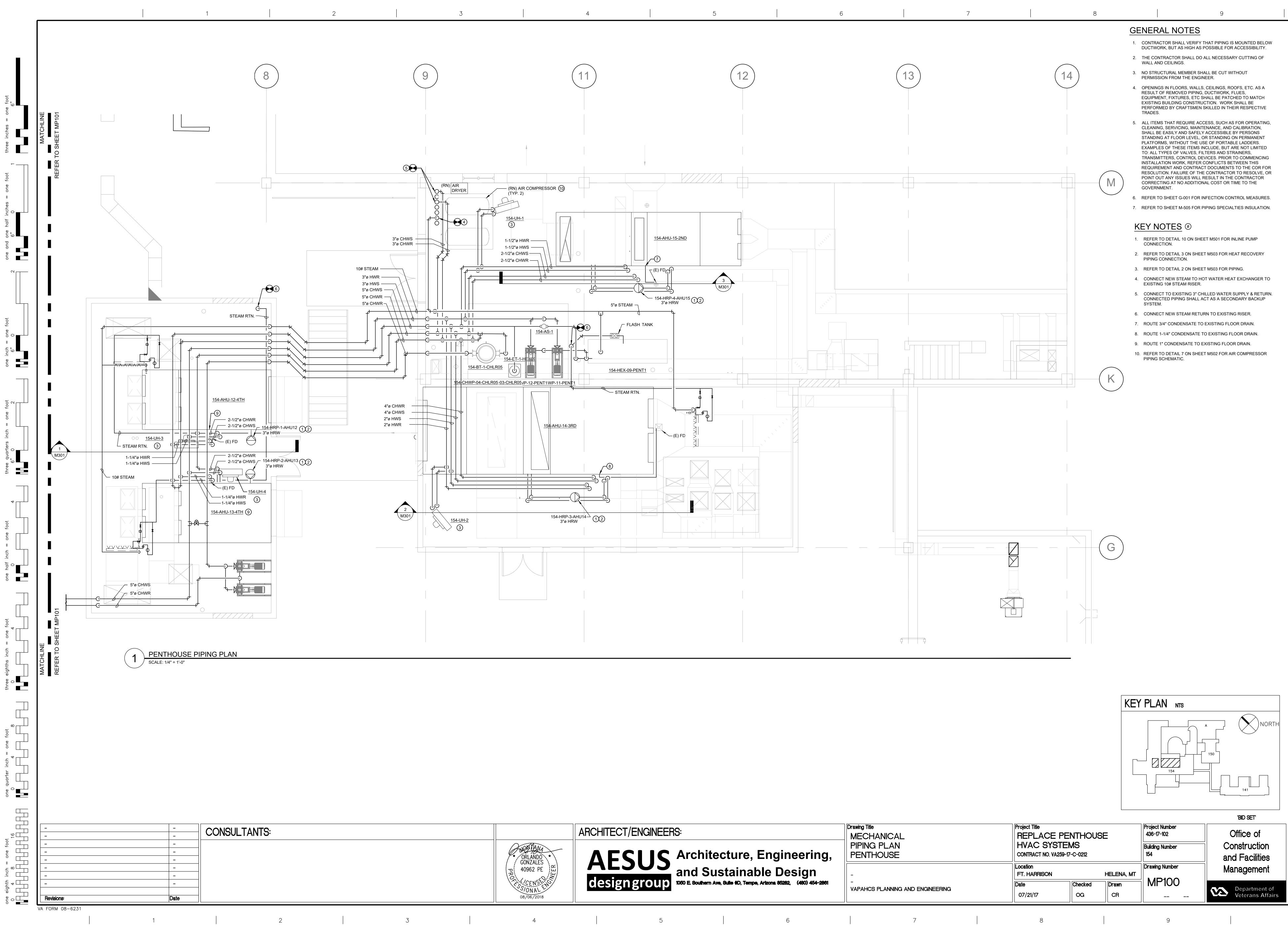


ngineering, e Design	Drawing Title MECHANICAL HVAC PLAN SECOND FLOOR	HVAC SYS	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212		Project Number 436-17-102 Building Numb 154
	_	Location FT. HARRISON HELENA, MT			Drawing Numb
ona 85282, (480) 454-2861	- VAPAHCS PLANNING AND ENGINEERING	Date 07/21/17	Checked OG	Drawn CR	MH1C

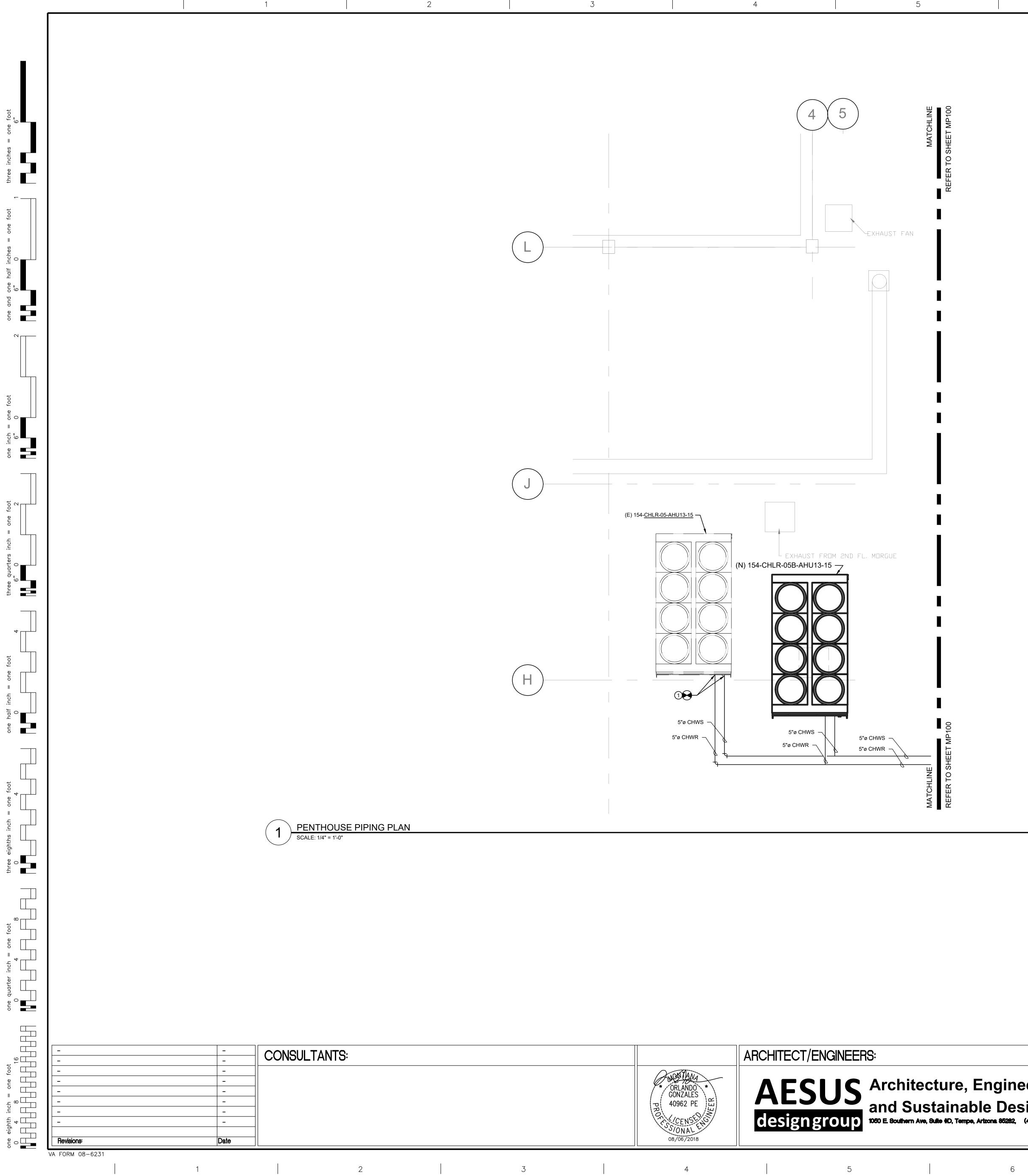
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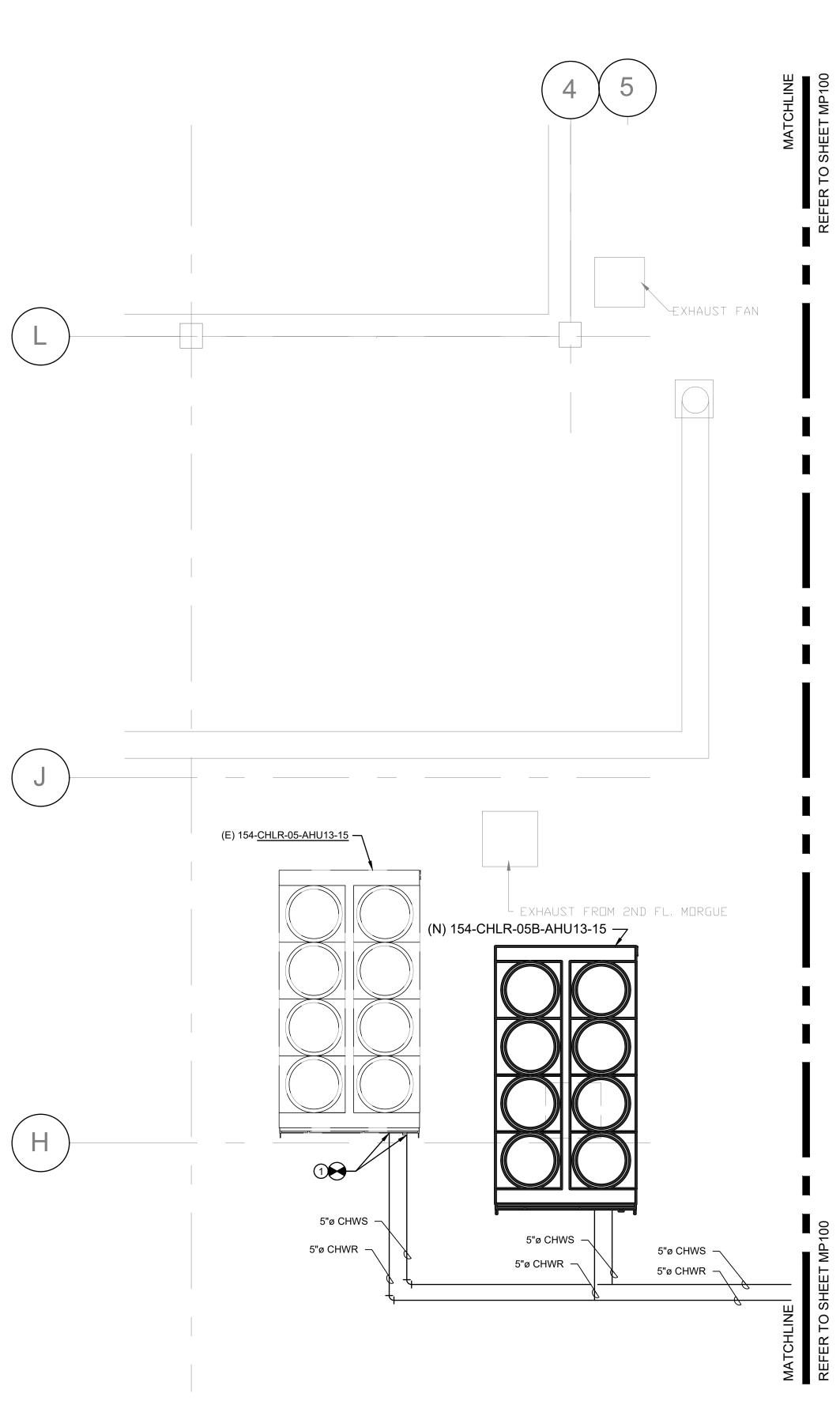
D SPRINKLER HEADS TAKE PRECEDENCE OV OCATION. CONTRACTOR SHALL MAKE NECESS T TO DIFFUSERS TO AVOID ANY CONFLICT WI YOUT AND SPRINKLER HEADS.
TS SHALL BE MOUNTED PER ADA REQUIREME EIGHT FOR FRONT ACCESS SHALL BE 48" AFF. ABOVE FIXED COUNTER UNLESS KNEE HOLE ROVIDED.



gineering,	Drawing Title MECHANICAL PIPING PLAN PENTHOUSE	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212		E	Project Numbe 436-17-102 Building Numbe 154
Design	_	Location FT. HARRISON		HELENA, MT	Drawing Numb
na 85282, (480) 454-2861	- VAPAHCS PLANNING AND ENGINEERING	Date 07/21/17	Checked OG	Drawn CR	MP10
				1	

9		
	<u>'</u>	
OR SHALL VERIFY THAT PIPING IS MOUNTED BELOW BUT AS HIGH AS POSSIBLE FOR ACCESSIBILITY. ACTOR SHALL DO ALL NECESSARY CUTTING OF		
EILINGS. JRAL MEMBER SHALL BE CUT WITHOUT		
I FROM THE ENGINEER. N FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A REMOVED PIPING, DUCTWORK, FLUES, , FIXTURES, ETC SHALL BE PATCHED TO MATCH JILDING CONSTRUCTION. WORK SHALL BE D BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE		
HAT REQUIRE ACCESS, SUCH AS FOR OPERATING, SERVICING, MAINTENANCE, AND CALIBRATION, ASILY AND SAFELY ACCESSIBLE BY PERSONS T FLOOR LEVEL, OR STANDING ON PERMANENT , WITHOUT THE USE OF PORTABLE LADDERS. OF THESE ITEMS INCLUDE, BUT ARE NOT LIMITED ES OF VALVES, FILTERS AND STRAINERS, ERS, CONTROL DEVICES. PRIOR TO COMMENCING ON WORK, REFER CONFLICTS BETWEEN THIS NT AND CONTRACT DOCUMENTS TO THE COR FOR N. FAILURE OF THE CONTRACTOR TO RESOLVE, OR ANY ISSUES WILL RESULT IN THE CONTRACTOR G AT NO ADDITIONAL COST OR TIME TO THE NT.		A
HEET G-001 FOR INFECTION CONTROL MEASURES. HEET M-505 FOR PIPING SPECIALTIES INSULATION.		
TES (#)		
DETAIL 10 ON SHEET M501 FOR INLINE PUMP DN.		В
DETAIL 3 ON SHEET M503 FOR HEAT RECOVERY INECTION.		5
DETAIL 2 ON SHEET M503 FOR PIPING. NEW STEAM TO HOT WATER HEAT EXCHANGER TO 0# STEAM RISER.		
TO EXISTING 3" CHILLED WATER SUPPLY & RETURN. D PIPING SHALL ACT AS A SECONDARY BACKUP		
NEW STEAM RETURN TO EXISTING RISER.		
CONDENSATE TO EXISTING FLOOR DRAIN. 4" CONDENSATE TO EXISTING FLOOR DRAIN.		
ONDENSATE TO EXISTING FLOOR DRAIN. DETAIL 7 ON SHEET M502 FOR AIR COMPRESSOR		
IEMATIC.		
		С
		D
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NTS		
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nber Office of		





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(GE	NERA
	1.	CONTRAC DUCTWOF
	2.	THE CONT
	3.	NO STRUO PERMISSI
	4.	OPENING RESULT C EQUIPMEI EXISTING PERFORM TRADES.
	5.	ALL ITEMS CLEANING SHALL BE

GOVERNMENT.

KEY PLAN NTS

ineering,	MECHANICAL PENTHOUSE		Project Title REPLACE HVAC SYS CONTRACT NO. VA	Project Number 436-17-102 Building Number 154			
)esign 1282, (480) 454-2861	- - VAPAHCS PLANNING AND ENGINEERING	Ì	Location FT. HARRISON Date 07/21/17 Checked OG		HELENA, MT Drawn CR	Drawing Number MP101 	_
6	7		8			9	

CTOR SHALL VERIFY THAT PIPING IS MOUNTED BELOW ORK, BUT AS HIGH AS POSSIBLE FOR ACCESSIBILITY. NTRACTOR SHALL DO ALL NECESSARY CUTTING OF ND CEILINGS.

RUCTURAL MEMBER SHALL BE CUT WITHOUT SSION FROM THE ENGINEER.

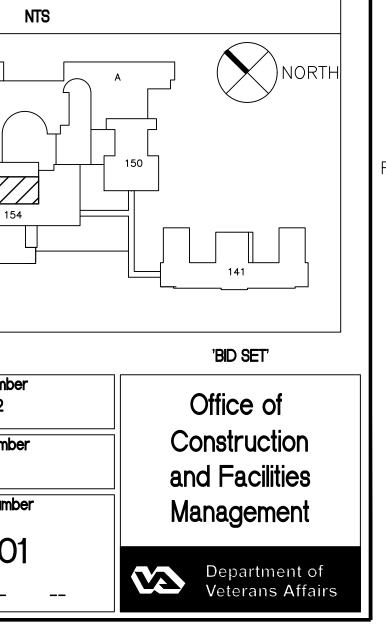
IGS IN FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A OF REMOVED PIPING, DUCTWORK, FLUES, IENT, FIXTURES, ETC SHALL BE PATCHED TO MATCH G BUILDING CONSTRUCTION. WORK SHALL BE RMED BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE

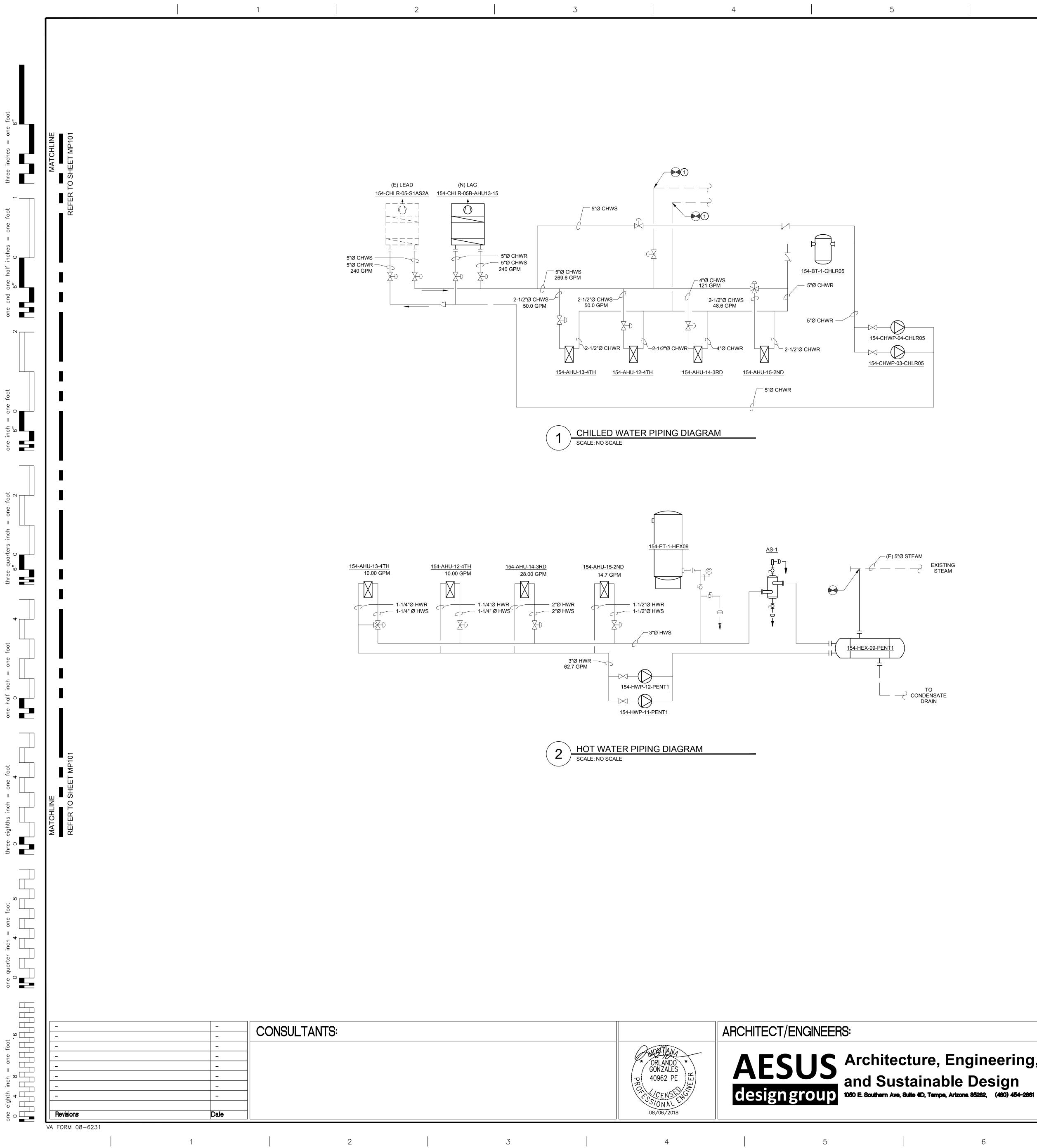
MS THAT REQUIRE ACCESS, SUCH AS FOR OPERATING, NG, SERVICING, MAINTENANCE, AND CALIBRATION, E EASILY AND SAFELY ACCESSIBLE BY PERSONS STANDING AT FLOOR LEVEL, OR STANDING ON PERMANENT PLATFORMS, WITHOUT THE USE OF PORTABLE LADDERS. EXAMPLES OF THESE ITEMS INCLUDE, BUT ARE NOT LIMITED TO: ALL TYPES OF VALVES, FILTERS AND STRAINERS, TRANSMITTERS, CONTROL DEVICES. PRIOR TO COMMENCING INSTALLATION WORK, REFER CONFLICTS BETWEEN THIS REQUIREMENT AND CONTRACT DOCUMENTS TO THE COR FOR RESOLUTION. FAILURE OF THE CONTRACTOR TO RESOLVE, OR POINT OUT ANY ISSUES WILL RESULT IN THE CONTRACTOR CORRECTING AT NO ADDITIONAL COST OR TIME TO THE

6. REFER TO SHEET G-001 FOR INFECTION CONTROL MEASURES.

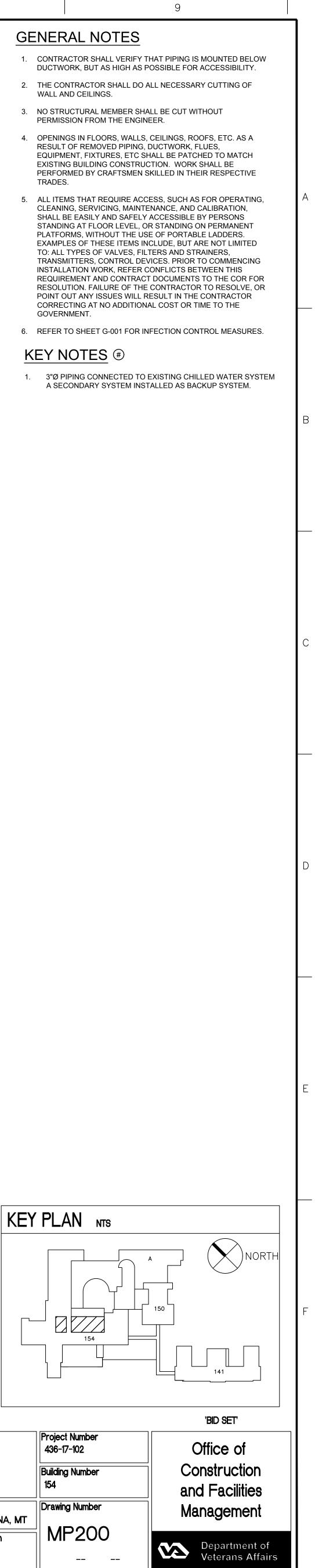
KEY NOTES

1. CONNECT NEW CWS/R TO EXISTING CHILLER.

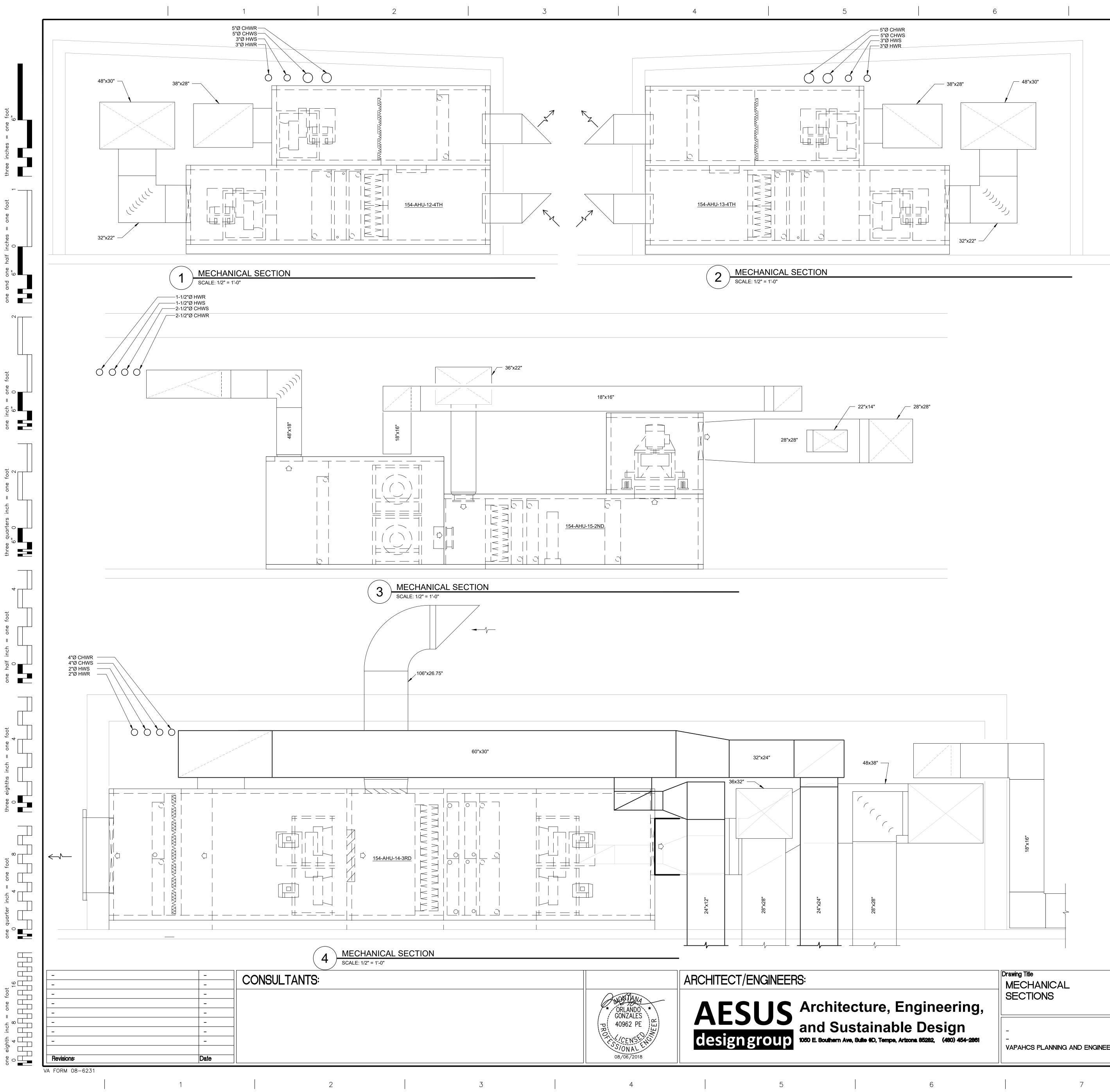




- - TRADES.

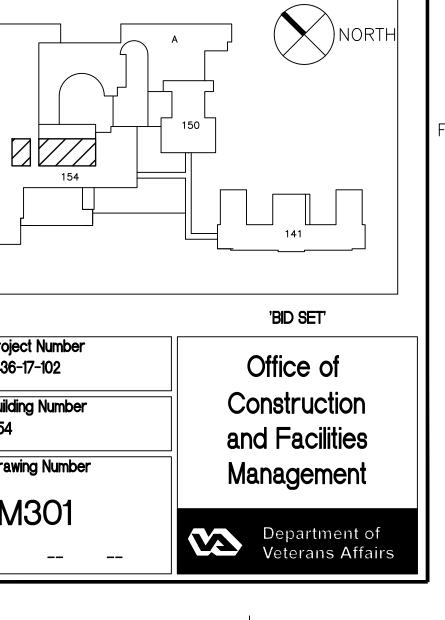


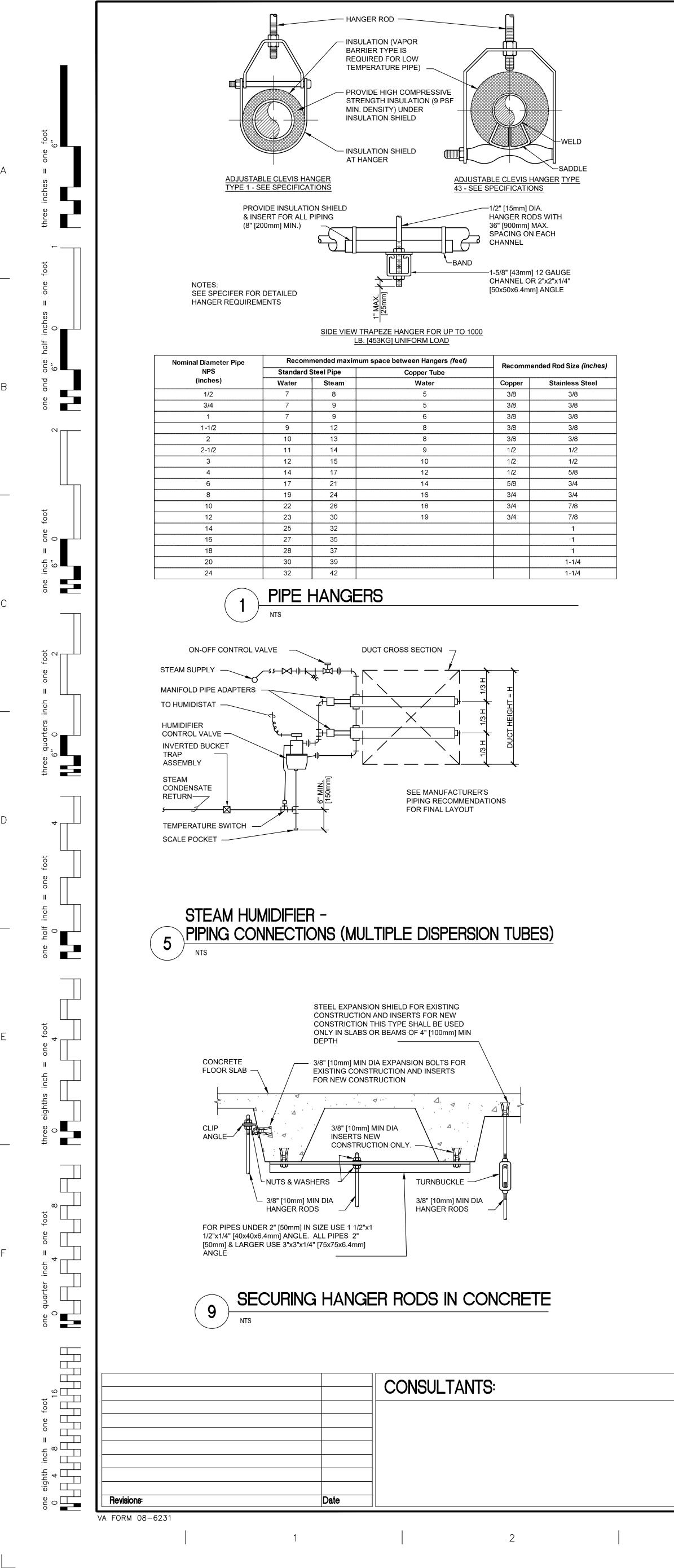
e, Engineering,	Drawing Title MECHANICAL PENTHOUSE PIPING PLAN		Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212			Project Number 436-17-102 Building Number 154		
able Design Tempe, Arizona 85282, (480) 454-2961	- - VAPAHCS PLANNING AN	D ENGINEERING		Location FT. HARRISON Date 07/21/17	Checked OG	HELENA, MT Drawn CR	Drawing Number)
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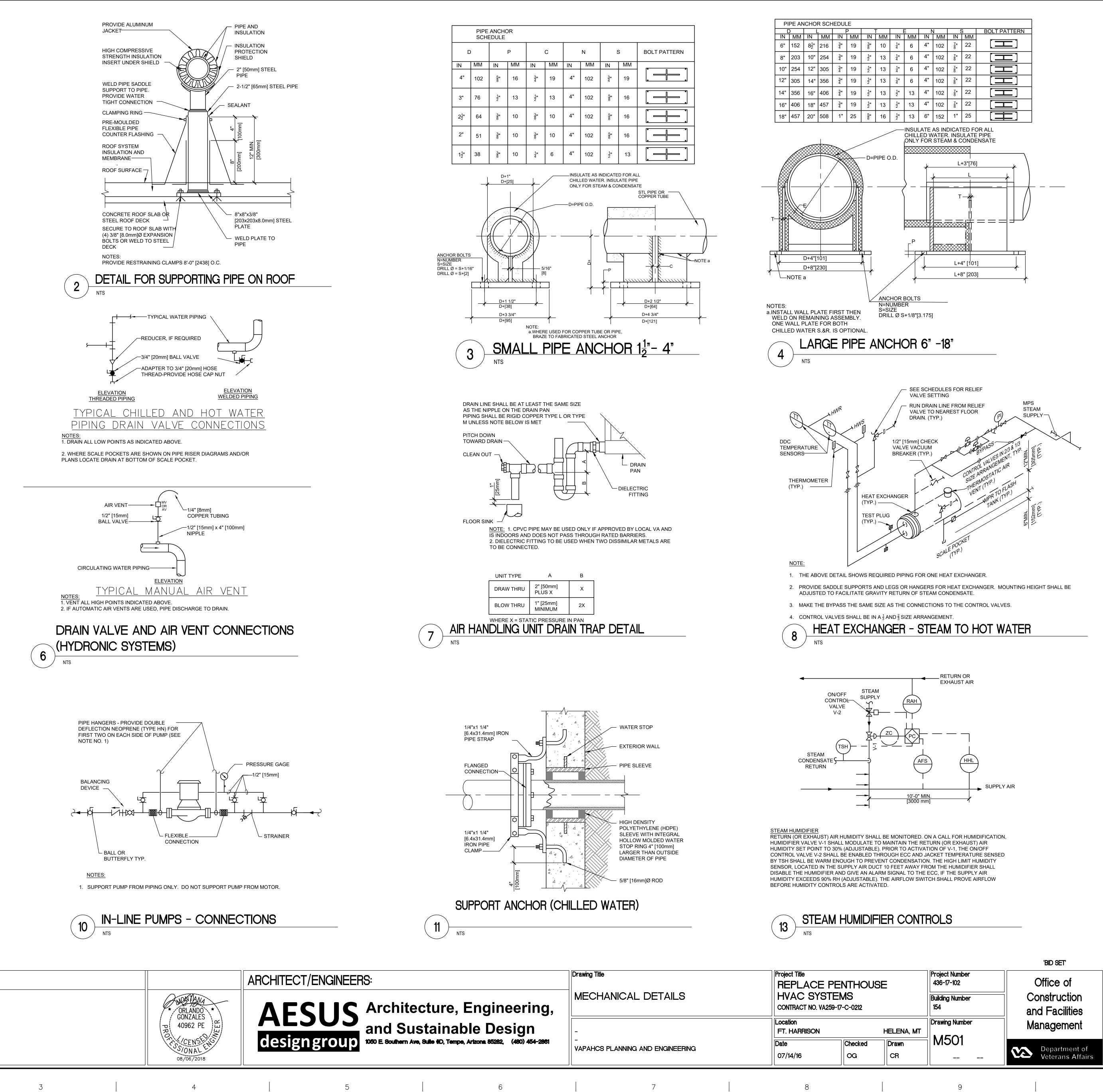


Title	Project Title			Project Number
CHANICAL	REPLACE PENTHOUSE			436-17-102
CTIONS	HVAC SYSTEMS			Building Number
	Location FT. HARRISON	.259-17-C-0212	HELENA, MT	Drawing Number
HCS PLANNING AND ENGINEERING	Date	Checked	Drawn	M301
	07/21/17	OG	CR	

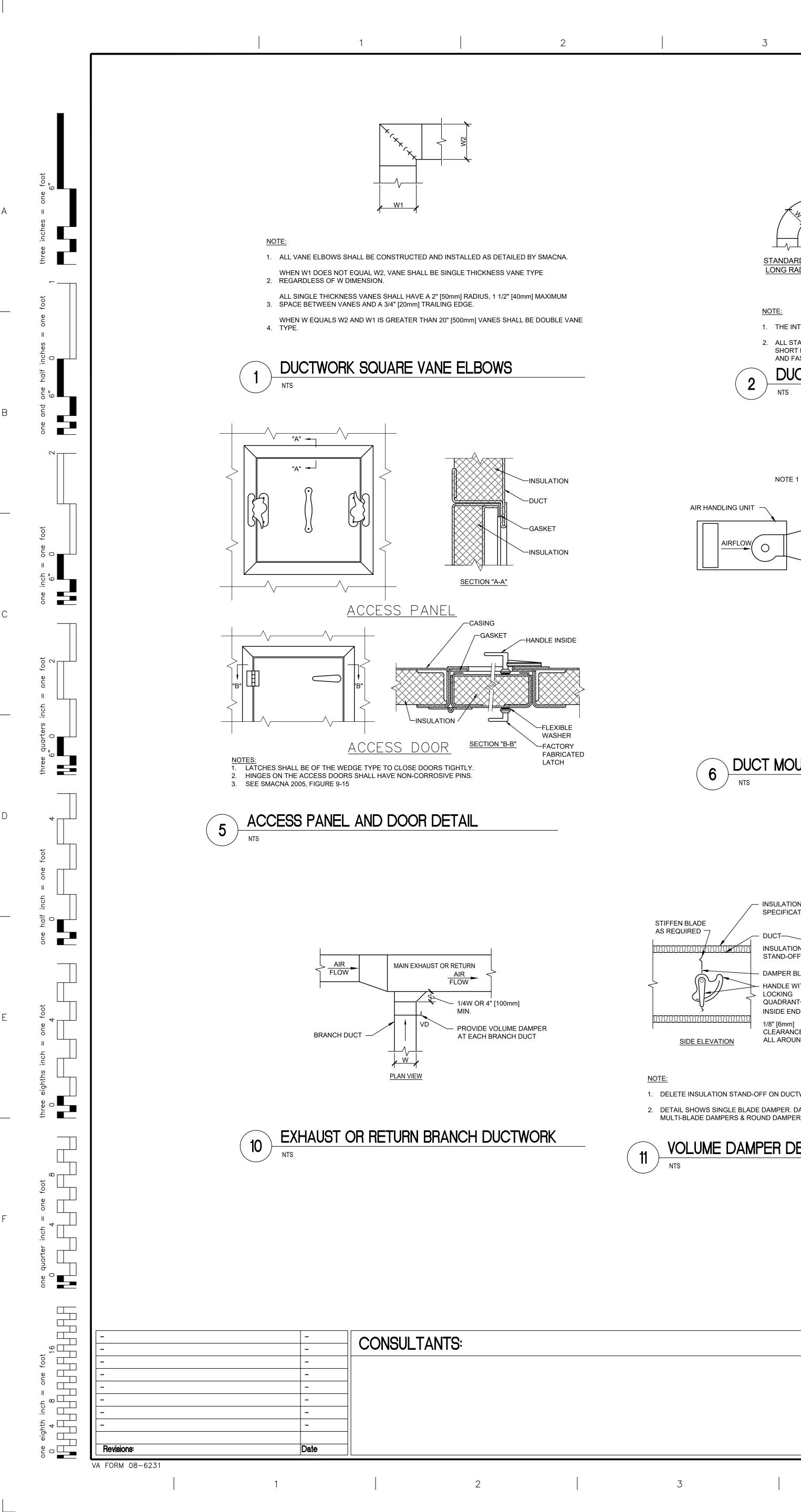
KEY	PLAN NTS

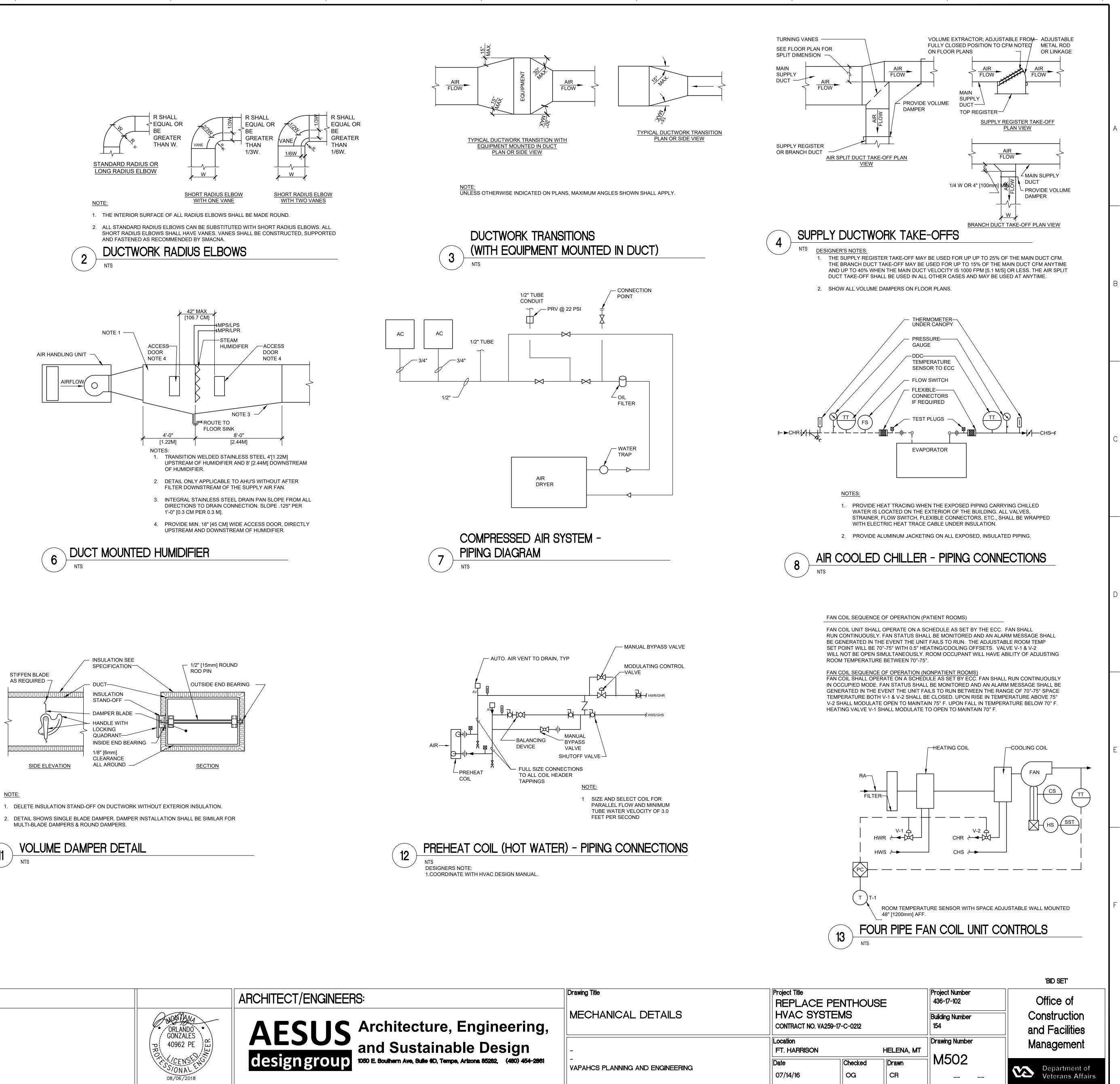








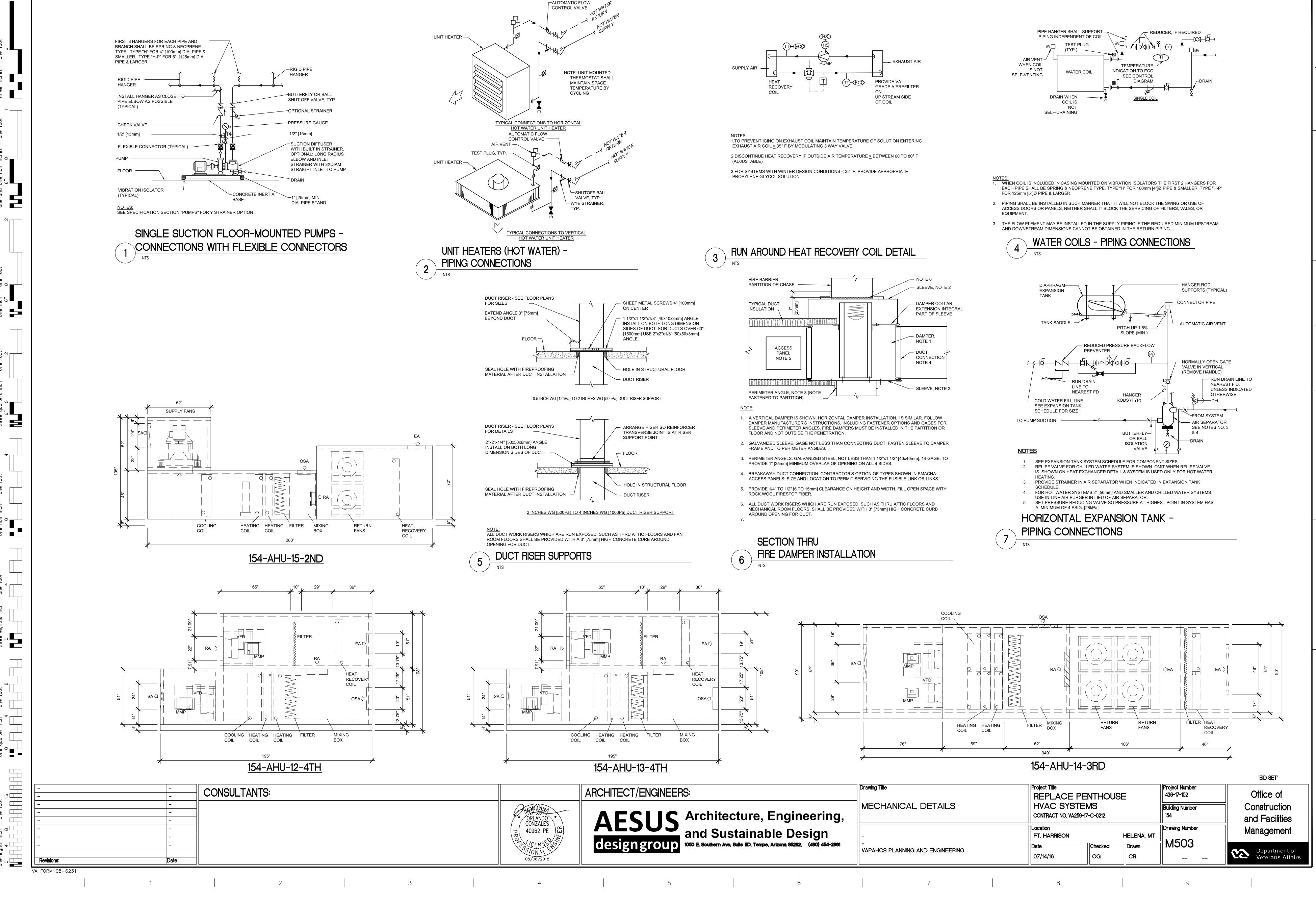


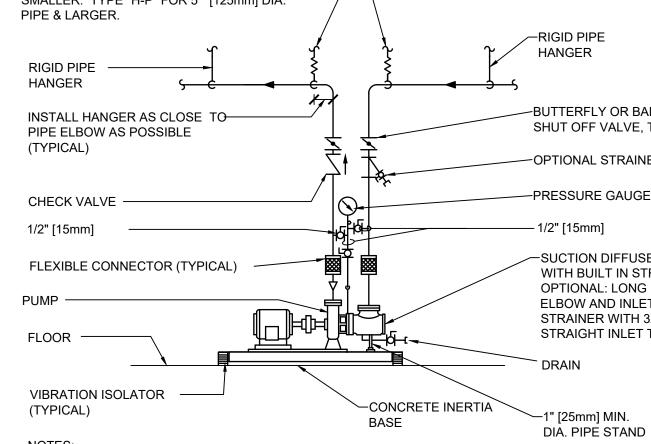


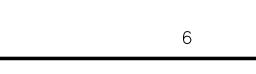


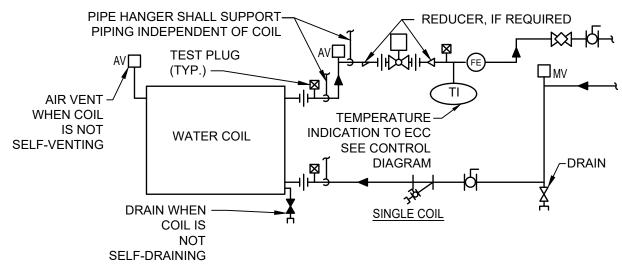
e, Engineering, able Design Tempe, Arizona 85282, (480) 454-2961	Drawing Title Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212			Project Numbe 436-17-102 Building Numbe 154		
	- - VAPAHCS PLANNING AND ENGINE	ERING	Location FT. HARRISON Date 07/14/16	Checked OG	HELENA, MT Drawn CR	Drawing Numb M502
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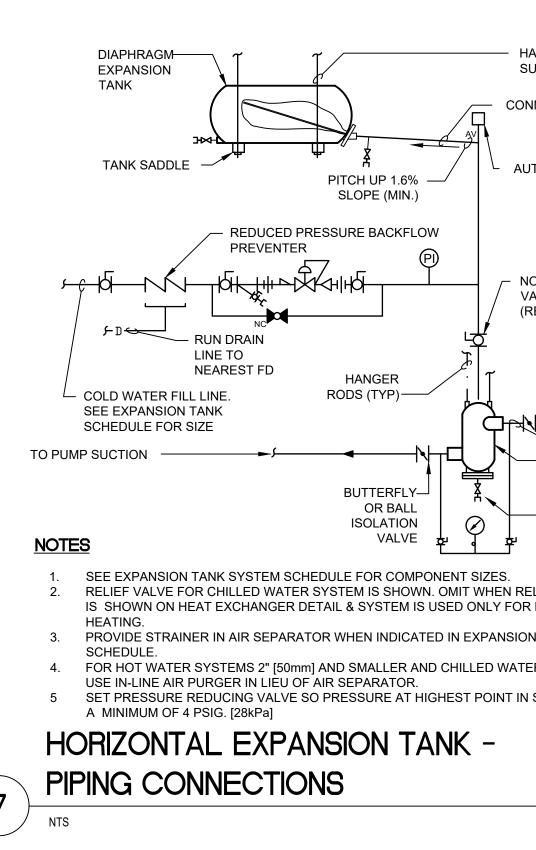


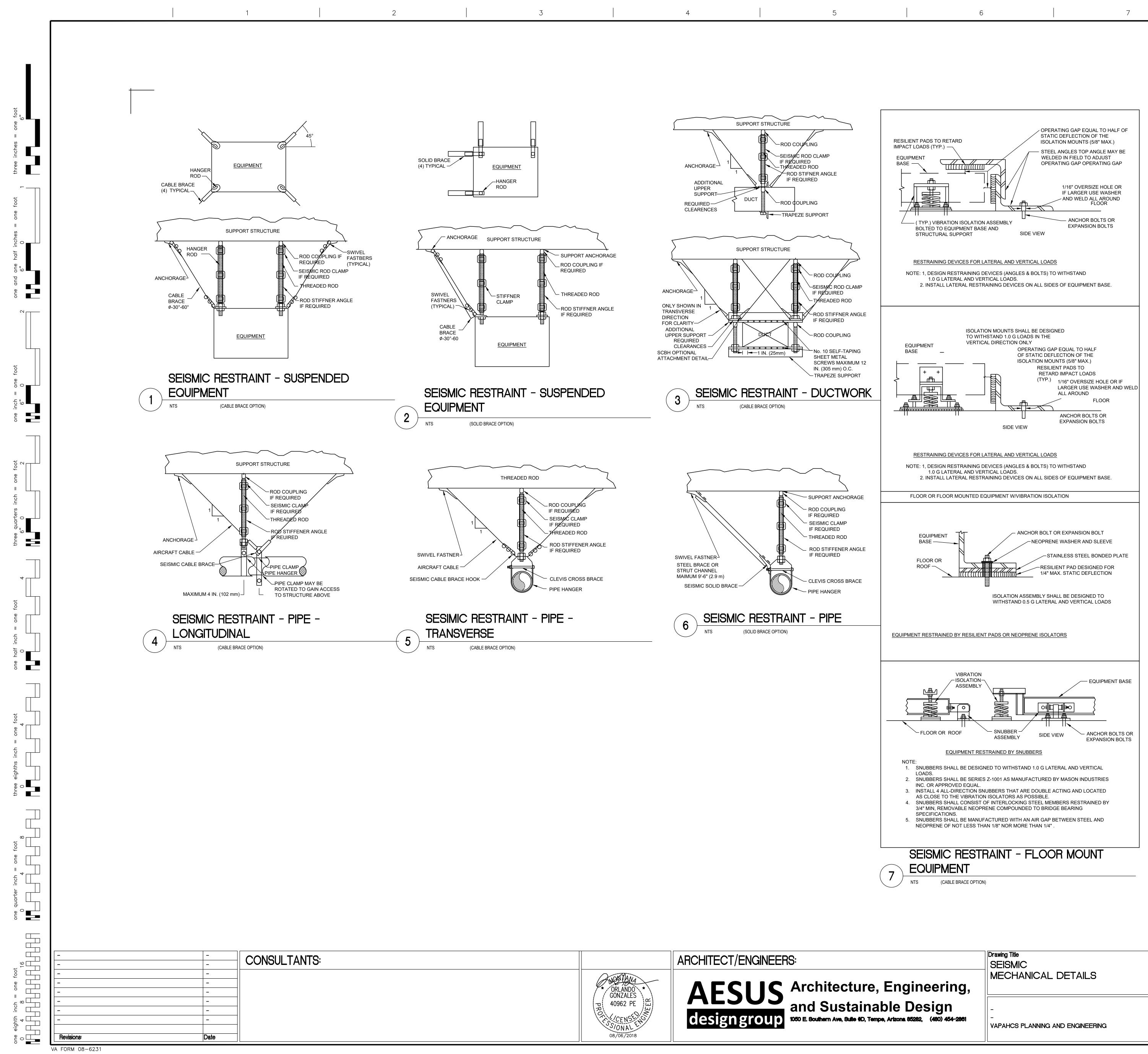






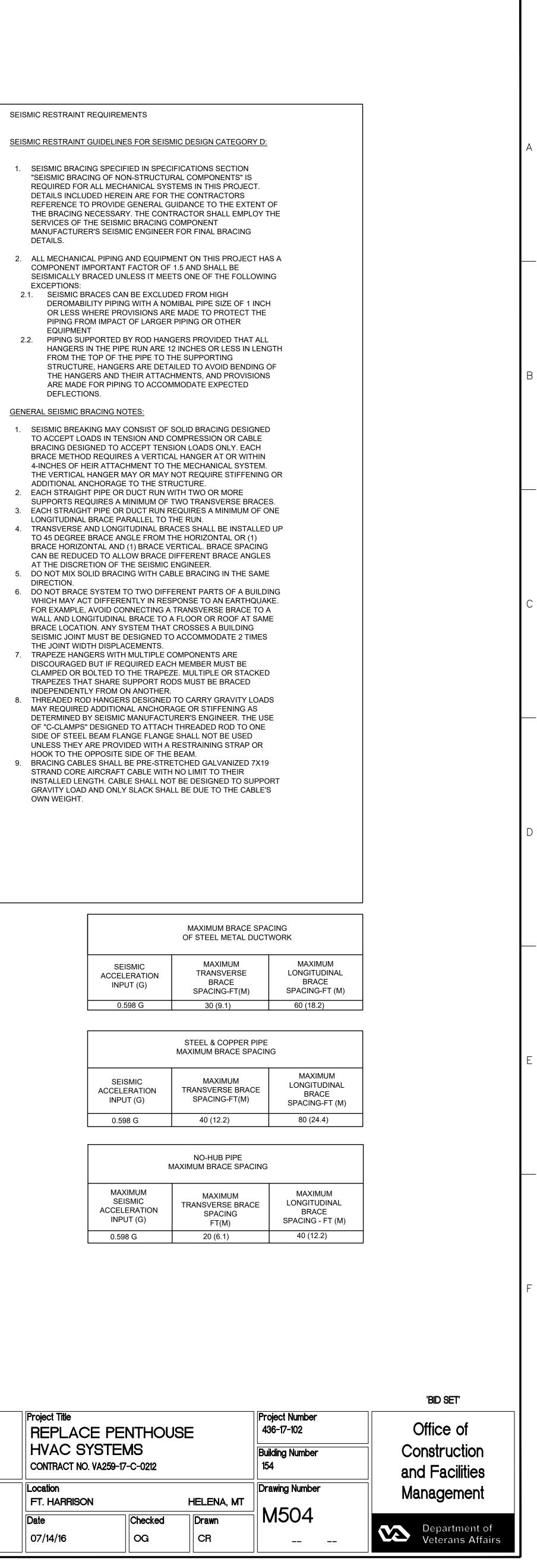






	ARCHITECT/ENGINEEF	RS:
ORLANDO ORLANDO GONZALES 40962 PE H S/ONAL O8/06/2018	AESUS design group	Architecture, En and Sustainable 1050 E. Bouthern Ave, Butte HD, Tempe, Arizon





	MAXIMUM BRACE SPA OF STEEL METAL DUCT	
SEISMIC ACCELERATION INPUT (G)	MAXIMUM TRANSVERSE BRACE SPACING-FT(M)	MA LONG E SPAC
0.598 G	30 (9.1)	60 (
	STEEL & COPPER PIPE MAXIMUM BRACE SPACIN	G
SEISMIC ACCELERATION INPUT (G)	MAXIMUM TRANSVERSE BRACE SPACING-FT(M)	M. LONG E SPAC
0.598 G	40 (12.2)	80
Ν	NO-HUB PIPE MAXIMUM BRACE SPACING	
MAXIMUM SEISMIC ACCELERATION INPUT (G)	MAXIMUM TRANSVERSE BRACE SPACING FT(M)	MA LONG B SPACI
0.598 G	20 (6.1)	40

gineering,	Drawing Title SEISMIC MECHANICAL DETAILS	Project Title REPLACE HVAC SYS CONTRACT NO. V		SE	Project Numbe 436-17-102 Building Numbe 154
Design	_	Location FT. HARRISON		HELENA, MT	Drawing Numb
na 85282, (480) 454-2861	- VAPAHCS PLANNING AND ENGINEERING	Date	Checked	Drawn	∣M504
		07/14/16	OG	CR	



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Cut 'n Wrap™ Insulation Kits* Flanges and Valves

Peel hook and 4. loop strips from the roll equal in lengths to the Cut 'n Wrap blanket plus 6 inches.

> Staple one end of each strip of hook and loop to one end of the Cut 'n Wrap blanket piece. Use at least 2 staples per strip.

Make a small loop at the loose end of the hook and loop material and staple. This makes it easier to work with gloves and to detach the hook and loop strip from itself.

Wrap the first blanket around the valve or flange to be insulated (Note: for a gate valve, that should be the stem, immediately beneath the wheel). Pull the hook and loop

straps so as to tighten the Cut'n Wrap blanket. If insulating a flange, you are done with that pipe component.











A Manufacturing, Inc. INNOVATIONON FIRE 34 Walker Road P.O. Box 220 Mechanic Falls, Maine 04256

T: 1-800-264-6689 • 207-345-8271 F: 207-345-3380 E-mail: sales@auburnmfg.com www.auburnmfg.com.com

8. For a gate valve, continue

installing the

around the

valve stem,

closest to the

valve blanket.

9. For a gate valve, continue

installing the

third blanket

around the

valve body. It

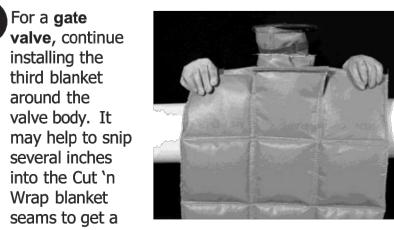
several inches into the Cut 'n Wrap blanket

seams to get a

second blanket

lower part of the

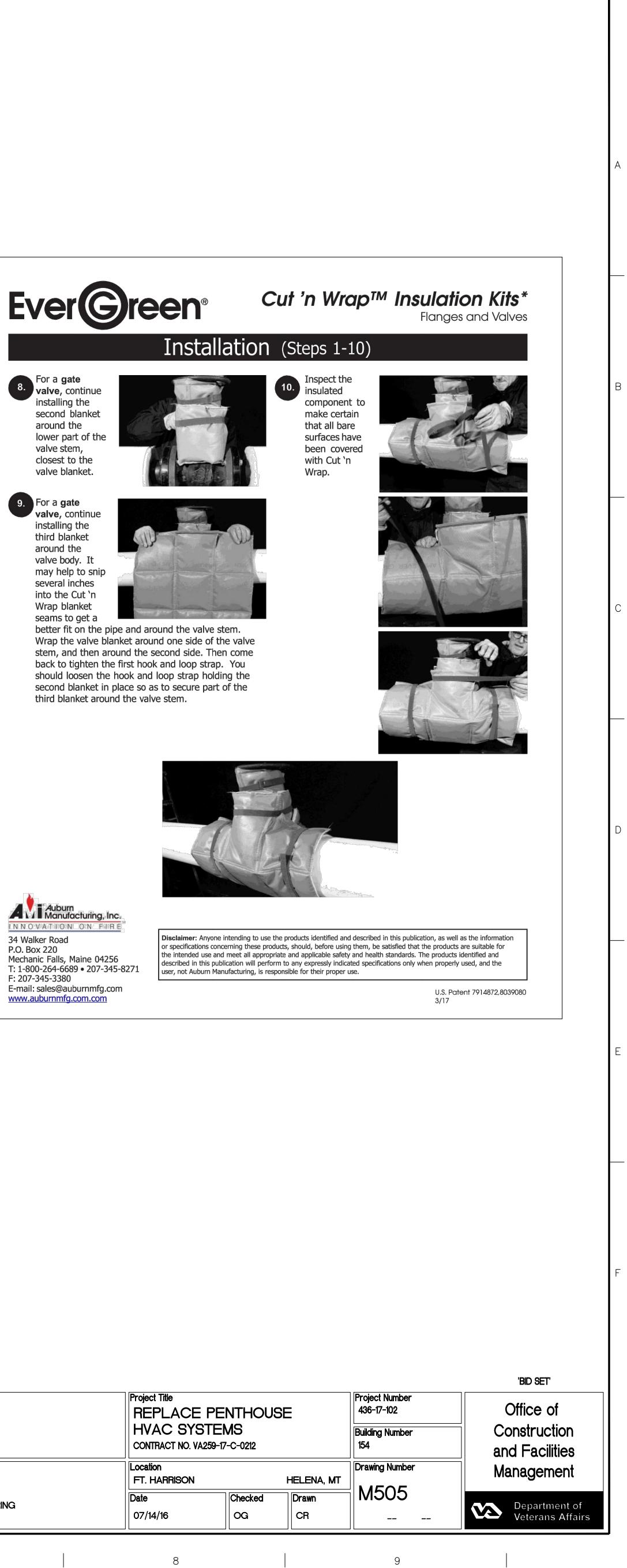




better fit on the pipe and around the valve stem. Wrap the valve blanket around one side of the valve stem, and then around the second side. Then come back to tighten the first hook and loop strap. You should loosen the hook and loop strap holding the second blanket in place so as to secure part of the third blanket around the valve stem.







gineering,	Drawing Title MECHAN	NICAL DETAILS		Project Title REPLACE HVAC SYS CONTRACT NO. VA		SE	Project Numl 436-17-102 Building Num 154
Design 85282, (480) 454-2861	- - VAPAHCS PL	ANNING AND ENGINEERING	i	Location FT. HARRISON Date 07/14/16	Checked OG	HELENA, MT Drawn CR	Drawing Nun M50
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											AIR C	OOLED	CHILL	ER SC	HEDULE	_										
		AREA									E	VAPORAT	OR		CONDEN SER					ELEC	TRICAL					
						# 05	MAV		MAX							C	COMPRES	SSOR MOTO	R		COI	NDENSER	FAN MOTO	DRS		
MARK	BASIS OF DESIGN	AND/OR BLDG SERVED	TYPE	CAPACITY	WEIGHT	# OF COMP	MAX kW/TON	MIN COP	IPLV (kW/TON)	FLOW	EWT	LWT	MAX WPD	FOULIN		# COMP	HP	PHASE	VOLT	# FANS	NOMINAL POWER		МСА	MOCP	VOLT	REMARKS
				TONS	LBS					GPM	°F	°F	FT		°F						HP		AMPS	AMPS		
154-CHLR- 05B-AHU13 15	1	PENTHOUSE UNITS	HELICAL ROTARY	100	6751	4	1.2	3	0.85	240	55	45	15	0.0001	-15	4	_	3	208	8	1.3	3	444	500	208	
2. "MAXI		D "MIN COP"	SPECIFIE	LICABLE ENG D ARE AT DE WITH UNIT.				kw/ton in	CLUDES CO	ONDENSE	R FANS.	-	1			1	4		I		1	1	1	1		

4. UNIT SHALL BE (CGAM 100A 2C02 AXD2 AIAI AIAX XAIC IA4X YAXX XAIA SAID XXXC XX) SAME AS EXISTING CHILLER.

	AREA	SYSTEM		AIR FLOW	MAX FACE	APD	E	AT	L	AT	TOTAL MIN		FLU	UID			-			
LOCATION	AND/OR	AND/OR	APPLICATION		VELOCITY	AFD	Db	Wb	Db	Wb		FLOW	EWT	LWT	WPD	PUMP NO	PUMP HP	PHASE	VOLT	REMARKS
	BLDG	SERVICE		CFM	FPM	IN WG	°F	°F	°F	°F	MBH	GPM	°F	°F	FT					
ELEVATOR PENTHOUSE	154	154-AHU-15-2ND	SUPPLY COIL	8000	400	0.3	34.6	-	48.6	-	121.2	75	52.7	49.5	5	- 1-P7	0.75	3	208	WINTER
ELEVATOR PENTHOUSE	154	154-AHU-15-2ND	EXHAUST COIL	8000	400	0.3	70	45	51	35.8	82	75	49.5	52	5		0.10		200	CONDITION
ELEVATOR PENTHOUSE	154	154-AHU-14-3RD	SUPPLY COIL	24200	400	0.3	40.6	-	51.6		261.8	200	54.2	51.6	12	– 1-P7	0.75	2	208	WINTER
ELEVATOR PENTHOUSE	154	154-AHU-14-3RD	EXHAUST COIL	24200	400	0.3	77	54.4	52.6	44.5	254.4	200	51.6	54	12		0.75	5	200	CONDITION
OUTBOARD PENTHOUSE	154	154-AHU-12-4TH	SUPPLY COIL	10000	400	0.3	51.2	_	55.2	-	43	100	56.2	55.3	12	1.07	0.75	2	208	WINTER
OUTBOARD PENTHOUSE	154	154-AHU-12-4TH	EXHAUST COIL	10000	400	0.3	70	54.4	55.5	48.2	45.5	100	55.3	56	12	– 1-P7	0.75	3	200	CONDITION
OUTBOARD PENTHOUSE	154	154-AHU-13-4TH	SUPPLY COIL	10300	400	0.3	51.2	-	55.2	-	43.9	100	55.6	54.8	12	4.07	0.75	2	000	WINTER
OUTBOARD PENTHOUSE	154	154-AHU-13-4TH	EXHAUST COIL	10300	400	0.3	70	54.4	54.8	47.8	40.4	100	54.7	56	12	– 1-P7	0.75	3	208	CONDITIO

	EXPANSION TANK SCHEDULE														
MARK	LOCATION	VOLUME (GAL.)	DIA. X LENGTH (IN)	OPER. PRESS. (PSIG)	OPER. WT. (LBS.)	REMARKS									
154-ET- 1- HEX09	PENTHOUSE	23	20x32	125	312	MODEL CA-90									
AIR SEPARATOR SCHEDULE															

			DIA. X	OPER.	OPER. WT.	
MARK	LOCATION	GPM	LENGTH	PRESS.	(LBS.)	REMARKS
			(IN)	(PSIG)	(LDO.)	
154-AS- 1	PENTHOUSE	130	17X17	125	50	MODEL ACT03

		CONSULTANTS:
Revisions:	Date	
VA FORM 08-6231		

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		STEAM HU	MIDIFER	SCHED	ULE (HE	EATING		N)							F		CHEDUL	E					
		PIFIER ABSORP. DISTANCE (IN.)		EAT Wb	Db °F	AT Wb	STEAM PRESS ENT VALVE PSIG	CONTROL		BASIS OF DESIGN	REMARKS	MARK LOCATION AREA AND/OR BLDG SERVED SERVED		FLUID	OW HEA	LE	B TEMPER ATURE	SP GR				TICAL MO	DTOR MAX RPN
	1-H2ND ELEVATOR 154-AHU- MOU PENTHOUSE 15-2ND DISPE TU	RSION 29 8 BE	000 36.6	37.6	85	56.3	10	DDC	73.1	DRISTEEM	1 1,2,3	154-CHWP-	D CENTRIF	U CHILLED WATER 46% 3 PGW	<u>PM FT</u> 30 51		°F 55	1.08	77	HP 10	3	208	1750
	1A-H4TH PENTHOUSE 12-4TH DUTBOARD 154-AHU- MOU PENTHOUSE 12-4TH TL DU	ITED 41 10 RSION BE	0300 48.5	46.2	85	57	10	DDC	55.6	DRISTEEM	1 1,2,3	154-HWP- 11-PENT1 ELEVATOR 154-HWP- PENTHOUSE BLDG 154 HOT	CAL	J HEATING HOT WATER 1 46% PGW	30 36.2	2.85	140	1.08	72	3	3	208	1750
	2A-H4TH OUTBOARD 154-AHU- MOU PENTHOUSE 13-4TH DISPE	ITED 40 10 RSION BE	0000 44.3	43.3	85	58.4	10	DDC	61.8	DRISTEEM	1,2,3		RY INLINE	HEAT RECOVERY 7 WATER	5 10	N/A		1	66	2	3	208	1750
	2-H3RD ELEVATOR 154-AHU- MOU PENTHOUSE 14-3RD DISPE	NTED 35 24	1200 36.6	37.5	85	56.8	10	DDC	240.1	DRISTEEM	1,2,3	154-HRP-1- AHU12ELEVATOR PENTHOUSE154-AHU- 12-4THHEAT RECOVE LOOF	RY INLINE	HEAT RECOVERY 1 WATER	00 25	N/A		1	66	2	3	208	1750
	ΝΟΤΕ	BE					1					154-HRP-2-ELEVATOR154-AHU-HEATAHU13PENTHOUSE13-4THRECOVELOOF	RY INLINE	HEAT RECOVERY 1 WATER	00 25	N/A		1	66	2	3	208	1750
	 CASING MATERIAL AND MOUNT STEAM TRAP SHALL BE ORDER PROVIDE PRESSURE/ZED CONT 	ED AS PART OF	THE MANUE	ACURER'S			ZED BY TH	IE MANUF	ACTURER			154-HRP-3- AHU14ELEVATOR PENTHOUSE154-AHU- 14-3RDHEAT RECOVE LOOF	RY INLINE	HEAT RECOVERY 2 WATER	00 10	N/A		1	66	7.5	3	208	1750

3. PROVIDE PRESSUREIZED CONDENSATE RETURN, PCR-1, FROM MANUFACTURER.

		AREA											CHILLED	WATER CO	JIL								PF	REHEAT CO)IL					F'	FILTER
MARK	LOCATION	AND/OR BLDG	TYPE	AIR FLOW		AIR FLOV	V	E	Α Τ	LA	LAT TOTAL SENSIBL EWT LWT % MAX FACE TEMPERATURES TOTAL EWT LWT GLYCOL VELOCITY EAT LAT OADAOUT GPM WPD EWT LWT GL		% GLYCOL	MAX FACE																	
		SERVED		FLOW	SUPPLY	MIN OA	RETURN	Db	Wb	Db	Wb	Υ	CAPACIT	GPIVI					VELOCITY	EAT	LAT	CAPACIT	GPM	VVPD				VELOCIT	HUM		
		SERVED			CFM	CFM	CFM	°F	°F	°F	°F	MBH	MBH			°F	°F	%	FPM	°F	°F	MBH	-		°F	°F	%	FPM	SECTION	PF1	PF2
	ELEVATOR	BLDG 154	FAN WALL	VAV	8,000	3,400	SA.OA	80.9	57	55.8	46.3	219.2	219.2	48.6	12.0	45	55	45	500	34.6	65.6	268.6	14.7	5.0	140	100	45	500	YES	MERV N 7 1	MERV 11
	ELEVATOR	BLDG 154	FAN WALL	VAV	24,200	11,300	SA.OA	79.4	59.6	55	50.7	547.3	547.3	121.0	8.8	45	55	45	500	40.6	65.7	597.3	28.0	3.3	140	100	45	500	NO	MERV N 7 1	MERV 11
	OUTBOARD	BLDG 154	FAN WALL	VAV	10,000	2,900	SA.OA	78	58.6	53.9	49.6	223.4	223.4	500	8.6	45	55	45	500	46.5	71.5	219.8	10.0	5.0	140	100	45	500	NO	MERV N 7 1	MERV 11
	OUTBOARD	BLDG 154	FAN WALL	VAV	10,300	2,500	7800	76.9	54.4	55.6	44.9	237.2	237.2	50.0	9.0	45	55	45	500	51.2	71	221.4	10.0	5.0	140	100	45	500	NO	MERV	MERV

	BUFFER TANK SCHEDULE														
MARK	LOCATION	VOLUME (GAL.)	DIA. X LENGTH (IN)	OPER. PRESS. (PSIG)	OPER. WT. (LBS.)	REMARKS									
154-BT- 1- CHLR05	PENTHOUSE	210	30X75	125	2,179	36,000									

	GLYCOL FEED PUMP SCHEDULE								
MARK	LOCATION	VOLUME (GAL.)	DIA. X LENGTH (IN)	GPM	PSIG	OPER. WT. (LBS.)	ELECTRICAL		
154-GF-1	PENTHOUSE	50	28X55	1.8	25	843	120V 1ph 60 HZ, 15amps		

			STE	AM TO	WATE	R HEAT	EXCH	ANGEF	R SCHE	DULE			
		AREA	SYSTEM			WATER CO	ONDITIONS		STEAM	CONTROL	TR	AP	
MARK	LOCATION	AND/OR	AND/OR	TYPE	FLOW	EWT	LWT	WPD	ENT	VALVE	TRAP #	CAPACIT	REMARKS
		BLDG	SERVICE		GPM	°F	°F	PSI	PSIG	LBS/HR		LBS/HR	
154-HX1	ELEVATOR PENTHOUSE	154	HEATING WATER	SHELL & COIL	133	140	180	7	10	2732			

ARCHITECT/ENGINEERS:



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AESUS Architecture, Eng and Sustainable D designgroup and Sustainable L 1050 E. Southern Ave, Suite #D, Tempe, Arizona &



		FAN SCHEDULE																
		AREA	SYSTEM		AIR FAN MOTOR ELECTRICAL													
MARK	LOCATIO N	AND/OR BLDG	AND/OR SERVICE	FLOW	TSP	NUMBER	DISCHAR GE	ĸ	MIN % EFF	DRIVE	FAN MAX RPM		-	PHASE	VOLT	RPM	SPEED CONTRO	REMARK S
		SERVED		CFM	IN			IN		8	1	BHP	HP				<u> </u>	
1-SF2ND	ELEVATOR PENTHOU SE	2ND FLOOR	154-AHU- 15-2ND	8000	4.7	2	TOP	-	90.0%	DIRECT	1800	4.4 (EA)	5.0 (EA)	3	208	1750	VARIABLE	1
1-RF2ND	ELEVATOR PENTHOU SE	2ND FLOOR	154-AHU- 15-2ND	8000	2.3	2	TOP		89.5%	DIRECT	1846	2.3 (EA)	3 (EA)	3	208	1750	VARIABLE	1
1A-SF4TH	OUTBOAR D PENTHOU SE	4TH FLOOR	154-AHU- 12-4TH	10300	4.9	2	ТОР		91.7%	DIRECT	1800	5.7	7.5 (EA)	3	208	1750	VARIABLE	1
1A-RF4TH	OUTBOAR D PENTHOU SE	4TH FLOOR	154-AHU- 12-4TH	10300	2.3	2	ТОР		89.5%	DIRECT	1800	3.2 (EA)	5 (EA)	3	208	1750	VARIABLE	1
2A-SF4TH	OUTBOAR D PENTHOU SE	4TH FLOOR	154-AHU- 13-4TH	10000	4.5	2	TOP		89.5%	DIRECT	1800	4.8 (EA)	5 (EA)	3	208	1750	VARIABLE	1
2A-RF4TH	OUTBOAR D PENTHOU SE	4TH FLOOR	154-AHU- 13-4TH	10000	2.3	2	TOP		89.5%	DIRECT	1800	3.1 (EA)	5 (EA)	3	208	1750	VARIABLE	1
2-SF3RD	ELEVATOR PENTHOU SE	3RD FLOOR	154-AHU- 14-3RD	24200	4.7	6	TOP		89.5%	DIRECT	1800	4.5 (EA)	5 (EA)	3	208	1750	VARIABLE	1
2-RF3RD	ELEVATOR PENTHOU SE	3RD FLOOR	154-AHU- 14-3RD	24200	2.1	4	TOP		89.5%	DIRECT	1800	3.5 (EA)	5 (EA)	3	208	1750	VARIABLE	1

NOTE

1. VFD SHALL BE INTEGRAL WITH UNIT AND PROVIDED BY MANUFACTURER

	VAR		FREQUE	ENCY D	RIVES	CHEDULE	
MARK	LOCATION	SERVES	МОТ	OR	RYPASS	BASIS OF DESIGN	
	LOOATION		HP	VOLT	БПХОО		
VFD-1	ELEVATOR PENTHOUSE	154-CHP-1	10	208/3	YES	DANFOS	1,2
VFD-2	ELEVATOR PENTHOUSE	154-CHP-2	10	208/3	YES	DANFOS	1,2
VFD-3	ELEVATOR PENTHOUSE	154-HWP-1	3	208/3	YES	DANFOS	1,2
VFD-4	ELEVATOR PENTHOUSE	154-HWP-2	3	208/3	YES	DANFOS	1,2

	НС	DT WATER UI		ATER S	CHEDULE		
MARK	TYPE	MANUFACTURER & MODEL NO.	CFM	GPM	VOLTAGE/PH.	BTU	REMARKS
154-UH-1 THRU 154-UH-4	HOT WATER UNIT HEATER	TRANE UHSBA36	850	3.6	115/1	36,000	1,2,3
2. PROVIDE I	MANUFACTU	PENSION AS DIR	JTY TSTA				

3. PROVIDE WITH INTEGRAL DISCONNECT.

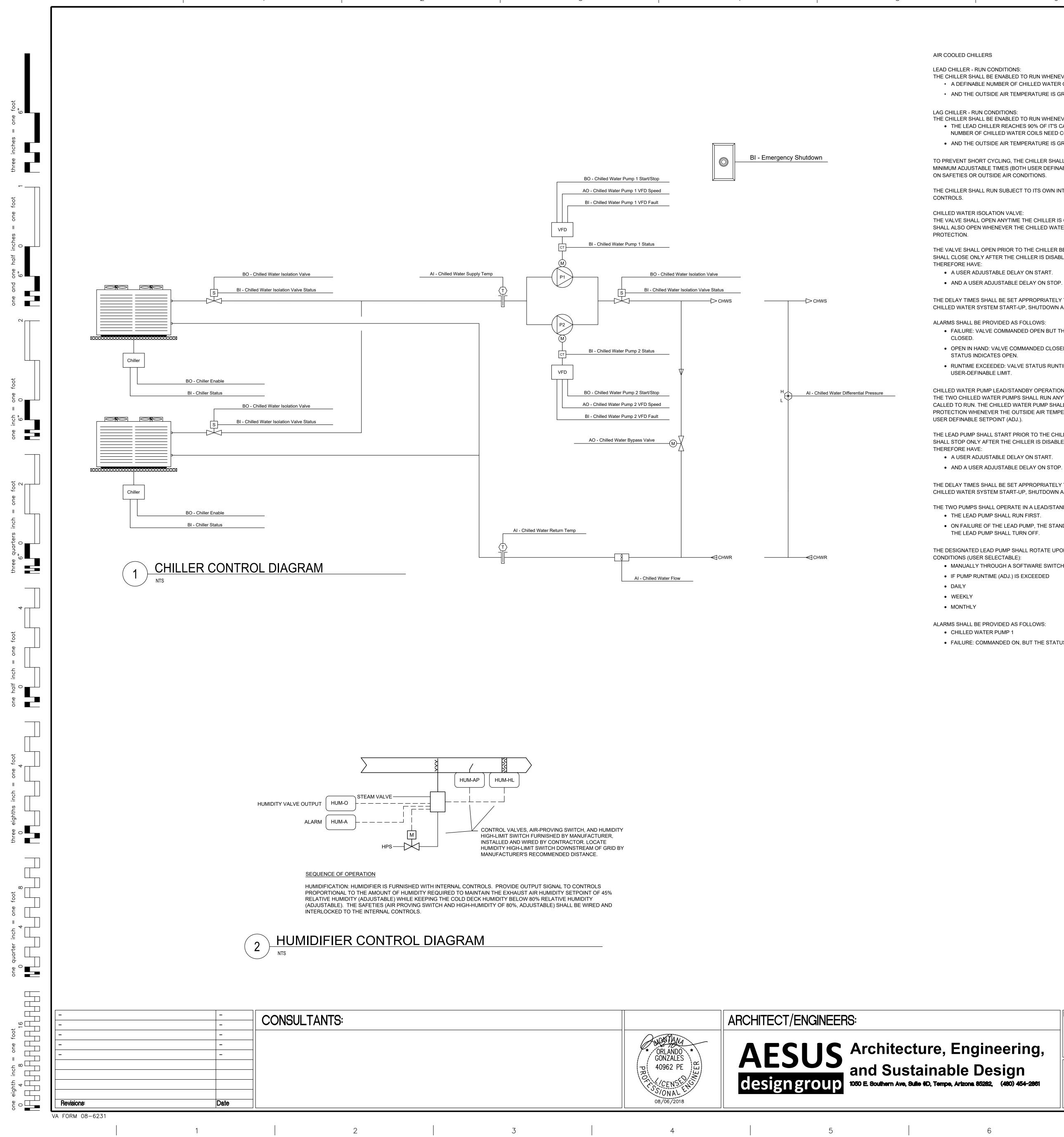
1. PROVIDE MINIMUM NEMA 1 ENCLOSURE FOR INDOOR INSTALLATION.

NOTE

2. ALL VFDS FURNISHED WITHIN EQUIPMENT CONTROL PANEL OR PROVIDED SEPERATIELY SHALL BE THE PRODUCT OF ONE MANUFACTURER.

						'BID SET'
	Drawing Title MECHANICAL	Project Title REPLACE	PENTHOUS	6E	Project Number 436-17-102	Office of
gineering,	SCHEDULES	HVAC SYS CONTRACT NO. VA			Building Number 154	Construction and Facilities
Design	-	Location FT. HARRISON		HELENA, MT	Drawing Number	Management
a 85282, (480) 454-286 1	VAPAHCS PLANNING AND ENGINEERING	Date 07/14/16	Checked OG	Drawn CR	M601	Department of Veterans Affairs

)R		
MAX RPM	SPEED CONTROL	REMARKS
1750	VARIABLE	
1750	VARIABLE	
750	CONSTANT	



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FMS

LEAD CHILLER - RUN CONDITIONS:

THE CHILLER SHALL BE ENABLED TO RUN WHENEVER: A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING • AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.).

LAG CHILLER - RUN CONDITIONS:

THE CHILLER SHALL BE ENABLED TO RUN WHENEVER: • THE LEAD CHILLER REACHES 90% OF IT'S CAPACITY AND A DEFINABLE NUMBER OF CHILLED WATER COILS NEED COOLING • AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.).

TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND

CHILLED WATER ISOLATION VALVE:

THE VALVE SHALL OPEN ANYTIME THE CHILLER IS CALLED TO RUN. THE VALVE SHALL ALSO OPEN WHENEVER THE CHILLED WATER PUMP RUNS FOR FREEZE

THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED. THE VALVE SHALL

A USER ADJUSTABLE DELAY ON START.

• AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

ALARMS SHALL BE PROVIDED AS FOLLOWS: FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES

OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE

STATUS INDICATES OPEN. RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A

CHILLED WATER PUMP LEAD/STANDBY OPERATION:

THE TWO CHILLED WATER PUMPS SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN. THE CHILLED WATER PUMP SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN A USER DEFINABLE SETPOINT (ADJ.).

THE LEAD PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE PUMP(S) SHALL

A USER ADJUSTABLE DELAY ON START.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE TWO PUMPS SHALL OPERATE IN A LEAD/STANDBY FASHION. THE LEAD PUMP SHALL RUN FIRST. ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP SHALL RUN AND

THE LEAD PUMP SHALL TURN OFF. THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING

CONDITIONS (USER SELECTABLE): MANUALLY THROUGH A SOFTWARE SWITCH

IF PUMP RUNTIME (ADJ.) IS EXCEEDED

ALARMS SHALL BE PROVIDED AS FOLLOWS:

CHILLED WATER PUMP 1

• FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

 RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

- VFD FAULT.
- CHILLED WATER PUMP 2
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

CHILLED WATER DIFFERENTIAL PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFD TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 10% (ADJ.).

- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

CHILLED WATER BYPASS VALVE - MINIMUM FLOW CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER FLOW THROUGH THE CHILLER AND, AS THE CHILLED WATER FLOW DROPS BELOW SETPOINT, THE CONTROLLER SHALL MODULATE THE CHILLED WATER BYPASS VALVE OPEN TO

MAINTAIN THE MINIMUM CHILLED WATER FLOW SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS: • LOW CHILLED WATER FLOW: IF THE CHILLED WATER FLOW IS 25% (ADJ.) LESS THAN SETPOINT.

CHILLER:

THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON CHILLER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER

CHILLER CHILLED WATER SUPPLY SETPOINT:

THE CHILLER SHALL MAINTAIN A CHILLED WATER SUPPLY TEMPERATURE SETPOINT AS DETERMINED BY ITS OWN INTERNAL CONTROLS (PROVIDED BY OTHERS).

CHILLED WATER TEMPERATURE MONITORING:

THE FOLLOWING TEMPERATURES SHALL BE MONITORED: CHILLED WATER SUPPLY.

CHILLED WATER RETURN.

DEFINABLE LIMIT.

- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
- LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

	Project Title			Project Number	
		PENTHOUS	SE .	436-17-102	Office of
HVAC CONTROL DIAGRAMS				Building Number 154	Construction and Facilities
-	Location FT. HARRISON		HELENA, MT	Drawing Number	Management
- VAPAHCS PLANNING AND ENGINEERING	Date	Checked	Drawn		Department of Veterans Affairs
	HVAC CONTROL DIAGRAMS	- FT. HARRISON	- CONTRACT NO. VA259-17-C-0212 - FT. HARRISON VAPAHCS PLANNING AND ENGINEERING Checked	- CONTRACT NO. VA259-17-C-0212 - FT. HARRISON HELENA, MT - Date Checked Drawn	- CONTRACT NO. VA259-17-C-0212 154 154 154 154 154 154 154 154 154 154

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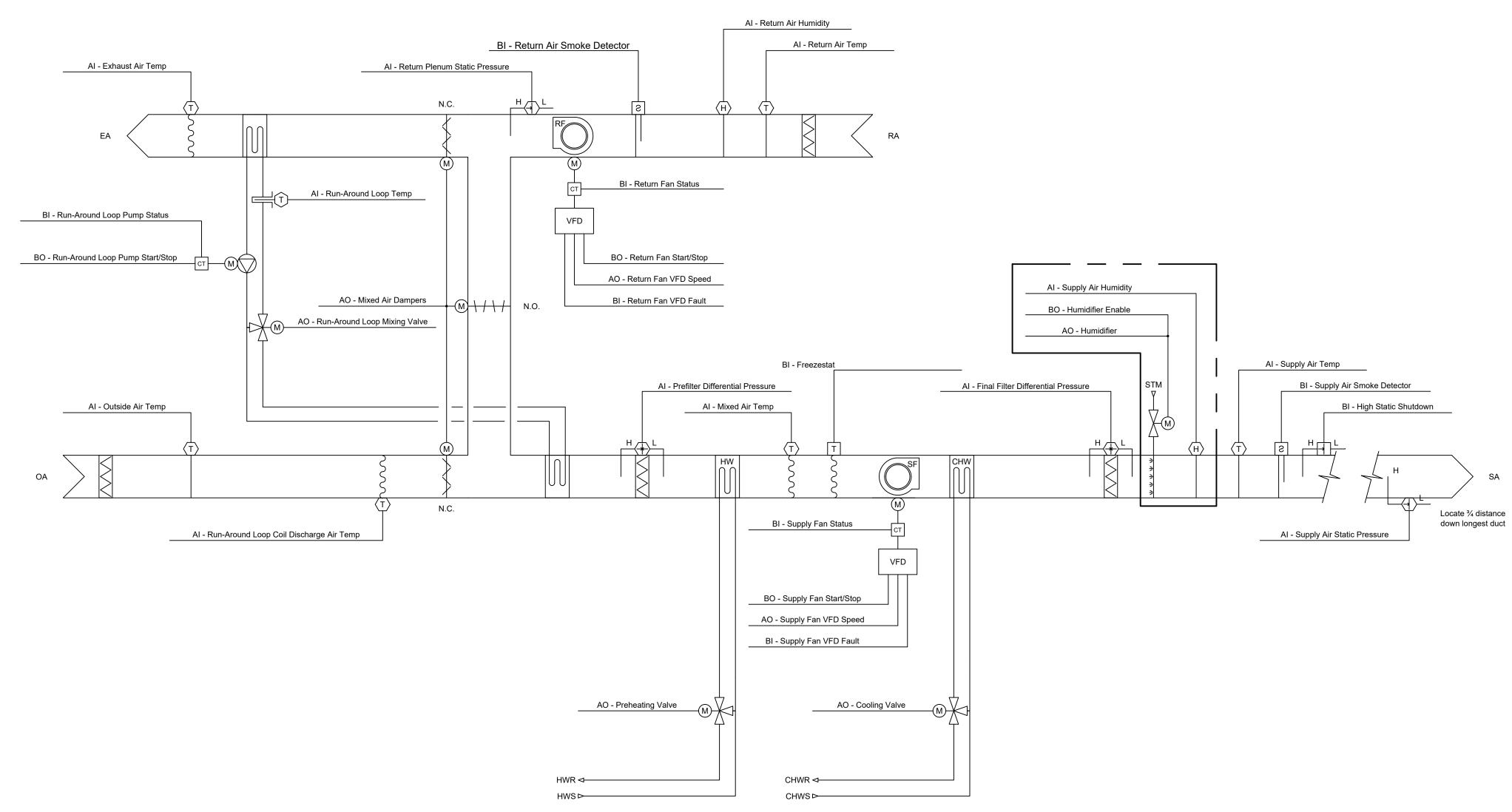
ABBREVIATIONS
DIRECT DIGITAL CONTROL
NORMALLY OPEN
NORMALLY CLOSED
SPRING RANGE
THROTTLING RANGE
PREHEAT
CONTROL POINT ADJUSTMENT
DIRECT ACTING
REVERSE ACTING
FACILITY MANAGEMENT SYSTEM
ENTERPRISE MANAGEMENT SYSTEM

SYMBOLS

HARD-WIRED SAFETY INTERLOCK

HARDWARE POINT





AHU CONTROL DIAGRAM

		Hardwa	re Points		Software Points						
Point Name	AI	AO	Bl	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Exhaust Air Temp	x								x		x
Final Filter Differential Pressure	x							*	x		
Mixed Air Temp	x								x		x
Outside Air Temp	х	1 - 2							х		х
Prefilter Differential Pressure	x			-					x		******
Return Air Humidity	x								x		x
Return Air Temp	x								x		x
Return Plenum Static Pressure	x								x		х
Run-Around Loop Coil Discharge Air Temp	x								x		х
Run-Around Loop Temp	x					-		-	x		x
Supply Air Hum idity	x					-		-	x		x
Supply Air Static Pressure	x			-				-	x	x	x
Supply Air Temp	x								x		x
Cooling Valve		x							x		х
Humidifier		x						-	x		x
Mixed Air Dampers		x							x		x
Preheating Valve		x			***	***************************************		***************************************	x		x
Return Fan VFD Speed		x							x		х
Run-Around Loop Mixing Valve		x							x		х
Supply Fan VFD Speed		x							x		x
Freezestat			x						x	x	x
High Static Shutdown			x			-			x	x	x
Return Air Smoke Detector			x						х	х	х
Return Fan Status			x						x		x
Return Fan VFD Fault			x							х	x
Run-Around Loop Pump Status			x						x		x
Supply Air Smoke Detector			x						x	x	x
Supply Fan Status			x						х		х
Supply Fan VFD Fault			x							х	х
Humidifier Enable				x							x
Return Fan Start/Stop	İ			x					x		x
Run-Around Loop Pump Start/Stop				x		-			x		x
Supply Fan Start/Stop				x					x		x
Economizer Mixed Air Temp Setpoint					x				x		x
Humidifier Setpoint					x						x
Preheating Mixed Air Temp Setpoint					x	-			x		x
Return Plenum Static Pressure Setpoint					x				x		x

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_	C	ONSULTANTS:
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Revisions:	Date	

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		Hardwa	Hardware Points				Software Points				
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphi
Supply Air Static Pressure Setpoint					x				x		x
Supply Air Temp Setpoint					x				x		x
Emergency Shutdown						x			х	x	x
Final Filter Change Required										x	x
High Mixed Air Temp	*******									x	
High Return Air Humidity										x	
High Return Air Temp										x	
High Return Plenum Static Pressure										x	
High Supply Air Humidity										x	
High Supply Air Static Pressure										x	
High Supply Air Static Pressure										x	
High Supply Air Temp										x	
High Supply Air Temp										x	
Low Mixed Air Temp										x	
Low Return Air Humidity										x	
Low Return Air Temp										x	
Low Return Plenum Static Pressure				***						×	
Low Supply Air Humidity										x	
Low Supply Air Static Pressure										x	
Low Supply Air Temp										x	
Low Supply Air Temp										x	
Prefilter Change Required								-		x	x
Return Fan Failure										x	
Return Fan in Hand										x	
Return Fan Runtime Exceeded										x	
Run-Around Loop Pump Failure										x	
Run-Around Loop Pump in Hand							-			x	
Run-Around Loop Pump Runtime Exceeded										x	
Supply Fan Failure										x	
Supply Fan in Hand						1				x	
Supply Fan Runtime Exceeded						1				x	1
Totals	13	7	9	4	6	1	0	0	36	35	40





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Architecture, Eng and Sustainable CESIGNGIOUD 1050 E. Southern Ave, Suite #D, Tempe, Arizona &



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SEQUENCE OF CONTROLS

RUN CONDITIONS - REQUESTED: THE UNIT SHALL RUN WHENEVER:

 ANY ZONE IS OCCUPIED. OR A DEFINABLE NUMBER OF UNOCCUPIED ZONES NEED HEATING OR COOLING.

EMERGENCY SHUTDOWN: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

FREEZE PROTECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

HIGH/LOW STATIC SHUTDOWN:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN HIGH OR LOW STATIC SHUTDOWN SIGNAL.

RETURN AIR SMOKE DETECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A RETURN AIR SMOKE DETECTOR STATUS. SUPPLY AIR SMOKE DETECTION:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SUPPLY AIR SMOKE DETECTOR STATUS.

AHU OPTIMAL START: THE UNIT SHALL START PRIOR TO SCHEDULED OCCUPANCY BASED ON THE TIME NECESSARY FOR THE ZONES TO REACH THEIR OCCUPIED SETPOINTS. THE START TIME SHALL AUTOMATICALLY ADJUST BASED ON CHANGES IN OUTSIDE AIR TEMPERATURE AND ZONE TEMPERATURES.

SUPPLY FAN (12 FANS): THE SUPPLY FANS SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FANS SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. SUPPLY FANS SHALL RAMP UP AS ONE FAN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

• SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. • SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

SUPPLY AIR DUCT STATIC PRESSURE CONTROL:

THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT. THE SPEED SHALL NOT DROP BELOW 30% (ADJ.). THE STATIC PRESSURE SETPOINT SHALL BE RESET BASED UPON THE POSITION OF THE ZONE DAMPERS, WITH A GOAL OF REDUCING THE STATIC PRESSURE UNTIL AT LEAST ONE ZONE DAMPER IS NEARLY WIDE OPEN.

- THE INITIAL DUCT STATIC PRESSURE SETPOINT SHALL BE 1.5IN H2O (ADJ.). • IF NO ZONE DAMPER IS NEARLY WIDE OPEN, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A
- MINIMUM OF 1.3IN H2O (ADJ.). AS ONE OR MORE DAMPERS NEARS THE WIDE OPEN POSITION, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 1.8IN H2O (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

• HIGH SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT • LOW SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT. SUPPLY FAN VFD FAULT.

RETURN FANS (12 FANS): THE RETURN FANS SHALL RUN WHENEVER THE SUPPLY FANS RUN. RETURN FANS SHALL RAMP UP AND DOWN AS ONE FAN AND NOT BE STAGED.

ALARMS SHALL BE PROVIDED AS FOLLOWS: RETURN FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RETURN FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. • RETURN FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.). RETURN FAN VFD FAULT.

RETURN PLENUM STATIC PRESSURE CONTROL:

THE CONTROLLER SHALL MEASURE RETURN PLENUM STATIC PRESSURE AND MODULATE THE RETURN FAN VFD SPEED TO MAINTAIN A RETURN PLENUM STATIC PRESSURE SETPOINT OF 0.2IN H2O (ADJ.). THE RETURN FAN VFD SPEED SHALL NOT DROP BELOW 20% (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

 HIGH RETURN PLENUM STATIC PRESSURE: IF THE RETURN AIR PLENUM STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT. LOW RETURN PLENUM STATIC PRESSURE: IF THE RETURN AIR PLENUM STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

ENERGY RECOVERY - RUN-AROUND LOOP COILS: THE CONTROLLER SHALL MODULATE THE RUN-AROUND LOOP MIXING VALVE FOR ENERGY RECOVERY AS FOLLOWS. COOLING RECOVERY MODE:

THE CONTROLLER SHALL MEASURE THE RUN-AROUND LOOP COIL DISCHARGE AIR TEMPERATURE (DOWNSTREAM OF THE OUTSIDE AIR COIL) AND MODULATE THE RUN-AROUND LOOP MIXING VALVE TO MAINTAIN A SETPOINT 2°F (ADJ.) LESS THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE RUN-AROUND LOOP SHALL RUN FOR COOL **RECOVERY WHENEVER:**

- UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE BELOW THE OUTSIDE AIR TEMPERATURE. AND THE UNIT IS IN A COOLING MODE.
- AND THE ECONOMIZER IS OFF. AND THE SUPPLY FAN IS ON.

HEATING RECOVERY MODE:

THE CONTROLLER SHALL MEASURE THE RUN-AROUND LOOP COIL DISCHARGE AIR TEMPERATURE (DOWNSTREAM OF THE OUTSIDE AIR COIL) AND MODULATE THE RUN-AROUND LOOP MIXING VALVE TO MAINTAIN A SETPOINT 2°F (ADJ.) GREATER THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE RUN-AROUND LOOP SHALL RUN FOR HEAT RECOVERY WHENEVER:

UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE ABOVE THE OUTSIDE AIR TEMPERATURE.

- AND THE UNIT IS IN A HEATING MODE.
- AND THE ECONOMIZER IS OFF.
- AND THE SUPPLY FAN IS ON.
- FROST PROTECTION:

THE RUN-AROUND LOOP PUMP SHALL RUN AND THE RUN-AROUND LOOP MIXING VALVE SHALL CLOSE TO 0% (ADJ.) IN ORDER TO CIRCULATE WATER THROUGH THE RUN-AROUND LOOP EXHAUST AIR COIL WHENEVER: RUN-AROUND LOOP TEMPERATURE DROPS BELOW 33°F (ADJ.) • OR THE EXHAUST AIR TEMPERATURE DROPS BELOW 30°F (ADJ.).

PREHEATING COIL VALVE:

THE CONTROLLER SHALL MEASURE THE MIXED AIR TEMPERATURE AND MODULATE THE PREHEATING COIL VALVE TO MAINTAIN ITS SETPOINT 5°F (ADJ.) LESS THAN THE SUPPLY AIR TEMPERATURE SETPOINT.

THE PREHEATING SHALL BE ENABLED WHENEVER: OUTSIDE AIR TEMPERATURE IS LESS THAN 60°F (ADJ.).

 AND THE ECONOMIZER IS DISABLED. AND THE SUPPLY FAN STATUS IS ON.

THE PREHEATING COIL VALVE SHALL OPEN FOR FREEZE PROTECTION WHENEVER: MIXED AIR TEMPERATURE DROPS FROM 40°F TO 35°F (ADJ.).

OR THE FREEZESTAT IS ON.

SUPPLY AIR TEMPERATURE SETPOINT - OPTIMIZED: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT RESET BASED ON ZONE COOLING AND HEATING REQUIREMENTS

THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR COOLING BASED ON ZONE COOLING REQUIREMENTS AS FOLLOWS:

THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).

 AS COOLING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 53°F (ADJ.). AS COOLING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF

72°F (ADJ.). IF MORE ZONES NEED HEATING THAN COOLING, THEN THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET

- FOR HEATING AS FOLLOWS: • THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 82°F (ADJ.).
- AS HEATING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 85°F (ADJ.).
- AS HEATING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 72°F (ADJ.).

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SEQUENCE OF CONTROLS (C

COOLING COIL VALVE: THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMP MAINTAIN ITS COOLING SETPOINT.

- AND THE HEATING IS NOT ACTIVE.
- THE COOLING COIL VALVE SHALL OPEN TO 50% (ADJ.) WHI ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPER

LOW SUPPLY AIR TEMPERATURE ALARM: THE CONTROLLER SHALL ALARM IF THE SUPPLY AIR TEMF

THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE . IS OFF. IF OPTIMAL START UP IS AVAILABLE THE MIXED AIR MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MO MINIMUM OUTSIDE AIR VENTILATION - FIXED PERCENTAGE

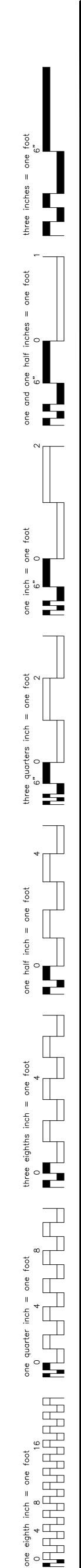
THE CONTROLLER SHALL MEASURE THE RETURN AIR HUMI SETPOINT OF 50% RH (ADJ.). THE HUMIDIFIER SHALL BE EN THE HUMIDIFIER SHALL TURN OFF WHENEVER:

GENERAL NOTES

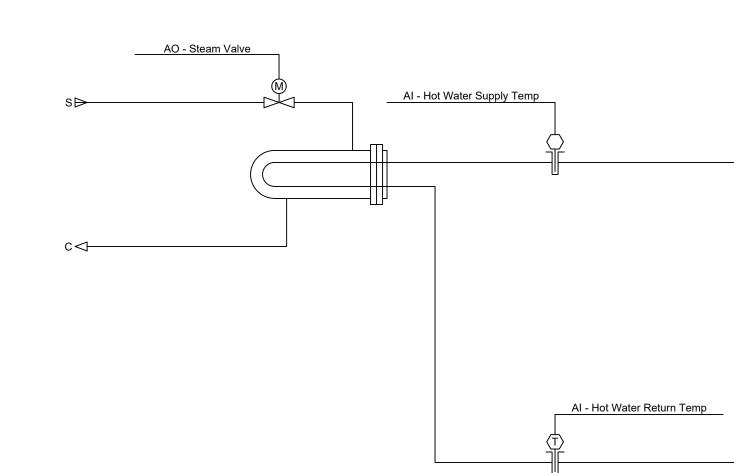
- CONTROLS CONTRACTOR SHALL ADD A LINK ON THE FRONT AND CONTROLS DIAGRAM FOR THE EQUIPMENT INSTALLED CAPABILITY TO SELECT THE EQUIPMENT AND REVIEW THE S
- 2. ALL NEW CONTROLS TO COMMUNICATE WITH EXISTING EMS EQUIPMENT TO DETERMINE CAPACITIES AND NETWORK LAY DIAGRAM AS REQUIRED BY SPECIFICATIONS.
- 3. PROVIDE CONTROL CABINET WHERE REQUIRED (SUITABLE I POWER SUPPLIES, CONDUIT, SENSOR WIRING, COMMUNIC/ SOFTWARE. UNLESS NOTED OTHERWISE, THE BUILDING CO EMERGENCY POWER.
- 4. ALL SETPOINTS INDICATED SHALL BE ADJUSTABLE AT THE COMPUTER CONNECTED TO ANY EMS CONTROL PANEL OR MATCH NAMING CONVENTION OF EXISTING EMS. POINT NAM REFERENCE ONLY.
- 5. COORDINATE ALL SENSOR INSTALLATIONS WITH THE MECH LOCATIONS ON PIPING COORDINATION DRAWING SUBMITTA MANUFACTURER'S RECOMMENDED UPSTREAM AND DOWNS (ESPECIALLY FLOW ELEMENTS AND TRANSMITTERS).
- WHENEVER A UNIT IS SHUTDOWN BECAUSE OF ONE OF ITS READING AND SET POINT OF EACH DEVICE TO HELP THE OP SHUTDOWN.
- 7. IF ANY LOCAL, TERMINAL, OR UNITARY CONTROLLER OR EQ LOSES COMMUNICATION WITH THE BAS NETWORK, AN ALAF THE LOCATION OF THE FAULT.
- 8. UNLESS NOTED OTHERWISE, ALL CONTROL VALVES SHALL FLOATING-POINT CONTROLS SHALL BE ALLOWED. VALVES S
- VFD'S SHALL BE CONNECTED TO THE EMS NETWORK THRO THROUGH THE HARDWIRED POINTS INDICATED. IT IS THE I COORDINATE AND ADAPT THE EMS NETWORK TO THE COM VFD MANUFACTURER. THE FOLLOWING POINTS SHALL BE I FREQUENCY OUTPUT, CURRENT, TORQUE, POWER, DC BUS DRIVE TEMPERATURE, ALARMS, STATUSES
- 10. DUCT SMOKE DETECTORS PROVIDED AND INSTALLED BY T WIRE AND CONDUIT TO THE MOTOR CONTROLLER AND THE TO THE DETECTOR, WIRE, AND CONDUIT BY THE ELECTRICA PLANS AND FIRE ALARM CONTRACTOR FOR REQUIRED POV
- 11. VFD'S SHALL BE CONNECTED TO THE EMS NETWORK THRO AS THROUGH THE HARDWIRED POINTS INDICATED. IT IS TH COORDINATE AND ADAPT THE EMS NETWORK TO THE COM VFD MANUFACTURER.
- 12. CONTROLS SHALL BE SCHNEIDER ELECTRIC BUILDING AUTO HARRISON ENGINEERING DEPARTMENT.

jineering,	Drawing Title HVAC CONTROL DIAGRAMS	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212	Project Num 436-17-102 Building Num 154			
Design	_	Location FT. HARRISON HELENA, MT				
35282, (480) 454-2861	- VAPAHCS PLANNING AND ENGINEERING	DateCheckedDrawn07/14/16OGCR	M80 2			

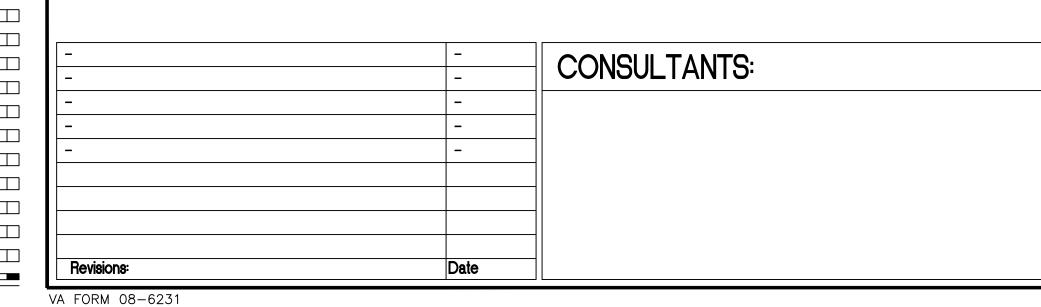
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SEQU	ENCE O	F CONTR	OLS (CONT.)	
	OIL VALVE: ROLLER SHALL M	IEASURE THE SUP	PLY AIR TEMPERATURE A	ND MODULATE THE COOLING COIL VALVE TO
HE COOLI		ABLED WHENEVE		
• ANC • ANC	THE ECONOMIZ	ER IS DISABLED C IN STATUS IS ON.	TER THAN 60°F (ADJ.). DR FULLY OPEN.	
HE COOLI	NG COIL VALVE S	SHALL OPEN TO 50	0% (ADJ.) WHENEVER THE	FREEZESTAT IS ON.
• HIGI			Y AIR TEMPERATURE IS 5°.	°F (ADJ.) GREATER THAN SETPOINT. A
THE CONTR	ROLLER SHALL A	LARM IF THE SUPF	PLY AIR TEMPERATURE IS	
SEQUENCE	TO MAINTAIN A	SETPOINT 2°F (AD	J.) LESS THAN THE SUPPL	D MODULATE THE ECONOMIZER DAMPERS IN Y AIR TEMPERATURE SETPOINT. THE OUTSIDE 20% (ADJ.) OPEN WHENEVER OCCUPIED.
OUTANE	SIDE AIR TEMPE	E ENABLED WHEN RATURE IS LESS T IR TEMPERATURE IN STATUS IS ON.		RN AIR TEMPERATURE.
• MIXI • OR	ED AIR TEMPERA THE FREEZESTA		DM 40°F TO 35°F (ADJ.).	
S OFF. IF C	OPTIMAL START L	JP IS AVAILABLE TI		FURN AIR DAMPER SHALL OPEN WHEN THE UN T IALL OPERATE AS DESCRIBED IN THE OCCUPIED FULLY CLOSED.
HE OUTSI	DE AIR DAMPERS OSED DURING UI	TILATION - FIXED F S SHALL MAINTAIN NOCCUPIED HOUR	A MINIMUM ADJUSTABLE	POSITION DURING BUILDING OCCUPIED HOURS B
HE CONTR				ODULATE THE HUMIDIFIER TO MAINTAIN A NEVER THE SUPPLY FAN STATUS IS ON.
• SUP	PLY AIR HUMIDIT	RN OFF WHENEVEI TY RISES FROM 90' PLY FAN STATUS.	% RH TO 95% RH (ADJ.).	
HIGILOW	H SUPPLY AIR HU / SUPPLY AIR HU	MIDITY: IF THE SU	IPPLY AIR HUMIDITY IS LES	EATER THAN 90% RH (ADJ.). SS THAN 30% RH (ADJ.).
THE CONTR	ROLLER SHALL M HALL BE PROVIDE	ED AS FOLLOWS:	ERENTIAL PRESSURE ACF	
(AD.	J.).	L PRESSURE MON		SSURE EXCEEDS A USER DEFINABLE LIMIT
ALARMS SH • FINA	HALL BE PROVIDE	ED AS FOLLOWS:	ERENTIAL PRESSURE ACF	ROSS THE FINAL FILTER.
HE CONTR	´ TEMPERATURE: ROLLER SHALL M		ED AIR TEMPERATURE AND	O USE AS REQUIRED FOR ECONOMIZER
ALARMS SH • HIGI	H MIXED AIR TEM	ED AS FOLLOWS: IP: IF THE MIXED A	AIR TEMPERATURE IS GREA	
RETURN AI THE CONTR	R HUMIDITY:			SE AS REQUIRED FOR ECONOMIZER CONTROL
LARMS SH • HIGI	HALL BE PROVIDE H RETURN AIR HU		ETURN AIR HUMIDITY IS GF ETURN AIR HUMIDITY IS LE	
RETURN AI THE CONTR	R TEMPERATURE ROLLER SHALL M	E: IONITOR THE RETU		ND USE AS REQUIRED FOR SETPOINT CONTROL
ALARMS SH • HIGI	H RETURN AIR TE	ED AS FOLLOWS: EMP: IF THE RETUF	RN AIR TEMPERATURE IS (RN AIR TEMPERATURE IS L	GREATER THAN 90°F (ADJ.).
	R TEMPERATURE	E	PLY AIR TEMPERATURE.	D
 HIGI 	H SUPPLY AIR TE		.Y AIR TEMPERATURE IS G Y AIR TEMPERATURE IS LE	REATER THAN 120°F (ADJ.).
			TAIR TEMPERATURE IS LE	-55 THAN 45 F (ADJ.).
ND CONTR	OLS DIAGRAM FO	OR THE EQUIPMEN	NT INSTALLED IN THIS PRO	HOWS THE SEQUENCE OF OPERATION JECT. THE CLIENT SHALL HAVE THE GRAM FOR THE EQUIPMENT.
L NEW CC	ONTROLS TO COM	MUNICATE WITH I	EXISTING EMS. FIELD INVI	ESTIGATE EXISTING CONTROLS TO BID. SUBMIT DETAILED NETWORK
ROVIDE CO DWER SUP	ONTROL CABINET PLIES, CONDUIT, UNLESS NOTED	WHERE REQUIRE , SENSOR WIRING,	, COMMUNICATION WIRING	ED LOCATION) COMPLETE WITH G AND RELATED HARDWARE AND TEM SHALL BE CONNECTED TO
L SETPOII	NTS INDICATED S	ANY EMS CONTRO	OL PANEL OR CONTROLLE	JTER WORKSTATION AND VIA A LAPTOP R. ACTUAL POINT NAMES SHALL ON THE CONTROL DIAGRAMS ARE FOR
EFERENCE DORDINAT DCATIONS	: ONLY. E ALL SENSOR IN ON PIPING COOF	ISTALLATIONS WIT	TH THE MECHANICAL CON NG SUBMITTAL. COORDIN/	TRACTOR AND SUBMIT PROPOSED ATE TO INSURE THAT THE SENSOR
SPECIALL [\] HENEVER	Y FLOW ELEMEN ⁻ A UNIT IS SHUTD	TS AND TRANSMIT	TERS). F ONE OF ITS SAFETIES, T	E DIAMETERS ARE PROVIDED HE BAS SHALL RETAIN IN MEMORY THE ISOLATE THE CAUSE OF THE
IUTDOWN	\L, TERMINAL, OR		OLLER OR EQUIPMENT MA	NUFACTURER'S CONTROL SYSTEM
IE LOCATI	ON OF THE FAUL	T. , ALL CONTROL VA	ALVES SHALL HAVE PROPO	
D'S SHALI	BE CONNECTED	D TO THE EMS NET	TWORK THROUGH A DIREC	ZE A 0-10 VDC CONTROL SIGNAL. CT NETWORK CONNECTION AS WELL AS ITY OF THE EMS CONTRACTOR TO
DORDINAT	E AND ADAPT TH ACTURER. THE F	E EMS NETWORK OLLOWING POINT ENT, TORQUE, PO	TO THE COMMUNICATION IS SHALL BE INTEGRATED	S PROTOCOLS AVAILABLE FROM THE INTO THE EMS: SPEED FEEDBACK, DUTPUT VOLTAGE, KWH COUNTER,
IRE AND C D THE DET	ONDUIT TO THE I ECTOR, WIRE, AN	MOTOR CONTROL	LER AND THE FACP BY TH	RM CONTRACTOR (BELOW IN SPACE). E FIRE ALARM CONTRACTOR. POWER TOR. COORDINATE WITH ELECTRICAL
D'S SHALI THROUG DORDINAT	L BE CONNECTED H THE HARDWIRI	D TO THE EMS NET ED POINTS INDICA	TWORK THROUGH A RS486 ATED. IT IS THE RESPONSI	OR BACNET IP CONNECTION AS WELL BILITY OF THE EMS CONTRACTOR TO S PROTOCOLS AVAILABLE FROM THE
ONTROLS			SUILDING AUTOMATION SEI	RVER OR APPROVED EQUAL BY VA FT. 'BID SET'
E PEI	NTHOUSE	E	Project Number 436-17-102	Office of
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				Veterans Affairs



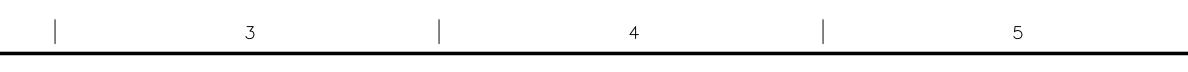
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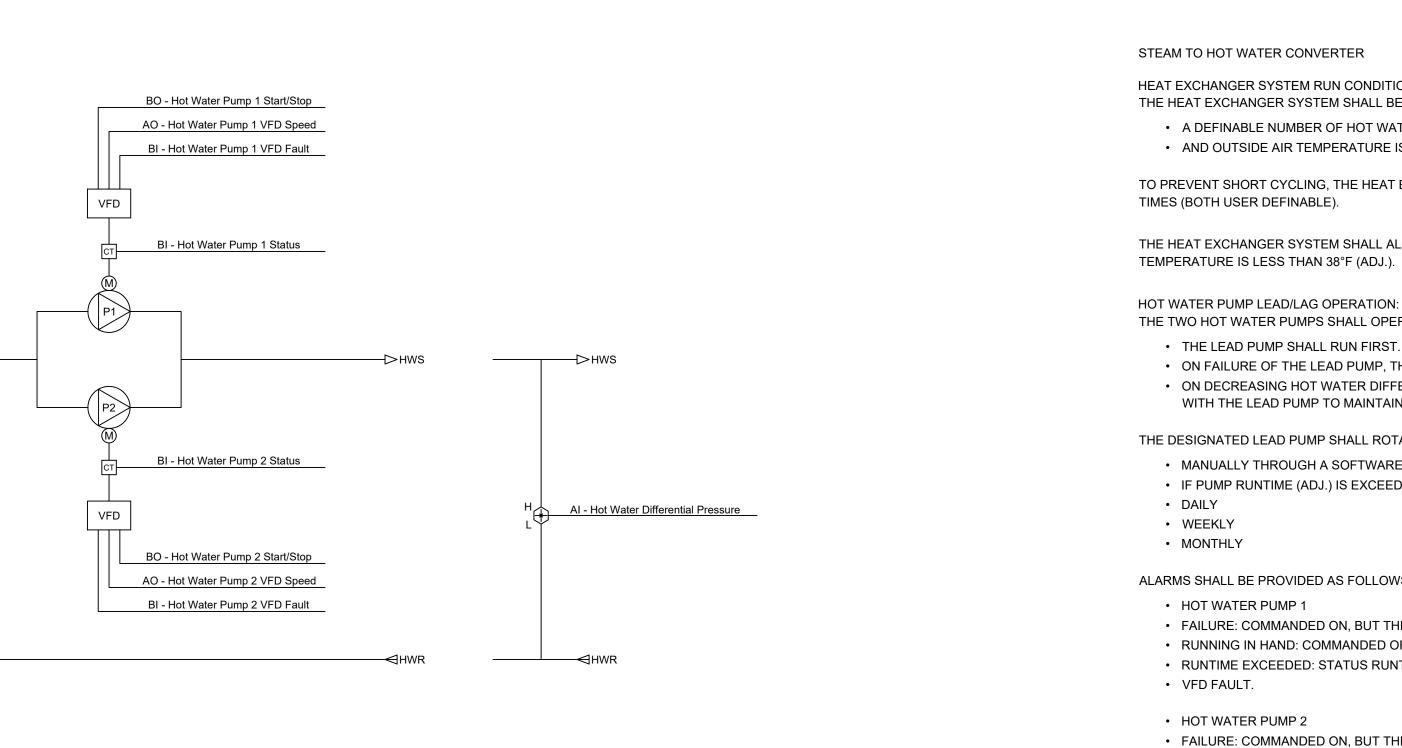


1 STEAM TO HOT WATER CONTROL DIAGRAM



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VFD FAULT. VFDS IN SEQUENCE TO MAINTAIN ITS HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

AS FOLLOWS:

ON RISING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS: • IF THE VFDS SPEEDS DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF. • THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS: • HIGH HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT. • LOW HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

MAINTAIN ITS SETPOINT.

THE STEAM VALVE SHALL OPEN TO 100% (ADJ.) WHENEVER THE HEAT EXCHANGER IS IN FREEZE PROTECTION DUE TO LOW OUTSIDE AIR TEMPERATURE.

200°F (ADJ.).

ARCHITECT/ENGINEERS:



designgroup and Sustainable Arizona &



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STEAM TO HOT WATER CONVERTER

HEAT EXCHANGER SYSTEM RUN CONDITIONS: THE HEAT EXCHANGER SYSTEM SHALL BE ENABLED TO RUN WHENEVER:

 A DEFINABLE NUMBER OF HOT WATER COILS NEED HEATING. • AND OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).

TO PREVENT SHORT CYCLING, THE HEAT EXCHANGER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE).

THE HEAT EXCHANGER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER OUTSIDE AIR

HOT WATER PUMP LEAD/LAG OPERATION:

THE TWO HOT WATER PUMPS SHALL OPERATE IN A LEAD/LAG FASHION. THE LEAD PUMP SHALL RUN FIRST.

• ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF. ON DECREASING HOT WATER DIFFERENTIAL PRESSURE, THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD PUMP TO MAINTAIN HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE): MANUALLY THROUGH A SOFTWARE SWITCH IF PUMP RUNTIME (ADJ.) IS EXCEEDED

ALARMS SHALL BE PROVIDED AS FOLLOWS: HOT WATER PUMP 1 • FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

• RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. • RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

 HOT WATER PUMP 2 • FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. • RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

HOT WATER DIFFERENTIAL PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE HOT WATER DIFFERENTIAL PRESSURE AND MODULATE THE HOT WATER PUMP

THE CONTROLLER SHALL MODULATE HOT WATER PUMP SPEEDS TO MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 20% (ADJ.).

ON DROPPING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT

• THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT. • IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON. • THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

HOT WATER SUPPLY TEMPERATURE SETPOINT: THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE A FIXED SETPOINT OF 180°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS: • HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.). LOW HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

HEAT EXCHANGER STEAM VALVE - HOT WATER CONTROL: THE CONTROLLER SHALL MEASURE THE HOT WATER SUPPLY TEMPERATURE AND MODULATE THE STEAM VALVE TO

THE STEAM VALVE SHALL BE ENABLED WHENEVER: • THE HEAT EXCHANGER IS CALLED TO RUN.

AND HOT WATER SUPPLY TEMPERATURE IS BELOW SETPOINT.

THE STEAM VALVE SHALL CLOSE WHENEVER THE HOT WATER SUPPLY TEMPERATURE RISES FROM 180°F TO

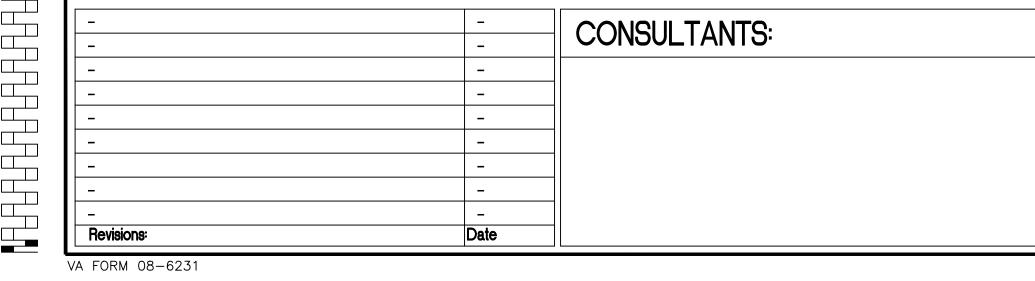
ngineering, e Design ma 85282, (480) 454-2861	Drawing Title HVAC CONTROL DIAGRAMS	HVAC SYS	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212				
	- - VAPAHCS PLANNING AND ENGINEERING	Location FT. HARRISON Date 07/14/16	FT. HARRISON HELENA, M Date Checked Drawn			M	
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hber	Office of
nber	Construction and Facilities
mber	Management
3	Department of Veterans Affairs

PH	SINGLE-PHASE	CAB	CABINET	DMR SW	DIMMER SWITCH	GFCI	GROUND FAULT CIRCUIT INTERRUPTER	MG	MOTOR GENERATOR	REC	RECESSED
		CALC	CALCULATE	DN	DOWN	GTB	GROUND TERMINAL BOX	MH	MANHOLE	RECPT	RECEPTACLE
	TWO-CONDUCTOR	CAP	CAPACITY	DPDT	DOUBLE POLE, DOUBLE THROW			MIN	MINIMUM	RGS	RIGID GALVANIZED STEEL
	THREE-CONDUCTOR	CAT	CATALOG	DPST	DOUBLE POLE, SINGLE THROW	HID	HIGH INTENSITY DISCHARGE	MOCP	MAXIMUM OVERCURRENT PROTECTION	RM	ROOM
		CATV	COMMUNITY ANTENNA TELEVISION	DRSW	DOOR SWITCH	HOA	HAND-OFF-AUTOMATIC	MIO	MAIN LUGS ONLY	RMS	ROOT MEAN SQUARE
	FOUR-CONDUCTOR	CCR	CONTROL CONTACTOR	DS	DISCONNECT SWITCH		HORSEPOWER	MT	MOUNT	REQD	REQUIRED
	FOUR-WIRE	CCTV	CLOSED CIRCUIT TELEVISION	DWG	DRAWING		HEIGHT		MOUNTED		
	TOOK WIKE	cd	CANDELA				HERTZ	MTG	MOUNTING	SCC	SHORT CIRCUIT CAPACITY
UNIT	AIR CONDITIONING UNIT	CD	CONSTRUCTION DOCUMENTS		EMPTY CONDUIT				MANUAL TRANSFER SWITCH	SES	SERVICE ENTRANCE SECTION
UNIT		CF	CONTRACTOR FURNISHED	EC	EQUIPMENT GROUND	IESNA	ILLUMINATION ENGINEERING SOCIETY OF		MANUAL TRANSFER SWITCH MEDIUM VOLTAGE	SES	SMOKE DETECTOR
	ARCHITECT/ENGINEER	CF CF/CI				IESINA					
			CONTRACTOR FURNISHED/CONTRACTOR				NORTH AMERICA	MVA	MEGAVOLT-AMPERE		SQUARE FOOT (FEET)
	ALTERNATING CURRENT OR ARMORED		INSTALLED	ELEC	ELECTRIC OR ELECTRICAL		INTERMEDIATE METAL CONDUIT	MW	MEGAWATT MICROWAVE	SHT	SHEET
		CF/OI	CONTRACTOR FURNISHED/OWNER	ELEV	ELEVATOR	INCAND	INCANDESCENT			SI	INTERNATIONAL SYSTEM OF UNITS
C	ACCESSIBLE		INSTALLED	EMCP	EMERGENCY MONITORING CONTROL	IR	INFRARED	NA	NOT APPLICABLE	SPEC	SPECIFICATION
)L	ADDITIONAL	CFE	CONTRACTOR FURNISHED EQUIPMENT		PANEL	IWH	INSTANTANEOUS WATER HEATER	NEC	NATIONAL ELECTRICAL CODE	SPST	SINGLE POLE, SINGLE THROW
	,	CHW	CHILLED WATER	EMER	EMERGENCY			NEMA	NATIONAL ELECTRICAL MANUFACTURERS	SURF	SURFACE
		CHWP	CHILLED WATER PUMP	EMI	ELECTROMAGNETIC INTERFERENCE	J-BOX	JUNCTION BOX		ASSOCIATION	SW	SWITCH
		CKT	CIRCUIT	EMT	ELECTRICAL METALLIC TUBING			NEUT OR N		SWBD	SWITCHBOARD
	ABOVE FINISHED COUNTER, AUTOMATIC		CIRCUIT BREAKER	ENCL	ENCLOSURE	kV	KILOVOLT	NFPA	NATIONAL FIRE PROTECTION ASSOCIATIO	NSWGR	SWITCHGEAR
	FREQUENCY CONTROL, OR AVAILABLE	CLF	CURRENT LIMITING FUSE	EPO	EMERGENCY POWER OFF	kVA	KILOVOLT AMPERE	NIC	NOT IN CONTRACT		
	FAULT CURRENT	CLG	CEILING	EPRF	EXPLOSION PROOF	kVAH	KILOVOLT AMPERE PER HOUR	NL	NIGHT LIGHT	TC	TIME CLOCK
	ABOVE FINISHED FLOOR	CMU	CONCRETE MASONRY UNIT	ESMT	EASEMENT	kVAR	KILOVOLT AMPERE REACTIVE	NO	NORMALLY OPEN	TEL	TELEPHONE
		COAX	COAX CABLE	EWC	ELECTRIC WATER COOLER	kW	KILOWATT	NS	NO SCALE	TP	TWISTED PAIR
		COMM	COMMUNICATION	I EWH	ELECTRIC WATER HEATER	kWH	KILOWATT HOUR	NTS	NOT TO SCALE	TPS	TWISTED PAIR SHIELDED
		COMPT	COMPARTMENT	EXIST	EXISTING	kWHM	KILOWATT HOUR METER				TELEPHONE TERMINAL BOARD
		CONC	CONCRETE	FA	FIRE ALARM				ON CENTER		TELEVISION
	ALTERNATE	CONC	CONTINUE	FAAP	FIRE ALARM ANNUNCIATOR PANEL		LIGHT EMITTING DIODE		OUTSIDE DIAMETER		TYPICAL
R A	AMBIENT	CONTR	CONTRACTOR	FABL	FIRE ALARM BELL		LINEAR FEET (FOOT)		OVERLOAD		
A	AMPERE	COORD		FABL						UFD	UNDERFLOOR DUCT
			COORDINATE		FIRE ALARM BOX				POLE	UGND	
	ARCHITECT	CPT	CONTROL POWER TRANSFORMER	FACP	FIRE ALARM CONTROL PANEL		LIGHT POLE				
	AMPS SHORT CIRCUIT	CRI	COLOR RENDERING INDEX		FOOTCANDLE		LOW PRESSURE SODIUM		PUBLIC ADDRESS		
	AMPERE TRIP	CI	CURRENT TRANSFORMER		FILM ILLUMINATOR		LOCKED ROTOR AMPS	PR	PANELBOARD, PULL BOX, OR	UON	UNLESS OTHERWISE NOTED
	AUTOMATIC TRANSFER SWITCH	CTV	CABLE TELEVISION	FIXT	FIXTURE	LTCP	LOCAL TEMPERATURE CONTROL PANEL		PUSHBUTTON	UPS	UNINTERRUPTIBLE POWER SUPPLY
	AUTOMATIC	CU	COPPER	FLA	FULL LOAD AMPS	LT	LIGHT	PBPU	PREFABRICATED BEDSIDE PATIENT UNIT	UTIL	UTILITY
	AUDIO VISUAL	CU FT	CUBIC FEET	FLEX	FLEXIBLE METALLIC CONDUIT	LTG	LIGHTING	PCB	POLYCHLORINATED BIPHENYL		
		CUR	CURRENT	FLT	FLOODLIGHT	LTG PNL	LIGHTING PANEL	PEC	PHOTOELECTRIC CELL	V	VOLT
	BATTERY			FLUOR	FLUORESCENT	LTNG	LIGHTNING	PED	PEDESTAL	VA	VOLT AMPERE
	BARE COPPER	DB	DECIBEL OR DIRECT BURIAL	FLUOR FIX	FLUORESCENT FIXTURE	LV	LOW VOLTAGE	PEND	PENDANT	VAR	VOLT AMPERE REACTIVE
	BOARD	DC	DIRECT CURRENT	FOUTT	TELEPHONE FLOOR OUTLET			PF	POWER FACTOR	VFD	VARIABLE FREQUENCY DRIVE
	BELOW FINISH FLOOR	DCP	DIMMER CONTROL PANEL	FP	FIRE PROTECTION	MATV	MASTER ANTENNA TELEVISION SYSTEM	PH	PHASE	VSD	VARIABLE SPEED DRIVE
		DEG C	DEGREES CELSIUS	FT	FEET OR FOOT	MAX	MAXIMUM	PNL	PANEL	VOLT	VOLTAGE
		DEG F	DEGREES FAHRENHEIT	FU SW	FUSED SWITCH	MC	METAL-CLAD	POD	POWER OPERATED DAMPER		
	BOILER PLANT INSTRUMENTATION PANEL		DEMOLITION	FVNR	FULL VOLTAGE NON-REVERSING	MCA	MINIMUM CIRCUIT AMPS	PT	POTENTIAL TRANSFORMER	W	watt
	BREAKER	DIAG	DIAGRAM	FVR	FULL VOLTAGE REVERSING	MCB	MAIN CIRCUIT BREAKER	PTRV	POWER TYPE ROOF VENTILATION	I W H	WATER HEATER
	BY PASS	DIAG	DISCONNECT		I OLL VOLIAGE NEVENSING		MAIN CIRCOIT BREAKER MOTOR CONTROL CENTER	PVC	POLYVINYL CHLORIDE (PLASTIC)		WEATHERPROOF
	UI FAJJ	DISC DISTR				MDP				** 「	
	CONDUIT			G OR GND			MAIN DISTRIBUTION PANEL	PWR	POWER		
	CONDUIT	DISTR PNL	DISTRIBUTION PANEL	GEN	GENERATOR	MECH	MECHANICAL	RCP	REFLECTED CEILING PLAN	XFER	TRANSFER
			1	1	1		1	1	1	XFMR	TRANSFORMER

ELECTRICAL	SYMBOLS	- DIAGRAM

ELEC	TRICAL SYMBOLS - DIAG	RAM		ELECT	RICAL SYMBOLS - POWER PI	_AN	
\Box	DELTA CONNECTION		FUSE WITH RATING		MOTOR, SINGLE-PHASE	€	DROP CORD, SINGLE CONVENIENCE OUT
\neg	MOTOR, SINGLE-PHASE		MOLDED CASE CIRCUIT BREAKER	Ø	MOTOR, THREE-PHASE		GROUNDING TYPE, 20A, W/#12 CONDUC CORD (CENTER LINE OF OUTLET: 6'-6"
Ø	MOTOR, THREE-PHASE	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	LOW-VOLTAGE DRAWOUT AIR CIRCUIT BREAKER	T	TRANSFORMER, PLAN		MINIMUM).
	TRANSFORMER		MEDIUM-VOLTAGE OIL CIRCUIT BREAKER	Υ.	WYE CONNECTION	R 50	RELAY; LETTER INDICATES RELAY TYPE 50 = INSTANTANEOUS OVERCURRENT O
Y.	WYE CONNECTION		MEDIUM-VOLTAGE DRAWOUT AIR CIRCUIT BREAKER	L I	EARTH GROUND		51 = AC - TIME OVERCURRENT 67 = AC - DIRECTIONAL OVERCURRENT
Ţ	EARTH GROUND		SWITCH AND FUSE UNIT	=	UNCTION DOV		86 = LOCK OUT
- 0	JUNCTION BOX	$\sim \sim \sim$	FUSED DRAWOUT POTENTIAL TRANSFORMER		JUNCTION BOX BRANCH CIRCUIT HOMERUN. LINES INDICATE NUMBER	Ľ	DISCONNECT SWITCH, FUSED
PB	PULL BOX	R 50	RELAY; LETTER INDICATES RELAY TYPE 50 = INSTANTANEOUS OVERCURRENT OR RATE-OF-RISE	Į – €	OF CIRCUITS, NEUTRAL, AND SWITCH LEG CONDUCTORS. ONE SEPARATE GREEN GROUNDING CONDUCTOR SHALL		DISCONNECT SWITCH, UNFUSED
۰_ م	PRESSURE SWITCH-CLOSE ON INCREASE		51 = AC - TIME OVERCURRENT 67 = AC - DIRECTIONAL OVERCURRENT		BE PROVIDED FOR EACH HOMERUN; NOT SHOWN		STARTER, COMBINATION WITH DISCONNED
			86 = LOCK OUT	PB	PULL BOX		STARTER OR MOTOR CONTROLLER
	DDECCUDE OWITCH ODEN ON INCDEACE	Ľ	DISCONNECT SWITCH, FUSED	WW	WIREWAY		VARIABLE FREQUENCY DRIVE
To	PRESSURE SWITCH-OPEN ON INCREASE		DISCONNECT SWITCH, UNFUSED			VFD TC	TIME CLOCK
\square		\frown	FUSIBLE LINK	BB	BUSWAY		– POTHEAD
✓ 0-	SWITCH, MULTIPOSITION		STARTER, COMBINATION WITH DISCONNECT SWITCH		PUSH BUTTON		- STRESS CONE
0-			STARTER OR MOTOR CONTROLLER	DP#	DISTRIBUTION PANEL		
	SWITCH, NORMALLY CLOSED FLOAT		VARIABLE FREQUENCY DRIVE		LIGHTING PANEL	R	RECTIFIER, CATHODIC PROTECTION SANIT
-07-0-	SWITCH, NORMALLY CLOSED FOOT OPERATED	G	GENERATOR, POWER		PANELBOARD CABINET, FLUSH MOUNTED	4	VENTILATOR OR FAN COIL UNIT OUTLET
-20-	SWITCH, NORMALLY CLOSED LIMIT	<u>+</u>	BATTERY		PANELBOARD CABINET, SURFACE MOUNTED	\otimes -	CONDUIT TERMINATED 6" [152mm] AFF
-0-10-	SWITCH, NORMALLY CLOSED TEMPERATURE ACTIVATE	_{ED} —)	CAPACITOR	-	RECEPTACLE, DUPLEX	Q	EXTENSION TO EQUIPMENT AS DIRECTED
5			POTHEAD	-	RECEPTACLE, DUPLEX ON EMERGENCY POWER	\bigcirc	CONDUIT TERMINATED W/COUPLING (FLU
-0-10-	SWITCH, NORMALLY CLOSED TIME DELAY	\longrightarrow	STRESS CONE	-	RECEPTACLE, DUPLEX WITH GROUND FAULT CIRCUIT	¢	FOR EXTENSION TO EQUIPMENT AS DIRE
~_^	SWITCH, NORMALLY OPEN FLOAT		LIGHTNING ARRESTOR	Щ Ц		D 2	SWITCH F = FUSED SWITCH K
Ó				₩	RECEPTACLE, QUADRAPLEX		L = LOCK LM M = MANUAL MOTOR STARTING M
-0~0-	SWITCH, NORMALLY OPEN LIMIT	R	RECTIFIER, CATHODIC PROTECTION		RECEPTACLE, SPECIAL PURPOSE A = 120V, 20A, 1 PHASE, 2-POLE, 3W, NEMA 5-20R.		MP= MOTOR SNAP WITH PILOT P LIGHT (THERMAL TYPE)
	SWITCH, NORMALLY OPEN TEMPERATURE ACTIVATED	A	AMMETER		B = 208V, 20A, 1 PHASE, 2-POLE, 3W, NEMA 6-20R. C = 120V, 30A, 1 PHASE, 2-POLE, 3W, NEMA 5-30R.		PB= PUSH BUTTON STATION ROWER WEATHER PROOF X
ے ` ۲		\bigtriangledown	VOLTMETER		D = 208V, 30A, 1 PHASE, 2-POLE, 3W, NEMA 6-30R. E = 208V, 60A, 1 PHASE, 3-POLE, 4W, NEMA 14-60R.		
-070-	SWITCH, NORMALLY OPEN TIME DELAY	W	WATTMETER		F = 208V, 30A, 3 PHASE, 3-POLE 4W, NEMA 15-30R.		
-0-0-	SWITCH, SINGLE BREAK	WH	WATT-HOUR METER		G = 208V, 50A, 3 PHASE, 3 POLE, 4W, NEMA 15-30R. H = 208V, 60A, 3 PHASE, 3 POLE, 4W, NEMA 15-60R.		
≭	NORMALLY CLOSED RELAY CONTACT						
+	NORMALLY OPEN RELAY CONTACT						



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ARCHITECT/ENGINEERS:



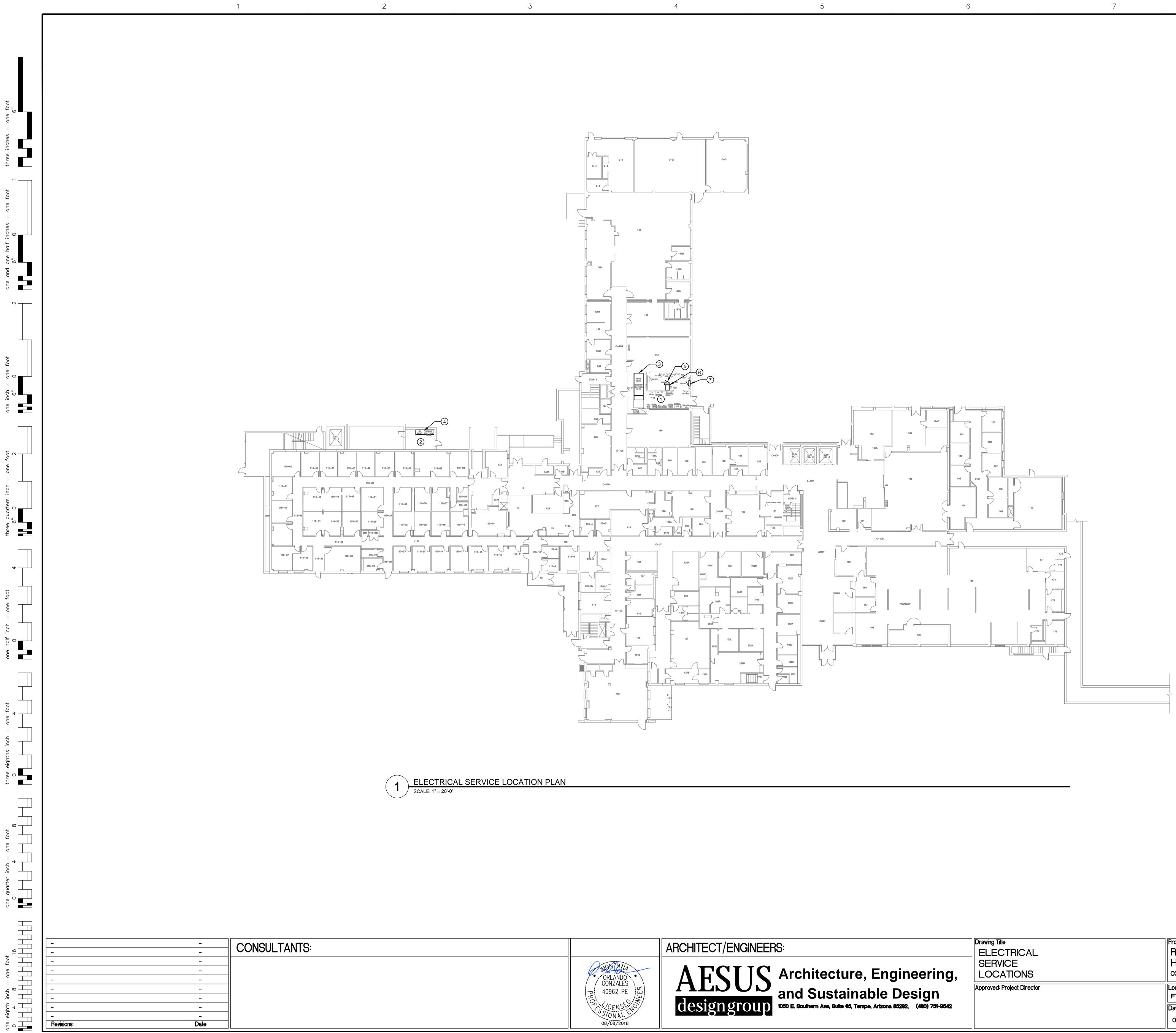
* ORLANDO GONZALES 40962 PE *CENSES S/ONAL* 08/08/2018

AESUS Architecture, Engineering Architecture

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ABBREVIATION Approved: Project Director		Location FT. HARRISON Date	Checked	HELENA, MT	Drawing Number
ELECTRICAL SYMBOLS ANI		Project Title REPLACE F HVAC SYST CONTRACT NO. VA25	EMS	E	Project Number 436-17-102 Building Number 154
	PB= PUSH BUTTON STATION T = TIMER OPERATED RECESSED DOWNLIGHT FIXTURE, LIGHT FIXTURE, RECESSED FLUOF LETTER INDICATES TYPE. LIGHT FIXTURE, RECE (1'x8'); LETTER INDIC LIGHT FIXTURE, SURI 305x2439mm (1'x8' LIGHT FIXTURE, FLUORESCENT EN LETTER INDICATES TYPE. HIGHT FIXTURE, WALL MOUNTE LIGHTING, EXTERIOR BUILDING EXIT SIGN, WALL MOUNTED WITH AS SHOWN	RC= REMOTE (WP= WEATHER Mo= OCCUPAN LETTER INDICATES TYPE RESCENT, 305×1220mm ESSED FLUORESCENT, 3 CATES TYPE. FACE MOUNTED FLUORE); LETTER INDICATES TY MERGENCY; ED DIRECTIONAL ARROWS TH DIRECTIONAL ARROWS	CONTROL PROOF CY SENSOR (1'x4'); 05x2439mm SCENT, 'PE.	BE FR PA EN DIF SU RE M. TH CO AL SU SY N. TH CO AL RE TH EN O. CO EX AN P. CO	EN REASSIGNED TO N OM SPARE BREAKERS NEL SUITABLE TO THE GINEER OF SUCH OCO RECTION. THE ENGINE GGESTIONS REGARDING FERENCED DEVICES. E CONTRACTOR IS REI ORDINATING WITH ALL L EQUIPMENT, DEVICES PORT AS REQUIRED STEM. E CONTRACTOR IS REI ORDINATING WITH ALL L CONNECTIONS AND QUIRED FOR A FULLY E SATISFACTION OF TH GINEER. ORDINATE WITH ARCHI ACT PLACEMENT OF L D DEVICES.
\$ #	BLANK = SINGLE POLE 3 = THREE-WAY D = DIMMER	2 = DOUBLE F 4 = FOUR-WA K = KEY OPEF	Y RATED	PE EN	RFORMED TO THE SAT GINEER. Y EXISTING DEVICES V
			<u>AN</u>	TR	L WORK IS TO BE PE ADESMEN WITH EXPER DRK TO BE PERFORME
ELECT	RICAL SYMBOLS -	LIGHTING	PLAN	AN WI	ILTI—GANG BACKBOXES ID TYPES OF EMERGEN RING DEVICES SHALL I VICES.
	Silence Silenc	SF SWITCH (# SUBSCRIPT AS INDICA BLANK = SINGLE POLE 3 = THREE-WAY D = DIMMER UNE LOW VOLTAGE UME LOW VOLTAGE MASTER PB PUSH BUTTON STATION T = TIMER OPERATED Image: Constraint of the state of the s	Switch (∦ SUBSCRIPT AS INDICATED BELOW): BANK = SNOLE POLE 2 = DOUBLE (3 = THREE-WAY 4 = FOUR-WA 4 = FOUR-WA 0 = DUMWER V= LOW VOLTAGE P = WITH PLC UME LOW VOLTAGE P = WITH PLC UME LOW VOLTAGE D= DUMWER K = KEY OFE PE PUSH BUTTON STATION WP = WEATHER WEATHER D= DUMWER K = KEY OFE UGHT FIXTURE, RECESSED FLUORESCENT, 305x1220mm LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x1250mm LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, RUDRESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, WALL MOUNTED Y UGHT FIXTURE, WALL MOUNTED Y UGHT FIXTURE, WALL MOUNTED WITH DIRECTIONAL ARROWS / AS SHOWN 10 EXT SIGN, WALL MOUNTED WITH DIRECTIONAL ARROWS AS SHOWN 10 EXT SIGN, WALL MOUNTED WITH DIRECTIONAL ARROWS AS SHOWN	BLANK = SINGLE POLE 2 = DOUBLE POLE 3 = THREE-WAY 4 = FOUR-WAY D = DIMMER K = KEY OPERATED UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE P = WITH PILOT LIGHT UV = LOW VOLTAGE MASTER RECESSED DOWNLIGHT FIXTURE, LETTER INDICATES TYPE. UGHT FIXTURE, RECESSED FLUORESCENT, 305x1220mm (1'x4'); LETTER INDICATES TYPE. UGHT FIXTURE, SURFACE MOUNTED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, SURFACE MOUNTED FLUORESCENT, 305x2439mm (1'x8'); LETTER INDICATES TYPE. UGHT FIXTURE, FLUORESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, FLUORESCENT EMERGENCY; LETTER INDICATES TYPE. UGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WI LIGHT FIXTURE, WALL MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN IGHT SIGN, CELLING MOUNTED WITH DIRECTIONAL ARROWS AND FACES AS SHOWN	ELECTRICAL SYMBOLS - LIGHTING PLAN ELECTRICAL SYMBOLS - LIGHTING PLAN S SWICH (# SUBSCRIPT AS INDICATED BELOW): BAAK = SINCL FOLE 3 - THEE-WY P = WHEN UN VOLTAGE 4 - FOUR-WY P = WHEN UN VOLTAGE YP = WHEN PLOT LIGHT WF = VECHER PROOF T = TIMER OFFRATE WF = VECHER PROOF T = TIMER OFFRATE UGV TOTAGE STOPE UGV T

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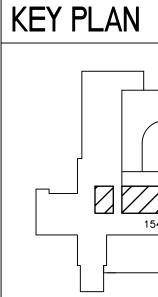
GENERAL

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- ACCORDANCE WI C. ALL WORK WILL B NATIONAL AND LC
- PROCEDURES. D. ALL DEMOLITION EXISTING DEVICE THEY REMAIN FU ELECTRICAL CON INTEGRITY TO ALL
- DEVICES TO THE S E. COORDINATE WIT CONTRACTOR FO MAY NEED TO BE I PROVIDED WITH N
- F. THE CONTRACTOR TRADES AND PRO AND SUPPORT AS
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- H. CONTRACTOR WI EQUIPMENT PER N I. ALL WIRING FOR I MINIMUM OF 10 A. FOR UNDERGROU
- COPPER GROUND J. VERIFY ALL EXISTI TO START OF WOR
- K. NO DESIGN CHAN APPROVAL OF TH INSPECTOR.
- L. PLANS WERE DES THIS INFORMATIC TENANT IMPROVE NOTES, ETC.
- M. HOWEVER, AS EX PROVE TO CONTA PRIOR INSTALLATI CONTRACTOR SH FIELD VERIFY EXIS
- N. THE CONTRACTO COMPLETE AND LOCATION, CIRCU EQUIPMENT (I.E.:) LUMINAIRES, SWIT DEVICES, CONDUI BY THIS PROJECT.

KEY NOTES

- 1. LOCATION OF ROO
- 2. LOCATION OF ROO ROOM 144-B, THE
- 3. LOCATION OF EXIS
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- 5. LOCATION OF EXIS 6. LOCATION OF AUT
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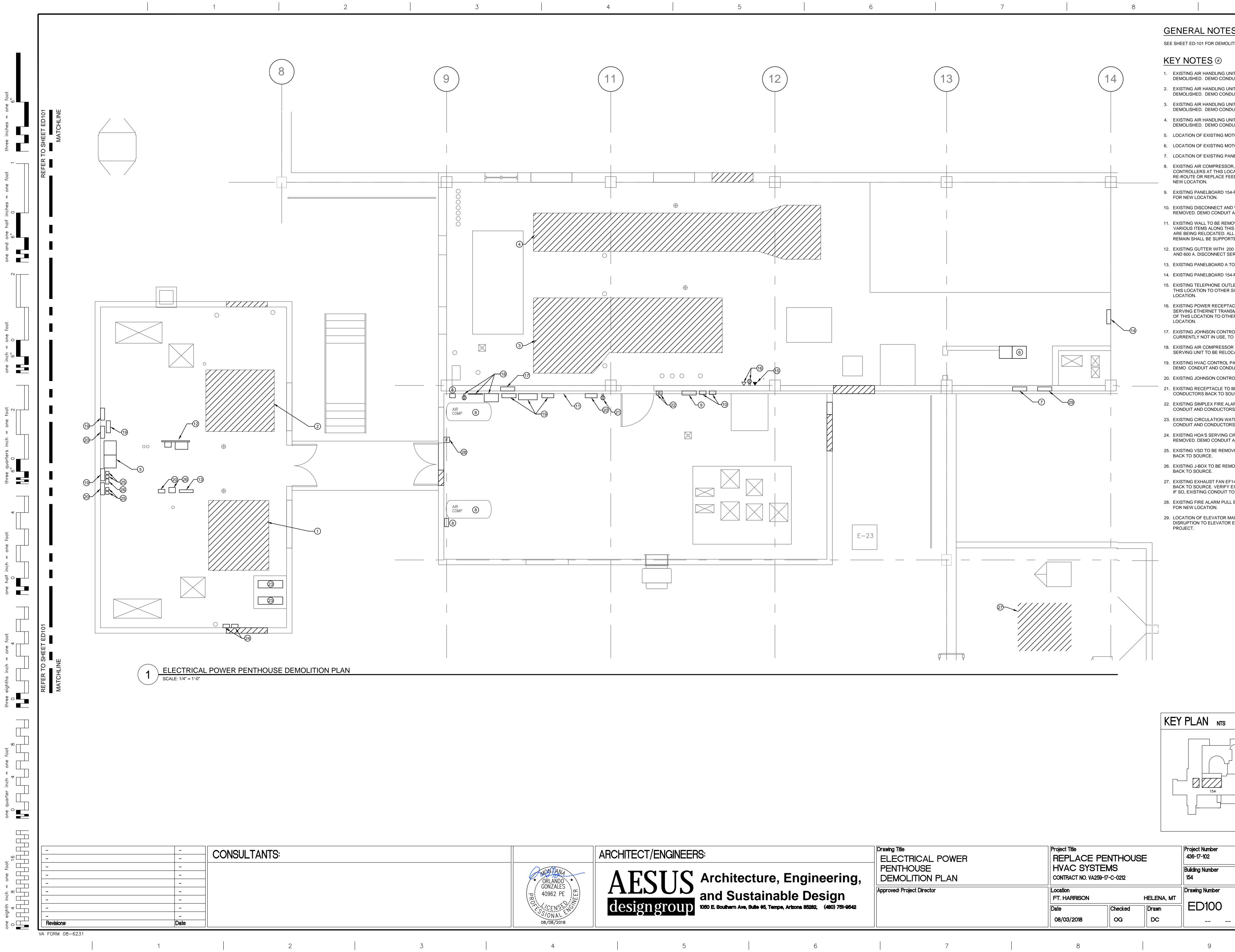


neering,	Drawing Title ELECTRIC SERVICE LOCATION		Project Title REPLACE F HVAC SYST CONTRACT NO. VA25	EMS	SE	Project Number 436-17-102 Building Number 154
esign 92, (480) 751-9542		Director	Location FT. HARRISON Date 08/03/2018	Checked OG	HELENA, MT Drawn DC	Drawing Number E002
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ENERAL	NOTES	
ALL EXTERIOR PROTECTED.	DEVICES SHALL BE WEATHERPROOF AND GFCI	
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COORDINATE N CONTRACTOR MAY NEED TO	WITH MECHANICAL AND PLUMBING DRAWINGS AND FOR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH BE DEMOLISHED, RELOCATED OR NEW WORK TO BE TH NEW CIRCUITS.	A
TRADES AND F	TOR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL EQUIPMENT, DEVICES, APPURTENANCES AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM.	
VENDORS AND REQUIRED FOR	TOR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL CONNECTIONS AND APPURTENANCES AS R A FULLY FUNCTIONING SYSTEM TO THE SATISFACTION R, TENANT AND ENGINEER.	
CONTRACTOR EQUIPMENT PE	WILL MAINTAIN CLEARANCES ABOUT ELECTRICAL ER NEC 110.26.	
MINIMUM OF 10 FOR UNDERGR	OR EXTERIOR LIGHTING AND POWER DEVICES SHALL BE A D A.W.G. COPPER WITH TYPE "THWN-2" INSULATION (UNO) COUND CIRCUITS RUN IN PVC. PROVIDE A 10 A.W.G. JND IN ADDITION TO CIRCUIT CONDUCTORS (UNO).	
TO START OF N	ANGE MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR	
INSPECTOR. PLANS WERE D THIS INFORMA	THE DESIGN ELECTRICAL ENGINEER AND THE ELECTRICAL DESIGNED USING INFORMATION AVAILABLE TO ENGINEER. TION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR	
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LOCATION, CIR EQUIPMENT (I.I LUMINAIRES, S	CUITING AND ROUTING OF ALL NEW AND RELOCATED E.: AIR HANDLERS, CHILLERS, FANS, RECEPTACLES, WITCHES, ETC) OVER-CURRENT DEVICES, STARTING DUIT, CONDUCTORS, AND ALL OTHER DEVICES IMPACTED	
EY NOTE	-5	С
	ROOM 144, BUILDING154 ELECTRICAL SERVICE ROOM.	
	ROOM 144-A, ELECTRICAL SERVICE ROOM, ADJACENT TO HE GENERATOR ROOM.	
	EXISTING MAIN SWITCHBOARD "154-MSBD". EXISTING SWITCHBOARD "SES-144B".	
	EXISTING GENERATOR PANELBOARD "154-GSBD".	
	AUTOMATIC TRANSFER SWITCH "ATS-TSEE". EXISTING PANELBOARD "154-DEE".	
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EY PLAN	NTS	
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Project Nu 436-17-10		
Building Nu 154	umber Construction and Facilities	

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Department of Veterans Affairs

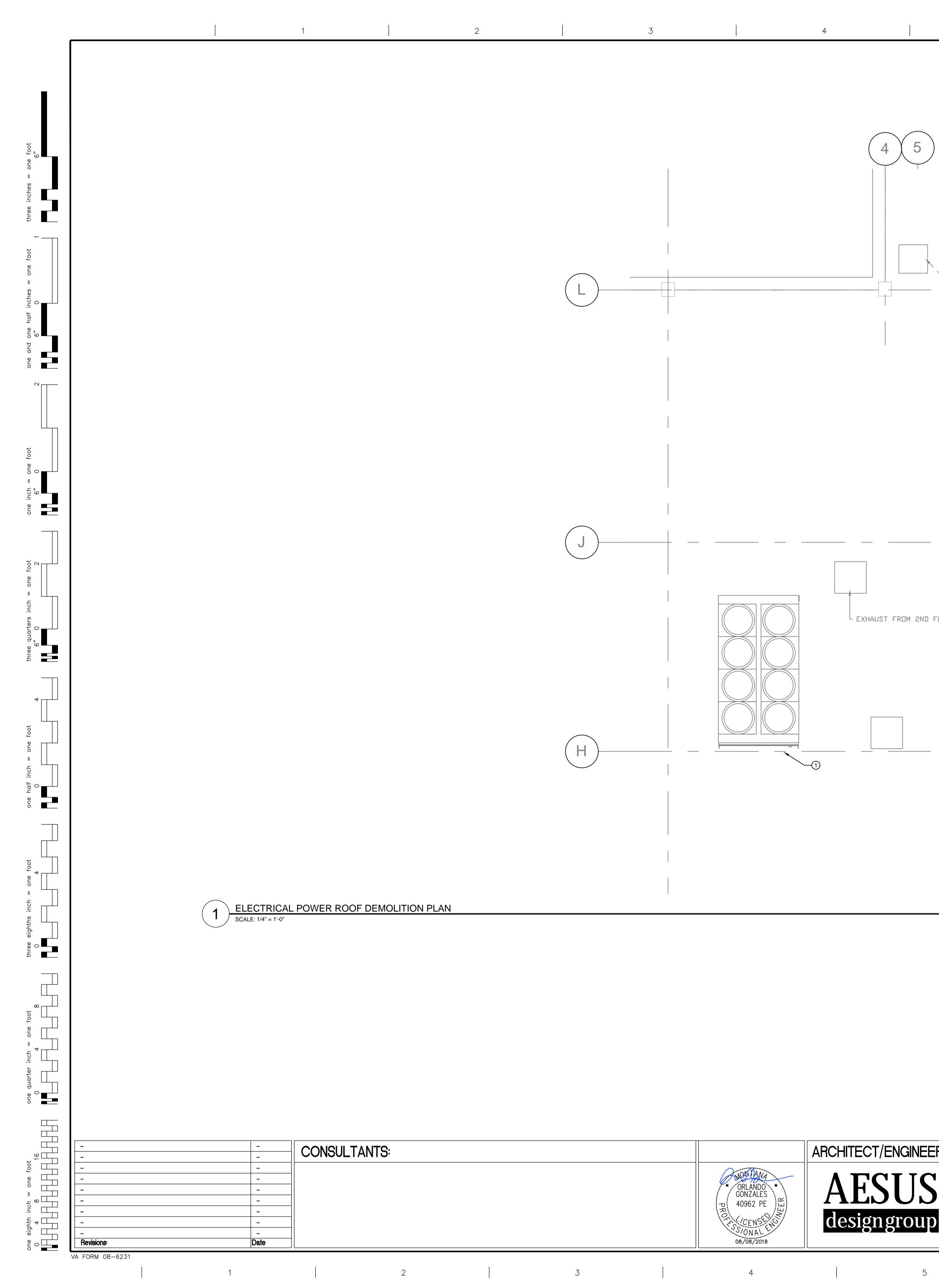


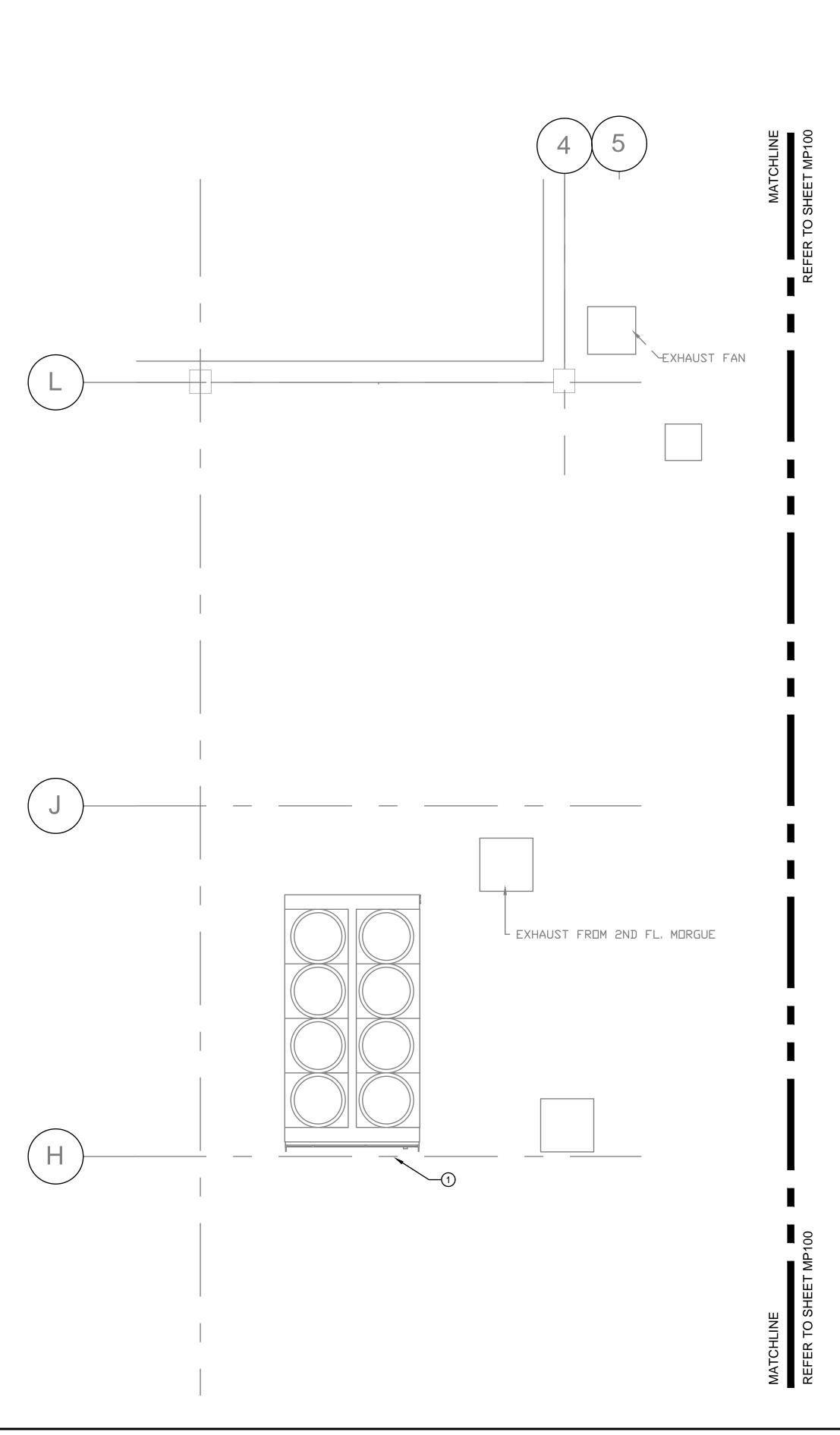
KEY PLAN

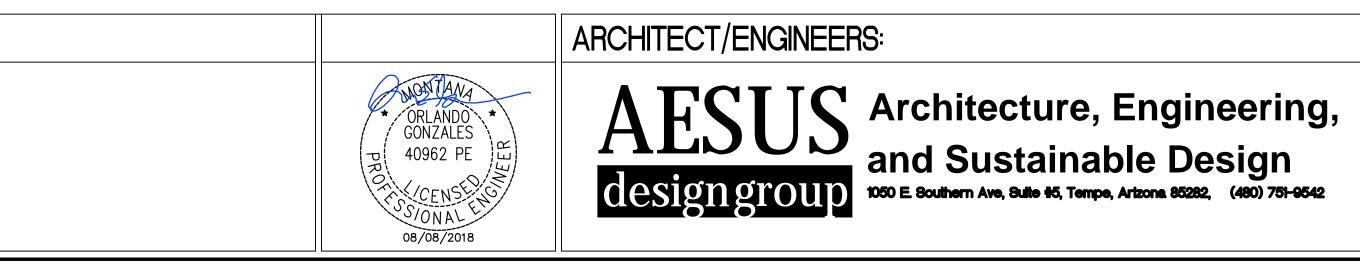
Design DEMOLITION PLAN CONTRACT NO. VA259-17-C-0212 154 Approved: Project Director Location FT. HARRISON HELENA, MT Drag	6-17-102
E DESIGN HELENA, MT	Building Number 154 Drawing Numb ED10
na 85282, (480) 751-9542	
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OR DEMOLITION GE	NERAL NOTES.	
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AT THIS LOCATION T	RD "154-PEE4". INNECTING MEANS AND TO BE RELOCATED. EXTEND, EQUIRED. SEE SHEET E100 FOR	
TION. NNECT AND VSD SE O CONDUIT AND CON TO BE REMOVED BE ALONG THIS WALL / DCATED. ALL CONDU BE SUPPORTED FOR ER WITH 200 AMPER ONNECT SERVING E BOARD A TO REMAN BOARD 154-PEE2 TO PHONE OUTLET TO B TO OTHER SIDE OF R RECEPTACLE ANE R RECEPTACLE ANE		B
SON CONTROL CABIN T IN USE, TO BE REM OMPRESSOR DRYER O BE RELOCATED. CONTROL PANELS A AND CONDUCTORS SON CONTROL CABIN PTACLE TO BE REMO BACK TO SOURCE. EX FIRE ALARM DEV ONDUCTORS BACK ILATION WATER PUN ONDUCTORS BACK	NET AT THIS LOCATION, MOVED. SYSTEM AND RECEPTACLE ALONG WALL TO BE REMOVED. BACK TO SOURCE. NET TO BE REMOVED DVED. DEMO CONDUIT AND MICES TO BE RELOCATED. DEMO TO SOURCE. MPS 1 AND 2 TO BE REMOVED. DEMO TO SOURCE. MON WATER PUMPS 1 AND 2 TO BE NDUCTORS BACK TO SOURCE.	С
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- A. ALL WORK WILL NATIONAL AND LC PROCEDURES.
- B. ALL WORK SHALL MANNER. CARE SH INCONVENIENCE C WHICH ARE TO RE
- C. ALL UTILITY OR SY THE OWNER AND I PRIOR PERMISSION
- D. THE CONTRACTOR CONDITIONS PRIO DISCREPANCIES S RESOLUTION.
- E. ALL DEMOLITION A EXISTING DEVICES THEY REMAIN FU ELECTRICAL CONT INTEGRITY TO ALL CONTRACTOR WIL DEVICES TO THE S
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- I. ALL SHUT DOWNS COORDINATED WI RESPONSIBLE FOR ITEMS WITH THE C PHASING REQUIRE
- J. OPENINGS IN FLO REMOVED CONDU PATCHED TO MAT SHALL BE PERFOR TRADES.
- K. CONTRACTOR SH METHODS, TECHN PROPERTY BOTH F L. FOR EXISTING CIR
- DEVICES, REMOVE SOURCE AND REM BREAKERS ARE 1 INDICATE ABANDC M. PLANS WERE DES
- ENGINEER. THIS I PLANS, PRIOR TEN SCHEDULES, FIELI
- N. HOWEVER, AS EXIS PROVE TO CONTAI PRIOR INSTALLATIO CONTRACTOR SH FIELD VERIFY EXIS
- O. THE CONTRACTOR COMPLETE AND A LOCATION, CIRCUI EQUIPMENT (I.E.: LUMINAIRES, SWIT DEVICES, CONDUI IMPACTED BY THIS
- **KEY NOTES** 1. LOCATION OF EXIS

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SEE SHEET ED-100 FOR DEMOLITION GENERAL NOTES.

Drawing Title ELECTRICAL POWER ROOF DEMOLITION PLAN	Project Title REPLACE PENTHOUS HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212	E
Approved: Project Director	Location FT. HARRISON	HELENA, MT

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Date

08/03/2018

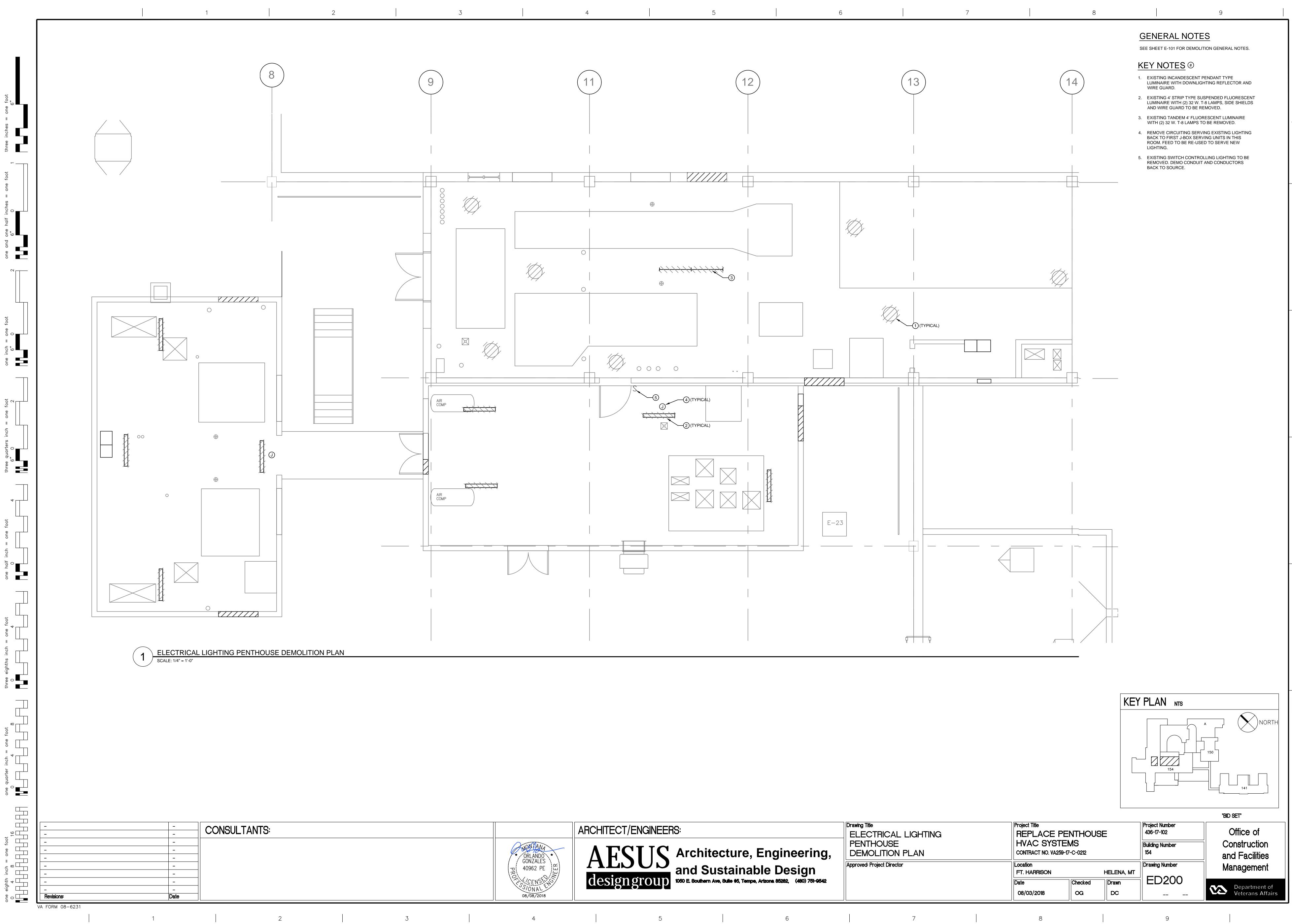
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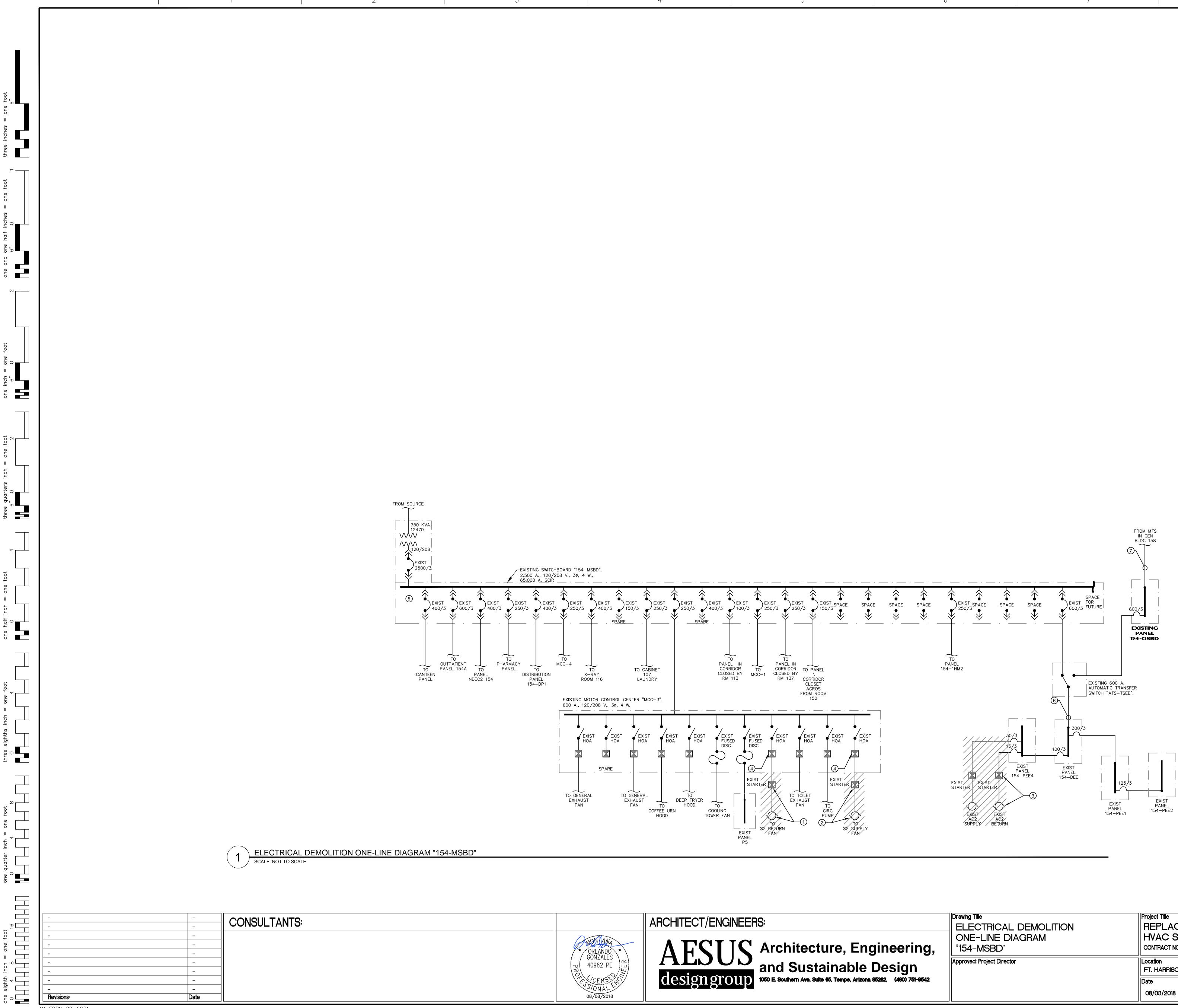
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D	EMOLITION GENERAL NOTES	
A.	ALL WORK WILL BE PERFORMED IN STRICT ACCORDANCE WITH ALL NATIONAL AND LOCAL CODES, STANDARDS AND SAFE WORK PROCEDURES.	
В.	ALL WORK SHALL BE PERFORMED IN A CLEAN AND WORKMANLIKE MANNER. CARE SHALL BE EXERCISED TO MINIMIZE ANY INCONVENIENCE OR DISTURBANCE TO OTHER AREAS OF THE BUILDING WHICH ARE TO REMAIN IN OPERATION.	
C.	ALL UTILITY OR SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER AND ENGINEER. NO SHUTDOWNS CAN OCCUR WITHOUT PRIOR PERMISSION FROM THE OWNER.	
D.	THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND FIELD CONDITIONS PRIOR TO PROCEEDING WITH ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR RESOLUTION.	A
E.	ALL DEMOLITION AND NEW WORK MUST BE PERFORMED SUCH THAT EXISTING DEVICES, EQUIPMENT, ETC. ARE TO BE PROTECTED SO AS THEY REMAIN FULLY FUNCTIONAL FOR CONTINUED USE. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR MAINTAINING CIRCUIT INTEGRITY TO ALL EQUIPMENT AND DEVICES TO REMAIN. THE CONTRACTOR WILL REPAIR ANY DAMAGE TO EXISTING EQUIPMENT OR DEVICES TO THE SATISFACTION OF THE ENGINEER.	
F.	ANY EXISTING DEVICES WHOSE CIRCUITS MAY HAVE BEEN REASSIGNED TO NEW WORK WILL BE RE-FED FROM SPARE BREAKERS IN THE NEAREST AVAILABLE PANEL SUITABLE TO THE ENGINEER. NOTIFY ENGINEER OF SUCH OCCURRENCES FOR FURTHER DIRECTION. THE ENGINEER WILL EVALUATE FIELD SUGGESTIONS REGARDING NEW SOURCES FOR REFERENCED DEVICES.	
G.	THE CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF DEMOLISHED EQUIPMENT AND DEVICES. THE CONTRACTOR WILL COORDINATE WITH THE OWNER AND ARCHITECT FOR ANY EQUIPMENT TO BE RETURNED TO OWNER STOCK PRIOR TO DISPOSAL.	
H.	THE CONTRACTOR SHALL COORDINATE WITH MECHANICAL AND PLUMBING DRAWINGS AND CONTRACTOR FOR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH MAY NEED TO BE DEMOLISHED, RELOCATED OR NEW WORK TO BE PROVIDED WITH NEW CIRCUITS.	В
I.	ALL SHUT DOWNS AND DEMOLITION SHALL BE PHASED AND COORDINATED WITH NEW WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION SHUT DOWNS AND REMOVAL OF ITEMS WITH THE OWNER'S REPRESENTATIVE AND THE OWNER'S PHASING REQUIREMENTS.	
J.	OPENINGS IN FLOORS, WALLS, CEILINGS, ROOFS, ETC. AS A RESULT OF REMOVED CONDUIT AND CONDUCTORS, BUSWAY, ETC SHALL BE PATCHED TO MATCH EXISTING BUILDING CONSTRUCTION. WORK SHALL BE PERFORMED BY CRAFTSMEN SKILLED IN THEIR RESPECTIVE TRADES.	
K.	CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND SAFETY TO THE PUBLIC AND TO PROPERTY BOTH PRIVATE AND PUBLIC.	
L.	FOR EXISTING CIRCUITS SERVING DEMOLISHED EQUIPMENT OR DEVICES, REMOVE CONDUIT TO NEAREST USABLE J-BOX OR TO SOURCE AND REMOVE CONDUCTORS TO SOURCE. EXISTING BREAKERS ARE TO REMAIN IN PANEL. RE-LABEL PANEL SCHEDULES TO INDICATE ABANDONED CIRCUITS AS SPARE.	
M.	PLANS WERE DESIGNED USING INFORMATION AVAILABLE TO ENGINEER. THIS INFORMATION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR TENANT IMPROVEMENT PLANS, EXISTING PANEL SCHEDULES, FIELD NOTES, ETC.	С
N.	HOWEVER, AS EXISTING INFORMATION MAY BE INCOMPLETE OR MAY PROVE TO CONTAIN INACCURACIES, THE ENGINEER CANNOT CERTIFY PRIOR INSTALLATIONS AS PERFORMED BY OTHERS. THEREFORE, THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL WORK AS REQUIRED TO FIELD VERIFY EXISTING CONDITIONS AND AVAILABLE CIRCUITS.	
Ο.	THE CONTRACTOR WILL PROVIDE ENGINEER AND OWNER WITH COMPLETE AND ACCURATE "AS-BUILTS". THESE SHALL INCLUDE THE LOCATION, CIRCUITING AND ROUTING OF ALL NEW AND RELOCATED	
	EQUIPMENT (I.E.: AIR HANDLERS, CHILLERS, FANS, RECEPTACLES, LUMINAIRES, SWITCHES, ETC) OVER-CURRENT DEVICES, STARTING DEVICES, CONDUIT, CONDUCTORS, AND ALL OTHER DEVICES	
KE	IMPACTED BY THIS PROJECT.	
1.	LOCATION OF EXISTING CHILLER 154-CHLR-05A.	
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K	EY PLAN NTS	
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	'BID SET'	
	Project Number 436-17-102 Office of	
	Building Number Construction 154 and Facilities	
IA, N	Drawing Number Management	
)	ED101 Department of	
	Veterans Affairs	



	Drawing Title				Project Number
ngineering,	_ ELECTRICAL LIGHTING PENTHOUSE DEMOLITION PLAN	HVAC SYST	REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212		Building Number
e Design	Approved: Project Director	Location FT. HARRISON HELENA, MT			Drawing Numb
na 85282, (480) 751-9542		Date	Checked	Drawn	
		08/03/2018	OG	DC	

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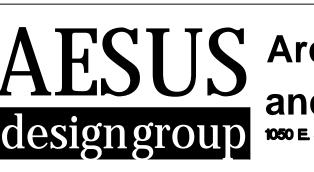
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GENERAL NOTES

SEE SHEET E-101 FOR DEMOLITION GENERAL NOTES.

- KEY NOTES 1. EXISTING AIR HANDLING UNIT "S2" RETURN FAN AND SOURCE.
- DEVICE TO BE REMOVED. DEMO FEED BACK TO SOURCE.
- BE REMOVED. DEMO FEED BACK TO SOURCE.
- 4. EXISTING HOA IN MOTOR CONTROL CENTER TO BE REMAIN. UNIT TO BE LISTED AS "SPARE".
- 5. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST
- 7. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST

	Drawing Title ELECTRICAL DEMOLITION	REPLACE PENTHOUSE			Project Numb 436-17-102
ngineering,	ONE-LINE DIAGRAM "154-MSBD"	HVAC SYS	HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212		
e Design	Approved: Project Director	Location FT. HARRISON HELENA, MT		HELENA, MT	
na 85282, (480) 751-9542		Date	Checked	Drawn	1 ED6
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STARTING DEVICE TO BE REMOVED. DEMO FEED BACK TO

2. EXISTING AIR HANDLING UNIT "S2" SUPPLY FAN AND STARTING

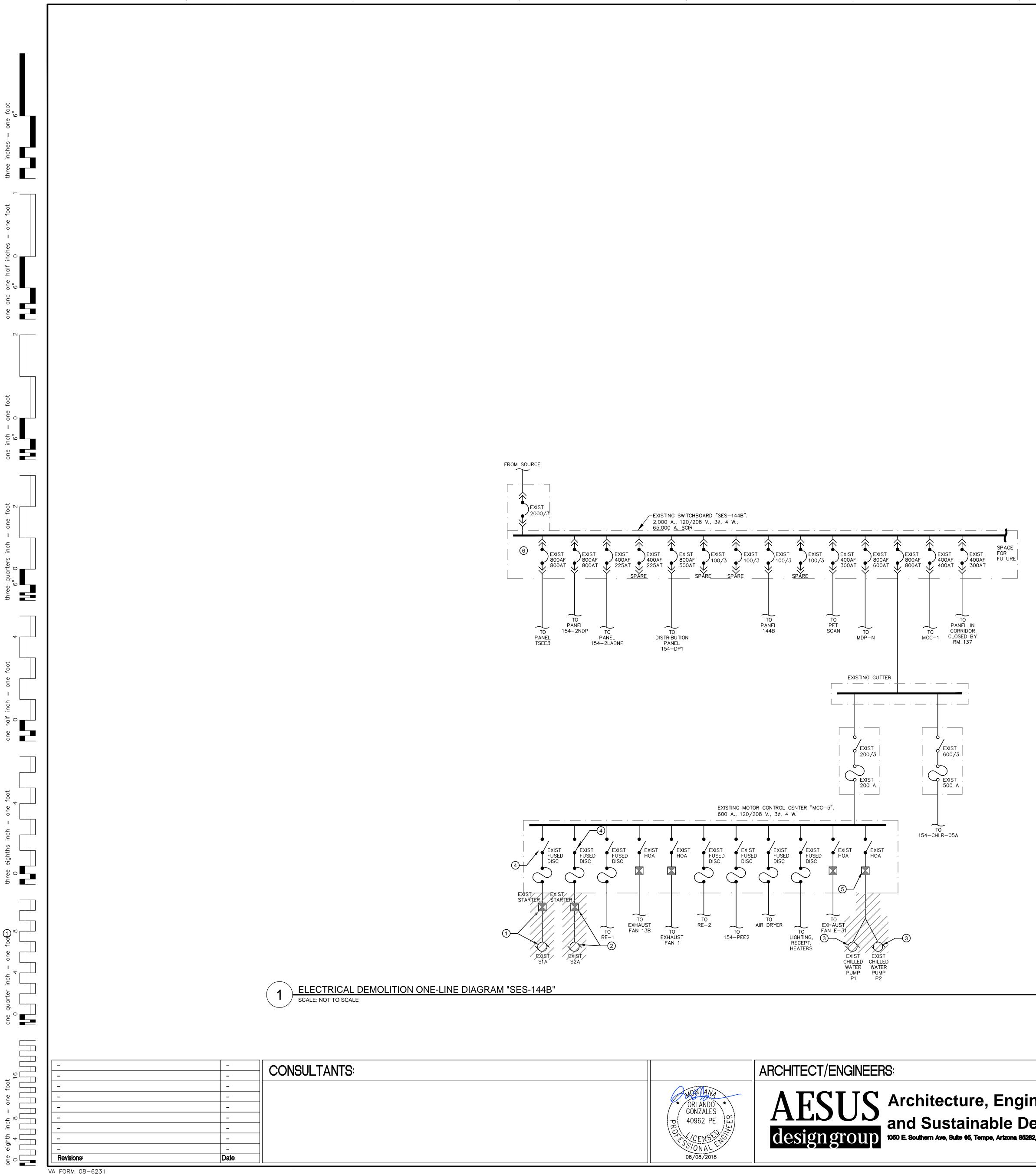
3. EXISTING AIR HANDLING UNIT "AC2" AND STARTING DEVICE TO

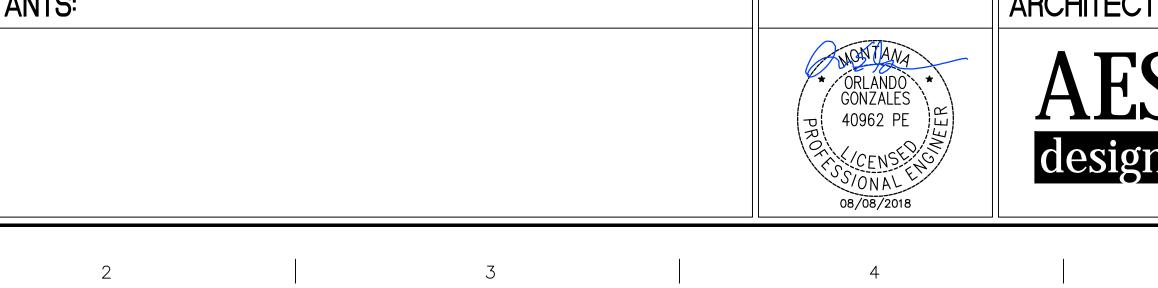
ON "154-MSBD" PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 2,100.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

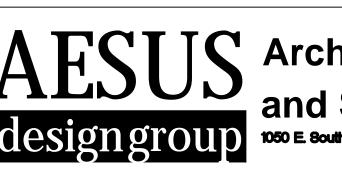
6. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST ON "154-DEE" FEEDERS PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 500.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

ON "154-GSBD" FEEDERS PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 1,800.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.

> 'BID SET' nber Office of Construction mber and Facilities umber Management 600 Department of Veterans Affairs -- --







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GENERAL NOTES

SEE SHEET E-101 FOR DEMOLITION GENERAL NOTES.

KEY NOTES **#**

1. EXISTING AIR HANDLING BE REMOVED. DEMO FEE

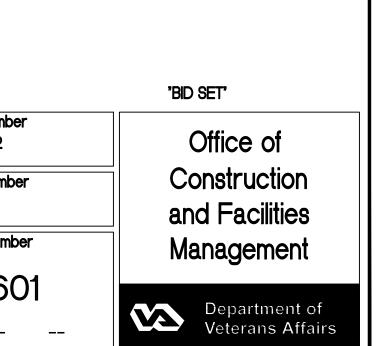
- 2. EXISTING AIR HANDLING BE REMOVED. DEMO FEE
- 3. EXISTING CHILLED WATE REMOVED. DEMO FEED E
- 4. EXISTING FUSED DISCONNECT IN MOTOR CONTROL CENTER TO REMAIN. UNIT TO BE LISTED AS "SPARE".
- TO BE LISTED AS "SPARE".

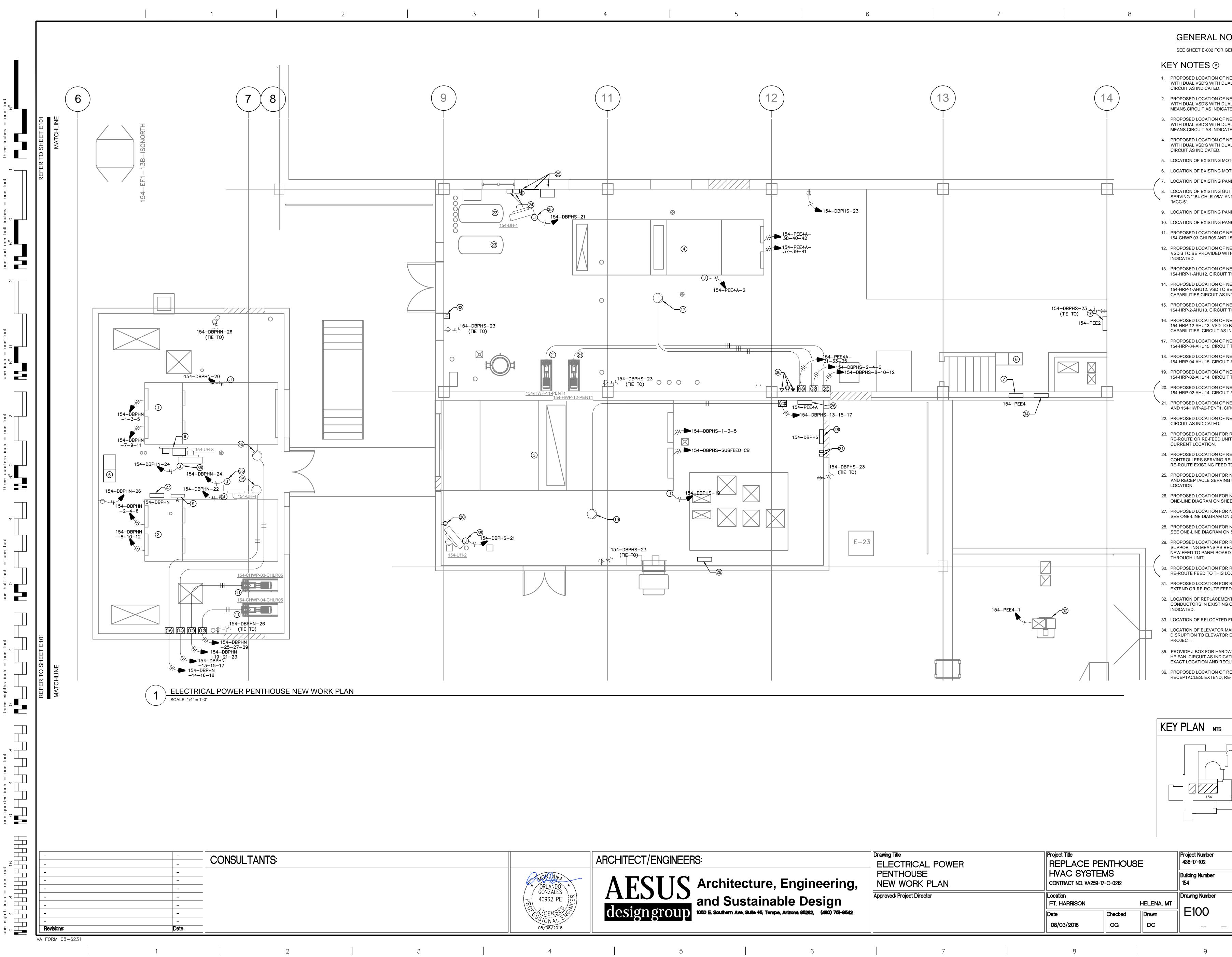
Architecture, Engineering, and Sustainable Design 250 E. Southern Ave, Suite #5, Tempe, Arizona 85282, (480) 751-9542	Drawing Title ELECTRICAL DEMOLITION ONE-LINE DIAGRAM "SES-144B" Approved: Project Director	Project Title REPLACE HVAC SYS CONTRACT NO. VA Location FT. HARRISON Date 08/03/2018	TEMS	BE HELENA, MT Drawn DC	Project Number 436-17-102 Building Number 154 Drawing Number ED601 	
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G UNIT "S1A" AND STARTING DEVICE TO EED BACK TO SOURCE.
G UNIT "S2A" AND STARTING DEVICE TO EED BACK TO SOURCE.
ER PUMPS "P1" AND "P2" TO BE BACK TO SOURCE.

5. EXISTING HOA IN MOTOR CONTROL CENTER TO REMAIN. UNIT

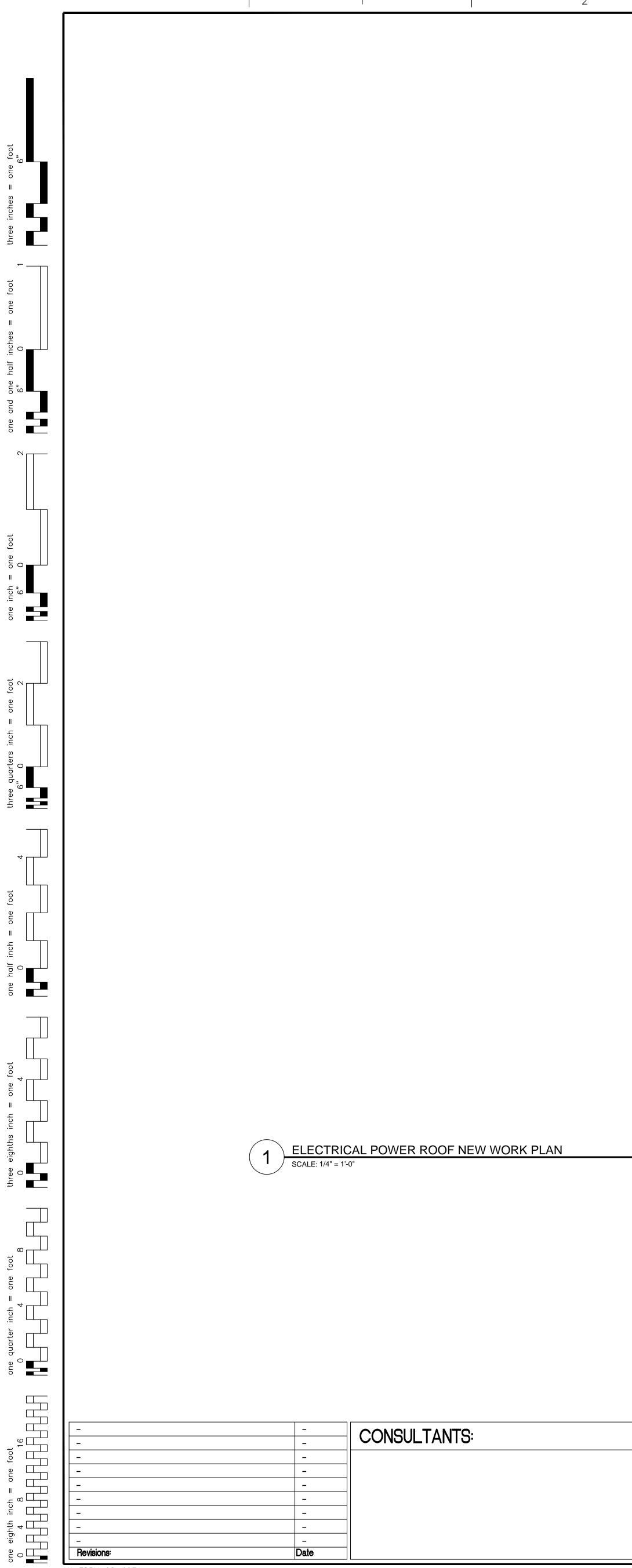
6. ELECTRICAL CONTRACTOR TO PERFORM 30 DAY LOAD TEST ON "SES-144B" PRIOR TO COMMENCING WORK. VERIFY EXISTING DEMAND LOAD IS LESS THAN 1,060.0 AMPS. PROVIDE ENGINEER OF RECORD WITH RESULTS. IF HIGHER, COORDINATE WITH ENGINEER FOR FURTHER DIRECTION.





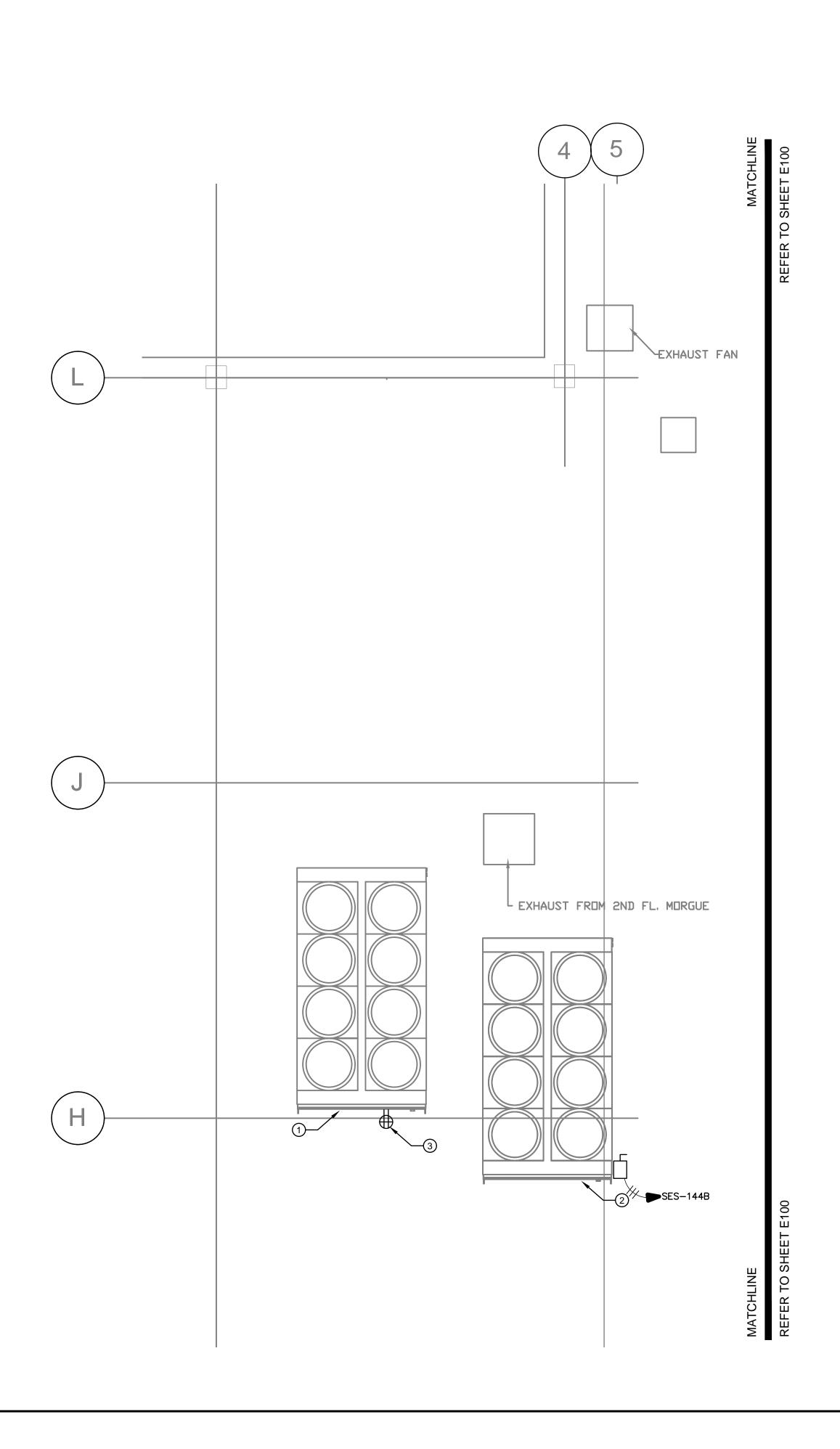
	Drawing Title ELECTRICAL POWER	Project Title REPLACE F	Project Title REPLACE PENTHOUSE		
ngineering,	PENTHOUSE NEW WORK PLAN	HVAC SYST CONTRACT NO. VA25			Building Nur 154
e Design	Approved: Project Director	Location FT. HARRISON		HELENA, MT	Drawing Nu
zo na 85282, (480) 751-9542		Date 08/03/2018	Checked OG	Drawn DC	E100

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RAL NOTES	
-002 FOR GENERAL NOTES.	
S # CATION OF NEW AIR HANDLING UNIT 154-AHU-12-4th, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING MEANS.	
ICATED. CATION OF NEW AIR HANDLING UNIT 154-AHU-13-4th, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING TAS INDICATED.	
ATION OF NEW AIR HANDLING UNIT 154-AHU-14-3rd, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING	А
AS INDICATED. CATION OF NEW AIR HANDLING UNIT 154-AHU-15-2nd, 'S WITH DUAL INTEGRAL MAIN DISCONNECTING MEANS.	
ICATED. XISTING MOTOR CONTROL CENTER "MCC-5".	
XISTING MOTOR CONTROL CENTER "MCC-3". XISTING PANELBOARD "154-PEE4".	
XISTING GUTTER WITH 600 AMPERE DISCONNECT HLR-05A" AND 200 AMPERE DISCONNECT SERVING	
XISTING PANELBOARD A. XISTING PANELBOARD 154-PEE2.	
ATION OF NEW CHILLED WATER PUMPS HLR05 AND 154-CHP-04-CHLR05. CIRCUIT THROUGH VSD.	
OVIDED WITH LOCKABLE OFF PROVISIONS. CIRCUIT AS	В
2. CIRCUIT THROUGH VSD. ATION OF NEW VSD SERVING HEAT RECOVERY PUMP	
2. VSD TO BE PROVIDED WITH LOCKABLE OFF IRCUIT AS INDICATED. ATION OF NEW HEAT RECOVERY PUMP	
3. CIRCUIT THROUGH VSD. ATION OF NEW VSD SERVING HEAT RECOVERY PUMP 13. VSD TO BE PROVIDED WITH LOCKABLE OFF	
CIRCUIT AS INDICATED. CATION OF NEW HEAT RECOVERY PUMP 115. CIRCUIT THROUGH VSD.	
CATION OF NEW VSD SERVING HEAT RECOVERY PUMP 115. CIRCUIT AS INDICATED.	
CATION OF NEW HEAT RECOVERY PUMP 114. CIRCUIT THROUGH VSD.	
ATION OF NEW VSD SERVING HEAT RECOVERY PUMP 14. CIRCUIT AS INDICATED. ATION OF NEW HOT WATER PUMPS 154-HWP-11-PENT1	С
2-PENT1. CIRCUIT THROUGH VSD'S. ATION OF NEW VSD'S SERVING HOT WATER PUMPS. ICATED.	
ATION FOR RELOCATED AIR COMPRESSOR. EXTEND, E-FEED UNIT AS REQUIRED. SEE SHEET ED100 FOR TION.	
ATION OF RELOCATED DISCONNECTS AND SERVING RELOCATED AIR COMPRESSORS. EXTEND OR	┝
TING FEED TO THIS LOCATION. ATION FOR NEW AIR COMPRESSOR DRYER SYSTEM LE SERVING UNIT. EXTEND OR RE-ROUTE FEED TO THIS	
ATION FOR NEW PANELBOARD "154-PEE4A". SEE RAM ON SHEET E600 FOR DETAILS.	
ATION FOR NEW DISTRIBUTION BOARD "154-PBPHN". DIAGRAM ON SHEET E601 FOR DETAILS.	D
ATION FOR NEW DISTRIBUTION BOARD "154-DBPHS". DIAGRAM ON SHEET E600 FOR DETAILS.	
EANS AS REQUIRED. EXTEND, RE-ROUTE OR PROVIDE ANELBOARD AND TO ALL DOWNSTEAM UNITS SERVED	
ATION FOR RELOCATED RECEPTACLE. EXTEND OR TO THIS LOCATION.	
CATION FOR RELOCATED SIMPLEX FIRE ALARM DEVICES. ROUTE FEED TO NEW LOCATION. EPLACEMENT EXHAUST FAN EF-14. PROVIDE NEW	
N EXISTING CONDUIT BACK TO CIRCUIT BREAKER ELOCATED FIRE ALARM PULL BOX.	
LEVATOR MAIN SHUTOFF PANEL. ENSURE THAT NO ELEVATOR EQUIPMENT OCCURS DURING THIS	
FOR HARDWIRE CONNECTION TO UNIT HEATER WITH $\frac{1}{20}$ T AS INDICATED. COORDINATE WITH MECHANICAL FOR IN AND REQUIREMENTS.	E
ATION OF RELOCATED POWER, DATA AND TELEPHONE EXTEND, RE-ROUTEOR REFEED AS REQUIRED.	
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Veterans Affairs	

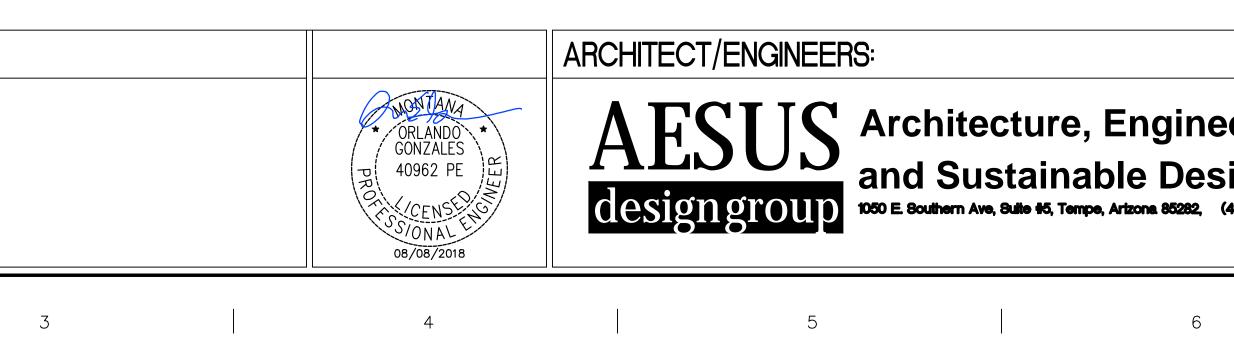


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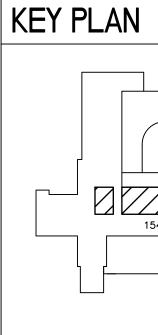
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GENERAL

- A. ALL EXTERIOR DI PROTECTED. B. MEMBRANE PENE
- ACCORDANCE WI C. ALL WORK WILL B NATIONAL AND LC
- PROCEDURES. D. ALL DEMOLITION EXISTING DEVICE THEY REMAIN FU ELECTRICAL CON INTEGRITY TO ALL
- CONTRACTOR WI DEVICES TO THE S E. COORDINATE WIT CONTRACTOR FO MAY NEED TO BE
- PROVIDED WITH N F. THE CONTRACTO TRADES AND PRC AND SUPPORT AS
- G. THE CONTRACTO VENDORS AND PF REQUIRED FOR A OF THE OWNER, 1
- H. CONTRACTOR WI EQUIPMENT PER N I. ALL WIRING FOR I MINIMUM OF 10 A FOR UNDERGROU
- COPPER GROUND J. VERIFY ALL EXISTI TO START OF WOR
- K. NO DESIGN CHAN APPROVAL OF TH INSPECTOR.
- L. PLANS WERE DES THIS INFORMATION TENANT IMPROVE NOTES, ETC.
- M. HOWEVER, AS EXI PROVE TO CONT PRIOR INSTALLAT CONTRACTOR SH FIELD VERIFY EXI
- N. THE CONTRACTO COMPLETE AND

KEY NOTES

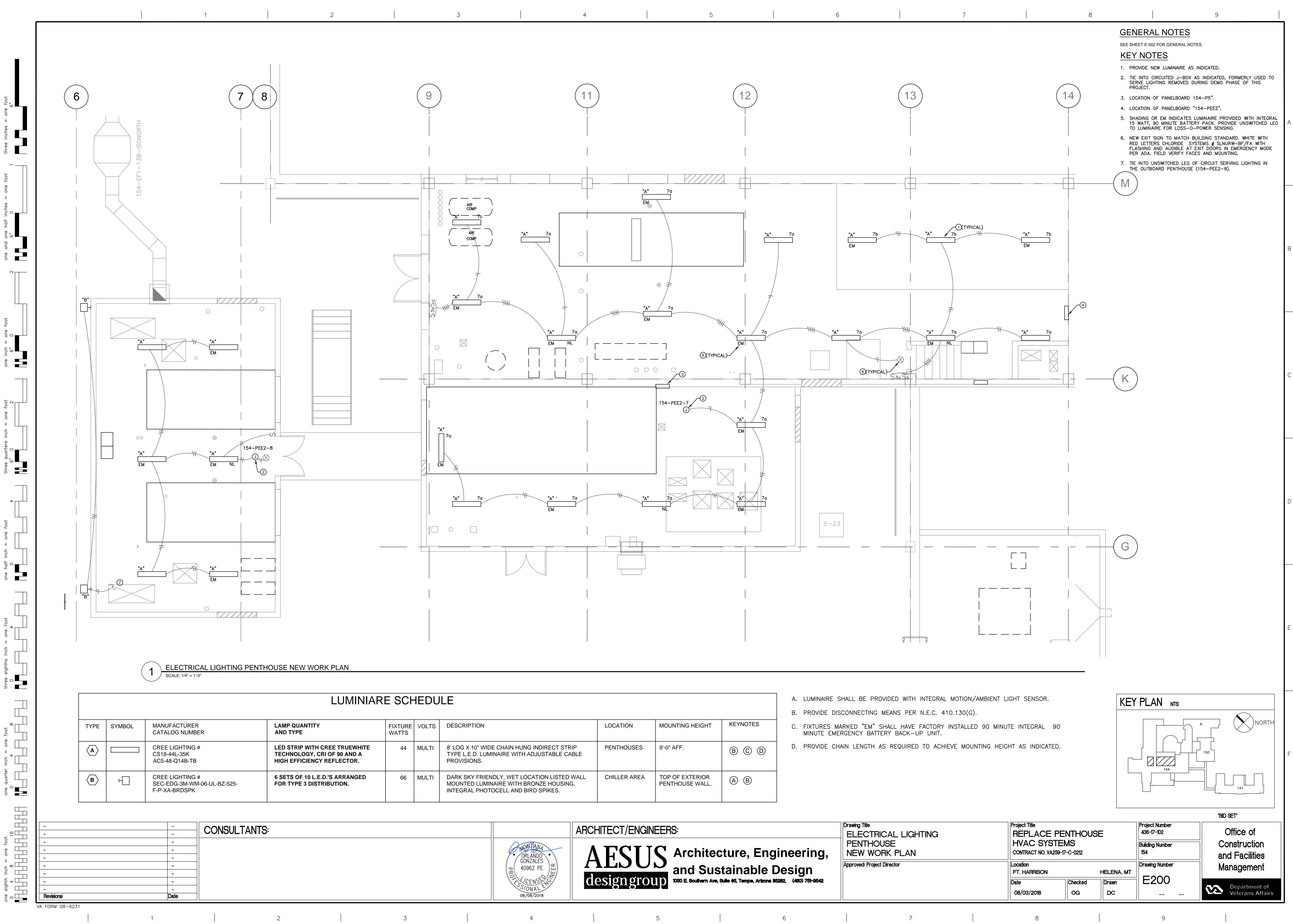
- 1. LOCATION OF EXI
- 2. PROPOSED LOCA 3. EXISTING GFCI PR
- MAINTENANCE REC COVER PER N.E.C. CIRCUIT 2.



ineering,	Drawing Title ELECTRICAL POWER ROOF NEW WORK PLAN	HVAC SYS	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212		
)esign	Approved: Project Director	Location FT. HARRISON HELENA, M		HELENA, MT	Drawing Number
282, (480) 751-9542		Date	Checked	Drawn	E101
		08/03/2018	OG	DC	

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NOTES]
DEVICES SHALL BE WEATHERPROOF AND GFCI	
IETRATION THROUGH WALLS SHALL BE PROTECTED IN WITH THE LATEST ADOPTED EDITION OF I.B.C. 712.32. BE PERFORMED IN STRICT ACCORDANCE WITH ALL LOCAL CODES, STANDARDS AND SAFE WORK	
N AND NEW WORK MUST BE PERFORMED SUCH THAT ES, EQUIPMENT, ETC. ARE TO BE PROTECTED SO AS FULLY FUNCTIONAL FOR CONTINUED USE. THE NTRACTOR IS RESPONSIBLE FOR MAINTAINING CIRCUIT LL EQUIPMENT AND DEVICES TO REMAIN. THE VILL REPAIR ANY DAMAGE TO EXISTING EQUIPMENT OR E SATISFACTION OF THE ENGINEER.	A
ITH MECHANICAL AND PLUMBING DRAWINGS AND OR ANY MECHANICAL OR PLUMBING EQUIPMENT WHICH E DEMOLISHED, RELOCATED OR NEW WORK TO BE I NEW CIRCUITS.	
OR IS RESPONSIBLE FOR COORDINATING WITH ALL OVIDING ALL EQUIPMENT, DEVICES, APPURTENANCES AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM.	
OR IS RESPONSIBLE FOR COORDINATING WITH ALL PROVIDING ALL CONNECTIONS AND APPURTENANCES AS A FULLY FUNCTIONING SYSTEM TO THE SATISFACTION , TENANT AND ENGINEER.	_
VILL MAINTAIN CLEARANCES ABOUT ELECTRICAL R NEC 110.26.	
R EXTERIOR LIGHTING AND POWER DEVICES SHALL BE A A.W.G. COPPER WITH TYPE "THWN-2" INSULATION (UNO) DUND CIRCUITS RUN IN PVC. PROVIDE A 10 A.W.G. ND IN ADDITION TO CIRCUIT CONDUCTORS (UNO).	
ORK. NGE MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR HE DESIGN ELECTRICAL ENGINEER AND THE ELECTRICAL	В
ESIGNED USING INFORMATION AVAILABLE TO ENGINEER. ION MAY CONSIST OF ORIGINAL BUILDING PLANS, PRIOR /EMENT PLANS, EXISTING PANEL SCHEDULES, FIELD	
XISTING INFORMATION MAY BE INCOMPLETE OR MAY TAIN INACCURACIES, THE ENGINEER CANNOT CERTIFY ITIONS AS PERFORMED BY OTHERS. THEREFORE, THE HALL INCLUDE IN HIS BID ALL WORK AS REQUIRED TO KISTING CONDITIONS AND AVAILABLE CIRCUITS. OR WILL PROVIDE ENGINEER AND OWNER WITH ACCURATE "AS-BUILTS".	
S KISTING CHILLER 154-CHLR-05-AHU13-15.	
ATION OF NEW CHILLER 154-CHLR-05B-AHU13-15. PROTECTED ROOF MOUNTED EQUIPMENT RECEPTACLE WITH WEATHERPROOF WHILE-IN-USE	С
.C. 210.63, CIRCUITED THROUGH PANELBOARD A,	
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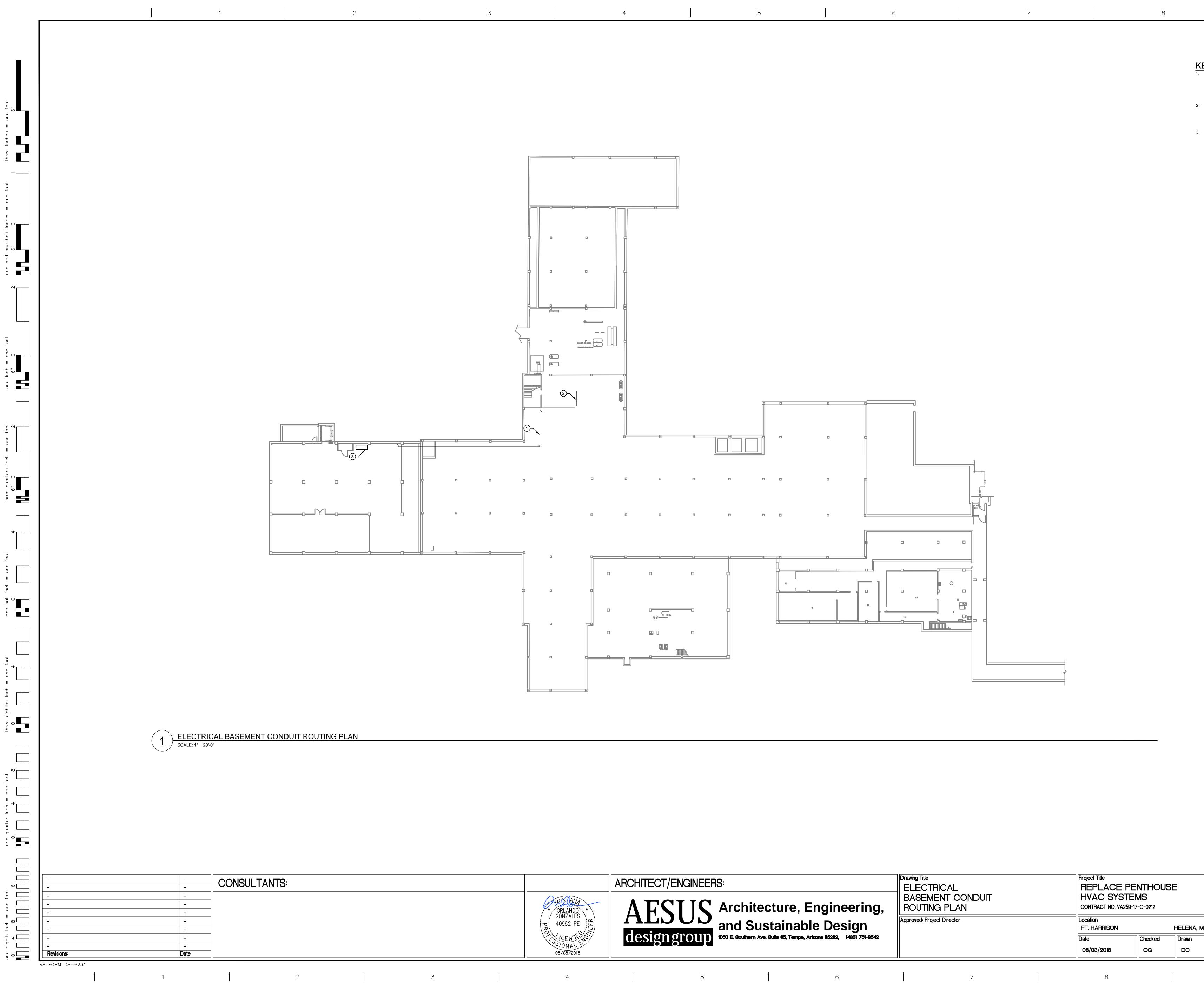


FIXTURE WATTS	VOLTS	DESCRIPTION	LOCATION	MOUNTING HEIGHT	KEYNOTES
44	MULTI	8' LOG X 10" WIDE CHAIN HUNG INDIRECT STRIP TYPE L.E.D. LUMINAIRE WITH ADJUSTABLE CABLE PROVISIONS.	PENTHOUSES	9'-0" AFF.	8 C D
66	MULTI	DARK SKY FRIENDLY, WET LOCATION LISTED WALL MOUNTED LUMINAIRE WITH BRONZE HOUSING, INTEGRAL PHOTOCELL AND BIRD SPIKES.	CHILLER AREA	TOP OF EXTERIOR PENTHOUSE WALL.	A B



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	CONDUIT AND CO "154-CHLR-05B" TO ROUTE UP TO LE\ THORUGH EXISTII
2.	ROUTE CONDUIT BELOW MOP ROO PROVIDING NEW (PULL BOXES AT E

E602 FOR DETAILS.

gineering, Design	Drawing Title ELECTRICAL BASEMENT CONDUIT ROUTING PLAN	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212				
	Approved: Project Director	Location FT. HARRISON	Drawing Numb			
na 85282, (480) 751-9542		Date	Checked	Drawn	ןׂ E300	
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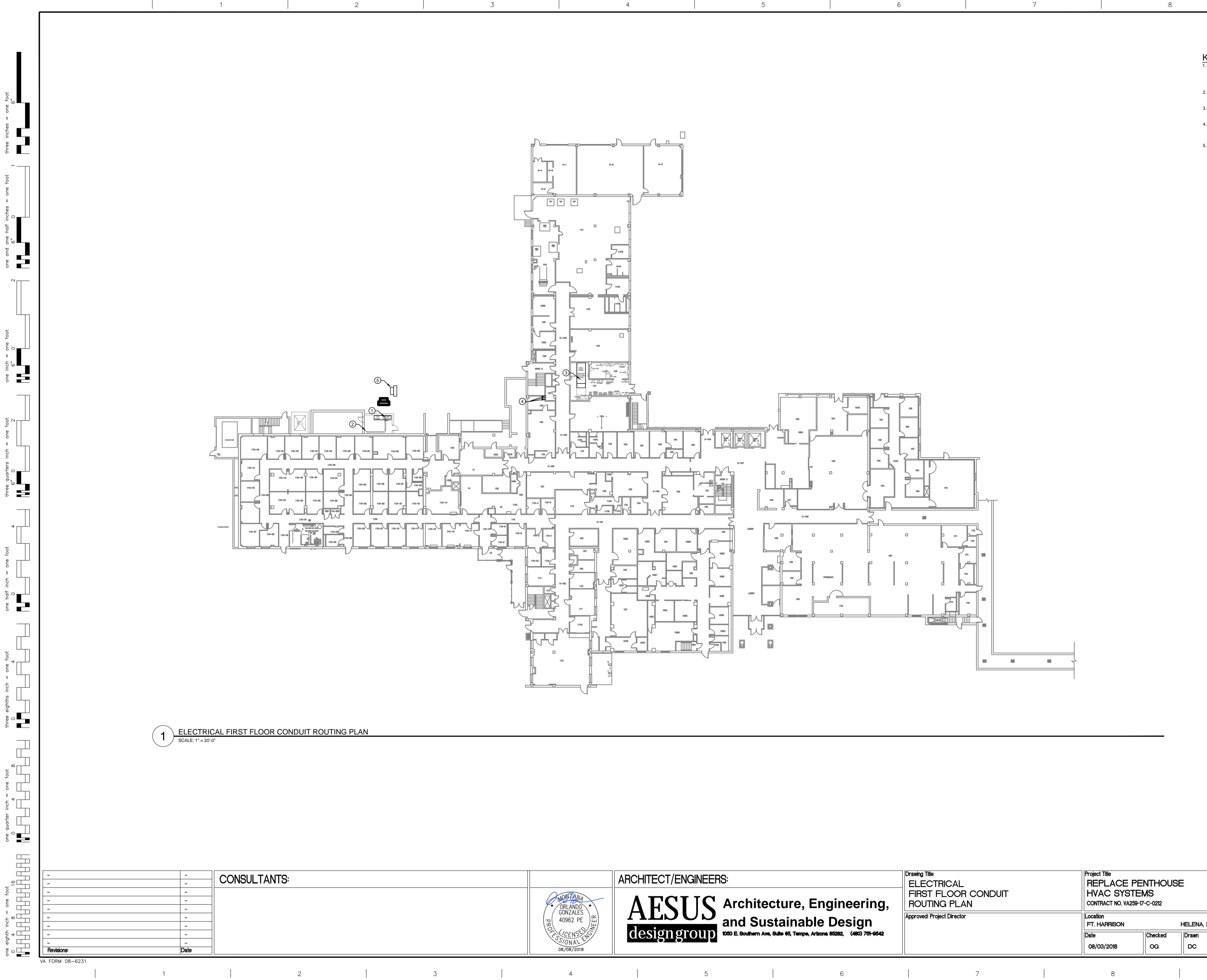
GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES # 1. INTERCEPT EXISTING CONDUIT STUBS AT BASEMENT WALL AND ROUTE ONDUCTORS SERVING"154-DBPHN" AND NEW CHILLER TO AREA BELOW MOP ROOMS ADJACENT TO STAIRWAY. EVEL 4, PROVIDING NEW CONDUIT AND CONDUCTORS TING PULL BOXES AT EACH LEVEL. T AND CONDUCTORS SERVING "154-DBPHS" TO AREA DOMS ADJACENT TO STAIRWAY. ROUT UP TO LEVEL 3, V CONDUIT AND CONDUCTORS THROUGH EXISITING EACH LEVEL.

PROPOSED LOCATION FOR NEW DISTRIBUTION BOARD "SES-144C", TO BE BID AS PART OF A LINE ITEM. SEE ONE-LINE DIAGRAM ON SHEET

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ber	Office of
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KEY NOTES # 1. CONDUITS AND CONDUCTORS SERVING NEW DISTRIBUTION BOARD THROUGH FLOOR TO BASEMENT.

- LEVEL.
 - FOR DETAILS.

	Drawing Title ELECTRICAL		Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212				
ngineering,	FIRST FLOOR CONDUIT ROUTING PLAN						
e Design	Approved: Project Director	Location FT. HARRISON	HELENA, MT	Drawing Num			
na 85282, (480) 751-9542		Date	Checked	Drawn	∦E301		
		08/03/2018	OG	DC			
		08/03/2018	OG	DC			

GENERAL NOTES

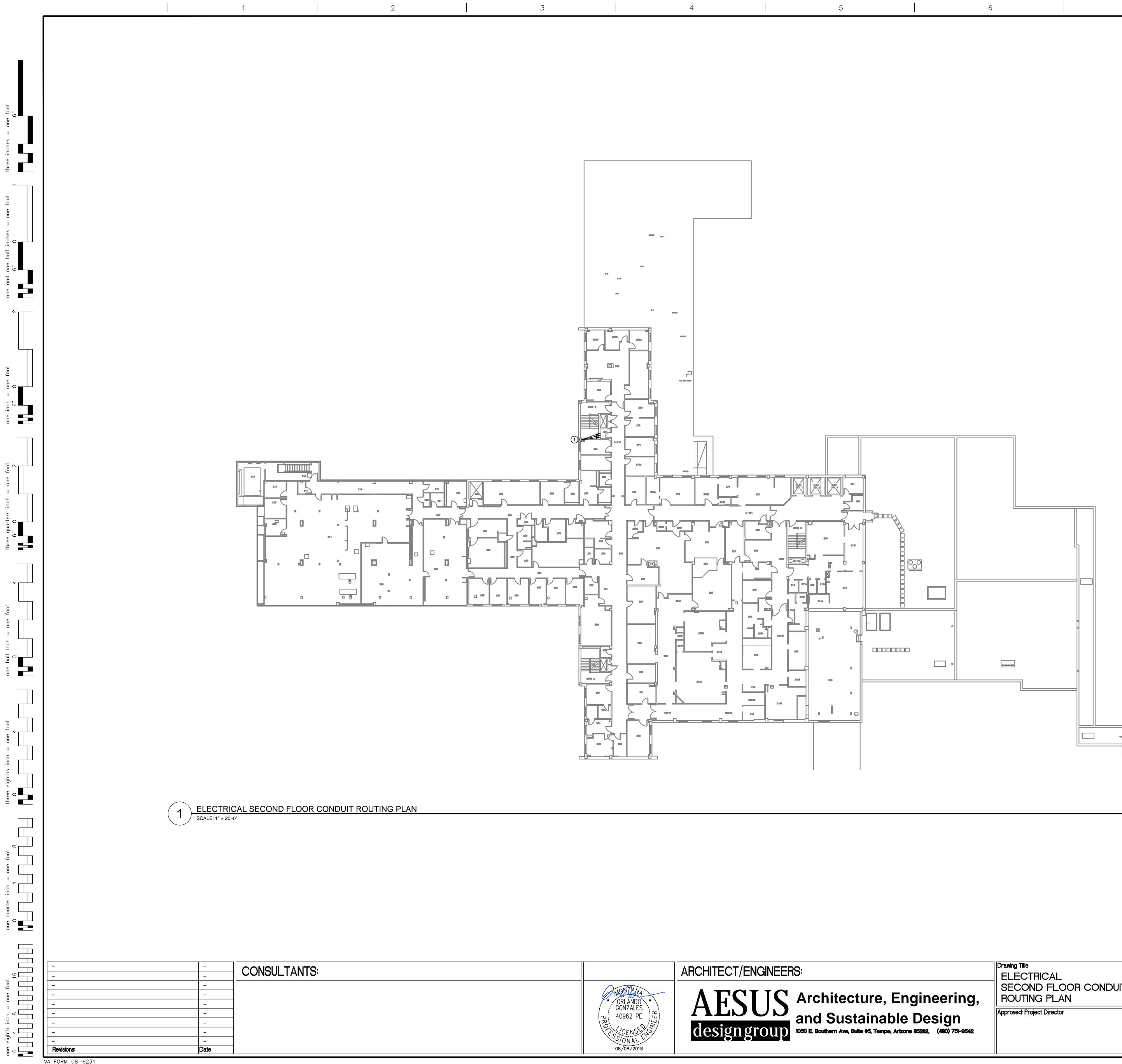
SEE SHEET E-002 FOR GENERAL NOTES.

"154-DBPHN" AND NEW CHILLER "154-CHLR-05B" TO BE ROUTED THROUGH TOP OF SES-144B TO CEILING AREA, TO WALL ACROSS FROM SES, TO CORNER ACROSS FROM SERVICE AND DOWN. 2. INTERCEPT TWO EXISTING 4" CONDUITS STUBBED INTO BASEMENT AND USE THESE TO ROUTE FEEDS INTO BASEMENT. SEE SHEET E300. 3. CONDUIT AND CONDUCTORS SERVING "154-DBPHS" TO BE ROUTED

(3) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, ONE FROM BASEMENT TO THIRD LEVEL, 2 FROM BASEMENT TO FOURTH

5. PROPOSED LOCATION FOR NEW DISTRIBUTION TRANSFORMER, TO BE BID AS PART OF A LINE ITEM. SEE ONE-LINE DIAGRAM ON SHEET E602

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VA FORM 08-6231

GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES (#) (3) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, ONE FROM BASEMENT TO THIRD LEVEL, 2 FROM BASEMENT TO FOURTH

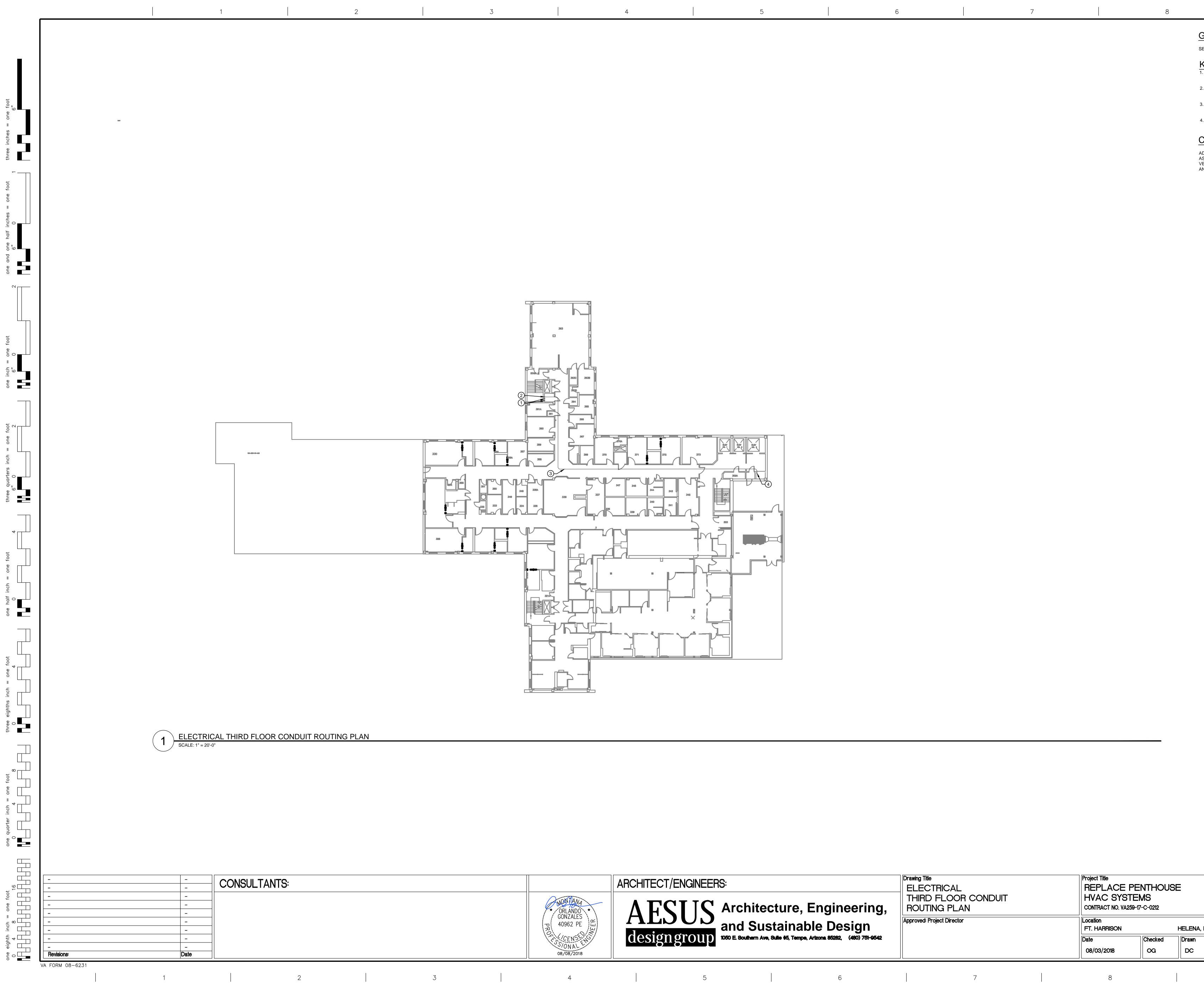
LEVEL.

ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

	CONSULTANTS:				cture, Engineering,	Drawing Title ELECTRICAL SECOND FLOOR CONDUIT ROUTING PLAN Approved: Project Director		Project Title REPLACE P HVAC SYSTE CONTRACT NO. VA259 Location FT. HARRISON Date	EMS -17-C-0212 Checked	HELENA, MT	Project Number 436-17-102 Building Number 154 Drawing Number E302	Office Constru and Fac Manage
Date			08/08/2018					08/03/2018	OG	DC		Vetera
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CONDUIT PENETRATION NOTE

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GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES

4. ROUTE UP IN CHASE AREA TO FOURTH LEVEL.

CONDUIT PENETRATION NOTE

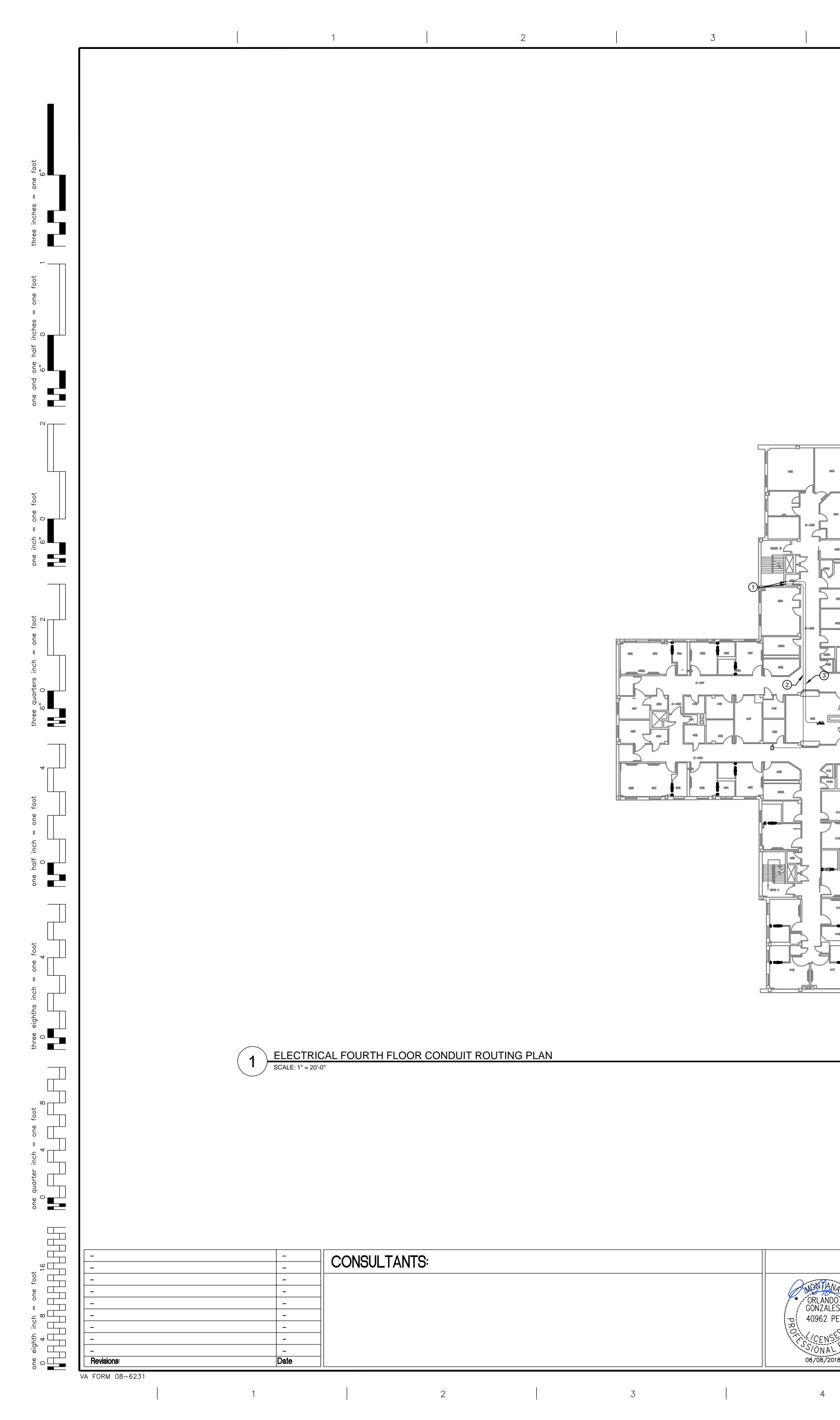
ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

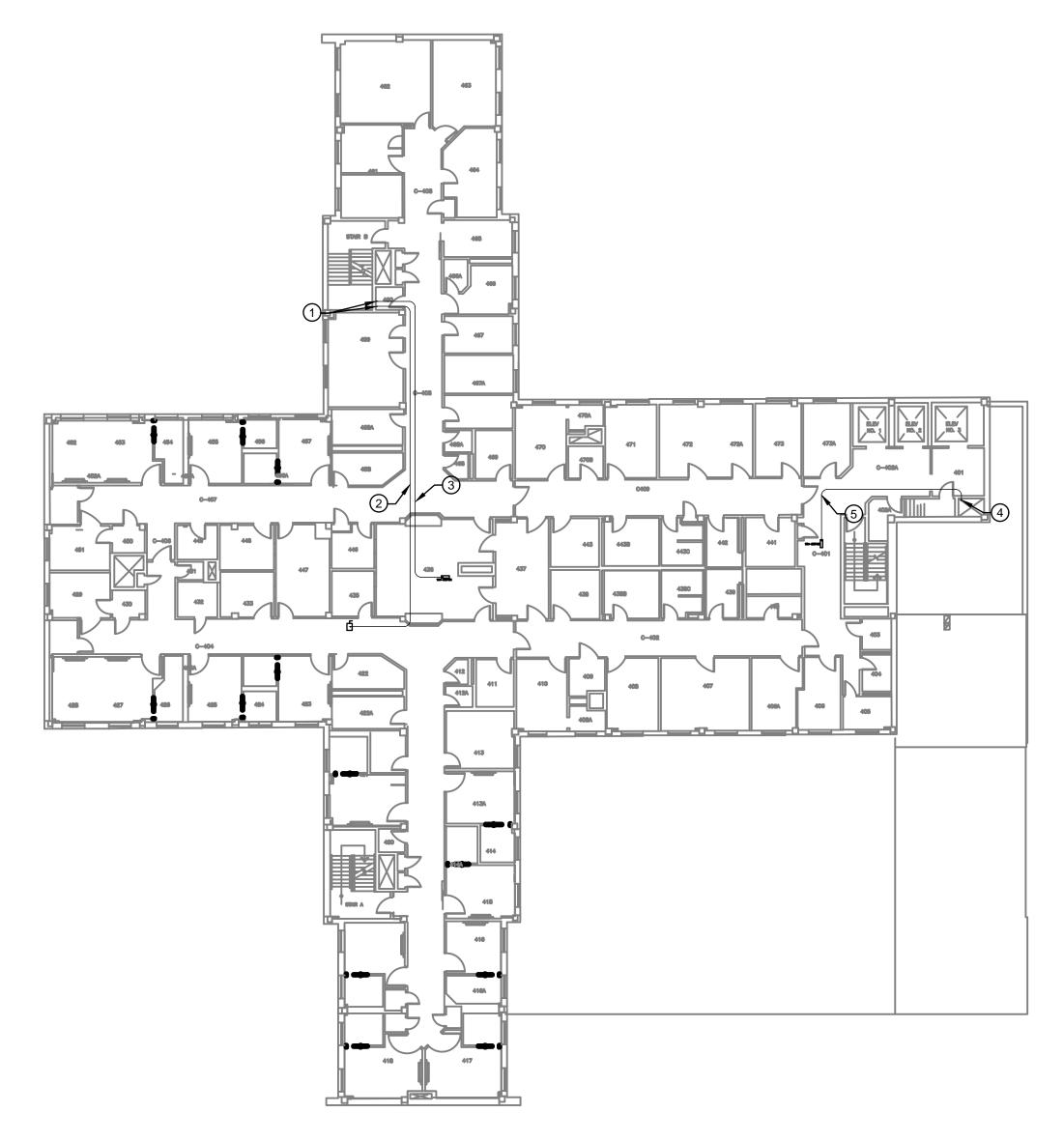
gineering,	Drawing Title ELECTRICAL THIRD FLOOR CO ROUTING PLAN	HVAC SYST	Project Title REPLACE PENTHOUSE HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212				
Design 1 85282, (480) 751-9542	Approved: Project Director		Location FT. HARRISON Date 08/03/2018	Checked OG	HELENA, MT Drawn DC	Drawing Number	
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 (2) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, FROM BASEMENT TO FOURTH LEVEL. (1) 4" CONDUIT AND CONDUCTORS ROUTED THROUGH MOP ROOM FROM BASEMENT LEVEL TO THIS LEVEL.

3. ROUTE CONDUIT FROM MOP ROOM THROUGH CORRIDORS TO UTILITY CHASE ACROSS FROM ELEVATOR BANK.

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AESUS Architecture, Engi and Sustainable L designgroup 1050 E. Bouthern Ave, Suite #5, Tempe, Arizona 852

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GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES

2. ROUTE 4" CONDUIT AND CONDUCTORS SERVING CHILLER

4. (1) 4" CONDUIT ROUTED THROUGH UTILITY CHASE FROM LEVEL THREE.

	Drawing Title	Project Title			Project Numl 436-17-102	
	_ ELECTRICAL FOURTH FLOOR CONDUIT	REPLACE PENTHOUSE				
gineering,	ROUTING PLAN	CONTRACT NO. VA259-17-C-0212				
Design	Approved: Project Director	Location FT. HARRISON HELENA, MT			Drawing Nun	
a 85282, (480) 751-9542		Date	Checked	Drawn	∦ E304	
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1. (2) 4" CONDUITS AND CONDUCTORS ROUTED THROUGH MOP ROOM, FROM BASEMENT TO FOURTH LEVEL.

"154-CHLR-05B" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW CHILLER DISCONNECT AND UP THROUGH ROOF DIRECTLY INTO CHILLER DISCONNECT. SEE SHEET E305 FOR LOCATION OF CHILLER AND CHILLER DISCONNECT.

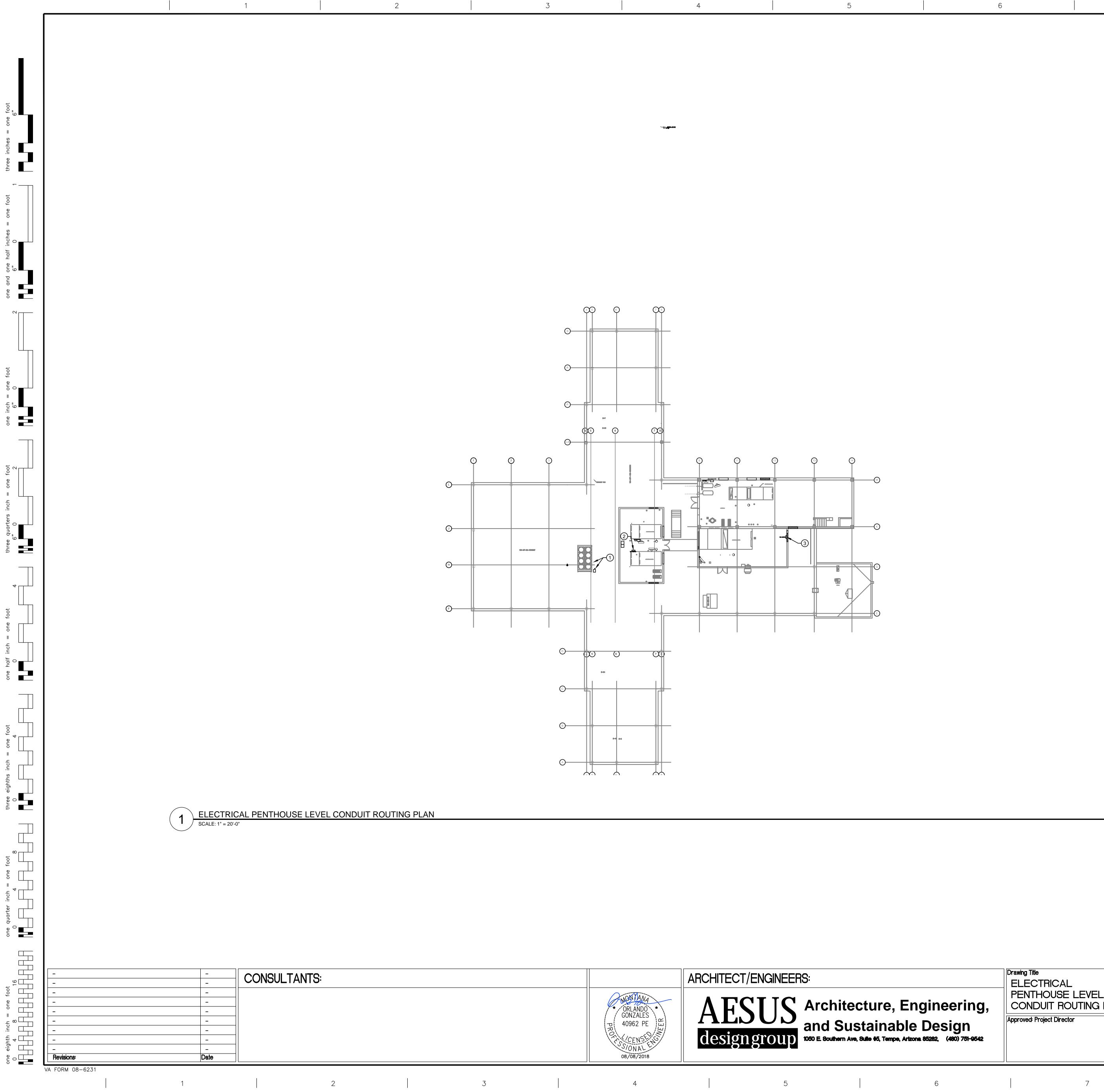
3. ROUTE 4" CONDUIT AND CONDUCTORS SERVING DISTRIBUTION BOARD "154-DBPHN" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW DISTRIBUTION BOARD AND UP THROUGH PENTHOUSE FLOOR DIRECTLY INTO DISTRIBUTION BOARD. SEE SHEET E305 FOR LOCATION OF DISTRIBUTION BOARD "154-DBPHN"

5. ROUTE 4" CONDUIT AND CONDUCTORS SERVING DISTRIBUTION BOARD "154-DBPHS" THROUGH FOURTH FLOOR CHASE AREA AS INDICATED TO SPACE IMMEDIATELY BELOW DISTRIBUTION BOARD AND UP THROUGH PENTHOUSE FLOOR DIRECTLY INTO DISTRIBUTION BOARD. SEE SHEET E305 FOR LOCATION OF DISTRIBUTION BOARD "154-DBPHS".

CONDUIT PENETRATION NOTE

ADDITIONAL CONDUIT STUBS BETWEEN FLOORS ARE BEING PROVIDED AS PART OF A SEPARATE PROJECT. SPARE CONDUITS MAY EXIST. FIELD VERIFY NUMBER, SIZES AND AVAILABILITY OF SPARE PENETRATIONS AND CONDUIT STUBS BETWEEN FLOORS PRIOR TO BID.

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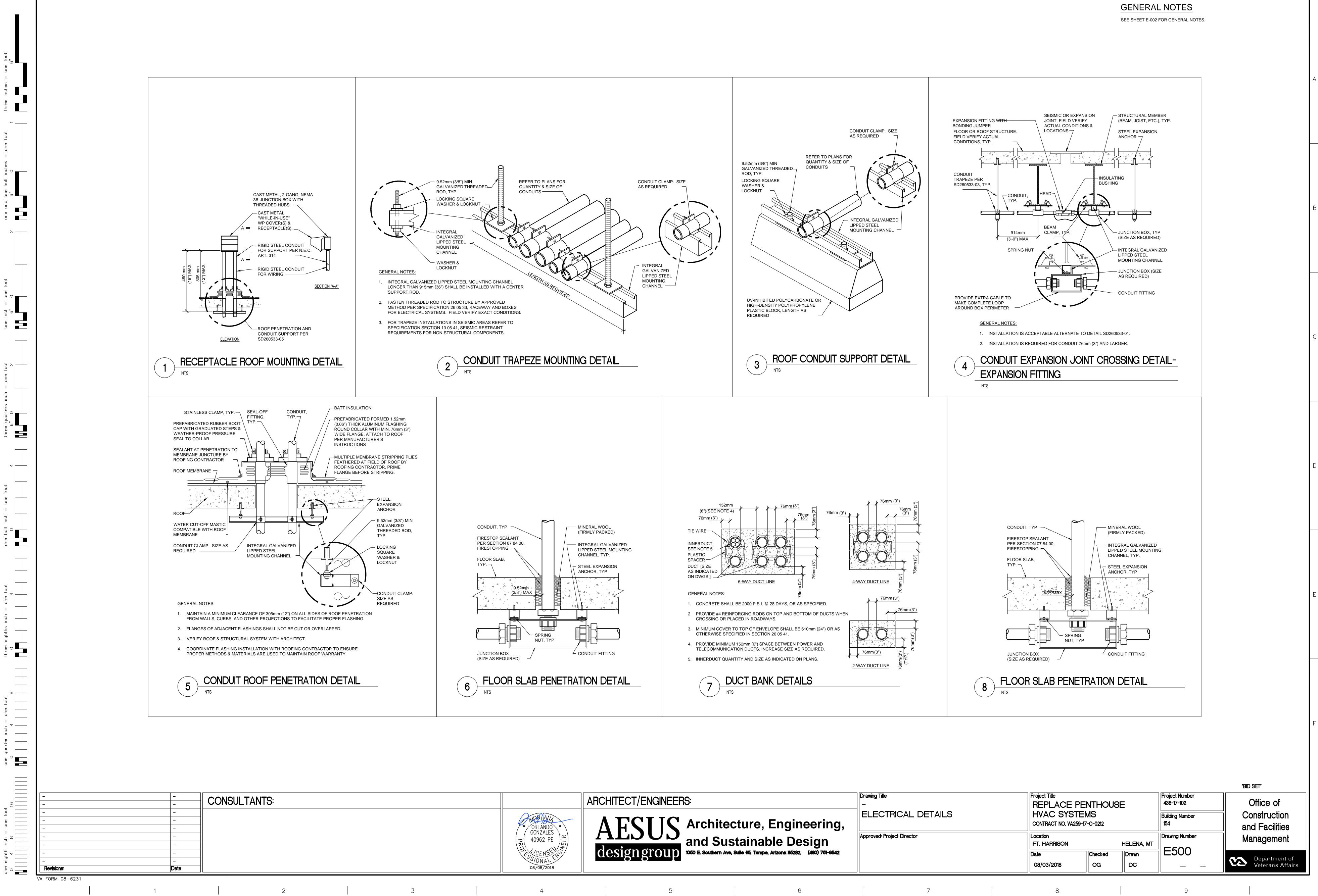
	Drawing Title ELECTRICAL	Project Title REPLACE I	PENTHOU	SE	Project Number 436-17-102
gineering,	PENTHOUSE LEVEL CONDUIT ROUTING PLAN	HVAC SYS CONTRACT NO. VA2			Building Number 154
Design	Approved: Project Director	Location FT. HARRISON		HELENA, MT	Drawing Number
85282, (480)751-9542		Date 08/03/2018	Checked OG	Drawn DC	E305

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R GENERAL NOTES.

154-CHLR-05B" AND CHILLER DISCONNECT. UNIT ROUTED TO AREA DIRECTLY BELOW UNIT THROUGH NEW PENETRATION THROUGH ROOF. ETAILS. UTION BOARD "154-DBPHN". ELECTRICAL FEED TO A DIRECTLY BELOW UNIT UNDER ROOF AND FED TRATION THROUGH ROOF. SEE SHEET E304 FOR UTION BOARD "154-DBPHS". ELECTRICAL FEED TO A DIRECTLY BELOW UNIT UNDER ROOF AND FED TRATION THROUGH ROOF. SEE SHEET E304 FOR

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E Design HELENA, MT	Drawing Numb
na 85282, (480) 751-9542 Date Checked Drawn 08/03/2018 OG DC	E500



	<u> </u>		
"MCC-3": LOAD REMOVED: S2 RETURN FAN S2 SUPPLY FAN TOTAL LOAD REMOVED	= = =	93.5	A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø.
"154-PEE4": LOAD REMOVED: AC2 TOTAL LOAD REMOVED	= =		A @ 208 V., 3Ø. A @ 208 V., 3Ø.
"154-DEE": LOAD REMOVED: THROUGH "154-PEE4" TOTAL LOAD REMOVED	= =		A @ 208 V., 3Ø. A @ 208 V., 3Ø.
ADDED LOAD: THROUGH "154-PEE4A" TOTAL ADDED LOAD NET ADDED LOAD	= = =	80.7	A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø.
EXISTING LOAD ADDED LOAD TOTAL LOAD	= = =		A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø.
"154-GSBD": ADDED LOAD: THROUGH "154-DEE" TOTAL ADDED LOAD	= =		A @ 208 V., 3Ø. A @ 208 V., 3Ø.
EXISTING LOAD ADDED LOAD TOTAL LOAD	= = =	50.4	A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø.
"154-MSBD": LOADS REMOVED: THROUGH "MCC3" TOTAL LOAD REMOVED	= =	123.8 123.8	A @ 208 V., 3Ø. A @ 208 V., 3Ø.
NET ADDED LOADS: THROUGH "154-DBPHS" THROUGH "154-DEE" TOTAL ADDED LOAD NET ADDED LOAD	= = =	255.9 50.4 306.3 182.5	A @ 208 V., 3Ø. A @ 208 V., 3Ø.
EXISTING LOAD ADDED LOAD TOTAL LOAD	= = =		A @ 208 V., 3Ø. A @ 208 V., 3Ø. A @ 208 V., 3Ø.

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NOTES:

EXISTING LOADS SHOWN ABOVE PER LOAD TESTS ON RESPECTIVE DISTRIBUTION GEAR. SEE SHEETS ED-600 AND ED-601 FOR LOAD TEST REQUIREMENTS.

LIGHTING IN OUTBOARD PENTHOUSE SERVED THROUGH PANEL "154-PEE2", CIRCUIT #8. LIGHTING LOAD REMOVED FROM THIS DISCONNECT DURING DEMO PHASE IS 256 WATTS. LIGHTING ADDED TO THIS DISCONNECT DURING NEW CONSTRUCTION PHASE IS 252 WATTS. NET LOAD REDUCTION OF 4 WATTS RESULTS FROM THIS PORTION OF THE LIGHITNG PROJECT.

LIGHTING IN MAIN PENTHOUSE IS SERVED THROUGH "154-PEE2", CIRCUIT #7. LIGHTING REMOVED DURING DEMO PHASE IS 956 WATTS. LIGHITNG ADDED TO THIS CIRCUIT BREAKER DURING NEW CONSTRUCTION PHASE IS 680 WATTS.NET LOAD REDUCTION OF 276 WATTS RESULTS FROM THIS PORTION OF THE LIGHTING PROJECT.

"154-CHP-1 PUMP AND "154-CHP-2" PUMP ARE NON-SIMULTANEOUS.

"154-HWP-1 PUMP AND "154-HWP-2" PUMP ARE

NON-SIMULTANEOUS.

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Date

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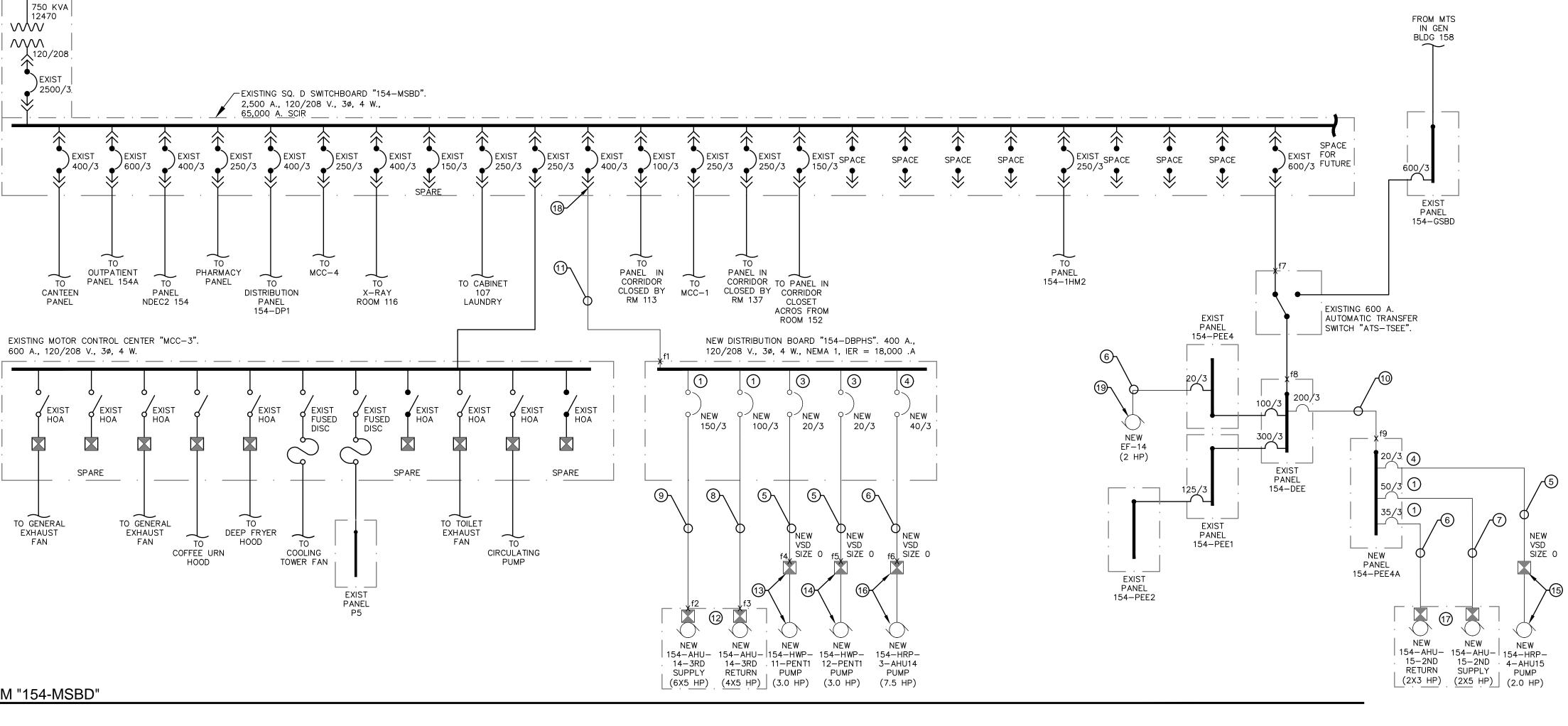
ELECTRICAL NEW ONE-LINE DIAGRAM "154-MSBD" SCALE: NOT TO SCALE CONSULTANTS:



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			EL-L			CURRENT CONDUCTORS PER PHASE				TRANSFORMER		ER	
FAULT POINT	EQUIPMENT	SHORT CURRENT AT BEGINNING OF RUN		LENGTH OF RUN	NO.	SIZE	"C"	f= <mark>Ух L х I</mark> ш С х Ец	$M=\frac{1}{1+f}$	f= <u>Isc. рв. х Vра х 7 х Z%</u> 100,000 х KVA пола	KVA	Z%	SHORT CIRCUIT CURRENT
AFC	"154-MSBD"	_	-	-	_	_	-	-	_	-	-	-	22,805 A.
f1	"154-DBPHS"	22,805	208	310	1	600	28033	1.212	0.452	-	_	-	7,356 A
f2	"154-AHU-14-3RD-SUPPLY"	7,356	208	52	1	2/0	11423	0.391	0.719	-	_	-	5,752 A.
f3	"154-AHU-14-3RD-RETURN"	7,356	208	54	1	1	7493	0.619	0.618	-	-	-	5,103 A.
f4	"154-HWP-11-PENT1"	7,356	208	39	1	10	981	3.414	0.227	-	-	-	2,141 A.
f5	"154-HWP-12-PENT1"	7,356	208	41	1	10	981	3.589	0.218	-	_	-	2,066 A.
f6	"154-HRP-3-AHU14 PUMP"	7,356	208	43	1	10	981	3.764	0.210	_	_	-	1,996 A.
f7	"ATS-TSEE"	22,805	208	27	2	400	24296	0.106	0.905	-	-	-	20,628 A.
f8	"154–DEE"	20,628	208	25	2	400	24296	0.088	0.919	_	-	-	18,953 A.
f9	"154-PEE4A"	18,953	208	205	1	300	20867	1.688	0.372	_	-	-	7,675 A.





ARCHITECT/ENGINEERS:



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 ORLANDO
 GONZALES PR 40962 PE HI 08/08/2018

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GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

VOLTAGE DROP NOTE EQUIPMENT FEEDER CONDUCTORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE DROP OF NO MORE THAN 3% TO PROVIDE REASONABLE EFFICIENCY OF OPERATIONS PER N.E.C. 215.2 (A)(4) INFORMATIONAL

NOTE #2.

KEY NOTES

- SERVE NEW AIR HANDLING UNIT.
- SERVE NEW CHILLED WATER PUMP.
- SERVE NEW HOT WATER PUMP.
- SERVE NEW HEAT RECOVERY PUMP.
- 21mm (3/4)") C.
- 27mm (1") C.
- 35mm (1-1/4") C.
- 41mm (1-1/2") C.
- 53mm (2") C.
- 63 mm (2-1/2") C.
- MOTORS. CIRCUIT AS INDICATED.

- INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE
- CIRCUIT AS INDICATED.
- CONTINUOUSLY. CIRCUIT AS INDICATED.

	Drawing Title ELECTRICAL NEW	Project Title REPLACE	PENTHOU	SE	Project Number 436-17-102
gineering,	ONE-LINE DIAGRAM "154-MSBD"	HVAC SYSTEMS CONTRACT NO. VA259-17-C-0212			Building Number 154
Design	Approved: Project Director -	Location FT. HARRISON		HELENA, MT	Drawing Number
a 85282, (480) 751-9542	- VAPAHCS PLANNING AND ENGINEERING	Date 08/03/2018	Checked OG	Drawn DC	E600

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1. PROVIDE NEW CIRCUIT BREAKER, SIZED AS INDICATED TO 2. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 3. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 4. PROVIDE NEW CIRCUIT BREAKER SIZED AS INDICATED TO 5. CONDUCTORS TO BE (3) 10 A.W.G. CU., (1) 10 A.W.G. CU GND., 6. CONDUCTORS TO BE (3) 8 A.W.G. CU., (1)10 A.W.G. CU GND., 7. CONDUCTORS TO BE (3) 4 A.W.G. CU., (1) 10 A.W.G. CU. GND., 8. CONDUCTORS TO BE (3) 1 A.W.G. CU., (1) 6 A.W.G. CU. GND., 9. CONDUCTORS TO BE (3) 1/0 A.W.G. CU., (1) 6 A.W.G. CU. GND., 10. CONDUCTORS TO BE (4) 300 KCMIL CU., (1) 1 A.W.G. CU. GND., 11. CONDUCTORS TO BE (3) 600 KCMIL CU., (1) 3/0 A.W.G. CU. NEUTRAL, (1) 2/0 A.W.G. CU. GND., 104mm (4") C. 12. NEW AIR HANDLING UNIT "154-AHU-14-3RD" WITH INTEGRAL DUAL VFD'S CONTROLLING THE SUPPLY AND RETURN 13. NEW HOT WATER PUMP "154-HWP-11-PENT1. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED.

14. NEW HOT WATER PUMP "154-HWP-12-PENT1. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED.

15. NEW HEAT RECOVERY PUMP "154-HRP-4-AHU15. CIRCUIT AS INDICATED THROUGH NEW VARIABLE SPEED DRIVE. VARIABLE SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED. 16. NEW HEAT RECOVERY PUMP "154-HRP-3-AHU14. CIRCUIT AS

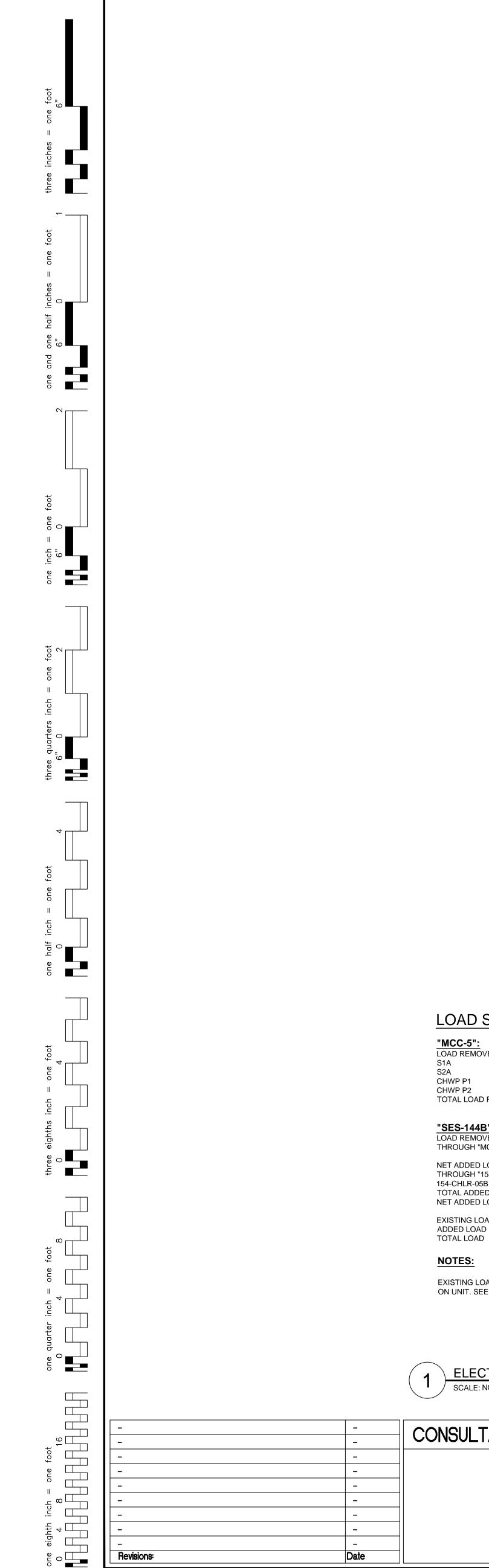
SPEED DRIVE PROVIDED BY MECHANICAL, INSTALLED AND CIRCUITED BY ELECTRICAL. CIRCUIT AS INDICATED. 17. NEW AIR HANDLING UNIT "154-AHU-15-2ND" WITH INTEGRAL DUAL VFD'S SERVING THE SUPPLYAND RETURN MOTORS.

18. EXISTING SPARE 400 AMPERE, 3 POLE CIRCUIT BREAKER TO BE USED TO SERVE NEW DISTRIBUTION BOARD "154-DBPHS". EXERCISE UNIT AND VERIFY IN GOOD WORKING ORDER. COORDINATE WITH OWNER FOR SCHEDULING. 19. NEW EXHAUST FAN EF-14. EXHAUST FAN TO RUN

> 'BID SET' nber mber *Imber*)()

Office of Construction and Facilities Management

Department of Veterans Affairs



LOAD SUMMARY:

'MCC-5":			
OAD REMOVED:			
51A	=	49.1	A @ 208 V., 3Ø.
52A	=	49.1	A @ 208 V., 3Ø.
CHWP P1	=	30.3	A @ 208 V., 3Ø.
CHWP P2	=	30.3	A @ 208 V., 3Ø.
OTAL LOAD REMOVED	=		A @ 208 V., 3Ø.
'SES-144B":			
OAD REMOVED:			
THROUGH "MCC-5"	=	158.8	A @ 208 V., 3Ø.
NET ADDED LOADS:			
	=	246 7	A @ 208 V., 3Ø.
		-	
	=		A @ 208 V., 3Ø.
	=		A @ 208 V., 3Ø.
IET ADDED LOAD	=	531.9	
EXISTING LOAD	=	1 060 0	A @ 208 V., 3Ø.
ADDED LOAD	=		A @ 208 V., 3Ø.
	_	551.9	$\pi \cong 200 \text{ V.}, 50.$

NOTES:

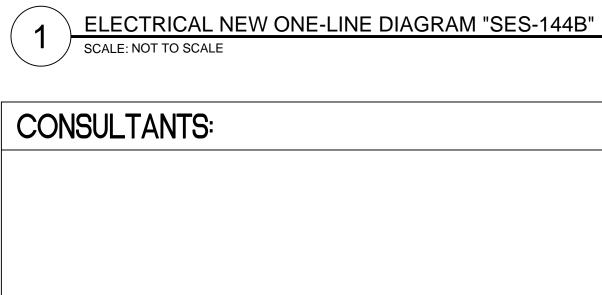
- |

Date

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EXISTING LOADS SHOWN ABOVE FOR "SES-144B" PER LOAD TEST ON UNIT. SEE SHEET ED-601 FOR LOAD TEST REQUIREMENTS.

= 1,591.9 A @ 208 V., 3Ø.



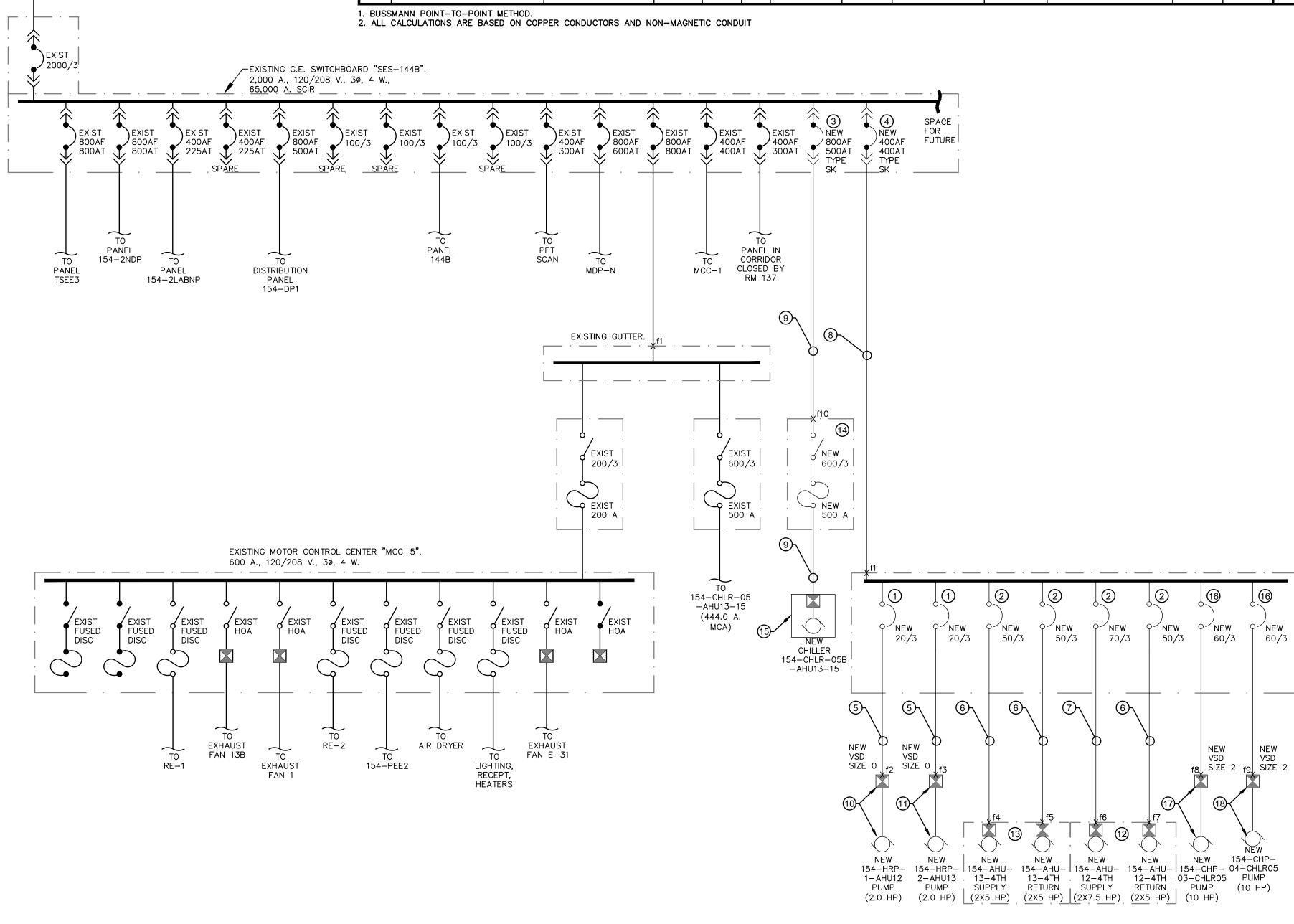
VA FORM 08-623

Revisions:

FROM SOURCE

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		lu.	EL-L	L		CONDUCTO PER PHAS				TRANSFORMER			Isc.
FAULT POINT	EQUIPMENT	SHORT CURRENT AT BEGINNING OF RUN	LINE VOLTAGE	LENGTH OF RUN		SIZE	"C"	f= <mark> </mark>	$M=\frac{1}{1+f}$	f= <u>I sc. pr. x Vpr. x 3 x Z%</u> 100,000 x KVA maas	KVA	Z%	SHORT CIRCUIT CURRENT
AFC	"SES-144B"	-	-	-	-	_	-	-	-	-	-	-	26,752 A.
f1	"154–DBPHN"	26,752	208	150	1	600	28033	0.626	0.615	-	-	-	12,204 A.
f2	"154-HRP-1-AHU12 PUMP"	12,204	208	30	1	10	981	3.837	0.207	-	_	-	2,971 A.
f3	"154-HRP-2-AHU13 PUMP"	12,204	208	30	1	10	981	3.837	0.207	-	_	-	2,971 A.
f4	"154-HRP-12-4TH SUPPLY"	12,204	208	15	1	2	6044	0.311	0.763	-	_	-	9,746 A.
f5	"154-HRP-12-4TH RETURN"	12,204	208	17	1	4	3825	0.558	0.642	-	_	-	8,407 A.
f6	"154-HRP-13-4TH SUPPLY"	12,204	208	15	1	2	6044	0.311	0.763	-	_	-	9,746 A.
f7	"154-HRP-13-4TH RETURN"	12,204	208	17	1	4	3825	0.558	0.642	-	-	-	8,407 A.
f8	"154-CHWP-03-CHLR05"	12,204	208	35	1	4	3825	0.930	0.518	-	_	-	6,322 A.
f9	"154-CHP-04-CHLR05"	12,204	208	37	1	4	3825	0.983	0.504	-	_	-	6,151 A.
f10	"154–CHLR–05B–AHU13–15" DISC	26,752	208	220	2	250	18593	2.636	0.275	_	_	_	7,358 A.



ARCHITECT/ENGINEERS: ORLANDO
 GONZALES AESUS Architecture, Eng designgroup and Sustainable 1 1050 E. Southern Ave, Suite 45, Tempe, Arizona 84 PR 40962 PE HI 08/08/2018 2 3 4 6 5

GENERAL NOTES

SEE SHEET E-002 FOR GENERAL NOTES.

VOLTAGE DROP NOTE

EQUIPMENT FEEDER CONDUCTORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE DROP OF NO MORE THAN 3% TO PROVIDE REASONABLE EFFICIENCY OF OPERATIONS PER N.E.C. 215.2 (A)(4) INFORMATIONAL NOTE #2.

	Drawing Title ELECTRICAL NEW	Project Title	PENTHOUS	6E	Project Numk 436-17-102
gineering,	ONE-LINE DIAGRAM "SES-144B"	HVAC SYS CONTRACT NO. VA2			Building Numk 154
Design	Approved: Project Director	Location FT. HARRISON		HELENA, MT	Drawing Num
na 85282, (480) 751-9542		Date 08/03/2018	Checked OG	Drawn DC	E601

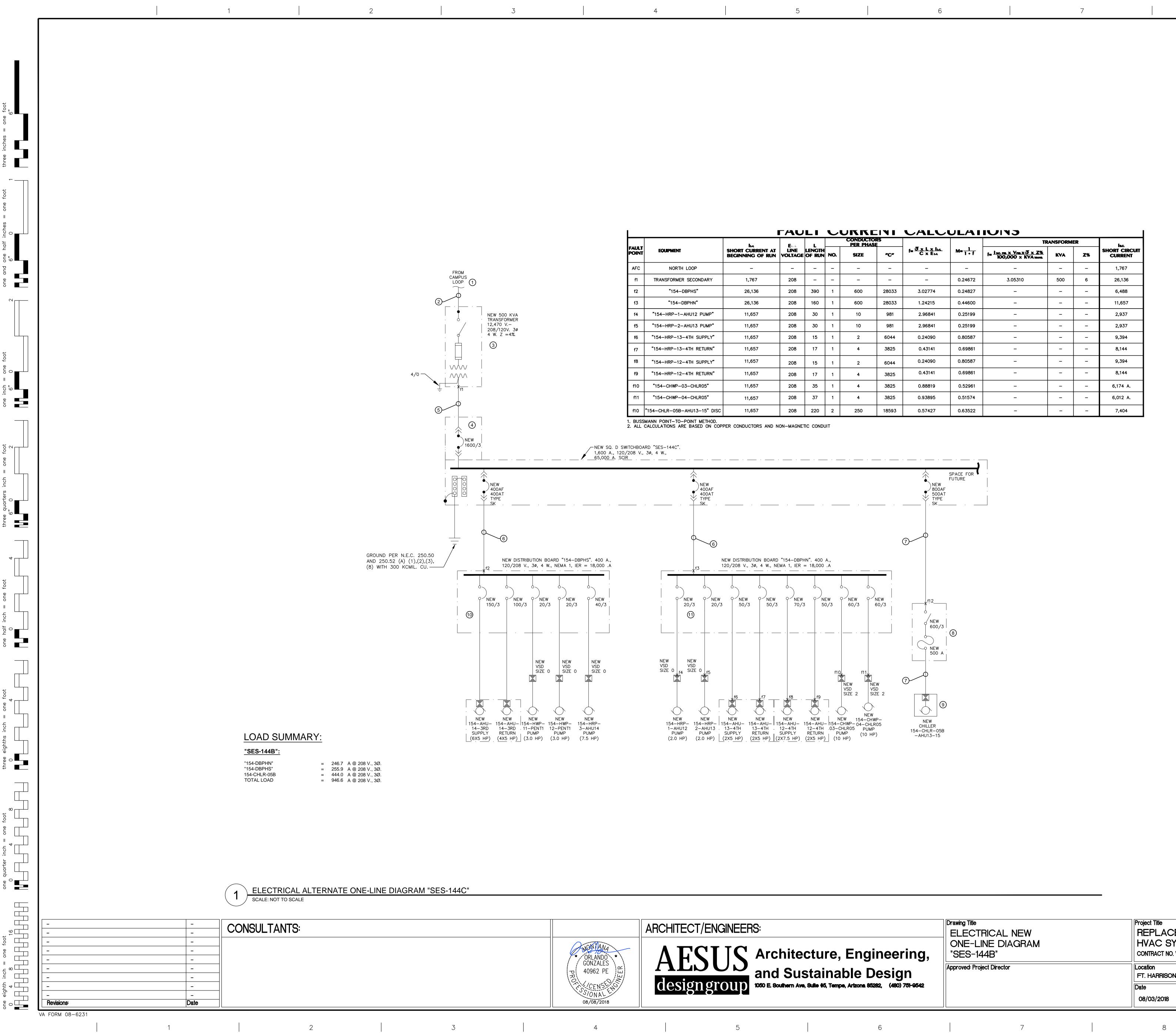
KEY	NO	FES	(#)

- 1. PROVIDE NEW CIRCUIT NEW HEAT RECOVERY
- 2. PROVIDE NEW CIRCUIT F NEW AIR HANDLING UNI
- 3. PROVIDE NEW CIRCUIT E NEW CHILLER.
- 4. PROVIDE NEW CIRCUIT I NEW DISTRIBUTION BOA
- 5. CONDUCTORS TO BE (3) 21mm (3/4)") C.
- 6. CONDUCTORS TO BE (3) 35mm (1-1/4") C.
- 7. CONDUCTORS TO BE (3) 41mm (1-1/2") C.
- 8. CONDUCTORS TO BE (3) NEUTRAL, (1) 2/0 A.W.G.
- 9. CONDUCTORS TO BE 2 S 1/0 A.W.G. CU. GND., IN (1 10. NEW HEAT RECOVERY F
- INDICATED THROUGH N SPEED DRIVE PROVIDED CIRCUITED BY ELECTRIC
- 11. NEW HEAT RECOVERY F INDICATED THROUGH N SPEED DRIVE PROVIDED CIRCUITED BY ELECTRIC
- 12. NEW AIR HANDLING UNIT DUAL VFD'S CONTOLLING CIRCUIT AS INDICATED.
- 13. NEW AIR HANDLING UNIT DUAL VFD'S CONTOLLING CIRCUIT AS INDICATED.
- 14. PROVIDE NEW WEATHER FUSES SIZED PER MANU SERVE NEW CHILLER. PI REQUIRED. MAINTAIN N.E UNIT.
- 15. NEW CHILLER "154-CHLR INTEGRAL VSD. CIRCUIT
- 16. PROVIDE NEW CIRCUIT E SERVE NEW CHILLED WA
- AS INDICATED THROUGH VARIABLE SPEED DRIVE INSTALLED AND CIRCUIT INDICATED.
- 18. NEW CHILLED WATER PL AS INDICATED THROUGH VARIABLE SPEED DRIVE INSTALLED AND CIRCUIT INDICATED.

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2.	-	NEW CIRCUIT BREAKER AS INDI HANDLING UNIT.	CATED TO SERVE	C
3.	PROVIDE NEW CHIL	NEW CIRCUIT BREAKER AS INDI LER.	CATED TO SERVE	
4.		NEW CIRCUIT BREAKER AS INDI RIBUTION BOARD "154-DBPHN"	CATED TO SERVE	
5.	CONDUCT 21mm (3/4	TORS TO BE (3) 10 A.W.G. CU., (1)") C.) 10 A.W.G. CU GND.,	
6.	CONDUCT 35mm (1-1	ORS TO BE (3) 6 A.W.G. CU., (1) /4") C.	10 A.W.G. CU. GND.,	
7.	CONDUCT 41mm (1-1	ORS TO BE (3) 4 A.W.G. CU., (1) /2") C.	8 A.W.G. CU. GND.,	
8.		ORS TO BE (3) 600 KCMIL CU., ((1) 2/0 A.W.G. CU. GND., 104mm		
9.		ORS TO BE 2 SETS OF (3) 300 K CU. GND., IN (1) 103mm (4") C.	CMIL XHHW-2 CU., (1)	
10.	INDICATEI SPEED DF	T RECOVERY PUMP "154-HRP-1- D THROUGH NEW VARIABLE SPE RIVE PROVIDED BY MECHANICAI D BY ELECTRICAL. CIRCUIT AS I	EED DRIVE. VARIABLE _, INSTALLED AND	D
11.	INDICATEI SPEED DF	T RECOVERY PUMP "154-HRP-2- D THROUGH NEW VARIABLE SPE RIVE PROVIDED BY MECHANICAI D BY ELECTRICAL. CIRCUIT AS I	EED DRIVE. VARIABLE _, INSTALLED AND	
12.	DUAL VFD	HANDLING UNIT "154-AHU-12-4TH 'S CONTOLLING THE SUPPLY AN IS INDICATED.		
13.	DUAL VFD	HANDLING UNIT "154-AHU-13-4TH 'S CONTOLLING THE SUPPLY AN \S INDICATED.	-	
14.	FUSES SIZ	NEW WEATHERPROOF DISCONI ZED PER MANUFACTURERS SPE EW CHILLER. PROVIDE SUPPOR D. MAINTAIN N.E.C. REQUIRED C	CIFICATIONS TO FING MEANS AS	
15.		LER "154-CHLR-05B-AHU13-15", . VSD. CIRCUIT AS INDICATED.	PROVIDED WITH	
16.		NEW CIRCUIT BREAKER SIZED A W CHILLED WATER PUMP.	AS INDICATED TO	E
17.	AS INDICA VARIABLE	LED WATER PUMP "154-CHWP-0 TED THROUGH NEW VARIABLE SPEED DRIVE PROVIDED BY MI D AND CIRCUITED BY ELECTRIC D.	SPEED DRIVE. ECHANICAL,	
18.	AS INDICA VARIABLE	LED WATER PUMP "154-CHWP-0 TED THROUGH NEW VARIABLE SPEED DRIVE PROVIDED BY MI D AND CIRCUITED BY ELECTRIC D.	SPEED DRIVE. ECHANICAL,	
				F
			'BID SET'	
		Project Number 436-17-102	Office of	
		Building Number	Construction	
		154 Drawing Number	and Facilities	
ELE	NA, MT		Management	
Draw		E601	Department of	
DC	;		Veterans Affairs	



GENERAL NOTE

SEE SHEET E-002 FOR GENERAL

VOLTAGE DROF

EQUIPMENT FEEDER CONDUCT DROP OF NO MORE THAN 3% TO OPERATIONS PER N.E.C. 215.2 (/

ALTERNATE SER

PROVIDE LINE ITEM TO BID FOR THE TRANSFORMER SECONDAR "SES-144C". THIS EQUIPMENT SH DETERMINED THAT EXISTING SE "154-MSBD" DO NOT HAVE SPARE ADDED LOADS. BID SHALL INCLU CONDUCTORS, TRENCHING, CON ENSURE A FULLY FUNCTIONAL ENGINEER AND THE AHJ.

THE FOLLOWING PROJECT SPEC THIS PROJECT AND APPLY TO T 26 05 13 MEDIUM VOLTAGE 26 05 26 GROUNDING AND B 26 05 41 UNDERGROUND EL 26 12 19 PAD MOUNTED, LIG 26 24 13 DISTRIBUTION SWIT

KEY NOTES (#)

- 1. TIE INTO EXISTING MEDIUM
- 2. CONDUCTORS TO BE (3) 1/0 5"C.
- 3. PROVIDE NEW TRANSFORM LOCATION.
- 4. PROVIDE NEW DISTRIBUTION LOCATION.
- 5. CONDUCTORS TO BE (5 SET (1) 300 KCMIL CU. GND., EACH
- 6. CONDUCTORS TO BE (3) 600 A.W.G. CU. GND., 104mm (4")
- 7. CONDUCTORS TO BE 2 SETS CU. GND., IN (1) 103mm (4") C
- 8. PROVIDE NEW WEATHERPRO SIZED PER MANUFACTURE PROVIDE SUPPORTING MEA CLEARANCES ABOUT UNIT.
- 9. NEW CHILLER "154-CHLR-05E CIRCUIT AS INDICATED. CHIL
- 10. SEE SHEET E600 FOR COND DEVICES SERVED THROUGH
- 11. SEE SHEET E601 FOR COND DEVICES SERVED THROUGH

gineering,	Drawing Title ELECTRICAL NEW ONE-LINE DIAGRAM "SES-144B"	Project Title REPLACE HVAC SYS CONTRACT NO. VA2	TEMS	SE	Project Numl 436-17-102 Building Num 154
Design	Approved: Project Director	Location FT. HARRISON		HELENA, MT	Drawing Num
a 85282, (480) 75 1-95 42		Date	Checked	Drawn	ןׂ E60
		08/03/2018	OG	DC	

600	28033	1.24215	0.44600	-	-	
10	981	2.96841	0.25199	-	-	
10	981	2.96841	0.25199	-	-	
2	6044	0.24090	0.80587	-	-	
4	3825	0.43141	0.69861	_	-	
2	6044	0.24090	0.80587	-	-	
4	3825	0.43141	0.69861	-	-	
4	3825	0.88819	0.52961	_	-	
4	3825	0.93895	0.51574	_	_	
250	18593	0.57427	0.63522	-	_	
			SPACE FOR			
		● 800AF 500AT TYPE . SK				

9	
ES AL NOTES.	
P NOTE TORS HAVE BEEN SIZED TO MAINTAIN VOLTAGE TO PROVIDE REASONABLE EFFICIENCY OF (A)(4) INFORMATIONAL NOTE #2.	А
R THE PROVISION OF THE 500 KVA TRANSFORMER, RY DISCONNECT AND DISTRIBUTION BOARD SHALL ONLY BE PROVIDED AND INSTALLED IF IT IS SERVICE ENTRANCE SECTIONS "SES-144B" AND RE POWER AVAILABLE TO ACCOMMODATE THE LUDE ALL APPRUTENANCES (IE: CONDUITS, ONCRETE PADS, VAULTS, ETC) AS REQUIRED TO SYSTEM TO THE SATISFACTION OF THE	
ECIFICATION SECTIONS HAVE BEEN ADDED TO THIS ADD/ALT ONLY: E CABLES D BONDING FOR ELECTRICAL SYSTEMS ELECTRICAL CONSTRUCTION IQUID FILLED, MEDIUM-VOLTAGE TRANSFORMERS VITCHBOARDS	В
M VOLTAGE NORTH LOOP. 10 MV-105, 15kV, 133%EPR,(1) 1 AWG XHHW GND., MER AS INDICATED. SEE SHEET E301 FOR ON BOARD AS INDICATED. SEE SHEET E300 FOR	
ETS) 103mm (4"), WITH (4) 600 KCMIL XHHW-2 CU., ACH. D0 KCMIL CU., (1) 3/0 A.W.G. CU. NEUTRAL, (1) 2/0 ") C., TS OF (3) 300 KCMIL XHHW-2 CU., (1) 1/0 A.W.G. C. ROOF DISCONNECT WITH LPNRKSP FUSES ERS SPECIFICATIONS TO SERVE NEW CHILLER. ANS AS REQUIRED. MAINTAIN N.E.C. REQUIRED 5B-AHU13-15", PROVIDED WITH INTEGRAL VSD. HILLER IS RATED @ 65,000 A. SCIR.	С
IDUIT AND CONDUCTOR SIZING FOR ALL GH "154-DBPHS". IDUIT AND CONDUCTOR SIZING FOR ALL GH "154-DBPHN".	
	D

	'BID SET'
lber	Office of
nber	Construction
	and Facilities
nber	Management
2	
	Department of Veterans Affairs

VOLTAGE: 120/240 V., 1ø, 3 W.					NTIN	TING: SURFACE TYPE: SQUARE D NQ		
USE and/or AREA SERVED	С/В	CIR NO	LO ØA	AD øB		С/В	USE AND/OR AREA SERVED	
(E) HEAT TRACE CHILLER	20	1	-		2	20/1	(E) RECEPT CHILLER AREA	
(E) HEAT TRACE EXT PIPE	20/1	3		_	4	20	SPARE	
(E) CHEMICAL PUMP	20/1	5	-		6	20	SPARE	
SPARE	20/1	7		-		20/1	SPARE	
SPACE	-	9	-		10	_	SPACE	
SPACE	-	11		-	12	-	SPACE	
SPACE	-	13			14	-	SPACE	
SPACE	-	15		-	16	-	SPACE	
SPACE	-	17	-		18	-	SPACE	
SPACE	-	19		-	20		SPACE	
SPACE	-	21	-		22	-	SPACE	
SPACE	-	23		-	24	-	SPACE	
SPACE	-	25	-		26	-	SPACE	
SPACE	-	27		-	28	_	SPACE	
SPACE	-	29	-		30	-	SPACE	
TOTAL LOAD PER PHAS	E:		_	_		-	• VA ÷ 120V = - AMPS	
* LOAD AT 125% PER N.E.C.		-	_	O PROV	/IDE	MECH	N C.B.'S \triangle NEW C.B.'S IANICAL INTERLOCK PER N.E.C. 210.4(F	

NEW PANELBOARD SCHEDU VOLTAGE: 120/208 V., 3ø, 4 W.	M		S: 225 /	4. M.L.O.	MOU	NTIN	lG:	SURFACE TYPE: GE AQ OR EQUA
USE and/or AREA SERVED	С/В	CIR	ØA	LOAD ØB	ØC	CIR NO	С/В	USE and/or AREA SERVED
SPARE	20	1		-			20	CONTROLS 154-AHU-15-2ND
SPARE	20	3				4	20	SPARE
SPARE	20	5			_	6	20	SPARE
SPARE	20	7	-	-			20/1	SPARE
SPARE	20	9					20/1	SPARE
SPARE	20	11			-		20	SPARE
SPARE	20	13]			20	SPARE
SPARE	20/1	15					20	SPARE
SPARE	20/1	17			_		20	SPARE
SPARE	20/1	19]			20	SPARE
SPACE	-	21				22	-	SPACE
SPACE	-	23			-	24	-	SPACE
SPACE	-	25]		26	-	SPACE
SPACE	-	27				28	-	SPACE
SPACE	-	29		L	-	30	-	SPACE
	20	31	1128]		32	-	SPACE
154-HRP-4-AHU15		33		1128		34	-	SPACE
PUMP	3	35			1128	36	-	SPACE
154-AHU-15-2ND	70	37	5010 3180			38	50	154-AHU-15-2ND
SUPPLY FANS		39	0100	5010 3180		40		RETURN FANS
(2 X 5.0 HP, EACH)	2	41			5010 3180		3	(2 X 3.0 HP, EACH)
TOTAL LOAD PER PHAS			9678	9318	9318			0 VA ÷120V = 80.7 AMPS
₩ LOAD AT 125% PER N.E.C.		(⊃тоск с	DN/OFF DE	VICES ON	L C.B.	s	

SCALE: NOT TO SCALE

-	-	
	-	
-	-	
-	_	
_	-	
-	-	
-	-	
Revisions:	Date	



VOLTAGE: 120/208 V., 3ø, 4 W.		NS: 125 A		MOU	NTIN	G: s	URFACE	TYPE: (S.E. TYPE	Α
USE and/or AREA SERVED	C/B	R ØA	LOAD ØB	ØC	CIR NO	с/в	USE A	nd/or Af	REA SE	RVE
EXIST AC2 LTG, FIRE DAMPERS	20 1	-	-	•	2	20/1		SPA	RE	
SPARE	2013		_	}		20/1	EXIST	RECEPT B	ELOW PAN	NEL
EXIST RECEPT RADIO, FIRE DAMPER	20 5		L		<u> </u>	20				
(1) REPLACEMENT LTG PENTHOUSE	20 7	880 396]		8			EMENT LTG,		
EXIST FIRE DAMPER AC-2	20 9		-]		/ 3	0	UTBOARD F	ENTHOUS	Е (
EXIST LTG ABOVE ELEV CONTROLS	20 1		L	-		20/1	EXIS	T ELEV FIRE	E SERVICE	-
LOAD REMOVED (PER PHASE):		1412	-	-		1412	2 VA÷	120V =	11.7 A	MPS
ADDED LOAD (PER PHAS	1276	-	-		127	6 VA÷	120V =	10.6 A	MPS	
NET LOAD REDUCTION	:	136	_	_		136	VA÷	120V =	1.1 A	MPS

Ӿ LOAD AT 125% PER N.E.C.



PANELBOARD SCHEDULE "154-PEE2" SCALE: NOT TO SCALE 2

NEW DIST. BOARD SCHEDU VOLTAGE: 120/208 V., 3ø, 4 W.	MAINS: 40	0 A. M.L.O.	MOUN	TING: S	SURFACE TYPE: SQUARE D NQ
USE and/or AREA SERVED		LOAD ØB	ØC I	CIR NO С/В	USE and/or AREA SERVED
154–AHU–14–3RD RETURN	100/1 1002 3 5 3	0	10020		154-HWP-11-PENT1 PUMP
SPARE	60 7 <u>-</u> 9 <u>11</u> 3	 0		20 8 10 12 3	154-HPW-12-PENT1 PUMP (NON-SIMULTANEOUS LOAD)
154-HRP-3-AHU14 PUMP	40 13 3630 0 15 17 3) 3630 0	3630	60 14 16 18 3	SPARE
CONTROLS 154-AHU-14-3RD 154-UH-1, 154-UH-2 SPARE	20 <u>19 360</u> 1 <u>-</u> 20 <u>21</u> 1 <u>-</u> 23	432		$\begin{array}{c c} 20 \\ 20 \\ 22 \\ 24 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3$	SPARE
SPARE	_ 25 _			26 -	SPARE
SPARE	_ 27	-		28 -	SPARE
SPARE	_ 29		_	30 -	SPARE
	1503	0	15030	CINEREED SUBFEED	154-AHU-14-3RD SUPPLY

PANELBOARD SCHEDULE "154-DBPHS"

ARCHITECT/ENGINEERS:



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AESUS Architecture, Eng and Sustainable L designgroup 1050 E. Southern Ave, Suite #5, Tempe, Arizona 85.



5

SCALE: NOT TO SCALE

1 2 3 4

GENERAL NOT

SEE SHEET E-002 FOR GENERAL NOTES.

KEY NOTES (#)

EXISTING PANELBOARD SCHEDL	ILE	154	-PE	<u> </u>	LOCA C.B.	TION: MAIN PENTHOUSE RATING: 10,000 A.I.C.
VOLTAGE: 120/208 V., 3ø, 4 W.	MAIN	IS: 125 A	A. M.L.O.	MOUN	NTING: SU	RFACE TYPE: GE NQB
USE and/or AREA SERVED	C/B CIR	ØA		ØC	CIR NO C/B	USE AND/OR AREA SERVED
(1) REPLACEMENT EXHAUST FAN EF-14	20 1	900	900	900	2	SPARE
EXISTING AC-2	30 3 3				4	EXISTING EXHAUST FAN ISOLATION ROOMS HRF-1
LOAD REMOVED (PER PHA	SE):	900	900	900	900	VA ÷ 120V = 7.5 AMPS
ADDED LOAD (PER PHAS	E):	900	900	900	900	VA ÷ 120V = 7.5 AMPS
NET LOAD REDUCTION	:	0	0	0	0	$VA \div 120V = 0$ AMPS

3 PANELBOARD SCHEDULE "154-PEE4" SCALE: NOT TO SCALE

EW IST. BOARD SCHEDUI	LE″15	54-	DB	PH		CATION: SOUTH ROOF PENTHOUSE B. RATING:18,000 A.I.C.	
OLTAGE: 120/208 V., 3ø, 4 W.	MAIN	S: 400 #	A. M.L.O.	MOU	NTING: S	SURFACE TYPE: SQUARE D NQ	
JSE and/or AREA SERVED	C/B CIR	ØA	LOAD ØB	ØC	CIR NO C/B	USE and/or AREA SERVED)
154-AHU-12-4TH SUPPLY	80 1 3 5 3	5010 7260	5010 7260	5010 7260	2 80 2 4 6 3	154-AHU-13-4TH SUPPLY	
154–AHU–12–4TH RETURN	50 7 9 11 3	5010 5010	5010 5010	5010 5010	50 8 10 12 3	154–AHU–13–4TH RETURN	
154-HRP-1-AHU12 PUMP	20 13 15 17 3	1128 1128	1128 1128	<u>1128</u> 1128	20 14 16 18 3	154-HRP-2-AHU13 PUMP	
	60 19	4620 360	-	1120	20 20 1	CONTROLS 154-AHU-12-4TH	
154-CHWP-03-CHLR05 PUMP	21		4620 360]	20 1	CONTROLS 154-AHU-13-4TH	
	3 23			4620 432	20	154-UH-3, 154-UH-4	
154-CHWP-04-CHLR05 PUMP	60 25	 0			26 -	SPARE	
(NON-SIMULTANEOUS LOAD)	27		- 0		28 -	SPARE	
(NON-SIMULTANEOUS LOAD)	3 29			 0	30 -	SPARE	
SPARE	_ 31	_			32 -	SPARE	
SPARE	_ 33				34 -	SPARE	
SPARE	_ 35		·	_	36 -	SPARE	
		29526	29536	29598	295	98 VA ÷120V = 246.7AMPS	

load at 125% per n.e.c.

LOCK ON/OFF DEVICES ON C.B.'s

PANELBOARD SCHEDULE "154-DBPHN" 6 SCALE: NOT TO SCALE

	Drawing Title PANELBOARD	Project Title REPLACE P	Project Numb 436-17-102		
gineering,	SCHEDULES	HVAC SYSTE CONTRACT NO. VA259			Building Numb 154
Design	Approved: Project Director	Location FT. HARRISON		HELENA, MT	Drawing Numb
na 85282, (480) 751-9542		Date 08/03/2018	Checked OG	Drawn DC	E700

6 7 8

TE	S

1. EXCERCISE CIRCUIT BREAKER PRIOR TO RE-USING TO VERIFY IN GOOD CONDITION. REPLACE AS REQUIRED.

'BID SET' nber Office of Construction nber and Facilities Management umber)() Department of Veterans Affairs --