STATE OF HAWAII

DEPARTMENT OF DEFENSE

OFFICE OF THE ADJUTANT GENERAL

JOB NO. CA-1009-D

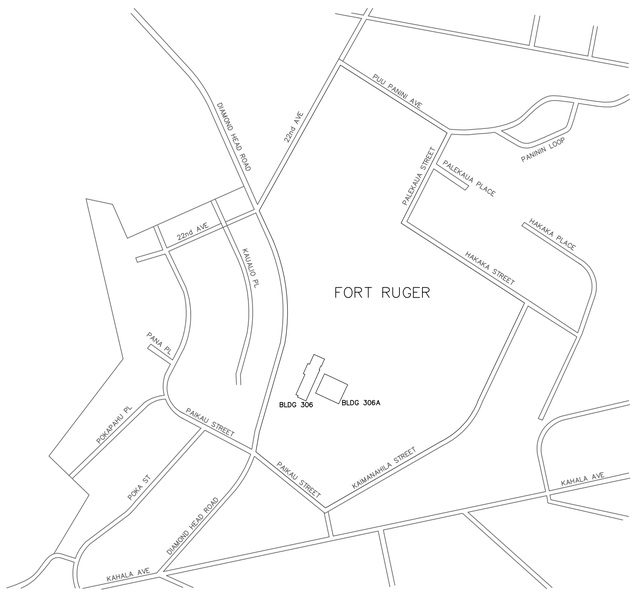
BUILDING 306 AIR CONDITIONING IMPROVEMENTS

FORT RUGER, HAWAII

ELECTRICAL ENGINEER: DOUGLAS ENGINEERING PACIFIC, INC.

MECHANICAL ENGINEER: DOUGLAS ENGINEERING PACIFIC, INC.

1 / T-1 LOCATION MAP
NOT TO SCALE



2 / T-1 VICINITY MAP
NOT TO SCALE

INDEX TO DRAWINGS

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ALBERT S. HIRATA
LICENSED PROFESSIONAL ENGINEER
No. 10717-M
HAWAII, U.S.A.

4/30/12
EXP. DATE

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

TITLE SHEET

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. T-1

LEGEND

SUPPLY AIR DIFFUSER TAG

CFM

RETURN AIR GRILLE TAG

CFM

XXX–X EQUIPMENT–NUMBER

THERMOSTAT

EXISTING COLD WATER (CW)

EXISTING HOT WATER (HW)

EXISTING VENT (V)

EXISTING WASTE (W)

EXISTING GAS (G)

NEW GAS (G)

NEW COLD WATER (CW)

NEW HOT WATER (HW)

NEW VENT (V)

NEW WASTE (W)

EXISTING CONDENSER WATER SUPPLY (CWS)

EXISTING CONDENSER WATER RETURN (CWR)

NEW CONDENSER WATER SUPPLY (CWS)

NEW CONDENSER WATER RETURN (CWR)

EXISTING CHILLED WATER SUPPLY (CHWS)

EXISTING CHILLED WATER RETURN (CHWR)

NEW CHILLED WATER SUPPLY (CHWS)

NEW CHILLED WATER RETURN (CHWR)

EXISTING DUCTWORK

NEW DUCTWORK

FLEX DUCTWORK

EXHAUST DUCT UP

MAKE UP AIR DUCT UP

SUPPLY DUCT UP

RETURN DUCT UP

NEW SUPPLY AIR DIFFUSER(SAD)

NEW RETURN AIR GRILLE(RAG)

BACK DRAFT DAMPER (BDD)

VOLUME DAMPER

ABBREVIATIONS

AD	AREA DRAIN
BDD	BACK DRAFT DAMPER
BS	BAR SINK
CO	CLEAN OUT
CHWS	CONDENSER WATER SUPPLY
CHWR	CONDENSER WATER RETURN
CO	CLEAN OUT
CW	COLD WATER
CDWS	CONDENSER WATER SUPPLY
CDWR	CONDENSER WATER RETURN
CHWS	CHILLER WATER SUPPLY
CHWR	CHILLER WATER RETURN
(E)	EXISTING
EF	EXHAUST FAN
FCO	FLOOR CLEAN OUT
FD	FLOOR DRAIN
FS	FLOOR SINK
GT	GREASE TRAP
GWH	GAS WATER HEATER
HW	HOT WATER
HS	HAND SINK
KSF	KITCHEN SUPPLY FAN
LL	LIQUID LINE
MS	MOP SINK
(N)	NEW
OA	OUTSIDE AIR
OAE	OR APPROVED EQUAL
P.O.C.	POINT OF CONNECTION
POR	POINT OF REMOVAL
PS	POT SINK
(R)	REMOVE
RTU	ROOF TOP UNIT
SK	SINK
SL	SUCTION LINE
TBR	TO BE REMOVED
V	VENT
VD	VOLUME DAMPER
VTR	VENT THRU ROOF
W	WASTE
WCO	WALL CLEAN OUT

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ROBERT S. ASHIN LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

4/30/12
EXP. DATE

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

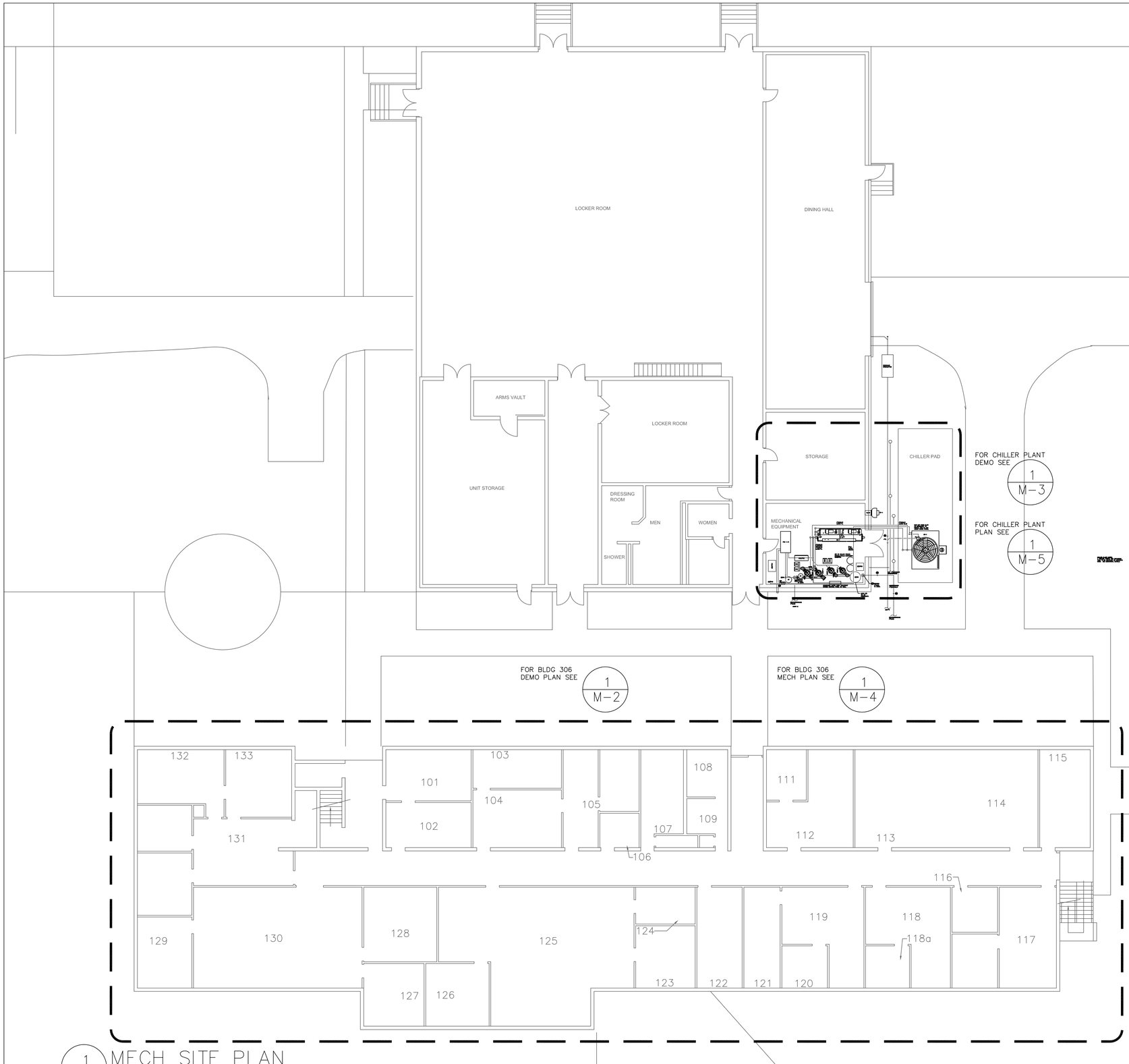
FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL LEGEND AND ABBREVIATION

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M–0



1 M-1 MECH SITE PLAN
3/32" = 1'-0"

NOTES:

1. CONTRACTOR TO SCHEDULE/SEQUENCE WORK TO MINIMIZE THE IMPACT ON FACILITY OPERATIONS AND TO MAINTAIN BLDG. AIR CONDITIONING WHENEVER POSSIBLE. CONTACT BLDG. FACILITIES MANAGER FOR COORDINATION.
2. EACH AIR HANDLING UNIT (AH) AND CORRESPONDING AREA SHALL BE BE OFFLINE A MAXIMUM OF FIVE DAYS.
3. EACH FAN COIL UNIT (FC) AND CORresponding AREA SHALL BE OFFLINE FOR A MAXIMUM OF THREE DAYS.

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL SITE PLAN

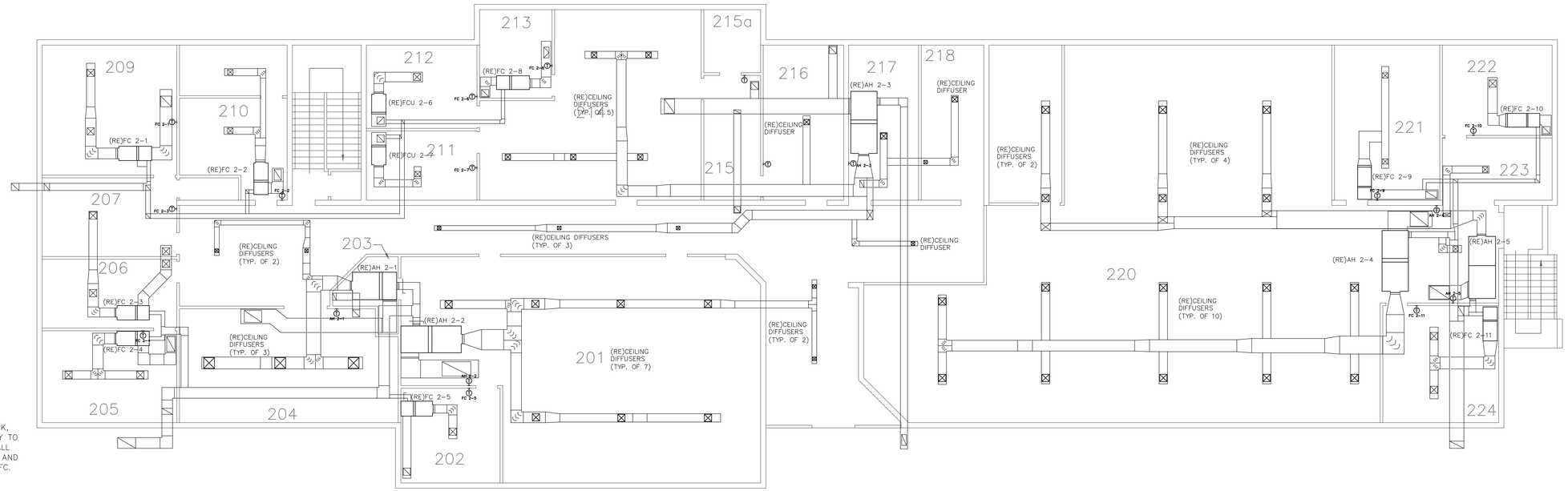
DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ _____
CHIEF ENGINEER DATE

DRAWING NO. M-1

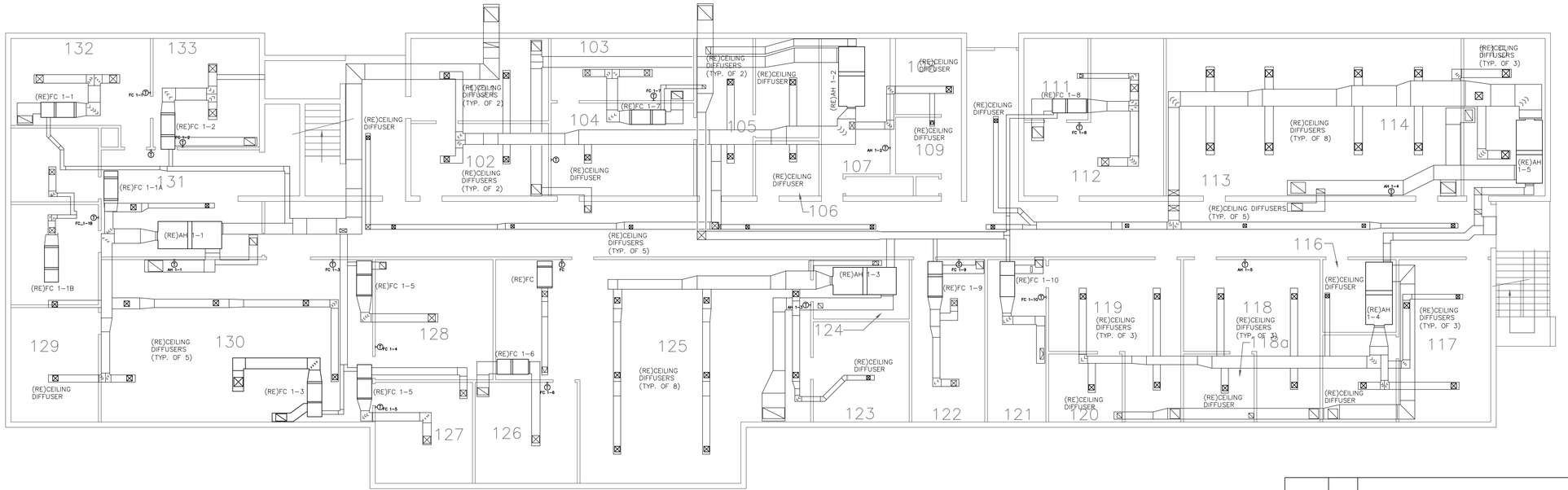
JOB NO. F58B631B

SHEET NO. 3 OF XX SHEETS



DEMOLITION NOTES:
1. REMOVE SUPPLY/RETURN DUCTWORK, CHWS/R, & CD PIPING AS NECESSARY TO ACCOMMODATE (N)AH/FC. REMOVE ALL DUCTWORK INSULATION EXTENDING 3' AND ALL PIPING INSULATION 5' FROM AH/FC.
2. REMOVE ALL THERMOSTATS.

1 / M-2 BLDG 306 UPPER FLOOR DEMOLITION PLAN
1/8" = 1'-0"



DEMOLITION NOTES:
1. REMOVE SUPPLY/RETURN DUCTWORK, CHWS/R, & CD PIPING AS NECESSARY TO ACCOMMODATE (N)AH/FC. REMOVE ALL DUCTWORK INSULATION EXTENDING 3' AND ALL PIPING INSULATION 5' FROM AH/FC.
2. REMOVE ALL THERMOSTATS.

1 / M-2 BLDG 306 LOWER FLOOR DEMOLITION PLAN
1/8" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ROBERT S. MAIN
LICENSED PROFESSIONAL ENGINEER
No. 10717-M
HAWAII, U.S.A.

4/30/12
EXP. DATE

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STATE OF HAWAII
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ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

DEMOLITION PLAN – BLDG. 306

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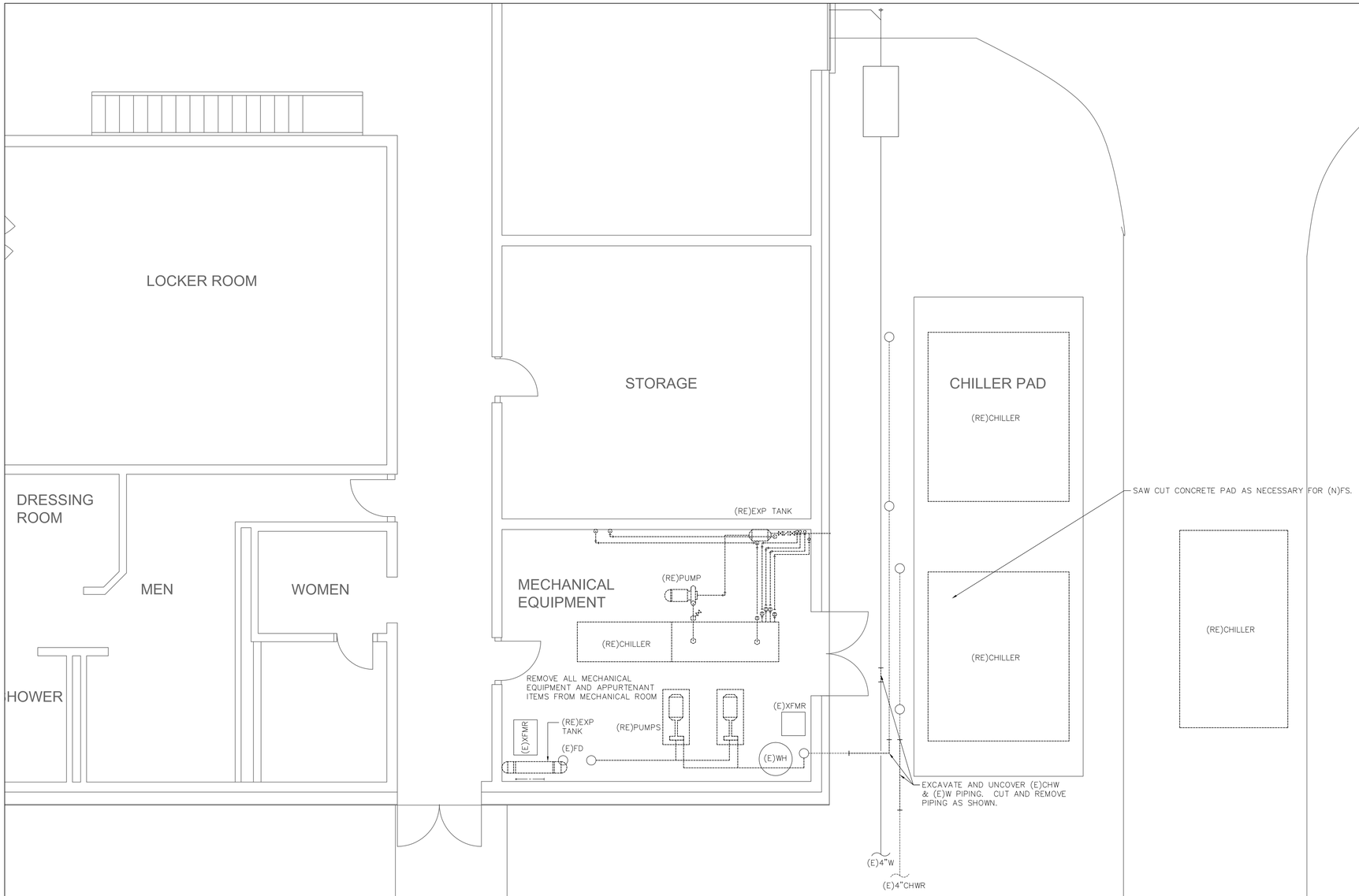
CHIEF ENGINEER DATE

DRAWING NO. M-2



1 / M-3 CHILLER PLANT DEMOLITION PLAN

1/4" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

STATE OF HAWAII
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ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

CHILLER PLANT DEMOLITION PLAN

ASH, ROBERT S. — LICENSED PROFESSIONAL ENGINEER — No. 10717-M — HAWAII, U.S.A.

4/30/12
EXP. DATE

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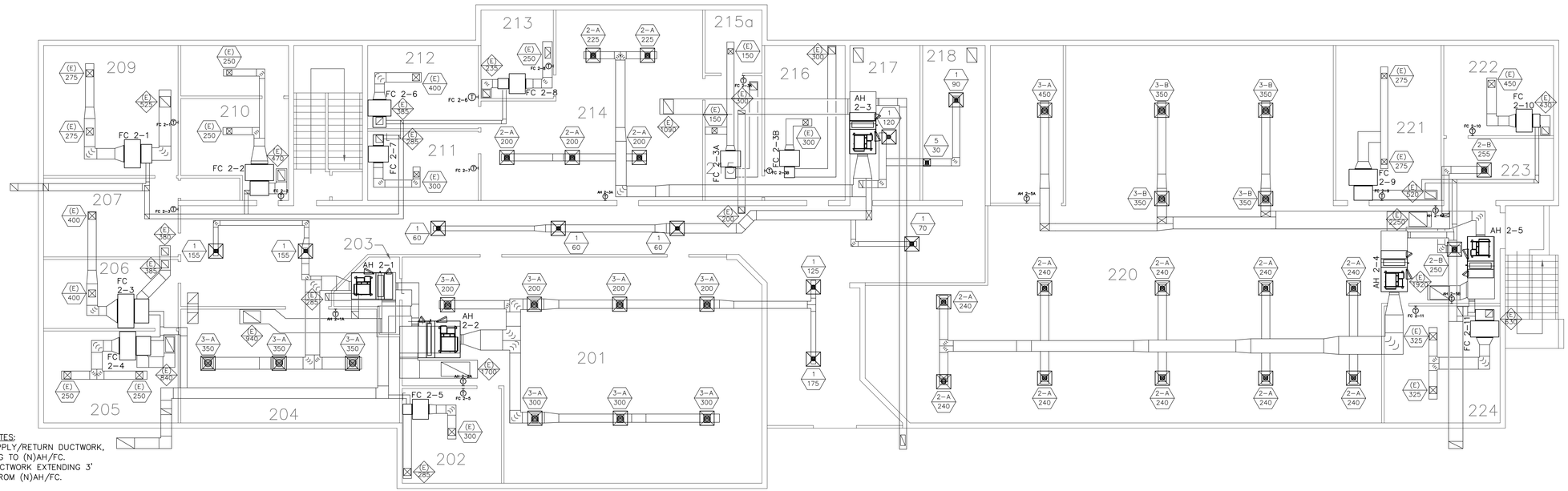
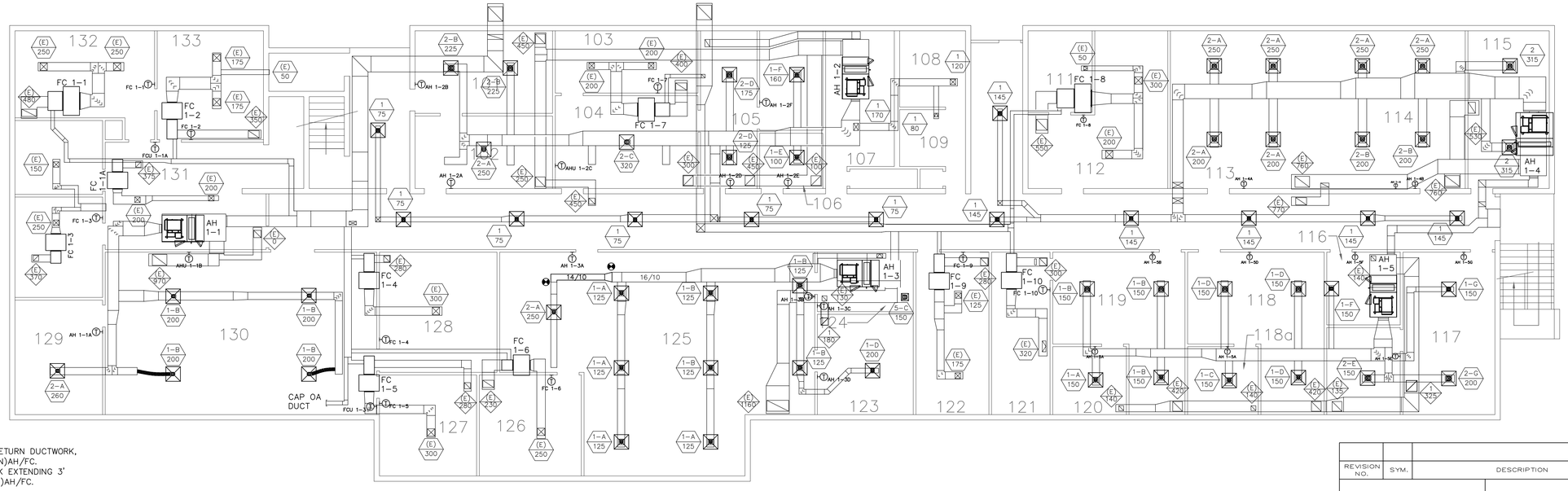
APPROVED: _____ CHIEF ENGINEER _____ DATE

DRAWING NO. M-3



AIR CONDITIONING NOTES:
1. RECONNECT (E)SUPPLY/RETURN DUCTWORK, CHWS/R, & CD PIPING TO (N)AH/FC. RE-INSULATE ALL DUCTWORK EXTENDING 3' AND ALL PIPING 5' FROM (N)AH/FC.

1 / M-4 BLDG 306 UPPER FLOOR AIR CONDITIONING PLAN
1/8" = 1'-0"



AIR CONDITIONING NOTES:
1. RECONNECT (E)SUPPLY/RETURN DUCTWORK, CHWS/R, & CD PIPING TO (N)AH/FC. RE-INSULATE ALL DUCTWORK EXTENDING 3' AND ALL PIPING 5' FROM (N)AH/FC.

2 / M-4 BLDG 306 LOWER FLOOR AIR CONDITIONING PLAN
1/8" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ALBERT S. KAWAMOTO
LICENSED PROFESSIONAL ENGINEER
No. 10717-M
HAWAII, U.S.A.

4/30/12
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FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

AIR CONDITIONING PLAN – BLDG. 306

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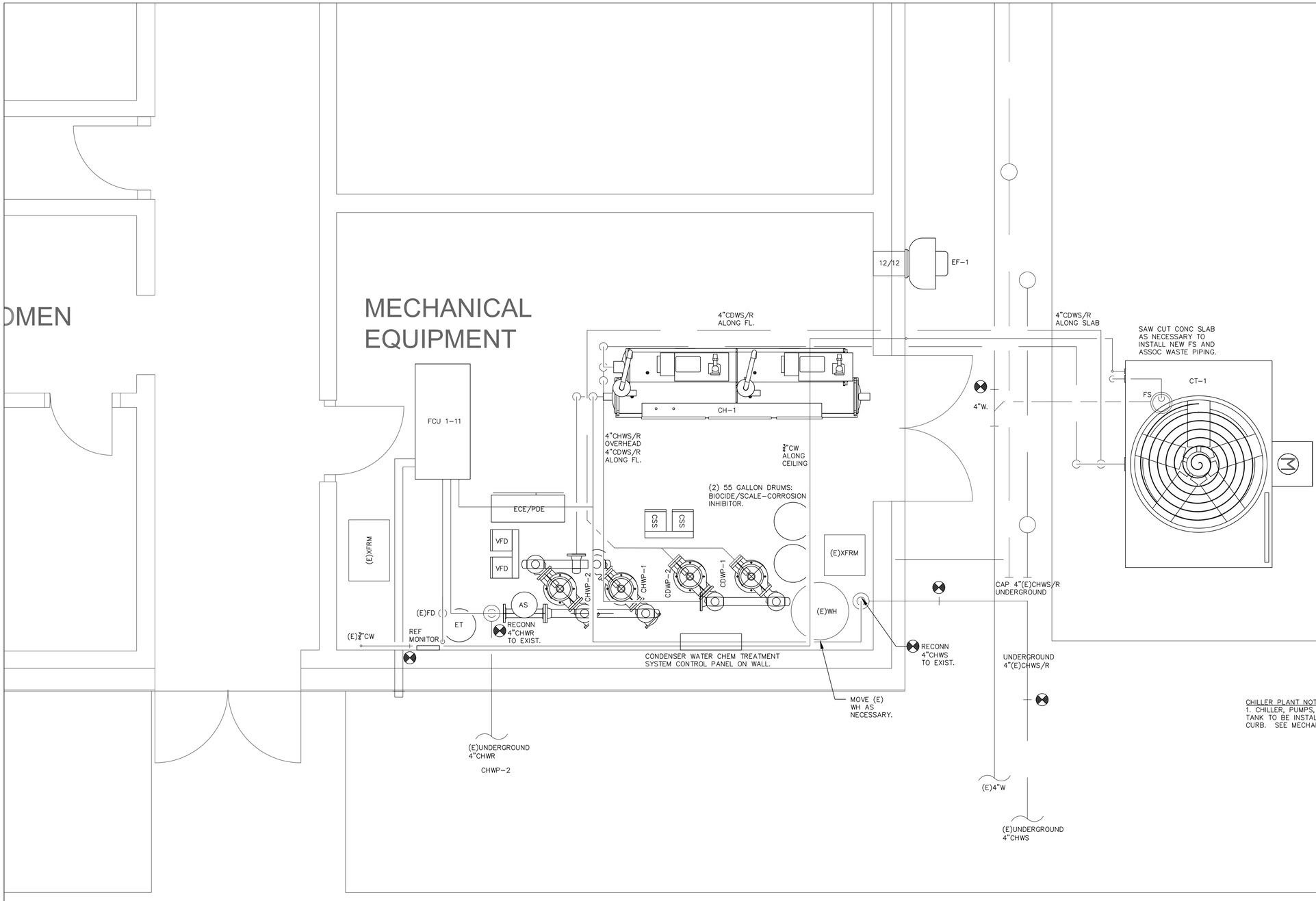
CHIEF ENGINEER

DRAWING NO. M-4

JOB NO. F58B631B



CHILLER PLANT NOTES:
1. CHILLER, PUMPS, AND EXPANSION TANK TO BE INSTALLED ON CONCRETE CURB. SEE MECHANICAL DETAILS.

1 / M–5 CHILLER PLANT PLAN
1/2" = 1'–0"

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

HARRY S. KIM LICENSED PROFESSIONAL ENGINEER No. 10717–M HAWAII, U.S.A.

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STATE OF HAWAII
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ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

CHILLER PLANT PLAN

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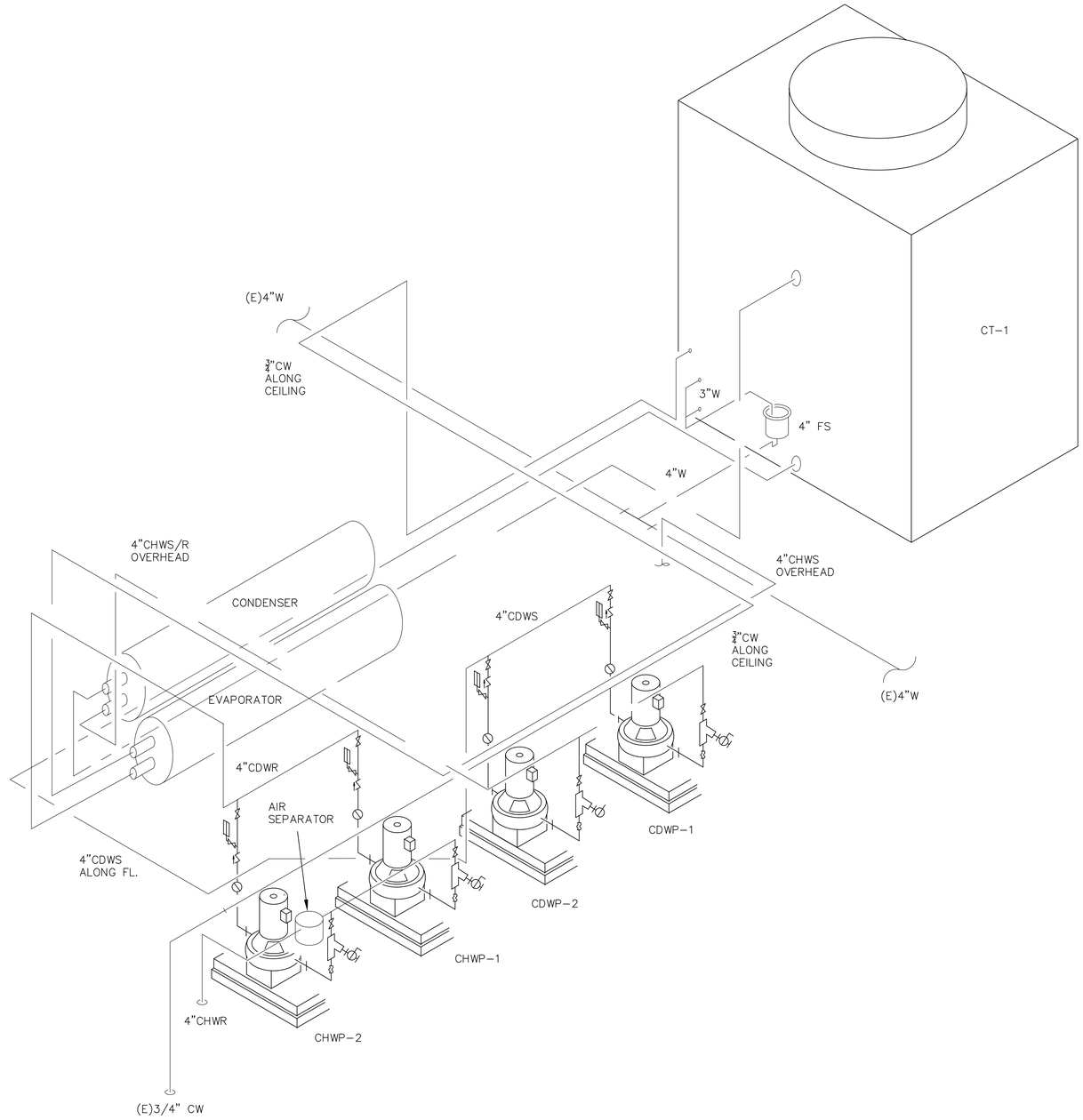
APPROVED:			DRAWING NO. M–5
CHIEF ENGINEER		DATE	



1 / M-6 CHILLER PLANT DIAGRAM
N.T.S.

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ROBERT S. ASH LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

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FT. RUGER, HAWAII – BUILDING 306
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HONOLULU, HAWAII

CHILLER PLANT DIAGRAM

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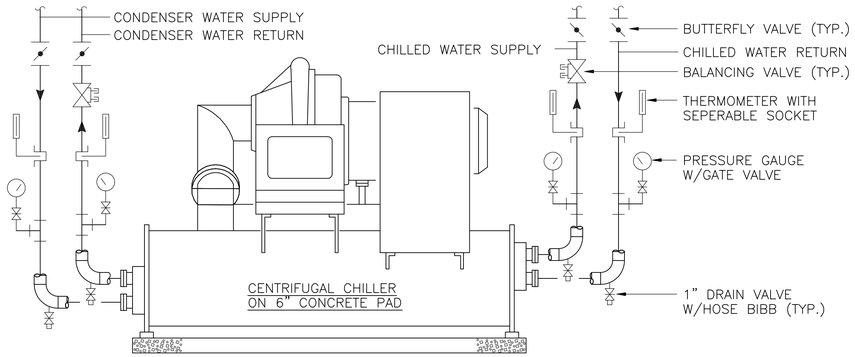
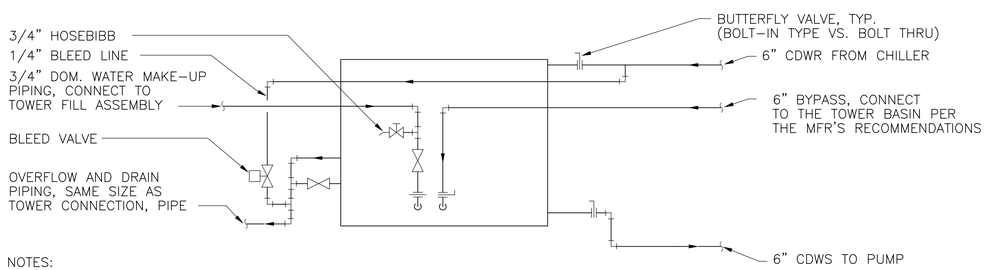
APPROVED: _____ CHIEF ENGINEER _____ DATE

DRAWING NO. M-6

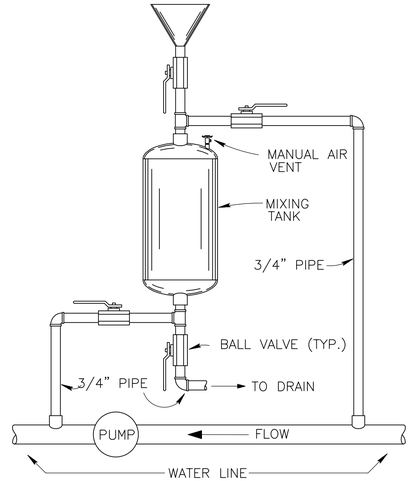


1 / M-7 CHILLER PIPING DETAIL
N.T.S.

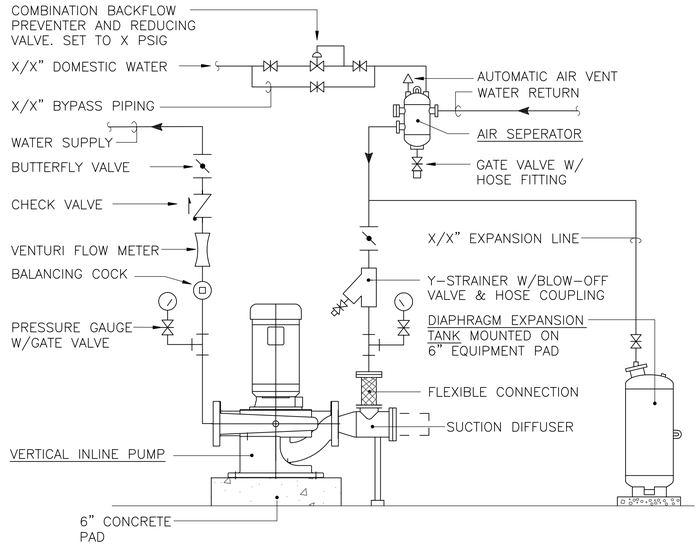


NOTES:
1. PROVIDE PIPE SUPPORTS PER DETAIL(S) ON SHEET M-8. SPACE SUPPORTS IN ACCORDANCE WITH SECTION 15501 OF THE SPECIFICATIONS.
2. INSTALL PIPING TO PERMIT COMPLETE MAINTENANCE ACCESS TO THE TOWER.

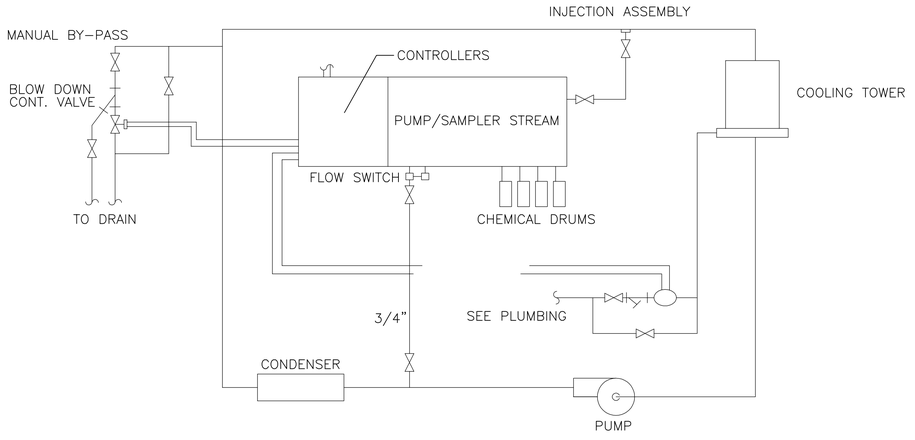
2 / M-7 COOLING TOWER PIPING
N.T.S.



3 / M-7 CHEMICAL FEEDER DETAIL
N. T. S.



4 / M-7 END-SUCTION PUMP, MAKEUP WATER, AND EXPANSION TANK DETAIL
N.T.S.



5 / M-7 CONDENSER WATER TREATMENT DETAIL
N.T.S.

6 / M-7 VIBRATION ISOLATOR DETAIL
N.T.S.

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FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL DETAILS

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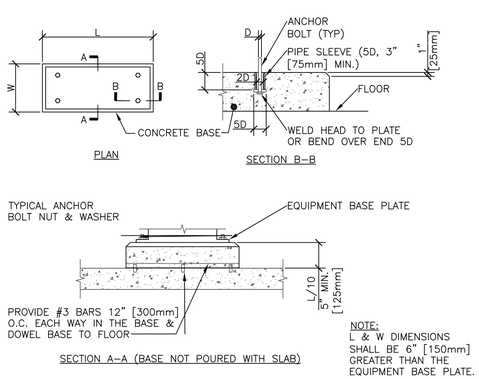
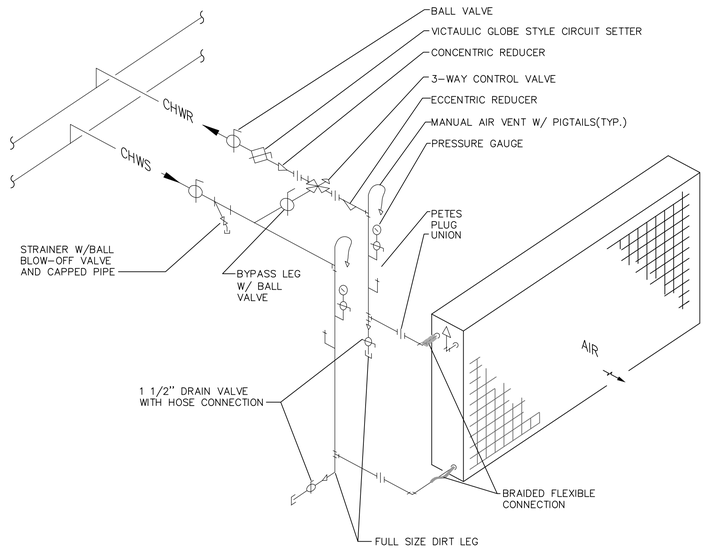
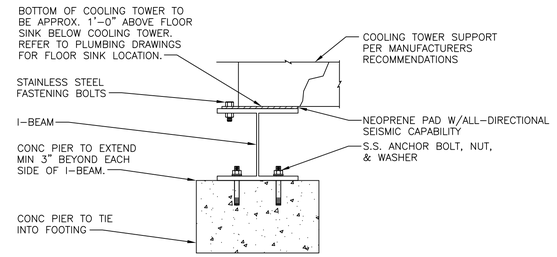
CHIEF ENGINEER		DATE	



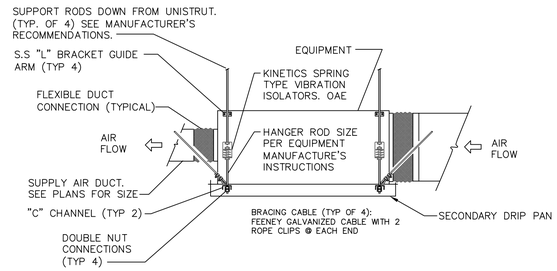
1 M-8 CONCRETE EQUIPMENT BASES
N.T.S.



2 M-8 COIL CONNECTION DETAIL
N.T.S.

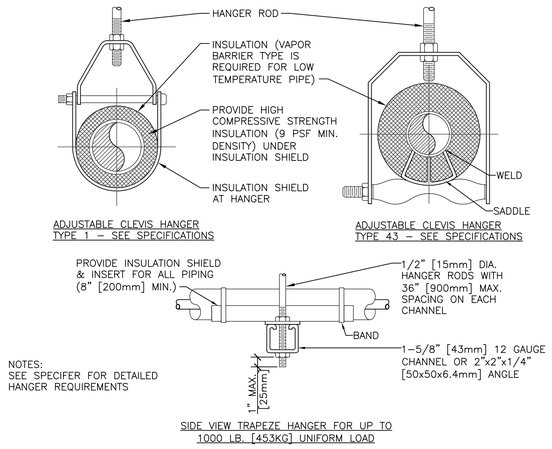


3 M-8 COOLING TOWER MOUNTING DETAIL
N.T.S.



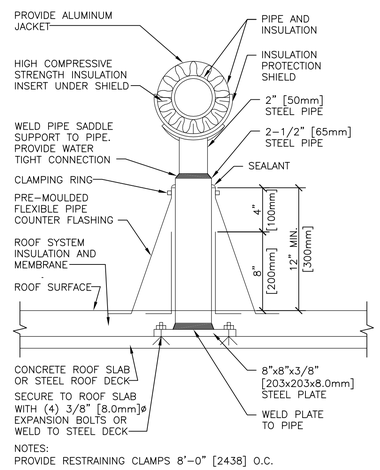
NOTE: LOCATE HANGER RODS AND VIBRATION ISOLATORS IN A LOCATION THAT DOES NOT HINDER SERVICE ACCESS TO UNIT.

4 M-8 EQUIPMENT HANGING DETAIL
N.T.S.



MAXIMUM PIPE/TUBING SUPPORT SPACING																				
NOM. SIZE	IN. [mm]	THRU 3/4 THRU [20]	1 [25]	1 1/4 [32]	1 1/2 [40]	2 [50]	2 1/2 [65]	3 [75]	4 [100]	5 [125]	6 [150]	8 [200]	10 [250]	12 [300]	14 [350]	16 [400]	18 [450]	20 [500]	24 [600]
PIPE	FT. [mm]	7 [2100]	7 [2100]	7 [2100]	9 [2700]	10 [3000]	11 [3400]	12 [3700]	14 [4100]	16 [4900]	17 [5200]	19 [5800]	22 [6700]	23 [7000]	25 [7600]	27 [8200]	28 [8500]	30 [9100]	32 [9600]
TUBING	FT. [mm]	5 FT [1500]	6 [1800]	7 [2100]	8 [2400]	8 [2400]	9 [2700]	10 [3000]	12 [3700]	13 [4000]	14 [4100]	16 [4900]	– –	– –	– –	– –	– –	– –	– –
NOTE: FOR TRAPEZE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZE.																				

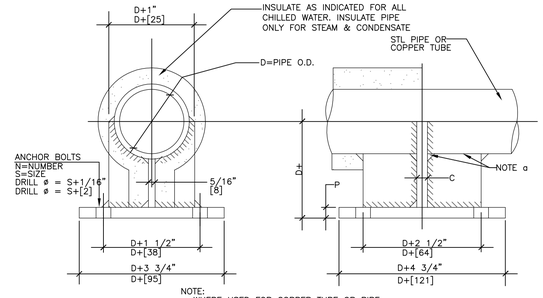
5 M-8 PIPE HANGERS
N.T.S.



NOTES:
PROVIDE RESTRAINING CLAMPS 8'-0" [2438] O.C.

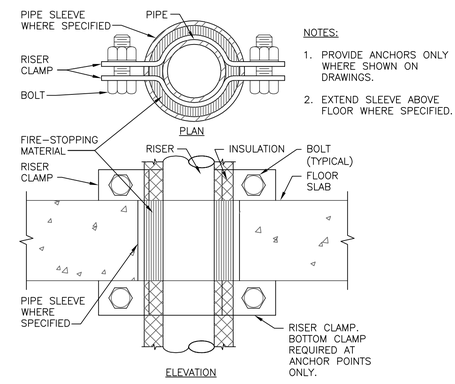
6 M-8 FLOOR MOUNTED PIPE DETAIL
N.T.S.

PIPE ANCHOR SCHEDULE											
D		P		C		N		S		BOLT PATTERN
IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	
4"	102	5/8"	16	3/4"	19	4"	102	3/4"	19	
3"	76	1/2"	13	1/2"	13	4"	102	5/8"	16	
2 1/2"	64	5/8"	10	5/8"	10	4"	102	5/8"	16	
2"	51	5/8"	10	5/8"	10	4"	102	5/8"	16	
1 1/2"	38	3/4"	10	1/4"	6	4"	102	1/2"	13	



NOTE:
a.WHERE USED FOR COPPER TUBE OR PIPE, BRAZE TO FABRICATED STEEL ANCHOR

6 M-8 SMALL PIPE ANCHOR 1 1/2" - 4"
N.T.S.



NOTES:
1. PROVIDE ANCHORS ONLY WHERE SHOWN ON DRAWINGS.
2. EXTEND SLEEVE ABOVE FLOOR WHERE SPECIFIED.

7 M-8 SUPPORT/ANCHOR FOR PIPE RISERS
N.T.S.

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ALBERT S. SHIN LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

4/30/12
EXP. DATE

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII - BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL DETAILS

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M-8

JOB NO. F58B631B

SHEET NO. 10 OF XX SHEETS

CHILLER SCHEDULE

MARK	DESCRIPTION	LOCATION	CAPACITY (TONS)	CONDENSER EWT (F)	CONDENSER LWT (F)	CONDENSER FLOW (GPM)	CONDENSER PD (FT. WG)	EVAP. PIPING	EVAP. EWT (F)	EVAP LWT (F)	EVAP FLOW (GPM)	EVAP PD (FT. WG)	INPUT POWER (KW)	IPLV (KW/TON)	POWER			OPER. WT. (lbs)	MANUFACTURER	MODEL
															VOLT/PH/HZ	MCA	MOCP			
CH-1	WATER COOLED SCREW	BLDG. 306A MECH. RM.	78.6	85	95	225	17.4	2	54	42	156.5	15.7	55.9	0.515	460 / 3 / 60	92.0	125.0	5,732	TRANE	RTWD

COOLING TOWER SCHEDULE

TAG	TYPE	CAPACITY (TON)	GPM	EWT °F	LWT °F	WB °F	V	PH	MOTOR QTY	FAN MOTOR HP	VFD	WEIGHT (LBS)	MANUFACTURER	MODEL	COMMENTS
CT-1	INDUCED DRAFT	84.53	225	95	85.0	78.0	460	3.0	1	3	Y	5,250	EVAPCO	USS-19-56L	STAINLESS STEEL

MECHANICAL NOTES: EQUIP WITH FAN VIBRATION SHUT-OFF SWITCH

AIR HANDLER UNIT SCHEDULE

MARK	SERVES	CFM (TOTAL)	CFM (O.A.)	ESP (IN)	COOLING COIL DATA					FAN DATA							WEIGHT	BASIS OF DESIGN	MECH NOTES
					SENS CAP (MBH)	TOTAL CAP (MBH)	ENT WB/DB (°F)	ROWS	GPM	MOTOR HP/W	FAN RPM	FLA	MCA	MAX FUSE	V	PH			
AH 1-1	129-130	1060	90	1.1	24.69	29.30	62.9/75.9	4	4.86	3/4 hp	1800	3.70	4.63	15	208	3	503.1	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 1-2	101-102, 104-109, HALL	2400	400	1.2	54.50	70.00	62.3/75.6	4	11.62	2 hp	1800	7.80	9.75	17.55	208	3	780.4	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 1-3	123-125	1500	130	1.1	36.65	45.20	63.2/75.8	4	7.51	1 hp	1800	4.80	6.00	10.80	208	3	686.9	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 1-4	113-115, HALL	3300	480	1.3	79.89	101.00	64.2/76.1	6	16.77	3 hp	1800	11.00	13.75	24.75	208	3	929.2	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 1-5	116-120	1650	130	1.2	36.03	41.60	62.7/75.7	2	6.91	1.5 hp	1800	6.90	8.63	15.53	208	3	643.3	HORIZONTAL CABINET DUCT FR/RTRN	1
																		HORIZONTAL CABINET DUCT FR/RTRN	1
AH 2-1	204, HALL	1360	135	1.2	30.72	40.80	64.2/76.5	4	6.77	1 hp	1800	4.80	6.00	10.80	208	3	662.3	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 2-2	201, HALL	2000	300	1.3	49.79	59.03	62.6/75.8	6	9.80	1.5 hp	1800	6.90	8.63	15.53	208	3	679.7	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 2-3	214-218	1650	300	1.2	35.86	44.10	64.2/76.5	4	7.32	1.5 hp	1800	6.90	8.63	15.53	208	3	671.2	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 2-4	220	2400	150	1.2	55.34	64.90	62.6/75.5	4	10.78	2 hp	1800	7.80	9.75	17.55	208	3	751.2	HORIZONTAL CABINET DUCT FR/RTRN	1
AH 2-5	220, 223	2100	130	1.2	51.66	60.20	62.3/75.5	6	10.00	2 hp	1800	7.80	9.75	17.55	208	3	684.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-1	132	475	20	0.230	11.76	12.59	61.1/75.5	4	2.12	0.22/55	1198	-	3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-1A	131	425	25	0.280	9.89	13.15	63.4/75.9	4	2.26	0.22/143	1585		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-2	133	425	20	0.283	9.95	12.52	62.6/75.6	4	2.16	0.22/143	1585		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-3	131a/b	425	30	0.283	10.18	12.57	62.5/76.0	4	2.16	0.22/143	1585		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-4	128	305	20	0.255	6.77	8.53	63.2/75.8	4	1.46	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-5	127	305	20	0.255	6.94	8.03	62.1/75.6	4	1.38	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-6	126	255	20	0.276	6.16	7.55	62.8/75.9	4	1.29	0.22/70	1440		3.38	15	115	1	63.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-7	103	425	15	0.282	10.20	11.84	61.5/75.4	4	2.05	0.22/143	1585		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-8	111-112	600	0	0.298	14.05	15.97	62.0/75.7	4	2.72	0.22/117	1435		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-9	122	305	20	0.255	6.74	8.53	63.4/75.8	4	1.48	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-10	121	350	20	0.285	8.55	10.78	62.4/75.5	4	1.85	0.22/99	1381		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 1-11	306A MECH RM	730	0	0.166	16.80	19.49	62.0/76.0	4	3.32	0.24/153	1329		4.50	15	115	1	156.4	HORIZONTAL CABINET GRILL FR/RTRN	1
FC 2-1	209	600	25	0.298	13.83	16.15	62.3/75.6	4	2.75	0.22/117	1435		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-2	210	475	30	0.227	11.29	13.50	62.5/75.6	4	2.27	0.22/55	1198		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-3	206-207	805	35	0.254	17.92	20.71	61.9/75.7	4	3.57	0.24/233	1530		4.50	15	115	1	156.4	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-3A	215-215a	300	25	0.255	7.12	8.07	62.0/76.0	4	1.39	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-3B	216	300	20	0.254	6.98	7.77	61.5/75.3	4	1.34	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-4	205	475	20	0.227	11.46	13.31	62.2/75.7	4	2.24	0.22/55	1198		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-5	202	300	15	0.255	6.97	8.14	62.3/75.8	4	1.40	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-6	212	425	15	0.282	10.05	12.20	62.1/75.5	4	2.11	0.22/143	1585		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-7	211	300	15	0.255	6.98	8.05	62.1/75.7	4	1.38	0.22/82	1485		3.38	15	115	1	91.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-8	213	255	15	0.276	6.30	7.20	61.9/75.8	4	1.23	0.276/70	1440		3.38	15	115	1	63.1	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-9	224	600	30	0.298	13.74	16.31	62.5/75.6	4	2.77	0.22/117	1435		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-10	222	355	20	0.257	8.70	10.95	62.4/75.5	4	1.87	0.22/99	1368		3.38	15	115	1	118.9	HORIZONTAL CABINET DUCT FR/RTRN	1
FC 2-11	224	630	20	0.235	14.69	16.10	61.5/75.5	4	2.74	0.22/117	1411		3.38	15	115	1	148.5	HORIZONTAL CABINET DUCT FR/RTRN	1

MECHANICAL NOTES:

1. ENTERING CHILLED WATER TEMPERATURE = 42 DEG. F.

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

4/30/12
EXP. DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL SCHEDULES

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M-9

SUPPLY DIFFUSER/ GRILLE SCHEDULE

MARK	MAX STATIC PD (IN WG)	MAX NC	MATERIAL	DAMPER (Y/N)	SIZE (IN.)	NECK (IN.)	FRAME TYPE	FINISH	BASIS OF DESIGN	MECH NOTES
1	0.13	30	ALUMINUM	N	24x24	6"	T-BAR LAY IN	WHITE	ACUTHERM TF-C	1
2	0.13	30	ALUMINUM	N	24x24	8"	T-BAR LAY IN	WHITE	ACUTHERM TF-C	1
3	0.13	30	ALUMINUM	N	24x24	10"	T-BAR LAY IN	WHITE	ACUTHERM TF-C	1
4	0.13	30	ALUMINUM	N	24x24	12"	T-BAR LAY IN	WHITE	ACUTHERM TF-C	1

MECHANICAL NOTES:

AIR SEPARATOR SCHEDULE

MARK	LOCATION	SERVES	TOTAL GPM	MIN FILTER EFF (%)	COLLECT CAP (GAL)	MAX PD (FT)	PURGE SIZE	D x H (INCHES)	BASIS OF DESIGN	MECH NOTES
AS	MECH ROOM	CH-1	156.5			1.5	0.75	10X24	AMTROL 3-AS	1

MECHANICAL NOTES:

1. 125 PSI WORKING PRESSURE

EXPANSION TANK SCHEDULE

MARK	LOCATION	SERVES	TANK VOLUME (GAL)	ACCEPTANCE VOLUME/TANK	ASME RATING PSIG	OPERATING TEMP (°F)	BASIS OF DESIGN	MECH NOTES
ET	MECH ROOM	CH-1	21.7	11.3	125	42	AMTROL AX-40V	1

MECHANICAL NOTES:

1. FLOOR MOUNTING W/SKIRT

EXHAUST FAN SCHEDULE

MARK	LOCATION	FAN DATA: FAN TYPE	FAN DATA: CFM	FAN DATA: EXTERNAL SP (IN WG)	FAN DATA: FAN RPM	MOTOR: DRIVE TYPE	MOTOR: POWER (HP)	MOTOR: V	MOTOR: PH	MOTOR: AMPS	WEIGHT (LBS)	MAX. SONES	BASIS OF DESIGN	NOTES
EF-1	SEE PLANS	CABINET	1,400	0.25	1,075	DIRECT	.18	120	1		72	10.9	Loren Cook 135W11D	1,2

MECHANICAL NOTES:

1. EXHAUST FAN SHALL BE CONTROLLED BY REFRIGERANT MONTOR.
2. EXHAUST FAN SHALL BE PROVIDED WITH GRAVITY BACKDRAFT DAMPER, SQUARE INLET GRILLE, EXTENDED LUBE LINES, AND BE PHENOLIC COATED.

PUMP SCHEDULE:

MARK	LOCATION	USE	PUMP TYPE	GPM	TOTAL HEAD ft. WG	RPM	ELECTRICAL: HP	ELECTRICAL: V	ELECTRICAL: PH	ELECTRICAL: HZ	WEIGHT (LBS)	BASIS OF DESIGN	NOTES
CHWP-1,2	MECH. ROOM	CHILLED WATER PUMP	VERTICAL IN-LINE	157	75	1,750	7.5	460	3	60	261	GRUNDFOS 20959 VL	1, 2, 3
CDWP-1,2	MECH. ROOM	CONDENSER WATER PUMP	VERTICAL IN-LINE	225	50	1,750	5	460	3	60	253	GRUNDFOS 30957 VL	1

MECHANICAL NOTES:

1. FLEXIBLE CONNECTIONS AT PUMP INLET & OUTLET
2. PROVIDE PUMP WITH VFD
3. PROVIDE PUMP WITH SUCTION DIFFUSER

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ALBERT S. ARAKAKI
LICENSED PROFESSIONAL ENGINEER
No. 10717-M
HAWAII, U.S.A.

4/30/12
EXP. DATE

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

MECHANICAL SCHEDULES

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
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APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M-10

Single Water Cooled Chiller and Cooling Tower (typical of 1)

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.).

To prevent short cycling, the chiller shall run for and be off for minimum adjustable times (both user definable), unless shutdown on safeties or outside air conditions.

The chiller shall run subject to its own internal safeties and controls.

Emergency Shutdown:
The chiller shall shut down and an alarm generated upon receiving an emergency shutdown signal status.

Refrigerant Detection:
The chiller shall shut down and an alarm generated upon receiving a refrigerant leak detection status.

Cooling Tower Vibration Switch:
The chiller and cooling tower shall shut down and an alarm generated upon receiving a vibration switch status.

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 therefore have:

- 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.

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
- daily
- weekly
- monthly

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.

Condenser Water Pump Lead/Standby Operation:
The condenser water pumps shall run anytime the chiller is called to run.

The lead pump shall start prior to the chiller being enabled and shall stop only after the chiller is disabled. The pumps shall therefore have:

- 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.

The condenser water 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
- daily
- weekly
- monthly

Alarms shall be provided as follows:

- Condenser 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.
- Condenser 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.

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 definable limit.

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).

Cooling Tower VFD Fan - Condenser Water Temperature Control:
The controller shall measure the cooling tower condenser water supply (basin) temperature and modulate the condenser water bypass valve and fan VFD in sequence to maintain setpoints.

The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.

On rising supply temperature, the controller shall modulate the condenser water bypass valve to maintain setpoint of 78°F (adj.) and the fan VFD to maintain setpoint of 82°F (adj.).

Alarms shall be provided as follows:

- Fan
  - 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.

- High Cooling Tower Supply (Basin) Temp: If greater than 86°F (adj.).
- Low Cooling Tower Supply (Basin) Temp: If less than 38°F (adj.).

Chilled Water Temperature Monitoring:
The following temperatures shall be monitored:

- Chilled water supply.
- Chilled water return.

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.).

Condenser Water Temperature Monitoring:
The following temperatures shall be monitored:

- Condenser water supply temperature.
- Condenser water return temperature.

Alarms shall be provided as follows:

- High Condenser Water Supply Temp: If the condenser water supply temperature is greater than 86°F (adj.).
- Low Condenser Water Supply Temp: If the condenser water supply temperature is less than 65°F (adj.).

- High Condenser Water Return Temp: If the condenser water return temperature is greater than 100°F (adj.).
- Low Condenser Water Return Temp: If the condenser water return temperature is less than 75°F (adj.).

Meter (typical of 1)

Electric Meter:
The controller shall monitor the electric meter for electric consumption on a continual basis. These values shall be made available to the system at all times.

Alarm shall be generated as follows:

- Meter Failure: Sensor reading indicates a loss of pulse output from the electric meter.

Peak Demand History:
The controller shall monitor and record the peak (high and low) demand readings from the electric meter. Peak readings shall be recorded on a daily, month-to-date, and year-to-date basis.

Usage History:
The controller shall monitor and record electric meter readings so as to provide a power consumption history. Usage readings shall be recorded on a daily, month-to-date, and year-to-date basis.

Demand Levels:
The controller shall set the system demand level (adj.) based on the current power consumption readings from the electric meter. There shall be six daily time periods in which the demand shall be adjusted on three levels. These demand levels shall be available for facility equipment to utilize for demand limiting.

- Demand Level 1: Power consumption has exceeded the first demand level threshold (adj.).
- Demand Level 2: Power consumption has exceeded the second demand level threshold (adj.).
- Demand Level 3: Power consumption has exceeded the third demand level threshold (adj.).

Chilled Water Energy (typical of 1)

Chilled Water Cooling Demand - Energy Meter:
The controller shall monitor the chilled water supply temperature, chilled water return temperature and chilled water flow to the building and calculate current energy demand on a continual basis. These values shall be made available to the system at all times.

Alarm shall be generated as follows:

- Invalid Reading: Sensor readings indicate an invalid demand value.

Peak Demand History:
The controller shall monitor and record the peak (high and low) demand readings from the chilled water energy meter. Peak readings shall be recorded on a daily, month-to-date, and year-to-date basis.

Usage History:
The controller shall monitor and record chilled water energy meter readings so as to provide an energy consumption history. Usage readings shall be recorded on a daily, month-to-date, and year-to-date basis.

1 / M-11 CHILLER PLANT SEQUENCE OF OPERATION
SCALE: NOT TO SCALE

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ROBERT S. HIRAHARA LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

4/30/12
EXP. DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

CHILLER PLANT SEQUENCE OF OPERATION

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M-11

Variable Air Volume - AHU (typical of 10)

Run Conditions - Requested:
The unit shall run whenever:

- Any zone is occupied.
- OR a definable number of unoccupied zones need heating or cooling.

High Static Shutdown:
The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

Supply Air Smoke Detection:
The unit shall shut down and generate an alarm upon receiving a supply air smoke detector status.

Supply Fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

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 shall modulate the supply fan VFD speed to maintain a duct static pressure setpoint of 1.5in H2O (adj.). The supply fan VFD speed shall not drop below 30% (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.

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 requirements.

The supply air temperature setpoint shall be reset 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.) .

Cooling Coil Valve:
The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint.

The cooling shall be enabled whenever:

- The supply fan status is on.

The cooling coil valve shall open to 50% (adj.) whenever the freezestat (if present) is on.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint.

Low Supply Air Temperature Alarm:
The controller shall alarm if the supply air temperature is less than 45°F (adj.).

Minimum Outside Air Ventilation - Carbon Dioxide (CO2) Control:
When in the occupied mode, the controller shall measure the return air CO2 levels and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 750 ppm (adj.).

Return Air Carbon Dioxide (CO2) Concentration Monitoring:
The controller shall measure the return air CO2 levels.

Alarms shall be provided as follows:

- High Return Air Carbon Dioxide Concentration: If the return air CO2 concentration is greater than 1000ppm (adj.) when in the unit is running.

Supply Air Temperature:
The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is greater than 75°F (adj.).
- Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Fan Coil Unit (typical of 21)

Run Conditions - Scheduled:
The unit shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
  - A 74°F (adj.) cooling setpoint

Unoccupied Mode (night setback): The unit shall maintain

- A 85°F (adj.) cooling setpoint.

Alarms shall be provided as follows:

- High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).

Zone Setpoint Adjust:
The occupant shall be able to adjust the zone temperature cooling setpoints at the zone sensor.

Zone Optimal Start:
The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

Zone Unoccupied Override:
A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.

Fan:
The fan shall run anytime the unit is commanded to run, unless shutdown on safeties. The fan speeds shall automatically be indexed as follows:

- Low speed shall run anytime the zone temperature is within setpoints.
- Medium speed shall run anytime the zone temperature is outside of setpoints.
- High speed shall run anytime the zone temperature is outside of setpoints by a definable amount (adj.).

Cooling Coil Valve:
The controller shall measure the zone temperature and modulate the cooling coil valve to maintain its cooling setpoint.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the zone temperature is above cooling setpoint.
- AND the fan is on.

The cooling coil valve shall open whenever the freezestat (if present) is on.

Fan Status:
The controller shall monitor the fan status.

Alarms shall be provided as follows:

- Fan Failure: Commanded on, but the status is off.
- Fan in Hand: Commanded off, but the status is on.
- Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

Environmental Index:
When the zone is occupied, the controller will monitor the deviation of the zone temperature from the cooling setpoint and calculate a 0 - 100% *Environmental Index* which gives an indication of how well the zone is maintaining comfort. The controller will also calculate the percentage of time since occupancy began that the Environmental Index is 70% or higher. Optionally, a weighting factor can be configured to adjust the contribution of the zone to the rollup average index based upon the floor area of the zone, importance of the zone, or other static criteria.

1 / M-12 AIRSIDE SEQUENCE OF OPERATION
SCALE: NOT TO SCALE

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

HAWAII, U.S.A. LICENSED PROFESSIONAL ENGINEER No. 10717-M

4/30/12
EXP. DATE

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STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

AIRSIDE SEQUENCE OF OPERATION

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

APPROVED: _____ DATE _____
CHIEF ENGINEER

DRAWING NO. M-12

SINGLE WATER COOLED CHILLER AND COOLING TOWER (TYPICAL OF 1)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Chilled Water Differential Pressure	×							×		×
Chilled Water Flow	×							×		×
Condenser Water Supply (Basin) Temp	×							×		×
Chilled Water Return Temp	×							×		×
Chilled Water Supply Temp	×							×		×
Condenser Water Return Temp	×							×		×
Condenser Water Supply Temp	×							×		×
Chilled Water Pump 1 VFD Speed		×						×		×
Chilled Water Pump 2 VFD Speed		×						×		×
Chilled Water Bypass Valve		×						×		×
Condenser Water Bypass Valve		×						×		×
Fan VFD Speed		×						×		×
Emergency Shutdown			×					×	×	×
Refrigerant Leak Shutdown			×					×	×	×
Vibration Status			×					×	×	×
Chilled Water Pump 1 Status			×					×		×
Chilled Water Pump 2 Status			×					×		×
Chilled Water Pump 1 VFD Fault			×						×	×
Chilled Water Pump 2 VFD Fault			×						×	×
Condenser Water Pump 1 Status			×					×		×
Condenser Water Pump 2 Status			×					×		×
Chiller Status			×					×		×
Fan Status			×					×		×
Fan VFD Fault			×						×	×
Chilled Water Pump 1 Start/Stop				×				×		×
Chilled Water Pump 2 Start/Stop				×				×		×
Condenser Water Pump 1 Start/Stop				×				×		×
Condenser Water Pump 2 Start/Stop				×				×		×
Chiller Enable				×				×		×
Fan Start/Stop				×						×
Outside Air Temp					×					
Chilled Water Differential Pressure Setpoint					×			×		×
Chilled Water Flow Setpoint					×			×		×
Chilled Water Pump 1 Failure									×	
Chilled Water Pump 2 Failure									×	
Chilled Water Pump 1 Running in Hand									×	
Chilled Water Pump 2 Running in Hand									×	
Chilled Water Pump 1 Runtime Exceeded									×	
Chilled Water Pump 2 Runtime Exceeded									×	

CHILLER INTERFACE (TYPICAL OF 1)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Chiller kW					×			×		×
Chilled Water Supply Temp Setpoint					×			×		×
Operating Hours					×					×
Chilled Water Supply Temp					×			×		×
Chilled Water Return Temp					×			×		×
Condenser Water Supply Temp					×			×		×
Condenser Water Return Temp					×			×		×
Evaporator Refrigerant Pressure					×			×		×
Condenser Refrigerant Pressure					×			×		×
Oil Differential Pressure					×			×		×
Oil Temp					×			×		×
Chiller Status						×		×		×
Chilled Water Flow Status						×		×		×
Condenser Water Flow Status						×		×		×
Totals	**0**	**0**	**0**	**0**	**11**	**3**	**0**	**13**	**0**	**14**

Total Hardware (0) **Total Software (27)**

VARIABLE AIR VOLUME - AHU (TYPICAL OF 10)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Supply Air Static Pressure	×							×	×	×
Mixed Air Temp	×							×		×
Return Air Carbon Dioxide PPM	×							×		×
~~Return Air Humidity~~	~~×~~							~~×~~		~~×~~
~~Return Air Temp~~	~~×~~							~~×~~		~~×~~
Supply Air Temp	×							×		×
Supply Fan VFD Speed		×						×		×
Cooling Valve		×						×		×
Mixed Air Dampers		×						×		×
High Static Shutdown			×					×	×	×
Supply Air Smoke Detector			×					×	×	×
Supply Fan VFD Fault			×						×	×
Supply Fan Status			×					×		×
Supply Fan Start/Stop				×				×		×
Supply Air Static Pressure Setpoint					×			×		×
Supply Air Temp Setpoint					×			×		×
~~Economizer Mixed Air Temp Setpoint~~					~~×~~			~~×~~		~~×~~
RA Carbon Dioxide PPM Setpoint					×			×		×
High Supply Air Static Pressure									×	
Low Supply Air Static Pressure									×	
Supply Fan Failure									×	
Supply Fan in Hand									×	
Supply Fan Runtime Exceeded									×	
High Supply Air Temp									×	
Low Supply Air Temp									×	
High Mixed Air Temp									×	
Low Mixed Air Temp									×	
High Return Air Carbon Dioxide Concentration									×	
~~High Return Air Humidity~~									~~×~~	
~~Low Return Air Humidity~~									~~×~~	
~~High Return Air Temp~~									~~×~~	
~~Low Return Air Temp~~									~~×~~	
High Supply Air Temp									×	
Low Supply Air Temp									×	
Totals	**6**	**3**	**4**	**1**	**4**	**0**	**0**	**17**	**20**	**18**

Total Hardware (14) **Total Software (41)**

FAN COIL UNIT (TYP OF 21)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Cooling Valve		×						×		×
Zone Override			×					×		×
Fan Status			×							×
Fan Low Speed				×				×		×
Fan Medium Speed				×				×		×
Fan High Speed				×				×		×
Environmental Index					×			×		
Percent of Time Satisfied					×			×		
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Totals	**2**	**1**	**2**	**3**	**2**	**0**	**1**	**10**	**5**	**10**

Total Hardware (8) **Total Software (18)**

ELECTRIC METER (TYPICAL OF 1)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Chilled Water Flow	×							×		×
Chilled Water Return Temp	×							×		×
Chilled Water Supply Temp	×							×		×
Demand					×			×		×
Peak Today								×		×
Peak Month-to-Date								×		×
Peak Year-to-Date								×		×
Usage Today								×		×
Usage Month-to-Date								×		×
Usage Year-to-Date								×		×
Totals	**3**	**0**	**0**	**0**	**1**	**0**	**0**	**10**	**0**	**10**

Total Hardware (3) **Total Software (11)**

CHILLED WATER ENERGY (TYPICAL OF 1)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
kW Pulse	×									×
Current Demand Level					×					×
kW Demand								×		×
kW Peak Today								×		×
kW Peak Month-to-Date								×		×
kW Peak Year-to-Date								×		×
kWh Today								×		×
MWh Month-to-Date								×		×
MWh Year-to-Date								×		×
Meter Failure									×	
Demand Level 1									×	
Demand Level 2									×	
Demand Level 3									×	
Totals	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**7**	**4**	**9**

Total Hardware (1) **Total Software (12)**

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ROBERT S. ASH LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

4/30/12
EXP. DATE

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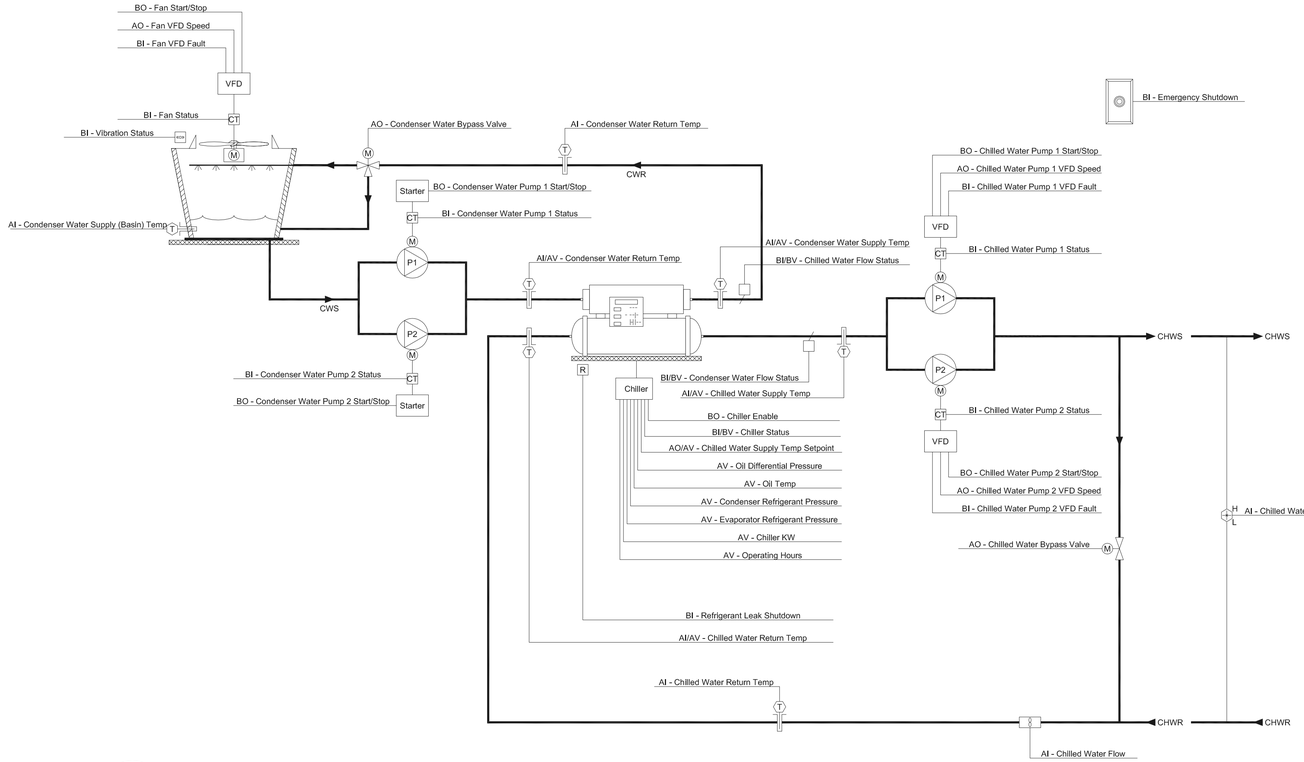
STATE OF HAWAII
DEPARTMENT OF DEFENSE
ENGINEERING DIVISION

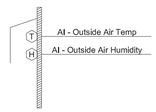
FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

CONTROL POINTS LIST

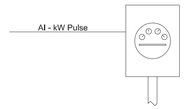
DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN
APPROVED:			DRAWING NO. M-13
CHIEF ENGINEER		DATE	



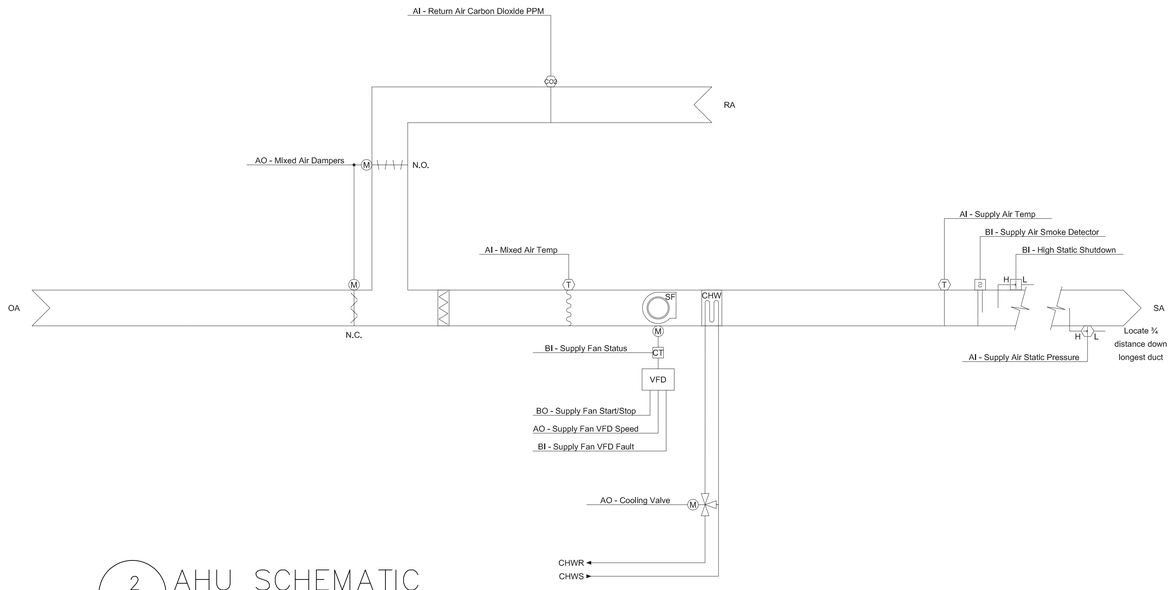
1 M-14 CHILLER PLANT SCHEMATIC
SCALE: NOT TO SCALE



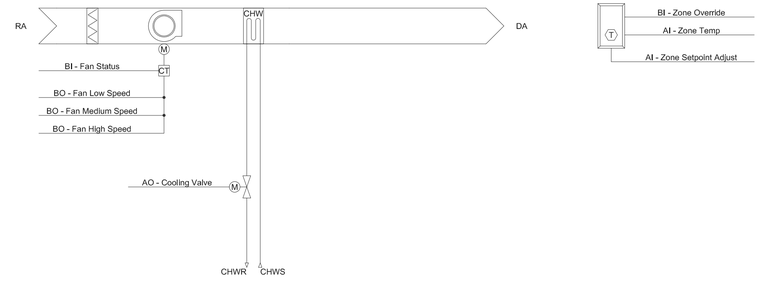
3 M-14 OUTSIDE SENSOR SCHEMATIC
SCALE: NOT TO SCALE



4 M-14 KW METER SCHEMATIC
SCALE: NOT TO SCALE



2 M-14 AHU SCHEMATIC
SCALE: NOT TO SCALE



5 M-14 FCU SCHEMATIC
SCALE: NOT TO SCALE

REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED

ALBERT S. MORIHARA LICENSED PROFESSIONAL ENGINEER No. 10717-M HAWAII, U.S.A.

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STATE OF HAWAII
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FT. RUGER, HAWAII – BUILDING 306
AIR CONDITIONING IMPROVEMENTS
HONOLULU, HAWAII

CONTROL SCHEMATICS

DESIGNED:	ASH	SUBMITTED:	
DRAWN:	ASH	DATE:	JULY 22, 2011
CHECKED:	ASH	SCALE:	AS SHOWN

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CHIEF ENGINEER

DRAWING NO. M-14