SCOPE OF WORK

Commissioning Authority Services

Airport Traffic Control Tower (ATCT) and Administrative Base Building

Palm Springs International Airport

Palm Springs, California

March 15, 2012

U.S. Department of Transportation
Federal Aviation Administration

Federal Aviation Administration

“Expect Excellence”

TABLE OF CONTENTS

1. INTRODUCTION

The Federal Aviation Administration (FAA) awarded a construction contract in March 2010 to Swinerton Builders headquartered in San Francisco California. The project is over 90% complete.

The FAA has a requirement for a Commissioning Authority who will direct the commissioning process detailed in the attached project specification sections 15995.

2. SCOPE

The firms interested in this contract will be required to submit a proposal including the following information:

1. Company history with commissioning projects. The FAA is looking for a minimum of 10 years experience with similar projects.
2. Names and resumes of personnel ready to begin work on the Palm Springs ATCT construction site immediately after contract award. Estimated contract award is March 30, 2012.
3. List of any previous experience working with Swinerton Builders and/or the FAA including references.
4. Project Cost estimate

Items 1-3 will be used to evaluate technical acceptability. 10 years or more company experience will score 1 and less than 10 years will score 0. Qualified personnel available to start work immediately, with 5 years experience will score 1 pt with a maximum of 5 pts. No qualified personnel available immediately or less than 5 years experience will score 0. Previous experience with Swinerton and/or FAA including references will score 1 point per project with a maximum of 3 points. No experience with the FAA or Swinerton will score 0 points. Each firm scoring at least 1point in each category will be deemed technically acceptable.

The contract will be awarded to the lowest priced technically acceptable vendor. If two technically acceptable firms have equal cost estimates, the technical score will determine the successful bid.

All personnel expected to work on the construction site must meet access requirements for the Airport Operations Area. Personnel must have a valid driver's license and must be escorted by FAA or Swinerton personnel authorized by the Palm Springs Airport Authority to provide escort services. Contract personnel are not permitted to drive on the airport operations area without an escort ***and*** an Airport Authority issued permit. The FAA will not compensate the contractor for any expenses incurred due to employees who do not meet access requirements or do not coordinate appropriate escort / vehicle permit requirements in advance of their arrival on site. Contractor employees acknowledge that parking within the Airport Operations Area may not be available and employees will need to find public parking on nearby streets. Employees will need to contact the COTR to arrange escort from the gate on Camino Bombero (between Signature Flight Services and the fire station) to the job site.

After contract award, the FAA Contracting Officer will issue a Notice-to-Proceed (NTP). Immediately upon receipt of the NTP, the selected firm shall contact the FAA COTR and coordinate a start date and time. Normal working hours will be established by the COTR and normal working days are Monday thru Friday. Night or weekend work may be required and the successful bidder will accommodate as required.

All work under this contract shall be performed in accordance with this SOW and technical input from the FAA. The successful bidder shall furnish sufficient skilled technical, supervisory, and administrative personnel to ensure the expeditious completion of the work specified herein.

Only the FAA Contracting Officer can make contract modifications. To facilitate the progress of this effort, coordination of change issues may be initiated with the COTR; however, all contract changes shall be issued by written modification from the FAA Contracting Officer.

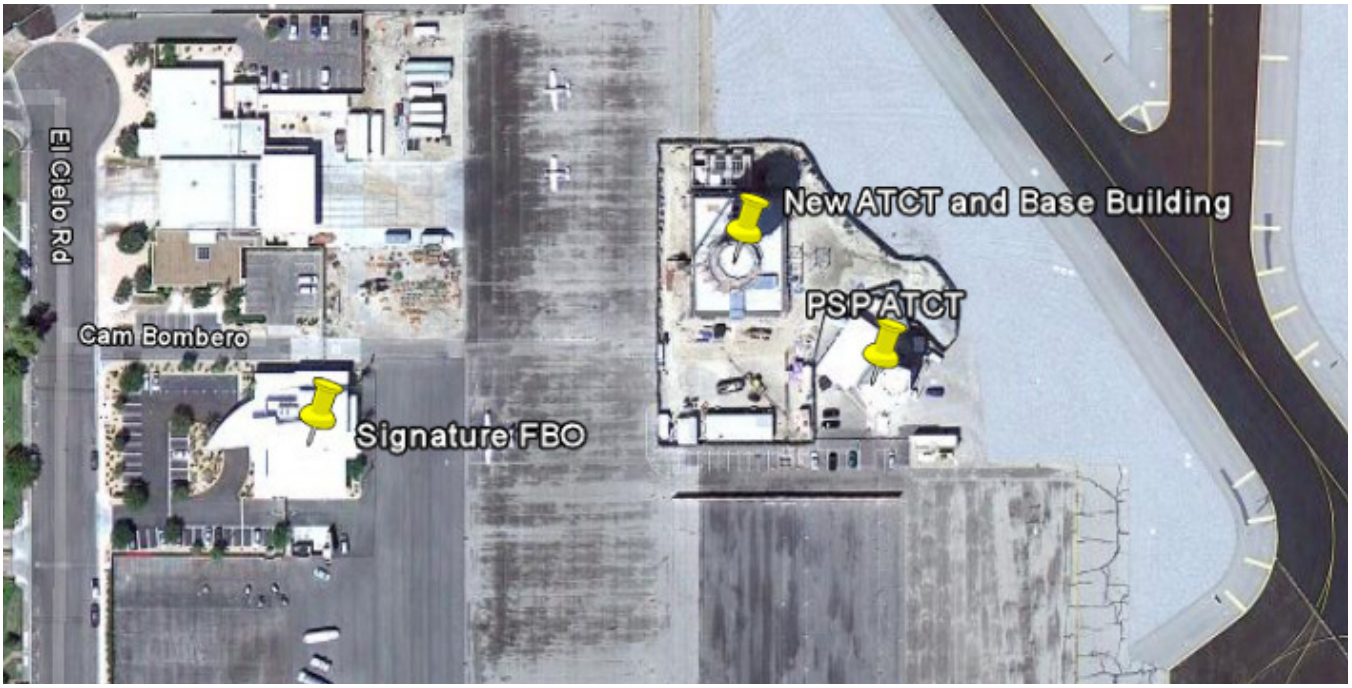
The final deliverables under this contract are specified in the attached specification sections. Electronic deliverables shall include a pdf copy of the entire document as well as separate word/excel or other native copies of all files.

This SOW will require 10+ years experience and expertise. It is the government position that no work under this contract shall be subcontracted.

At the conclusion of the contract, all documents shall become the property of the FAA.

3. BACKGROUND INFORMATION AND GENERAL REQUIREMENTS

The Google Earth photos below show the nearby surface streets (El Cielo and Camino Bombero aka Airport Tower Road) and the close proximity to the airport taxiway. The second photo shows a closer view of the construction site and the existing Airport Traffic Control Tower (ATCT).



Project Commitment: It is assumed that the successful firm will devote the level of effort, skilled manpower, and other resources necessary to complete this work in compliance with the performance time of this contract.

Project Schedule: The firm shall develop a schedule based on the requirements in the attached specifications. The schedule shall assume contract award and NTP both occur April 2, 2012 and the schedule shall be submitted with the firm's proposal. The schedule shall be updated with the actual start date and any necessary revisions within one week after the contract NTP, and submitted to the FAA COTR.

Performance Time, Deliverables, and Submittals: The firm shall complete all aspects of the work outlined in this SOW within the defined performance time. All change orders, revisions, or modifications to this SOW must be approved by the FAA Contracting Officer and may result in an adjustment of the performance time; however, the firm will need to show the impacts to the project schedule, specifically the critical path, to justify additional time.

4. CONTACT INFORMATION

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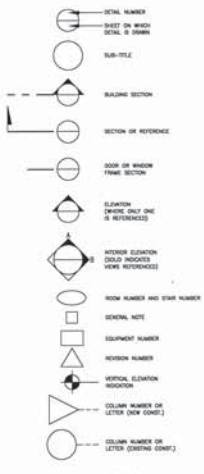
5. PROJECT SPECIFIC INFORMATION

See Attached Drawings and Specifications

MECHANICAL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	SANITARY SEWER (BELOW FLOOR)		GATE VALVE		CHILLED WATER SUPPLY (COOLING)
	STORM SEWER (BELOW FLOOR)		GLOBE VALVE		CHILLED WATER RETURN (COOLING)
	STORM SEWER OVERFLOW (BELOW FLOOR)		CHECK VALVE		HOT WATER SUPPLY (HEATING)
	SUBSOIL DRAIN (BELOW FLOOR)		BUTTERFLY VALVE		HOT WATER RETURN (HEATING)
	SANITARY SEWER (ABOVE FLOOR)		ECCENTRIC PLUG VALVE		CONDENSER WATER SUPPLY
	STORM SEWER (ABOVE FLOOR)		BALL VALVE		CONDENSER WATER RETURN
	STORM SEWER OVERFLOW (ABOVE FLOOR)		STRAINER		EQUIPMENT DRAIN
	SUBSOIL DRAIN (ABOVE FLOOR)		UNION		LOW PRESSURE STEAM
	SANITARY VENT		FLANGE		MEDIUM PRESSURE STEAM
	ACID WASTE (BELOW FLOOR)		CAP		LOW PRESSURE CONDENSATE
	ACID WASTE (ABOVE FLOOR)		BLIND FLANGE		MEDIUM PRESSURE CONDENSATE
	ACID VENT		SHUTOFF VALVE (GATE, PLUG, BUTTERFLY OR BALL)		HIGH PRESSURE CONDENSATE
	DOMESTIC COLD WATER				PUMPED CONDENSATE
	DOMESTIC HOT WATER		GAS COCK		REFRIGERANT SUCTION
	DOMESTIC HOT WATER RECIRCULATING		PRESSURE REGULATING VALVE		REFRIGERANT LIQUID
	DOMESTIC HOT WATER 180°F.		SOLENOID VALVE		REFRIGERANT HOT GAS DISCHARGE
	DOMESTIC HOT WATER 180°F.RECIRCULATING		CONTROL VALVE (3-WAY)		CHEMICAL FEED
	TEMPERED WATER		CONTROL VALVE (3-WAY)		ETHYLENE GLYCOL SUPPLY
	TEMPERED WATER RECIRCULATING		THERMOMETER		ETHYLENE GLYCOL RETURN
	DRINKING WATER SUPPLY		PRESSURE GAGE		HEAT PUMP WATER SUPPLY
	DRINKING WATER RECIRCULATING		SAFETY RELIEF VALVE		HEAT PUMP WATER RETURN
	NON-POTABLE WATER		COCK (GAS,AIR,WT.,DRAIN)		HIGH TEMP WATER SUPPLY (HEATING)
	IRRIGATION WATER MAIN		PIPE ANCHOR		HIGH TEMP WATER RETURN (HEATING)
	NATURAL GAS		PIPE GUIDE		HOT OR CHILLED WATER SUPPLY
	FIRE LINE		EXPANSION COMPENSATOR		HOT OR CHILLED WATER RETURN
	SPRINKLER MAIN		VACUUM BREAKER		
	COMPRESSED AIR		SUPERVISED O S & Y VALVE	DOUBLE LINE / SINGLE LINE	DUCTWORK
	VACUUM		THERMOSTAT		
	MEDICAL COMPRESSED AIR		HUMIDISTAT		ROUND FACE SUPPLY DIFFUSER
	MEDICAL VACUUM		TEMPERATURE SENSOR		
	OXYGEN		PRESSURE SENSOR		SQUARE FACE SUPPLY DIFFUSER
	NITROUS OXIDE		FLOW MEASURING ELEMENT		RECTANGULAR REGISTER
	NITROGEN		TEST PLUG		RETURN OR EXHAUST
	CARBON DIOXIDE		SIGHT GLASS (FLOW TYPE)		RECTANGULAR REGISTER OR
	FUEL OIL SUPPLY		AIR ELIMINATOR		DIFFUSER-SUPPLY
	FUEL OIL RETURN		TEMP. & PRESS. RELIEF VALVE		RECTANGULAR DUCT(FIRST NUMBER IS SIDE SHOWN IN INCHES)
	FUEL OIL VENT		STEAM TRAP		
	FUEL OIL FILL				ROUND DUCT
	FUEL OIL GAGE		PIPE ELBOW UP		
WC-	WATER CLOSET (WALL HUNG)		PIPE ELBOW DOWN		FLAT OVAL DUCT – FIRST NUMBER IS SIDE SHOWN
			PIPE TEE UP		
WC-	WATER CLOSET (TANK TYPE)		PIPE TEE DN		VOLUME DAMPER
		CO	CLEANOUT		
WC-	WATER CLOSET (FLOOR MOUNT)	FL CO	FLOOR CLEANOUT		SUPPLY AIR DUCT
		G CO	GRADE CLEANOUT		
		DF-	DRINKING FOUNTAIN		RETURN OR EXHAUST DUCT
UR-	URINAL	EWC-	ELECTRIC WATER COOLER		
		SH-	SHOWER HEAD		OUTSIDE AIR DUCT
L-	LAVATORY (WALL HUNG)	(DRAINED)	FLOOR –FD TRENCH –TD AREA–AD		
L-	LAVATORY (COUNTER TOP)	RD-	ROOF DRAIN		FLEXIBLE CONNECTION
		ORD-	OVERFLOW ROOF DRAIN		
SS-	SERVICE SINK	HB-	HOSE BIBB		MOTORIZED DAMPER OR CONTROL DAMPER – CD
		WH-	WALL HYDRANT		
MS-	FLOOR MOP SINK		FIRE DEPARTMENT CONNECTION		FLEXIBLE DUCT
		FS	FLOW SWITCH		FIRE DAMPER–FD
SK-	SINK (COUNTERTOP SINGLE BOWL)	M	WATER METER		SMOKE DAMPER–SD
		PVI-	SNOWFLOW PREVENTER		COMBINATION FIRE & SMOKE DAMPER–FD/SD
SK-	SINK (COUNTERTOP DOUBLE BOWL)	FHC	FIRE HOSE CABINET		DUCT PRESSURE CLASS DESIGNATION
		FVC	FIRE VALVE CABINET		
BT-	BATH TUB		PLUMBING RISER NUMBER		RETURN GRILLE WITH ACOUSTIC BOOT
			CONNECT TO EXISTING		TRANSFER DUCT ABOVE CEILING
				601 / 100	OUTLET SIZE/ DIFFUSER TAG CFM

REFERENCE



FIRE RATED PARTITIONS

1 – HOUR
2 – HOUR
3 – HOUR
4 – HOUR

STANDARD ABBREVIATIONS

A

AC	ALTERNATING CURRENT
A/C	AIR CONDITIONING
AD	AREA DRAIN
ADJ	ADJACENT OR ADJUSTABLE
ADR	ACCESS DOOR
AFF	ABOVE FINISH FLOOR
AHU	AIR HANDLING UNIT
AL	ALUMINUM
ALT	ALTERNATE
APPROX	APPROXIMATELY
ARCH	ARCHITECT(URAL)
ASPH	ASPHALT
ATB	AIR TERMINAL BOX
ATD	AIR TRANSFER DUCT
ATC	ACOUSTICAL TILE CEILING
ATU	AIR TERMINAL UNIT
AUX	AUXILIARY
AZ	AZIMUTH

B

BE	BOTTOM ELEVATION
BL	BUILDING LINE
BLDG	BUILDING
BTU	BRITISH THERMAL UNIT

C

CP	CEMENT PIPE
CAB	CABINET
CB	CIRCUIT BREAKER OR CATCH BASIN
CC	COOLING COIL
C/C	CENTER TO CENTER
CDU	CONDENSING UNIT
CE	COVER ELEVATION
CEM	CEMENT
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CH	CHILLER
CIP	CAST IRON PIPE
CJ	CONTROL JOINT
CL	CENTER LINE
CLG	CEILING
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
COL	COLUMN
COMB	COMBINATION OR COMBINE
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTINUATION
CONTR	CONTRACTOR
CORR	CORRIDOR
CRAC	COMPUTER ROOM A/C
CTR	CENTER
CUH	CABINET UNIT HEATER
CUYD	CUBIC YARD
CWS	CHILLED WATER SUPPLY
CWR	CHILLED WATER RETURN

D

DIFF	DIFFUSER
DBL	DOUBLE
DEPR	DEPRESSED
DET	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DN	DOWN
DS	DOWNSPOUT
DWG	DRAWING
DWP	DOMESTIC WATER PUMP

E

EA	EACH
EF	EXHAUST FAN
EL	ELEVATION
ELEC	ELECTRIC (AL)
ELEV	ELEVATOR
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPOSED
EXT	EXTERIOR

F

FA	FIRE ALARM
FCU	FAN COIL UNIT
FD	FLOOR DRAIN OR FIRE DAMPER
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FIN	FINISH
FIX	FIXTURE
FL	FLOOR
FM	FORCE MAIN
FP	FIREPROOFING
FR	FIRE RATED
FT	FEET
FVC	FIRE VALVE CABINET

G

GA	GAGE
GALV	GALVANIZED
GEN	GENERATOR
GI	GALVANIZED IRON
GPM	GALLONS PER MINUTE
GR	GRADE
GWB	GYPSUM WALLBOARD

H

HB	HOSE BIBB
HC	HEATING COIL
HDCP	HANDICAP (PED)
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPT	HIGH POINT
HR	HOUR
HS	HIGH STRENGTH
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HVAC	HEATING/VENTILATING/AIR CONDITIONING
HZ	HERTZ
HW	DOMESTIC HOT WATER
HWS	HEATING HOT WATER SUPPLY
HWR	HEATING HOT WATER RETURN
HWC	DOMESTIC HOT WATER CIRCULATION

I

ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IN	INCH
INSUL	INSULATION
INT	INTERIOR

J

JAN	JANITOR
JB	JUNCTION BOX
JST	JOIST
JT	JOINT

K

KIT	KITCHEN
KS	KITCHEN SINK
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATTS

L

LAV	LAVATORY
LBS	POUNDS
LF	LINEAR FEET
LIN	LINEAR
LVL	LEVEL

M

MAINT	MAINTENANCE
MAT	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MET	METAL
MFR	MANUFACTURE
MG	MOTOR GENERATOR
MH	MANHOLE
MIN	MINIMUM
MTG	MOUNTING OR MOUNTED

N

NEC	NATIONAL ELECTRICAL CODE
NO	NUMBER
NOM	NOMINAL
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE

O

OA	OUTSIDE AIR
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPNG	OPENING
OPP	OPPOSITE
O/S	OFFSET
OZ	OUNCE

P

P	PUMP
PART	PARTITION
PAVT	PAVEMENT
PCF	POUNDS PER CUBIC FOOT
PERP	PERPENDICULAR
PHC	PREHEAT COIL
PHVAC	PLUMBING, HEATING, VENTILATING AND AIR CONDITIONING
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PKG	PARKING
PL	PROPERTY LINE OR PLATE
PLAS	PLASTER
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNL	PANEL
PR	PAIR
PROJ	PROJECTION
PRV	PRESSURE REGULATING VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PTVC	POINT OF VERTICAL CURVATURE
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY

R

R	RADIUS
REG	REGISTER
RA	RETURN AIR
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
REF	REFERENCE
REFL	REFLECTED
REINF	REINFORCING
REQD	REQUIRED
REV	REVERSE
RF	RETURN FAN
RGS	RIGID GALVANIZED STEEL
RH	ROOF HOOD
RHC	REHEAT COIL
RM	ROOM

S

S	SANITARY SEWER
SA	SUPPLY AIR OR SOUND ATTENUATOR
SAN	SANITARY
SCH	SCHEDULE
SECT	SECTION
SF	SUPPLY FAN
SHT	SHEET
SIM	SIMILAR
SK	SINK
SP	SUMP PUMP
SPEC	SPECIFICATIONS
SQ	SQUARE
SS	STORM SEWER
SSO	STORM SEWER OVERFLOW
SSTL	STAINLESS STEEL
STA	STATION
STD	STANDARD
STE	STANDARD TAPERED END
STIFF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL
SUSP	SUSPENDED
SW	SWITCH
SWGR	SWITCHGEAR
SYM	SYMMETRICAL

T

T&B	TOP AND BOTTOM
TE	TOP EDGE
TEMP	TEMPERATURE
TOIL	TOILET
TOPO	TOPOGRAPHY
TOS	TOP OF STEEL
TOW	TOP OF WALL
TP	TOP OF PAVEMENT
TRANS	TRANSVERSE
TYP	TYPICAL

U

UG	UNDERGROUND
UH	UNIT HEATER
UV	UNIT VENTILATOR
UR	URINAL

V

V	VOLT
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VEST	VESTIBULE
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THROUGH ROOF

W

W	WATT
W/	WITH
WC	WATER CLOSET OR WALL COVERING
WH	WATER HEATER
W/O	WITHOUT
WP	WEATHERPROOF
WPFG	WATERPROOFING
WS	WATER STOP
WT	WEIGHT
WWF	WELDED WIRE FABRIC

Y

YD	YARD
YH	YARD HYDRANT

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REGISTERED PROFESSIONAL ENGINEER CHARLES F. [illegible] No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

MECHANICAL SYMBOLS AND ABBREVIATIONS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY		SUBMITTED BY	APPROVED BY
SUBMITTER'S TITLE:			APPROVER'S TITLE:
DESIGNED	GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE: October 5, 2009 JCN
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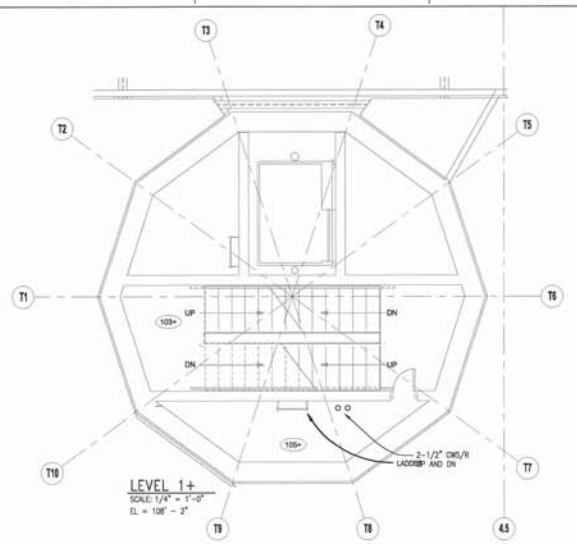
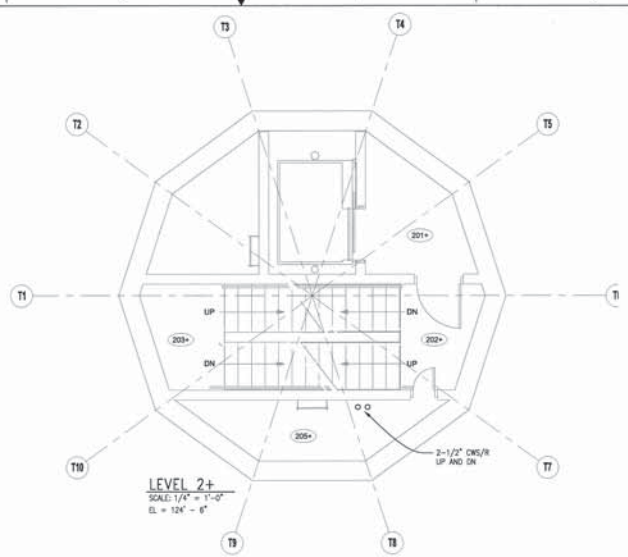
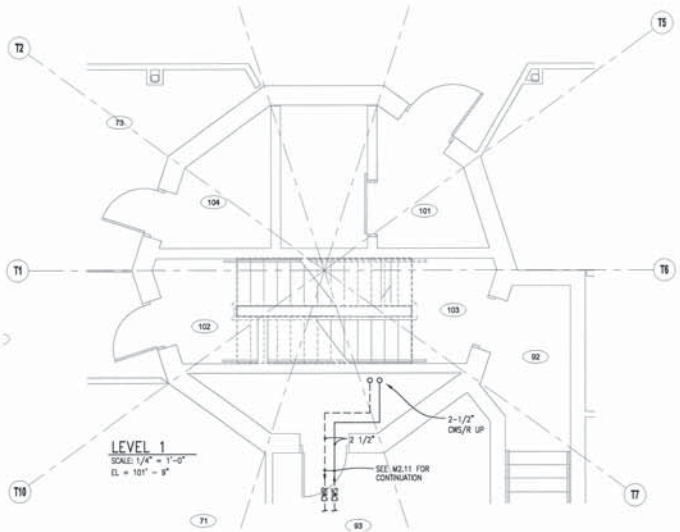
CHECKED	MPH		



LEVEL 1+
SCALE: 1/4" = 1'-0"
EL = 108' - 2"



LEVEL 2+
SCALE: 1/4" = 1'-0"
EL = 124' - 6"



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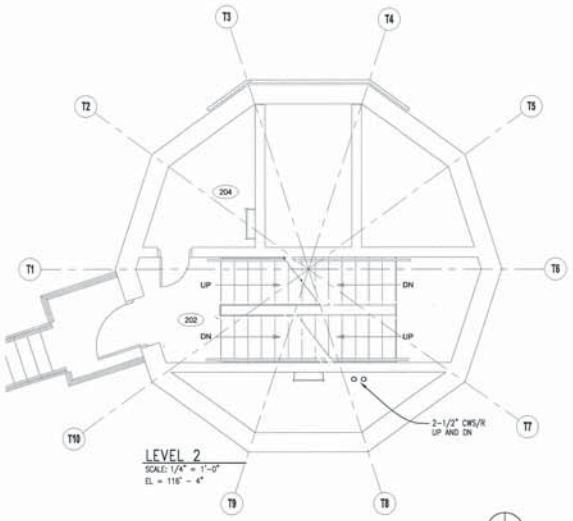

LEVEL 2
SCALE: 1/4" = 1'-0"
EL = 116' - 4"

Room Schedule	
Room Number	Room Name
LEVEL 1	
101	ELEVATOR LOBBY
102	SERVICE STAIR
103	EXIT STAIR
104	CABLE CHASE
105	PIPE CHASE
LEVEL 1+	
102+	SERVICE STAIR
103+	EXIT STAIR
LEVEL 2	
202	SERVICE STAIR
203	EXIT STAIR
204	CABLE CHASE
205	PIPE CHASE
LEVEL 2+	
201+	ELEVATOR LOBBY
202+	SERVICE STAIR
203+	EXIT STAIR

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REGISTERED PROFESSIONAL ENGINEER
CHARLES F. PUSKAR
No. M 38905
Exp. 6-30-11
MECHANICAL
STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND
ESTABLISH BASE BUILDING

TOWER LEVELS 1 AND 2
HVAC PLANS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
SUBMITTER'S TITLE:		APPROVER'S TITLE:	
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009	JCN
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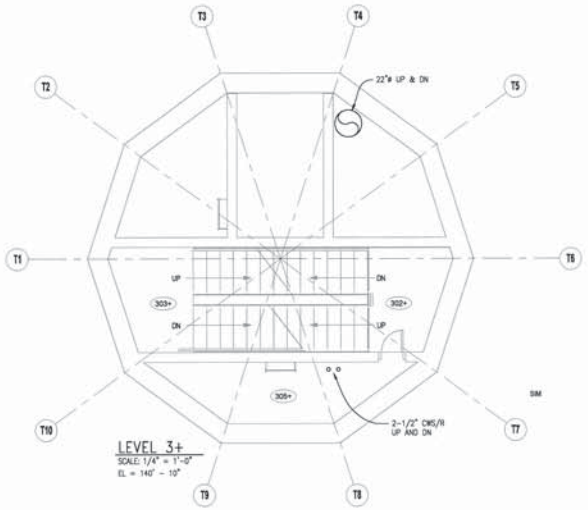
CHECKED MPH			



LEVEL 3+
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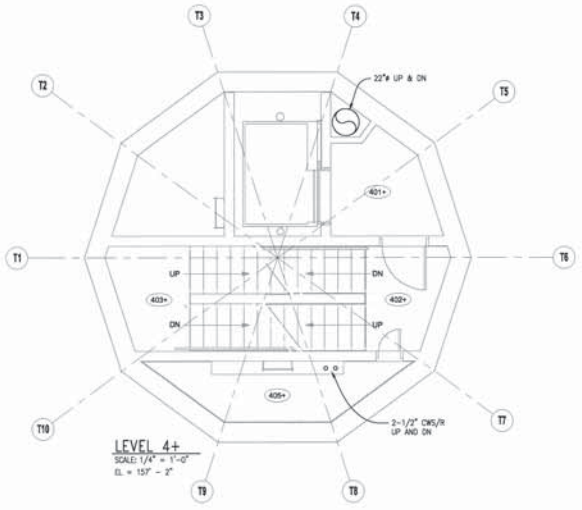
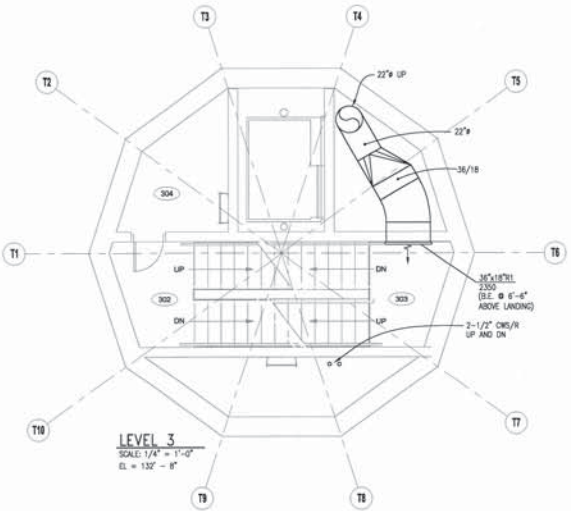
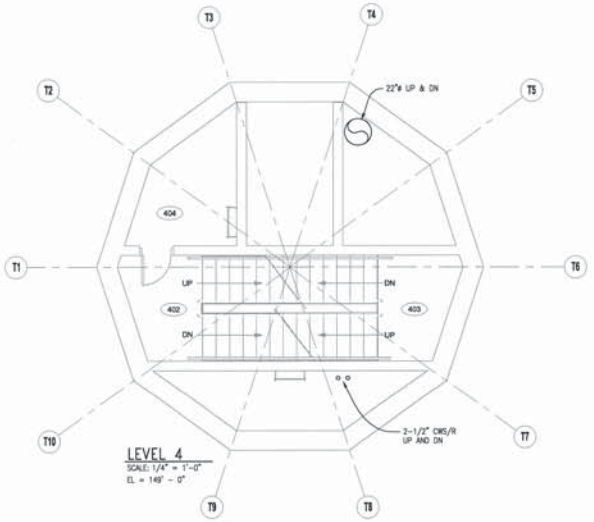
EL = 140' - 10"



LEVEL 4+
SCALE: 1/4" = 1'-0"
EL = 157' - 2"



LEVEL 3
SCALE: 1/4" = 1'-0"
EL = 132' - 8"



LEVEL 4
SCALE: 1/4" = 1'-0"
EL = 149' - 0"

Room Schedule	
Room Number	Room Name
LEVEL 3	
302	SERVICE STAIR
303	EXIT STAIR
304	CABLE CHASE
305	PIPE CHASE
LEVEL 3+	
302+	SERVICE STAIR
303+	EXIT STAIR
LEVEL 4	
402	SERVICE STAIR
403	EXIT STAIR
404	CABLE CHASE
405	PIPE CHASE
LEVEL 4+	
401+	ELEVATOR LOBBY
402+	SERVICE STAIR
403+	EXIT STAIR

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

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REGISTERED PROFESSIONAL ENGINEER
CHARLES F. CHAMBERLAIN
No. M 38803
Exp. 6-30-11
MECHANICAL
STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

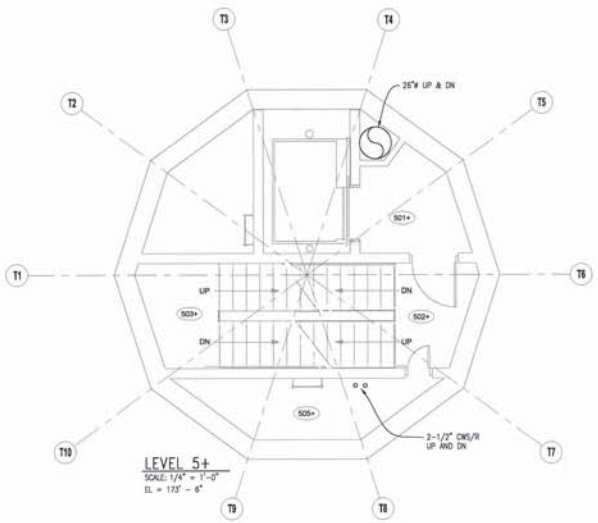
REPLACE AIRPORT TRAFFIC CONTROL TOWER AND
ESTABLISH BASE BUILDING

TOWER LEVELS 3 AND 4
HVAC PLANS

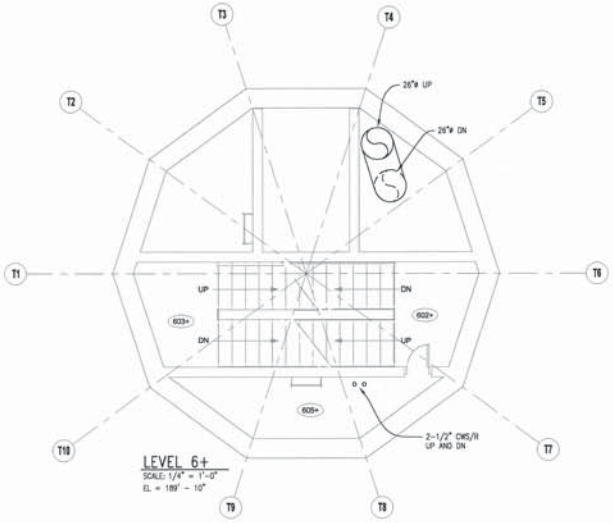
PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	
SUBMITTED BY	
SUBMITTER'S TITLE:	
DESIGNED	GNR
DRAWN	PEH
CHECKED	MPH
ISSUED BY	ENGINEERING SERVICES TERMINAL – LOS ANGELES
APPROVED BY	
APPROVER'S TITLE:	
DATE	October 5, 2009
JCN	
DRAWING NO	PSP–D–ATCT– M102
REV	

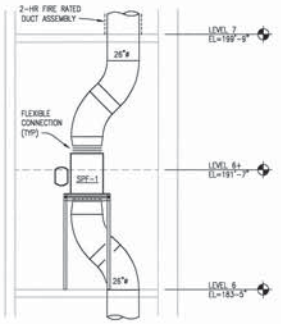
J:\2002-10096-000\E Design SD-DD-CD\01 Drawings\07 Mechanical\PSPM102M.dwg October 23, 2009 - 11:00am pshrell



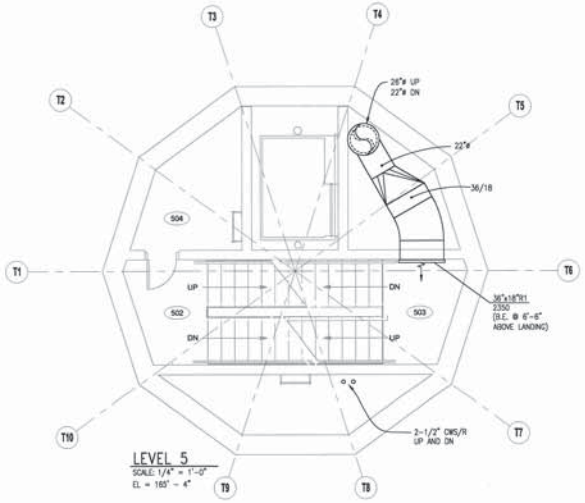
LEVEL 5+
SCALE: 1/4" = 1'-0"
EL = 173' - 6"



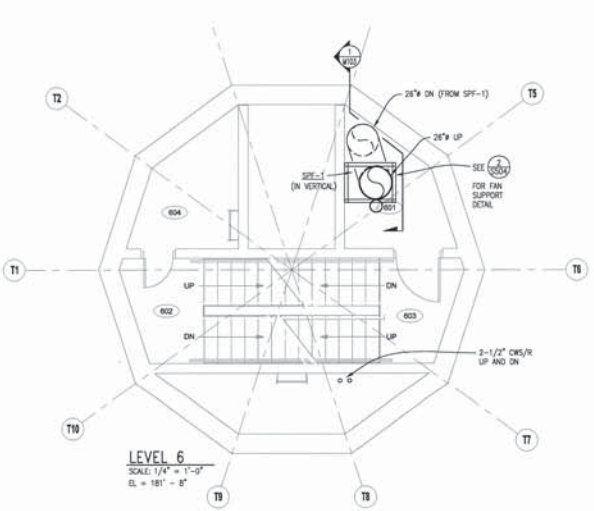
LEVEL 6+
SCALE: 1/4" = 1'-0"
EL = 189' - 10"



1 / M103 SECTION
SCALE: 1/4" = 1'-0"



LEVEL 5
SCALE: 1/4" = 1'-0"
EL = 165' - 4"



LEVEL 6
SCALE: 1/4" = 1'-0"
EL = 181' - 8"

Room Schedule	
Room Number	Room Name
LEVEL 5	
502	SERVICE STAIR
503	EXIT STAIR
504	CABLE CHASE
505	PIPE CHASE
LEVEL 5+	
501+	ELEVATOR LOBBY
502+	SERVICE STAIR
503+	EXIT STAIR
LEVEL 6	
601	SPF ROOM
602	SERVICE STAIR
603	EXIT STAIR
604	CABLE CHASE
605	PIPE CHASE
LEVEL 6+	
602+	SERVICE STAIR
603+	EXIT STAIR

Z
2" 0 2" 4"
SCALE: 1/4"=1'-0"

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LAD NOS: 003.100NE.000

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND
ESTABLISH BASE BUILDING

TOWER LEVELS 5 AND 6
HVAC PLANS

PALM_SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
	SUBMITTER'S TITLE:	APPROVER'S TITLE:	
DESIGNED	GNR	ISSUED BY	DATE: October 5, 2009 JCN
DRAWN	PEH	ENGINEERING SERVICES	DRAWING NO: PSP-D-ATCT- M103 REV
CHECKED	MPH	TERMINAL - LOS ANGELES	

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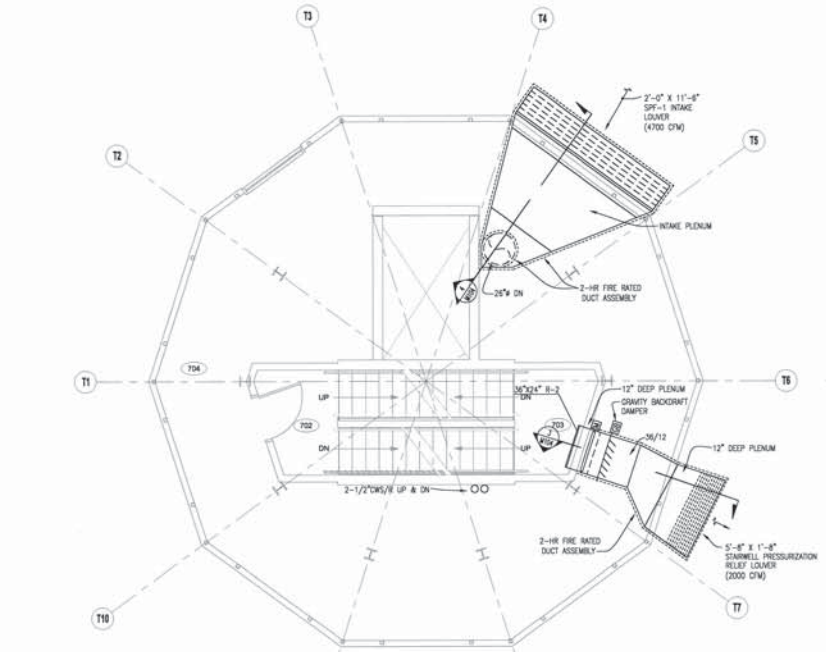
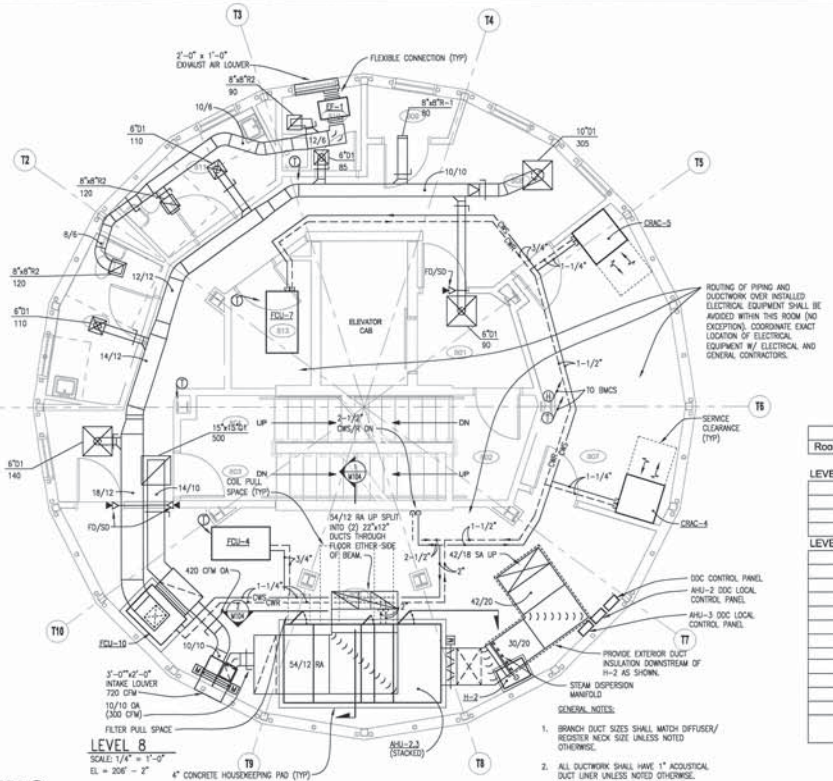


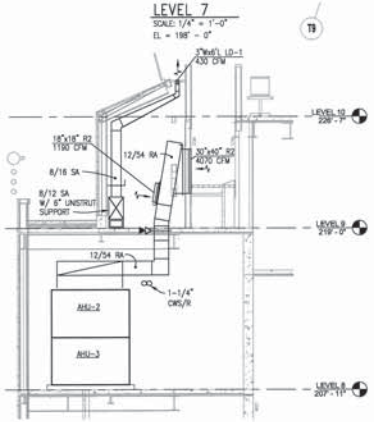


LEVEL 8
SCALE: 1/4" = 1'-0"
EL = 206' - 2"

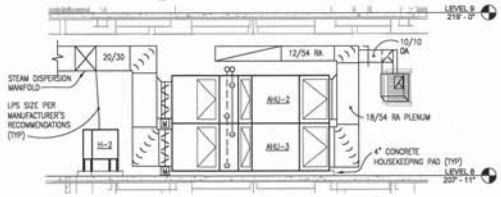
Room Schedule	
Room Number	Room Name
LEVEL 7	
702	SERVICE STAIR
703	EXIT STAIR
704	CABLE CHASE
705	PIPE CHASE
LEVEL 8	
801	ELEVATOR LOBBY
802	SERVICE STAIR
803	EXIT STAIR
804	CAB STAIR
805	CORRIDOR
806	MECHANICAL
807	EQUIPMENT
808	OPEN AREA
809	CLOSET
810	JANITOR
811	MEN
812	WOMEN
813	ELEVATOR CONTROLLER

GENERAL NOTES:

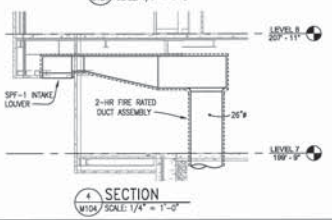
1. BRANCH DUCT SIZES SHALL MATCH DIFFUSER/ REGISTER NECK SIZE UNLESS NOTED OTHERWISE.
2. ALL DUCTWORK SHALL HAVE 1" ACOUSTICAL DUCT LINER UNLESS NOTED OTHERWISE. DUCT DIMENSIONS ARE CLEAR INSIDE DIMENSIONS.
3. SEE PLUMBING DRAWINGS FOR CONDENSATE DRAIN PIPING.



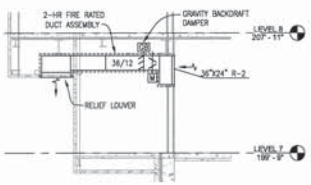
1 SECTION M104 SCALE: 1/4" = 1'-0"



2 SECTION M104 SCALE: 1/4" = 1'-0"



4 SECTION M104 SCALE: 1/4" = 1'-0"



3 SECTION M104 SCALE: 1/4" = 1'-0"

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

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No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

TOWER LEVELS 7 AND 8 HVAC PLANS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
SUBMITTER'S (TITLE)			APPROVER'S TITLE
DESIGNED	GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN
DRAWN	PEH		DRAWING NO PSP-D-ATCT- M104 REV
CHECKED	MPH		

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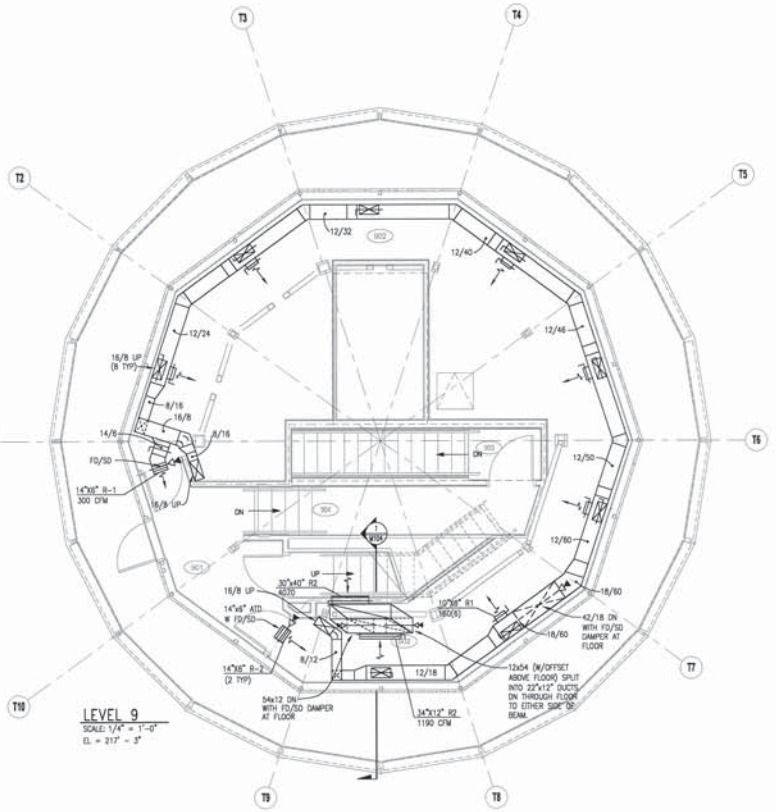
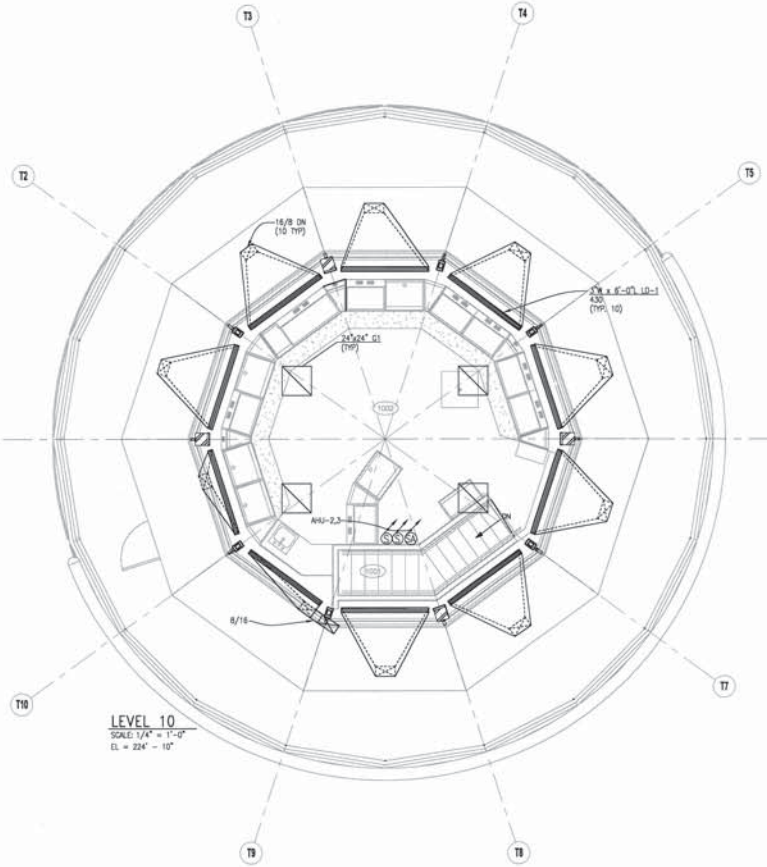
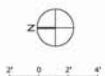




Room Schedule	
Room Number	Room Name
LEVEL 9	
901	CORRIDOR
902	EQUIPMENT
904	CAB STAIR
1001	CAB STAIR
LEVEL 10	
1001	CAB STAIR
1002	CONTROL CAB



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LAD NO: 003-10096-000

REGISTERED PROFESSIONAL ENGINEER
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Exp. 6-30-11
MECHANICAL
STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

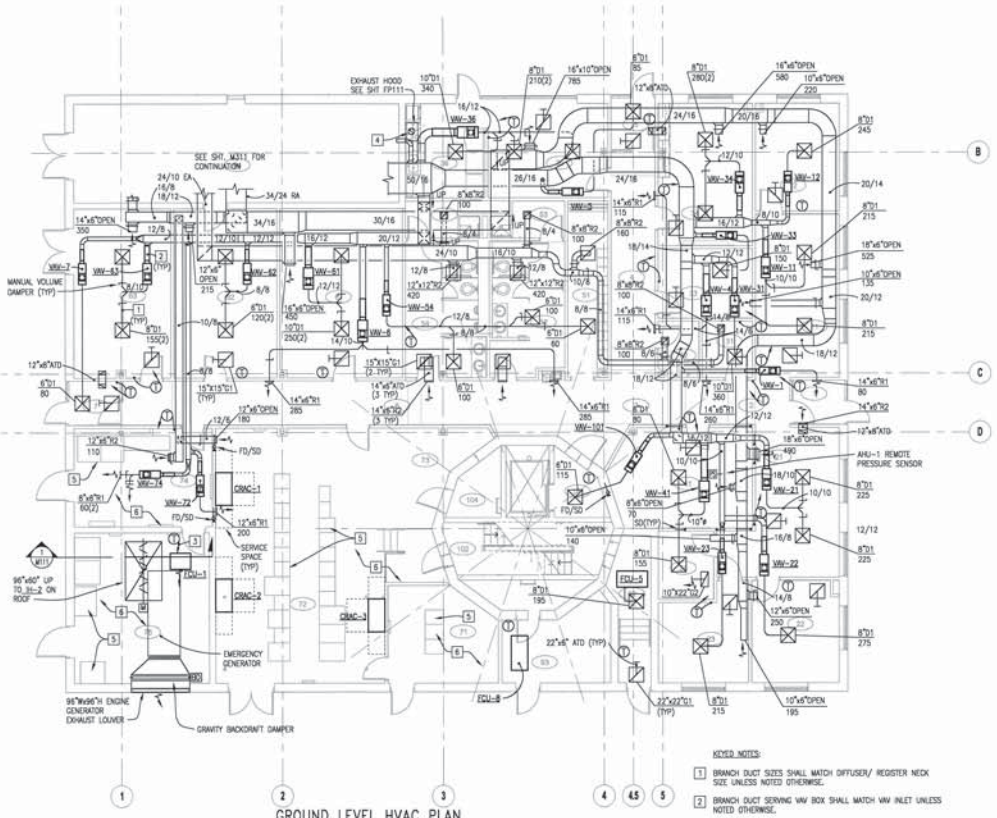
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND
ESTABLISH BASE BUILDING

TOWER LEVELS 9 AND 10
HVAC PLANS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
	SUBMITTER'S TITLE:		APPROVER'S TITLE:
	DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN
	DRAWN PEH		DRAWING NO PSP–D–ATCT– M105 REV
	CHECKED MPH		



GROUND LEVEL HVAC PLAN

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

KEYED NOTES:

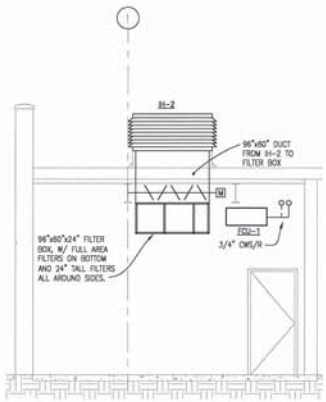
1. BRANCH DUCT SIZES SHALL MATCH DIFFUSER/ REGISTER NECK SIZE UNLESS NOTED OTHERWISE.
2. BRANCH DUCT SERVING VAV BOX SHALL MATCH VAV INLET UNLESS NOTED OTHERWISE.
3. FOR FCU-1.
4. 10"ø STAINLESS STEEL DUCT FROM RANGE HOOD UP AND TRANSITION TO EC-1 ROOF CAP.
5. ELECTRICAL EQUIPMENT (TYP) COORDINATE EXACT LOCATION W/ ELECTRICAL AND GENERAL CONTRACTORS.
6. ROUTING OF DUCTWORK ABOVE INSTALLED ELECTRICAL EQUIPMENT SHALL BE AVOIDED WITHIN THIS ROOM (NO EXCEPTIONS).

GENERAL NOTES:

1. ALL DUCTWORK SHALL HAVE 1" ACOUSTICAL DUCT LINER UNLESS NOTED OTHERWISE. DUCT DIMENSIONS ARE CLEAR INSIDE DIMENSIONS.

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

Room Schedule	
Room Number	Room Name
GROUND LEVEL	
1	VESTIBULE
2	RECEPTION AREA
3	CORRIDOR A
4	CORRIDOR B
5	VESTIBULE B
6	CORRIDOR C
7	VESTIBULE C
11	SSC ADMIN COORD
12	SSC MANAGER
21	OPEN AREA/ADMIN ASSIST
22	AT MANAGER
23	OPS SUP
24	TAPE PLAYBACK
31	COPY/PRINTER
32	JANITOR
33	CBI
34	CONFERENCE
35	BREAK ROOM
36	FOOD PREP AREA
41	COPY/ADMIN STOR
51	LOCKER ROOM
52	WOMEN
53	SHOWER
54	MEN
55	SHOWER
61	TECH OPS WORK AREA
62	ENVIRONMENTAL SHOP
63	TECH STORAGE /DARKSPACE
64	MECHANICAL
71	TELCO
72	EQUIPMENT
73	TECH LIBRARY
74	E SWITCH GEAR ROOM
75	SWITCH GEAR ROOM
76	EG ROOM
91	TOWER VESTIBULE
92	EXIT PASSAGEWAY
93	PUMP ROOM



1 / M111 SECTION

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

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REGISTERED PROFESSIONAL ENGINEER CHARLES F. [illegible] No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

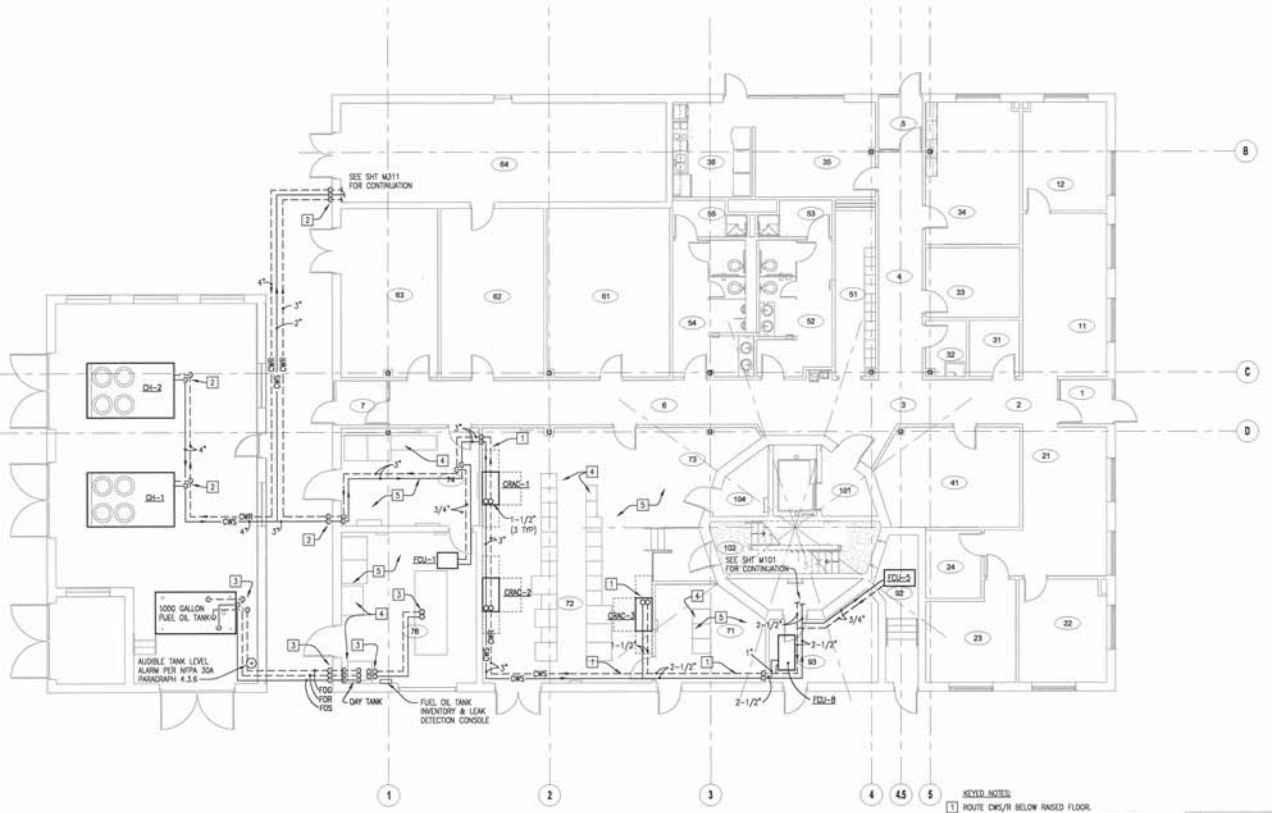
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

GROUND LEVEL HVAC PLAN

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
SUBMITTER'S TITLE		APPROVER'S TITLE	
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN	
DRAWN PEH		DRAWING NO PSP-D-ATCT- M111	REV
CHECKED MPH			



GROUND LEVEL HVAC PIPING PLAN
SCALE: 1/8"=1'-0"

Room Schedule	
Room Number	Room Name
GROUND LEVEL	
1	VESTIBULE
2	RECEPTION AREA
3	CORRIDOR A
4	CORRIDOR B
5	VESTIBULE B
6	CORRIDOR C
7	VESTIBULE C
11	SSC ADMIN COORD
12	SSC MANAGER
21	OPEN AREA/ADMIN ASSIST
22	AT MANAGER
23	OPS SUP
24	TAPE PLAYBACK
31	COPY/PRINTER
32	JANITOR
33	CBI
34	CONFERENCE
35	BREAK ROOM
36	FOOD PREP AREA
41	COPY/ADMIN STOR
51	LOCKER ROOM
52	WOMEN
53	SHOWER
54	MEN
55	SHOWER
61	TECH OPS WORK AREA
62	ENVIRONMENTAL SHOP
63	TECH STORAGE SORKSPACE
64	MECHANICAL
71	TELCO
72	EQUIPMENT
73	TECH LIBRARY
74	E SWITCH GEAR ROOM
75	SWITCH GEAR ROOM
76	EQ ROOM
91	TOWER VESTIBULE
92	EXIT PASSAGEWAY
93	PUMP ROOM

KEYED NOTES:
1. ROUTE CWS/R BELOW RAISED FLOOR.
2. ROUTE CWS/R ON IN COVERED TRENCH, SEE 4/M402
3. ROUTE FOS/R/G ON IN COVERED TRENCH, SEE 4/M406
4. ELECTRICAL EQUIPMENT (TYP) COORDINATE EXACT LOCATION W/ ELECTRICAL AND GENERAL CONTRACTORS.
5. ROUTING OF PIPING ABOVE INSTALLED ELECTRICAL EQUIPMENT SHALL BE AVOIDED WITHIN THIS ROOM (NO EXCEPTION).

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

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REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

GROUND LEVEL HVAC PIPING PLAN

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
SUBMITTER'S TITLE:			APPROVER'S TITLE:
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009	JCN
DRAWN PEH		DRAWING NO PSP–D–ATCT– M211	REV
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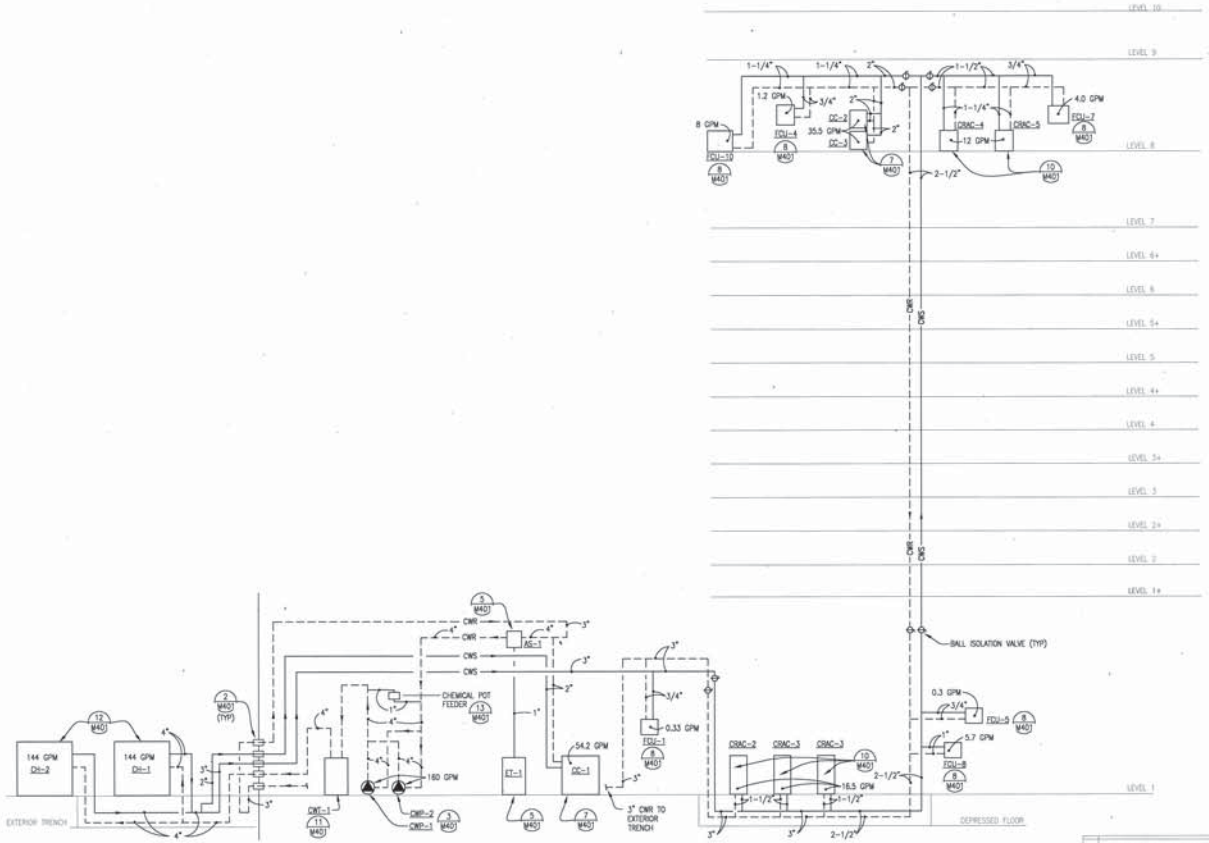

CHILLED WATER SCHEMATIC DIAGRAM
SCALE: NONE

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REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CHILLED WATER SCHEMATIC DIAGRAM

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

LAD JOB NO: 003-100196-000

REGISTERED PROFESSIONAL ENGINEER — CHARLES P. [illegible] — No. M 33803 — Exp. 6-30-11 — MECHANICAL — STATE OF CALIFORNIA

REVIEWED BY
SUBMITTED BY
APPROVED BY
SUBMITTER'S TITLE:
APPROVER'S TITLE:
DESIGNED GNR
DRAWN PEH
CHECKED MPH
ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES
DATE October 5, 2009 JCN
DRAWING NO PSP-D-ATCT- M301 REV

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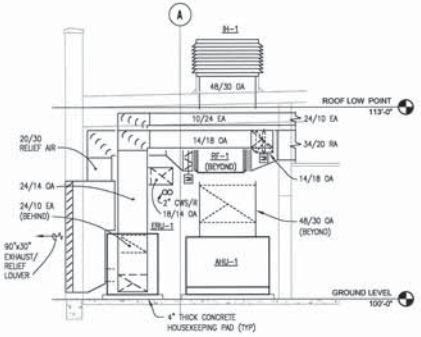
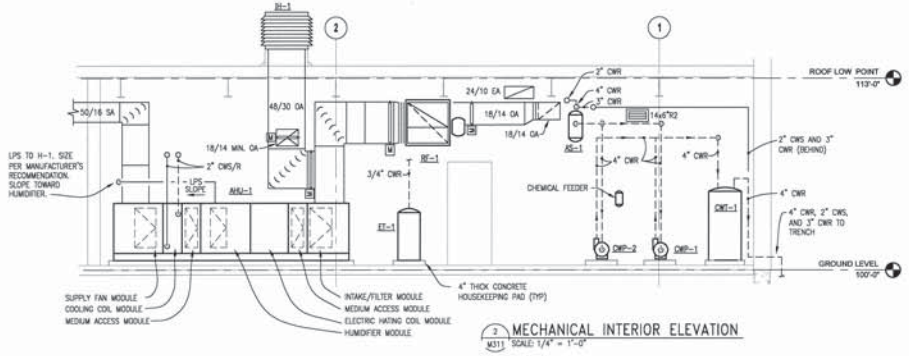
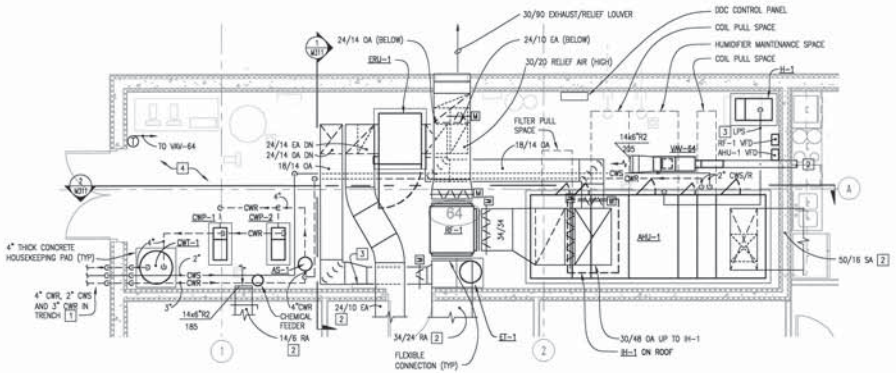


1 M311 MECHANICAL INTERIOR ELEVATION
SCALE: 1/4" = 1'-0"



2 M311 MECHANICAL INTERIOR ELEVATION
SCALE: 1/4" = 1'-0"



3 M311 GROUND LEVEL MECHANICAL ROOM HVAC PLAN
SCALE: 1/4" = 1'-0"

KEYED NOTES:

1. SEE SHEET M211 FOR CONTINUATION.
2. SEE SHEET M111 FOR CONTINUATION.
3. SIZE LPS FROM H-1 PER MANUFACTURER'S RECOMMENDATIONS
4. ELECTRICAL EQUIPMENT (TYP) COORDINATE EXACT LOCATION W/ ELECTRICAL AND GENERAL CONTRACTORS.
5. ROUTING OF PIPING & DUCTWORK ABOVE INSTALLED ELECTRICAL EQUIPMENT SHALL BE AVOIDED WITHIN THIS ROOM (NO EXCEPTION).

2' 0 2' 4'
SCALE: 1/4"=1'-0"

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LAD NO.: 003 10096-000

REGISTERED PROFESSIONAL ENGINEER
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No. M 33805
Exp. 6.30.11
MECHANICAL
STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

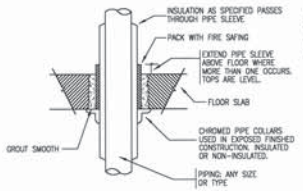
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND
ESTABLISH BASE BUILDING

GROUND LEVEL MECHANICAL ROOM HVAC PLAN

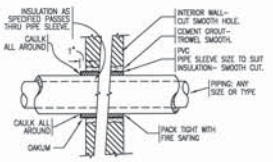
PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
	SUBMITTER'S TITLE:	APPROVER'S TITLE:	
DESIGNED GNR	ISSUED BY	DATE October 5, 2009 JCN	
DRAWN PEH	ENGINEERING SERVICES	DRAWING NO	REV
CHECKED MPH	TERMINAL – LOS ANGELES	PSP-D-ATCT- M311	



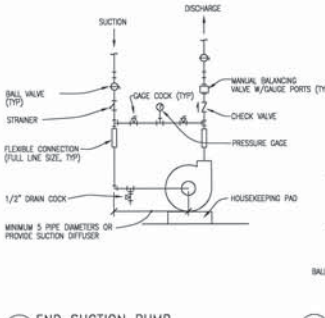
PIPE FLOOR SLAB PENETRATION DETAIL

1 / M401 SCALE: NONE



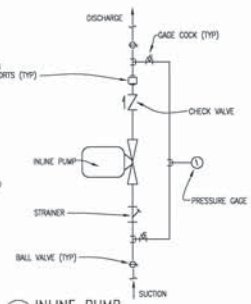
PIPE EXTERIOR WALL PENETRATION DETAIL

2 / M401 SCALE: NONE



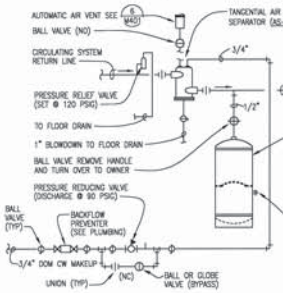
END SUCTION PUMP

3 / M401 SCALE: NONE



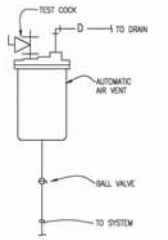
INLINE PUMP

4 / M401 SCALE: NONE



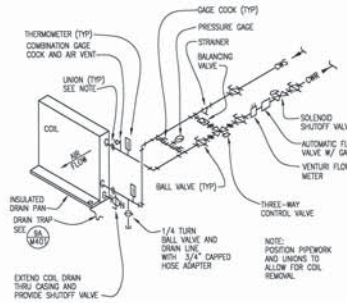
CHILLED WATER EXPANSION TANK (ET-1)

5 / M401 SCALE: NONE



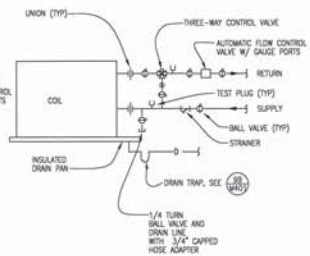
AUTOMATIC AIR VENT

6 / M401 SCALE: NONE



COOLING COIL (CC-)

7 / M401 SCALE: NONE

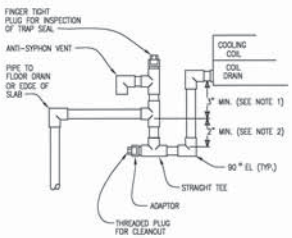


FAN COIL (FCU-)

8 / M401 SCALE: NONE

DRAW THRU DRAIN NOTES:

1. THIS DIMENSION SHALL BE THE SUCTION PRESSURE (INCHES OF WATER GAGE) DOWNSTREAM OF THE COOLING COIL RELATIVE TO ATMOSPHERE PLUS 1" OR SHALL BE 3", WHICHEVER IS GREATER.
2. THIS DIMENSION SHALL BE 1/2 THE SUCTION PRESSURE (INCHES OF WATER GAGE) DOWNSTREAM OF THE COOLING COIL RELATIVE TO ATMOSPHERE PLUS 1" OR SHALL BE 2", WHICHEVER IS GREATER.

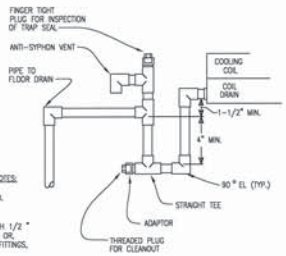


CONDENSATE DRAIN PIPING FOR DRAWTHRU UNITS

9A / M401 SCALE: NONE

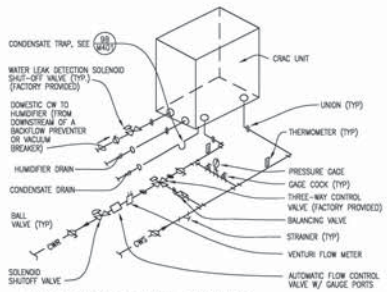
GENERAL CONDENSATE DRAIN NOTES:

1. CONSTRUCT DRAIN OF 7/8" O.D. COPPER PIPE AND FITTINGS.
2. INSULATE ALL DRAIN PIPING WITH 1/2" THICK ELASTOMERIC INSULATION OR, WHERE NOT FEASIBLE DUE TO FITTINGS, USE INSULATION TAPE WRAP.



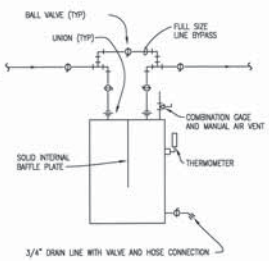
CONDENSATE DRAIN PIPING FOR BLOWTHRU UNITS

9B / M401 SCALE: NONE



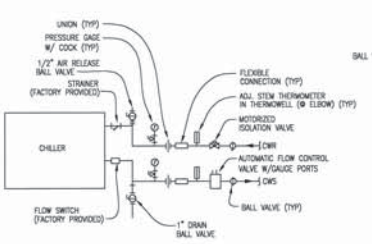
THREE-WAY COOLING COMPUTER ROOM AIR CONDITIONING UNIT (CRAC-)

10 / M401 SCALE: NONE



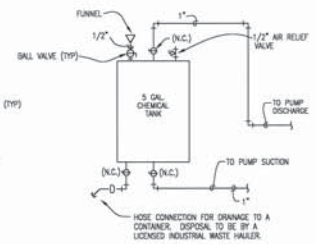
CHILLED WATER BUFFER TANK (CWT-1) DETAIL

11 / M401 SCALE: NONE



AIR COOLED CHILLER PIPING DETAIL

12 / M401 SCALE: NONE



NOTE:
SEQUENCE SHOULD BE SUCH THAT TANK IS "FILLED" THROUGH FUNNEL TO A POINT TO ELIMINATE AS MUCH AIR AS POSSIBLE IN TANK. AFTER WHICH THE FUNNEL BALL VALVE IS CLOSED AND THE PUMP SUCTION AND DISCHARGE BALL VALVES SHALL BE OPENED. AFTER A PERIOD OF TIME THE PUMP SUCTION AND DISCHARGE VALVES SHALL BE CLOSED AND THE DRAIN AND FUNNEL BALL VALVE SHALL BE OPENED TO DRAIN TANK.

CHEMICAL POT FEEDER

13 / M401 SCALE: NONE

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LAD NO.: 002-10096-000

REGISTERED PROFESSIONAL ENGINEER CHARLES P. GNR No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

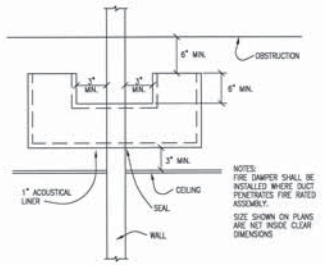
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

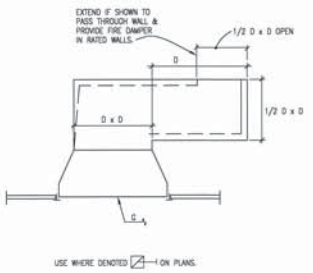
DETAILS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

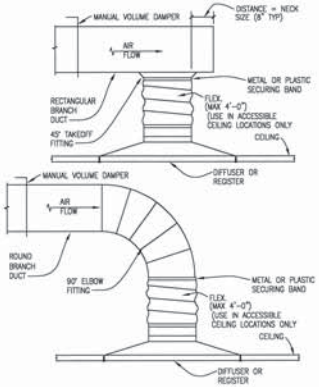
REVIEWED BY	SUBMITTED BY		APPROVED BY
	SUBMITTER'S TITLE:		APPROVER'S TITLE:
	DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN
	DRAWN PEH		DRAWING NO PSP-D-ATCT- M401 REV
	CHECKED MPH		



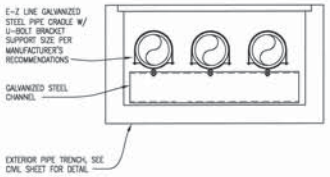
1 M402 AIR TRANSFER DUCT
SCALE: NONE



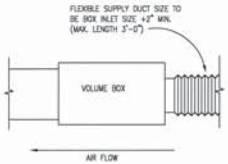
2 M402 RETURN GRILLE
SCALE: NONE



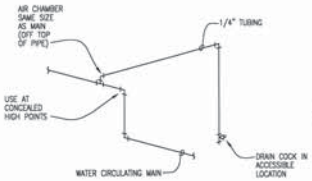
3 M402 DIFFUSER CONNECTION
SCALE: NONE



4 M402 EXTERIOR PIPE TRENCH SUPPORT DETAIL
SCALE: NONE

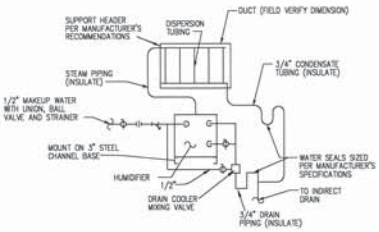


5 M402 VAV BOX DETAIL
SCALE: NONE

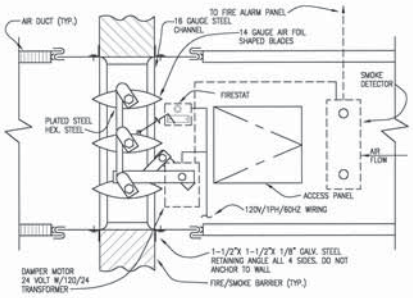


NOTE: PROVIDE AT ALL HIGH SPOTS OF CHILLED WATER AND HEATING HOT WATER SYSTEMS.

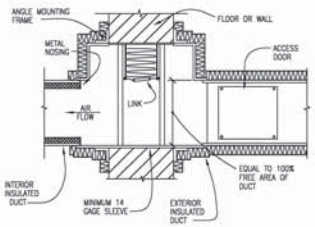
6 M402 AIR ELIMINATOR
SCALE: NONE



7 M402 ELECTRIC STEAM HUMIDIFIER
SCALE: NONE

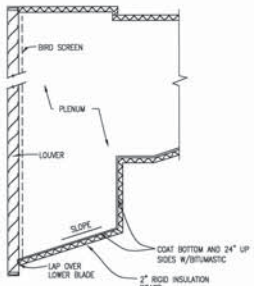


8 M402 FIRE/SMOKE DAMPER AT RATED WALLS
SCALE: NONE



NOTES:
1. PROVIDE TYPE A FIRE DAMPER WITH LINK AND FIRE CURTAIN COMPLETELY OUT OF CLEAR DUCT DIMENSION.

9 M402 FIRE DAMPER DETAIL
SCALE: NONE



10 M402 LOUVER DETAIL
SCALE: NONE

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LAD NO: 003 100196-000

REGISTERED PROFESSIONAL ENGINEER — No. M 33803 — Exp. 6.30.11 — MECHANICAL — STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

DETAILS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY		SUBMITTED BY	APPROVED BY
		SUBMITTER'S TITLE	APPROVER'S TITLE
DESIGNED	GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE: October 5, 2009 JCN
DRAWN	PEH		DRAWING NO: PSP–D–ATCT– M402 REV
CHECKED	MPH		

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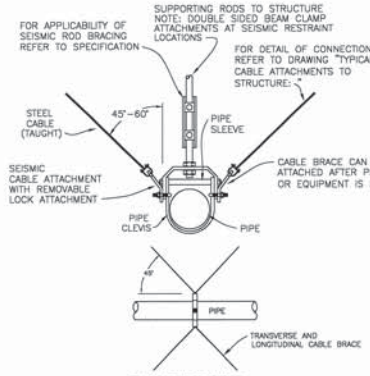
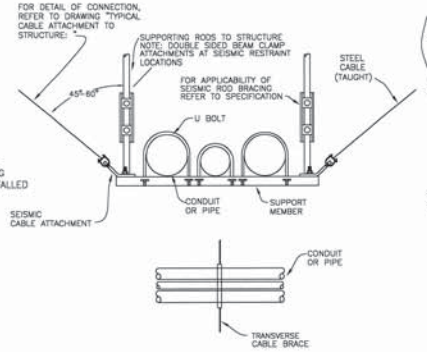


NOTE: 1. SEE SPECIFICATION FOR CABLE BRACING DISTANCE REQUIREMENTS.
2. SLACK CABLE 1/2" IN CENTER IF ISOLATED.

TRANSVERSE & LONGITUDINAL CABLE BRACE FOR CLEVIS HUNG PIPING & CONDUIT

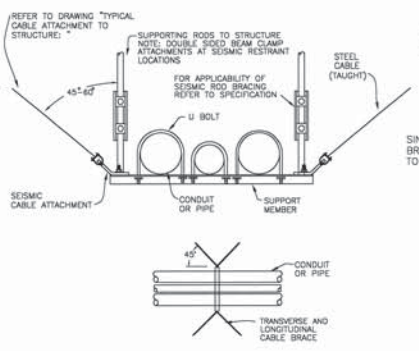
1 / M403 SCALE: NONE



NOTE: 1. SEE SPECIFICATION FOR CABLE BRACING DISTANCE REQUIREMENTS.
2. SLACK CABLE 1/2" IN CENTER IF ISOLATED.

TRANSVERSE CABLE BRACE FOR TRAPEZE HUNG PIPING & CONDUIT

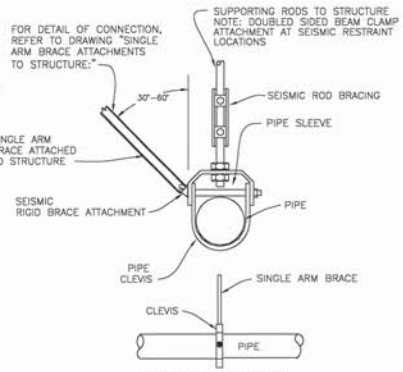
2 / M403 SCALE: NONE



NOTE: 1. SEE SPECIFICATION FOR CABLE BRACING DISTANCE REQUIREMENTS.
2. SLACK CABLE 1/2" IN CENTER IF ISOLATED.

TRANSVERSE & LONGITUDINAL CABLE BRACE FOR TRAPEZE HUNG PIPING & CONDUIT

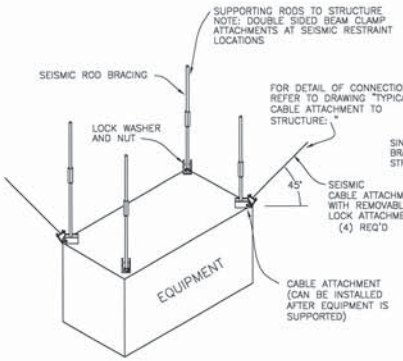
3 / M403 SCALE: NONE



NOTE: 1. SEE SPECIFICATION FOR RIGID BRACING DISTANCE REQUIREMENTS.
NOTE: 2. CANNOT BE USED WITH ISOLATION HANGERS.

TRANSVERSE ARM BRACE FOR CLEVIS HUNG PIPING

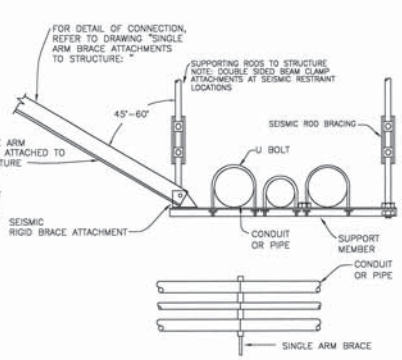
4 / M403 SCALE: NONE



NOTE: 1. CABLE BRACING OCCURS DIAGONALLY AT (4) CORNERS OF EQUIPMENT ANGLED APPROXIMATELY 45° UP TO STRUCTURE.

TYPICAL SEISMIC RESTRAINT OF CEILING HUNG EQUIPMENT

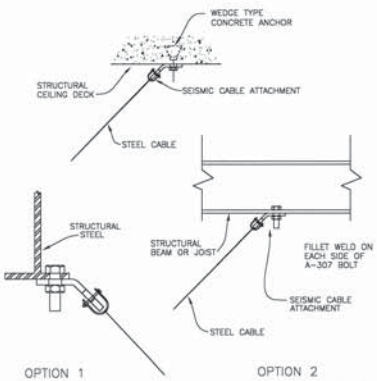
5 / M403 SCALE: NONE



NOTE: 1. SEE SPECIFICATION FOR RIGID BRACING DISTANCE REQUIREMENTS.
NOTE: 2. CANNOT BE USED WITH ISOLATION HANGERS.

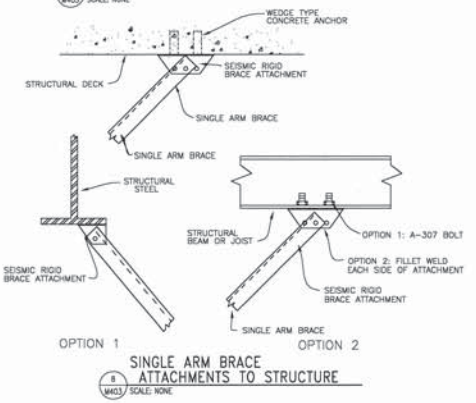
TRANSVERSE SINGLE ARM BRACE FOR TRAPEZE HUNG PIPING & CONDUIT

6 / M403 SCALE: NONE



TYPICAL CABLE UNISTRUT ATTACHMENTS TO STRUCTURE

7 / M403 SCALE: NONE



SINGLE ARM BRACE ATTACHMENTS TO STRUCTURE

8 / M403 SCALE: NONE

LEO A DALY
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LAD NO: 003.1009K.000

REGISTERED PROFESSIONAL ENGINEER No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

DETAILS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
SUBMITTER'S TITLE:			APPROVER'S TITLE:
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN	
DRAWN PEH		DRAWING NO PSP-D-ATCT- M403	REV
CHECKED MPH			

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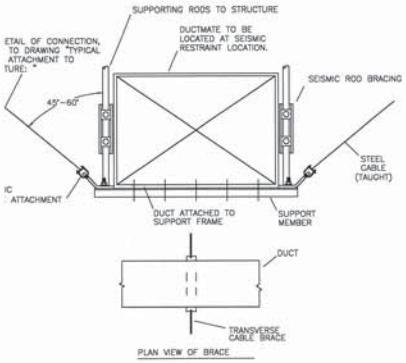
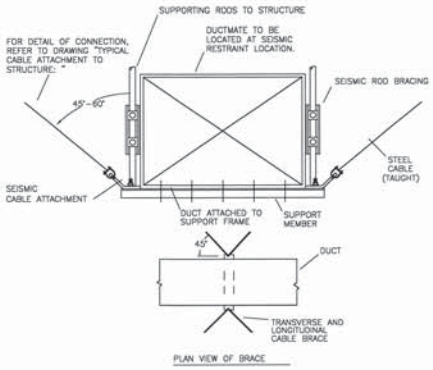
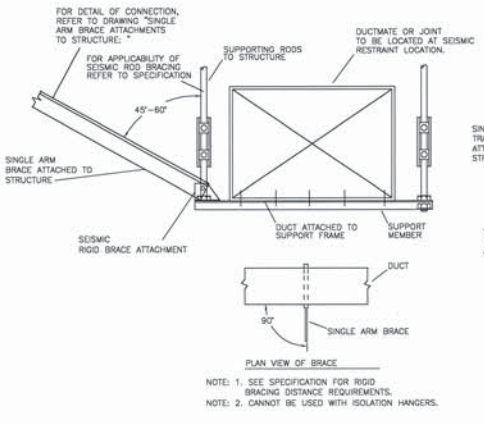


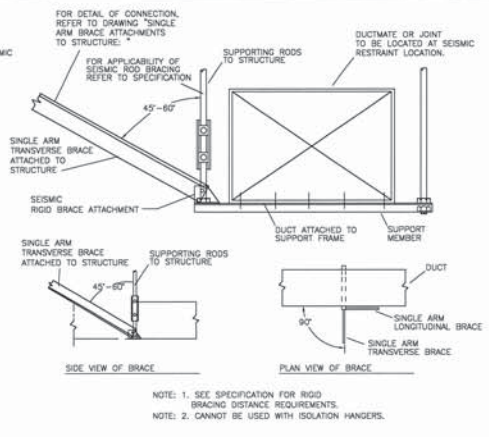
1 M404 TRANSVERSE CABLE BRACE FOR DUCTWORK
SCALE: NONE



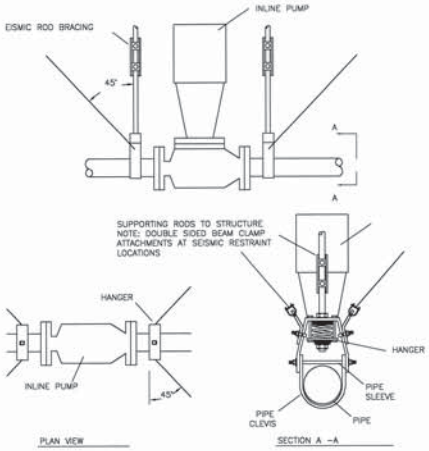
2 M404 TRANSVERSE & LONGITUDINAL CABLE BRACE FOR DUCTWORK
SCALE: NONE



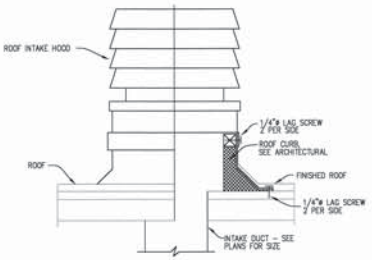
3 M404 TRANSVERSE SINGLE ARM BRACE FOR DUCTWORK
SCALE: NONE



4 M404 SINGLE ARM BRACE FOR DUCTWORK TRANSVERSE & LONGITUDINAL
SCALE: NONE



5 M404 TYPICAL INSTALLATION OF INLINE PUMP
SCALE: NONE



6 M404 ROOF INTAKE HOOD CURB DETAIL
SCALE: NONE

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Omaha, NE 68114-4039
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LAD NO: 003.10096.000

REGISTERED PROFESSIONAL ENGINEER GREGORY P. HUGHES No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

DETAILS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

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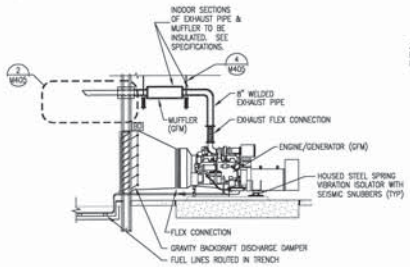
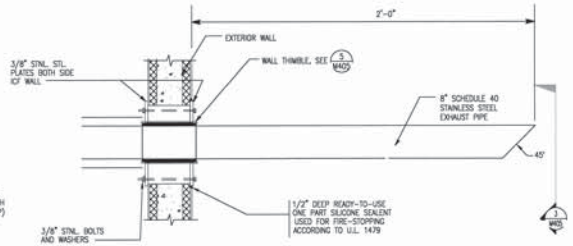
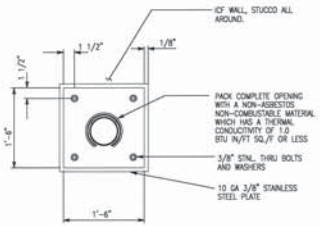
	SUBMITTER'S TITLE:		APPROVER'S TITLE:
	DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL - LOS ANGELES	DATE October 5, 2009 JCN
	DRAWN PEH		DRAWING NO PSP-D-ATCT- M404 REV
	CHECKED MPH		



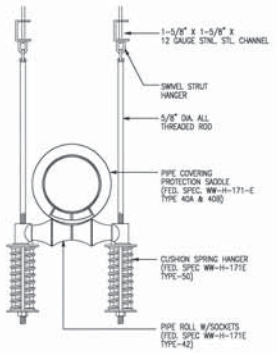
1 M405 GENERATOR/MUFFLER SUPPORT DETAIL
SCALE: NONE



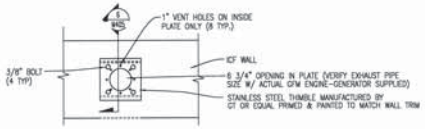
2 M405 MUFFLER SUPPORT DETAIL
SCALE: NONE



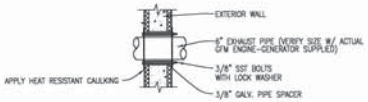
3 M405 EXHAUST PIPE EXIT DETAIL
SCALE: NONE



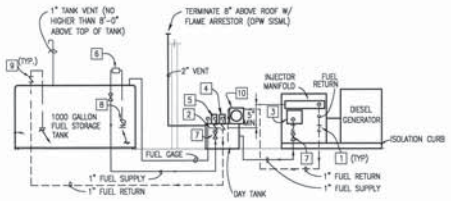
4 M405 INTERIOR EXHAUST PIPE SUPPORT DETAIL
SCALE: NONE



5 M405 THIMBLE DETAIL
SCALE: NONE



6 M405 THIMBLE SECTION
SCALE: NONE



7 M405 DIESEL FUEL SYSTEM SCHEMATIC
SCALE: NONE

KEYED NOTES:

1. FLEX FUEL PIPE
2. MAXIMUM FUEL LEVEL.
3. GENERATOR FUEL PUMP.
4. REVERSE FLOW PUMP.
5. SUPPLY PUMP.
6. ANTI-SIPHON VALVE.
7. MANUAL SHUT-OFF VALVE, (LOCKABLE)
8. INTAKE DOUBLE POPPET FOOT VALVE W/SCREEN.
9. CHECK VALVE
10. FUEL COOLER FC-1, FUEL RETURNED TO DAY TANK.

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LAD NO: 002-10096-000

REGISTERED PROFESSIONAL ENGINEER CHARLES R. MERCHANT No. M 23855 Exp. 6.30.11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

DETAILS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
SUBMITTER'S TITLE:		APPROVER'S TITLE:	
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN	
DRAWN PEH		DRAWING NO PSP–D–ATCT– M405	REV
CHECKED MPH			

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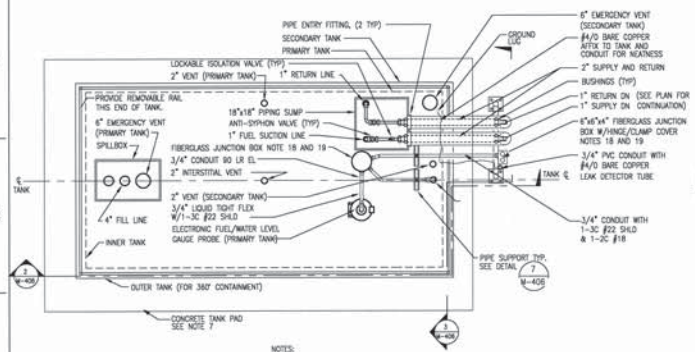
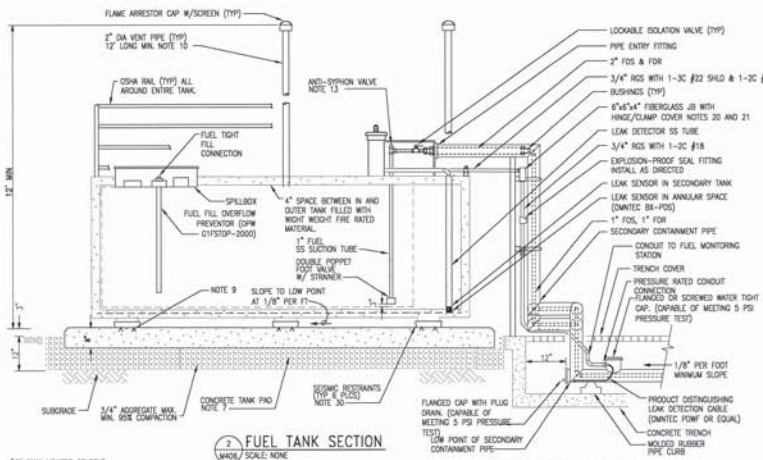
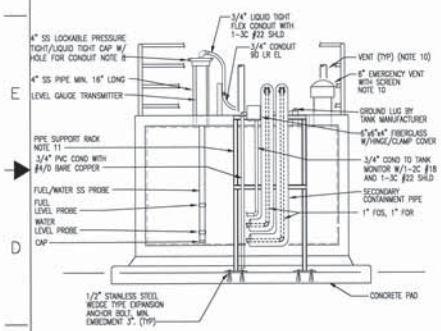


1 M406 FUEL TANK PLAN
SCALE: NONE



2 M406 FUEL TANK SECTION
SCALE: NONE



3 M406 FUEL TANK SECTION
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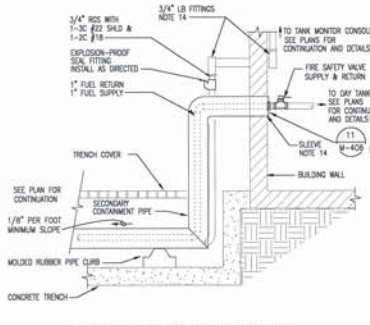
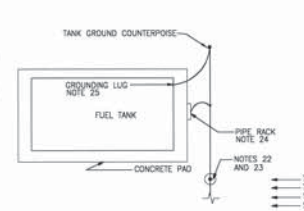
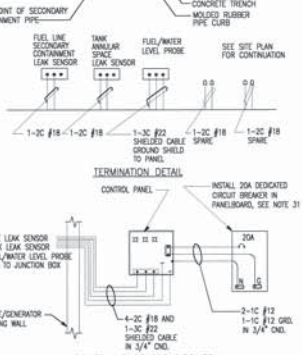


4 M406 BUILDING WALL PENETRATION
SCALE: NONE



5 M406 TANK GROUNDING PLAN
SCALE: NONE



6 M406 TANK MONITOR SYSTEM
SCALE: NONE

CONSTRUCTION NOTES:

GENERAL

1. DRAWINGS AND SPECIFICATIONS ARE INTENDED TO INDICATE THE FINISHED PRODUCT. METHODS OR SEQUENCES OF INSTALLATION ARE NOT SHOWN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL MEANS, METHODS, TECHNIQUES AND PROCEDURES IN ACCORDANCE WITH ACCEPTED CONSTRUCTION PRACTICES. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR SAFE WORK CONDITIONS DURING PERFORMANCE OF THE WORK.
2. ANY DIMENSIONS, DESCRIPTIONS OR OTHER QUALIFICATIONS REGARDING EXISTING STRUCTURES AND FEATURES INDICATED ON DRAWINGS OR IN THE SPECIFICATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. FOR ALL INTERIOR BUILDING LOCATIONS AND DETAILS OF FUEL LINES, CONDUIT AND WIRING, SEE SITE SPECIFIC DRAWINGS.
3. FUEL TANK MATERIALS AND INSTALLATION SHALL COMPLY WITH NFPA 30 AND SHALL MEET OR EXCEED ALL FEDERAL, STATE AND LOCAL CODES AND REGULATIONS.
4. ALL ELECTRICAL AND GROUNDING WORK SHALL BE IN ACCORDANCE WITH NEC AND FAA STANDARD SPECIFICATIONS.
5. ANY REFERENCE MADE ON THE DRAWINGS AND SPECIFICATIONS TO A SPECIFIC MANUFACTURER AND/OR PRODUCT IS ONLY FOR THE PURPOSE OF INDICATING REQUIRED CONFIGURATION, CAPACITY, FUNCTION, PERFORMANCE AND QUALITY. ANY MANUFACTURER/PRODUCT THAT MEETS OR EXCEEDS THESE PARAMETERS WILL BE CONSIDERED TO BE ACCEPTABLE.

FUEL STORAGE TANK

6. THE TANK SHALL BE A 1000 GALLON DOUBLE CONTAINMENT VAULT TANK MANUFACTURED BY CONVAULT. THE TANK SHALL BE UL 142 LISTED. THE LEAK DETECTOR PORT SHALL BE LOCATED ON THE FILL PORT END AS SHOWN ON THE DRAWINGS. TANK ACCESSORIES ARE SET FORTH IN THE SPECIFICATIONS. SEE SPECIFICATIONS FOR DETAILED INFORMATION.
7. THE SUPPORTING REINFORCED CONCRETE PAD SHALL BE AN APPROVED PRECAST UNIT OR CAST-IN-PLACE 8" THICK WITH THE CONCRETE HAVING A 28 DAY STRENGTH OF 4,500 PSI IN ACCORDANCE WITH THE TANK MANUFACTURER'S APPROVED DESIGN.
8. LOCKING DEVICES WILL BE FURNISHED AND INSTALLED BY FAA.
9. LEVEL TANK LEDS IN 3/4" THICK, NON-SHRINK, NON-METALLIC GROUT. SEE SPECS.
10. TANK VENT PIPE SHALL BE 2" DIA, 12" LONG MIN., BLACK IRON SCHED 40. PIPE SHALL BE PAINTED PER SPECIFICATIONS. VENT TERMINAL SHALL NOT BE LOCATED WITHIN 5 FEET MINIMUM OF THE ENGINE GENERATOR EXHAUST. EMERGENCY VENT SHALL BE 6" DIA, EPOXY PAINT PER SPECS.
11. PIPE AND CONDUIT SUPPORTS SHALL BE 1 1/2" FIBERGLASS MEMBERS WITH CORNER SUPPORT FITTINGS. SECURE TO CONCRETE TANK PAD AND STAIRS.

PIPING AND APPURTANENCES

12. PROVIDE DOUBLE-WALLED PIPING SYSTEM, ROVANCO STEEL CONTAINMENT PIPING, OR EQUAL. THE CARRIER PIPE SHALL BE SCHEDULE 40 BLACK STEEL. THE OUTER CONDUIT SHALL BE HOT DIPPED GALVANIZED STEEL, 4" DIA., 10 GAUGE MINIMUM. THE OUTER CASING SHALL BE ASSEMBLED TO BE WATERTIGHT AND SHALL HAVE A SMOOTH INNER CASING TO ALLOW FREE FLOW OF MOISTURE. THE CONDUIT WILL PROVIDE SECONDARY CONTAINMENT. LEAK DETECTION SHALL BE PROVIDED AT CONDUIT LOW POINTS. PROVIDE BUSHINGS AT END POINTS WHERE CARRIER PIPING EXITS THE CONTAINMENT CONDUIT. PIPING IN TRENCH SHALL BE SUPPORTED BY MOLDED RUBBER PIPE CURB. (PIPE CURBS SHALL BE KEYCURB, MANUFACTURED BY ROOFTOP ACCESSORIES OR EQUAL). PROVIDE SUPPORTS AT ELBOWS AND AT MIDPOINT.
13. VALVES SHALL BE STAINLESS STEEL SUITABLE FOR PETROLEUM PRODUCTS. THE ANTI-SYPHON VALVES SHALL BE BY PREFERRED UTILITIES CORP. HEAD SHALL BE 5'-10".
14. ALL PENETRATIONS SHALL BE SEALED WEATHERTIGHT WITH AN APPROVED SEALANT. SEE PLANS FOR LOCATION AND ELEVATION OF FUEL PIPE AND CONDUIT BUILDING PENETRATIONS.
15. ALL PRIMARY FUEL PIPING CONNECTIONS SHALL BE LEAK TESTED AT 50 PSI FOR A MINIMUM OF 2 HOURS. ALL CONTAINMENT PIPING SHALL BE LEAK TESTED AT 5 PSI FOR A MINIMUM OF 1 HOUR.
16. FILL TUBE SHALL BE AN OPW 61FSTOP-2000 TO AUTOMATICALLY SHUT OFF FLOW TO PREVENT AN OVERFILL CONDITION. FILL TUBE CONNECTION SHALL BE A TIGHT-FIT CAM AND GROOVE CONNECTION. PROVIDE TANK SIGNAGE STATING THAT THE TANK WILL ONLY ACCEPT TIGHT-FIT NOZZLES.

ELECTRICAL

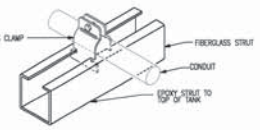
17. CONDUIT ENTRANCE TO ELECTRICAL BOXES SHALL BE PROVIDED WITH INSULATED GROUNDING METALLIC BUSHINGS.
18. TERMINATE 2-2C #18 (SPARES) IN JUNCTION BOX.
19. ALL JUNCTION BOXES SHALL BE NEMA 4X RATED.
20. SPLICING OF SHIELDED CABLE WILL NOT BE PERMITTED.
21. ALL EXTERIOR CONDUIT AND FITTINGS SHALL BE RIGID GALVANIZED STEEL, SCHED 40 AND FACTORY COATED PER SPECIFICATIONS. INTERIOR CONDUIT SHALL BE EMT.

GROUNDING

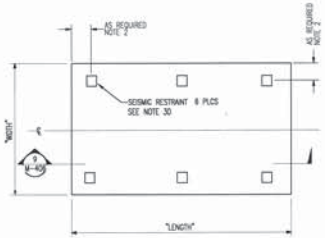
22. IF INDICATED ON SITE SPECIFIC PLAN, CONNECT TANK GROUND COUNTERPOISE WITH #4/0 BC TO FACILITY GROUND COUNTERPOISE.
23. INSTALL ACCESS WELL. SEE SPECIFICATIONS.
24. EACH METAL PIPE AND CONDUIT SHALL BE BONDED TOGETHER WITH APPROVED GROUNDING CLAMPS AND CONNECTED BY #2 BC TO TANK GROUND COUNTERPOISE.
25. GROUND TANK LUG TO TANK GROUND COUNTERPOISE WITH #4/0 BARE COPPER. APPROVED TANK GROUND LUG SHALL BE PROVIDED AND INSTALLED BY THE TANK MANUFACTURER AND WELDED TO THE TANK.
26. GROUND SHIELDED CABLE TO A JUMPER CABLE AT JUNCTION BOX.
27. EXCEPT AS NOTED, ALL GROUNDING CONNECTIONS SHALL BE MADE BY EXOTHERMIC WELD.

MISCELLANEOUS NOTES:

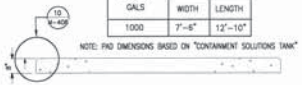
28. THE TANK MONITORING SYSTEM SHALL AS SPECIFIED.
29. REINFORCING STEEL SHALL COMPLY WITH ASTM A615 GRADE 60. REINFORCING STEEL PLACEMENT AND BENDING SHALL COMPLY WITH ACI STANDARDS.
30. SEISMIC RESTRAINTS SHALL BE PROVIDED BY THE TANK MANUFACTURER AND SHALL MEET STATE AND LOCAL CODE REQUIREMENTS. LOCATE AND INSTALL SEISMIC RESTRAINTS PER MANUFACTURERS INSTRUCTIONS AND REQUIREMENTS.
31. SEE DRAWINGS FOR LOCATION OF PANELBOARD AND FOR LOCATION OF TANK MONITOR CONSOLE.
32. PROVIDE, ON ALL FOUR SIDES OF TANK, SIGNAGE STATING THE PRODUCT STORED IN THE TANK (DIESEL), THE TANK CAPACITY (1000 GALLONS), THE API COLOR CODE, AND THAT THE TANK IS COMPATIBLE ONLY WITH TIGHT-FIT FILL CONNECTIONS AND THAT LOOSE FIT FILL CONNECTIONS ARE PROHIBITED.



7 M406 PIPE SUPPORT DETAIL
SCALE: NONE



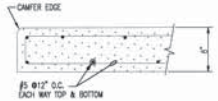
8 M406 EQUIPMENT PAD PLAN
SCALE: NONE



TANK SIZE GALS	PAD DIMENSIONS WIDTH	LENGTH
1000	7'-6"	12'-10"

NOTE: PAD DIMENSIONS BASED ON "CONTAINMENT SOLUTIONS TANK"

9 M406 EQUIPMENT PAD SECTION
SCALE: NONE



10 M406 EQUIPMENT PAD DETAIL
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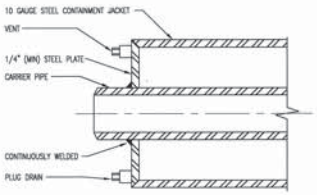

11 M406 CONTAINMENT PIPING END SEAL DETAIL
SCALE: NONE

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REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA LOS ANGELES, CA

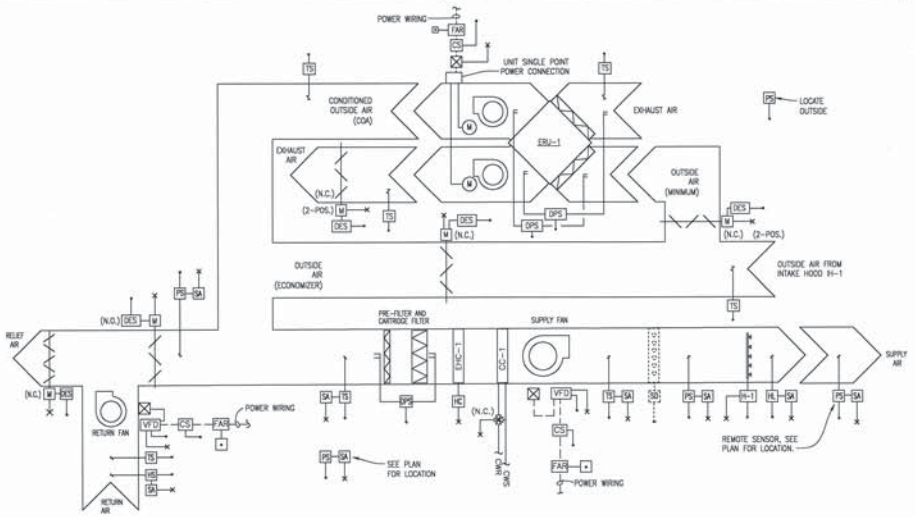
REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

DETAILS

PALM SPRINGS PALM SPRINGS INTERNATIONAL AIRPORT (PSP) CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
SUBMITTER'S TITLE:			APPROVER'S TITLE:
DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009	JCN
DRAWN PEH		DRAWING NO	REV
CHECKED MPH		PSP-D-ATCT- M406	

REGISTERED PROFESSIONAL ENGINEER No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA



1 M501 AHU-1, RF-1, ERU-1, H-1 CONTROL DIAGRAM
SCALE: NONE

SEQUENCE OF OPERATION

1) GENERAL: UNIT IS A VARIABLE AIR VOLUME (VAV) AIR HANDLING UNIT (AHU) SUPPORTED BY A STATIC PLATE PACK ENERGY RECOVERY UNIT (ERU-1) PROVIDING COOLING, HEATING & VENTILATION FOR AREAS SHOWN ON THE DRAWINGS.

2) OPERATION: UPON A CALL FROM THE BMCS TO OPERATE THE RETURN AIR DAMPER SHALL OPEN, THE MINIMUM OUTSIDE AIR DAMPER SHALL OPEN, AND THE EXHAUST AIR DAMPER SHALL OPEN. THE ERU-1 EXHAUST AND OUTSIDE AIR FANS SHALL START AND AHU-1 SUPPLY AND RETURN FANS SHALL START AND RUN CONTINUOUSLY. THE ERU-1 EXHAUST FAN SHALL RUN CONTINUOUSLY DURING OCCUPIED PERIODS. THE ERU-1 OUTSIDE AIR FAN SHALL ALSO OPERATE DURING OCCUPIED PERIODS, EXCEPT DURING PERIODS WHEN AHU-1 IS IN ECONOMIZER MODE AND THE ELECTRIC HEATING COIL IS NOT OPERATING. DURING THESE PERIODS OF "FREE COOLING" THE ERU-1 OUTSIDE AIR FAN SHALL NOT OPERATE AND THE MINIMUM OUTSIDE AIR DAMPER SHALL BE CLOSED. ALARM BMCS OPERATOR IF FANS DO NOT "PROVE" START OR STOPS AFTER CALLED TO OPERATE. ALARM SHALL BE THROUGH CURRENT SENSING RELAY.

3) SUPPLY FAN SPEED CONTROL: THE AHU SUPPLY FAN SHALL BE EQUIPPED WITH A VARIABLE FREQUENCY DRIVE WHICH WILL RESPOND TO MAINTAIN THE REMOTE SUPPLY AIR DUCT STATIC PRESSURE SETPOINT OF 1 INCH W.G. (ADJ). REMOTE DUCT STATIC PRESSURE SHALL BE MONITORED BY THE BMCS AND SHALL SIGNAL AN ALARM TO THE BMCS SHOULD PRESSURE RISE ABOVE OR FALL BELOW PREDETERMINED SETPOINTS (ADJ.).

4) RETURN FAN SPEED CONTROL:
THE RETURN FAN SHALL BE EQUIPPED WITH A VARIABLE FREQUENCY DRIVE WHICH WILL RESPOND TO MAINTAIN A NEGATIVE PRESSURE OF 0.25 IN. W.G. (ADJ.) DOWNSTREAM OF THE RETURN AIR DAMPER. ALARM BMCS SHOULD PRESSURE RISE ABOVE OR FALL BELOW PREDETERMINED SETPOINTS (ADJ.).

5) TEMPERATURE CONTROL:
A) ECONOMIZER/HEATING: WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW THE RETURN AIR TEMPERATURE BY A MINIMUM OF 5°F (ADJ.), THE RELIEF AIR AND THE ECONOMIZER OUTSIDE AIR DAMPER SHALL MODULATE OPEN IN CONJUNCTION WITH THE RETURN AIR DAMPER MODULATING CLOSED TO PROVIDE THE LOWEST POSSIBLE MIXED AIR TEMPERATURE DOWN TO A MINIMUM OF 53 DEGREES F (ADJ.). IF MIXED AIR TEMPERATURE FALLS BELOW 50 DEGREES F SETPOINT AND THE RETURN AIR DAMPER IS FULL OPEN THE BMCS SHALL STAGE THE ELECTRIC HEATING COIL TO MAINTAIN 55 DEG (ADJ.) LEAVING AIR TEMPERATURE.

B) COOLING: WHEN THE ECONOMIZER OPERATION CANNOT MAINTAIN A SUPPLY AIR TEMPERATURE OF 55 DEGREES F (ADJ.) THE BMCS SHALL MODULATE COOLING COIL CONTROL VALVE OPEN TO THE COIL TO MAINTAIN SUPPLY AIR SETPOINT. IF SUPPLY AIR TEMPERATURE RISES MORE THAN 5 DEGREES F (ADJ.) ABOVE SETPOINT FOR 5 MINUTES (ADJ) SIGNAL ALARM TO OPERATOR.

C) SUPPLY AIR TEMPERATURE RESET: WHEN ALL VAV BOXES ARE CALLING FOR HEAT AND ALL (ADJ.) ARE IN MINIMUM SA POSITION, THE SUPPLY AIR TEMPERATURE OF AHU-1 SHALL BE RAISED IN 2°F (ADJ) INCREMENTS UNTIL ONE VAV BOX RESETS TO AN "ABOVE MINIMUM" POSITION FOR (5) MINUTES (ADJ.). RESET "INCREMENTS" SHALL BE NO SOONER THAN 5 MINUTES (ADJ.) BEFORE THE NEXT 2 DEGREE INCREMENT IS INITIATED. SUPPLY AIR TEMPERATURE SHALL BE RESET "UP" UNTIL TWO (ADJ.) VAV BOXES ARE AT MAXIMUM COOLING SETTING FOR 5 MINUTES (ADJ.). AFTER WHICH SA SHALL RESET "DOWN" IN TWO DEGREE F (ADJ) INCREMENTS UNTIL SA TEMPERATURE REACHES 55 DEGREE F (ADJ.)

6) HUMIDIFICATION:
RETURN AIR HUMIDITY SENSOR SHALL MONITOR RELATIVE HUMIDITY (RH). IF RH IS BELOW 30% (ADJ.), BMCS SHALL ENABLE HUMIDIFIER AND THE HUMIDIFIER PACKAGED CONTROLS SHALL MODULATE TO MAINTAIN RETURN AIR RH SETPOINT. IF THE HIGH LIMIT SENSOR DETECTS DUCT RH ABOVE 90% RH (ADJ.), BMCS SHALL DISABLE HUMIDIFIER & SHALL ALARM BMCS OPERATOR.

7) BUILDING PRESSURIZATION:
THE RELIEF AIR DAMPER SHALL MODULATE TO MAINTAIN THE BUILDING POSITIVE STATIC PRESSURE BETWEEN 0.03 IN. W.G. TO 0.10 IN. W.G. (ADJ.).

8) FILTER STATUS: DIFFERENTIAL PRESSURE SWITCH SHALL ALARM THE BMCS TO SIGNAL FILTER MAINTENANCE SHOULD THE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANK(S) RISE ABOVE PREDETERMINED SETPOINTS. SETPOINT FOR FILTER ALARM SHALL BE DETERMINED DURING BALANCING BY SIMULATING A DIRTY FILTER USING CARDBOARD OR OTHER DEVICE TO BLOCK AIR HANDLING UNIT FILTER SECTION FREE AREA BY 30%.

9) FAN SHUTDOWN STATIC PRESSURE: AT UNIT DUCT STATIC PRESSURE SHALL BE MONITORED BY THE BMCS AND SHALL SIGNAL AN ALARM TO THE BMCS SHOULD PRESSURE RISE ABOVE PREDETERMINED SETPOINT OF 3.0 INCHES W.G. (ADJ). UPON ALARM, BMCS SHALL SHUTDOWN SUPPLY & RETURN FAN.

10) SMOKE SHUTDOWN/FIRE ALARM: WHEN SMOKE DETECTOR ALARMS OR UPON A SIGNAL FROM THE FIRE ALARM SYSTEM, BMCS SHALL BE NOTIFIED & FIRE ALARM SHALL SHUTDOWN THE SUPPLY FAN, RETURN FAN, AND ERU-1 FANS.

11) ENERGY RECOVERY: BMCS SHALL CALCULATE THE AMOUNT OF ENERGY RECOVERED BY ERU-1 THROUGH THE FOLLOWING FORMULA:

BTUH RECOVERED = [ABSOLUTE VALUE] CONDITIONED OUTSIDE AIR CFM * 1.08 * [OUTSIDE AIR TEMP (Y) – CONDITIONED OUTSIDE AIR TEMP (Y)]

12) EMERGENCY GENERATOR OPERATION: IF THE EMERGENCY GENERATOR IS OPERATING, THEN THE ELECTRIC HEATING COIL AND THE HUMIDIFIER WILL BE LOCKED OUT.

SYMBOL LEGEND

(APPLIES TO ALL CONTROL DIAGRAM SHEETS)

- SA — ADJUSTABLE SETPOINT
- /// — GRAVITY BACKDRAFT DAMPER
- SD — SMOKE DETECTOR (FURNISHED BY ELECTRICAL)
- FAN
- AIR VALVE
- MOTOR STARTER
- MODULATING CONTROL VALVE (TWO WAY)
- MODULATING CONTROL VALVE (THREE WAY)
- WALL MOUNTED SENSOR
- DUCT MOUNTED SENSOR
- DES — DAMPER END SWITCH
- INPUT TO BMCS (DIGITAL/ANALOG)
- OUTPUT FROM BMCS (DIGITAL/ANALOG)
- (N.C.) NORMALLY CLOSED (POSITION UPON LOSS OF POWER)
- (N.O.) NORMALLY OPEN (POSITION UPON LOSS OF POWER)
- DPS DIFFERENTIAL PRESSURE SWITCH
- T THERMOSTAT
- PS PRESSURE SENSOR
- TS TEMPERATURE SENSOR
- HL HIGH LIMIT
- HS HUMIDITY SENSOR
- RH RELATIVE HUMIDITY
- AV AIR VALVE
- ES END SWITCH
- CC — COOLING COIL
- EHC — ELECTRIC HEATING COIL
- EDH — ELECTRIC DUCT HEATER
- PUMP
- FILTER
- VFD — VARIABLE FREQUENCY DRIVE CONTROLLER
- M — MOTORIZED DAMPER
- FD/SD — COMBINATION FIRE/SMOKE DAMPER
- SD — SMOKE DAMPER
- AMS — AIR FLOW MEASURING STATION
- FAR — FIRE ALARM RELAY (BY ELECTRICAL)
- INPUT TO/OUTPUT FROM FIRE ALARM CONTROL PANEL
- POWER WIRING (BY ELECTRICAL)
- CS — CURRENT SENSOR
- FM — FLOW METER
- SENSOR IN THERMOWELL
- HC — ELECTRIC HEATING COIL CONTROLLER

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	BTUH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	DAMPER POSITION	VALVE POSITION	OUTPUTS: ANALOG: SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI. ANALOG	LOW ANALOG	HI. BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SUPPLY FAN					●																	●		
VAR. FREQ. DRIVE (SUPPLY FAN)										●		●			●							●		①
SUPPLY AIR	●														●			●	●			●	●	
RETURN AIR	●		●												●			●	●			●	●	ADJUST RH
MIXED AIR	●														●				●			●	●	
STATIC PRESSURE (REMOTE IN DUCT)		●													●			●	●			●	●	
STATIC PRESSURE (AT UNIT IN DUCT)		●													●			●	●			●	●	
STATIC PRESSURE (RETURN AIR DUCT)		●													●			●	●			●	●	
COOLING COIL CONTROL VALVE														●										
HEATING COIL											●						●							
FILTERS (EACH)						●														●		●	●	
RELIEF AIR DAMPER									●			●				●								
RETURN AIR DAMPER									●			●				●								
OUTSIDE AIR DAMPER (ECONOMIZER)									●			●				●								
OUTSIDE AIR DAMPER (MINIMUM)									●	●														
EXHAUST AIR DAMPER									●	●														
SMOKE DETECTOR							●															●		
OUTSIDE AIR	●	●																					●	
RETURN FAN					●								●									●		
VAR. FREQ. DRIVE (RETURN FAN)										●					●							●		①
HUMIDIFIER (H-1)					●					●												●		
HUMIDIFIER HIGH LIMIT			●												●			●				●		
STATIC PRESSURE (BUILDING)		●													●			●				●		
EXHAUST AIR (UPSTREAM OF ERU-1)	●																						●	
EXHAUST AIR (DOWNSTREAM OF ERU-1)	●																						●	
CONDITIONED OUTSIDE AIR	●																						●	
ENERGY RECOVERY UNIT		●	●							●														
ENERGY GENERATOR																						●		

NOTES:
① SEE VFD SPECIFICATION FOR ADDITIONAL POINTS TO MONITOR & CONTROL BY BMCS.

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	LEVEL (GALLONS)	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	VALVE POSITION	OUTPUTS: ANALOG: SET POINT ADJUSTMENT	MODULATION	ALARMS: HI. ANALOG	LOW ANALOG	HI. BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SP-1 SERVING ELEVATOR PIT																				●		②
DWBP-1																				●		③
SPF-1					●															●		⑤
FUEL TANK MONITORING AND DETECTION				●																●		①
DWCP-1					●							●								●		④

NOTES:
① AN ALARM ISSUED BY THE FUEL MONITORING AND LEAK DETECTION SYSTEM SHALL ALSO BE SENT TO THE BMCS SYSTEM.
② BMCS TO MONITOR SP-1 CONTROL PANEL. HIGH WATER ALARM & SHALL ALARM OPERATOR UPON HIGH WATER CONDITION.
③ BMCS SHALL MONITOR DWBP-1 CONTROL PANEL & SHALL SIGNAL ALARM TO OPERATOR FROM GENERAL DWBP-1 ALARM(S).
④ THE DOMESTIC HOT WATER CIRCULATING PUMP SHALL OPERATE DURING OCCUPIED PERIODS.
⑤ BMCS TO MONITOR SPF-1 STATUS & SHALL ALARM OPERATOR WHEN SPF-1 IS CALLED TO OPERATE.

2 M-501 MISCELLANEOUS BMCS POINT SCHEDULE
SCALE: NONE

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REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

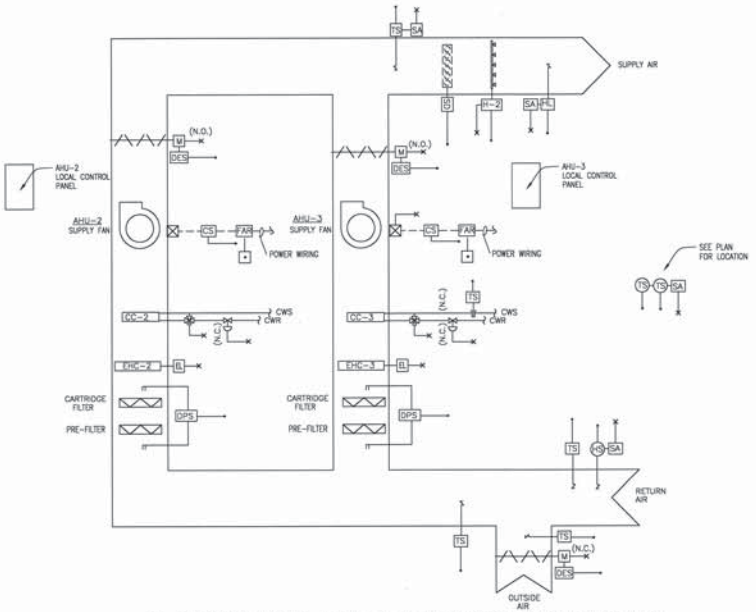
REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY		APPROVED BY
	SUBMITTER'S TITLE:		APPROVER'S TITLE:
	DESIGNED: GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE: October 5, 2009 JCN
	DRAWN: PEH		DRAWING NO: PSP-D-ATCT- M501 REV
	CHECKED: MPH		

REGISTERED PROFESSIONAL ENGINEER — CHARLES P. MCCARTHY — No. M 33803 — Exp. 6-30-11 — MECHANICAL — STATE OF CALIFORNIA



1 M502 CONSTANT VOLUME AHU-2, 3, & H-2 CONTROL DIAGRAM (CAB AHU)

SCALE: NONE

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	CFM	BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SUPPLY FAN (EACH)					●							●											
SUPPLY AIR (COMMON)	●																●	●			●	●	
CAB SPACE TEMP SENSORS (EA)	●													●			●	●			●	●	
RETURN AIR	●		●											●							●	●	
MIXED AIR (COMMON)	●																		●			●	
OUTSIDE AIR	●																					●	
COOLING COIL (EA.)													●		●								
HEATING COIL (EA)											●					●							
FILTER (EA)						●													●		●	●	
DISCHARGE DAMPER (AHU-2)									●	●													
DISCHARGE DAMPER (AHU-3)									●	●													
OUTSIDE AIR DAMPER (COMMON)									●	●													
SMOKE DETECTOR							●														●		
HUMIDIFIER (H-2)					●						●				●						●		NOTE 1
HUMIDIFIER HIGH LIMIT		●												●			●				●		
COOLING COIL ISOLATION VALVE (EA.)									●	●													
EMERGENCY GENERATOR					●																●		
CWS	●																●					●	

NOTES: 1. INTERLOCK TO ENABLE ONLY WITH SUPPLY FAN (AHU-1 OR 2) OPERATION.

SEQUENCE OF OPERATION

1) GENERAL:
   A) UNITS ARE CONSTANT VOLUME AIR HANDLING UNITS (AHU) PROVIDING COOLING, HEATING, AND VENTILATION FOR THE CAB AREA AS SHOWN ON THE DRAWINGS. ONE UNIT SHALL OPERATE AS LEAD UNIT AND ONE SHALL OPERATE AS STANDBY (LAG). BMCS SHALL ALTERNATE UNITS EVERY 7 DAYS FROM LEAD TO LAG TO PROVIDE EQUAL RUN TIME.

   B) PROVIDE INDEPENDENT "LOCAL" DDC CONTROL PANELS FOR AHU-2 & AHU-3 TO INSURE AHU OPERATIONAL REDUNDANCY.

2) OPERATION: UPON A CALL FROM THE BMCS TO OPERATE, THE LEAD SOLENOID COIL ISOLATION VALVE SHALL OPEN, THE DISCHARGE DAMPER FOR THE LEAD UNIT SHALL OPEN AND THE LEAD SUPPLY FAN SHALL START AND RUN CONTINUOUSLY. ALARM BMCS OPERATOR IF THE DISCHARGE DAMPER DOES NOT PROVE OPEN, OR THE FAN DOES NOT "PROVE" START OR STOPS AFTER CALLED TO OPERATE. WHEN UNIT IS OFF THE ASSOCIATED MOTORIZED ISOLATION VALVE SHALL BE CLOSED AND THE COOLING COIL SHALL BE AT FULL BYPASS.

3) TEMPERATURE CONTROL:
   A) TWO CAB SPACE TEMPERATURE SENSORS SHALL BE PROVIDED FOR REDUNDANCY BMCS SHALL "AVERAGE" THESE FOR CONTROL. ONE SPACE TEMPERATURE SETPOINT ADJUSTMENT DEVICE SHALL BE PROVIDED.

   B) COOLING: WHEN THE CAB SPACE TEMPERATURE SENSORS CALLS FOR COOLING THE SOLENOID ISOLATION VALVE SHALL OPEN, AND THE THREE-WAY COOLING COIL CONTROL VALVE SHALL MODULATE OPEN TO THE COIL TO MAINTAIN CAB SPACE TEMPERATURE SETPOINT.

   C) HEATING: WHEN THE SPACE IS CALLING FOR HEATING THE THE BMCS SHALL STAGE THE ELECTRIC HEATING COIL TO MAINTAIN CAB SPACE TEMPERATURE SETPOINT.

4) HUMIDITY CONTROL:

   A) HUMIDIFICATION: RETURN AIR HUMIDITY SENSOR SHALL MONITOR RELATIVE HUMIDITY (RH). IF RH FALLS BELOW 35% RH SETPOINT (ADJUSTABLE), BMCS SHALL ENABLE HUMIDIFIER (H-2) AND THE HUMIDIFIER PACKAGED CONTROLS (SEE SPECIFICATIONS) SHALL MODULATE TO MAINTAIN SPACE RH SETPOINT. IF THE HIGH LIMIT CUTOUT SENSOR DETECTS DUCT RH ABOVE 90% RH (ADJUSTABLE) BMCS SHALL DISABLE HUMIDIFIER AND SHALL ALARM BMCS OPERATOR.

5) FILTER STATUS: DIFFERENTIAL PRESSURE SWITCH SHALL ALARM THE BMCS TO SIGNAL FILTER MAINTENANCE SHOULD THE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANK RISE ABOVE PREDETERMINED SETPOINT (ADJ).

6) SMOKE SHUTDOWN/FIRE ALARM: WHEN SMOKE SUPPLY AIR DETECTOR ALARMS OR UPON A SIGNAL FROM THE FIRE ALARM SYSTEM, BMCS SHALL BE NOTIFIED & FIRE ALARM SHALL THEN SHUTDOWN THE SUPPLY FAN.

7) BACKUP OPERATION:

   A) IF THE LEAD UNIT FAILS FOR ANY REASON (DISCHARGE DAMPER DOES NOT OPEN, FAN STOPS (SENSED THROUGH CURRENT SENSING RELAY), SPACE TEMPERATURE IS MORE THAN 5°F (ADJ) ABOVE SETPOINT FOR 5 MINUTES (ADJ) AND CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 48°F (ADJ.), THE BMCS SHALL ALARM OPERATOR AND SHALL AUTOMATICALLY SHUT DOWN THE LEAD UNITS OPERATION AND SHALL START THE LAG UNIT. LAG UNIT OPERATION SHALL BE AS DESCRIBED ABOVE.

   B) IF LAG UNIT FAILS FOR ANY REASON AS DESCRIBED ABOVE, THE BMCS SHALL ALARM OPERATOR AND SHALL AUTOMATICALLY SHUT DOWN THE LAG UNITS OPERATION AND SHALL THEN TRY TO RESTART LEAD UNIT.

8) IF THE EMERGENCY GENERATOR IS OPERATING, THE THE ELECTRIC HEATING COIL AND THE HUMIDIFIER SHALL BE LOCKED OUT.

9) OCCUPIED/UNOCCUPIED MODES IF SPACE TEMPERATURE SENSOR DETECTS SPACE TEMPERATURE ABOVE 85°F (ADJ) OR BELOW 50°F (ADJ) WHEN IN UNOCCUPIED MODE BMCS SHALL START LEAD UNIT & SHALL OPERATE HEATING/COOLING TO MAINTAIN 50°F–80°F.

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REGISTERED PROFESSIONAL ENGINEER — CHARLES F. ROBERTS — No. M 33803 — Exp. 6-30-11 — MECHANICAL — STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

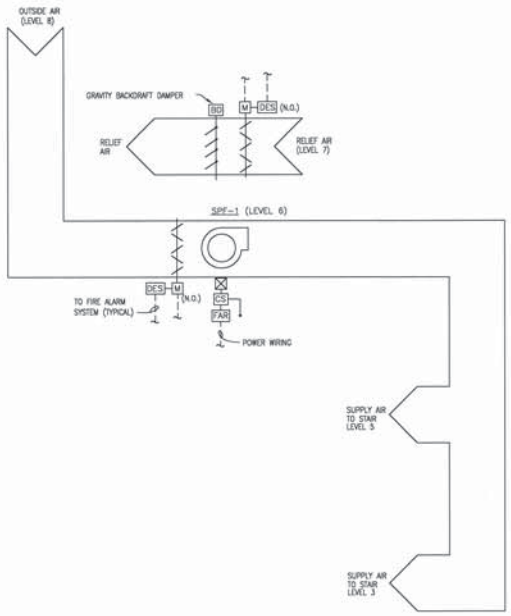
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	
SUBMITTED BY	
SUBMITTER'S TITLE:	
APPROVED BY	
APPROVER'S TITLE:	
DESIGNED	GNR
DRAWN	PEH
CHECKED	MPH
ISSUED BY	ENGINEERING SERVICES TERMINAL – LOS ANGELES
DATE	October 5, 2008 JCN
DRAWING NO	PSP-0-ATCT- M502 REV

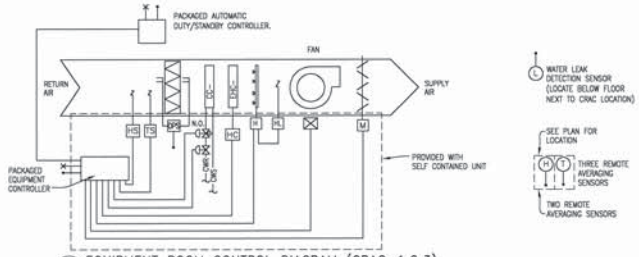


1 M503 SPF-1 CONTROL DIAGRAM
SCALE: NONE

SEQUENCE OF OPERATION

1) GENERAL: STAIRWELL PRESSURIZATION FAN PROVIDES STAIR PRESSURIZATION FOR THE TOWER STAIR AS SHOWN ON THE DRAWINGS. SYSTEM SHALL NOT BE CONNECTED TO THE BMCS. THE SYSTEM IS DESIGNED TO MAINTAIN POSITIVE STAIR PRESSURIZATION WITH ONE DOOR BEING OPEN TO THE STAIR. 2000 CFM ADDITIONAL IS PROVIDED TO COMPENSATE FOR AN OPEN DOOR.

2) OPERATION: THE SYSTEM SHALL ACTIVATE AUTOMATICALLY THROUGH THE FIRE ALARM SYSTEM UPON A SIGNAL FROM THE FIRE ALARM SYSTEM (SEE FIRE ALARM MATRIX). THE OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER SHALL FULLY OPEN AND THE STAIR PRESSURIZATION FAN SHALL START AND RUN CONTINUOUSLY.



2 M503 EQUIPMENT ROOM CONTROL DIAGRAM (CRAC-1,2,3)
SCALE: NONE

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	EMERGENCY GENERATOR	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	DIRTY FILTER	NOTES
SPACE	●		●													●	●			●			
PACKAGED UNIT CONTROLLER				●	●				●		●	●		●						●		●	
PACK. DUTY/STANDBY CONTROLLER											●									●			
WATER DETECTION																				●			

SEQUENCE OF OPERATION

1) GENERAL: UNITS PROVIDE HEATING, COOLING & HUMIDITY CONTROL FOR THE AREAS AS SHOWN ON THE DRAWINGS. TWO UNITS SHALL OPERATE AS LEAD UNIT & ONE UNIT SHALL OPERATE AS STANDBY (LAG). PACKAGED DUTY/STANDBY CONTROLLER SHALL ALTERNATE UNITS EVERY 7 DAYS TO PROVIDE EQUAL RUN TIME. THE CHILLED WATER SOLENOID VALVE ON THE STANDBY UNIT SHALL REMAIN CLOSED.

2) OPERATION: BMCS SHALL ENABLE THE PACKAGED DUTY/STANDBY CONTROLLER WHICH SHALL OPEN SUPPLY AIR DAMPER AND THEN START & RUN THE LEAD UNIT(S) CONTINUOUSLY. CONTROL OF THE UNIT SHALL BE THROUGH THE PACKAGED UNIT MOUNTED CONTROLLER (SEE SPECIFICATIONS). DUTY/STANDBY CONTROLLER SHALL START & RUN LAG UNIT IF LEAD UNIT(S) CANNOT MAINTAIN SETPOINTS.

3) TEMPERATURE CONTROL: UNIT MOUNTED CONTROLLER SHALL OPEN LEAD UNIT(S) SOLENOID ISOLATION VALVE(S) AND SHALL MODULATE COOLING COIL CONTROL VALVE(S) OPEN TO COIL AND STAGE ELECTRIC HEATING COIL TO MAINTAIN RETURN AIR HEATING & COOLING SETPOINTS (ADJ.). NOTE, THE TWO LEAD UNITS SHOULD OPERATE IN PARALLEL.

4) HUMIDITY CONTROL: UNIT MOUNTED CONTROLLER SHALL MODULATE COOLING COIL CONTROL VALVE, STAGE ELECTRIC HEATING COIL & MODULATE HUMIDIFIER TO MAINTAIN RETURN AIR RELATIVE HUMIDITY (ADJ.). HIGH LIMIT HUMIDITY SENSOR SHALL SHUTOFF HUMIDIFIER WHEN DISCHARGE AIR HUMIDITY EXCEEDS SETPOINT (ADJ.).

5) BMCS SHALL BE ABLE TO ADJUST SPACE TEMPERATURE & RELATIVE HUMIDITY SETPOINTS THROUGH UNIT MOUNTED CONTROLLER.

6) ALARMS:
A) BMCS SHALL ALARM OPERATOR & SHALL ENABLE LAG UNITS IF HEATING, COOLING OR RELATIVE HUMIDITY SETPOINTS ARE NOT MAINTAINED.

B) BMCS SHALL MONITOR GENERAL ALARMS OF PACKAGED UNIT CONTROLLER & PACKAGED DUTY/STANDBY CONTROLLER.

C) BMCS SHALL MONITOR WATER DETECTOR SUPPLIED WITH UNIT & SHALL ALARM OPERATOR UPON DETECTION.

D) BMCS SHALL MONITOR FILTER STATUS DIFFERENTIAL PRESSURE SWITCH AND SHALL ALARM THE BMCS TO SIGNAL FILTER MAINTENANCE SHOULD THE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANK RISE ABOVE PREDETERMINED SETPOINTS (ADJ.).

7) EMERGENCY GENERATOR OPERATION: IF THE EMERGENCY GENERATOR IS OPERATING, THEN THE HUMIDIFIER AND ELECTRIC REHEAT ON THE UNITS SHALL BE LOCKED OUT.

8) OCCUPIED/UNOCCUPIED MODES IF SPACE TEMPERATURE SENSOR DETECTS SPACE TEMPERATURE ABOVE 85°F (ADJ) OR BELOW 50°F (ADJ) WHEN IN UNOCCUPIED MODE BMCS SHALL START LEAD UNIT & SHALL OPERATE HEATING/COOLING TO MAINTAIN 50°F-80°F.

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REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

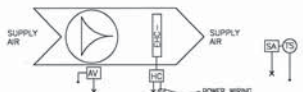
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY
	SUBMITTER'S TITLE:	APPROVER'S TITLE:
DESIGNED GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE: October 5, 2009 JCN
DRAWN PEH		DRAWING NO: PSP-D-ATCT- M503 REV
CHECKED MPH		



1 M504 SCALE: NONE

AIR TERMINAL UNIT (VAV-) (W/ ELECTRIC REHEAT COIL) CONTROL DIAGRAM

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	CFM	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN/CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
VAV BOX AIR VALVE				●										●					●	●			
SPACE TEMPERATURE	●													●							●	●	
ELECTRIC HEATING COIL										●						●							
VAV-72 SUPPLY AIR	●																		●	●	●		

SEQUENCE OF OPERATION

1) GENERAL: VARIABLE AIR VOLUME (VAV) BOX SHALL PROVIDE HEATING, COOLING AND VENTILATION TO THE AREAS AS SHOWN ON THE DRAWINGS.

2) OPERATION: UPON A CALL FROM THE SPACE TEMPERATURE SENSOR, THE BMCS SHALL MODULATE THE VAV BOX AIR VALVE OPEN WHEN TEMPERATURE IS ABOVE SETPOINT AND CLOSED TO MINIMUM AIR VALVE POSITION WHEN TEMPERATURE IS BELOW SETPOINT. IF THE SENSOR CONTINUES TO CALL FOR HEAT THE BMCS SHALL STAGE THE ELECTRIC HEATING COIL ON TO SATISFY SPACE TEMPERATURE SETPOINT.

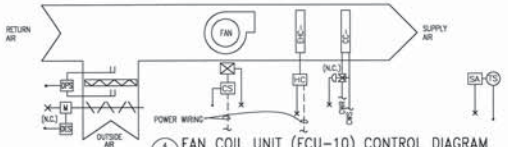
3) HEATING: THE INTERGAL VAV BOX CONTROLLER SHALL INCLUDE MINIMUM AIR FLOW "PROVING" PRIOR TO ENGAGING THE ELECTRIC HEATING COIL.

4) VAV-72 PROVIDES CONSTANT VOLUME AIR FLOW TO ROOM NO. 72 AS SHOWN ON DRAWINGS. UNIT HEATING COIL SHALL STAGE TO MAINTAIN 72°F (ADJ) SUPPLY AIR TEMPERATURE TO ROOM NO. 72.

5) ALARM BMCS OPERATOR IF SPACE TEMPERATURE IS MORE THAN 5°F (ADJ) ABOVE OR BELOW SETPOINT FOR A CONTINUOUS PERIOD OF 5 MINUTES (ADJ).

6) IF THE EMERGENCY GENERATOR IS OPERATING, LOCK OUT THE ELECTRIC HEATING COIL.

7) OCCUPIED/UNOCCUPIED MODES IF SPACE TEMPERATURE SENSOR DETECTS SPACE TEMPERATURE ABOVE 85°F (ADJ) OR BELOW 50°F (ADJ) WHEN IN UNOCCUPIED MODE BMCS SHALL START AHU-1 & VAV BOX SHALL OPERATE HEATING/COOLING TO MAINTAIN 50°F-82°F.



4 M504 SCALE: NONE

FAN COIL UNIT (FCU-10) CONTROL DIAGRAM

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN/CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	STAGE ON	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SPACE SENSOR	●														●		●	●					
FAN				●																	●		
COOLING COIL															●								
HEATING COIL																●							
FILTER																			●		●		
OUTSIDE AIR DAMPER								●	●														

SEQUENCE OF OPERATION

1) GENERAL: FANCOIL UNIT SHALL PROVIDE HEATING, COOLING, & VENTILATION TO THE AREA AS SHOWN ON THE DRAWINGS.

2) OPERATION:
A) GENERAL: WHEN SPACE IS OCCUPIED THE FANCOIL UNIT FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL BE OPEN.

B) UPON A CALL FOR COOLING BMCS SHALL MODULATE COOLING COIL CONTROL VALVE OPEN TO COIL TO MAINTAIN SETPOINT.

C) UPON A CALL FOR HEATING BMCS SHALL STAGE HEATING COIL TO MAINTAIN SETPOINT.

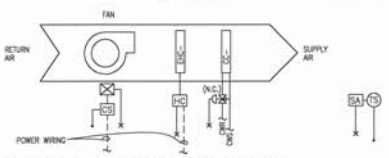
D) ALARM BMCS OPERATOR IF SPACE TEMPERATURE RISES ABOVE 80°F (ADJ.), OR FALLS BELOW 45°F (ADJ), OR WHEN FAN FAILS WHEN CALLED TO OPERATE.

E) BMCS SHALL MONITOR FILTER STATUS DIFFERENTIAL PRESSURE SWITCH AND SHALL ALARM THE BMCS TO SIGNAL FILTER MAINTENANCE SHOULD THE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANK RISE ABOVE PREDETERMINED SETPOINTS (ADJ).

F) INCLUDE MINIMUM AIR "PROVING" PRIOR TO ENGAGING THE ELECTRIC HEATING COIL.

3) IF THE EMERGENCY GENERATOR IS OPERATING, LOCK OUT THE ELECTRIC HEATING COIL.

4) OCCUPIED/UNOCCUPIED MODES IF SPACE TEMPERATURE SENSOR DETECTS SPACE TEMPERATURE ABOVE 85°F (ADJ) OR BELOW 50°F (ADJ) WHEN IN UNOCCUPIED MODE BMCS SHALL START FANCOIL UNIT & SHALL OPERATE HEATING/COOLING TO MAINTAIN 50°F-80°F.



2 M504 SCALE: NONE

FAN COIL UNIT (FCU-4, 5, & 8) CONTROL DIAGRAM

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	STAGE ON	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SPACE SENSOR	●														●		●	●					
FAN				●																	●		
COOLING COIL															●								
HEATING COIL																●							

SEQUENCE OF OPERATION

1) GENERAL: FANCOIL UNIT SHALL PROVIDE HEATING & COOLING TO THE AREA AS SHOWN ON THE DRAWINGS.

2) OPERATION:
A) GENERAL: WHEN SPACE CALLS FOR EITHER HEATING OR COOLING THE FANCOIL UNIT FAN SHALL RUN CONTINUOUSLY.

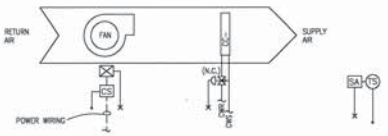
B) UPON A CONTINUED CALL FOR COOLING BMCS SHALL MODULATE COOLING COIL CONTROL VALVE OPEN TO COIL TO MAINTAIN SETPOINT.

C) UPON A CONTINUED CALL FOR HEATING BMCS SHALL STAGE HEATING COIL TO MAINTAIN SETPOINT.

D) ALARM BMCS OPERATOR IF SPACE TEMPERATURE RISES ABOVE 80°F (ADJ.), OR FALLS BELOW 45°F (ADJ), OR WHEN FAN FAILS WHEN CALLED TO OPERATE.

E) INCLUDE MINIMUM AIR "PROVING" PRIOR TO ENGAGING THE ELECTRIC HEATING COIL.

3) IF THE EMERGENCY GENERATOR IS OPERATING, LOCK OUT THE ELECTRIC HEATING COIL.



5 M504 SCALE: NONE

FAN COIL UNIT (FCU-7) CONTROL DIAGRAM

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	STAGE ON	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
SPACE SENSOR	●														●		●	●					
FAN				●																	●		
COOLING COIL															●								

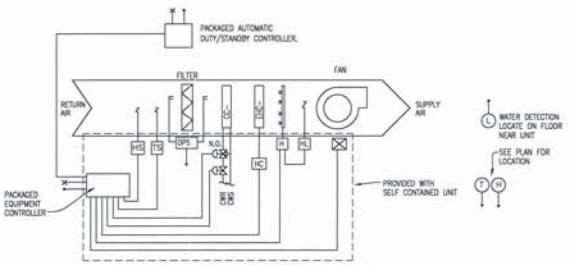
SEQUENCE OF OPERATION

1) GENERAL: FANCOIL UNIT SHALL PROVIDE COOLING TO THE AREA AS SHOWN ON THE DRAWINGS.

2) OPERATION:
A) GENERAL: WHEN SPACE CALLS COOLING THE FANCOIL UNIT FAN SHALL RUN CONTINUOUSLY.

B) UPON A CONTINUED CALL FOR COOLING BMCS SHALL MODULATE COOLING COIL CONTROL VALVE OPEN TO COIL TO MAINTAIN SETPOINT.

C) ALARM BMCS OPERATOR IF SPACE TEMPERATURE RISES ABOVE 80°F (ADJ.), OR FALLS BELOW 45°F (ADJ), OR WHEN FAN FAILS WHEN CALLED TO OPERATE.



3 M504 SCALE: NONE

EQUIPMENT ROOM CONTROL DIAGRAM (CRAC -4 AND 5)

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	INPUTS: BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	EMERGENCY GENERATOR	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	OUTPUTS: ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	DIRTY FILTER	NOTES
SPACE	●	●															●	●			●		
PACKAGED UNIT CONTROLLER				●	●				●		●	●		●							●	●	
PACK. DUTY/STANDBY CONTROLLER												●									●		
WATER DETECTION																					●		

SEQUENCE OF OPERATION

1) GENERAL: UNITS PROVIDE HEATING, COOLING & HUMIDITY CONTROL FOR THE AREAS AS SHOWN ON THE DRAWINGS. ONE UNIT SHALL OPERATE AS LEAD UNIT & ONE UNIT SHALL OPERATE AS STANDBY (LAC). PACKAGED DUTY/STANDBY CONTROLLER SHALL ALTERNATE UNITS EVERY 7 DAYS TO PROVIDE EQUAL RUN TIME. SOLENOID VALVE ON STANDBY UNIT'S CHILLED WATER COIL SHALL REMAIN CLOSED.

2) OPERATION: BMCS SHALL ENABLE THE PACKAGED DUTY/STANDBY CONTROLLER WHICH SHALL THEN START & RUN THE LEAD UNIT CONTINUOUSLY. CONTROL OF THE UNIT SHALL BE THROUGH THE PACKAGED UNIT MOUNTED CONTROLLER (SEE SPECIFICATIONS). DUTY/STANDBY CONTROLLER SHALL START & RUN LAG UNIT IF LEAD UNIT CANNOT MAINTAIN SETPOINTS.

3) TEMPERATURE CONTROL: UNIT MOUNTED CONTROLLER SHALL OPEN LEAD UNIT SOLENOID ISOLATION VALVE AND SHALL MODULATE COOLING COIL CONTROL VALVE, AND STAGE ELECTRIC HEATING COIL TO MAINTAIN RETURN AIR HEATING & COOLING SETPOINTS (ADJ.).

4) HUMIDITY CONTROL: UNIT MOUNTED CONTROLLER SHALL MODULATE COOLING COIL CONTROL VALVE, HEATING COIL CONTROL VALVE & HUMIDIFIER TO MAINTAIN RETURN AIR RELATIVE HUMIDITY (ADJ). HIGH LIMIT HUMIDITY SENSOR SHALL SHUTOFF HUMIDIFIER WHEN DISCHARGE AIR HUMIDITY EXCEEDS SETPOINT (ADJ).

5) BMCS SHALL BE ABLE TO ADJUST SPACE TEMPERATURE & RELATIVE HUMIDITY SETPOINTS THROUGH UNIT MOUNTED CONTROLLER.

6) ALARMS:
A) BMCS SHALL ALARM OPERATOR & SHALL ENABLE LAG UNITS IF HEATING, COOLING OR RELATIVE HUMIDITY SETPOINTS ARE NOT MAINTAINED.

B) BMCS SHALL MONITOR GENERAL ALARM OF PACKAGED UNIT CONTROLLER & PACKAGED DUTY/STANDBY CONTROLLER.

C) BMCS SHALL MONITOR WATER DETECTOR SUPPLIED WITH UNIT & SHALL ALARM OPERATOR UPON DETECTION.

D) BMCS SHALL MONITOR FILTER STATUS DIFFERENTIAL PRESSURE SWITCH AND SHALL ALARM THE BMCS TO SIGNAL FILTER MAINTENANCE SHOULD THE DIFFERENTIAL PRESSURE ACROSS THE FILTER BANK RISE ABOVE PREDETERMINED SETPOINTS (ADJ).

7) IF THE EMGERGENCY GENERATOR IS OPERATING, THEN THE HUMIDIFIER AND ELECTRIC REHEAT SHALL BE LOCKED OUT.

8) OCCUPIED/UNOCCUPIED MODES IF SPACE TEMPERATURE SENSOR DETECTS SPACE TEMPERATURE ABOVE 85°F (ADJ) OR BELOW 50°F (ADJ) WHEN IN UNOCCUPIED MODE BMCS SHALL START LEAD UNIT & SHALL OPERATE HEATING/COOLING TO MAINTAIN 50°F-80°F.

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REGISTERED PROFESSIONAL ENGINEER CHARLES F. [illegible] No. M 33935 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

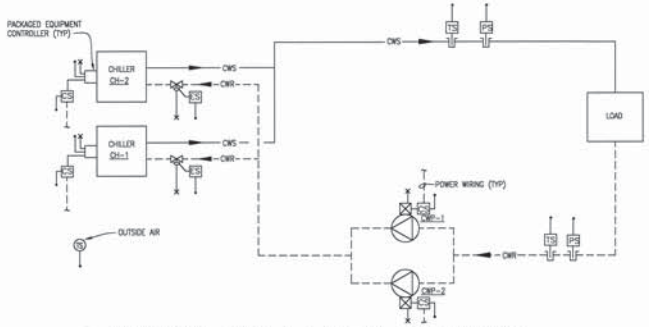
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY	
SUBMITTER'S TITLE:		APPROVER'S TITLE:	
DESIGNED GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE: October 5, 2009	JCN
DRAWN PEH		DRAWING NO: PSP-D-ATCT- M504	REV
CHECKED MPH			



1 M505 CHILLED WATER (CWP-1, 2 & CH-1, 2) CONTROL DIAGRAM
SCALE: NONE

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	ANALOG: PRESSURE	ANALOG: PH	ANALOG: DPW	BINARY: STATUS ON / OFF	BINARY: FILTER STATUS	BINARY: SMOKE	BINARY: AIR FLOW	BINARY: STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	BINARY: ENABLE / DISABLE	BINARY: START / STOP	ANALOG: VALVE POSITION	ANALOG: SET POINT ADJUSTMENT	ANALOG: MODULATION	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	FAILED TO CLOSE	NOTES
CWS	●	●														●				●			
CWR	●	●																					
CWP-1, 2 (EACH)					●							●								●			
OUTSIDE AIR	●																						
CH-1, 2 (EACH)					●						●			●						●			ADJUST CWS
MOTORIZED ISOLATION VALVE									●	●										●			

SEQUENCE OF OPERATION

1) GENERAL: PUMPS CWP-1,2, AND CHILLERS CH-1,2 PROVIDE CHILLED WATER FOR COOLING OF THE FACILITY. THE CHILLERS AND PUMPS ARE REDUNDANT. ONLY ONE CHILLER AND PUMP WILL OPERATE AT ANY TIME. BMCS SHALL ALTERNATE UNITS EVERY 7 DAYS TO PROVIDE EQUAL RUN TIME.

THE SWITCHOVER OF CHILLERS SHALL OCCUR AS FOLLOWS:
A. THE OPERATIONAL (LEAD) CHILLER SHALL BE DE-ENERGIZED, WITH FLOW CONTINUING THROUGH THE CHILLER.
B. THE LAG CHILLER'S ISOLATION VALVE SHALL OPEN. AFTER LAG CHILLER ISOLATION VALVE PROVES 50% OPEN (ADJ.) THE LEAD CHILLER'S ISOLATION VALVE SHALL BEGIN TO CLOSE. THE CHILLER VALVES "OPENING AND CLOSING" SHALL BE ACCOMPLISHED IN LESS THAN 1 MINUTE.
C. AFTER A 2 MINUTE (ADJ.) DELAY TO INSURE FULL ACTUATION OF THE ISOLATION VALVES, THE LAG CHILLER SHALL BE ENERGIZED.
D. IF LAG UNIT FAILS AS DESCRIBED ABOVE, BMCS SHALL THEN TRY TO RESTART LEAD UNIT.

THE SWITCHOVER OF PUMPS SHALL OCCUR AS FOLLOWS:
A. THE LAG PUMP ENERGIZING, THEN AFTER A 2 MINUTE PERIOD (ADJ.) OF BOTH PUMPS OPERATING TO INSURE THE LAG PUMP IS AT FULL SPEED, THE LEAD PUMP SHALL THEN SHUT DOWN.
B. IF LAG PUMP FAILS AS DESCRIBED ABOVE, BMCS SHALL THEN TRY TO RESTART LEAD PUMP.

2) OPERATION:
A) COOLING OPERATION:
DURING OCCUPIED MODE, THE BMCS SHALL OPEN THE LEAD CHILLER ISOLATION VALVE, SHALL ENABLE THE LEAD CHILLER, AND THE LEAD CHILLED WATER PUMP SHALL START AND RUN CONTINUOUSLY. THE PACKAGED CHILLER CONTROLS SHALL THEN MODULATE THE COMPRESSORS TO MAINTAIN 45 DEGREES F (ADJ.) LEAVING CHILLED WATER SUPPLY TEMPERATURE AT THE CHILLER. THE BMCS SHALL ALTERNATE EVERY 7 DAYS THE LEAD CHILLER AND LEAD CHILLED WATER PUMP TO PROVIDE EQUAL RUN TIME.

C) BMCS SHALL INTERFACE WITH THE CHILLERS AND SHALL BE ABLE TO RESET THE CHILLED WATER SUPPLY TEMPERATURE THROUGH THE BMCS AT THE PACKAGED CHILLER CONTROLS.

3) ALARMS:
A) IF LEAD CHILLED WATER PUMP FAILS TO START OR STOPS AFTER BEING CALLED TO OPERATE, BMCS SHALL ALARM OPERATOR & SHALL START LAG PUMP. ALARM SHALL BE THROUGH CURRENT SENSING RELAY.

B) IF BUILDING CWS TEMPERATURE RISES ABOVE PREDETERMINED SETPOINT BY MORE THAN 5 DEGREES F (ADJ.) FOR MORE THAN 5 MINUTES (ADJ.), BMCS SHALL ALARM OPERATOR.

C) BMCS SHALL MONITOR GENERAL ALARM FROM PACKAGED CHILLER CONTROLS AND SHALL SIGNAL ALARM TO OPERATOR.

D) IF LEAD CHILLER STOPS AFTER BEING ENABLED OR CANNOT MAINTAIN CWS SETPOINT AT CHILLER, BMCS SHALL ALARM OPERATOR AND SHALL START LAG CHILLER.
FREEZE PROTECTION:
4) (A) WHEN OUTSIDE AIR TEMPERATURE IS BELOW 32°F (ADJ) THE BMCS SHALL ALTERNATE EVERY 4 HOURS (ADJ) THE LEAD CHILLER TO PROVIDE PERIODIC FLOW THROUGH EACH CHILLER TO PREVENT FREEZING.

MANUAL OPERATION: CHILLERS, PUMPS, AND ISOLATION VALVES SHALL BE ABLE TO BE MANUALLY ACTIVATED AND ACTUATED
5) IN CASE OF FAILURE OF DDC SYSTEM.

VAV BOX AND FANCOIL UNIT DDC SYSTEM GRAPHICAL INFORMATION INTERFACE

MARK	TEMPERATURE (°F): SETPOINT COOLING	SETPOINT HEATING	ACTUAL	CFM: DESIGN MAXIMUM	DESIGN MINIMUM	ACTUAL	ELECTRIC HEATING COIL: ENABLED (4)	STEPS ON (5)	STATUS (6)	ALARM (7)
VAV-1	75	72		80	55					
VAV-4	75	72		490	190					
VAV-5	75	72		85	55					
VAV-6	75	72		570	300					
VAV-7	75	72		80	55					
VAV-11	75	72		430	190					
VAV-12	75	72		245	105					
VAV-21	75	72		450	190					
VAV-22	75	72		275	190					
VAV-23	75	72		215	105					
VAV-31	75	72		360	190					
VAV-33	75	72		150	105					
VAV-34	75	72		560	300					
VAV-36	75	72		870	425					
VAV-41	75	72		235	105					
VAV-54	75	72		260	105					
VAV-61	75	72		500	300					
VAV-62	75	72		240	105					
VAV-63	75	72		310	190					
VAV-64	75	72		205	80					
VAV-72	75	72		200	200					
VAV-74	75	72		120	55					
VAV-101	73	72		115	55					
FCU-1	80	40		N/A	N/A	N/A				
FCU-4	80	65		N/A	N/A	N/A				
FCU-5	75	72		N/A	N/A	N/A				
FCU-7	75	70		N/A	N/A	N/A	N/A	N/A		
FCU-8	80	65		N/A	N/A	N/A				
FCU-10	75	72		N/A	N/A	N/A				

REMARKS:
1) PROVIDE A GRAPHICAL INTERFACE SCREEN SIMILAR TO ABOVE FOR USE BY BMCS OPERATOR AS DESCRIBED BELOW.
2) TEMPERATURE SETPOINT SHALL BE ADJUSTABLE THRU GRAPHIC INTERFACE.
3) PROVIDE FLOOR PLAN GRAPHIC DISPLAY/INTERFACE THAT SHOWS VAV BOX AND FANCOIL UNIT LOCATIONS AND ROOM SENSOR LOCATIONS. PLAN SHALL BE CLEARLY LABELED TO INDICATE VAV BOX NUMBER, FANCOIL UNIT NUMBER, SENSOR NUMBER, SETPOINT TEMPERATURE AND ACUTAL TEMPERATURE. UNITS THAT ARE COOLING SHALL BE BLUE IN COLOR, HEATING ORANGE IN COLOR & ALARM RED IN COLOR.
4) ENABLE = YES / NO
5) STEPS ON = 0 / 1 / 2 / 3
6) STATUS = OCCUPIED / UNOCCUPIED
7) ALARM = HIGH TAMP / LOW TEMP / SENSOR FAIL / FAN FAILURE

2 M505 VAV BOX / FANCOIL UNIT GRAPHICAL INTERFACE
SCALE: NONE

OCCUPIED / UNOCCUPIED SCHEDULE

EQUIPMENT	WEEKDAY: START	WEEKDAY: STOP	WEEKEND: START	WEEKEND: STOP	HOLIDAY: START	HOLIDAY: STOP
CH-1/2	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
CWP-1/2	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
AHU-1 & RF-1	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
ERU-1	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
AHU-2/3	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
H-1	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
H-2	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
EF-1	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
DWBP-1	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
DWCP-1	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
FCU-1	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
FCU-4	4:00AM	10:00PM	4:00AM	10:00PM	4:00AM	10:00PM
FCU-5	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
FCU-7	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
FCU-8	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
FCU-10	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
CRAC-1,2,3	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
CRAC-4,5	12:00AM	12:00PM	12:00AM	12:00PM	12:00AM	12:00PM
VAV-1	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-4	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-5	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-6	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-7	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-11	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-12	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-21	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-22	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-23	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-31	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-33	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-34	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-36	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-41	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-54	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-61	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-62	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-63	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-64	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-72	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-74	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF
VAV-101	6:00AM	6:00PM	8:00AM	5:00PM	OFF	OFF

REMARKS:
1) PROVIDE A OCCUPIED/UNOCCUPIED SCHEDULE SCREEN SIMILAR TO ABOVE FOR USE BY BMCS OPERATOR AS DESCRIBED BELOW.
2) ALL TIMES SHALL BE ADJUSTABLE THRU GRAPHIC INTERFACE BY SELECTING INDIVIDUAL TIME. SELECTING SHALL BE BY HOUR AND 15 MINUTE INCREMENTS AND SHALL ALSO INCLUDE OFF
3) BMCS SHALL NOT ALLOW INVALID TIME SELECTIONS. BMCS SHALL POST A LOCAL SREEN ERROR INDICATING INVALID START/STOP TIMES.
4) TO DENOTE A TWENTY FOUR HOUR RUN TIME, SELECTION SHALL BE 12:00 PM (START)/12:00 PM (STOP).

3 M505 OCCUPIED/UNOCCUPIED SCHEDULE
SCALE: NONE

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REGISTERED PROFESSIONAL ENGINEER GREGORY F. PEH No. M 33895 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

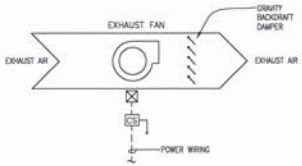
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY
	SUBMITTER'S TITLE	APPROVER'S TITLE
DESIGNED GNR	ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES	DATE October 5, 2009 JCN
DRAWN PEH		DRAWING NO PSP-D-ATCT- M505 REV
CHECKED MPH		



1 / M506 EXHAUST FAN (EF-1) CONTROL DIAGRAM
SCALE: NONE

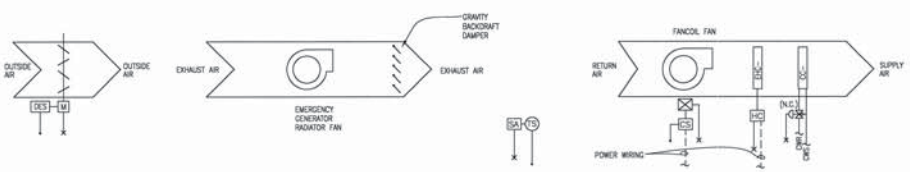
BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	LEVEL (GALLONS)	BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
EXHAUST FAN					●						●								●		

SEQUENCE OF OPERATION

1) GENERAL: EXHAUST FAN PROVIDES EXHAUST FOR THE AREAS AS SHOWN ON THE DRAWINGS.

2) OPERATION: EXHAUST FAN SHALL BE INTERLOCKED WITH AHU-2 & 3 SUCH THAT WHENEVER AHU-2 OR AHU-3 IS ON THE FAN SHALL START & RUN CONTINUOUSLY. ALARM OPERATOR IF FAN DOES NOT START OR STOPS AFTER BEING CALLED TO OPERATE.



2 / M506 GENERATOR ROOM VENTILATION (GENERATOR RADIATOR FAN AND FCU-1) CONTROL DIAGRAM
SCALE: NONE

BMCS POINT SCHEDULE

SYSTEM, APPARATUS, OR AREA DESCRIPTION	INPUTS: ANALOG: TEMPERATURE	PRESSURE	RH	KW DEMAND OF FACILITY	BINARY: STATUS ON / OFF	FILTER STATUS	SMOKE	AIR FLOW	STATUS OPEN / CLOSED	OUTPUTS: BINARY: OPEN / CLOSE	ENABLE / DISABLE	START / STOP	ANALOG: VALVE POSITION	SET POINT ADJUSTMENT	MODULATION	STAGE	ALARMS: HI ANALOG	LOW ANALOG	HI BINARY	LOW BINARY	REMOTE ALARM	SENSOR FAIL	NOTES
OUTSIDE AIR DAMPER									●	●											●		
EMERGENCY GENERATOR				●																	●		
SPACE SENSOR	●													●			●	●			●		
FANCOIL FAN						●						●										●	
FANCOIL COOLING COIL													●		●								
FANCOIL HEATING COIL												●				●							
KW DEMAND OF FACILITY				●																			

SEQUENCE OF OPERATION – GENERATOR RUNNING

1) GENERAL: RADIATOR FAN PROVIDES VENTILATION FOR THE ENGINE GENERATOR ROOM DURING GENERATOR OPERATION AS SHOWN ON THE DRAWINGS.

2) OPERATION: WHENEVER ENGINE GENERATOR IS CALLED TO OPERATE OUTSIDE AIR DAMPER SHALL OPEN.

3) ALARM OPERATOR IF:
   A) OUTSIDE AIR DAMPER DOES NOT "PROVE" POSITION AFTER BEING CALLED TO OPERATE.
   B) SPACE TEMPERATURE IS BELOW 40°F (ADJ.) OR ABOVE 125°F (ADJ.).

4) WHEN THE EMERGENCY GENERATOR STARTS OR UPON LOSS OF POWER FOR ANY REASON THE FOLLOWING START-UP SEQUENCE OF MECHANICAL EQUIPMENT SHALL OCCUR SO AS TO NOT OVERLOAD THE GENERATOR;
   A) CHILLED WATER PUMP CWP-1 OR CWP-2, 20 SECONDS AFTER POWER FAILURE.
   B) CRAC-1, 2, 3, 4, & 5, 30 SECONDS AFTER POWER FAILURE.
   C) AHU-2 OR 3, 40 SECONDS AFTER POWER FAILURE.
   D) CHILLER CH-1 OR CH-2 LEAD (FIRST) CIRCUIT, 120 SECONDS AFTER POWER FAILURE.
   E) REMAINDER OF MECHANICAL EQUIPMENT, 180 SECONDS AFTER POWER FAILURE.
   F) CHILLER CH-1 OR CH-2 LAG (SECOND) CIRCUIT, 240 SECONDS AFTER POWER FAILURE. THIS WILL BE AN OPTIONAL FUNCTION OF THE BMCS SUCH THAT WHEN THE GENERATOR IS RUNNING THE BMCS WILL LOCK OUT THE SECOND CHILLER CIRCUIT BASED ON A TOTAL KW LOAD ON THE FACILITY OF BEING LESS THAN 300KW WITH THE SECOND CIRCUIT ON. WHEN THE EQUIPMENT RESTART OCCURS WITH THE FACILITY BEING ON NORMAL POWER, THE SECOND CHILLER CIRCUIT WILL BE ALLOWED TO START "NORMALLY" BASED ON THE COOLING DEMAND OF THE FACILITY.

SEQUENCE OF OPERATION – GENERATOR OFF

1) GENERAL: FANCOIL UNIT SHALL PROVIDE HEATING & COOLING TO THE GENERATOR ROOM AS SHOWN ON THE DRAWINGS.

2) OPERATION:
   A) GENERAL: WHEN SPACE CALLS FOR EITHER HEATING (50°F SETPOINT(ADJ)) OR COOLING (80°F SETPOINT (ADJ)) THE FANCOIL UNIT FAN SHALL RUN CONTINUOUSLY.
   B) UPON A CONTINUED CALL FOR COOLING BMCS SHALL MODULATE COOLING COIL CONTROL VALVE OPEN TO COIL TO MAINTAIN SETPOINT.
   C) UPON A CONTINUED CALL FOR HEATING BMCS SHALL STAGE HEATING COIL TO MAINTAIN SETPOINT.
   D) ALARM BMCS OPERATOR IF SPACE TEMPERATURE RISES ABOVE 90°F (ADJ.), OR FALLS BELOW 40°F (ADJ.), OR WHEN FAN FAILS WHEN CALLED TO OPERATE.
   E) INCLUDE MINIMUM AIR "PROVING" PRIOR TO ENGAGING THE ELECTRIC HEATING COIL.

3) IF THE EMERGENCY GENERATOR IS OPERATING, LOCK OUT THE ELECTRIC HEATING COIL.

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LAD NO: 002-10096-000

REGISTERED PROFESSIONAL ENGINEER No. M 33885 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REVISE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

CONTROL DIAGRAMS

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	SUBMITTED BY	APPROVED BY
	SUBMITTER'S TITLE:	APPROVER'S TITLE:

DESIGNED	GNR
DRAWN	PEH
CHECKED	MPH

ISSUED BY: ENGINEERING SERVICES TERMINAL – LOS ANGELES

DATE: October 5, 2009 JCN

DRAWING NO: PSP-0-ATCT- M506 REV

J:\002-10096-000\C Design\ SD-00-001\01 Drawings\07 Mechanical\PSPM506.dwg October 23, 2009 - 11:01am pwhall

COMPUTER AIR CONDITIONER SCHEDULE

MSCACW

MARK	LOCATION	CFM	STATIC PRESS IN WG	COOLING CAPACITY EAT °F			MBH	WATER GPM	WATER ENT °F	WATER LWT °F	MAX. PD FT	REHEAT CAPACITY EAT °F DB	REHEAT CAPACITY MBH	ELECTRIC KW	HUMIDIFICATION STEAM (LB/HR)	HUMIDIFICATION KW	ELECTRICAL DATA FLA	VOL	PH	HZ	FILTER TYPE	MANUF. & MODEL NO.	REMARKS
				DB	WB	SENS	TOTAL																
CRAC-1	BASE BLDG EQUIP. RM.	5250	0.2	72	60	60	75	16.5	45	55	10.5	55	39.2	10	3	11.0	4.8	51.7	208	3	60	DISPOSABLE-30% EFFICIENT	LIEBERT CW026	1, 2, 5
CRAC-2	BASE BLDG EQUIP. RM.	5250	0.2	72	60	60	75	16.5	45	55	10.5	55	39.2	10	3	11.0	4.8	51.7	208	3	60	DISPOSABLE-30% EFFICIENT	LIEBERT CW026	1, 2, 5
CRAC-3	BASE BLDG EQUIP. RM.	5250	0.2	72	60	60	75	16.5	45	55	10.5	55	39.2	10	3	11.0	4.8	51.7	208	3	60	DISPOSABLE-30% EFFICIENT	LIEBERT CW026	1, 2, 5
CRAC-4	TOWER EQUIP. RM.	3000	0.3	72	60	54.4	59.9	12	45	55	10.0	55	56.2	15	2	11.0	4.8	62.4	208	3	60	DISPOSABLE-30% EFFICIENT	LIEBERT BU102C	3, 4, 5
CRAC-5	TOWER EQUIP. RM.	3000	0.3	72	60	54.4	59.9	12	45	55	10.0	55	56.2	15	2	11.0	4.8	62.4	208	3	60	DISPOSABLE-30% EFFICIENT	LIEBERT BU102C	3, 4, 5

REMARKS:
1. UNIT TO BE LIEBERT CHILLED WATER DOWN FLOW UNIT W/ INFRARED HUMIDIFIER, ELECTRIC REHEAT, AND 3 HP SUPPLY FAN.
2. SEE DETAIL 2/M5.03 FOR SEQUENCE OF OPERATION.
3. SEE DETAIL 3/M5.04 FOR SEQUENCE OF OPERATION.
4. UNIT TO BE LIEBERT CHILLED WATER UP FLOW UNIT W/ TOP DISCHARGE/PLENUM GRILLE, INFRARED HUMIDIFIER, ELECTRIC REHEAT, CONDENSATE PUMP, AND 2 HP SUPPLY FAN.
5. UNIT TO BE SUPPLIED W/ REVERSE OSMOSIS WATER SUPPLY.
6. UNIT TO BE SUPPLIED A RELAY TO ALLOW ELECTRIC REHEAT AND HUMIDIFIER TO BE LOCKED OUT WHEN EMERGENCY GENERATOR IS OPERATING.

FAN COIL UNIT SCHEDULE

MSFCU

MARK	LOCATION	TYPE	CFM	STAT PRESS IN WG EXT	STAT PRESS IN WG TOTAL	COOLING DATA EAT °F DB	EAT °F WB	MIN. CAP MBH SENS	MIN. CAP MBH TOTAL	CHILLED WATER GPM	CHILLED WATER EWT °F	CHILLED WATER LWT °F	MAX PD FT. WG	HEATING DATA EAT °F DB	HEATING DATA KW	STEPS	ELECTRICAL DATA HP	RPM	VOL	PH	HZ	MANUF AND MODEL NO.	REMARKS
FCU-1	RM 76	HORZ. CAB.	175	---	---	85	62	4.5	4.5	1.0	45	54	10	55	1.5	1	0.03	685	208	1	60	TRANE UNITRANE SIZE 020	1
FCU-4	RM 806	HORZ. CAB.	415	---	---	85	62	11	11	1.5	45	62	10	55	2	2	0.07	895	208	1	60	TRANE UNITRANE SIZE 060	1
FCU-5	RM 92	HORZ. CONCEAL	130	0.05	---	85	62	2.5	2.5	0.3	45	64	10	55	1	1	0.03	656	208	1	60	TRANE UNITRANE SIZE 020	3
FCU-7	RM 813	HORZ. CAB.	440	---	---	75	62	10.6	13.5	4.0	45	52	10	–	–	---	0.12	1021	208	1	60	TRANE UNITRANE SIZE 080	1
FCU-8	RM 93	HORZ. CAB.	550	---	---	85	62	21.2	21.2	5.7	45	50	18	55	2	2	0.13	1043	208	1	60	TRANE UNITRANE SIZE 080	1
FCU-10	RM 806	VERT. DUCTED	920	0.75	1.2	98	70	38.9	43.9	8.0	45	57	10	75	5.5	3	0.5	1417	208	1	60	TRANE BLOWER COIL BCVC036	4

REMARKS:
1. PROVIDE FRONT GRILLE DISCHARGE AND BOTTOM STAMPED INLET.
2. PROVIDE FRONT TOE INLET, TOP GRILLE OUTLET AND CONDENSATE PUMP.
3. PROVIDE DUCT COLLAR OUTLET.
4. PROVIDE UNIT WITH INLET PLENUM WITH 1" FILTER AND CONDENSATE PUMP.

PUMP SCHEDULE

MSP

MARK	LOCATION	SERVES	TYPE	GPM	TOTAL HEAD FT WG	MOTOR DATA HP	MOTOR DATA RPM	MOTOR DATA VOL	MOTOR DATA PH	MOTOR DATA HZ	MIN EFF %	MANUFACTURER AND MODEL NO.
CWP-1,2	BASE BUILDING	CHILLERS	CLOSE-COUPLED	160	100	10	1750	208	3	60	65	BELL AND GOSSETT 1531-2E
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HUMIDIFIER SCHEDULE

MARK	LOCATION	SERVES	TYPE	CFM	CAPACITY LBS./HR.	KW	ELECTRICAL DATA FLA	VOL	PH	HZ	MANUFACTURER AND MODEL NO.	REMARKS
H-1	BASE BUILDING	AHU-1	ELECTRIC	4510	86.1	30	84	208	3	60	ARMSTRONG HC-6500	1, 2, 4
H-2	TOWER MECH.	AHU-2,3	ELECTRIC	5560	13.2	9	23	208	3	60	ARMSTRONG HC-6100	1, 3, 4

REMARKS:
1. PROVIDE PROPORTIONAL OUTPUT CONTROL, DDC INTERFACE FOR ENABLE/DISABLE, SETPOINT (ADJUSTABLE), AND ALARM OUTPUT.
2. DISPERSION GRID TO BE MOUNTED IN AHU.
3. DISPERSION GRID TO BE MOUNTEDIN SUPPLY AIR DUCTWORK (AHU-2 AND AHU-3 SHALL SHARE DISPERSION GRID).
4. UNITS TO BE SUPPLIED W/ REVERSE OSMOSIS WATER SUPPLY.

AIR COOLED CHILLER SCHEDULE

MSACC

MARK	LOCATION	TYPE	AMBS TEMP °F DB	MIN CAP TONS	EVAPORATOR WATER GPM	EVAPORATOR WATER EWT °F	EVAPORATOR WATER LWT °F	EVAPORATOR WATER MAX PD FT WG	CONDENSER FAN DATA NO.	CONDENSER FAN DATA TYPE	ELECTRICAL DATA (4) FLA TOTAL	ELECTRICAL DATA (4) VOL	ELECTRICAL DATA (4) PH	ELECTRICAL DATA (4) HZ	COMPRESSOR NO.	COMPRESSOR FLA	COMPRESSOR TOTAL STEPS	COMPRESSOR TONS/ STEP	MANUFACTURER AND MODEL NO.	REMARKS
CH-1	SEE DWGS	AIR-COOLED SCROLL	115	66.1	165	54.6	45	15	6	PROPELLER	39.4	208	3	60	4	4	4	17.2/36.0/50.6/66.1	TRANE CGAM080	1, 2, 3
CH-2	SEE DWGS	AIR-COOLED SCROLL	115	66.1	165	54.6	45	15	6	PROPELLER	39.4	208	3	60	4	4	4	17.2/36.0/50.6/66.1	TRANE CGAM080	1, 2, 3

REMARKS:
1. PROVIDE COPPER TUBES AND COPPER FINS.
2. PROVIDE UNIT W/ LOW AMBIENT OPERATION.
3. CHILLER SHALL BE RATED TO OPERATE AT 125°F, PROVIDING 60.3 TONS OF CAPACITY AT THE SCHEDULED FLOWRATE AND A 55 DEGREE EWT.
4. CHILLER TO HAVE DUAL PT POWER CONNECTION. FLA SHOWN ARE FOR EACH POWER CONNECTION.

FAN SCHEDULE

MSF

MARK	LOCATION	SERVES	TYPE	CFM	STAT PRESS IN WG EXT	STAT PRESS IN WG TOTAL	FAN RPM	MOTOR DATA HP	MOTOR DATA RPM	MOTOR DATA VOL	MOTOR DATA PH	MOTOR DATA HZ	WHEEL DIA AND TYPE	DRIVE	MANUFACTURER AND MODEL NO.	REMARKS
RF-1	BASE BUILDING	BASE BUILDING	SQ. IN-LINE	4890	1.00	---	815	1.5	1725	208	3	60	24.5" B.I.	BELT	COOK 245 SQN-B	2
EF-1	TOWER LVL-8	TOWER TOILETS	SQ. IN-LINE	330	0.375	---	---	173W	1200	120	1	60	–	BELT	COOK GN520	1
SPF-1	TOWER LVL-6	STAIR PRESSURIZATION	MIXED FLOW	4700	1.50	---	1657	2.0	1725	208	3	60	–	BELT	COOK 165 GMX	
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REMARKS:
1. PROVIDE FAN W/ GRAVITY BACKDRAFT DAMPER.
2. RETURN FAN SHALL BE CONTROLLED BY VARIABLE FREQUENCY DRIVE.

AIR HANDLING UNIT SCHEDULE

MSAHU

MARK	LOCATION	SERVES	TYPE	CFM	STAT PRESS IN WG EXT	STAT PRESS IN WG TOTAL	FAN RPM	MOTOR DATA HP	MOTOR DATA RPM	MOTOR DATA VOL	MOTOR DATA PH	MOTOR DATA HZ	WHEEL DIA AND TYPE	MIN OA CFM	MANUFACTURER AND MODEL NO.	REMARKS
AHU-1	BASE BUILDING	BASE BUILDING	DRAW-THRU	6950	2.25	3.68	1168	7.5	1800	208	3	60	18.5" F.C.	2060	TRANE MCC 14	3,4
AHU-2	TOWER MECH.	CAB	DRAW-THRU	5560	2.00	4.18	2300	7.5	1800	208	3	60	19" PLENUM	300	TRANE MMC 12	1,2
AHU-3	TOWER MECH.	CAB	DRAW-THRU	5560	2.00	4.18	2300	7.5	1800	208	3	60	19" PLENUM	300	TRANE MMC 12	1,2
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REMARKS:
1. UNIT SHALL INCLUDE THE FOLLOWING MODULES: FILTER MODULE W/ 2" (30% EFFICIENT) PLEATED MEDIA AND 12" (85% EFFICIENT) CARTRIDGE, ELECTRIC HEATING COIL, ACCESS, COOLING COIL AND SUPPLY FAN.
2. AIR HANDLERS SHALL BE STACKED WITHOUT REQUIRING SUPPLEMENTAL STRUCTURAL SUPPORTS OR BRACING, INCLUDING SEISMIC REQUIREMENTS OTHER THAN MFR. BASE RAILS.
3. UNIT SHALL INCLUDE THE FOLLOWING MODULES: AIR MIXING MODULE W/ 2" (30% EFFICIENT) PLEATED MEDIA FILTER, ACCESS, ELECTRTIC HEATING COIL, HUMIDIFICATION MODULE, ACCESS, COOLING COIL, AND SUPPLY FAN WITH TOP DISCHARGE.
4. UNIT SUPPLY FAN SHALL BE CONTROLLED BY VARIABLE FREQUENCY DRIVE.

CHILLED WATER COOLING COIL SCHEDULE

MSCWCC

MARK	SERVES	CFM	MAX FACE VEL FPM	EAT °F DB	EAT °F WB	LAT °F DB	LAT °F WB	MAX AIR PD INCH WG	MIN. CAP MBH SENS.	MIN. CAP MBH TOTAL	CHILLED WATER GPM	CHILLED WATER EWT °F	CHILLED WATER LWT °F	MAX. PD FT	MIN ROWS	MANUFACTURER AND MODEL NO.	REMARKS
CC-1	AHU-1	6950	489	90.6	66.3	55.0	53.3	0.47	271.8	271.8	54.2	45	55	6.0	4	TRANE TO FIT AHU-1	
CC-2	AHU-2	5560	452	80.3	64.8	55.0	54.1	0.42	154.6	178.3	35.5	45	55	6.0	4	TRANE TO FIT AHU-2	
CC-3	AHU-3	5560	452	80.3	64.8	55.0	54.1	0.42	154.6	178.3	35.5	45	55	6.0	4	TRANE TO FIT AHU-3	
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REMARKS:

ELECTRIC HEATING COIL SCHEDULE

MSEHC

MARK	SERVES	TYPE	CFM	MIN VEL FPM	MAX VEL FPM	EAT °F	MAX AIR PD INCH WG	ELEMENT DATA VOLT	ELEMENT DATA PH	ELEMENT DATA HZ	ELEMENT DATA KW	ELEMENT DATA STEPS	MANUFACTURER AND MODEL NO.	REMARKS
EHC-1	AHU-1	ELECTRIC	6950	---	1500	43	0.16	208	3	60	26.3	SCR	TRANE TO FIT AHU-1	1
EHC-2	AHU-2	ELECTRIC	5560	---	1500	66.3	0.14	208	3	60	41.3	SCR	TRANE TO FIT AHU-2	1
EHC-3	AHU-3	ELECTRIC	5560	---	1500	66.3	0.14	208	3	60	41.3	SCR	TRANE TO FIT AHU-3	1
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REMARKS
1. FIN-TUBULAR TYPE. PROVIDE AIRFLOW INTERLOCK SWITCH AND DISCONNECT INTEGRAL TO CONTROL PANEL ACCESS DOOR.

ENERGY RECOVERY UNIT SCHEDULE

MSERU

MARK	SERVES	TYPE	CFM O.A.	CFM E.A.	MAX APD S.P. IN.	HEATING S.A. IN DB °F	HEATING S.A. OUT DB °F	HEATING E.A. IN DB °F	COOLING S.A. IN DB °F	COOLING S.A. IN WBT	COOLING S.A. OUT DB °F	COOLING S.A. OUT WBT	COOLING E.A. IN DB °F	COOLING E.A. IN WBT	MANUFACTURER AND MODEL NO.	REMARKS
ERU-1	AHU-1	STATIC PLATE	2060	1400	0.50	31	52.5	75	50	112	73	94.0	68.7	75	45	RENEWARE HE2X	1

REMARKS:
1. PROVIDE W/ INTEGRAL 2HP OUTSIDE AIR FAN AND 2HP EXHAUST FAN.

MAX COMBINED FAN SOUND POWER LEVELS

MARK	SOUND EMMISSION POINT	MIN OPER. INSERT. LOSS DB RE 10^{-12} WATTS HZ 63	125	250	500	1000	2000	4000	8000
FCU-1	TOTAL	54	63	63	59	57	52	49	43
FCU-4	TOTAL	54	60	60	58	56	54	50	43
FCU-5	TOTAL	45	39	48	46	41	37	28	23
FCU-7	TOTAL	54	62	63	58	55	50	45	38
FCU-8	TOTAL	54	63	63	59	57	52	49	43
FCU-10	DISCHARGE	85	70	65	65	65	62	60	54
RF-1	TOTAL	77	84	81	74	70	68	64	60
EF-1	TOTAL	62	62	58	51	34	28	33	36
AHU-1	DISCHARGE	104	94	92	88	88	86	83	74
AHU-2,3	DISCHARGE	99	89	87	84	83	80	77	69

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LAD NO: 003-10096-000

REGISTERED PROFESSIONAL ENGINEER CHARLES F. PEH No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REQUIRE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

SCHEDULES

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY		SUBMITTED BY	APPROVED BY
		SUBMITTER'S TITLE	APPROVER'S TITLE
		DESIGNED GNR	ISSUED BY ENGINEERING SERVICES TERMINAL – LOS ANGELES
		DRAWN PEH	DATE October 5, 2009 JCN
		CHECKED MPH	DRAWING NO. PSP-D-ATCT- M601 REV

DIFFUSER, REGISTER AND GRILLE SCHEDULE

MARK	SERVES	TYPE	NECK SIZE	FINISH	MAX PD INCH WG	MAX N.C.	MANUFACTURER AND MODEL NO.	REMARKS
D-1	SEE PLANS	SQUARE SUPPLY DIFFUSER	SEE PLAN	WHITE	0.10	38	TITUS TDC	1
LD-1	SEE PLANS	LINEAR DIFFUSER	SEE PLAN	(NOTE 3)	0.08	38	TITUS CT-481 W/ BOARDER TYPE B11	2
R-1	SEE PLANS	SUPPLY BLADE REGISTER	SEE PLAN	WHITE	0.10	38	TITUS 300 RL	
R-2	SEE PLANS	RETURN/EXHAUST BLADE REGISTER	SEE PLAN	WHITE	0.10	38	TITUS 350 RL	
G-1	SEE PLANS	RETURN PERFORATED GRILLE 24"x24" FACE	SEE PLAN	WHITE	0.05	38	TITUS PAR	
G-2	SEE PLANS	RETURN PERFORATED GRILLE 24"x12" FACE	SEE PLAN	WHITE	0.05	38	TITUS PAR	

REMARKS:
1. 12"x12" W/ 24"x24" EXTENDED PANEL.
2. DIFFUSER TO HAVE 15° DIRECTIONAL BLADES, DIRECT DIFFUSER TO BLOW AIR "OUT" TOWARDS CAB GLASS.
3. PROVIDE ANODIZED FINISH TO MATCH CAB GLASS FRAME.

AIR TERMINAL UNIT SCHEDULE

MARK	TYPE	CFM MAX	CFM MIN	INLET SIZE INCH	PD @ MAX CFM INCH WG	NC AT MIN SP OUTLET	NC AT MIN SP RAD	ELEC. HEATING COIL KW	VOL	PH	HZ	STEPS	MANUFACTURER AND MODEL NO.	REMARKS
VAV-1	VAV W/ ELECTRIC REHEAT	80	55	4	0.25	22	22	0.5	208	1	60	1	TITUS DESV 4	
VAV-4	VAV W/ ELECTRIC REHEAT	490	190	8	0.25	22	22	2.5	208	1	60	3	TITUS DESV 8	
VAV-5	VAV W/ ELECTRIC REHEAT	85	55	4	0.25	22	22	0.5	208	1	60	1	TITUS DESV 4	
VAV-6	VAV W/ ELECTRIC REHEAT	570	300	10	0.25	22	22	2.5	208	1	60	3	TITUS DESV 10	
VAV-7	VAV W/ ELECTRIC REHEAT	80	55	4	0.25	22	22	0.5	208	1	60	1	TITUS DESV 4	
VAV-11	VAV W/ ELECTRIC REHEAT	430	190	8	0.25	22	22	1.5	208	1	60	3	TITUS DESV 8	
VAV-12	VAV W/ ELECTRIC REHEAT	245	105	6	0.25	22	22	1.0	208	1	60	2	TITUS DESV 6	
VAV-21	VAV W/ ELECTRIC REHEAT	450	190	8	0.25	22	22	1.5	208	1	60	3	TITUS DESV 8	
VAV-22	VAV W/ ELECTRIC REHEAT	275	190	8	0.25	22	22	1.0	208	1	60	2	TITUS DESV 8	
VAV-23	VAV W/ ELECTRIC REHEAT	215	105	6	0.25	22	22	1.0	208	1	60	2	TITUS DESV 6	
VAV-31	VAV W/ ELECTRIC REHEAT	360	190	8	0.25	22	22	1.0	208	1	60	2	TITUS DESV 8	
VAV-33	VAV W/ ELECTRIC REHEAT	150	105	6	0.25	22	22	0.5	208	1	60	1	TITUS DESV 6	
VAV-34	VAV W/ ELECTRIC REHEAT	560	300	10	0.25	22	22	1.5	208	1	60	3	TITUS DESV 10	
VAV-36	VAV W/ ELECTRIC REHEAT	870	425	12	0.25	22	22	3.0	208	1	60	3	TITUS DESV 12	
VAV-41	VAV W/ ELECTRIC REHEAT	235	105	8	0.25	22	22	0.5	208	1	60	1	TITUS DESV 6	
VAV-54	VAV W/ ELECTRIC REHEAT	260	105	6	0.25	22	22	0.5	208	1	60	1	TITUS DESV 6	
VAV-61	VAV W/ ELECTRIC REHEAT	500	300	10	0.25	22	22	1.5	208	1	60	3	TITUS DESV 10	
VAV-62	VAV W/ ELECTRIC REHEAT	240	105	6	0.25	22	22	0.5	208	1	60	1	TITUS DESV 6	
VAV-63	VAV W/ ELECTRIC REHEAT	310	190	8	0.25	22	22	1.5	208	1	60	3	TITUS DESV 8	
VAV-64	VAV W/ ELECTRIC REHEAT	205	80	6	0.25	22	22	1.5	208	1	60	3	TITUS DESV 6	
VAV-72	VAV W/ ELECTRIC REHEAT	200	200	6	0.25	22	22	0.5	208	1	60	1	TITUS DESV 6	1
VAV-74	VAV W/ ELECTRIC REHEAT	120	55	4	0.25	22	22	0.5	208	1	60	1	TITUS DESV 4	
VAV-101	VAV W/ ELECTRIC REHEAT	115	55	4	0.25	22	22	1.0	208	1	60	2	TITUS DESV 4	

REMARKS:
1. UNIT TO BE CONSTANT VOLUME UNIT TO PROVIDE VENTILATION AIR TO EQUIPMENT ROOM NO. 72 AS SHOWN ON THE DRAWINGS.

OUTSIDE AIR INTAKE OR RELIEF SCHEDULE

MARK	LOCATION	SERVES	AIR FLOW CFM	MAX PD INCH WG	VELOCITY FPM	THROAT SIZE INCH	HEIGHT INCH	MANUFACTURER AND MODEL NO.	REMARKS
IH-1	ROOF	BASE BUILDING	6950	0.15	695	30"X48"	30"	COOK TRE 30x48x8 TRE	2
IH-2	ROOF	EMERGENCY GENERATOR	20,905	0.15	530	60"x96"	33.5	COOK TRE 60x96x9 TRE	1, 2
EC-1	ROOF	BREAK ROOM EXHAUST	600	0.10	775	12"ø	12"	COOK PR-12	2
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REMARKS:
1. PROVIDE 30% EFFICIENT "ROUGHING" FILTER.
2. PROVIDE WITH 12" ROOF CURB.

MECHANICAL EQUIPMENT SCHEDULE

MARK	FUNCTION	SPECIFICATION	MANUFACTURER AND MODEL NO.	REMARKS
CWT-1	CHILLED WATER BUFFER TANK	210 GALLON INSUL. WELDED STEEL w/ (125 PSI) A.S.M.E. STAMP	LAARS CBT-30-077 w/FLNGD 3" I/O CONNECTIONS	1
AS-1	AIR SEPARATOR (CHILLED WATER)	144 GPM MAX. FLOW RATE 3" CONNECTIONS	TACO AC3	

REMARKS:
1. PROVIDE INTERNAL BAFFLES TO INSURE ANTI-STRATIFICATION/BLENDING THRU TANK AND 1-1/2" EXTERIOR FIBERGLASS INSULATION.

EXPANSION TANK SCHEDULE

MARK	LOCATION	SERVES	SIZE DIA. X L INCH	MIN. ACCEPTANCE GALLONS	MIN. TOTAL CAPACITY GALLONS	MANUFACTURER AND MODEL NO.	REMARKS
ET-1	MECH. RM	CHILLED WATER LOOP	16"ø X42-3/4"H	11.3	33.6	AMTROL SX-60 (VERTICAL)	

CONTROL VALVE SCHEDULE

SERVES	FUNCTION	DESIGN GPM	VALVE TYPE	ACCEPTABLE Cv RANGE	RECOMMENDED VALVE
CC-1	CHILLED WATER COIL FOR AHU-1	54.2	3-WAY MODULATING EQUAL PERCENTAGE	20.5-27.1	BELIMO 1" B320VS, Cv=21
CC-2	CHILLED WATER COIL FOR AHU-2	35.5	3-WAY MODULATING EQUAL PERCENTAGE	11-17.8	BELIMO 3/4" B320VS, Cv=11
CC-3	CHILLED WATER COIL FOR AHU-3	35.5	3-WAY MODULATING EQUAL PERCENTAGE	11-17.8	BELIMO 3/4" B320VS, Cv=11
CRAC-1	BASE BUILDING EQUIPMENT RM.	16.5	3-WAY MODULATING EQUAL PERCENTAGE	6.2-11	BELIMO 3/4" B320VS, Cv=11
CRAC-2	BASE BUILDING EQUIPMENT RM.	16.5	3-WAY MODULATING EQUAL PERCENTAGE	6.2-11	BELIMO 3/4" B320VS, Cv=11
CRAC-3	BASE BUILDING EQUIPMENT RM.	16.5	3-WAY MODULATING EQUAL PERCENTAGE	6.2-11	BELIMO 3/4" B320VS, Cv=11
CRAC-4	TOWER EQUIPMENT RM.	12	3-WAY MODULATING EQUAL PERCENTAGE	4.5-6	BELIMO 1/2" B315VS, Cv=4.8
CRAC-5	TOWER EQUIPMENT RM.	12	3-WAY MODULATING EQUAL PERCENTAGE	4.5-6	BELIMO 1/2" B315VS, Cv=4.8

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REGISTERED PROFESSIONAL ENGINEER CHARLES F. PEH No. M 33803 Exp. 6-30-11 MECHANICAL STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	JCN	REDLINE DATE	APVD

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN SERVICE AREA — LOS ANGELES, CA

REPLACE AIRPORT TRAFFIC CONTROL TOWER AND ESTABLISH BASE BUILDING

SCHEDULES

PALM SPRINGS — PALM SPRINGS INTERNATIONAL AIRPORT (PSP) — CALIFORNIA

REVIEWED BY	
SUBMITTED BY	
SUBMITTED'S TITLE:	
APPROVED BY	
APPROVER'S TITLE:	
DESIGNED	GNR
DRAWN	PEH
CHECKED	MPH
ISSUED BY	ENGINEERING SERVICES TERMINAL - LOS ANGELES
DATE	October 5, 2009 JCN
DRAWING NO	PSP-D-ATCT- M602 REV

SECTION 15950 - HVAC TESTING/ADJUSTING/BALANCING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Section 15995, COMMISSIONING OF HVAC SYSTEMS.

1.2 DESCRIPTION OF WORK

A. The work includes test, adjust, and balance (TAB) of new heating, ventilating, and cooling (HVAC) air and water distribution systems including equipment, ducts, and piping which are located within, on, under, between, and adjacent to buildings.

B. Air Distribution Systems. Systems shall be tested, adjusted, and balanced (TAB'd) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems under Section 15080 THERMAL INSUALTION FOR MECHANICAL SYSTEMS.

C. Water Distribution Systems. Systems shall be TAB'd in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems under Section 15080 THERMAL INSUALTION FOR MECHANICAL SYSTEMS. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd. Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. The ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After completion of work under this section, the flow control valves and devices shall be insulated under Section 15080 THERMAL INSUALTION FOR MECHANICAL SYSTEMS.

D. Phasing of Work. This Specification Section is structured as though the HVAC construction, and thereby the TAB work, is going to be completed in a single phase. All elements of the TAB work are addressed on this premise. When a contract is to be completed in construction phases, including the TAB work, the TAB work shall be planned for, completed and approved by the Contracting Officer with each phase. An example of this case would be one contract that requires the rehabilitation of the HVAC in each of several separated buildings. At the completion of the final phase, all approved reports shall be compiled and submitted as one document.

1.3 DEFINITIONS

A. TAB team supervisor: TAB team engineer.

B. TAB team technician: TAB team assistant.

C. TAB'd: HVAC Testing/Adjusting/Balancing procedures performed.

D. Field check group: One or more systems of the same basic type; the subgroup of a "field check group" is a "system". An example of a "system" is a supply air handler with its duct system, which is its supply, return, and outside air ducts.

E. Out-of-tolerance data: Pertains only to field checking of Certified TAB report. When applied to TAB work this phase means "a measurement taken during TAB field checking which does not fall within the range of plus 5 to minus 5 percent of the original measurement reported on the certified TAB Report for a specific parameter."

F. Season of maximum heating load: Time of year when outdoor ambient temperature at equipment installation site remains within following range throughout the period of data recording for TAB work. Indicated winter outdoor design dry bulb temperature plus 30 to minus 30 degrees Fahrenheit.

G. Season of maximum cooling load: Time of year when outdoor ambient temperature at equipment installation site remains within following range throughout the period of data recording for TAB work. Indicated summer outdoor design dry bulb temperature plus 15, minus 5 degrees Fahrenheit.

1.4 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

B. Test Reports
1. Certified TAB report
2. Submit certified reports in the specified format including the above data.

C. Certificates
1. Independent TAB agency personnel qualifications; G
2. TAB Submittal and Work Schedule; G
3. Design review report; G
4. Pre-field TAB engineering report; G
5. Advanced notice for TAB field work; G

1.5 TAB SUBMITTAL AND WORK SCHEDULE

A. Submit this schedule, adapted for this particular contract, to the Contracting Officer for review and approval. Include with the submittal the planned calendar dates for each submittal or work item. Resubmit an updated version for CO approval every 90 calendar days. Compliance with the following schedule is the Contractor's responsibility.

B. Qualify TAB Personnel. Within 45 calendar days after date of contract award, submit TAB agency and personnel qualifications.

C. Pre-TAB Meeting. Within 30 calendar days after the date of approval of the TAB agency and personnel, meet with the Contracting Officer's TAB representative.

D. Design Review Report. Within 60 calendar days after the date of the TAB agency personnel qualifications approval, submit design review report.

E. Pre-Field TAB Engineering Report. Within 21 calendar days after approval of the TAB agency Personnel Qualifications, submit the Pre-Field TAB Engineering Report.

F. Prerequisite HVAC Work Check Out List and Advanced Notice For TAB Field Work. At a minimum of 120 calendar days prior to CCD, submit prerequisite HVAC work check out list certified as complete, and submit advance notice of commencement of TAB field work.

G. TAB Field Work. At a minimum of 90 calendar days prior to CCD, and when the ambient temperature is within limits, accomplish TAB field work.

H. Submit TAB Report. Within 15 calendar days after completion of TAB field work, submit certified TAB report.

I. TAB Field Check. 30 calendar days after certified TAB report is approved by the Contracting Officer, conduct field check.

J. Complete TAB Work. Prior to CCD, complete all TAB work.

K. TAB Field Work. At a minimum of 90 calendar days prior to CCD, accomplish TAB field work; submit certified TAB report; and conduct field check.

L. Complete TAB Work. Prior to CCD, complete all TAB work.

1.6 QUALITY ASSURANCE

A. Modifications of References. Accomplish work in accordance with referenced publications of AABC or NEBB except as modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear. Interpret reference to the "authority having jurisdiction," the "Administrative Authority," the "Owner," or the "Design Engineer" to mean the "Contracting Officer."

B. Certificates.

1. Independent TAB Agency Personnel Qualifications
   a. For agency proposed for approval, submit information certifying that the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract , including design, furnishing equipment, or construction.
   b. Submit the following, for the agency, to Contracting Officer for approval in compliance with paragraph entitled "TAB Personnel Qualification Requirements."
      1) Independent AABC or NEBB certified TAB agency:
      2) TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification.
      3) TAB team supervisor: Name and copy of AABC or NEBB TAB supervisor certificate and expiration date of current certification.
      4) TAB team field leader: Name and documented evidence that the team field leader shall have satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.
      5) TAB team field technicians: Names and documented evidence that each field technician shall have satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.
      6) Current certificates: Registrations and certifications shall be current, and valid for the duration of this contract. Certifications which expire prior to completion of the TAB work, shall be renewed in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification shall not perform TAB work on this contract.
      7) TAB Team Members: TAB team approved to accomplish work on this contract shall be full-time employees of the TAB agency. No other personnel shall do TAB work on this contract.
      8) Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.
2. Design Review Report. Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the duct leakage testing work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.
3. Pre-Field TAB Engineering Report. Submit report containing the following information:
   a. Step-by-step TAB procedure:
      1) Strategy: Describe the method of approach to the TAB field work from start to finish. Include in this description a complete methodology for accomplishing each seasonal TAB field work session.
      2) Procedural steps: Delineate fully the intended procedural steps to be taken by the TAB field team to accomplish the required TAB work of each air distribution system and each water distribution system. Include intended procedural steps for TAB work for subsystems and system components.
   b. Pre-field data: Submit AABC or NEBB or SMACNA HVACTAB data report forms with the following pre-field information filled in:
      1) Design data obtained from system drawings, specifications, and approved submittals.
      2) Notations detailing additional data to be obtained from the contract site by the TAB field team.
      3) Designate the actual data to be measured in the TAB field work.
      4) Provide a list of the types of instruments, and the measuring range of each, which are anticipated to be used for measuring in the TAB field work. By means of a keying scheme, specify on each TAB data report form submitted, which instruments will be used for measuring each item of TAB data. If the selection of which instrument to use, is to be made in the field, specify from which instruments the choice will be made. The instrument key number shall be placed in the blank space where the measured data would be entered.
   c. Prerequisite HVAC work checkout list: Provide a list of inspections and work items which are to be completed by the Contractor. This list shall be acted upon and completed by the Contractor and then submitted and approved by the Contracting Officer prior to the TAB team coming to the contract site. At a minimum, a list of the applicable inspections and work items listed in the NEBB TABES, Section III, "Preliminary TAB Procedures" under paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" shall be provided for each separate system to be TAB'd.

C. Responsibilities. The Contractor shall be responsible for ensuring compliance with the requirements of this section. The following delineation of specific work responsibilities is specified to facilitate execution of the various work efforts by personnel from separate organizations. This breakdown of specific duties is specified to facilitate adherence to the schedule listed in paragraph entitled "TAB Submittal and Work Schedule".

1. Contractor.
   a. TAB personnel: Ensure that the TAB work is accomplished by a group meeting the requirements specified in paragraph entitled "TAB Personnel Qualification Requirements".
   b. Pre-TAB meeting: Attend the meeting with the TAB Supervisor, and ensure that a representative is present for the sheet metal contractor, mechanical contractor, electrical contractor, and automatic temperature controls contractor.
   c. HVAC documentation: Furnish one complete set of the following HVAC-related documentation to the TAB agency:
      1) Contract drawings and specifications
      2) Approved submittal data for equipment
      3) Construction work schedule
      4) Up-to-date revisions and change orders for the previously listed items
   d. Submittal and work schedules: Ensure that the schedule for submittals and work required by this section and specified in paragraph entitled "TAB Submittal and Work Schedule," is met.
   e. Coordination of supporting personnel:
      1) Provide the technical personnel, such as factory representatives or HVAC controls installer required by the TAB field team to support the TAB field measurement work.
      2) Provide equipment mechanics to operate HVAC equipment and ductwork mechanics to provide the field designated test ports to enable TAB field team to accomplish the TAB field measurement work. Ensure these support personnel are present at the times required by the TAB team, and cause no delay in the TAB field work.
      3) Conversely, ensure that the HVAC controls installer has required support from the TAB team field leader to complete the controls check out.
   f. Deficiencies: Ensure that the TAB Agency supervisor submits all Design/Construction deficiency notifications directly to the Contracting officer within 3 days after the deficiency is encountered. Further, the Contractor shall ensure that all such notification submittals are complete with explanation, including documentation, detailing deficiencies.
   g. Prerequisite HVAC work: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Include as prerequisite work items, the deficiencies pointed out by the TAB team supervisor in the design review report.
   h. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. Do not allow the TAB team to commence TAB field work until all of the following are completed.
      1) HVAC system installations are fully complete.
      2) HVAC prerequisite checkout work lists specified in the paragraph "Pre-Field TAB Engineering Report" have been completed, submitted, and approved. Ensure that the TAB Agency gets a copy of the approved prerequisite HVAC work checklist.
      3) HVAC system filters are clean for both Season 1 and Season 2 TAB field work.
   i. Advance notice: Furnish to the Contracting Officer with advance written notice for the commencement of the TAB field work.
2. TAB Agency. Provide the services of a TAB team which complies with the requirements of paragraph entitled "Independent TAB Agency Personnel Qualifications". The work to be performed by the TAB agency shall be limited to testing, adjusting, and balancing of HVAC air and water systems to satisfy the requirements of this specification section.
3. TAB Team Supervisor
   a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical TAB procedures and TAB team field work.
   b. Pre-TAB meeting: Attend meeting with Contractor.
   c. Design review report: Review project specifications and accompanying drawings to verify that the air systems and water systems are designed in such a way that the TAB engineer can accomplish the work in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.
   d. Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish

the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report, during the TAB field work.

e. Pre-field engineering report: Utilizing the following HVAC-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.

f. Prerequisite HVAC work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.

g. Technical Assistance for TAB Work: Provide immediate technical assistance to the TAB field team for the TAB work.

h. Certified TAB report: Certify the TAB report. This certification includes the following work:

1) Review: Review the TAB field data report. From this field report, prepare the certified TAB report.

2) Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

i. Design/Construction deficiencies: Within 3 working days after the TAB Agency has encountered any design or construction deficiencies, the TAB Supervisor shall submit written notification directly to the Contracting Officer, with a separate copy to the Contractor, of all such deficiencies. Provide in this submittal a complete explanation, including supporting documentation, detailing deficiencies. Where deficiencies are encountered that are believed to adversely impact successful completion of TAB, the TAB Agency shall issue notice and request direction in the notification submittal.

j. TAB Field Check: The TAB team supervisor shall attend and supervise TAB field check.

4. TAB Team Field Leader

a. Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, "Execution."

b. Full time: Be present at the contract site when TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

D. Test Reports

1. Certified TAB Reports. Submit Certified TAB Report for Season 1 and Certified TAB Report for Season 2 in the following manner:

a. Report format: Submit the completed pre-field data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed and certified by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

b. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded.

1) Data shall be measured/recorded only after the HVAC systems installations are complete, the systems fully balanced and the HVAC systems controls operating in fully automatic mode.

2) Data may be compiled using direct digital controls trend logging where available. Otherwise, the Contractor shall temporarily install calibrated time versus temperature/humidity recorders for this purpose. The HVAC systems and controls shall have been fully operational a minimum of 24 hours in advance of commencing data compilation. The specified data shall be included in the TAB Report.

c. Static Pressure Profiles: Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. The static pressure report data shall include, in addition to NEBB/AABC required data, the following:

1) Report supply fan, return fan, relief fan, and exhaust fan inlet and discharge static pressures.

2) Report static pressure drop across chilled water coils, hot water coils, and electric resistance heating coils installed in unit cabinetry or the system ductwork.

3) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry, or in the system ductwork.

4) Report static pressure drop across air filters, acoustic silencers, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

5) Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.
6) Report static pressure drop across outside air and relief/exhaust air louvers.
7) Report supply, return, exhaust/relief, outside air duct static pressure readings, including the following locations:
   a) Main Duct: Take readings at four locations along the full length of the main duct. Locations shall be at 25 percent, 50 percent, 75 percent, and 100 percent of the total duct length.
   b) Floor Branch Mains: Take readings at floor branch mains served by a main duct vertical riser.
   c) Branch Main Ducts: Take readings at branch main ducts.
   d) VAV Terminals: Take readings at inlet static pressure at VAV terminal box primary air branch ducts.
   e) VAV Terminals, Fan Powered: Take readings at fan discharge and inlet static pressures for series and parallel fan powered VAV terminal boxes.

d. Duct Transverses: Report duct traverses for main and branch main supply, return, exhaust, relief and outside air ducts. This shall include all ducts, including those which lack 7 1/2 duct diameters upstream and 2 1/2 duct diameters downstream of straight duct unobstructed by duct fittings/offsets/elbows. The TAB Agency shall evaluate and report findings on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pitot traverse plane as defined by AMCA 203, "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane".

e. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instrumentation, used for taking wet bulb temperature readings shall provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

f. Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

g. Performance Curves: The TAB Supervisor shall include, in the Certified TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.

h. Calibration Curves: The TAB Supervisor shall include, in the Certified TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturis and flow orifices TAB'd on the job.

1.7 PRE-TAB MEETING

A. Meet with the Contracting Officer's TAB representative to develop a mutual understanding relative to the details of the TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 TAB PROCEDURES

A. TAB Field Work
1. Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Conduct TAB work, including maintenance and calibration of instruments, measurement accuracy, and sound measurement work in conformance with the AABC MN-1 and AABC MN-4, or NEBB TABES, and NEBB MASV, except as supplemented and modified by this section. Provide instruments and consumables required to accomplish the TAB work.
2. Air systems and water systems shall be proportionately balanced and reported in the certified TAB report.

B. Preliminary Procedures. Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. Test ports required for testing by the TAB engineer shall be located in the field by the TAB engineer during TAB field work. It shall be the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

C. TAB Air Distribution Systems
1. Air Handling Units. Air handling unit systems including fans (air handling unit fans, exhaust fans and winter ventilation fans), coils, ducts, plenums, mixing boxes, terminal units, variable air volume boxes, and air distribution devices for supply air, return air, outside air, mixed air relief air, and makeup air.
2. Fan Coils. Fan coil unit systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.
3. Return Air Fans. Return air fan system including fan ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.
4. Heating and Ventilating Units. Heating and ventilating unit systems including fans, coils, ducts, plenums, roof vents, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.
5. Exhaust Fans. Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.
6. Cooling Units.

D. TAB Water Distribution Systems
1. Chilled Water. Chilled water systems including chillers, pumps, coils, system balance valves and flow measuring devices.

E. TAB Work on Performance Tests Without Seasonal Limitations
1. Performance Tests. In addition to the TAB proportionate balancing work on the air distribution systems and the water distribution systems, accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the heating systems and cooling systems.
2. Ambient Temperatures. On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.
3. Water Chillers. For water chillers, data as required by NEBB Form TAB 15-83, NEBB TABES shall be reported, including refrigeration operational data.
4. Coils. Heating and cooling performance capacity tests shall be reported for heating and chilled water coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:
    a. For Central station air handlers with capacities greater than 7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, capacity tests shall be conducted in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing".
        1) Entering and leaving wet and dry bulb temperatures shall not be determined by single point measurement, but shall be the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing".
        2) Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; the data shall be used for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing", paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).
    b. For units with capacities of 7.5 tons (90,000 Btu) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units. The apparent coil capacity shall be determined by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; the calculations shall be submitted with the coil reports.

F. TAB Work on Performance Tests With Seasonal Limitations
1. Performance Tests. Accomplish proportionate balancing TAB work on the air distribution systems and water distribution systems, in other words, accomplish adjusting and balancing of the air flows and water flows, any time during the duration of this contract, subject to the limitations specified elsewhere in this section. However, accomplish, within the following seasonal limitations, TAB work on HVAC systems which directly transfer thermal energy.
2. Season of Maximum Load. Visit the contract site for at least two TAB work sessions for TAB field measurements. Visit the contract site during the season of maximum heating load and visit the contract site during the season of maximum cooling load, the goal being to TAB the operational performance of the heating systems and cooling systems under their respective maximum outdoor environment-caused loading. During the seasonal limitations, TAB the operational performance of the heating systems and cooling systems.
3. Ambient Temperatures. On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.

4. Air Cooled Chillers. For air cooled chillers, data as required by NEBB Form TAB 15-83, NEBB TABES shall be reported, including refrigeration operational data.
5. Coils. Heating and cooling performance capacity tests shall be reported for heating and chilled water coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:
    a. For Central station air handlers with capacities greater than 7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, capacity tests shall be conducted in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing".
        1) Entering and leaving wet and dry bulb temperatures shall not be determined by single point measurement, but shall be the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing".
        2) Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; the data shall be used for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).
    b. For units with capacities of 7.5 tons (90,000 Btu) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, such as through-the-wall heat pumps:
        1) The apparent coil capacity shall be determined by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; the calculations shall be submitted with the coil reports.

G. Workmanship. Conduct TAB work on specified HVAC systems until measured parameters are within plus or minus 10 percent of the design values, that is, the values specified or indicated on the contract documents.

H. Deficiencies.
1. Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph entitled "Workmanship", provide written notice as soon as possible to the Contractor and the Contracting Officer describing the deficiency and recommended correction.
2. Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB team supervisor's.

I. Data From TAB Field Work
1. After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and certification, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship".
2. After completion of the TAB work, prepare a pre-final TAB report using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship" of this Section.
3. Prepare the report neatly and legibly; the pre-final TAB report shall be the final TAB report minus the TAB supervisor's review and certification. Obtain, at the contract site, the TAB supervisor's review and certification of the TAB report.
4. Verbally notify the Contracting Officer's TAB representative that the field check of the Certified TAB report data can commence; give this verbal notice 48 hours in advance of when the field checking shall commence. Do not schedule field check of the Certified TAB report until the specified workmanship requirements have been met or written approval of the deviations from the requirements have been received from the Contracting Officer.

J. Quality Assurance - Contracting Officer TAB Field Checks
1. Field Check.
    a. During field check, the Contractor shall check, in the presence of the Contracting Officer's TAB representative, random selections of data (water, air quantities, air motion, sound level readings) recorded in the Certified TAB Report. Points and areas of field checks shall be selected by the

Contracting Officer's TAB representative. Measurement and test procedures shall be the same as approved for TAB work for the Certified TAB Report.

b. Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the report.

2. Additional Field Checks

a. If any of the data checked for a given HVAC field check group are determined to be out-of-tolerance, data checking for all affected data for that group shall be terminated and the affected TAB report data for the given group shall be disapproved. The Contractor shall make the necessary corrections and prepare a revised Certified TAB Report. A field check of the revised report data shall then be rescheduled with the Contracting Officer's TAB representative.

b. Further, if any data on the Certified TAB Report for a given field check group is out-of-tolerance, then data for one additional field check group shall be field checked as specified herein. This increase field check work shall continue until out-of-tolerance data ceases to be found. This additional field checking is up and above the original 25 percent of the reported data entries to be field checked.

c. If there are no more of the similar field check group, additional field checking from another, but different, type of field check group shall be checked.

3. Prerequisite for Approval. Compliance with the field checking requirements of this section is a prerequisite for the final Contracting Officer approval of the certified TAB report submitted.

3.2 MARKING OF SETTINGS

A. Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted certified TAB report.

3.3 MARKING OF TEST PORTS

A. The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

END OF SECTION 15950

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SECTION 15995 - COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

B. Product Data
1. Commissioning Team. List of team members who will represent the Contractor in the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Proposed revision to the list, prior to the start of the impacted work.
2. Tests. Detailed procedures for pre-commissioning checks and functional performance tests, at least 4 weeks prior to the start of pre-commissioning checks.
3. Pre-Commissioning Checks. Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

C. Test Reports. Completed pre-commissioning checklists and functional performance test checklists organized by system and by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.2 SEQUENCING AND SCHEDULING

A. The work described in this Section shall begin only after all work required in related Sections, including Section 15910 DIRECT DIGITAL CONTROL SYSTEMS and Section 15950 TESTING/ADJUSTING/BALANCING, has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 COMMISSIONING TEAM AND CHECKLISTS

A. The Contractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified herein. In addition, the Government will be represented by a representative of the Contracting Officer, the Design Agent's Representative, and the Using Agency. The team members shall be as follows:

Designation	Function
Q	Contractor's Chief Quality Control Representative
M	Contractor's Mechanical Representative
E	Contractor's Electrical Representative
T	Contractor's Testing, Adjusting, and Balancing Representative
C	Contractor's Controls Representative
D	Design Agent's Representative
O	Resident Engineer/Project Engineer
U	Using Agency's Representative

B. Appendices A and B are provided as a general checklist and have been prepared to best match the various equipment selected during the design of this project. Each checklist shown in Appendices A and B shall be reviewed and modified as necessary to reflect equipment actually installed during construction of the project. The commissioning team shall review the accuracy and applicability of each item in the checklist and revise as needed. Equipment shown in the checklist but not installed for the project shall be annotated as "NA". Likewise, equipment installed but not listed in the checklist shall be added or revised accordingly. A note as to why it was added or revised shall be inserted with the reviewer's initial. The commissioning team shall also add or modify to any of the equipment checklist items as required and/or specified by the equipment manufacturer. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date, unless an "X" is

shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.

3.2 TESTS

A. The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. The Contractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating non-Government commissioning team member of which participation is specified is not present for the test. The Contractor shall reimburse the Government for all costs associated with effort lost due to tests that are aborted. These costs shall include salary, travel costs and per diem (where applicable) for Government commissioning team members. The Contractor shall submit Test Reports as specified in the Submittals paragraph.

B. Pre-Commissioning Checks. Pre-commissioning checks shall be performed for the items indicated on the checklists in Appendix A. Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable contract requirements.

C. Functional Performance Tests. Functional performance tests shall be performed for the items indicated on the checklists in Appendix B. Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

Pre-commissioning checklist - Piping

For [_____] Piping System

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Piping complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Piping flushed and cleaned.	___	___	X	___	X	___	___	___
d. Strainers cleaned.	___	___	X	___	X	___	___	___
e. Valves installed as required.	___	___	X	___	X	___	___	___
f. Piping insulated as required.	___	___	X	___	X	___	___	___
g. Thermometers and gauges installed as required.	___	___	X	___	X	___	___	___
h. Verify operation of valves.	___	___	X	___	___	___	___	___
i. Air vents installed as specified.	___	___	X	X	X	___	___	___
j. Flexible connectors installed as specified	___	___	X	X	X	___	___	___
k. Verify that piping has been labeled and valves identified as specified.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Hydrostatic test complete.	___	___	X	___	X	___	___	___
b. TAB operation complete.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Ductwork

For Air Handler: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Ductwork complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Ductwork leak test complete.	___	___	X	___	X	___	___	___
d. Fire dampers, smoke dampers, and access doors installed as required with installation of each verified by the specified team members initialing each location on a copy of the as-built drawings.	___	___	X	___	X	___	___	___
e. Ductwork insulated as required.	___	___	X	___	X	___	___	___
f. Thermometers and gauges installed as required.	___	___	___	___	___	___	___	___
g. Verify open/closed status of dampers.	___	___	X	___	X	___	___	___
h. Verify smoke and fire damper operation.	___	___	X	___	___	___	___	___
i. Flexible connectors installed as specified	__	___	X	___	X	___	___	___
j. Seismic Restraints Installed.	___	___	X	___	___	X	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB operation complete.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	___	___	X	X	X	___	___	___
b. Inspection and access doors are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed. (Visually verify drainage by pouring a cup of water into drain pan.)	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
e. Power available to electric heating coil.	__	___	___	X	X	___	___	___
Coils								
a. Chilled water piping properly connected.	___	___	X	X	X	___	___	___
b. Chilled water piping pressure tested.	___	___	X	X	X	___	___	___
d. Air vents installed on water coils with shutoff valves as specified.	___	___	X	X	X	___	___	___
e. Any damage to coil fins has been repaired.	__	___	X	___	X	___	___	___

Controls								
a. Automatic control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Automatic control valves/actuators operable.	___	___	X	___	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location, installation and calibration of duct static pressure sensor.	___	___	X	___	___	___	___	___
f. Fan air volume controller operable.	___	___	X	___	___	___	___	___
g. Air handler controls system operational.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	__	___	X	___	___	___	___	___
b. TAB report submitted.	___	___	X	___	X	___	___	___
c. TAB results within limits specified in Section 15950								
d. TAB results for outside air intake within limits specified in Section 15950	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - VAV Terminal

For VAV Terminal: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. VAV terminal in place.	___	___	X	X	X	___	___	___
b. VAV terminal ducted.	___	___	X	X	X	___	___	___
c. VAV terminal connected to controls.	___	___	X	X	___	___	___	___
e. Electric reheat coil connected to local disconnect.	___	___	___	___	X	___	___	___
f. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Controls								
a. Cooling only VAV terminal controls set.	___	___	X	X	___	___	___	___
b. Cooling only VAV controls verified.	___	___	X	X	___	___	___	___
c. Reheat VAV terminal controls set.	___	___	X	X	___	___	___	___
d. Reheat terminal/coil controls verified.	___	___	X	X	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Verify terminal maximum air flow set.	___	___	X	___	___	___	___	___
b. Verify terminal minimum air flow set.	___	___	X	___	___	___	___	___
c. TAB operation complete.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Pumps

For Pump: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Pumps grouted in place.	___	___	X	X	X	___	___	___
b. Pump vibration isolation devices functional.	___	___	X	X	X	___	___	___
c. Pump/motor coupling alignment verified.	___	___	X	X	X	___	___	___
d. Piping system installed.	___	___	X	X	X	___	___	___
e. Piping system pressure tested.	___	___	X	X	X	___	___	___
f. Pump not leaking.	___	___	X	X	X	___	___	___
g. Field assembled couplings aligned to meet manufacturer's prescribed tolerances.	_____		X	X	X	___	___	___
Electrical								
a. Power available to pump disconnect.	___	___	___	X	X	___	___	___
b. Pump rotation verified.	___	___	___	X	X	___	___	___
c. Control system interlocks functional.	___	___	___	X	___	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Pressure/temperature gauges installed.	___	___	X	___	X	___	___	___
b. Piping system cleaned.	___	___	X	X	X	___	___	___
c. Chemical water treatment complete.	___	___	X	X	X	___	___	___
d. Water balance complete.	___	___	X	___	X	___	___	___
e. Water balance with design maximum flow.	___	___	X	___	X	___	___	___
f. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Packaged Air Cooled Chiller

For Chiller: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Chiller properly piped.	___	___	X	___	___	___	___	___
b. Chilled water pipe leak tested.	___	___	X	X	X	___	___	___
c. Verify that refrigerant used complies with specified requirements.	___	___	X	X	X	___	___	___
d. Any damage to coil fins has been repaired.	__	___	X	___	X	___	___	___
e. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
f. Low ambient kit installed.	___	___	X	X	X	___	___	___
g. Copper tubes and copper fins installed.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Separate power is supplied to electric heating tape.	___	___	___	X	___	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Factory startup and checkout complete.	___	___	X	X	___	___	___	___
b. Chiller safety/protection devices tested.	___	___	X	X	___	___	___	___
c. Chilled water flow switch installed.	___	___	X	X	___	___	___	___
d. Chilled water flow switch tested.	___	___	X	X	___	___	___	___
e. Chilled water pump interlock installed.	___	___	X	X	X	___	___	___
f. Chilled water pump interlock tested.	___	___	___	X	___	___	___	___

Pre-commissioning Checklist - Fan Coil Unit

For Fan Coil Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	___	___	X	X	X	___	___	___
b. Access doors/removable panels are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed.	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
h. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
e. Power available to electric heating coil.	___	___	___	X	X	___	___	___
Coils								
a. Chilled water piping properly connected.	___	___	X	X	X	___	___	___
b. Chilled water piping pressure tested.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	X	___	___	___	___
c. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___

Testing, Adjusting, and Balancing (TAB)

a. Construction filters removed and replaced.__ ___ X ___ ___ ___ ___ ___

b. TAB results within limits specified in Section 15990A

c. TAB Report submitted. ___ ___ X ___ X ___ ___ ___

Pre-commissioning Checklist - Exhaust Fan

For Exhaust Fan: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Fan belt adjusted.	___	___	X	___	X	___	___	___
Electrical								
a. Power available to fan disconnect.	___	___	___	X	___	___	___	___
b. Proper motor rotation verified.	___	___	___	___	X	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Control interlocks properly installed.	___	___	___	X	___	___	___	___
b. Control interlocks operable.	___	___	___	X	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB results within limits specified in Section 15990A	___	___	X	___	X	___	___	___
b. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Computer Room Unit

For Computer Room Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Unit properly supported.	___	___	X	X	X	___	___	___
b. Access doors are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed and routed to floor drain.	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance operational clearance provided.	___	___	X	X	X	___	___	___
h. Drain pipe installed.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Proper motor rotation verified.	___	___	___	___	X	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
e. Power available to reheat coils.	___	___	___	___	X	___	___	___
Coils/Humidifier								
a. Chilled water piping properly connected.	___	___	X	___	___	___	___	___
b. Chilled water piping pressure tested.	___	___	X	X	X	___	___	___
c. Humidifier makeup water connected.	___	___	X	X	X	___	___	___
Controls								
a. Control valves operable.	___	___	X	X	___	___	___	___
b. Unit control system operable and verified.	___	___	___	X	___	___	___	___

c. Verify proper location and installation of thermostat and humidistat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	__	___	X	___	X	___	___	___
b. TAB results within limits specified in Section 15950	___	___	X	___	X	___	___	___
c. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - HVAC System Controls

For HVAC System: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. As-built shop drawings submitted.	___	___	X	X	___	___	___	___
b. Layout of control panel matches drawings.	___	___	X	X	___	___	___	___
c. Framed instructions mounted in or near control panel.	___	___	X	X	___	___	___	___
d. Components properly labeled (on inside and outside of panel).	___	___	X	X	___	___	___	___
e. Control components piped and/or wired to each labeled terminal strip.	___	___	X	X	___	___	___	___
f. EMCS connection made to each labeled terminal strip as shown.	___	___	X	X	___	___	___	___
g. Control wiring and tubing labeled at all terminations, splices, and junctions.	___	___	X	X	___	___	___	___
h. Shielded wiring used on electronic sensors.	__	__	X	X	___	___	___	___
Main Power and Control Air								
a. 110 volt AC power available to panel.	___	___	___	X	___	___	___	___
Testing, Commissioning, and Balancing								
a. Testing, Commissioning, and Balancing Report submitted.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	__	___	X	X	X	___	___	___
b. Inspection and access doors are operable and sealed.	__	___	X	___	X	___	___	___
c. Casing undamaged.	__	___	X	X	X	___	___	___
d. Insulation undamaged.	__	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed.	__	___	X	X	X	___	___	___
f. Fan belt adjusted.	__	___	X	___	X	___	___	___
g. Any damage to coil fins has been repaired.	__	__	X	___	X	___	___	___
h. Manufacturer's required maintenance clearance provided.	__	___	X	X	X	___	___	___
i. Seismic restraints installed.	__	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	__	___	___	X	X	___	___	___
b. Power available to unit control panel.	__	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	__	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	__	X	___	___	___	___
e. Power available to electric heating coil.	__	___	___	X	___	___	___	___
Coils								
a. Chilled water piping properly connected.	__	___	X	__	___	___	___	___
b. Chilled water piping pressure tested.	__	___	X	X	X	___	___	___
e. Air vents installed on water coils [with shutoff valves] as specified.	___	___	X	X	X	__	___	___
f. Any damage to coil fins has been repaired.	___	___	X	___		___	___	___

Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	___	___	X	___	X	___	___	___
b. TAB results within limits specified in Section 15950	___	___	X	___	X	___	___	___
c. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Energy Recovery Unit

For Energy Recovery Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Seismic restraints installed.	__	___	X	X	X	___	___	___
b. Inspection and access doors are operable and sealed.	__	___	X	___	X	___	___	___
c. Casing undamaged.	__	___	X	X	X	___	___	___
d. Insulation undamaged.	__	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed.	__	___	X	X	X	___	___	___
f. Fan belts adjusted.	__	___	X	___	X	___	___	___
g. No damage to heat exchanger plates.	__	__	X	___	X	___	___	___
h. Manufacturer's required maintenance clearance provided.	__	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	__	___	___	X	X	___	___	___
b. Power available to unit control panel.	__	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	__	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	__	X	___	___	___	___
e. Power available to outside air fan.	__	___	___	X	___	___	___	___
f. Power available to exhaust fan.	__	___	___	X	___	___	___	___
Controls								
a. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
b. Dampers/actuators operable.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	___	___	X	___	X	___	___	___
b. TAB results within limits specified in Section 15950	___	___	X	___	X	___	___	___
c. TAB Report submitted.	___	___	X	___	X	___	___	___

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

Functional Performance Test Checklist - Pumps

For Pump: [_____]

Prior to performing this checklist, ensure that for closed loop systems, system is pressurized and the make-up water system is operational or, for open loop systems, that the sumps are filled to the proper level.

1. Activate pump start using control system commands (all possible combination, on/auto, etc.). ON_____ AUTO_____ OFF_____

a. Verify pressure drop across strainer:

Strainer inlet pressure _____ psig
Strainer outlet pressure _____ psig

b. Verify pump inlet/outlet pressure reading, compare to Testing, Adjusting, and Balancing (TAB) Report, pump design conditions, and pump manufacturer's performance.

	DESIGN	SYSTEM TEST	ACTUAL
Pump inlet pressure (psig)	_____	_____	_____
Pump outlet pressure (psig)	_____	_____	_____

c. Operate pump at shutoff and at 100 percent of designed flow when all components are in full flow. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent	INCHES
Pump inlet pressure (psig)	_____	_____	
Pump outlet pressure	_____	_____	
Pump flow rate (gpm)	_____	_____	
Pump impeller (size)			_____

d. Operate pump at shutoff and at minimum flow or when all components are in full by-pass. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent
Pump inlet pressure (psig)	_____	_____
Pump outlet pressure	_____	_____
Pump flow rate (gpm)	_____	_____

2. Verify motor amperage each phase and voltage phase to phase and phase to ground for both the full flow and the minimum flow conditions.

a. Full flow:

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage		_____	_____
Voltage		_____	
Voltage to ground	_____	_____	_____

b. Minimum flow:

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage		_____	_____
Voltage		_____	
Voltage to ground	_____	_____	_____

3. Unusual vibration, noise, etc.

_____

_____

4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - VAV Terminals

The Contracting officer will select VAV terminals to be spot-checked during the functional performance test. The number of terminals shall not exceed [2] [10] [10 percent].

1. Functional Performance Test: Contractor shall demonstrate operation of selected VAV boxes as per specifications including the following:

a. Cooling only VAV boxes:

(1) Verify VAV box response to room temperature set point adjustment. Turn thermostat to 5 degrees F above ambient and measure maximum air flow. Turn thermostat to 5 degrees F below ambient and measure minimum air flow.

Maximum flow [_____] cfm
Minimum flow [_____] cfm

(2) Check damper maximum/minimum flow settings.

Maximum flow setting [_____] cfm
Minimum flow setting [_____] cfm

b. Cooling with reheat VAV boxes:

(1) Verify VAV box response to room temperature set point adjustment. Turn thermostat to 5 degrees F above ambient and measure maximum air flow. Turn thermostat to 5 degrees F below ambient and measure minimum air flow.

Maximum flow [_____] cfm
Minimum flow [_____] cfm

(2) Check damper maximum/minimum flow settings.

Maximum flow setting [_____] cfm
Minimum flow setting [_____] cfm

Reheat coil operation range (full open to full closed) _____

c. Fan powered VAV boxes:

(1) Verify VAV box response to sensor call for heating via set point adjustment. Changes to be cooling setpoint to heating set point and return to cooling set point. _____ Verify cooling damper closes to minimum position, blower fan energizes according to sequence of operation, and upon further drop in space temperature, heating coil activation and deactivation.

_____

(2) Check primary air damper maximum/minimum flow settings.

Maximum flow setting [_____] cfm
Minimum flow setting [_____] cfm

(3) Check blower fan flow. [_____] cfm

(4) Verify free operation of fan backdraft damper (insure no primary air is being discharged through the recirculated air register).

_____

(5) Verify that no recirculated air is being induced when box is in full cooling. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions.

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

a. The following shall be verified when the [supply fan operating] [supply and return fans operating] mode is initiated:

(1) All dampers in normal position [and fan inlet vanes modulate to maintain the required static pressure]. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

(4) VAV fan controller shall "soft-start" fan. _____

(5) Modulate all VAV boxes to minimum air flow and verify that the static pressure does not exceed the design static pressure Class shown.

_____

b. Occupied mode of operation - economizer de-energized.

(1) Outside air damper at minimum position. _____

(2) Return air damper open. _____

(3) Relief air damper [at minimum position] [closed]. _____

(4) Chilled water control valve modulating to maintain leaving air temperature set point. _____

(5) Fan VAV controller receiving signal from duct static pressure sensor and modulating fan to maintain supply duct static pressure set point.

_____

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulated to maintain mixed air temperature set point. _____

(2) Relief air damper modulates with outside air damper according to sequence of operation. _____

(3) Chilled water control valve modulating to maintain leaving air temperature set point. _____

(4) Fan VAV controller receiving signal from duct static pressure sensor and modulating fan to maintain supply duct static pressure set point.

_____

d. Unoccupied mode of operation

(1) All dampers in normal position. _____

(2) Verify low limit space temperature is maintained as specified in sequence of operation. _____

e. The following shall be verified when the [supply fan off] [supply and return fans off] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fan de-energizes. _____

f. Verify the chilled water coil control valve operation by setting all VAV's to maximum and minimum cooling.

	Max cooling	Min cooling
Supply air volume _____ cfm)	_____	_____
Supply air temp. (_____ degrees F)	_____	_____

g. Verify safety shut down initiated by smoke detectors. _____

h. Verify safety shut down initiated by low temperature protection thermostat. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

a. The following shall be verified when the supply and return fan operating mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

b. Occupied mode of operation - economizer de-energized.

(1) Outside air damper at minimum position. _____

(2) Return air damper open. _____

(3) Relief air damper [at minimum position] [closed]. _____

(4) Chilled water control valve modulating to maintain space cooling temperature set point. _____

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulated to maintain mixed air temperature set point. _____

(2) Relief air damper modulates with outside air damper according to sequence of operation. _____

(3) Chilled water control valve modulating to maintain space cooling temperature set point. _____

d. Unoccupied mode of operation

(1) All dampers in normal position. _____

(2) Verify low limit space temperature is maintained as specified in sequence of operation. _____

e. The following shall be verified when the [supply fan off] [supply and return fans off] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fan de-energizes. _____

f. Verify cooling coil and heating coil operation by varying thermostat set point from cooling set point to heating set point and returning to cooling set point. _____

g. Verify safety shut down initiated by smoke detectors. _____

h. Verify safety shut down initiated by low temperature protection thermostat. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - Packaged Air Cooled Chiller

For Chiller: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of chilled water system as per specifications including the following: Start building air handler to provide load for chiller. Activate controls system chiller start sequence as follows.

a. Start chilled water pump and establish chilled water flow. Verify chiller-chilled water proof-of-flow switch operation. _____

b. Verify control system energizes chiller start sequence. _____

c. Verify chiller senses chilled water temperature above set point and control system activates chiller start. _____

d. Verify functioning of "soft start" sequence. _____

e. Shut off air handling equipment to remove load on chilled water system. Verify chiller shutdown sequence is initiated and accomplished after load is removed. _____

f. Restart air handling equipment one minute after chiller shut down. Verify chiller restart sequence. _____

2. Verify chiller inlet/outlet pressure reading, compare to Testing, Adjusting, and Balancing (TAB) Report, chiller design conditions, and chiller manufacturer's performance data.

	DESIGN	SYSTEM TEST	ACTUAL
Chiller inlet pressure (psig)	_____	_____	_____
Chiller outlet pressure (psig)	_____	_____	_____

3. Verify chiller amperage each phase and voltage phase-to-phase and phase-to-ground.

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage		_____	_____
Voltage		_____	
Voltage to ground	_____	_____	_____

4. Record the following information:

Ambient dry bulb temperature _____ degrees F
Ambient wet bulb temperature _____ degrees F
Entering chilled water temperature _____ degrees F
Leaving chilled water temperature _____ degrees F

5. Unusual vibration, noise, etc.

_____

_____

6. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - Fan Coil Units

The Contracting Officer will select fan coil units to be spot-checked during the functional performance test. The number of terminals shall not exceed 10 percent.

1. Functional Performance Test: Contractor shall demonstrate operation of selected fan coils as per specifications including the following:

a. Cooling only fan coils:

(1) Verify fan coil unit response to room temperature set point adjustment. Changes to be cooling set point to cooling set point minus 10 degrees and return to cooling set point. _____

(2) Check blower fan air flow.
Check blower fan air flow. _____ cfm

(3) Check cooling coil water flow.
Check cooling coil water flow. _____ gpm

(4) Verify proper operation of cooling water control valve. _____

b. Cooling/heating fan coils:

(1) Verify fan coil unit response to room temperature set point adjustment. Changes to be cooling set point to heating set point and return to cooling set point. _____

(2) Check blower fan air flow.
Check blower fan air flow. _____ cfm

(3) Check cooling coil water flow.
Check cooling coil water flow. _____ cfm

(4) Verify proper operation of cooling water control valve. _____

(5) Check cooling mode inlet air temperature.
Check cooling mode inlet air temperature. _____ degrees F

(6) Check cooling mode outlet air temperature.
Check cooling mode outlet air temperature. _____ degrees F

(7) Check heating coil power.
Check heating coil capacity. _____ kw

(8) Check heating mode inlet air temperature.
Check heating mode inlet air temperature. _____ degrees F

(9) Check heating mode outlet air temperature.
Check heating mode outlet air temperature. _____ degrees F

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - Computer Room Unit

For Computer Room Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of computer room unit as per specification including the following:

a. System safeties allow start if safety conditions are met. _____

b. Verify cooling and heating operation by varying thermostat set point from space set point to space set point plus 10 degrees, space set point minus 10 degrees, and returning to space set point. _____

c. Verify humidifier operation by varying humidistat set point from space set point to space set point plus 20 percent RH, and returning to space set point. _____

d. Verify that airflow is within +10/-0 percent of design airflow. _____

e. Verify unit shut down during fire event initiated by smoke/heat sensors. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

For Energy Recovery Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of Energy Recovery Unit as per specification including the following:

a. The following shall be verified when the outside air and exhaust air fans operating mode is initiated:

(1) All dampers in open position. _____

b. Verify when the outside air fan is de-energized that the minimum outside air damper closes.

(1) Outside air damper closed. _____

c. Verify when the exhaust air fan is de-energized that the exhaust air damper closes.

(1) exhaust air damper closed. _____

2. Record the following information during an approximate design cooling day condition:

Outside Air dry bulb temperature _____ degrees F
Outside Air wet bulb temperature _____ degrees F
Exhaust Air dry bulb temperature (before heat exchanger)_____ degrees F
Exhaust Air wet bulb temperature (before heat exchanger)_____ degrees F
Leaving Exhaust Air dry bulb temperature _____ degrees F
Leaving Exhaust Air wet bulb temperature _____ degrees F
Leaving Outside Air dry bulb temperature _____ degrees F
Leaving Outside Air wet bulb temperature _____ degrees F

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative
_____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative
_____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: [_____]

The Resident Engineer will select HVAC control systems to undergo functional performance testing. The number of systems shall not exceed 6.

1. Functional Performance Test: Contractor shall verify operation of HVAC controls by performing the following tests:

a. Verify that controller is maintaining the set point by manually measuring the controlled variable with a thermometer, sling psychrometer, inclined manometer, etc.

b. Verify sensor/controller combination by manually measuring the controlled medium. Take readings from control panel display and compare readings taken manually. Record all readings.

Sensor _____
Manual measurement _____
Panel reading value _____

c. Verify system stability by changing the controller set point as follows:

(1) Air temperature - 10 degrees F

(2) Water temperature - 10 degrees F

(3) Static pressure - 10 percent of set point

(4) Relative humidity - percent (RH)

The control system shall be observed for 10 minutes after the change in set point. Instability or excessive hunting will be unacceptable.

d. Verify interlock with other HVAC controls.

e. Verify interlock with fire alarm control panel.

f. Verify interlock with EMCS.

[g. Change controller set point 10 percent with EMCS and verify correct response.]

2. Verify that operation of control system conforms to that specified in the sequence of operation.

3. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative
_____

Contractor's Controls Representative _____

Resident Engineer _____

Using Agency's Representative _____

END OF SECTION 15995