	INF	PUT/C	OUTPUT S	UMMARY FOR	AIR HAN	DLING UNI	T AH-01 (7	TYP 4 SYSTEMS)		
			INPUTS		OU	TPUTS		SYSTEM FEATURES		
SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION	ANALOG MEASURED CALCULATED		- BINARY	DIGITAL	ANALOG	ALARMS	PROGRAMS	GENERAL		
	TEMPERATURE PRESSURE RH KW AIR FLOW		TEMP	STATUS FIL TER SMOKE FREEZE AIR FLOW METER	OFF-ON OFF-AUTO-ON OFF-HI-LO OPEN-CLOSE MULTI-STAGE	DAMPER POSITION VALVE POSITION SET POINT ADJUSTMENT VANE POSITION SCR CONTROL	HI ANALOG LOW ANALOG HI BINARY LOW BINARY PROOF	TIME SCHEDULING DEMAND LIMITING DUTY CYCLE START/STOP OPTION ENTHALPY OPTION SMOKE CNT TREND ALARM INSTRUCT MAINT WK ORD	COLOR GRAPHIC	SUPPLEMENTARY NOTES
OUTSIDE TEMERATURE										
OUTSIDE RELATIVE HUMIDITY										
PREHEAT COIL, HC-14						•				
PREHEAT COIL, HC-15				•						
AIR FILTER AF-01 (TYP 2)	•									2 SENSORS
AIR FILTER AF-02 (TYP 2)	•									2 SENSORS
MIXING AIR DAMPER OI										
MIXING AIR DAMPER 02										
COOLING COIL CC-01	•									
COOLING COIL CC-02	•									
HUMIDIFIER HU-01	•									
HUMIDIFIER HU-02						•	00			
SUPPLY FAN SF-01		•	•							
SUPPLY FAN SF-02		•								
SUPPLY AIR TEMP (TYP 2)										
SUPPLY AIR RELATIVE HUMIDITY										
ROOM TEMPERATURE (TYPICAL 5 ZONES)										
SPACE AVERAGE RELATIVE HUMIDITY										
ZONE DUCT HEATER (VEA)										
ZONE DUCT HEATERS (TYPICAL 5 ZONES)										
SMOKE DETECTOR (SD-01)				•						
MIXING AIR TEMP										
MIXING AIR RELATIVE HUMIDITY										
AIR COMPRESSORS (TYP 2)	•									
TOILET EXHAUST FAN, EF-01										
AIR FLOW DIAGRAM										
HEPA FILTERS	•									
FLOOR PLANS										

	INPU	JT/OU	TPUT	SUMI	MARY FOR) WA	TER CHIL	LERS CH	-0	1 & C	CH-0	2 (TYF	9 4 .	SYSTEM	5)				
SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION		INPUTS						OUTPUTS			SYSTEM FEATURES									
	ANALOG MEASURED CALCULATED			BINARY		DIGITAL	ANALOG		ALARMS			PROGRAMS			GENERAL		RAL			
		AIR FLOW LEVEL VIBRATIONS GPM	KWH ENTHALPY	KUN IIME EFFICIENCY WET BULB TEMP	STATUS FILTER SMOKE FREEZE AIR FLOW	MEIER	OFF-ON OFF-AUTO-ON OFF-HI-LO OPEN-CLOSE MULTI-STAGE	DAMPER POSITION VALVE POSITION SET POINT ADJUSTMENT VANE POSITION SCR CONTROL		HI ANALOG LOW ANALOG HI BINARY LOW BINARY	PROOF	TIME SCHEDIII IMS	DEMAND LIMITING	UUIY CYCLE START/STOP OPTION ENTHALPY OPTION	SMOKE CNT TREND ALARM INSTRUCT MAINT WK ORD		COLOR GRAPHIC			SUPPLEMENTARY NOTES
WATER CHILLER, CH-01				o								6		0						
WATER CHILLER, CH-02	•			o				0		0 0				•	00					
CHILLED WATER PUMP, WP-01		00		•			0				0			•						
CHILLED WATER PUMP, WP-02	•	00		6								•		•	0					
CHILLED WATER RETURN TEMP	•														•					
CHILLED WATER SUPPLY TEMP															•					
CHILLED WATER BOOSTER PUMP	•						0								00					PUMP BY VE CONTRACTOR
CHILLED WATER FLOW DIAGRAM																	0			
FLOOR PLANS																	0			

NOTES:

- I. FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES SEE SHEETS
- WA-H-001 AND WA-H-002.

 2. SMOKE DETECTORS WILL BE HARD WIRED TO THE SUPPLY FANS SF-01 & SF-02 MOTOR STARTER TO STOP FANS WHEN SMOKE DETECTED IN THE RETURN AIR STREAM. ALSO SMOKE DETECTORS WILL BE SOFTWARE CONNECTED TO DDC CONTROL PANEL AND THE FACILITY CONTROL ROOM.
- 3. CONTROL SYSTEM SHALL BE STAND ALONE TYPE AND CONNECTED TO THE MAIN CONTROL AND MONITORING SYSTEM AT THE FACILITY CONTROL ROOM IN THE CORNER STATION BUILDING.
- 4. VACUUM EQUIPMENT ROOM WILL BE PROVIDED WITH FOUR TEMPERATURE SENSORS TO CONTROL THE RESPECTIVE DUCT HEATER. SYSTEM MAY AVERAGE THE READING OF THE FOUR ROOM TEMPERATURE SENSORS OR SELECT ANY SENSOR TO CONTROL THE DUCT HEATER.

SEQUENCE OF OPERATION:

I. CHILLED WATER PLANT:

SETPOINT (42°F).

UPON A SIGNAL FROM THE CENTRAL CONTROL SYSTEM THE PACKAGED CONTROLS PROVIDED WITH THE WATER CHILLER WILL PERFORM THE FOLLOWING:

- A. THE LEAD CHILLED WATER PUMP (WP-01) WILL START TO ESTABLISH STEADY WATER FLOW THROUGH THE SYSTEM.
- B. UPON PROOF OF ESTABLISHED WATER FLOW THE LEAD CHILLER (CH-01) WILL START TO MAINTAIN THE LEAVING CHILLED WATER TEMPERATURE
- C. THE PACKAGED DDC CONTROLS ON THE WATER CHILLER WILL CYCLE THE REFRIGERATION COMPRESSORS IN SEQUENCE TO MATCH THE SYSTEM THERMAL LOAD.
- D. WHEN THE THERMAL LOAD DROPS BELOW THE MINIMUM OPERATING CAPACITY OF THE WATER CHILLER, THE PACKAGED CONTROL WILL ACTIVATE THE HOT GAS BYPASS CYCLE.
- E. PACKAGED CONTROLS WILL RUN SELF DIAGNOSTICS TEST BEFORE STARTING THE REFRIGERATION COMPRESSORS TO PROVE THAT ALL OPERATING CONDITIONS ARE WITHIN THE NORMAL LIMITS.
- F. PACKAGED CONTROLS WILL CONTINUOUSLY MONITOR THE CHILLER
 OPERATION AND REPORT ANY OPERATIONAL OR SAFETY ALARMS TO THE
 OPERATOR COMPUTER IN THE FACILITY CONTROL ROOM. PACKAGED
 CONTROLS WILL AUTOMATICALLY STOP THE MALFUNCTIONING WATER CHILLER
 AND START THE STANDBY CHILLER.
- G. CENTRAL CONTROL SYSTEM WILL ALTERNATE THE LEAD AND STANDBY
 WATER CHILLERS TO MAINTAIN EQUAL OPERATING PERIODS ON BOTH WATER

II. AIR HANDLING SYSTEM:

MOST DEMANDING ZONE.

UPON A SIGNAL FROM THE CENTRAL CONTROL SYSTEM THE LEAD SUPPLY AIR FAN (SF-01) WILL START TO ESTABLISH A STEADY AIR FLOW THROUGH THE SYSTEM. THE DDC CONTROLS WILL PERFORM THE FOLLWING:

- A. MODULATE THE CONTROLLABLE PITCH VANES ON THE SUPPLY AIR FANS TO MAINTAIN THE DESIRED CONSTANT AIR VOLUME FLOW RATE REGARDLESS OF THE SYSTEM STATIC PRESSURE.
- B. THE TEMPERATURE SENSORS LOCATED DOWN STREAM OF THE OUTSIDE AIR PREHEAT COILS WILL BE USED TO CONTROL THE CAPACITY OF THE DUCT ELECTRIC HEATERS TO MAINTAIN THE OUTSIDE AIR DRY BULB TEMPERATURE AT 50°F.
- C. THE TEMPERATURE SENSOR LOCATED DOWN STREAM OF THE COOLING COIL WILL BE USED TO MODULATE THE 3-WAY CONTROL VALVE ON THE CHILLED WATER LOOP TO MAINTAIN THE LEAVING AIR DRY BULB TEMPERATURE AT THE SET POINT (50°F).
- D. THE DDC CONTROLS WILL COMPARE THE SPACE ROOM TEMPERATURE SENSORS AND MODULATE THE FACE AND BYPASS DAMPER BASED ON THE
- E. THE ROOM TEMPERATURE SENSORS (TOTAL 4) OF VACUUM EQUIPMENT AREA SHALL BE USED TO MODULATE THE SCR CONTROLS ON THE RESPECTIVE ELECTRIC DUCT HEATER TO MAINTAIN THE ROOM TEMPERATURE SETPOINT (72°F)
- F. THE ROOM TEMPERATURE SENSORS FOR OTHER ROOMS SHALL BE USED TO SEQUENCE THE CAPACITY CONTROL STAGES OF THEIR RESPECTIVE DUCT HEATERS TO MAINTAIN THE ROOM TEMPERATURE SET POINT.
- G. WHEN THE ROOM TEMPERATURE RISES 5 DEGREES F ABOVE THE SETPOINT,
 THE CONTROL SYSTEM SHALL REPORT AN ALARM SIGNAL TO THE FACILITY
 CONTROL ROOM.
- H. THE RELATIVE HUMIDITY SENSOR LOCATED IN VACUUM EQUIPMENT ROOM SHALL
 BE USED TO SEQUENCE THE CAPACITY CONTROL STAGES OF THE ELECTRIC HUMIDIFIER
- TO MAINTAIN THE SPACE MINIMUM RELATIVE HUMIDITY SETPOINT (30 % RH).

 I. THE SMOKE DUCT DETECTOR IN THE RETURN AIR DUCTS SHALL STOP THE SUPPLY AIR FANS WHEN SMOKE IS DETECTED IN THE RETURN AIR STREAM AND REPORT AN ALARM SIGNAL (AUDIO AND VISIUAL) AT THE FACILITY CONTROL ROOM AND
- LOCAL CONTROL PANEL.
 THE SPACE DIFFERENTIAL PRESSURE SENSORS SHALL BE USED TO MODULATE THE MOTORIZED CONTROL DAMPERS ON THE RETURN AIR DUCTS AND THE OUTSIDE AIR DUCTS TO MAINTAIN THE SPACE PRESSURIZATION AT THE SETPOINT.

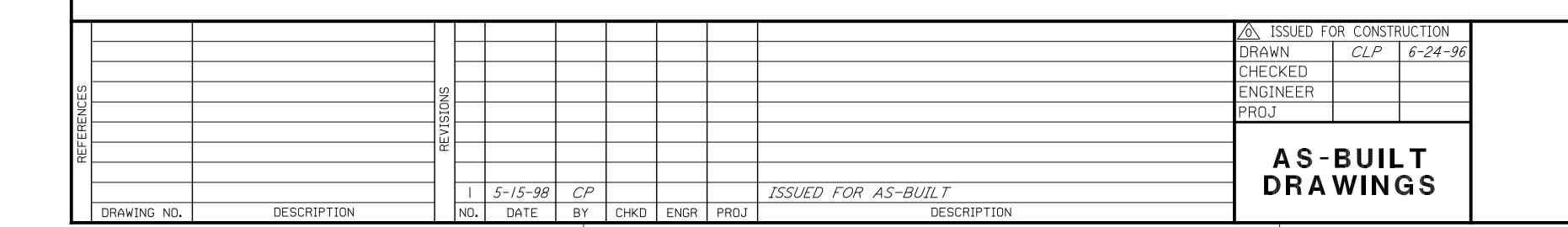
III. EQUIPMENT START UP:

- A. ALL WATER CHILLER SHALL BE SOFT START
- B. THE SUPPLY AIR FANS SF-01 & SF-02 SHALL START AT THE MINIMUM STATIC PRESSURE AND GRADUALLY INCREASE THE SYSTEM STATIC PRESSURE TO MAINTAIN THE DESIRED AIR FLOW RATE.
- C. THE BUILDING PRESSURIZATION SENSORS FOR LVEA AND OSB (LAB AREA) SHALL MODULATE THE MOTORIZED DAMPERS LOCATED ON THE RETURN AIR & OUTSIDE AIR DAMPERS TO START AT 100% RETURN AIR AND GRADUALLY MODULATE THE DAMPERS TO MAINTAIN THE BUILDING PRESSURIZATION SETPOINT.

IV. TOILET EXHAUST FAN:

A. THE TOILET EXHAUST FAN WILL RUN CONTINUOUSLY.

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PASADENA, CALIFORNIA



LASER INTERFEROMETER
GRAVITATIONAL-WAVE OBSERVATORY
SITE NO. I - HANFORD, WASHINGTON

HVAC
MID & END STATIONS
SEQUENCES OF OPERATION &
I/O SUMMARY SHEET

NONE PPI50969 8094

SHEET NUMBER PROJECT NUMBER PROJECT NUMBER REVISION