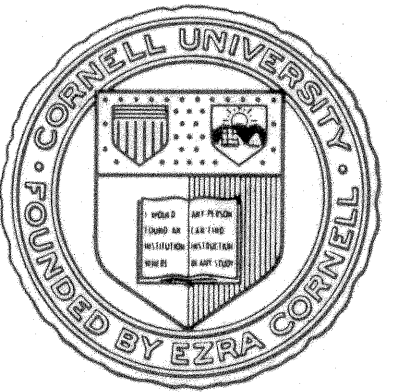




APPROVAL DATE

Philip L Cox 8/8/89
FACILITIES ENGINEERING

LIFE SAFETY

DRAWN BY DATE
DCS 8/8/89

CHECKED BY

ARCH *LAG* ENERGY
CIVIL *JAR* ENVIR
ELEC *JAR*
MECH *LAG*
STRUCT

REV DATE BY DESCRIPTION

DRAWING TITLE
CONTROLS

PROJECT
WILSON LAB
CESR COOLING
TOWERS

LOCATION NO. 2085

SCALE AS NOTED
FILE NO. 85610
DRAWING NO. D-2849
SHEET NO. M6
18 OF 20

CESR LOW CONDUCTIVITY WATER COOLING AND COOLING TOWER SEQUENCE OF OPERATION

1. CESR Process Cooling (by ATC):

- Receiver-controller TC-1 senses the CESR supply temperature TT-1 and modulates butterfly control valve CV-1 to maintain its 85°F setpoint.

2. Staging of Cooling Tower (by ATC):

- Differential pressure switch PS-1 senses CESR process water flow and energizes control relay R-1 starting selected operating pump P-1A or P-1B and the automatic filtration unit AFU-1 will start. On pump start, time delay relay R-2 energizes and locks out tower fan start for its adjustable 0-5 minute delay period.
- Receiver-controller TC-3 senses sump water temperature TT-2. Below its setting, 60°F, sump butterfly valve CV-2 and tower piping drain valve CV-3 are open to the sump. Above its setting of 60°F CV-3 closes and CV-2 switches to full flow through the tower. This sequence will reverse on temperature decrease.
- Receiver-controller TC-2 senses sump water temperature TT-2. At 73°F TC-2 starts CT-1A fan on low speed through pressure switch PE-1, 2. As the sump temperature increases to 76°F, TC-2 starts CT-1B fan on low speed through pressure switch PE-3, 4. On an increase to 79°F, TC-2 starts CT-1A fan on high speed through pressure switch PE-2. On a further increase to 82°F, CT-1B fan starts on high speed through pressure switch PE-4. This sequence will reverse on temperature decrease.

- Each stage of the step controller will be individually adjustable.

- When switching from the 30 horsepower highspeed cooling tower fan operation to the 7-1/2 horsepower low speed forward or reverse, there will be a 30 second time delay for coastdown (by Electrical).
- When switching from the low speed reverse to either the low speed forward or to the high speed, there will be 30 second time delay for coast down (by EC).

- There will be an electrical lockout to prevent the 30 and 7-1/2 horsepower cooling tower fan motors from operating at the same time and also the 7 1/2 horsepower reversing motor will be electrically interlocked to prevent closure of both forward and reversing coils (by EC).

- For winter ice removal each cell can be operated in reverse, manually only, on low speed (by EC).

- The vibration cutoff switch on each cooling tower cell will automatically stop the respective fan motor and initiate a remote alarm (cooling tower MFR supplied contacts).

- Mechanical Room Temperature Control:

- Space thermostat T-1, provided with and mounted to the unit heater, will modulate the electric unit heater to maintain a 45°F space temperature.

- Mechanical Room Ventilation Control:

- Exhaust Fan, EF-1, will run continuously. When EF-1 is on, the motor actuator M-1 will open the intake louver, LV-1. When EF-1 is off, LV-1 will be closed.

- Alarms: (panel, conduit, and wiring by ATC)

- Acceptable manufacturers - Annunciator Panel

- Johnson Controls
- Rochester Instrument Systems
- Panalarm

- In cooling tower mechanical room, provide alarm connections to a labelled terminal strip.

- Each alarm in the annunciator panel shall be individually lighted. All alarms will be acknowledged with a light, 1 common output horn, horn quiet push-button, and common alarm relay. Panel will include test and reset buttons (all alarms shall be fully latching).

- The common alarm relay will be tied from the annunciator panel to the Central Control Room Monitoring Station (coordinate with Wilson Lab Personnel).

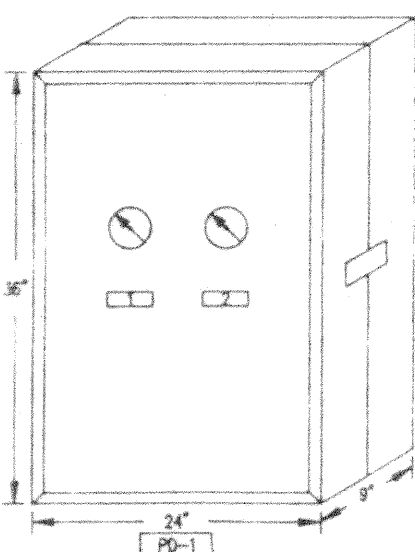
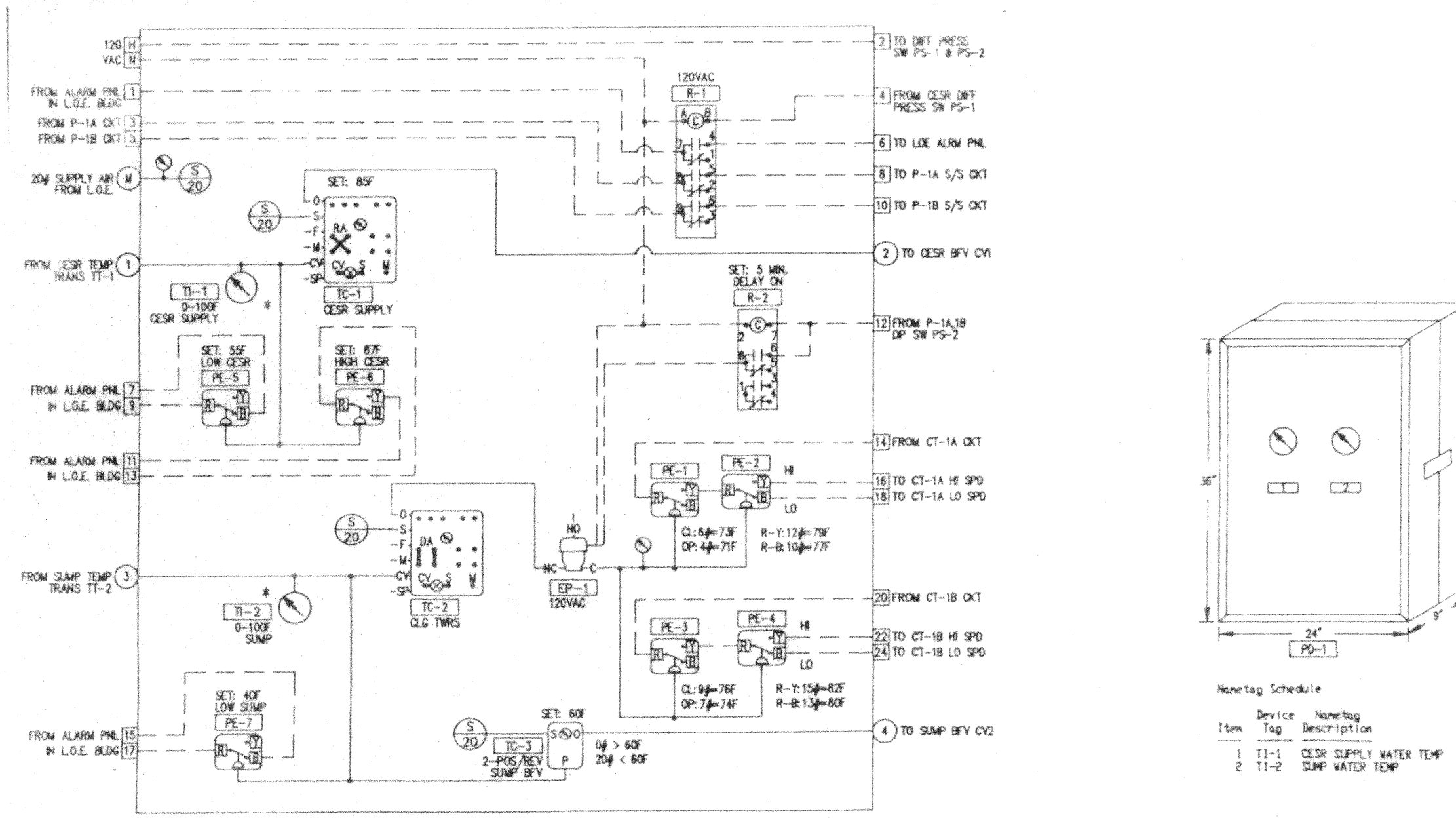
- Run remote alarms from the cooling tower mechanical building to the Central Control Room Annunciator Panel.

- Control System Alarms:

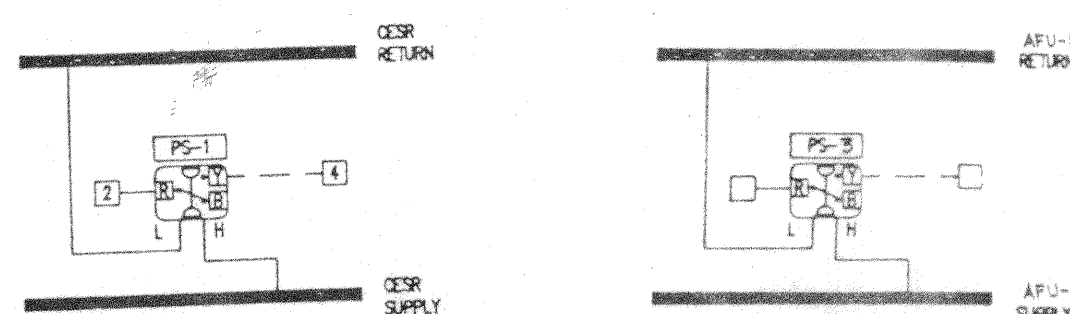
- CESR Process LCW Loop On (flow switch by ATC)
- High CESR Water Supply Temperature (set @ 87°F contacts by ATC)
- Low CESR Water Supply Temperature (set @ 55°F contacts by ATC)
- Low Cooling Tower Sump Temperature (set @ 45°F contacts by ATC)
- Vibration Cutoff CT-1A (MFR supplied contacts)
- Vibration Cutoff CT-1B (MFR supplied contacts)
- Sump Level High (MFR supplied contacts)
- Sump Level Low (MFR supplied contacts)
- P-1A Motor Fault (MCC contacts by EC)
- P-1B Motor Fault (MCC contacts by EC)
- CT-1A 7-1/2 HP Motor Fault (MCC contacts by EC)
- CT-1A 30 HP Motor Fault (MCC contacts by EC)
- CT-1B 7-1/2 HP Motor Fault (MCC contacts by EC)
- CT-1B 30 HP Motor Fault (MCC contacts by EC)
- Automatic Filter High Pressure (diff press switch by ATC)
- Fire Alarm Panel (FAP contacts by EC)

GENERAL NOTES

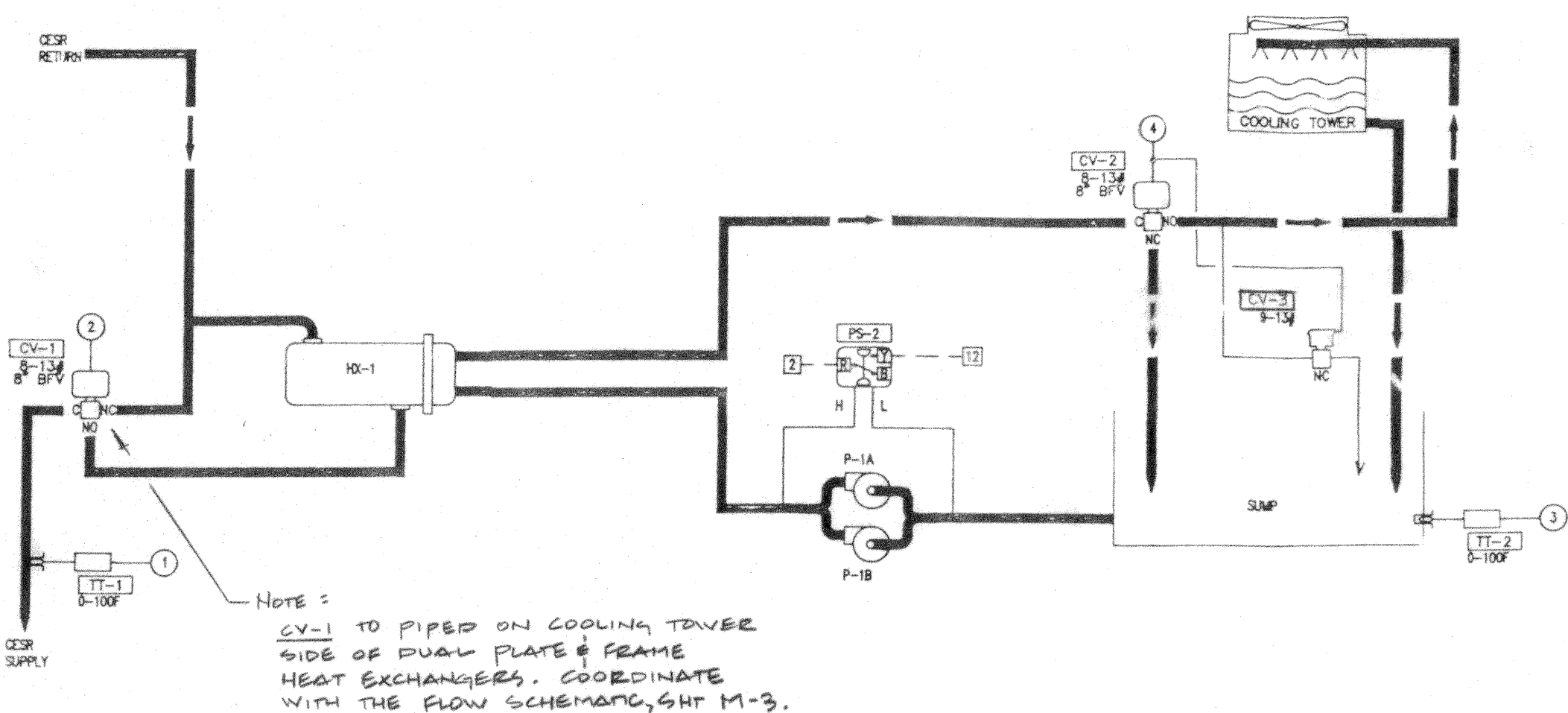
- Provide one spare control air line in the 1 1/2" buried conduit from LOE Main Building to the new cooling tower Mechanical Building. Cap air line ends for future use.



Device Tag	Number	Description
1	11-1	CESR SUPPLY WATER TEMP
2	11-2	SUMP WATER TEMP



COOLING TOWER CONTROL



AUTOMATIC TEMPERATURE CONTROL SCHEMATIC

NO SCALE

Field Devices

Device Tag	Code Number	Description
CV-1,2	8LC-8285-4	8" TIT GRINNELL PNEU BFV, 8-13#
CV-3	V-3974-1005	1" NC GL 9-13# W/A 13.9
PS-1,2	P74FA-5	DIFF. PRESS. CONTR., SPDT
TT-1,2	T-5210-1002	TRANS. 0/100F "B"
	T-800-1605	WELL BRASS 6-1/2"

Panel Devices

Device Tag	Code Number	Description
EP-1	V-2410-2	3-WAY SOLENOID AIR VALVE, 120VAC
PD-1	M-8100-2436	CONTROL PANEL 24 X 36 X 9
PE-1,4	P10BC-7	PRESSURE SWITCH, SPDT
PE-5,6,7	P10BG-3	PRESSURE SWITCH, SPDT, CLOSE DIFF.
R-1	PD-109-20	RELAY 3 PDT 10A 120 VAC
	PD-101-35	SOCKET-11 PIN BLADE
R-2	PD-109-12	TIME DELAY RELAY, DPDT, DELAY ON
	PD-101-36	RELAY SOCKET - 8 PIN
TC-1,2	T-5800-1	RECEIVER - CONT., SINGLE
TC-3	T-5312-3	RECEIVER - CONT., 2 - POS
TI-1,2	T-5502-1002	PNEU THERMOMETER 0/100F