HYDRAULIC SETTING MINERAL WOOL.

D. FINISHING CEMENT: ASTM C449.

E. ADHESIVES: COMPATIBLE WITH INSULATION.

PART 3: EXECUTION

3.1 PREPARATION

A. INSTALL MATERIALS AFTER PIPING HAS BEEN TESTED AND APPROVED.

3.2 INSTALLATION

A. WATER PIPING INSULATION:

1. INSTALL MATERIALS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

2. CONTINUE INSULATION WITH VAPOR BARRIER THROUGH PENETRATIONS.

3. IN EXPOSED PIPING, LOCATE INSULATION AND COVER SEAMS IN LEAST VISIBLE LOCATIONS.

4. ON INSULATED PIPING WITH VAPOR BARRIER, INSULATE FITTINGS, VALVES, UNIONS, FLANGES, STRAINERS, FLEXIBLE CONNECTIONS AND EXPANSION JOINTS.

5. ON INSULATED PIPING WITHOUT VAPOR BARRIER AND PIPING CONVEYING FLUIDS 140 DEGREES F OR LESS, DO NOT INSULATE FLANGES AND UNIONS AT EQUIPMENT, BUT BEVEL AND SEAL ENDS OF INSULATION AT SUCH LOCATIONS.

6. PROVIDE AND INSERT NOT LESS THAN 6 INCHES LONG, OF SAME THICKNESS AND CONTOUR AS ADJOINING INSULATION BETWEEN SUPPORT SHIELD AND PIPING, BUT UNDER THE FINISH JACKET, ON PIPING 2 INCHES DIAMETER OR LARGER TO PREVENT INSULATION FROM SAGGING AT SUPPORT POINTS. INSERTS SHALL BE CELLULAR GLASS OR OTHER HEAVY DENSITY INSULATING MATERIAL SUITABLE FOR THE PLANNED TEMPERATURE RANGE. FACTORY FABRICATED INSERTS MAY BE USED.

7. NEATLY FINISH INSULATION AT SUPPORTS, PROTRUSIONS AND INTERRUPTIONS.

8. WHERE PIPE HANGERS ARE EQUIPPED WITH ROLLERS, PROVIDE A 16 GA. GALVANIZED SHIELD, COVERING 180° OF THE INSULATION CIRCUMFERENCE BETWEEN ROLLERS AND HIGH DENSITY INSERT SUPPORTED PIPING.

B. JACKETS:

1. INDOOR, CONCEALED APPLICATIONS: INSULATED PIPES CONVEYING FLUIDS ABOVE AMBIENT TEMPERATURE SHALL HAVE STANDARD JACKETS, WITH VAPOR BARRIER, FACTORY–APPLIED. INSULATE FITTINGS, JOINTS AND VALVES WITH INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJOINING PIPE AND FINISH WITH GLASS CLOTH AND ADHESIVE. PVC JACKETS MAY BE USED.

2. INDOOR, CONCEALED APPLICATIONS: INSULATED DUAL–TEMPERATURE PIPES OR PIPES CONVEYING FLUIDS BELOW AMBIENT TEMPERATURE (INCLUDING ROOF DRAINS AND CONDENSATE LINES) SHALL HAVE VAPOR BARRIER JACKETS, FACTORY–APPLIED. INSULATE FITTINGS, JOINTS, AND VALVES WITH MOLDED INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJACENT PIPE, AND FINISH WITH GLASS CLOTH AND VAPOR BARRIER ADHESIVE.

3. INDOOR, EXPOSED APPLICATIONS: FOR PIPE EXPOSED IN MECHANICAL EQUIPMENT ROOMS OR IN FINISHED SPACES, INSULATE AS FOR CONCEALED APPLICATIONS. FINISH WITH CANVAS JACKET; SIZE FOR FINISH PAINTING. DO NOT USE PVC JACKETS.

4. EXTERIOR APPLICATIONS: PROVIDE VAPOR BARRIER JACKETS. COVER WITH ALUMINUM JACKET WITH SEAMS LOCATED ON BOTTOM SIDE OF HORIZONTAL PIPING. INSULATE FITTINGS, JOINTS AND VALVES WITH INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJOINING PIPE, AND FINISHED WITH GLASS MESH REINFORCED VAPOR BARRIER CEMENT.

3.3 SCHEDULE OF INSULATION THICKNESS

INSULATION THICKNESS AND CONDUCTIVITY SHALL BE AS REQUIRED BY THE LATEST CALIFORNIA ENERGY COMMISSION STANDARDS BUT NOT LESS THAN THAT INDICATED IN THE TABLE BELOW:

CONDENSATE: BELOW 40°F WITH A CONDUCTIVITY RANGE OF 0.23 TO 0.27 AND INSULATION MEAN RATING OF 75°F – (1" PIPE AND LESS = 1.0)(1.25" – 2" = 1.0)(2.5" – 4" = 1.5)

CONDENSATE: 40°F TO 60°F WITH A CONDUCTIVITY RANGE OF 0.23 TO 0.27 AND INSULATION MEAN RATING OF 75°F – (1" PIPE AND LESS = .5)(1.25" – 2" = .5)(2.5" – 4" = 1.0)(5" – 6" = 1.0)

4.1 WARRANTY

A. PROVIDE THREE–YEAR MANUFACTURERS WARRANTY.

END OF SECTION

PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. VALVES: MANUFACTURER'S NAME AND PRESSURE RATING MARKED ON VALVE BODY.

B. PERFORM NATURAL GAS WORK IN ACCORDANCE WITH NFPA 54.

C. PERFORM WORK IN ACCORDANCE WITH CPC.

D. PERFORM WORK IN ACCORDANCE WITH ASME B31.9 CODE FOR INSTALLATION OF PIPING SYSTEMS AND ASME SECTION IX FOR WELDING MATERIALS AND PROCEDURES.

E. PERFORM WORK IN ACCORDANCE WITH APPLICABLE CODE AWS D1.1 FOR WELDING HANGER AND SUPPORT ATTACHMENTS TO BUILDING STRUCTURE.

F. FURNISH SHUTOFF VALVES COMPLYING WITH ASME B16.33 OR ANSI Z21.15.

G. MAINTAIN ONE COPY OF EACH DOCUMENT ON SITE.

2.1 SUBMITTALS

A. SUBMIT PRODUCT DATA UNDER PROVISIONS OF DIVISION 1.

B. PRODUCT DATA:

1. PIPING: SUBMIT DATA ON PIPE MATERIALS, FITTINGS AND ACCESSORIES. SUBMIT MANUFACTURERS CATALOG INFORMATION.

2. VALVES: SUBMIT MANUFACTURERS CATALOG INFORMATION WITH VALVE DATA AND RATINGS FOR EACH SERVICE.

C. TEST REPORTS: INDICATED RESULT OF PIPING SYSTEM PRESSURE TEST.

D. MANUFACTURERS CERTIFICATE: CERTIFY PRODUCTS MEET OR EXCEED SPECIFIED REQUIREMENTS.

E. WELDERS CERTIFICATE: CERTIFY WELDERS EMPLOYED ON THE WORK, VERIFYING AWS QUALIFICATION WITHIN 12 MONTHS

2.2 DELIVERY, STORAGE AND HANDLING

A. ACCEPT VALVES ON SITE IN SHIPPING CONTAINER WITH LABELING IN PLACE, INSPECT FOR DAMAGE.

B. PROTECT PIPING AND FITTINGS FROM SOIL AND DEBRIS WITH TEMPORARY END CAPS AND CLOSURES. MAINTAIN IN PLACE UNTIL INSTALLATION. FURNISH TEMPORARY PROTECTIVE COATING ON CAST IRON AND STEEL VALVES.

2.3 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. CAST IRON PIPE: HUBLESS, ASTM A888. FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSED TYPE WITH ASTM C564 NEOPRENE GASKETING SYSTEM. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. PVC PIPE: ASTM D3033 OR D3034, SDR 35. FITTINGS: PVC. JOINTS: ASTM F477, ELASTOMERIC GASKETS.

C. POLYETHYLENE ENCASEMENT: ASTM D1248 POLYETHYLENE TUBE OR SHEET FORM TO ENCASE CAST IRON PIPE, WITH MINIMUM 0.008–INCH (0.20MM) THICKNESS. INSTALL ENCASEMENT AS PER ASTM A74 AND MANUFACTURER'S RECOMMENDATIONS. T. CHRISTY ENTERPRISES, INC. OR EQUAL.

2.4 SANITARY SEWER AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. CAST IRON PIPE: HUBLESS, ASTM A888. FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSED TYPE WITH ASTM C564 NEOPRENE GASKET. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. CAST IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPE 301 STAINLESS STEEL CLAMP–AND–SHIELD ASSEMBLIES WITH NEOPRENE GASKETS. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURES: ABI, CHARLOTTE AND TYLER PIPE.

C. POLYETHYLENE ENCASEMENT: ASTM D1248 POLYETHYLENE TUBE OR SHEET FORM TO ENCASE IRON PIPE, WITH MINIMUM 0.008–INCH (0.20MM) THICKNESS. INSTALL ENCASEMENT AS PER ASTM A74 AND MANUFACTURER'S RECOMMENDATIONS. T. CHRISTY ENTERPRISES, INC. OR EQUAL.

2.5 SANITARY SEWER AND VENT PIPING, ABOVE GRADE.

A. CAST IRON PIPE: HUBLESS, ASTM A888. FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSED TYPE WITH ASTM C564 NEOPRENE GASKET. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. CAST IRON PIPE: IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPE 301 STAINLESS STEEL CLAMP–AND–SHIELD ASSEMBLIES WITH NEOPRENE GASKETS. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURES: ABI, CHARLOTTE AND TYLER PIPE.

C. COPPER PIPE: ASTM B306, DMW. FITTINGS: ANSI B16.3, CAST BRONZE, OR ANSI B16.29, WROUGHT COPPER. JOINTS: ASTM B32, SOLDER, GRADE 50B

2.6 ACID WASTE PIPING, ABOVE GRADE.

A. WASTE PIPING BETWEEN SCIENCE ROOM SINKS AND DILUTION TRAP SHALL BE ASTM F1412 FLAME RETARDANT, ASTM D4101 POLYPROPYLENE PIPE AND FITTINGS. THE PIPE AND FITTINGS SHALL BE JOINED USING MECHANICAL JOINT COUPLINGS. THE PIPE AND FITTING SHALL BE MANUFACTURED BY ENFIELD, ORION OR LAB LINE.

2.7 WATER PIPING BURIED BEYOND 5 FEET OF BUILDING

A. CAST IRON PIPE: AWWA C151, CEMENT LINING AS PER AWWA C104. FITTINGS: DUCTILE IRON, CLASS 52. JOINTS: AWWA C111, RUBBER GASKET WITH 3/4–INCH DIAMETER RODS.

B. COPPER TUBING: ASTM B88, TYPE K HARD DRAWN. FITTINGS: ANSI B16.18, CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS. JOINTS: ASTM B32, SOLDER, GRADE 95TA FOR 3 INCH PIPE DIAMETER AND SMALLER.

C. PVC PIPE: AWWA C–900, CLASS 200 WITH ASTM D3139 JOINTS WITH FLEXIBLE ELASTOMERIC SEALS, AND THRUST BLOCKS AT EACH CHANGE IN DIRECTION. FOR 4" PIPE DIAMETER AND LARGER.

2.8 WATER PIPING, BURIED 5 FEET OF BUILDING

A. ASTM B88, TYPE K SOFT. FITTINGS: ANSI B16.18, CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

B. CAST IRON PIPE: AWWA C151, CEMENT LINING AS PER AWWA C104. FITTINGS: DUCTILE IRON, CLASS 52. JOINTS: AWWA C111 RUBBER GASKET WITH 3/4–INCH DIAMETER RODS.

2.9 WATER PIPING ABOVE GRADE

A. COPPER TUBING: ASTM B88, TYPE L HARD DRAWN. FITTINGS: ANSI B16.18, CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

2.10 STORM WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. CAST IRON PIPE: ASTM A888, FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST ION SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. CAST IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPS 301 STAINLESS STEEL CLAMP–AND–SHIELD ASSEMBLIES WITH NEOPRENE GASKETS. PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

C. PVC PIPE: ASTM D3033 OR D3034, SDR 35. FITTINGS: PVC. JOINTS: ASTM F477, ELASTOMERIC GASKETS.

D. POLYETHYLENE ENCASEMENT: ASTM D1248 POLYETHYLENE TUBE OR SHEET FORM TO ENCASE CAST IRON PIPE, WITH MINIMUM 0.008–INCH (0.20MM) THICKNESS. INSTALL ENCASEMENT AS PER ASTM A74 AND MANUFACTURER'S RECOMMENDATIONS.

2.11 STORM WATER PIPING, BURIED WITHIN FEET OF BUILDING

A. CAST IRON PIPE: ASTM A888. FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS. PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. CAST IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPI 301 STAINLESS STEEL CLAMP–AND–SHIELD ASSEMBLIES WITH NEOPRENE GASKETS. PIPE AND FITTING SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

C. POLYETHYLENE ENCASEMENT: ASTM D1248 POLYETHYLENE TUBE OR SHEET FORM TO ENCASE CAST IRON PIPE, WITH MINIMUM 0.008–INCH (0.20MM) THICKNESS. INSTALL ENCASEMENT AS PER ASTM A74 AND MANUFACTURER'S RECOMMENDATIONS.

2.12 STORM WATER PIPING, ABOVE GRADE

A. CAST IRON PIPE: ASTM A888. FITTINGS: CAST IRON. JOINTS: CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS. PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST ION SOIL PIPE INSTITUTE. ACCEPTABLE MANUFACTURERS: ABI, CHARLOTTE AND TYLER PIPE.

B. ALL EXPOSED STORM DRAIN PIPE TO BE SCHEDULE 40 GALVANIZED STEEL SCREWED PIPE WITH CAST IRON DRAINAGE FITTINGS.

2.13 NATURAL GAS PIPING, BELOW GRADE

A. POLYETHYLENE PIPE: ASTM D2513, SDR 11.5. FITTINGS: ASTM D2683 OR ASTM D2513 SOCKET TYPE. JOINTS: FUSION WELDED; PLASTIC TO STEEL CONNECTION WITH ASTM D2513 TRANSITION FITTINGS OR RISERS. PIPE SHALL BE BURIED 30 INCHES DEEP AND BACKFILL WITH SAND, INCLUDING IDENTIFICATION TAPE AND #14 INSULATED COPPER TRACER WIRE.

B. TRANSITION RISER FROM BELOW GRADE POLYETHYLENE PIPE TO ABOVE GRADE STEEL PIPE; ASTM D2513, SCHEDULE 40 STEEL EPOXY COATED CASING WELD OR THREADED END. THE POLYETHYLENE END SHALL BE FUSION WELDED, AS MANUFACTURED BY "CENTRAL" OR EQUAL.

2.14 NATURAL GAS PIPING, ABOVE GRADE

A. STEEL PIPE: ASTM A53, SCHEDULE 40 BLACK. FITTINGS: ANSI B16.3, MALLEABLE IRON THREADED FITTINGS, OR ASTM A234, FORGED STEEL WELDING TYPE. JOINTS: SCREWED WITH APPROVED STANDARD THREADS, OR AWS D1.1 WELDED.

B. STEEL PIPE EXPOSED TO WEATHER SHALL BE PRIME COATED AND PAINTED. COLOR AS SELECTED BY OWNER.

2.15 FLANGES, UNIONS, AND COUPLINGS

A. PIPE SIZE 2 INCHES AND UNDER: 150 PSIG MALLEABLE IRON UNIONS FOR THREADED FERROUS PIPING; BRONZE UNIONS FOR COPPER PIPE, SOLDERED JOINTS.

B. PIPE SIZE OVER 2 INCHES: 150 PSIG FORGED STEEL SLIP–ON FLANGES FOR FERROUS PIPING; BRONZE FLANGES FOR COPPER PIPING; NEOPRENE GASKETS FOR GAS SERVICE; 1/16 INCH THICK PREFORMED.

C. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, AND WATER IMPERVIOUS BARRIER. UNDERGROUND METAL PIPING SHALL BE BONDED FOR ELECTRICAL CONTINUITY.

2.16 CONDENSATE DRAIN PIPING, ABOVE GRADE

A. DWV COPPER TUBING: ASTM B88, TYPE L HARD DRAWN. FITTINGS: ANSI B16.29, WROUGHT COPPER SOLDER JOINT DRAINAGE FITTINGS. JOINTS: ASTM B32, SOLDER GRADE 95TA. INSULATE CONCEALED PIPING WITH ONE–INCH THICK FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER JACKET.

2.17 ACCEPTABLE MANUFACTURES – GLOBE VALVES

A. CRANE

B. STOCKHAM

C. MILWAUKEE

2.18 GLOBE VALVES

A. UP TO 2 INCHES: BRONZE BODY, RISING STEM AND HANDWHEEL, INSIDE SCREW, RENEWABLE COMPOSITION DISC, SCREWED ENDS, WITH BACKSEATING CAPACITY.

B. OVER 2 INCHES: IRON BODY, BRONZE TRIM RISING STEM AND HANDWHEEL, OS&Y, PLUG–TYPE DISC, FLANGED ENDS.

2.19 ACCEPTABLE MANUFACTURERS – BALL VALVES

A. APOLLO, MODEL 77CLF–100 SERIES

B. NIBCO, MODEL T–685–66–LF

C. MILWAUKEE, MODEL UPBA400S

2.20 BALL VALVES

A. UP TO 2 INCHES: BRONZE BODY, STAINLESS STEEL BALL, TEFLON SEATS AND STUFFING BOX RING, LEVER HANDLE, THREADED ENDS, LEAD FREE.

B. OVER 2 INCHES: CAST STEEL BODY, CHROME PLATED STEEL BALL, FEFLON SEAT AND STUFFING BOX SEALS, LEVEL HANDLE, FLANGED.

2.21 ACCEPTABLE MANUFACTURERS – GAS COCKS

A. PEER HEALEY

B. CONRACO

2.22 GAS COCKS

A. UP TO 2 INCHES: BRONZE BODY, BRONZE PLATED TAPERED PLUG, NON–LUBRICATED, TEFLON PACKING, THREADED ENDS.

B. OVER 2 INCHES: CAST IRON BODY AND PLUG, NON–LUBRICATED, TEFLON PACKING, FLANGED ENDS.

2.23 ACCEPTABLE MANUFACTURERS – SWING CHECK VALVES

A. CRANE, MODEL LF37

B. STOCKHAM, MODEL LFB319Y

C. MILWAUKEE, MODEL UP967

2.24 SWING CHECK VALVES

A. UP TO 2 INCHES: BRONZE 45 DEGREE SWING DISC, THREADED ENDS, LEAD FREE.

B. OVER 2 INCHES: IRON BODY, BRONZE TRIM, 45 DEGREE SWING DISC, RENEWABLE DISC AND SEAT, FLANGED ENDS.

2.25 ACCEPTABLE MANUFACTURERS – SPRING LOADED CHECK VALVES

A. CRANE

B. STOCKHAM

C. MILWAUKEE

2.26 SPRING LOADED CHECK VALVES

A. IRON BODY, BRONZE TRIM, SPRING LOADED, RENEWABLE COMPOSITION DISC, SCREWED, WAFER OR FLANGED ENDS.

2.27 ACCEPTABLE MANUFACTURES – WATER PRESSURE REDUCING VALVES

A. WATTS

B. WILKINS

C. SPENCE

2.28 WATER PRESSURE REDUCING VALVES

A. UP TO 2 INCHES: BRONZE BODY, STAINLESS STEEL AND THERMOPLASTIC INTERNAL PARTS, FABRIC–REINFORCED DIAPHRAGM, STRAINER, THREADED DOUBLE UNION ENDS.

B. OVER 2 INCHES: CAST IRON BODY, BRONZE FITTED, ELASTOMER DIAPHRAM AND SEAT DISC, FLANGED.

2.29 ACCEPTABLE MANUFACTURERS – RELIEF VALVES

A. WATTS

B. WILKINS

C. CONBRACO

2.30 RELIEF VALVES

A. BRONZE BODY, TEFLON SEAT, STEEL STEM AND SPRINGS, AUTOMATIC, DIRECT PRESSURE ACTUATED, CAPACITIES ASME CERTIFIED AND LABLED.

3.1 ACCEPTABLE MANUFACTURERS – SOLENOID VALVES FOR GAS SERVICE

A. ASCO RED HEAT

B. GC VALVES

C. POWER AIRE, INC

3.2 SOLENOID VALVES FOR FUEL GAS SERVICE

A. NORMALLY CLOSED, UL LISTED, ALUMINUM BODY, BUNA "N " SEAT TYPE 1 GENERAL PURPOSE ENCLOSURE, 120V–60HS, ZERO PSI MINIMUM OPERATING PRESSURE DIFFERENTIAL, MODEL 8215 SERIES AS MANUFACTURED BY ASCO RED HEAT.

3.3 INSTALLATION – BURIED PIPING SYSTEMS

A. INSTALL NATURAL GAS PIPING IN ACCORDANCE WITH NFPA 54.

B. VERIFY CONNECTION TO EXISTING PIPING SYSTEM SIZE, LOCATION, AND INVERT ARE AS INDICATED ON DRAWINGS

C. ESTABLISH ELEVATIONS OF BURIED PIPING WITH NOT LESS THAT THAT INDICATED ON THE DRAWINGS.

D. ESTABLISH MINIMUM SEPARATION OF 1 FOOT FROM OTHER SERVICE PIPING IN ACCORDANCE WITH CPC CODE.

E. REMOVE SCALE AND DIRT ON INSIDE OF PIPING BEFORE ASSEMBLY.

F. INSTALL PIPE TO ELEVATION AS INDICATED ON DRAWINGS.

G. PLACE BEDDING MATERIAL AT TRENCH BOTTOM TO PROVIDE UNIFORM BEDDING FOR PIPING, LEVEL BEDDING MATERIALS IN ON CONTINUOUS LAYER NOT EXCEEDING 6 INCHES COMPACTED DEPTH; COMPACT TO 95 PERCENT MAXIMUM DENSITY.

H, INSTALL PIPE ON PREPARED BEDDING.

I. ROUTE PIPE IN STRAIGHT LINE.

J. INSTALL TRACE WIRE CONTINUOUS OVER TOP OF PIPE. BURIED 6 INCHES BELOW PIPE LINE.

K. EXCAVATE IN ACCORDANCE WITH DIVISION 2 FOR WORK OF THIS SECTION.

L. BACKFILL IN ACCORDANCE WITH DIVISION 2 FOR WORK OF THIS SECTION.

3.4 INSTALLATION – ABOVE GROUND PIPING SYSTEMS

A. INSTALL NATURAL GAS PIPING IN ACCORDANCE WITH NFPA 54.

B. PROVIDE NON–CONDUCTING DIELECTRIC CONNCETION WHEREVER JOINTING DISSIMILAR METALS.

C. ROUT PIPING IN ORDERLY MANNER AND MAINTAIN GRADIENT.

D. WHERE REQUIRED, BEND PIPE WITH PIPE BENDING TOOLS IN ACCORDANCE WITH PROCEDURES INTENDED FOR THAT PURPOSE.

E. INSTALL PIPING TO CONSERVE BUILDING SPACE AND NOT INTERFERE WITH USE OF SPACE,

F. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS.

G. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE. JOINTS, OR CONNECTED EQUIPMENT.

H. PROVIDE CLEARANCE FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS.

I. PROVIDE ACCESS WHERE VALVES AND FITTINGS ARE NOT EXPOSED.

J. WHERE PIPE SUPPORT MEMBERS ARE WELDED TO STRUCTURAL BUILDING FRAMING, SCRAPE, BRUSH CLEAN, WELD, AND APPLY ONE COAT OF ZINC RICH PRIMER.

K. PROVIDE SUPPORT FOR UTILITY METERS IN ACCORDANCE WITH REQUIREMENTS OF UTILITY COMPANY.

L. INSTALL VENT PIPING FROM GAS PRESSURE REDUCING VALVES TO OUTDOORS AND TERMINATE IN WEATHERPROOF HOOD. PROTECT VENT AGAINST ENTRY OF INSECTS AND FOREIGN MATERIALS.

1. MINIMUM VENT SIZE: CONNECTION SIZE AT REGULATOR VENT CONNECTION.

2. RUN INDIVIDUAL VENT LINE FROM EACH RELIEF DEVICE, INDEPENDENT OF BREATHER VENTS.

M. BREATHER VENTS MAY BE MANIFOLDED TOGETHER WITH PIPING SIZED FOR COMBINED APPLIANCE VENT REQUIREMENTS.

N. PREPARE PIPE, FITTINGS SUPPORTS, AND ACCESSORIES NOT PRE–FINISHED, READY FOR FINISH PAINTING.

O. INSTALL IDENTIFICATION ON PIPING SYSTEMS INCLUDING UNDERGROUND PIPING.

P. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.

Q. PROTECT PIPING SYSTEM FROM ENTRY OF FOREIGN MATERIALS BY TEMPORARY COVERS, COMPLETING SECTION OF THE WORK, AND ISOLATING PARTS OF COMPLETED SYSTEM.

R. INSTALL MEDIUM PRESSURE GAS PRESSURE REGULATOR WITH TEE FITTING BETWEEN REGULATOR AND UPSTREAM SHUTOFF VALVE. CPA OR PLUG ONE OPENING OF TEE FITTING.

S. INSTALL GAS PRESSURE REGULATOR WITH INDEPENDENT VENT FULL SIZE OPENING ON REGULATOR AND TERMINATE OUTDOORS.

T. SLOPE WATER PIPING AND ARRANGE TO DRAIN AT LOW POINTS.

U. ESTABLISH ELEVATIONS OF BURIED PIPING OUTSIDE THE BUILDING TO ENSURE NOT LESS THAN 1.5 FT. OF COVER.

V. PREPARE PIPE, FITTINGS, SUPPORTS AND ACCESSORIES NOT PREFINISHED, READY FOR FINISH PAINTING.

W. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.

X. PROVIDE FIRESTOPPING AT FIRE RATED WALLS, FLOORS OR CEILING ASSEMBLIES UNDER PROVISIONS OF DIVISION 7.

3.5 APPLICATION

A. INSTALL UNIONS DOWNSTREAM OF VALVES AND AT EQUIPMENT OR APPARATUS CONNECTIONS.

B. INSTALL BRASS MALE ADAPTERS EACH SIDE OF VALVES IN COPPER PIPED SYSTEM. SWEAT SOLDER ADAPTERS TO PIPE.

C. INSTALL GATE OR BALL VALVES FOR SHUT–OFF AND TO ISOLATE EQUIPMENT OR PART OF SYSTEM.

D. INSTALL GLOBE OR BALL VALVES FOR THROTTLING, BYPASS OR MANUAL FLOW CONTROL SERVICES. INSTALL ACCESS PANEL IN HARD CEILING AND OR WALLS AS INDICATED ON PLANS.

E. PROVIDE SPRING LOADED CHECK VALVES ON DISCHARGE OF WATER PUMP.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. DISINFECT ION OF POTABLE WATER SYSTEM SHALL COMPLY WITH ANSI/AWWA C651–92.

B. WHEN HOT AND COLD WATER PIPNG, INCLUDING FIXTURES, HAVE BEEN INSTALLED, TESTED AND ACCEPTED. DISINFECT THE SYSTEM USING ANY OF THE THREE METHODS OF CHLORINATION EXPLAINED IN AWWA C651–92 STANDARD.

C. THAT BASIC DISINFECTION PROCEDURE SHALL CONSIST OF:

1. PREVENTING CONTAMINATING MATERIALS FROM ENTERING THE WATER PIPING SYSTEM DURING STORAGE, CONSTRUCTION OR REPAIR.

2. REMOVING, BY FLUSHING OR OTHER MEANS, THOSE MATERIAL THAT MAY HAVE ENTERED THE WATER PIPING SYSTEM.

3. CHLORINATING ANY RESIDUAL CONTAMINATION THAT MAY REMAIN, AND FLUSHING THE CHLORINATED WATER FROM THE PIPING SYSTEM.

4. PROTECTING THE EXISTING DISTRIBUTION SYSTEM FROM BACKFLOW DUE TO HYDROSTATIC PRESSURE TEST AND DISINFECTION PROCEDURES.

5. DETERMINING THE BACTERIOLOGICAL QUALITY BY LABORATORY TEST AFTER DISINFECTION. AT LEAST ONE WATER SAMPLE FROM THE EXISTING DISTRIBUTION SYSTEM SHALL BE TESTED.

6. FINAL CONNECTION OF THE WATER PIPING SYSTEM TO THE ACTIVE DISTRIBUTION SYSTEM.

D. SUBMIT RECORD OF COMPLIANCE: THE RECORD OF COMPLIANCE SHALL BE THE BACTERIOLOGICAL TEST RESULTS CERTIFYING THE WATER SAMPLE FROM THE WATER PIPING SYSTEM TO BE FREE OF COLIFORM BACTERIA CONTAMINATION, AND TO BE EQUAL TO OR BETTER THAN THE BACTERIOLOGICAL WATER QUALITY IN THE DISTRIBUTION SYSTEM.

E. SUBMIT RECORD OF COMPLIANCE: THE RECORD OF COMPLIANCE SHALL BE THE BACTERIOLOGICAL TEST RESULTS CERTIFYING THE WATER SAMPLED FROM THE NEW WATER PIPING TO BE FREE OF COLIFORM BACTERIA CONTAMINATION.

3.7 TESTS

A. TEST ENTIRE PIPING SYSTEMS, INCLUDING VALVES AND FITTINGS IN ACCORDANCE WITH GOVERNING CODES AND ORDINANCES, CONDUCT TESTING IN THE PRESENCE OF OWNER'S REPRESENTATIVE AND THE LOCAL INSPECTOR UNTIL SATISFACTORY TO BOTH.

B. SANITARY SOIL, WASTE, STORM DRAIN AND VENT PIPING: THE SYSTEM SHALL BE TESTED WITH TEN–FOOT HEAD OF WATER. THE WATER SHALL BE KEPT IN THE SYSTEM FOR AT LEAST FIFTEEN MINUTES BEFORE INSPECTION STARTS. THE SYSTEM SHALL THEN BE TIGHT AT ALL POINTS.

C. DOMESTIC AND INDUSTRIAL HOT AND COLD WATER PIPING SYSTEMS: THE SYSTEM SHALL BE TESTED AND PROVED TIGHT UNDER A WATER PRESSURE NOT LESS THAN THE WORKING PRESSURE UNDER WHICH IT IS TO BE USED. THE PIPING SHALL WITHSTAND THE TEST WITHOUT LEAKING FOR A PERIOD OF NOT LESS THAN FIFTEEN MINUTES.

D. PRESSURE TEST NATURAL GAS PIPING IN ACCORDANCE WITH NFPA 54.

E. GAS SYSTEM: THE SYSTEM SHALL BE TESTED WITH AIR, CO2 OR NITROGEN, THE PIPING SHALL STAND A PRESSURE OF NOT LESS THAN TEN POUNDS PER SQUARE INCH GAUGE PRESSURE, TEST PRESSURE SHALL BE HELD FOR NOT LESS THAN FIFTEEN MINUTES, WITH NOT PERCEPTIBLE DROP IN PRESSURE FOR WELDED PIPING AND FOR PIPING CARRYING GAS AT PRESSURES IN EXCESS OF FOURTEEN INCHES OF WATER COLUMN PRESSURE, THE TEST PRESSURE SHALL BE NOT LESS THAN 60 POUNDS PER SQUARE INCHES AND SHALL BE CONTINUED FOR NOT LESS THAN THIRTY MINUTES.

3.8 CLEANING PIPING SYSTEMS

A. AFTER PIPING SYSTEMS HAVE BEEN TESTED AND PROVED TIGHT, CLEAN PIPING SYSTEMS OF DIRT, SCALE, OIL, GREASE, WASTE AND OTHER FOREIGN SUBSTANCES THAT MAY HAVE ACCUMULATED DURING THE PROCESS OF INSTALLATION.

3.9 SERVICE CONNECTIONS

A. PROVIDE NEW SANITARY SEWER SERVICE. BEFORE COMMENCING WORK CHECK INVERT ELEVATIONS REQUIRED FOR SEWER CONNECTION, CONFIRM INVERTS AND ENSURE THAT THESE CAN BE PROPERLY CONNECTED WITH SLOPE OF DRAINAGE.

B. PROVIDE NEW WATER SERVICE COMPLETE WITH SLEEVE IN WALL FOR SERVICE MAIN AND SUPPORT AT WALL WITH REINFORCED CONCRETE BRIDGE. CAULK ENLARGED SLEEVE AND MAKE WATERTIGHT WITH PLIABLE MATERIAL. ANCHOR SERVICE MAIN INSIDE TO WALL. PROVIDE 18 GAUGE GALVANIZED SHEET METAL SLEEVE AROUND SERVICE MAIN TO 6 INCH ABOVE FLOOR AND 2 FEET MINIMUM BELOW GRADE. SIZE FOR MINIMUM OF 2 INCHES OF LOOSE BATT INSULATION STUFFING.

C. PROVIDE NEW GAS SERVICE COMPLETE WITH GAS METER AND REGULATORS. GAS SERVICE DISTRIBUTION PIPING TO HAVE INITIAL MINIMUM PRESSURE OF 5 PSI. PROVIDE REGULATORS ON EACH LINE SERVING GRAVITY TYPE APPLIANCES, SIZED IN ACCORDANCE WITH EQUIPMENT.

4.1 WARRANTY

A. PROVIDE THREE–YEAR MANUFACTURERS WARRANTY.

END OF SECTION

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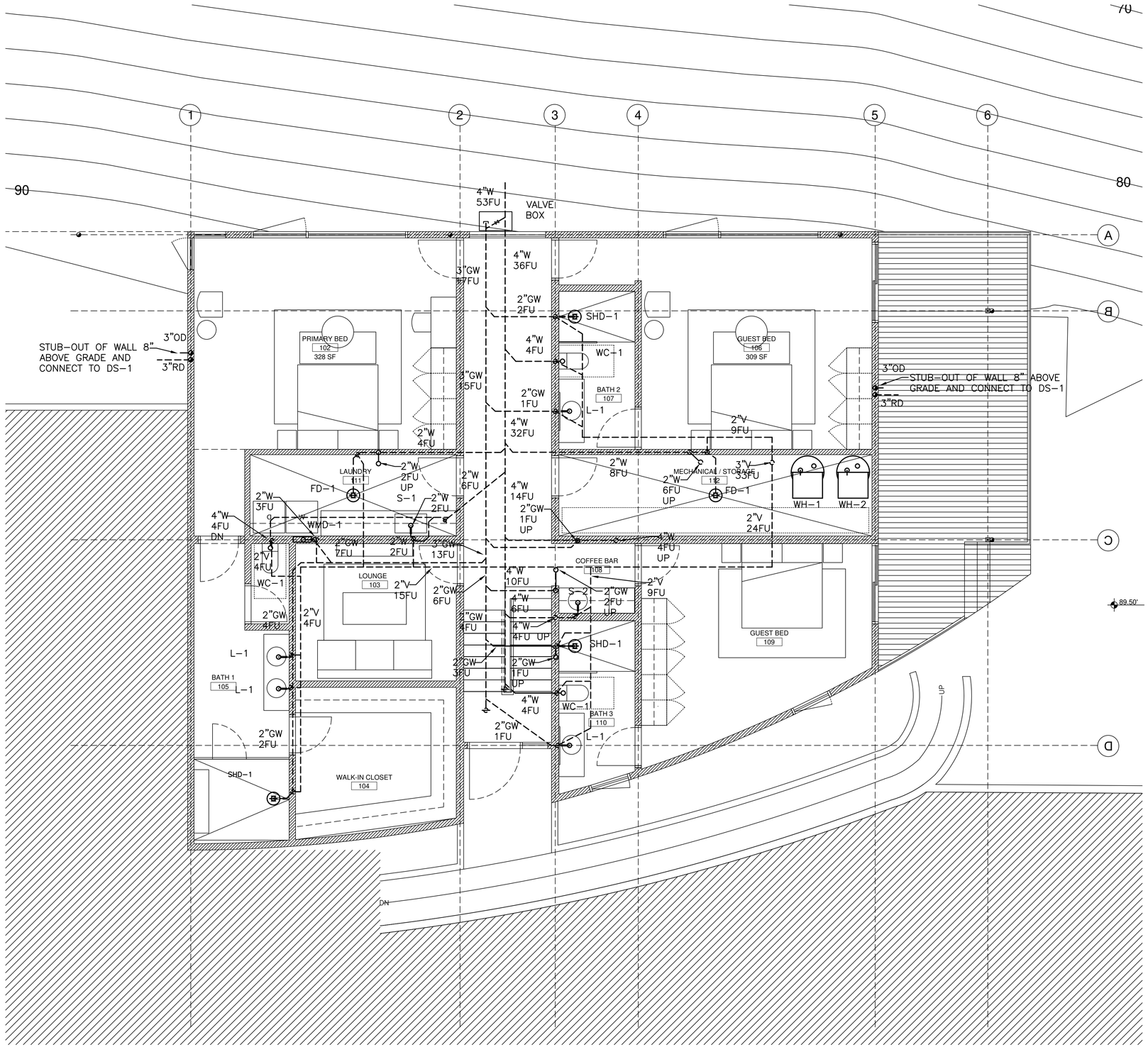
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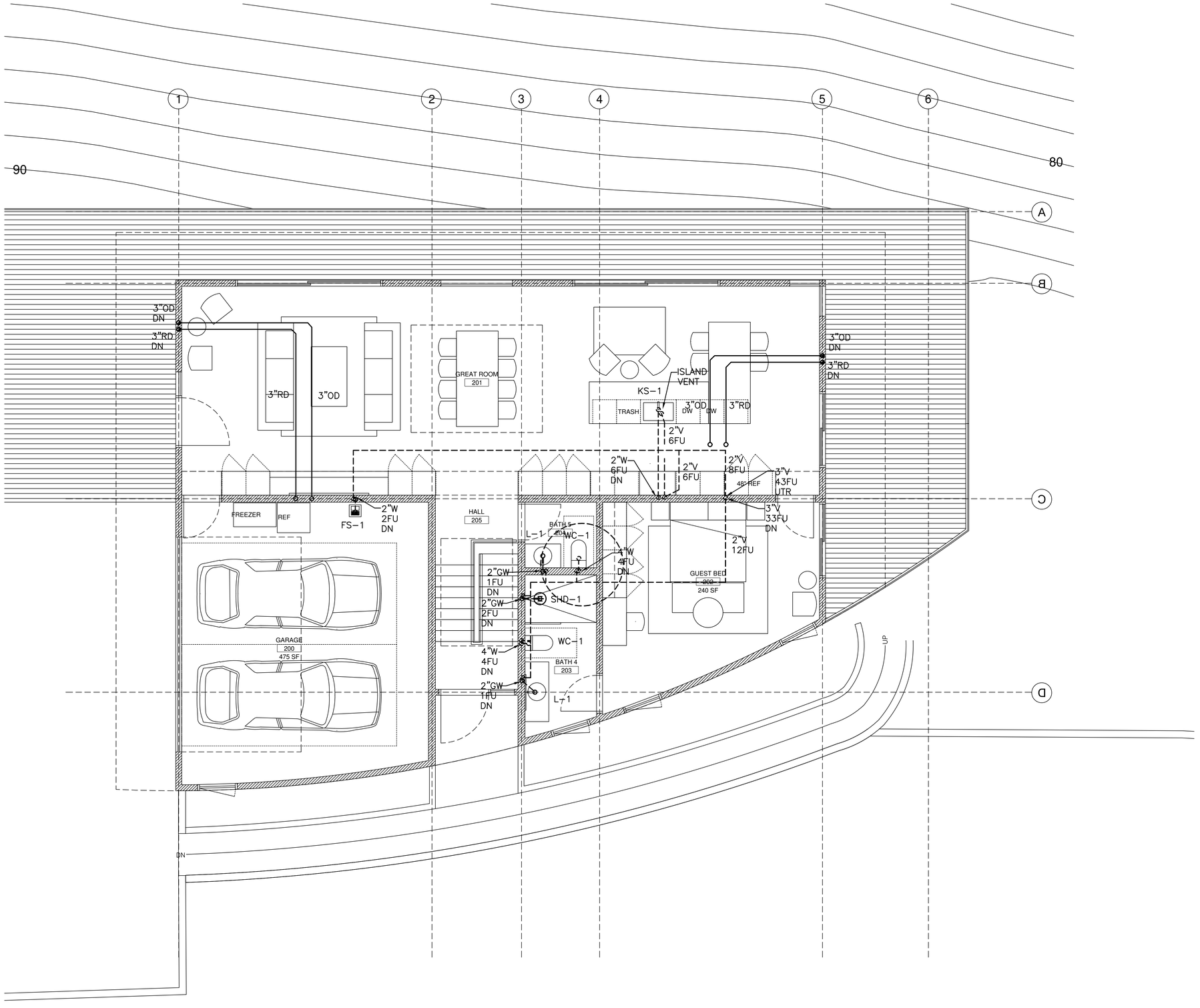
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FIRST FLOOR WASTE AND VENT FLOOR PLAN

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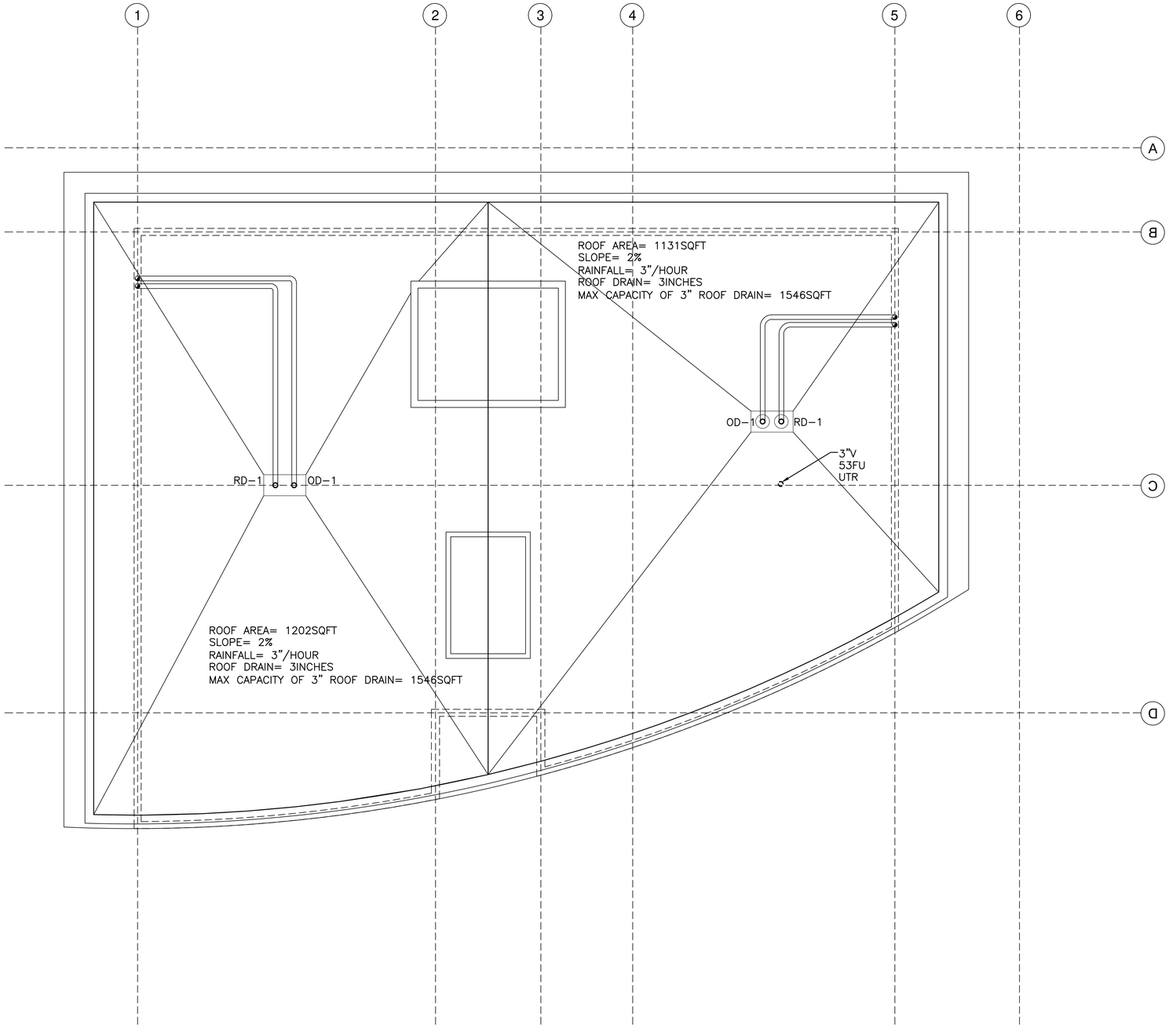
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SECOND FLOOR WASTE AND VENT FLOOR PLAN

08 / SHEET NUMBER

P201



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04 / KEY PLAN

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05 / PROJECT NAME / ADDRESS

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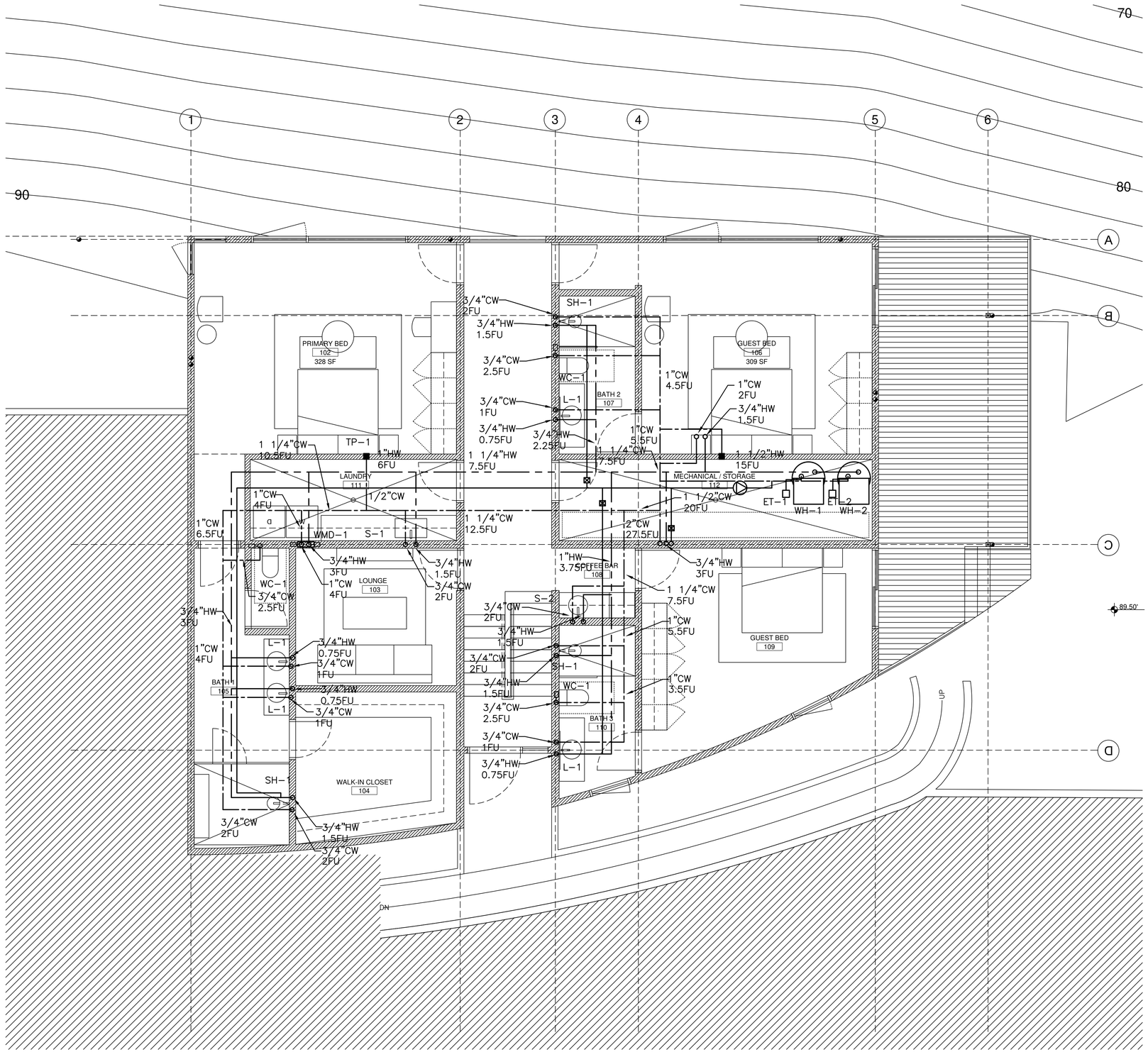
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ROOF WASTE AND VENT

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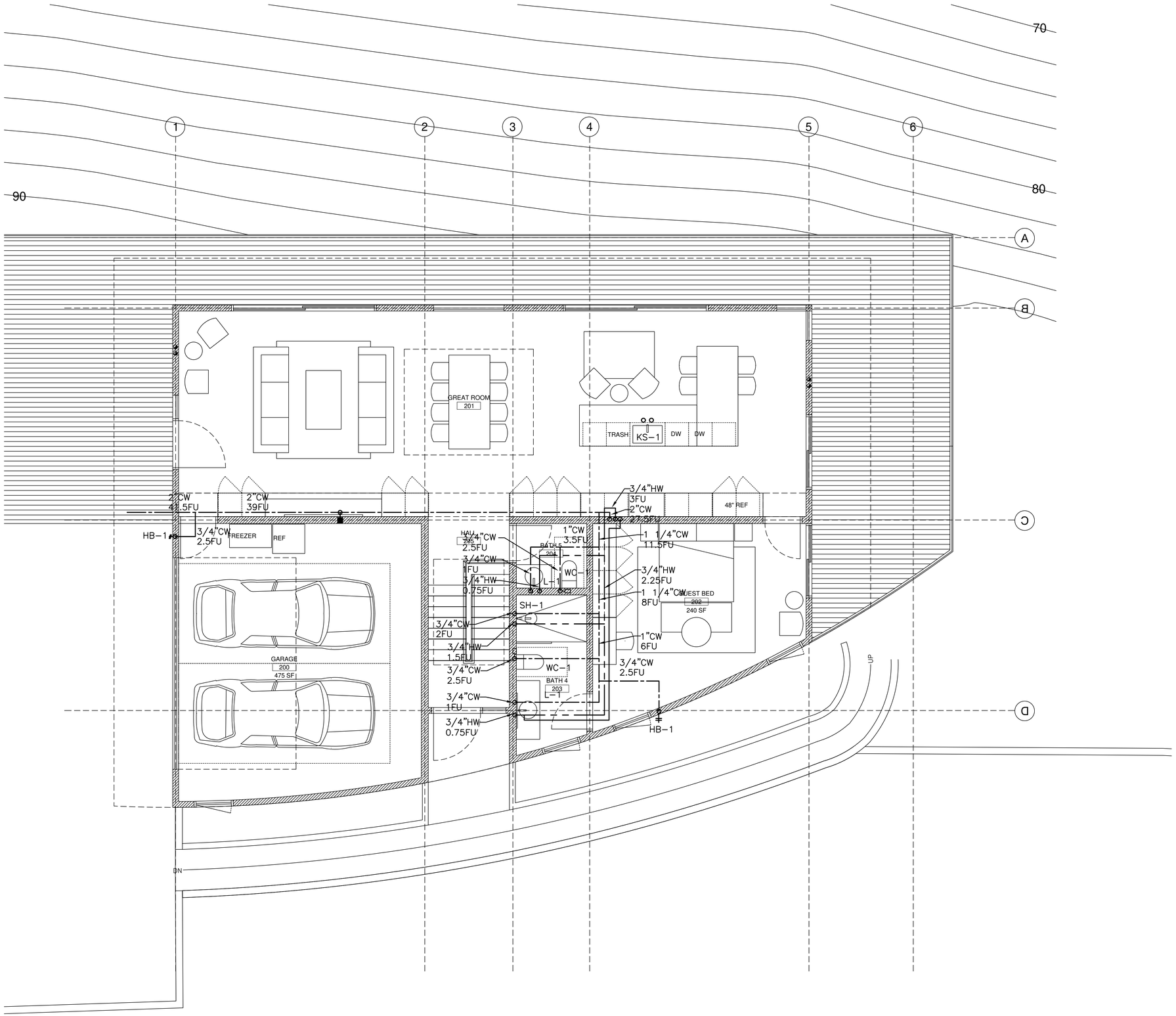
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FIRST FLOOR COLD AND HOT WATER PLAN

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P203



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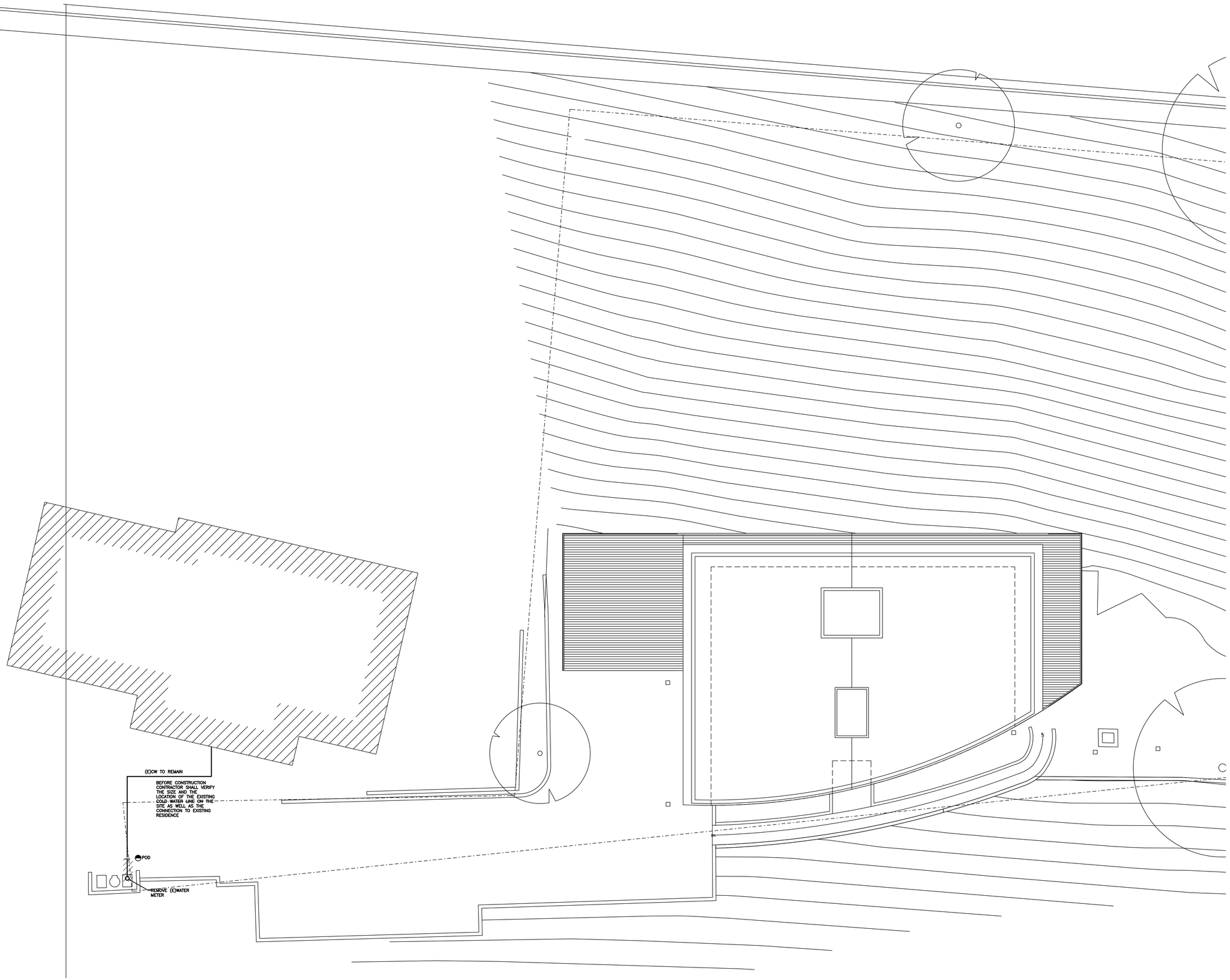
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SECOND FLOOR COLD AND HOT WATER FLOOR PLAN

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P204



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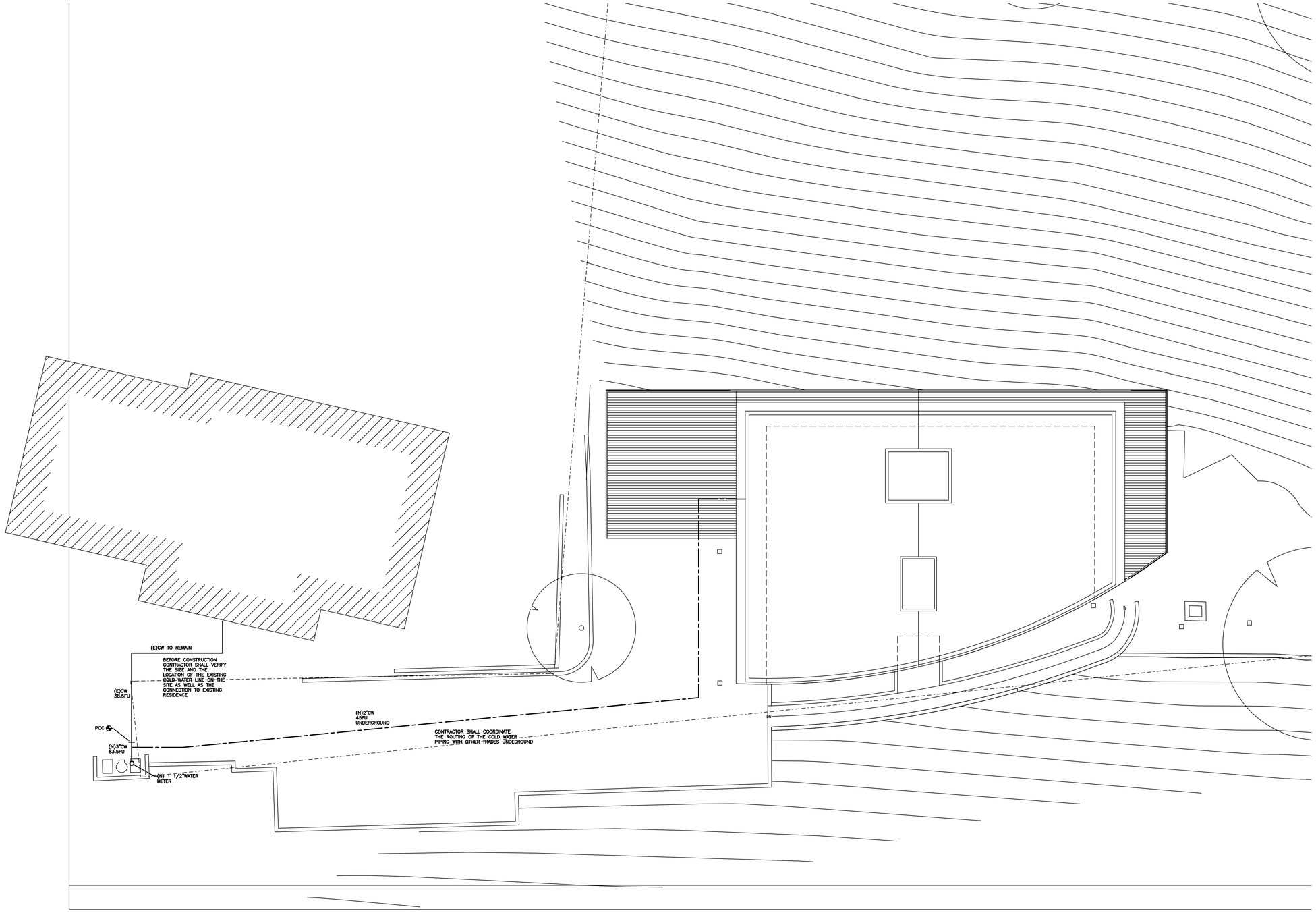
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DEMO SITE PLAN

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P205



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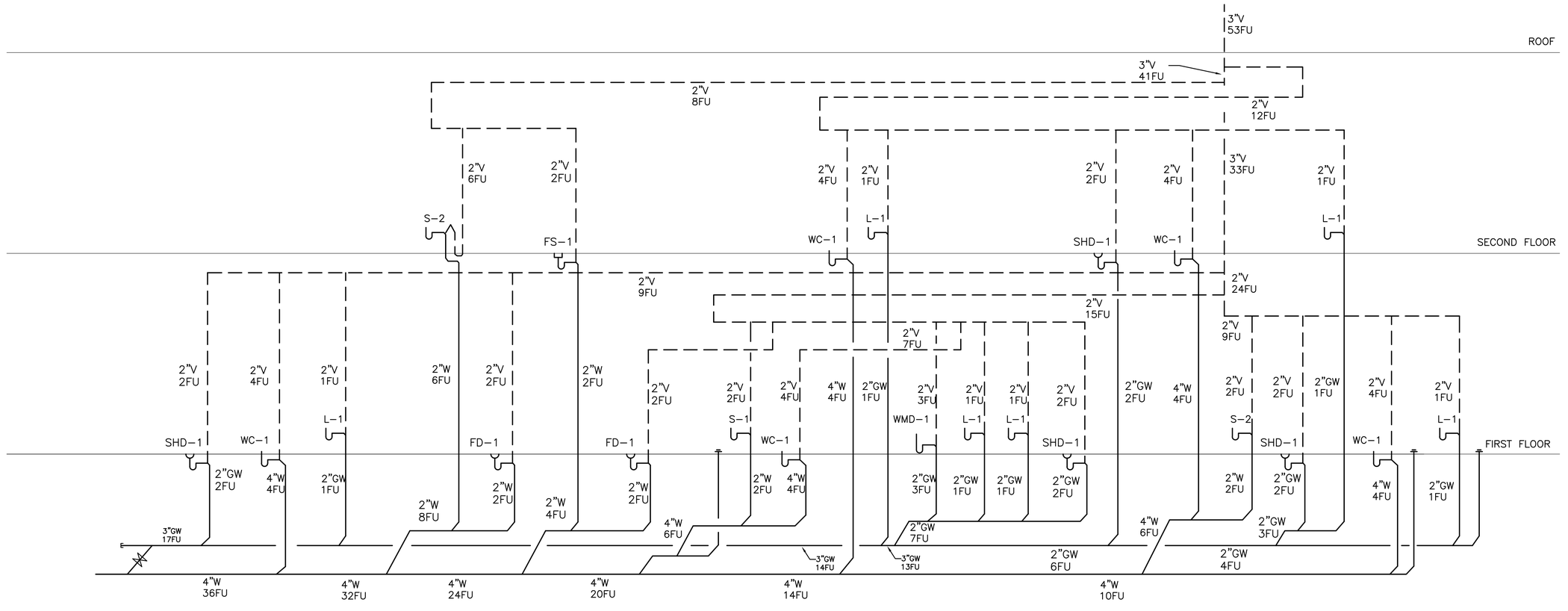
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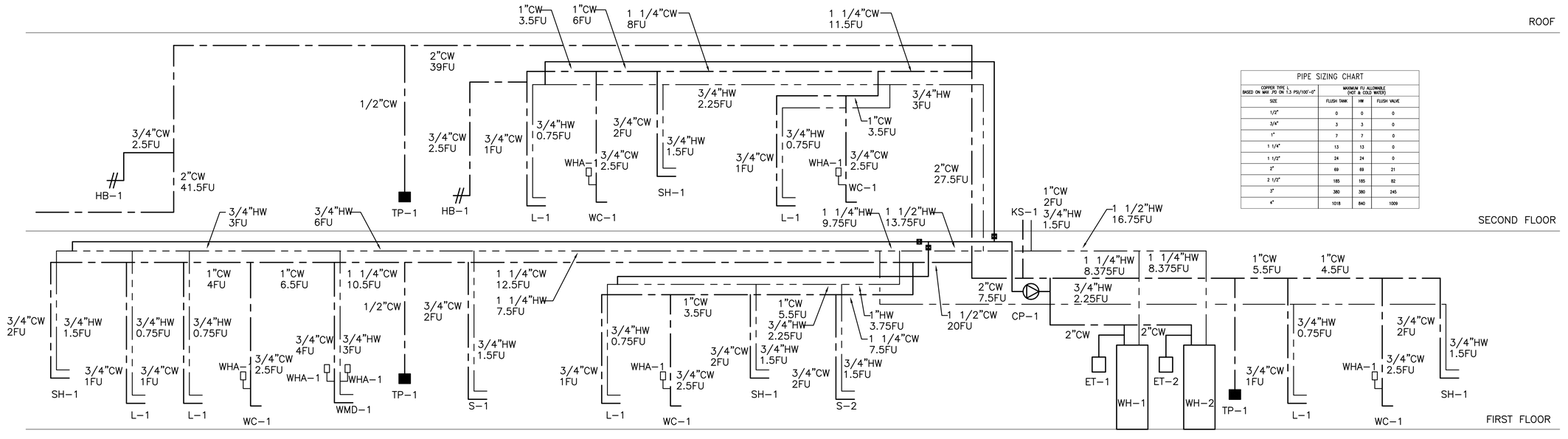
DEMO SITE PLAN

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P206



WASTE AND VENT RISER DIAGRAM



COLD AND HOT WATER PIPING

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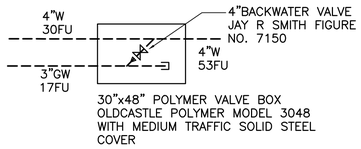
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RISER DIAGRAMS

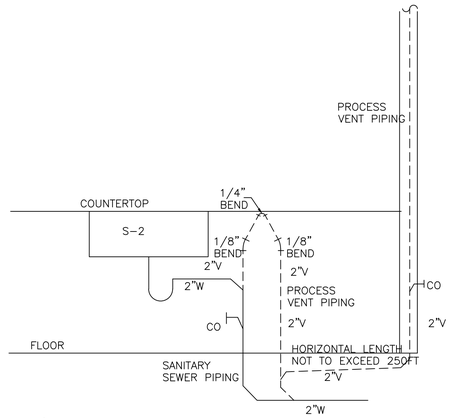
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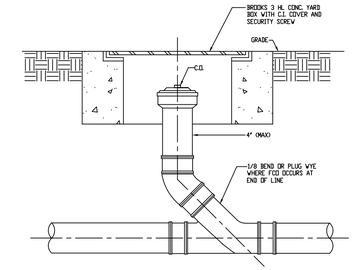
7 DETAIL OF GREY WATER CONNECTION TO SEWER

REF. SCALE: NONE



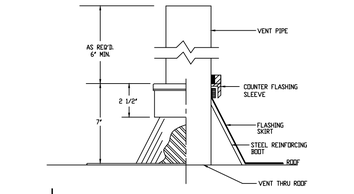
4 BAR SINK DETAIL S-2

REF. SCALE: NONE



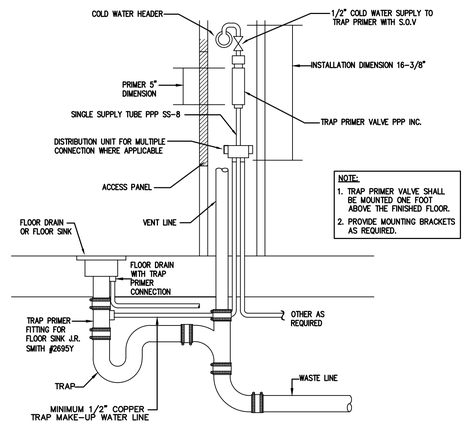
1 CLEANOUT GRADE DETAIL

REF. SCALE: NONE



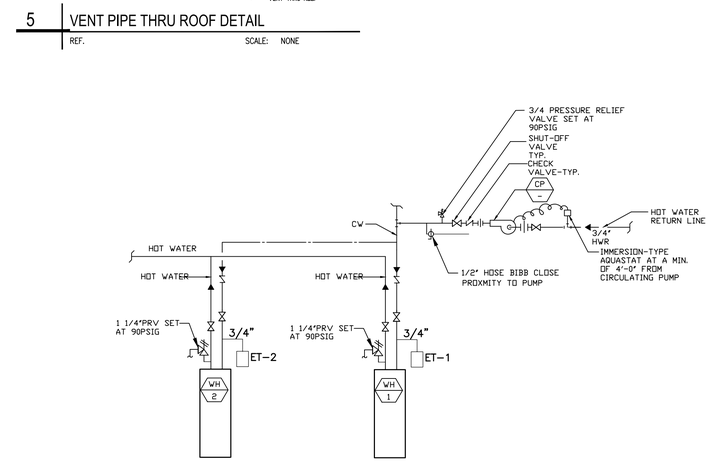
5 VENT PIPE THRU ROOF DETAIL

REF. SCALE: NONE



2 TRAP PRIMER INSTALLATION

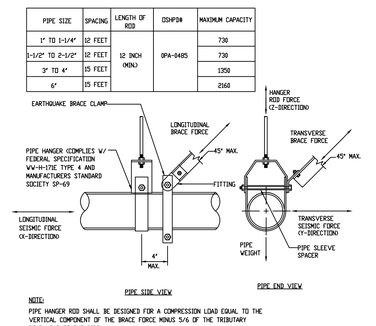
REF. SCALE: NONE



6 TYPICATL WATER HEATER DETAIL

REF. SCALE: NONE

PIPE SIZE	SPACING	LENGTH OF ROD	DSHP28	MAXIMUM CAPACITY
1" TO 1-1/4"	12 FEET	12 INCH (MIN.)	GPA-0485	730
1-1/2" TO 2-1/2"	12 FEET			730
3" TO 4"	15 FEET			1250
6"	15 FEET			2160



NOTE:
PIPE HANGER ROD SHALL BE DESIGNED FOR A COMPRESSION LOAD EQUAL TO THE VERTICAL COMPONENT OF THE BRACE FORCE MINUS 5/6 OF THE TRIBUTARY DEAD LOAD OF THE PIPE.

3 SEISMIC BRACING SYTEMS

REF. SCALE: NONE

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SITE NOTES:

1. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS AN UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.
2. THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
3. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NEC 110.26]
4. ALTERNATE POWER SOURCE PLACARD SHALL BE PLASTIC, ENGRAVED IN A CONTRASTING COLOR TO THE PLAQUE. THIS PLAQUE WILL BE ATTACHED USING AN APPROVED METHOD. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC.
5. THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE BETWEEN THE GROUNDING ELECTRODE AND THE PANEL (OR INVERTER) IF SMALLER THAN #6 AWG COPPER WIRE PER NEC 250-64B. THE GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT PER [NEC 250.64C.]
6. ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SHALL SERVE TO PROTECT THE BUILDING OR STRUCTURE.
7. RIGID CONDUIT (AND/OR NIPPLES) MUST HAVE A PULL BUSHING TO PROTECT WIRES.
8. BOLTED CONNECTION REQUIRED IN DC DISCONNECTS ON THE WHITE GROUNDED CONDUCTOR (USE POLARIS BLOCK OR NEUTRAL BAR)
9. ANY CONNECTION ABOVE LIVE PARTS MUST BE WATERTIGHT. REDUCING WASHERS DISALLOWED ABOVE LIVE PARTS, MEYERS HUBS RECOMMENDED

INTERCONNECTION NOTES:

1. PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED AT THE OPPOSITE END OF THE BUS FROM THE MAIN SERVICE BREAKER OR TRANSFORMER INPUT FEEDER IN ACCORDANCE WITH [NEC 705.12]
2. SUM OF BREAKER RATINGS SUPPLYING THE BUS MAY NOT EXCEED 120% OF THE THE BUSBAR RATING PER [NEC 705.12].
3. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9] & [NEC 230.95] ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. THIS SYSTEM IS INTENDED TO CONNECT TO THE EXISTING FACILITY'S POWER SYSTEM AT ONE POINT, POINT OF COMMON COUPLING (POCC). THIS CONNECTION SHALL BE IN COMPLIANCE WITH THE NEC ARTICLE 705.12 "POINT OF CONNECTION".

SOLAR CONTRACTOR NOTES:

1. MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
2. IF APPLICABLE, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE MARKED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS.
3. AS INDICATED BY DESIGN, OTHER NRTL LISTED MODULE GROUNDING DEVICES MAY BE USED IN PLACE OF STANDARD GROUNDING LUGS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ.
4. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
5. CONDUIT POINT OF PENETRATION FROM EXTERIOR TO INTERIOR TO BE INSTALLED AND SEALED WITH A SUITABLE SEALING COMPOUND.
6. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC UNLESS NOT AVAILABLE.
7. ALL INVERTERS, MOTOR GENERATORS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AC PHOTOVOLTAIC MODULES, SOURCE CIRCUIT COMBINERS, AND CHARGE CONTROLLERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4 (D).
8. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE.

DISCONNECT NOTES:

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DC CURRENT CONDUCTORS ARE TO REMAIN OUTSIDE OF BUILDING PRIOR TO EITHER A FUSIBLE SOURCE CIRCUIT COMBINER BOX OR A LOAD-BREAK DISCONNECTING DEVICE.
4. OVERCURRENT PROTECTION IS REQUIRED IN ONLY ONE LEG OF A PV CIRCUIT PER NEC [690.9(C)].
5. DISCONNECTING MEANS ARE REQUIRED IN BOTH LEGS OF A PV CIRCUIT PER NEC 690.15.

EQUIPMENT LOCATIONS:

1. ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY [NEC 110.26].
2. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY [NEC 690.31 (A)-(B)] AND [NEC TABLE 310.15 (B)(2)(C)].
3. ADDITIONAL AC DISCONNECTS SHALL BE PROVIDED WHERE THE INVERTER IS NOT ADJACENT TO THE UTILITY AC DISCONNECT, OR NOT WITHIN SIGHT OF THE UTILITY AC DISCONNECT.
4. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
5. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

MARKINGS:

1. ALL INTERACTIVE SYSTEM POINTS OF INTERCONNECTION WITH OTHER SOURCES SHALL BE MARKED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTION MEANS.
2. A PERMANENT PLAQUE OR DIRECTORY SHALL BE PROVIDED IDENTIFYING THE LOCATION OF THE SERVICE DISCONNECTION MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTION MEANS, IF NOT LOCATED AT THE SAME LOCATION.
3. PHOTOVOLTAIC MODULES SHALL BE MARKED TO IDENTIFY LEAD POLARITY, DEVICE RATINGS, AND SPECIFICATIONS FOR VOLTAGE, CURRENT, AND POWER.

WIRING & CONDUIT SIZES:

1. ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS
2. ALL PV CABLES AND HOMERUN WIRES BE #10AWG *USE-2, PV WIRE, OR PROPRIETARY SOLAR CABLING SPECIFIED BY MFR, OR EQUIVALENT; ROUTED TO SOURCE CIRCUIT COMBINER BOXES AS REQUIRED
3. ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC 690.8 (A)(1) & (B)(1)], [NEC 240] [NEC 690.7] FOR MULTIPLE CONDUCTORS
4. ALL PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE DERATED ACCORDING TO [NEC TABLE 310.15 (B)(2)(C)] BLACK ONLY**
5. EXPOSED ROOF PV DC CONDUCTORS SHALL BE USE-2, 90°C RATED, WET AND UV RESISTANT, AND UL LISTED RATED FOR 600V, UV RATED SPIRAL WRAP SHALL BE USED TO PROTECT WIRE FROM SHARP EDGES
6. ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
7. AC CONDUCTORS >4AWG COLOR CODED OR MARKED: PHASE A OR L1- BLACK, PHASE B OR L2- RED, PHASE C OR L3- BLUE, NEUTRAL- WHITE/GRAY
   *USE-2 IS NOT INDOOR RATED BUT PV CABLE IS RATED THWN/THWN-2 AND MAY BE USED INSIDE.
   **USE-2 IS AVAILABLE AS UV WHITE
8. IF USED, ALL EXPOSED WIRENUTS ARE TO BE SILICONE FILLED, EQUIVALENT TO IDEAL BLUE, AND MUST BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS BY A QUALIFIED/CERTIFIED PERSON. USE OF WIRENUTS SHALL BE APPROVED BY OWNER PRIOR TO USE.
9. ALL CONDUITS ON ROOF MUST BE AT MIN. 3 1/2" ABOVE ROOF.
10. PV SYSTEM SHOULD NOT HAVE WHITE OR GRAY COLORED DC PV CONDUCTORS.

GROUNDING NOTES:

1. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH [NEC 690-47] AND [NEC 250-50] THROUGH [NEC 60 250-166] SHALL BE PROVIDED. PER NEC, GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO AT THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, OR IS ONLY METALLIC WATER PIPING, A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT GROUND ROD WITH ACORN CLAMP.
2. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO GREATER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
3. PV SYSTEM SHALL BE GROUNDED IN ACCORDANCE TO [NEC 250.21], [NEC TABLE 250.122], AND ALL METAL PARTS OR MODULE FRAMES ACCORDING TO [NEC 690.43].
4. MODULE SOURCE CIRCUITS SHALL BE GROUNDED IN ACCORDANCE TO [NEC 690.42].
5. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDED CONDUCTOR TO ANOTHER MODULE.
6. EACH MODULE WILL BE GROUNDED USING THE SUPPLIED CONNECTIONS POINTS IDENTIFIED IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
7. ENCLOSURES SHALL BE PROPERLY PREPARED WITH REMOVAL OF PAINT/FINISH AS APPROPRIATE WHEN GROUNDING EQUIPMENT WITH TERMINATION GROUNDING LUGS.
8. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVISES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR DIRECT BURIAL.
9. GROUNDING AND BONDING CONDUCTORS SHALL BE COPPER, SOLID OR STRANDED, AND BARE WHEN EXPOSED.
10. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZE ACCORDING TO [NEC 690.45] AND BE A MINIMUM OF #10AWG WHEN NOT EXPOSED TO DAMAGE (#6AWG SHALL BE USED WHEN EXPOSED TO DAMAGE).
11. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN (OR MARKED GREEN IF #4 AWG OR LARGE.
12. ALL CONDUIT BETWEEN THE UTILITY AC DISCONNECT AND THE POINT OF CONNECTION SHALL HAVE GROUNDED BUSHINGS AT BOTH ENDS.
13. AC SYSTEM GEC SIZED ACCORDING TO [NEC 690.47], [NEC TABLE 250.66], DC SYSTEM GEC SIZED ACCORDING TO [NEC 250.166], MINIMUM #8AWG WHEN INSULATED, #6AWG WHEN EXPOSED TO DAMAGE.
14. EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENTS, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.136(A) REGARDLESS OF VOLTAGE.
15. GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE INVERTER IN ACCORDANCE WITH [NEC 690.5(A).
16. PHOTOVOLTAIC INVERTERS SHALL BE EQUIPPED WITH DC GROUND FAULT PROTECTION TO REDUCE FIRE HAZARDS. INVERTERS SHALL BE EQUIPPED WITH ANTI-ISLANDING CIRCUITRY.

REQUIRED SAFETY SIGNS AND LABELS:

REQUIRED SAFETY SIGNS AND LABELS SHALL BE PERMANENTLY ATTACHED BY ADHESIVE OR OTHER MECHANICAL MEANS. LABELS SHALL COMPLY WITH ARTICLE 690 OF THE NEC OR OTHER APPLICABLE STATE AND LOCAL CODES. SEE LABELS AND MARKING PAGE E.8 FOR MORE INFORMATION

1. ANY SWITCH, FUSES, OR CIRCUIT BREAKERS THAT CAN BE ENERGIZED IN EITHER DIRECTION SHALL BE LABELED AS FOLLOWS:

   WARNING:
   ELECTRICAL SHOCK HAZARD. DO NOT TOUCH TERMINALS.
   TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

2. THIS PHOTOVOLTAIC SYSTEM WILL BE EQUIPPED WITH AN AC DISCONNECT WHICH WILL BE LABELED AS FOLLOWS:

   PHOTOVOLTAIC
   DISCONNECTING MEANS
   AC DISCONNECT

3. A MARKING SPECIFYING THE PHOTOVOLTAIC POWER SOURCE RATED AS FOLLOWS SHALL BE PROVIDED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTION MEANS FOR THE POWER SOURCE:

   OPERATING CURRENT
   OPERATING VOLTAGE
   MAXIMUM SYSTEM VOLTAGE
   SHORT CIRCUIT CURRENT
   FUSE RATING

ELECTRICAL NOTES:

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE FOLLOWING CODES:

   2019 CALIFORNIA ADMINISTRATIVE CODE (CAC)
   PART 1, TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR)
   2019 CALIFORNIA BUILDING CODE (CBC)
   PART 2, TITLE 24, CCR
   BASED ON THE 2012 INTERNATIONAL BUILDING CODE (IBC)
   2019 CALIFORNIA ELECTRICAL CODE (CEC)
   PART 3, TITLE 24, CCR
   BASED ON THE 2012 NATIONAL ELECTRICAL CODE (NEC)
   2019 CALIFORNIA MECHANICAL CODE (CMC)
   PART 4, TITLE 24, CCR
   BASED ON THE 2012 UNIFORM MECHANICAL CODE (UMC)
   2019 CALIFORNIA PLUMBING CODE (CPC)
   PART 5, TITLE 24, CCR
   BASED ON THE 2012 UNIFORM PLUMBING CODE (UPC)
   2019 CALIFORNIA FIRE CODE (CFC)
   PART 9, TITLE 24, CCR
   BASED ON THE 2012 INTERNATIONAL FIRE CODE (IFC)
   2019 CALIFORNIA REFERENCED STANDARDS
   PART 12, TITLE 24, CCR
   2019 PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS.

   NOTHING IN THIS PLANS OR SPECIFICATIONS ARE TO BE CONSTRUED AS TO PERMIT WORK NOT CONFORMING TO THESE CODES.

2. THE ELECTRICAL DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC IN NATURE, THE DRAWINGS SHOWS THE APPROXIMATE LOCATIONS OF THE EQUIPMENT, HOWEVER, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL THE EQUIPMENT AND ASSOCIATED WIRING IN SUCH A MANNER AS TO CONFORM WITH THE EXISTING STRUCTURE OF THE BUILDING, AVOID ALL OBSTRUCTIONS AND MEET ALL APPLICABLE CODE REQUIREMENTS, IN THE CITY OF PALM SPRINGS.
3. ALL ELECTRICAL MATERIALS AND EQUIPMENT TO BE USED SHALL BE U.L. LISTED AND LABELED. RECOGNIZED ELECTRICAL TESTING LABORATORY OR APPROVED BY THE CITY OF PALM SPRINGS.
4. ANY DEFICIENCY PERTAINING TO WORKMANSHIP FOUND BY THE INSPECTOR SHALL BE CORRECTED WITHOUT ADDITIONAL COST TO THE OWNER.
5. ALL WIRING SHALL BE COPPER, 600V WITH THWN/THHN INSULATION, MINIMUM SIZE SHALL BE #12 UNLESS OTHERWISE NOTED.
6. ALL WIRING SHALL BE IN NON-METALLIC CABLE (GROUNDED), OR ELECTRICAL METALLIC TUBING FLEXIBLE METALLIC, OR APPROVED EQUAL, 1/2" MINIMUM UNLESS OTHERWISE NOTED.
7. THE ELECTRICAL CONTRACTOR SHALL PROVIDE SUPPORT FOR ALL ELECTRICAL EQUIPMENT TO COMPLY WITH THE SEISMIC REQUIREMENTS OF THE UNIFORM BUILDING CODE AND ALL LOCAL ORDINANCES.
8. THE NEW INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
9. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUITS, WIRES, BOXES AND CONVENIENCE RECEPTACLES, AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS FOR A COMPLETE AND OPERATIONAL ELECTRICAL SYSTEM.
10. THE ELECTRICAL CONTRACTOR SHALL NOT BORE, NOTCH OR IN ANY OTHER WAY CUT INTO STRUCTURAL MEMBERS WITHOUT THE WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.
11. THE ELECTRICAL CONTRACTOR SHALL MAKE POWER CONNECTIONS TO ALL EQUIPMENT FURNISHED BY OTHERS.
12. ALL CONDUITS CONNECTIONS TO EQUIPMENT SUBJECT TO VIBRATIONS SHALL BE MADE WITH SEALTIGHT FLEXIBLE CONDUIT PROVIDING SUFFICIENT SLACK TO MINIMIZE VIBRATION.
13. ALL WIRING SHALL BE AS PER EQUIPMENT SUPPLIER, ELECTRICAL CONTRACTOR TO COORDINATE.
14. THE PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE CBC SECTION 1609 TO WITHSTAND A MINIMUM 110 MPH WIND LOAD.
15. WHEN A BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, BREAKER SHALL NOT READ LINE AND LOAD.
16. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
17. THIS SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURISDICTION AND THE UTILITY IS OBTAINED.
18. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL OR BUILDING ROOF VENTS.

SCOPE OF WORK

1. NEW PV SYSTEM WITH SOLAR BATTERY BACKUP FOR SINGLE FAMILY RESIDENCE.
2. 32 SUN POWER SPR-X22-370-E-AC SOLAR PANELS.
3. 32 SUN POWER TYPE E(IQ 7XS) MICROINVERTERS.
4. 4 NEW TESLA POWERWALLS.

SYMBOL LEGEND

SYMBOL	DESCRIPTION
	ATTIC VENTS
	MECHANICAL & PLUMBING VENTS
	CHIMNEY
	SOLAR MODULES
	CSFM 3' SETBACKS
	PROPERTY LINE
	CIRCUIT HOMERUN TO PANEL
	CONDUIT: THROUGH THE ATTIC
	CONDUIT
M	ELECTRIC METER
PV	PV METER
	MAIN SERVICE PANEL AND UTILITY PANEL
	SUBPANEL
I	MICROINVERTER
LC	LOAD CENTER
AC	AC DISCONNECT
DC	DC DISCONNECT
JB	JB DISCONNECT
CB	COMBINER BOX
G	GAS MAIN
F	FUSED DISCONNECT

ABBREVIATIONS:

A.F.F.	ABOVE FINISH FLOOR	HP	HORSE POWER
CAB.	CABINET	J	JUNCTION BOX
C.B.	CIRCUIT BREAKER	L.C.L.	LONG CONTINUOUS LOAD
CKT.	CIRCUIT	N.I.C.	NOT IN CONTRACT
CLG.	CEILING	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
C.O.	CONDUIT ONLY	S	SWITCH
DISC.	DISCONNECT	WP	WEATHERPROOF
DISTR.	DISTRIBUTION	U.O.N.	UNLESS OTHERWISE NOTED
GRD.	GROUND	E.M.	ON EMERGENCY

REVISIONS	DATE

SHEET TITLE:
ELECTRICAL NOTES, SYMBOL LIST & ABBREVIATIONS

PROJECT TITLE & ADDRESS:
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DRAWN
CHECKED
–
DATE
10-21-2022
SCALE
AS SHOWN
JOB NO.
--
SHEET
PV-1.0

1 COMBINER BOX / CIRCUITS / CONDUIT
COMBINER BOX / EMT ENCLOSURES

⚠WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

PER NEC 690.17(E)

⚠WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

PER NEC 110.27(C) & OSHA 1910.145(f)(7)

⚠WARNING
ELECTRICAL SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

PER NEC 690.35(F)

2 BUILDING / STRUCTURE

CAUTION
POWER TO THIS SERVICE IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN

PER NEC 690.56(B)

3 EMT / CONDUIT RACEWAYS
* (REFLECTIVE MATERIAL REQUIRED)

WARNING: PHOTOVOLTAIC POWER SOURCE

PER NEC 690.31
* 3/8" TALL LETTERS ON REFLECTIVE MATERIAL

WARNING
PHOTOVOLTAIC POWER SOURCE
DO NOT REMOVE UNLESS REPLACED IN EXACT LOCATION - PV POWER CIRCUIT DIRECTLY BELOW

PER NEC 690.4(F)

1. TO BE INSTALLED EVERY 20'. FOR VERTICAL CONDUIT, A MINIMUM OF ONE LABEL TO BE AFFIXED AT EYE LEVEL.

⚠ CAUTION
SOLAR PV WIRING MAY REMAIN ENERGIZED AFTER DISCONNECTION DURING DAYLIGHT HOURS.

2. EXTERIOR/ INTERIOR OF ELECTRICAL PANEL SIGNAGE.

⚠ CAUTION
SOLAR PV SYSTEM INSTALLED. WHEN POWER DISCONNECTED, SOLAR PANELS AND WIRING IN CONDUIT TO INVERTER MAY REMAIN ENERGIZED DURING DAYLIGHT HOURS.

4 DC DISCONNECT / BREAKER / RECOMBINER BOX

⚠WARNING
ELECTRICAL SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

PER NEC 690.35(F)

⚠WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT

PER NEC 690.17(4)

5 INVERTER

⚠WARNING
ELECTRICAL SHOCK HAZARD
IF A GROUND FAULT IS INDICATED
NORMALLY GROUNDED CONDUCTORS
MAY BE UNGROUNDED AND ENERGIZED

PER NEC 690.5(C)

6 AC DISCONNECT / BREAKER / POINTS OF CONNECTION

PHOTOVOLTAIC AC DISCONNECT
"ACDS-1.1"

PER IFC 605.11.1, IFC 605.11.1.4, NEC 690.15, NEC 690.14(C)(2) & NEC 690.13(B)

PHOTOVOLTAIC AC DISCONNECT
MAXIMUM AC OPERATING CURRENT: 67.1A
NOMINAL OPERATING AC VOLTAGE: 240V

PER NEC 690.54

⚠WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

[redacted]

7 BREAKER PANEL / PULL BOXES

⚠WARNING
ELECTRICAL SHOCK HAZARD
IF A GROUND FAULT IS INDICATED
NORMALLY GROUNDED CONDUCTORS
MAY BE UNGROUNDED AND ENERGIZED

PER NEC 690.5(C)

⚠WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

PER NEC 690.17(E)

⚠WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

PER NEC 110.27(C) & OSHA 1910.145(f)(7)

⚠WARNING
ELECTRICAL SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

PER NEC 690.35(F)

[redacted]

PER NEC 690.33(E)(2)

[redacted]

PER NEC 705.12(D) & NEC 690.64

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

PER NEC 705.12(D) & NEC 690.64

⚠ WARNING
INVERTER OUTPUT CONNECTION, DO NOT RELOCATE THIS OVERCURRENT DEVICE.

PER NEC 705.12(D)(2)(C)

A = BLACK
B = RED
C = BLUE
NEUTRAL = WHITE

PER NEC 210.5 (C)(1)(B)

8 MAIN SERVICE DISCONNECT

⚠WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

PER NEC 690.17(E)

⚠WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

PER NEC 690.5(C)

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

PER NEC690.15 & NEC 690.13(B)

[redacted]

PER NEC 690.15 & NEC 690.13(B)

9 MAIN SERVICE DISCONNECT / UTILITY METER

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

PER NEC 690.15 & NEC 690.13(B)

10 FIELD MARKING

NOTE :
ELECTRICAL SERVICE EQUIPMENT MUST BE FIELD MARKED PER THE NEC CODE WHEN IT IS PRESENT IN A BUILDING OR STRUCTURE (OTHER THAN DWELLING UNITS) SUPPORTED BY MORE THAN ONE SERVICE PROVIDER (I.E., PUBLIC UTILITIES SUCH AS ELECTRICITY AND A PV SYSTEM).
THIS INCLUDES ARC FLASH AND INFORMATIONAL LABELING.

a. INVERTER

INV-CP-1.1	INV-CP-2.1	INV-CP-3.1
INV-CP-3.2	INV-CP-4.1	INV-CP-4.2
INV-CP-5.1	INV-CP-5.2	INV-CP-6.1

PER NEC 408.4(B)

b. BREAKER PANEL / PULL BOXES / MAIN SERVICE DISCONNECT

⚠WARNING
ARC-FLASH AND SHOCK HAZARD
APPROPRIATE PPE REQUIRED

PER NEC ARTICLE 110.16 AND NFPA 70E ARTICLE 130.5(C)(1),(2),(3)

c. BREAKER PANEL

THIS PANEL FED FROM INV-CP-1.1
TO INV-CP-3.2 & INV-8.1

PER NEC 408.4(B)

d. BREAKER PANEL

THIS PANEL FED FROM INV-CP-4.1
TO INV-CP-6.1 & SPNLBD-1.2

PER NEC 408.4(B)

e. MAIN SERVICE DISCONNECT / UTILITY METER

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

PER NEC 690.56(C)
* 3/8" TALL LETTERS ON REFLECTIVE MATERIAL

GENERAL NOTES FOR LABELS AND MARKINGS

1. LABELS AND MARKINGS SHALL BE APPLIED TO THE APPROPRIATE COMPONENTS IN ACCORDANCE WITH THE NEC.
2. SOLAR MODULES ARE SUPPLIED FROM THE MANUFACTURER WITH MARKINGS PRE-APPLIED TO MEET THE REQUIREMENTS OF THE NEC.
3. THE INVERTER IS SUPPLIED FROM THE MANUFACTURER WITH THE APPROPRIATE LABELS AND MARKINGS TO MEET THE REQUIREMENTS OF NEC.
4. ALL OTHER WARNING AND CAUTION LABELS, UNLESS OTHERWISE SPECIFIED, MUST MEET THE REQUIREMENTS OF ANSI Z535.4 – 2011 PER ARTICLE 110.21(B) IN THE NEC 2014. THE ANSI STANDARD REQUIRES THAT DANGER, WARNING, AND CAUTION SIGNS USED THE STANDARD HEADER COLORS, HEADER TEXT, AND SAFETY ALERT SYMBOL ON EACH LABEL. THE ANSI STANDARD REQUIRES A HEADING THAT IS AT LEAST 50% TALLER THAN THE BODY WHILE NOT REQUIRED IN THE NEC 2014, THE MESSAGE TEXT SHOULD BE AT LEAST .12" TALL. IF WE COMPARE THIS TO OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OHSA)1910.145 AND THE AMERICAN NATIONAL STANDARD INSTITUTE (ANSI) Z535, IT IS SPECIFIED THAT SIGNS MUST BE VISIBLE AT A SAFE VIEWING DISTANCE FROM THE HAZARD. THEY ALSO RECOMMEND THE USE OF SAFETY ALERT SYMBOLS, WHERE APPLICABLE.

REQUIREMENTS FOR ELECTRICAL INSTALLATIONS (FIELD MARKING):

NEC 210.5(C)(1)(B):

BRANCH CIRCUITS: THE IDENTIFICATION METHODS USED FOR CONDUCTORS ORIGINATING WITHIN EACH BRANCH CIRCUIT SHALL BE DOCUMENTED IN A MANNER THAT IS READILY AVAILABLE OR SHALL BE PERMANENTLY POSTED AT EACH BRANCH- CIRCUIT PANELBOARD OR DISTRIBUTION EQUIPMENT.

NEC 705.12(D)(2)(C):

IN SYSTEMS WITH PANEL BOARDS CONNECTED IN A SERIES, THE RATING OF THE FIRST OVERCURRENT DEVICE DIRECTLY CONNECTED TO THE OUTPUT OF THE UTILITY, INTERACTIVE INVERTER(S) SHALL BE USED IN CALCULATIONS FOR ALL BUSBARS AND CONDUCTORS. A PERMANENT LABEL SHALL BE APPLIED TO THE DISTRIBUTION EQUIPMENT WITH THE FOLLOWING OR EQUIVALENT WORDING.

NEC 705.12(D)(4):

EQUIPMENT CONTAINING OVERCURRENT DEVICES IN CIRCUITS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SUPPLIED FROM MULTIPLE SOURCES SHALL BE MARKED TO INDICATE THE PRESENCE OF ALL SOURCES.

OSHA 1910.145(F)(7):

WARNING TAGS ARE USED TO REPRESENT A HAZARD LEVEL BETWEEN "CAUTION" AND "DANGER".

LABELING REQUIREMENTS FOR ARTICLE 690:

NEC 690.13(B):

EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT.

NEC 690.15, IFC 605.11.1 & IFC 605.11.1.4:

IF THE EQUIPMENT IS ENERGIZED FROM MORE THAN ONE SOURCE, THE DISCONNECTING MEANS MUST BE GROUPED AND IDENTIFIED.

NEC 690.16(B):

NON--LOAD BREAK RATED DISCONNECT MEANS SHALL BE MARKED.

NEC 690.17(E):

WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING LABEL SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECTING MEANS.

NEC 690.31(B), IFC 605.11.1.2:

IDENTIFICATION AND GROUPING PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPARATE COLOR CODING, MARKING TAPE, TAGGING OR OTHER APPROVED MEANS.

NEC 690.31(E)(3), IFC 605.11.1.2:

LABELS SHALL APPEAR AT EVERY SECTION OF THE WIRING SYSTEM THAT IS SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS OR FLOORS. SPACING BETWEEN LABELS NOT TO EXCEED 10 FEET (3M).

NEC 690.33(E)(2):

INTERRUPTION CURRENT -- BE A TYPE THAT REQUIRES THE USE OF A TOOL TO OPEN WILL BE MARKED "DO NOT DISCONNECT UNDER LOAD".

NEC 690.35(F):

A PV POWER SOURCE SHALL BE LABELED AT EACH JUNCTION BOX, COMBINER BOX OR DISCONNECT, AND DEVICE WHERE ENERGIZED, UNGROUNDED CIRCUITS MAY BE EXPOSED DURING SERVICE.

NEC 690.4(F):

WHERE CIRCUITS ARE EMBEDDED IN BUILDUP, LAMINATE OR MEMBRANE ROOFING MATERIALS NOT COVERED BY PV MODULES AND ASSOCIATED EQUIPMENT, THE LOCATION OF THE CIRCUITS SHALL BE CLEARLY MARKED.

NEC 690.4(G):

BIPOLAR PHOTOVOLTAIC SYSTEMS SHALL BE CLEARLY MARKED WITH A PERMANENT, LEGIBLE WARNING NOTICE INDICATING THAT THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT.

NEC 690.5(C):

A LABEL SHALL APPEAR ON THE UTILITY INTERACTIVE INVERTER OR BE APPLIED BY THE INSTALLER NEAR THE GROUND FAULT INDICATOR AT A VISIBLE LOCATION.

NEC 690.52:

AC MODULES SHALL BE MARKED WITH IDENTIFICATION TERMINALS OR LEADS WITH THE RATINGS AS SHOWN ON THE LABEL.

NEC 690.53:

A PERMANENT LABEL FOR THE DIRECT--CURRENT PV POWER SOURCE SHALL BE PROVIDED BY THE INSTALLER AT THE PV DISCONNECTING MEANS.

NEC 690.54:

ALL INTERACTIVE SYSTEM POINTS OF INTERCONNECTION WITH OTHER SOURCES SHALL BE MARKED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS THE POWER SOURCE AND WITH THE RATED AC OUTPUT CURRENT AND THE NOMINAL OPERATING AC VOLTAGE.

NEC 690.55:

PV POWER SYSTEMS EMPLOYING ENERGY STORAGE SHALL ALSO BE MARKED WITH THE MAXIMUM OPERATING VOLTAGE, INCLUDING ANY EQUALIZATION VOLTAGE AND POLARITY OF THE GROUNDED CIRCUIT CONDUCTOR.

NEC 690.56(C):

EACH RAPID SHUTDOWN SWITCH SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC RAPID SHUTDOWN. THE SIGN OR PLACARD SHALL BE MARKED AS "PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN" USING WHITE LETTERS THAT ARE 3/8" TALL ON A RED BACKGROUND AND SHALL BE REFLECTIVE.

NEC 690.64:

POINTS OF CONNECTION SHALL BE IN ACCORDANCE WITH NEC 705.12.

ADHESIVE FASTENED SIGNS

NEC 110.21(B)(5):

ANSI Z535.4 - 2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR THE DESIGN AND DURABLITITY OF SAFETY SIGNS AND LABELS FOR APPLICATION TO ELECTRICAL EQUIPMENT.

NEC 110.21:

THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.

NEC 110.21(B):

FIELD MARKING WHERE REQUIRED ELSEWHERE IN THIS CODE ANY FIELD APPLIED LABELS, WARNING(S) AND MARKINGS SHALL COMPLY WITH ANSI Z535.4

IFC 605.11.1.3:

ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT.

REVISIONS	DATE

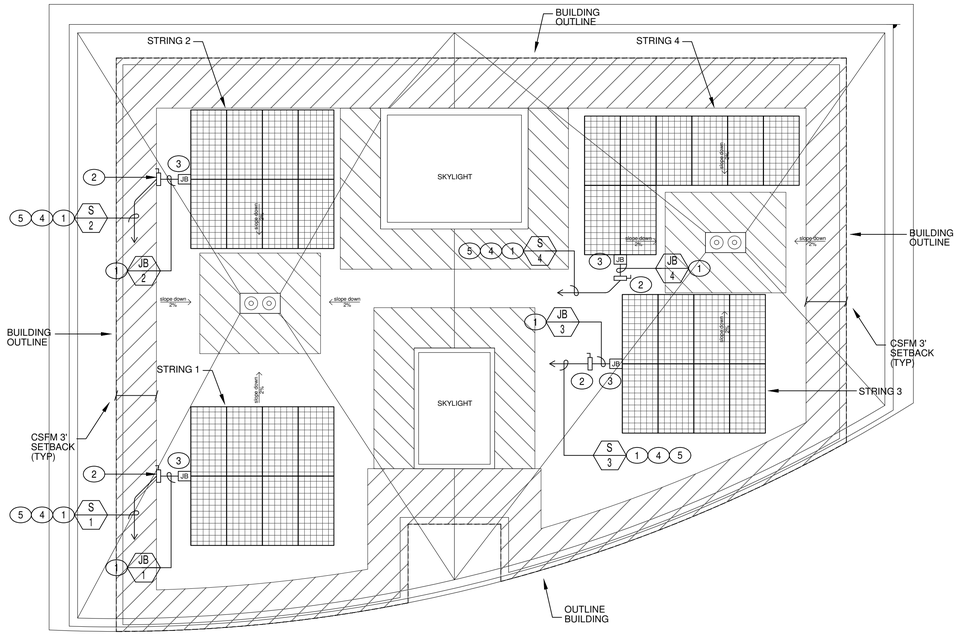
SHEET TITLE:
MARKING & LABELS

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505

REGISTERED PROFESSIONAL ENGINEER
WILLIAM ANDREW BOBADILLA
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STATE OF CALIFORNIA

PACIFIC ENGINEERS GROUP
Consulting MEPF Engineers 1106
W. Magnolia Blvd., Suite A Burbank, CA 91506
(818) 842-7285 Y24-133

DRAWN
CHECKED
–
DATE
10-21-2022
SCALE
AS SHOWN
JOB NO.
--
SHEET
PV-1.1



1 PV-2.0 ROOF PLAN - ELECTRICAL

SCALE: 3/16" = 1'-0" 0 4 8 FT. NORTH

GENERAL NOTES

1. PROPOSED FLOOR PLAN IS FOR CONSTRUCTION. FIELD VERIFY EXISTING CONDITIONS.
2. G.C. TO VERIFY EXISTING CONDITIONS AND NOTIFY ARCHITECT OF DISCREPANCIES.
3. WALL-MOUNTED OUTLETS AND J-BOXES TO BE AT 18" A.F.F. TO BOTTOM OF OUTLET BOX, UNLESS NOTED OTHERWISE.
4. ALL SETBACKS DESIGNED PER 2022 CFC, TITLE 24, PART 9, CHAPTER 12.
5. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
6. VERIFY MOUNTING REQUIREMENTS OF ELECTRICAL EQUIPMENT.
7. ALL ELECTRICAL / DATA IS DESIGN BUILD BY GC. CONTRACTOR RESPONSIBLE FOR OBTAINING ALL ELECTRICAL PERMITS.
8. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH SOLAR MANUFACTURER PER FIELD CONDITION PRIOR TO BID AND START OF WORK.
9. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
10. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
11. FURNISH AND INSTALL BY OTHERS. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT/WIRING. FINAL CONNECTION BY SOLAR MANUFACTURER/CONTRACTOR AND UNDER SEPARATE PERMIT.

KEYED NOTES

1. SEE SINGLE LINE DIAGRAM AND FEEDER SCHEDULE ON SHEET PV-4 FOR MORE INFORMATION.
2. 30AS, 20AF-2P, 250V RATED FUSED DISCONNECT IN NEMA 3R ENCLOSURE. PROVIDE MOUNTING SUPPORT.
3. UL LISTED PV JUNCTION BOX, 600V RATED IN NEMA 4X ENCLOSURE. PROVIDE MOUNTING SUPPORT.
4. THE MAXIMUM NUMBER OF MODULES FOR A SINGLE 20 A CIRCUIT IN A 240 V SINGLE-PHASE SYSTEM IS 12.
5. LOCAL DISCONNECT INTEGRATED WITHIN SOLAR MODULES' AC CONNECTORS PER NEC 690.15.
6. ROOF ACCESS FROM BALCONY BELOW.

REVISIONS	DATE

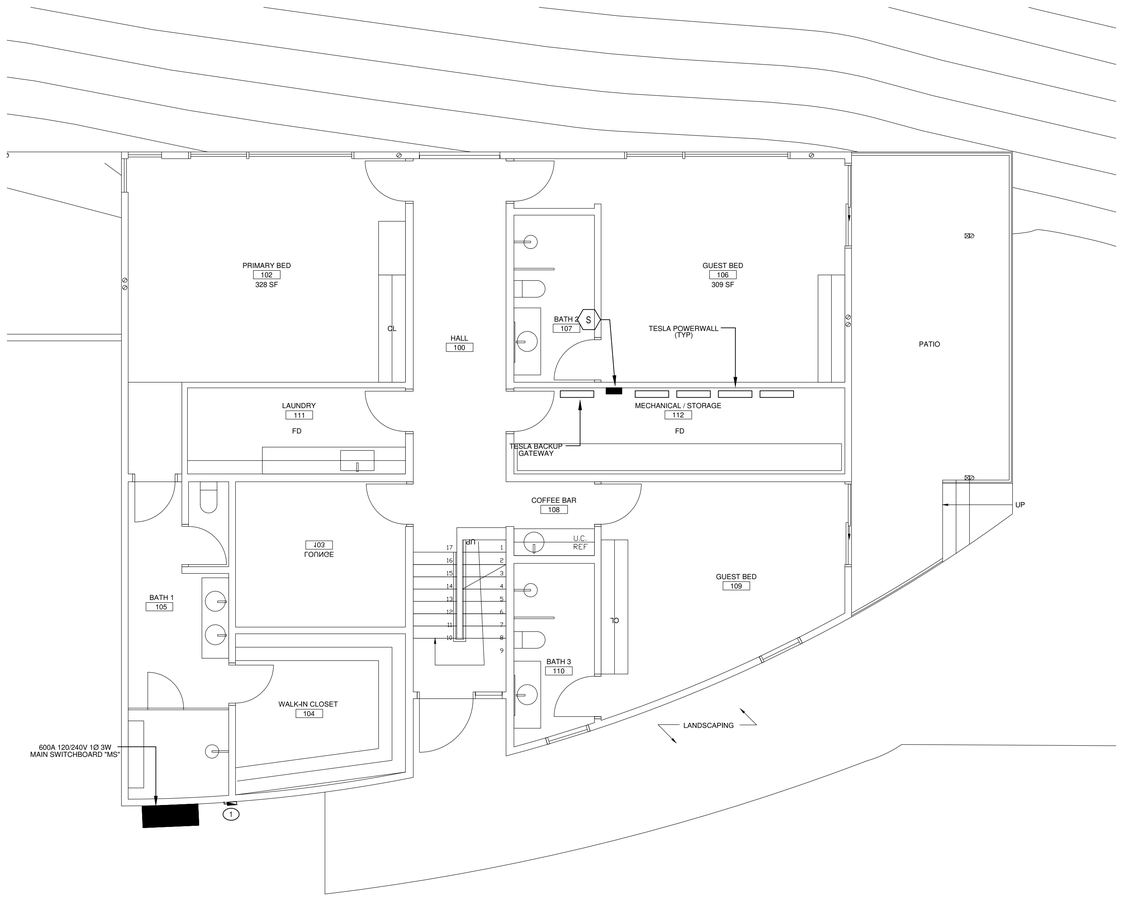
SHEET TITLE: SITE PLAN

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505

REGISTERED PROFESSIONAL ENGINEER
ALI POURKEY
E21979
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DRAWN	
CHECKED	–
DATE	10-21-2022
SCALE	AS SHOWN
JOB NO.	--
SHEET	PV-2.0



1 PV-2.1 FIRST FLOOR PLAN - ELECTRICAL

SCALE: 3/16" = 1'-0" 0 4 8 FT. NORTH

GENERAL NOTES

1. PROPOSED FLOOR PLAN IS FOR CONSTRUCTION. FIELD VERIFY EXISTING CONDITIONS.
2. G.C. TO VERIFY EXISTING CONDITIONS AND NOTIFY ARCHITECT OF DISCREPANCIES.
3. WALL-MOUNTED OUTLETS AND J-BOXES TO BE AT 18" A.F.F. TO BOTTOM OF OUTLET BOX, UNLESS NOTED OTHERWISE.
4. ALL SETBACKS DESIGNED PER 2022 CFC, TITLE 24, PART 9, CHAPTER 12.
5. VERIFY EQUIPMENT SPECIFICATIONS, POWER AND INSTALLATION REQUIREMENTS WITH MANUFACTURER TO ENSURE PROPER FIT AND FUNCTION.
6. VERIFY MOUNTING REQUIREMENTS OF ELECTRICAL EQUIPMENT.
7. ALL ELECTRICAL / DATA IS DESIGN BUILD BY GC. CONTRACTOR RESPONSIBLE FOR OBTAINING ALL ELECTRICAL PERMITS.
8. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH SOLAR MANUFACTURER PER FIELD CONDITION PRIOR TO BID AND START OF WORK.
9. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
10. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
11. FURNISH AND INSTALL BY OTHERS. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT/WIRING. FINAL CONNECTION BY SOLAR MANUFACTURER/CONTRACTOR AND UNDER SEPARATE PERMIT.

KEYED NOTES

(1) 200AS-250V RATED NON FUSED DISCONNECT IN NEMA 3R ENCLOSURE.

REVISIONS	DATE

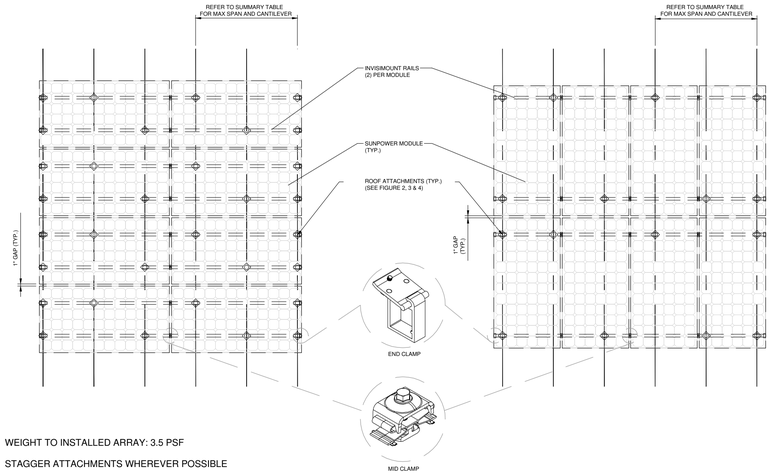
SHEET TITLE: FIRST FLOOR PLAN

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505

REGISTERED PROFESSIONAL ENGINEER
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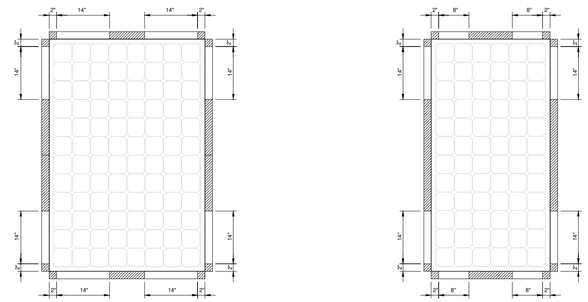
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CHECKED	–
DATE	10-21-2022
SCALE	AS SHOWN
JOB NO.	--
SHEET	PV-2.1



WEIGHT TO INSTALLED ARRAY: 3.5 PSF

STAGGER ATTACHMENTS WHEREVER POSSIBLE

FIGURE 1: PLAN VIEW, TYPICAL ARRAY LAYOUT
SCALE: NOT TO SCALE



INVISIMOUNT RAILS SHALL BE POSITIONED IN THE NON-CROSS HATCHED REGIONS

FIGURE 2: INVISIMOUNT MOUNTING CLAMP POSITIONING DETAILS
SCALE: NOT TO SCALE

GENERAL NOTES:

1. DIAGRAM IS FOR REFERENCE ONLY. CONTRACTOR IS TOO COORDINATE WITH SUPPLIER FOR EXACT DIMENSIONS AND CONFIGURATIONS PRIOR TO BID AND START OF WORK.
2. COORDINATE WITH STRUCTURAL FOR EXACT LOCATION AND REQUIREMENTS PRIOR TO BID AND START OF WORK.

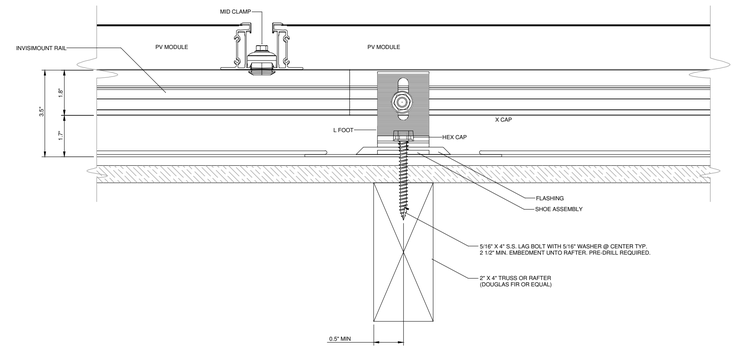


FIGURE 3: INVISIMOUNT ROOF ATTACHMENT DETAILS @ TRUSS/RAFTERS
SCALE: NOT TO SCALE

FIGURE 4: INVISIMOUNT ROOF ATTACHMENT DETAILS @ BLOCKED LOCATIONS
SCALE: NOT TO SCALE

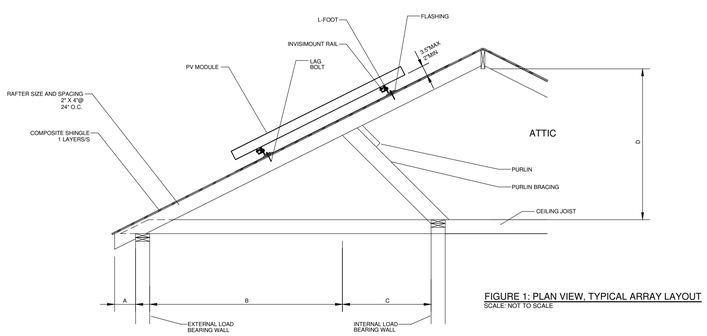


FIGURE 1: PLAN VIEW, TYPICAL ARRAY LAYOUT
SCALE: NOT TO SCALE

FIGURE B: STRUCTURAL FRAMING DETAIL (NTA)
SCALE: NOT TO SCALE

REVISIONS	DATE

SHEET TITLE:
DETAILS

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
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REGISTERED PROFESSIONAL ENGINEER
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(818) 842-7285 124-133

DRAWN	
CHECKED	--
DATE	10-21-2022
SCALE	AS SHOWN
JOB NO.	--
SHEET	PV-3.0

PV MODULE SPECIFICATIONS		
MODULE NUMBER:	SUNPOWER SPR-X22-370-E-AC	
WEIGHT:	42.9	LBS.
DIMENSIONS:	61.3 X 41.2 X 1.73	INCHES
MODULE POWER @ STC:	370	WATTS
VOC (OPEN-CIRCUIT VOLTAGE):	69.5	VOLTS DC
VMP (MAX-POWER VOLTAGE):	59.1	VOLTS DC
ISC (SHORT-CIRCUIT CURRENT):	6.66	AMPS
IMP (MAX-POWER CURRENT):	6.26	AMPS
POWER TEMP. COEFFICIENT:	-0.29	%/C

POWERWALL SPECIFICATIONS		
MODEL NUMBER:	TESLA POWERWALL 2	
WEIGHT:	251.3	LBS.
DIMENSIONS:	45.3 X 29.6 X 5.75	INCHES
TOTAL ENERGY:	14.0	KWH
USABLE ENERGY:	13.5	KWH
APPARENT POWER, MAX CONT.:	5.8	KVA
APPARENT POWER, MAX PEAK:	7.2	KVA
AMPERAGE @ 240V:	24.2	A

MICROINVERTER SPECIFICATIONS		
MODEL NUMBER:	SUNPOWER TYPE E(IQ 7XS)	
PEAK OUTPUT POWER:	320	VOLT AMPS
MAX CONTINUOUS OUTPUT POWER:	315	VOLT AMPS
NOM. VOLTAGE RANGE:	211-264	VOLTS
MAC CONTINUOUS OUTPUT CURRENT:	1.31	AMPS
MAX UNITS PER 20A BRANCH CIRCUIT:	12	
AC SHORT CIRCUIT FAULT (3 CYCLES):	5.8	AMPS (RMS)
AC PORT BACKFEED CURRENT:	0.018	AMPS

PANEL "S" SPECIFICATIONS		
SERVICE VOLTAGE:	240	VAC
BUS AMP RATING:	400	AMPS
MAIN BREAKER RATING:	125	AMPS
SERVICE FEED:	BOTTOM	
SOLAR CAPACITY:	355	AMPS

4 ARRAY CONFIGURATION	
AC MODULE QUANTITY:	32
BRANCH CIRCUIT QUANTITY:	4
LENGTH OF BRANCH # 1-4	8
ARRAY POWER (KWSTC):	11.84
REQUIRED (KWSTC)	3.15

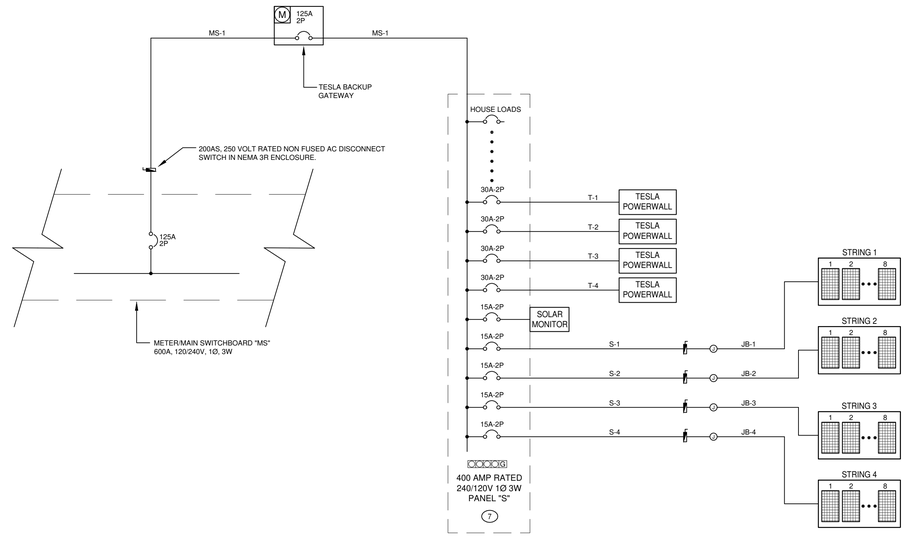
REQUIRED SOLAR CAPACITY EQUATION 150.1-C

$kW_{PV} = (CFA \times A)/1000 + (NDwell \times B)$

kW_{PV} = kWdc SIZE OF THE PV SYSTEM
CFA = CONDITIONED FLOOR AREA
NDwell = NUMBER OF DWELLING UNITS
A = ADJUSTMENT FACTOR FROM TABLE 150.1-C
B = DWELLING ADJUSTMENT FACTOR FROM TABLE 150.1-C

$kW_{PV} = (4300 \times 0.594)/1000 + (1 \times 1.23) = 3.15kW$

INTERCONNECTION RULE 705.12.B.3 - METHOD 1	
BUSS RATING 400A @100%	400A
OCPD RATING 125A @100%	125A
SOLAR CIRCUIT 1 RATING 15A @125%	18.75A
POWERWALL 1 RATING 30A @125%	37.5A
SOLAR CIRCUIT 2 RATING 15A @125%	18.75A
POWERWALL 2 RATING 30A @125%	37.5A
SOLAR CIRCUIT 3 RATING 15A @125%	18.75A
POWERWALL 3 RATING 30A @125%	37.5A
SOLAR CIRCUIT 4 RATING 15A @125%	18.75A
POWERWALL 4 RATING 30A @125%	37.5A
TOTAL	350A
400A>350A	



PARTIAL SINGLE LINE DIAGRAM
N.T.S.
NOTE: ALL ITEMS SHOWN ARE NEW UNLESS OTHERWISE NOTED.

FEEDER SCHEDULE

FDR. NO.	FROM	TO	CONDUCTOR QUANTITY	CONDUCTOR SIZE	CONDUCTOR TYPE	GROUND SIZE	GROUND TYPE	CONDUIT SIZE	CONDUIT TYPE	APPROX. DIST.
MS-1	MAIN SWITCHBOARD	SOLAR SUB PANEL "S"	3	AWG#3/0	THWN-2	AWG#4	THWN-2	2"	EMT	50'
T-1	SOLAR SUB PANEL "S"	TESLA POWER WALL	3	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	10'
T-2	SOLAR SUB PANEL "S"	TESLA POWER WALL	3	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	10'
T-3	SOLAR SUB PANEL "S"	TESLA POWER WALL	3	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	10'
T-4	SOLAR SUB PANEL "S"	TESLA POWER WALL	3	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	10'
S-1	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	2	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	60'
S-2	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	2	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	60'
S-3	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	2	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	100'
S-4	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	2	AWG#10	THWN-2	AWG#10	THWN-2	3/4"	EMT	100'
JB-1	JUNCTION BOX "JB"	SOLAR PANEL STRING 1	2	AWG#10	AC TRUNK CABLE	AWG#10	THWN-2	N/A	AC TRUNK CABLE	20'
JB-2	JUNCTION BOX "JB"	SOLAR PANEL STRING 2	2	AWG#10	AC TRUNK CABLE	AWG#10	THWN-2	N/A	AC TRUNK CABLE	20'
JB-3	JUNCTION BOX "JB"	SOLAR PANEL STRING 3	2	AWG#10	AC TRUNK CABLE	AWG#10	THWN-2	N/A	AC TRUNK CABLE	20'
JB-4	JUNCTION BOX "JB"	SOLAR PANEL STRING 4	2	AWG#10	AC TRUNK CABLE	AWG#10	THWN-2	N/A	AC TRUNK CABLE	20'

CONDUCTOR SPECIFICATIONS / REQUIRED CONDUCTOR AMPACITY / AMPACITY CHECK #1

FDR. NO.	FROM	TO	MATERIAL	TEMP. RATING	TRADE SIZE	AMPACITY @ 75°C PER 310.15(B)(16)	CONT. OPERATION 690.8 (B)(1)	X	MAXIMUM CURRENT (A)	=	REQUIRED AMPACITY	REQUIRED AMPACITY 690.8(B)(2)(b)	<	DERATED CONDUCTOR AMPACITY
MS-1	MAIN SWITCHBOARD	SOLAR SUB PANEL "S"	COPPER	75°C	AWG#3/0	200 AMPS	1.25	X	41.92 = 96.8 (PV+PW)	=	173.4 AMPS	173.4 AMPS	<	200.00 AMPS
T-1	SOLAR SUB PANEL "S"	TESLA POWER WALL	COPPER	75°C	AWG#10	35 AMPS	1.25	X	24.2	=	30.3 AMPS	30.3 AMPS	<	35.00 AMPS
T-2	SOLAR SUB PANEL "S"	TESLA POWER WALL	COPPER	75°C	AWG#10	35 AMPS	1.25	X	24.2	=	30.3 AMPS	30.3 AMPS	<	35.00 AMPS
T-3	SOLAR SUB PANEL "S"	TESLA POWER WALL	COPPER	75°C	AWG#10	35 AMPS	1.25	X	24.2	=	30.3 AMPS	30.3 AMPS	<	35.00 AMPS
T-4	SOLAR SUB PANEL "S"	TESLA POWER WALL	COPPER	75°C	AWG#10	35 AMPS	1.25	X	24.2	=	30.3 AMPS	30.3 AMPS	<	35.00 AMPS
							CONT. OPERATION 690.8 (B)(1)	X	INVERTER OUTPUT CURRENT (A)	X	# OF MICRO-INVERTERS IN PARALLEL	=	REQUIRED AMPACITY			
S-1	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
S-2	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
S-3	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
S-4	SOLAR SUB PANEL "S"	JUNCTION BOX "JB"	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
JB-1	JUNCTION BOX "JB"	SOLAR PANEL STRING 1	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
JB-2	JUNCTION BOX "JB"	SOLAR PANEL STRING 2	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
JB-3	JUNCTION BOX "JB"	SOLAR PANEL STRING 3	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS
JB-4	JUNCTION BOX "JB"	SOLAR PANEL STRING 4	COPPER	75°C	AWG#10	35 AMPS	1.25	X	1.31	X	8	=	13.1 AMPS	13.1 AMPS	<	35.00 AMPS

CONDUCTOR TEMPERATURE DERATE / CONDUIT FILL DERATING / CORRECTED AMPACITY CALCULATION / AMPACITY CHECK #2

FDR. NO.	CIRCUIT ENVIRONMENT	LOCAL 2% HIGH TEMP AVG.	HEIGHT ABOVE ROOF (IN)	TEMP ADDER PER 310.15(B)(2)(c)	OPERATING TEMP (C°)	AMPACITY CORRECTION 310.15(B)(2)(a)	# OF UNGROUNDED CONDUCTORS	AMPACITY CORRECTION 310.15(B)(3)(a)	CONDUCTOR AMPACITY	X	TEMP. DERATE	X	CONDUIT FILL DERATE	=	DERATED CONDUCTOR AMPACITY	REQUIRED AMPACITY 690.8(B)(2)(b)	<	DERATED CONDUCTOR AMPACITY
MS-1	INTERIOR WALL	26.3°C	N/A	N/A	26.3°C	1.00	3	1.00	200	X	1.00	X	1.00	=	200.00 AMPS	173.4 AMPS	<	200.00 AMPS
T-1	INTERIOR WALL	26.3°C	N/A	N/A	26.3°C	1.00	3	1.00	40	X	1.00	X	1.00	=	40.00 AMPS	30.3 AMPS	<	40.00 AMPS
T-2	INTERIOR WALL	26.3°C	N/A	N/A	26.3°C	1.00	3	1.00	40	X	1.00	X	1.00	=	40.00 AMPS	30.3 AMPS	<	40.00 AMPS
T-3	INTERIOR WALL	26.3°C	N/A	N/A	26.3°C	1.00	3	1.00	40	X	1.00	X	1.00	=	40.00 AMPS	30.3 AMPS	<	40.00 AMPS
T-4	INTERIOR WALL	26.3°C	N/A	N/A	26.3°C	1.00	3	1.00	40	X	1.00	X	1.00	=	40.00 AMPS	30.3 AMPS	<	40.00 AMPS
S-1	ROOFTOP, CONDUIT	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
S-2	ROOFTOP, CONDUIT	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
S-3	ROOFTOP, CONDUIT	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
S-4	ROOFTOP, CONDUIT	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
JB-1	ROOFTOP, FREE AIR	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
JB-2	ROOFTOP, FREE AIR	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
JB-3	ROOFTOP, FREE AIR	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS
JB-4	ROOFTOP, FREE AIR	26.3°C	3-1/2" MIN	17°C	43.3°C	0.87	2	1.00	40	X	0.87	X	1.00	=	34.80 AMPS	13.1 AMPS	<	34.80 AMPS

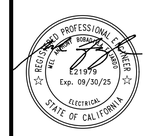
KEYED NOTES

1. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH SOLAR MANUFACTURER PER FIELD CONDITION PRIOR TO BID AND START OF WORK.
2. SEE FEEDER SCHEDULE THIS SHEET FOR MORE INFORMATION.
3. ALL WORK EXPOSED TO WEATHER SHALL BE WEATHERPROOF TYPE IN NEMA 3R ENCLOSURE.
4. PROVIDE AND MAINTAIN REQUIRED ACCESS AND WORKING SPACE FOR ALL ELECTRICAL EQUIPMENT. NEC 110.26.
5. FURNISH AND INSTALL BY OTHERS. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT/WIRING. FINAL CONNECTION BY SOLAR MANUFACTURER/CONTRACTOR AND UNDER SEPARATE PERMIT.
6. SEE NOTES ON SHEET PV-1 FOR MORE INFORMATION.
7. CONNECT TO MAIN SWITCHBOARD GROUNDING SYSTEM. SEE GROUNDING NOTES SHEET PV-1 FOR MORE INFORMATION.

REVISIONS	DATE

SHEET TITLE:
SOLAR SINGLE LINE DIAGRAM

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505



PACIFIC ENGINEERS GROUP
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(818) 842-7285

DRAWN	
CHECKED	–
DATE	10-21-2022
SCALE	AS SHOWN
JOB NO.	--
SHEET	PV-4.0

POWERWALL

Tesla Powerwall is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, time-based control, and backup.

Powerwall's electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.



PERFORMANCE SPECIFICATIONS

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy	14 kWh
Usable Energy	13.5 kWh
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10 s, off-grid/backup)	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10 s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/- 1.0 adjustable
Power Factor Range (full-rated power)	+/- 0.85
Internal Battery DC Voltage	50 V
Round Trip Efficiency[2]	90%
Warranty	10 years

[1]Values provided for 25°C (77°F), 3.3 kW charge/discharge power.
[2]In Backup mode, grid charge power is limited to 3.3 kW.
[3]AC to battery to AC, at beginning of life.

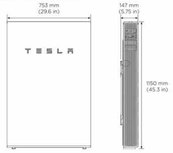
COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1973, UL 9540, IEEE 1547, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)

MECHANICAL SPECIFICATIONS

Dimensions[1]	1150 mm x 755 mm x 147 mm (45.3 in x 29.6 in x 5.75 in)
Weight[1]	114 kg (251.3 lbs)
Mounting options	Floor or wall mount

[1]Dimensions and weight differ slightly if manufactured before March 2019. Contact Tesla for additional information.



ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Recommended Temperature	0°C to 30°C (32°F to 86°F)
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

TESLA

TESLA.COM/ENERGY

SunPower® Equinox™ Accessories

Equinox Junction Boxes



InvisiMount™ Rail-Mounted Junction Box (RMJ) v2

- 70% larger than original InvisiMount J-box.
- Integrated grounding to InvisiMount rail, replacing grounding lug assembly.
- Snap-on attachment for fast and secure installation.



Composition Shingle Roof Transition Junction Box

- Enables transitioning conductors directly through the roof.
- Integrated flashing for peace of mind.
- Compatible with composition shingle roofs.

SPECIFICATIONS

Model	RMJ v2	Comp Shingle Transition J-Box
Kit Part Number	530167	530168
Max. Voltage Rating	600 V (AC or DC)	
Ambient Temp. Range	−35°C to 75°C (−31°F to 167°F)	
Enclosure Material	Flame-retardant, UV-resistant, high-impact resistant resin	
Attachment/Flashing Material	304 stainless steel	Steel w/zinc-aluminum coating
Cavity Dimensions	150 × 150 × 62 mm (5.91" × 5.91" × 2.13")	
Enclosure Volume	1150 cc (70 in³)	
Attachment/Flashing Finish	Black oxide	Black powder coat
Compatibility	InvisiMount rail	Comp shingle roofs
Assembled Weight	0.78 kg (1.7 lb)	1.27 kg (2.8 lb)
Certifications & Ratings	• Watertight, UL Type 4 • UL 94 5VA • UL 1741 • UL 2703 (with InvisiMount)	• Watertight, UL Type 4 • UL 94 5VA • UL 1741
Additional Hardware Included	• 3/4" cord grip • Lay-in lug	• 3/4" cord grip • #12 screws with EPDM washer

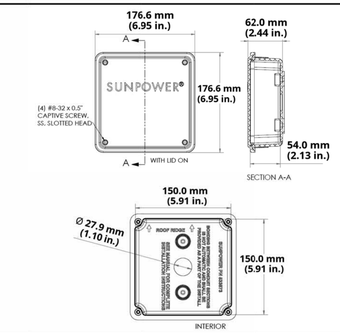
Datasheet SUNPOWER®

SunPower® Equinox™ Accessories

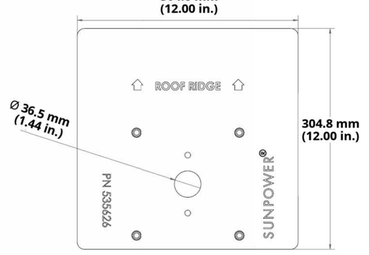
Equinox Junction Boxes

COMPONENT DIMENSIONS

J-Box Enclosure
(used in both RMJ and Transition J-box)



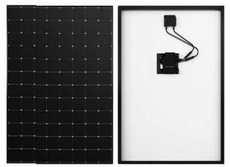
Flashing
(used only with Transition J-Box)



539382 RevA

Datasheet SUNPOWER®

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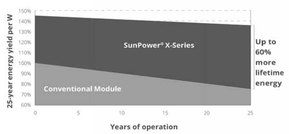
SunPower® X-Series: X22-370 | X22-360

SunPower® Residential AC Module

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered, and warranted by one manufacturer.

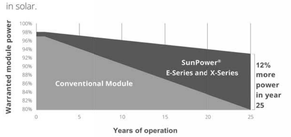
Maximum Power. Minimalist Design.
Industry-leading efficiency means more power and savings per available space. With fewer modules required and hidden microinverters, less is truly more.

Highest Lifetime Energy and Savings.
Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.[1]



Best Reliability. Best Warranty.
With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.

25-Yr SunPower Complete Confidence



Fundamentally Different. And Better.



The SunPower® Maxeon® Solar Cell
- Enables highest-efficiency modules available [2]
- Unmatched reliability [3]
- Patented solid metal foundation prevents breakage and corrosion



Factory-integrated Microinverter
- Simpler, faster installation
- Integrated wire management, rapid shutdown
- Engineered and calibrated by SunPower for SunPower modules

Datasheet

X-Series: X22-370 | X22-360 SunPower® Residential AC Module

AC Electrical Data	
Inverter Model: Type E (IQ 7XS)	@240 VAC
Peak Output Power	320 VA
Max. Continuous Output Power	315 VA
Nom. (L–L) Voltage/Range[2] (V)	240 / 211–264
Max. Continuous Output Current (A)	1.31
Max. Units per 20 A (L-L) Branch Circuit[3]	12 (single phase)
CEC Weighted Efficiency	97.5%
Nom. Frequency	60 Hz
Extended Frequency Range	47-68 Hz
AC Short Circuit Fault Current Over 3 Cycles	5.8 A rms
Overvoltage Class AC Port	III
AC Port Backfeed Current	18 mA
Power Factor Setting	1.0
Power Factor (adjustable)	0.7 lead. / 0.7 lag.
No active phase balancing for three-phase installations	

DC Power Data	SPR-X22-370-E-AC	SPR-X22-360-E-AC
Nominal Power [1] (Pnom)	370 W	360 W
Power Tolerance	+5/–0%	+5/–0%
Module Efficiency [5]	22.7%	22.1%
Temp. Coef. (Power)	–0.29%/°C	–0.29%/°C
Shade Tolerance	• Three bypass diodes • Integrated module-level maximum power point tracking	

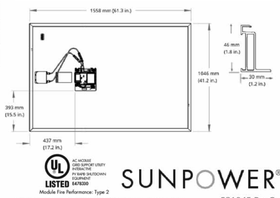
Tested Operating Conditions	
Operating Temp.	–40°F to +185°F (–40°C to +85°C)
Max. Ambient Temp.	122°F (50°C)
Max. Test Load[3]	Wind: 154 psf, 7400 Pa, 754 kg/m² back Snow: 208 psf, 10000 Pa, 1019 kg/m² front
Design Load	Wind: 62 psf, 3000 Pa, 305 kg/m² back Snow: 125 psf, 6000 Pa, 611 kg/m² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

Mechanical Data	
Solar Cells	96 Monocrystalline Maxeon Gen III
Front Glass	High-transmission tempered glass with anti-reflective coating
Environmental Rating	Module: Outdoor rated Inverter: NEMA Type 6 Class II
Frame	Class 1 black anodized (highest AAMA rating)
Weight	42.9 lb (19.5 kg)
Recommended Max. Module Spacing	1.3 in. (33 mm)

Warranties, Certifications, and Compliance	
Warranties	• 25-year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• UL 1703 • UL 1741 / IEEE-1547 • UL 1741 AC Module (Type 2 fire rated) • UL 62109-1 / IEC 62109-2 • FCC Part 15 Class B • ICES-0003 Class B • CAN/CSA-C22.2 NO. 107.1-01 • CA Rule 21 (UL 1741 SA)[4] (includes Volt/Var and Reactive Power Priority) • UL Listed PV Rapid Shutdown Equipment[6] Enables installation in accordance with: • NEC 690.6 (AC module) • NEC 690.12 Rapid Shutdown (inside and outside the array) • NEC 690.15 AC Connectors, 690.33(A)-(E)(1) When used with InvisiMount racking and InvisiMount accessories (UL 2703): • Module grounding and bonding through InvisiMount • Class A fire rated When used with AC module Q Cables and accessories (UL 6703 and UL 2238)[7]: • Rated for load break disconnect
PID Test	Potential-induced degradation free

1 SunPower 360 W compared to a conventional module on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²). 4% more energy per watt (based on third-party module characterization and PVSim), 0.75%/yr. lower degradation (Jordan, Compeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2016).
2 Based on search conducted by SunPower Corporation using the CEC Directory, as of January 2017.
3 #1 ranked Powerhouse Photovoltaic Initiative for Solar Modules; Part 3 "PV Powerhouse Magazine, 2015, Compeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.
4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning.
5 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25°C). NREL calibration standard: SOMS current, LACCS FF and voltage. All DC voltage is fully contained within the module.
6 This product is UL Listed as PVRSE and conforms with NEC 2014 and NEC 2017 690.12; and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.
7 Please read the safety and installation instructions for more information regarding load ratings and mounting configurations.

See www.sunpower.com/facts for more reference information.
For more details, see extended datasheet www.sunpower.com/datasheets Specifications included in this datasheet are subject to change without notice.
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AC MODULE PHOTOVOLTAIC MODULE UL 1703 SUNPOWER E370/E360 64/6500
LISTED
Module Fire Performance: Type 2

SUNPOWER®

Please read the Safety and Installation Instructions for details.

531945 RevC

sunpower.com

REVISIONS	DATE

SHEET TITLE: SOLAR CUT SHEETS

PROJECT TITLE & ADDRESS:
TORRANCE HILL HOUSE
4501 VIA CORONA
TORRANCE, CALIFORNIA 90505



PACIFIC ENGINEERS GROUP
Consulting MEPF Engineers 1106
W. Magnolia Blvd., Suite A Burbank,
CA 91506
(818) 842-7285 Y24-133

DRAWN	
CHECKED	
DATE	10-21-2022
SCALE	AS SHOWN
JOB NO.	---
SHEET	PV-5.0