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November 10, 1981

Director, Nuclear Reactor Regulation
Att Mr Dennis M Crutchfield, Chief
Operating Reactors Branch No 5
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -
PALISADES PLANT - SEP TOPIC IX-5, VENTILATION SYSTEMS

By letter dated August 3, 1981, the NRC issued for comment a draft evaluation of SEP Topic IX-5, for the Palisades Plant. Consumers Power Company has reviewed this evaluation and provides the attached comments for your consideration.

We do not consider it significant that Palisades' ventilation systems are generally not classified as 1E. Ample time exists in most cases for operator action to prevent equipment problems due to loss of ventilation. The only areas for which system improvements may be appropriate (namely the control room and Technical Support Center areas) are already being addressed by ongoing CPCo programs.

Brian D Johnson (Signed)

Brian D Johnson
Senior Licensing Engineer

CC Director, Region III, USNRC
NRC Resident Inspector - Palisades

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PALISADES PLANT
SEP Topic IX-5, Ventilation Systems
Comments on NRC Topic Evaluation

AUXILIARY AND RADWASTE AREA VENTILATION SYSTEM

The fourth paragraph on Page 3 should be rewritten to read: "If loss of instrument air were to occur, the radwaste area supply damper PO-3010, the two exhaust dampers PO-1839 and PO-1840 and safeguard rooms supply and exhaust dampers would fail closed (safeguard room cooling is addressed in Section V.E.). This would result in a loss of ventilation for the Chemical and Volume Control System. In addition, if normal station power is lost, the ARAVS would fail."

This event actually occurred during a plant trip which occurred on September 24, 1977(1) when the switchyard "R" Bus was automatically de-energized during an electrical storm. The CVCS was required to operate 4 hours and 34 minutes on diesel power with the ARAVS de-energized. No temperature-related equipment failures occurred in the auxiliary and radwaste areas. This demonstrates that ample time exists for operator action. The probability of a sustained loss of instrument air is not credible since station demand is less than 400 cfm and the original plant is equipped with three 200 cfm compressors, 2 of which can be powered from emergency diesel 1-1, and the other from 1-2. In addition, the Feedwater Purity Building houses two 500 cfm compressors, which can be paralleled into the original plant instrument air system by opening a single control room activated control valve(2). These two compressors do require offsite electrical power.

The loss of offsite power does have a higher probability of occurrence than loss of instrument air but loss of offsite power also trips the reactor and only activates the engineered safeguard equipment. Thus, there is a minimum of operating equipment to add heat. A simplified analysis was performed on the charging pump room assuming the three pump motors provide the heat input. The only other heat input would be that radiated from the insulated process lines carrying 120°F water. Since the normal design ambient for the pump and motor is also 120°F(5) the terminal temperature from this source is equal to the design temperature. Attachment 1 contains the input parameters and graphical output from the simplified analysis. This demonstrates less than an 11°F rise in 6 hours and a temperature rise of only 0.4°F during the fifth hour. Thus, assuming an initial temperature of 80°F it would take on the order of 83 hours to reach the design temperature of 120°F. This would allow ample time to restore normal power via back feed through the main transformer or to install temporary air movers.

TURBINE AREA VENTILATION SYSTEM

The single Auxiliary Feedwater Pump Room is susceptible to common mode failure due to flooding and internally generated missiles as well as ventilation failure. Realizing this, Consumers Power has initiated a plant modification to remove total reliance on this one room. The total modification, with schedule, will be submitted in the near future. The basic concept is to provide a third pump in the West Engineered Safeguard Room, which will take suction from the existing condensate storage tank and discharge through new auxiliary feedwater control valves. Safeguard room cooling is addressed in Section V.E.

This pump room experienced the same 4 hour 34 minute power outage as the CVCS with the motor driven pump in operation. This demonstrates there is ample time to take corrective action in the event of loss of TAVS. This room was evaluated in a manner similar to the charging pump room (see Attachment 2). The majority of the pipes in this room are uninsulated and the process fluid is condensate storage tank water which has a normal operating range of 50°F to 80°F. Thus, this piping normally acts as a heat sink rather than a heat source. The analysis was run assuming only the motor driven pump was operating. This is the normal operating mode and this single pump has adequate capacity for all plant transients. If the steam driven pump were operated, room temperature would be increased considerably due to the uninsulated steam supply and exhaust piping. This could jeopardize parallel operation of these pumps since room temperature could exceed the design rating of the motor, but this high ambient should not affect the turbine driver nor either pump since it is pumping less than 80°F liquid. Since the capacity of either pump exceeds normal transient flow requirements, it is not anticipated that there would be sustained parallel operation. The analysis indicates a 38°F rise in 6 hours with a temperature rise of 1.5°F during the fifth hour. This room has two other mitigating design features which were not factored into the analysis. The ceiling is 20 feet high with all active components within 7 feet of the floor. Secondly, there is an 18-inch diameter, 5-foot tall chimney located in the ceiling. This chimney, the normal air discharge duct, has a 5-foot extension above the 590-foot elevation to protect the auxiliary feedwater pump room from flooding. These two features would provide a natural circulation of some quantity of air driven by convective forces.

The second sentence on Page 4 indicates there are 4 supply fans labeled V-9 and 2 labeled V-21. In reality, there are 4 fans labeled V-9 and 21 labeled V-21.

<u>ENGINEERED SAFETY FEATURES VENTILATION SYSTEM</u>

1. Engineered Safeguard Equipment Rooms

   Failure of the Engineered Safeguard Room isolation damper to close would result in increased activity in the discharge ductwork between the point where the duct exits the safeguard rooms and the stack. The exit points are at the 590-foot elevation of the auxiliary building in the area of the equipment hatches which are within 15 feet of the ARAVS exhaust fans. No normal or emergency operating activities are required in this small compartment. After the leakage through a failed ESFVS isolation damper has been diluted with the flow from these ARAVS fans there would be no significant risk to personnel exposure from high activity within the ductwork.

   The possibility of exceeding 10 CFR 100 limits by leakage through failed ESFVS isolation dampers was analyzed by the NRC while preparing the safety evaluation supporting Amendment No 31 to the Palisades FSAR. This analysis assumed "significant leakage occurred"; see Assumption 11, Table 9.0-1 of Reference 4. CP Co's understanding during a meeting with the NRC on this safety evaluation was that "significant leakage" was equated to damper failure since the device was not IE or constructed as a safety-related quality component.

The referenced safety evaluation required CP Co to assess possible iodine removal system improvements. These assessments were made and responded to in CP Co to NRC correspondence dated 12/01/77 and 03/09/78. The referenced safety evaluation has also been rereviewed by the NRC while compiling the safety evaluation for SEP Topic XV-19.

A plant modification that was initiated as a result of TMI Lessons Learned but was not included in the above evaluations is the return of Engineered Safeguards Room sump liquid to the containment which would further reduce possible offsite releases of noble gases or iodine.

2. Viewing Gallery, Switchgear and Cable Spreading Rooms

The report implies there are 3 fans within a single system, a supply fan V-33, an exhaust fan V-47 and a recirculation fan V-43. In actuality, there is a ventilation system composed of V-33 and V-43 with supplemental ventilation supplied by V-47. Supply fan V-33 provides 20,000 scfm of air to the areas identified. Makeup air to V-33 is a blend of outside air and recirculated air from V-43. This blend is controlled by temperature controller TC-1554 to maintain a supplied air temperature of 72°F. When outside air temperature increases, the amount of recirculation is decreased, and the amount of makeup and exhaust increases up to the full 20,000 scfm.

Separate from this 2 fan ventilation system is a 30,000 scfm exhaust fan that takes suction on the cable spreading, switchgear and 2.4 kV switchgear rooms only. When air temperature in the upper region of the rooms increases above 104°F, temperature switches 1824, 1825 and 1826 will initiate a control room annunciator. The operator manually starts the supplemental exhaust fan V-47. Normally, the temperature will drop below the 104°F set point within 10 minutes and the operator will stop V-47.

If the high-temperature alarm does not clear, other corrective measures available to the operator would be: check fan and damper operation, insure heating steam controller and cooling controllers are functioning, insure filter media is clear, block open doors, place fire protection smoke blowers in rooms as temporary air movers. It is recognized that the final two options would require security and fire protection surveillance.

Temperatures in these rooms were recorded during the month of August 1981. Although that month was not a high-temperature record breaker, on the average it is the hottest period of the year. Evaluation of these records indicates an absolute maximum peak of 94°F, which exceeded the weekly average of 91°F for 15 hours. Weekly averages ranged from 83°F to 91°F. See Attachment 3.

The testing of this room was within the scope of an existing project related to the technical support center ventilation. The intent was to perform a test to prove the adequacy of the existing ventilation system cooling capacity. If this test is positive then the appropriate fans may be aligned to emergency power after the Peak Design Basis Accident emergency electrical demand has subsided. If the test is negative, other alternatives will be considered to ensure long-term adequacy of ventilation to these areas.

3. Penetration and Fan Room Ventilation System (P&FR)

The areas supplied by these fans (V-78 and V-79) have been designated as hostile environment areas under the Electrical Equipment Qualification Program (see Enclosure 3, Section II of Reference 3). The safety equipment located in this area is being qualified to survive a main steam line break within this area. Thus, it follows that this equipment could also survive the failure of either the supply or exhaust fan or even both.

REFERENCES

(1)Unit Outage Report 77-17, HWKeiser to JGLewis, dated 10/13/77, UFI 950-22*40*10.

(2)Emergency Operating Procedure EOP-5, Immediate Action Item No 3.

(3)Environmental Qualification of Safety Related Electrical Equipment Report, dated September 1981. Submitted to NRC by letter DPHoffman to DMCrutchfield, dated September 3, 1981.

(4)Letter NRC to CP Co, ASchwencer to DBixel, dated 11/01/77. Amendment No 31 to Provisional Operating License DPR-20.

(5)Combustion Engineering Specification 70P-016 File Location M-1HA.

TO KWBerry, P24-207A

FROM WGBrigger, P24-106 *[signature]*

DATE October 23, 1981

SUBJECT Palisades Charging Pump Room Heatup

Consumers Power Company

INTERNAL CORRESPONDENCE

WGB 15-81

CC DJVandeWalle, P24-104

REF "Charging Pump Room Heatup", File No. SP.CVCS1. 811018

The room air temperature following a loss of HVAC cooling was calculated for the charging pump room at Palisades. The calculation is contained in the above reference and the results are plotted in Figure 1. As shown, the temperature increases rapidly until the energy removal by the concrete in the room becomes significant. At that time the increase in temperature only slowly increases with time reaching only 91.0°F at the end of 6 hrs.

The calculation of room air temperature was performed using the CONTEMPT computer code. This code calculates the atmospheric pressure and temperature response of a compartment to time dependent energy additions and/or losses. Energy additions can be due to water/steam blowdown, decay heat, or "pure" energy. Energy losses can be due to spray systems, fan coolers, heat conduction to outside the compartment, or heat absorption by structures and equipment within the compartment (heat sinks). For this analysis the charging pump room was considered a single compartment. Energy was assumed to be added to the compartment only by the heat losses of the 3 charging pump motors. This energy addition was modeled as "pure" energy which just adds energy to the atmosphere without any changes in mass. Energy was assumed to be removed from the compartment by the absorption of energy by the concrete floor, walls, and ceiling only. It was thus conservatively assumed that there was no heat conduction to spaces outside the room and that no cooling air would enter or exit the room. A listing of CONTEMPT input parameters is shown in TABLE 1.

TABLE 1

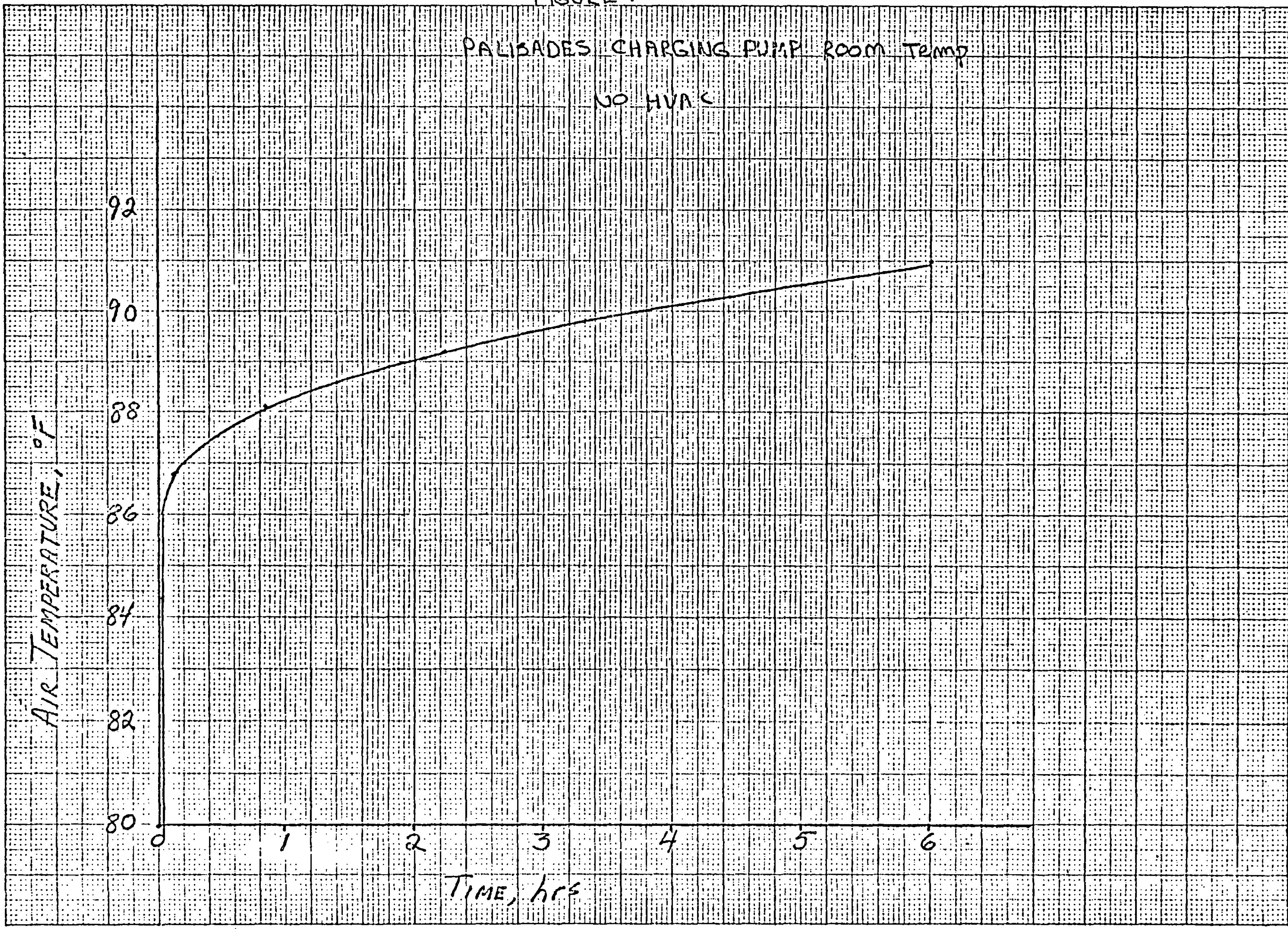
CONTEMPT INPUT PARAMETER

PALISADES CHARGING PUMP ROOM

FREE VOLUME	14,000 ft^3
Initial Room Air Temperatures	80 °F
Initial Room RH	60%
Initial Room Pressure	14.7 psia
Energy Addition	792 Btu/min

Heat Sink	Concrete Walls	Concrete Ceiling	Concrete Floor
Surface Area, ft^2	3226.	1134.	1134.
Thickness, ft	2.	3.	3.
Heat transfer coefficient between air and heat sink, Btu/hr ft^2 °F	1.46	1.63	1.08
Thermal conductivity of heat sink, Btu/hr-ft^2-°F	0.9	0.9	0.9
Volumetric heat capacity of heat sink, Btu/ft^3-F	32.9	32.9	32.9

FIGURE 1


PALISADES CHARGING PUMP ROOM Temp
NO HVAC
92
90
88
86
84
82
80
AIR TEMPERATURE, °F
0
1
2
3
4
5
6
TIME, hrs

To KWBerry, P24-207A

From TCDuffy, P24-106 Timothy C. Duffy

Date October 30, 1981

Subject Palisades Aux Feed Water Pump Room Heat Up

Consumers Power Company

Internal Correspondence

TCD 1-81

CC DJVandeWalle, P24-104

Ref. "Aux Feed Water Pump Room Heat Up". PAL - 2181/A00

The air temperature of the Auxiliary Feed Pump Room was calculated after a loss of HVAC cooling. The calculations are contained in the above reference and a plot of the results is shown in Fig. I. The rapid rise in temperature at the beginning of the problem is due to the fact that the heat sinks don't reach their full capacity right away. Once the sinks do begin to work effectively the rate of heat up is slowed to a much more steady pace for the remainder of the problem where it reaches 118°F.

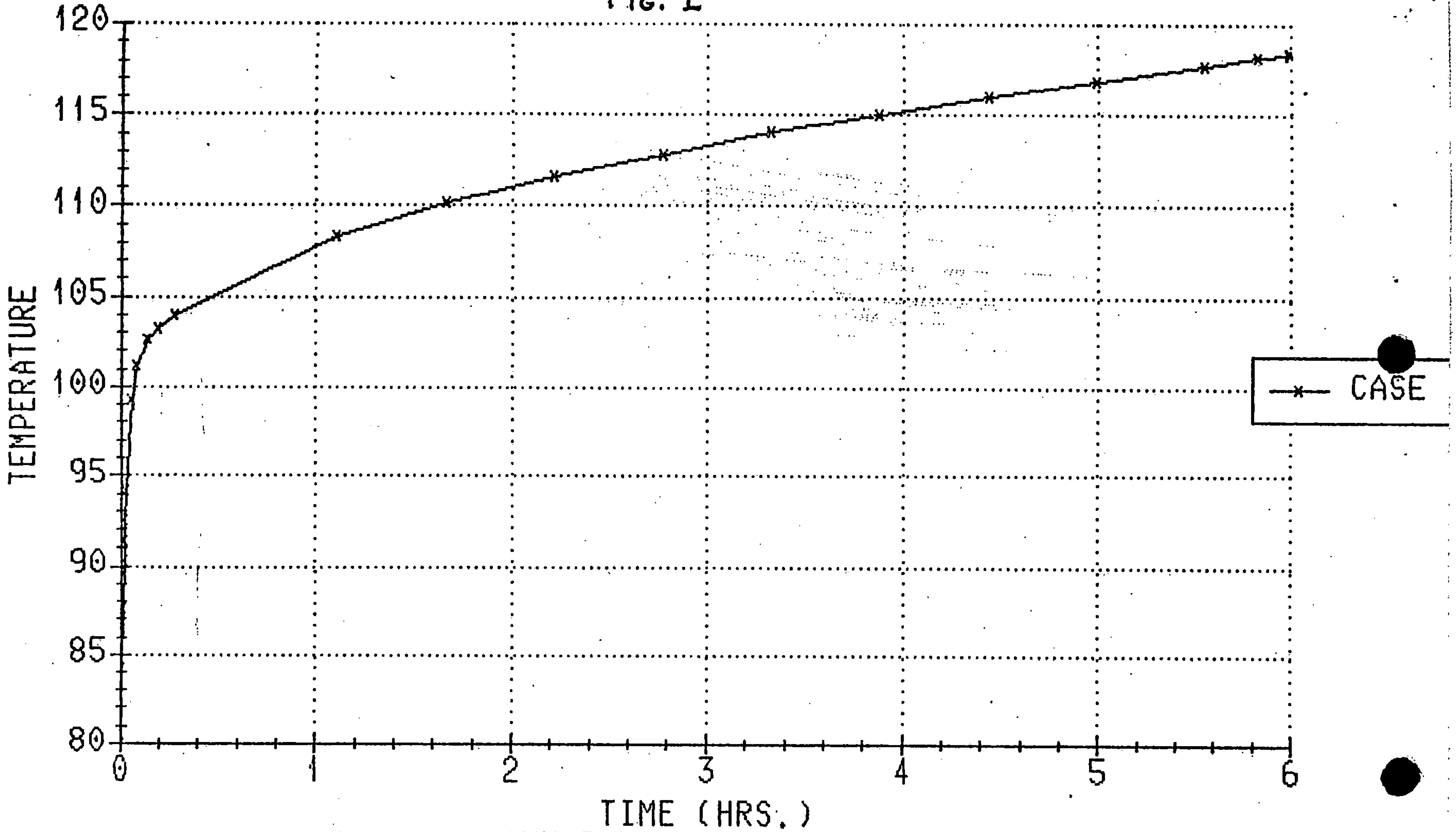
Contempt was used to perform the calculation in the same manner as it was for the Charging Pump Room Heat Up problem, WGB (PAL 2180/A00). The room was modeled as a single compartment receiving 24.2 Btu/min. from the pump motor, and reject piping. Other input used by contempt can be found in Table I. It was conservatively assumed that no cooling air entered or left the room, so the only way for the energy to be removed was absorbtion by the walls, floor, ceiling, uninsulated piping, and the air.

TABLE I

Free Volume	7938 ft^3
Initial Room Air Temperature	80 F
Initial Room R.H.	60%
Initial Room Pressure	14.7 psi
Energy Addition Rate	24.2 Btu/min

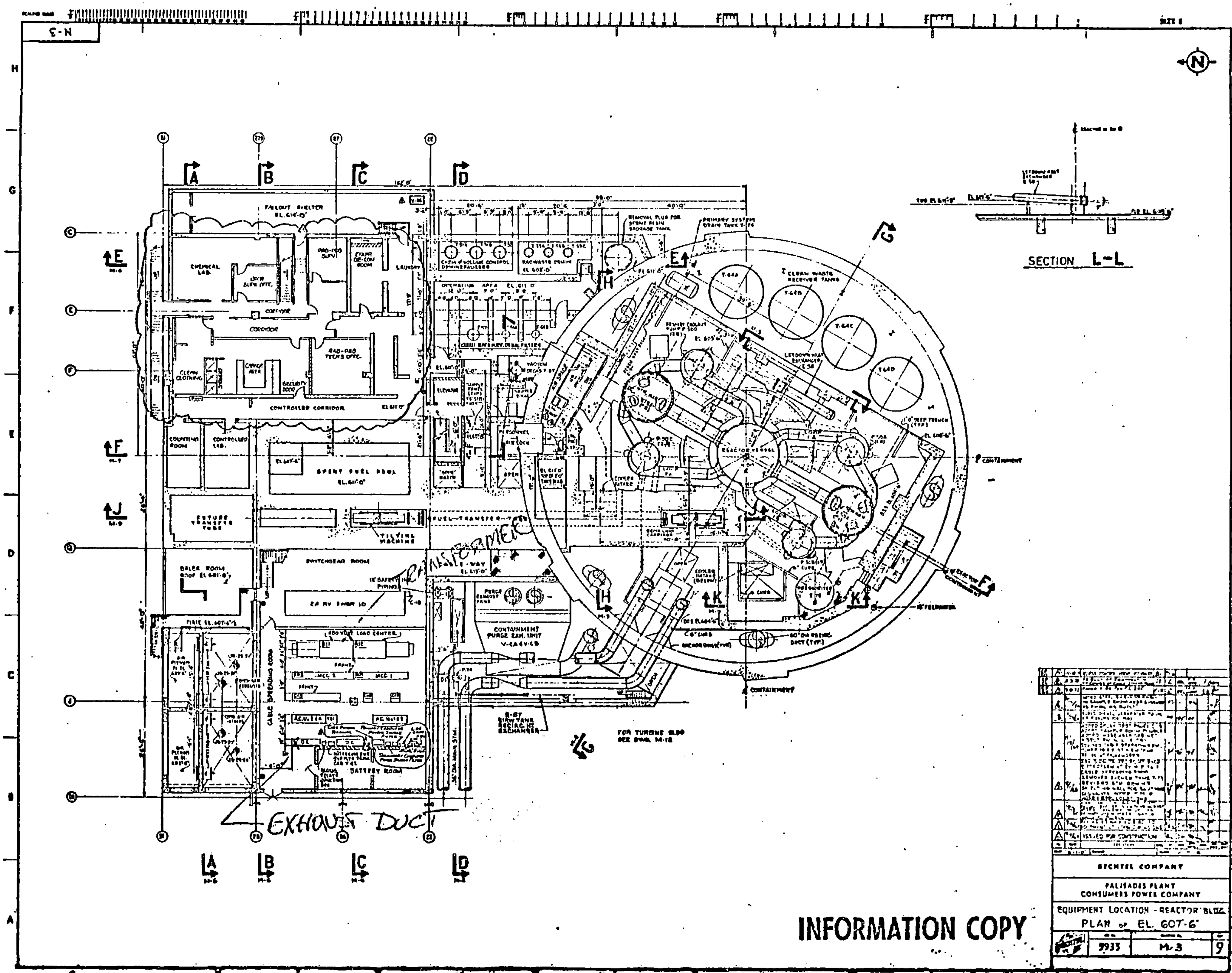
HEAT SINKS ARA *	#1 WALL 577.0	#2 WALL 996.0	#3 CEILING 534.0	#4 FLOOR 550.0	#5 PIPE 82.0
Thickness	1.0 ft	2.5 ft	3.0 ft	1.0 ft	.036 ft
Heat transfer Coeffiecient between air & heat sinks ($Btu/hr-ft^2-F$)	1.46	1.46	1.63	1.08	1.63
K(Btu/Hr-Ft-F)	.9	.9	.9	.9	28.0
Volumetric Heat Capacity	32.9	32.9	32.9	32.9	58.8

Fig. I

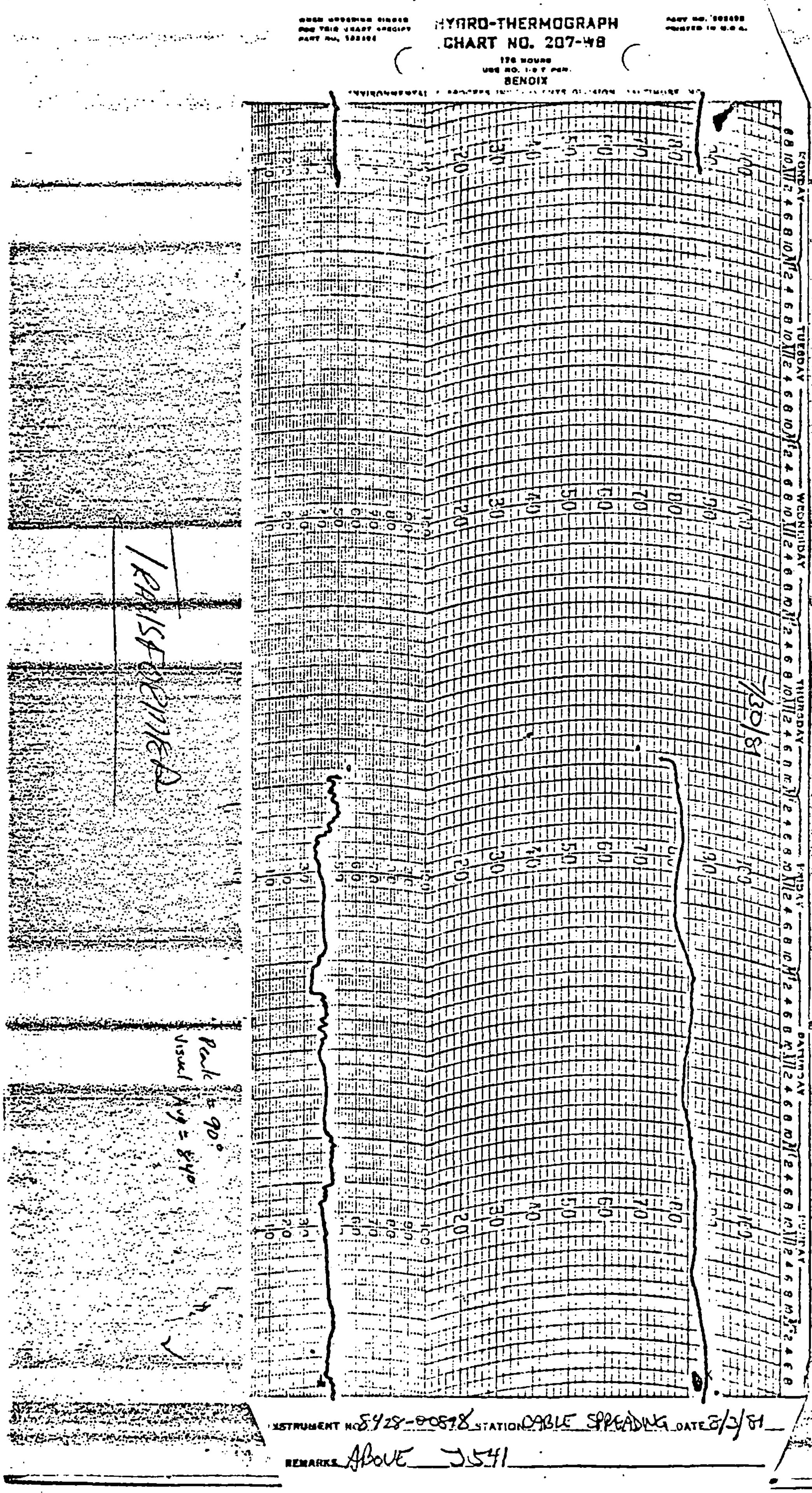


AUX PUMP ROOM HEAT UP
(TEMP vs TIME)

Attachment 3
KWB 36-81
Page 1 of 12

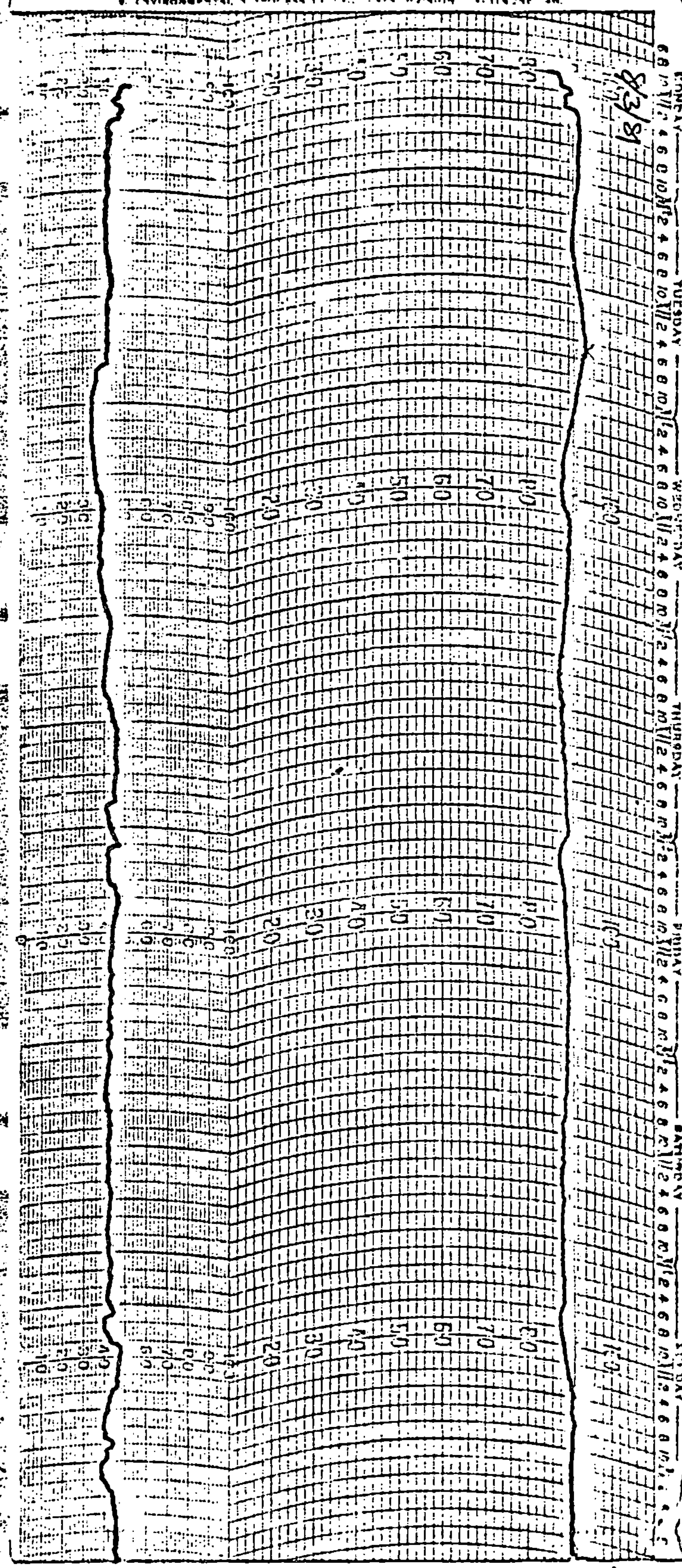


INFORMATION COPY


HYDRO-THERMOGRAPH
CHART NO. 207-48
BENDIX
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
7/30/81
Peak = 90°
Visual Avg = 84°
INSTRUMENT NO 5428-00898 STATION CABLE SPREADING DATE 8/3/81
REMARKS ABOVE J541

HYGRO-THERMOGRAPH
CHART NO. 207-W8

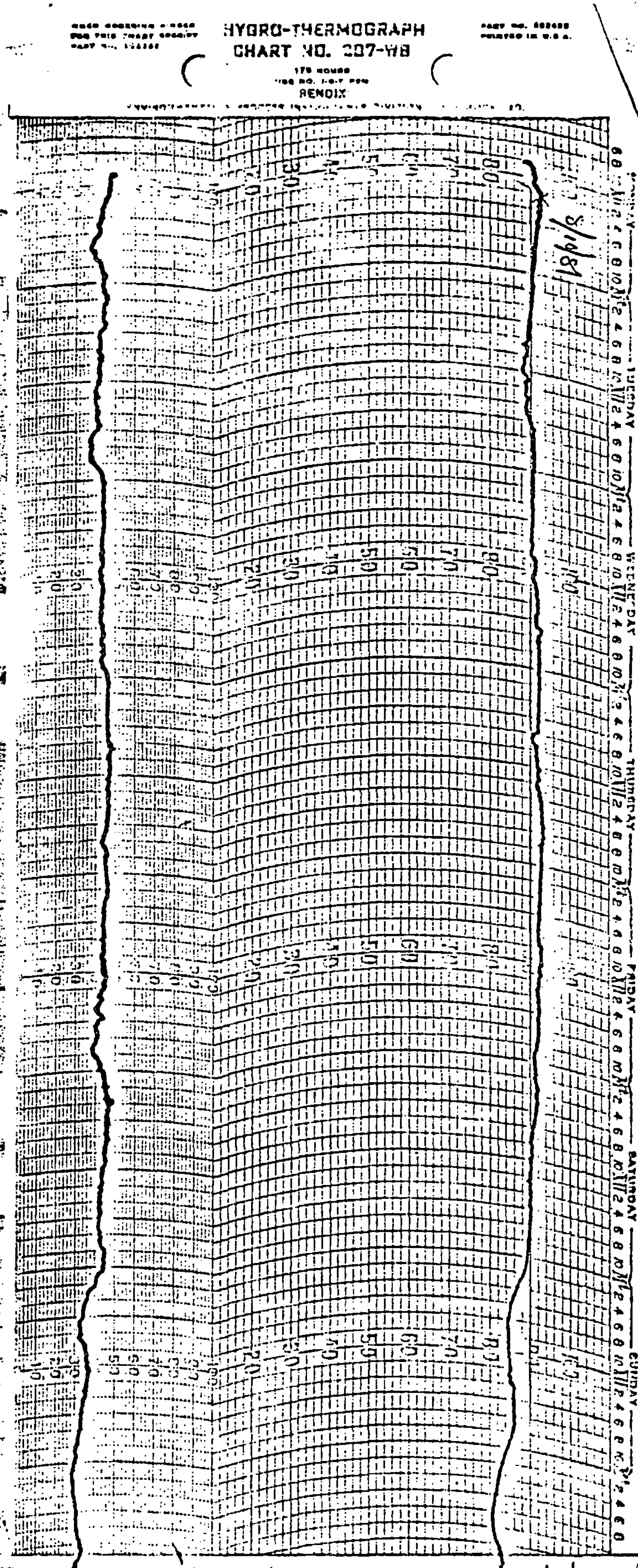
BENDIX



Peak = 94
Visual Avg = 91

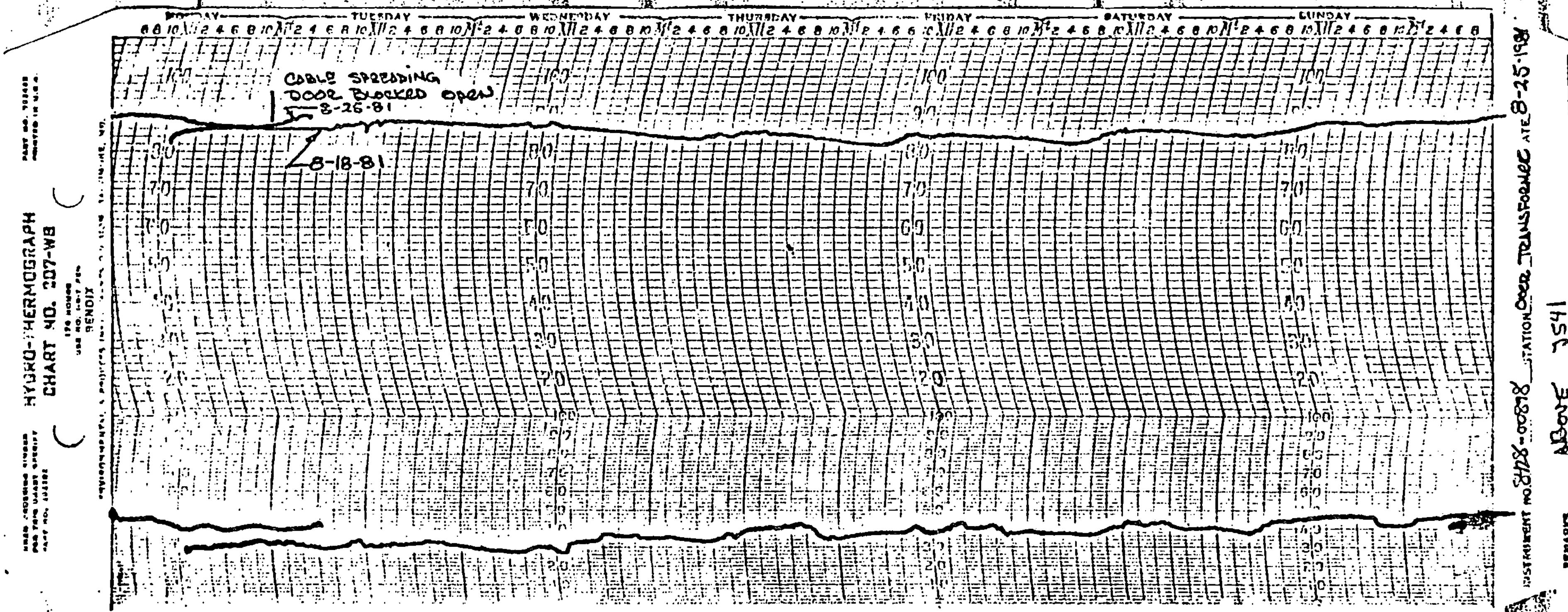
INSTRUMENT NO. 8428-00898 STATION NEVE J51 DATE 8/10/81

REMARKS SWITCHGEAR Room

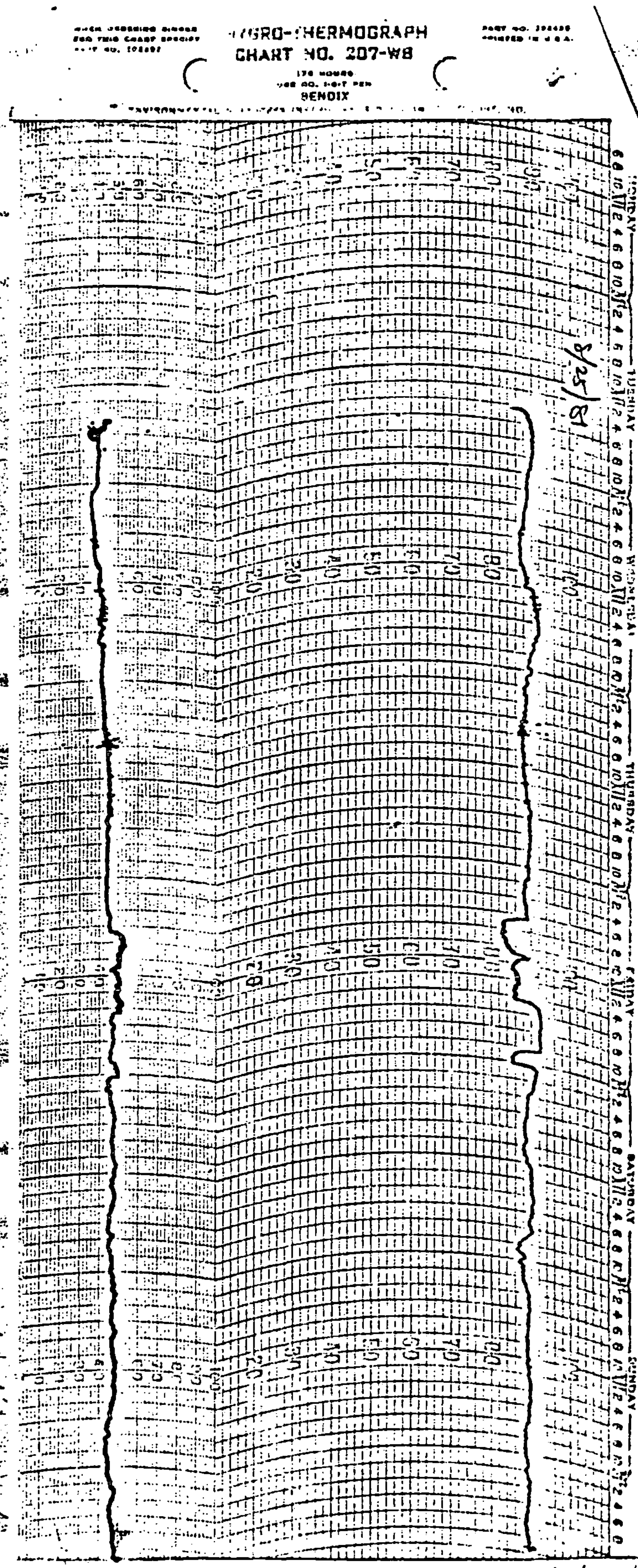


INSTRUMENT NO. 8428-00648 STATION ABOVE J 541 DATE 8/13/81

REMARKS CABLE SPREADING ROOM



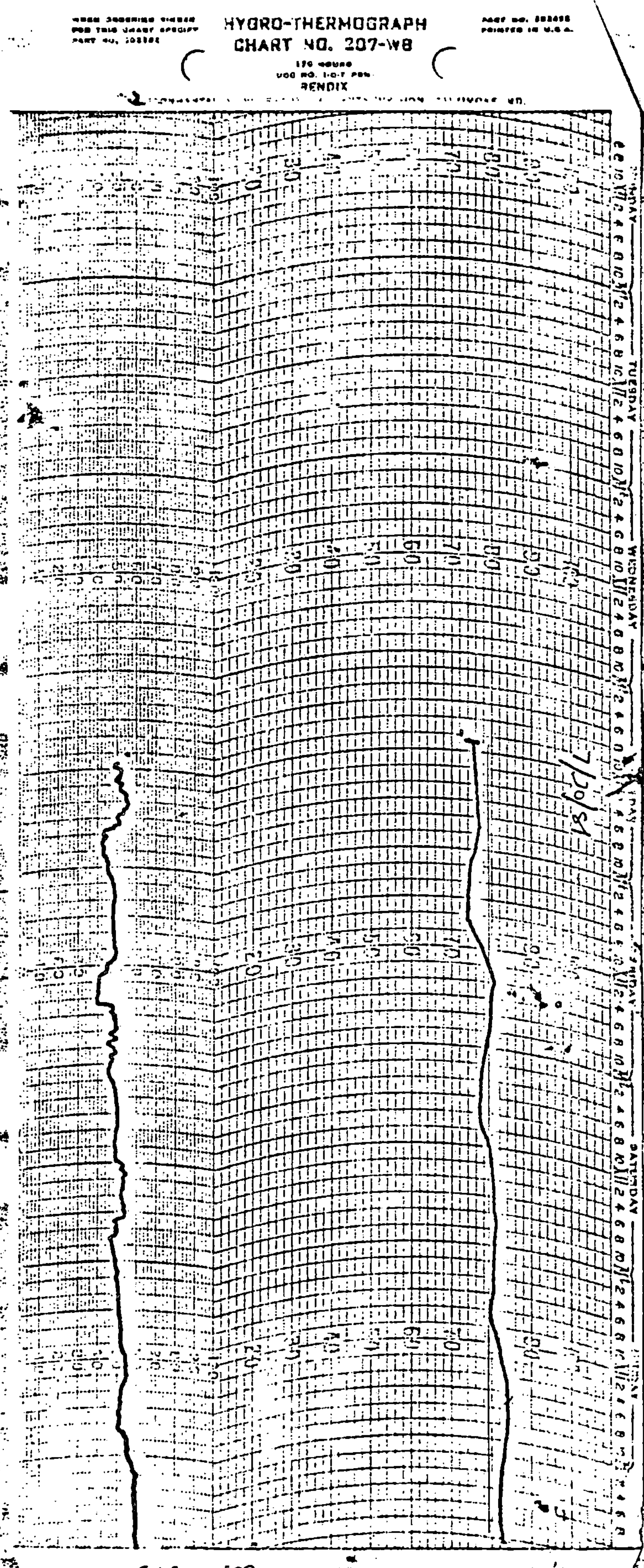
Data rejected due ✓
To doors being blocked
open for outage
work. KWB



Data rejected due to doors being blocked open for outage work
KWB

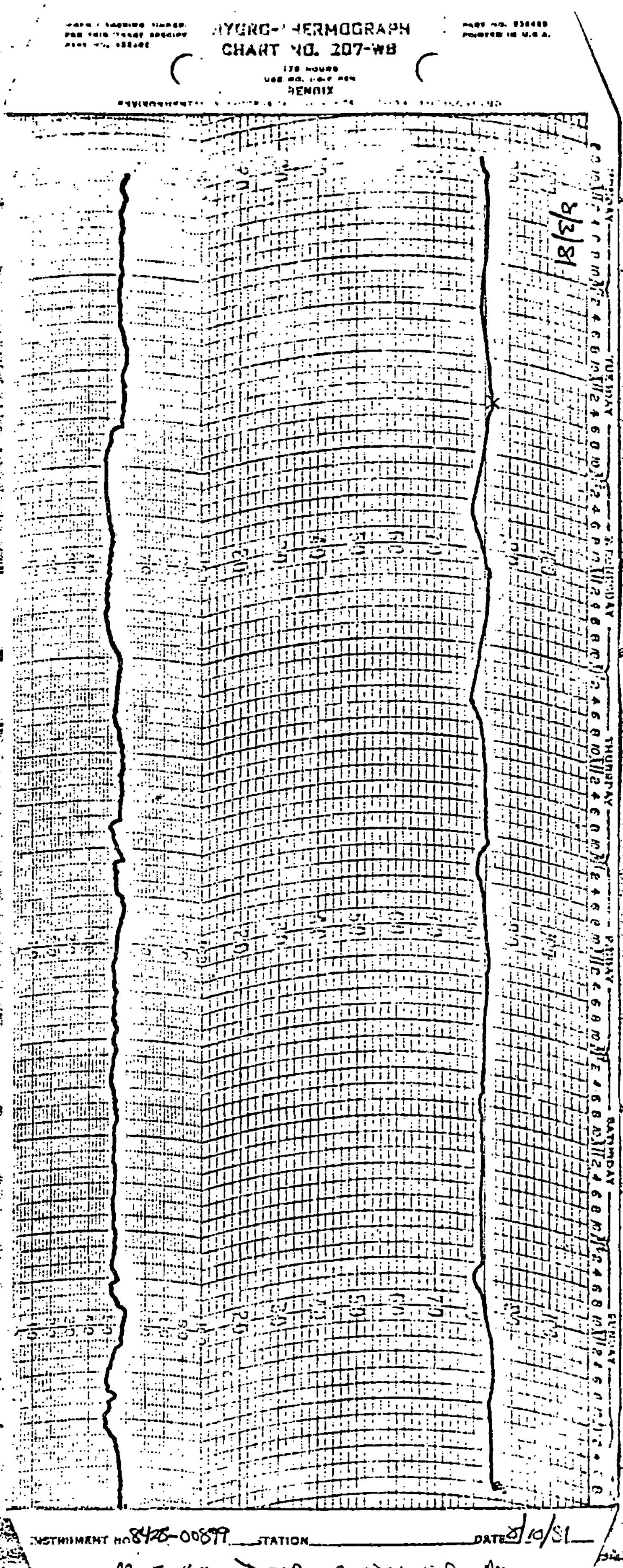
INSTRUMENT NO. 8428-00898 STATION ________ DATE 8/31/81

REMARKS Above J541



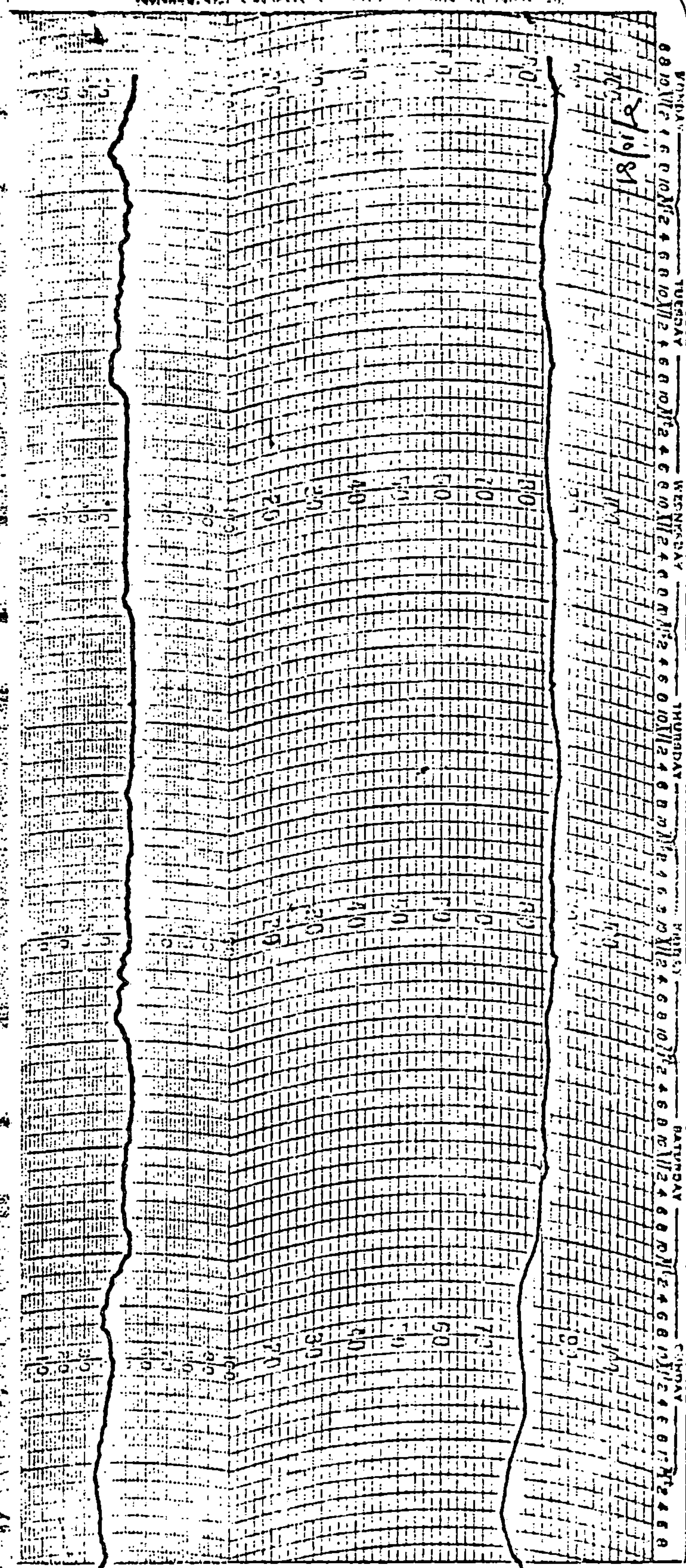
INSTRUMENT NO. 8428-00899 STATION DATE

REMARKS By EXHAUST DUCT ABOVE PNL D21B



peak = 86
Visual Avg = 83

HYDRO-THERMOGRAPH
CHART NO. 207-WB
BENDIX

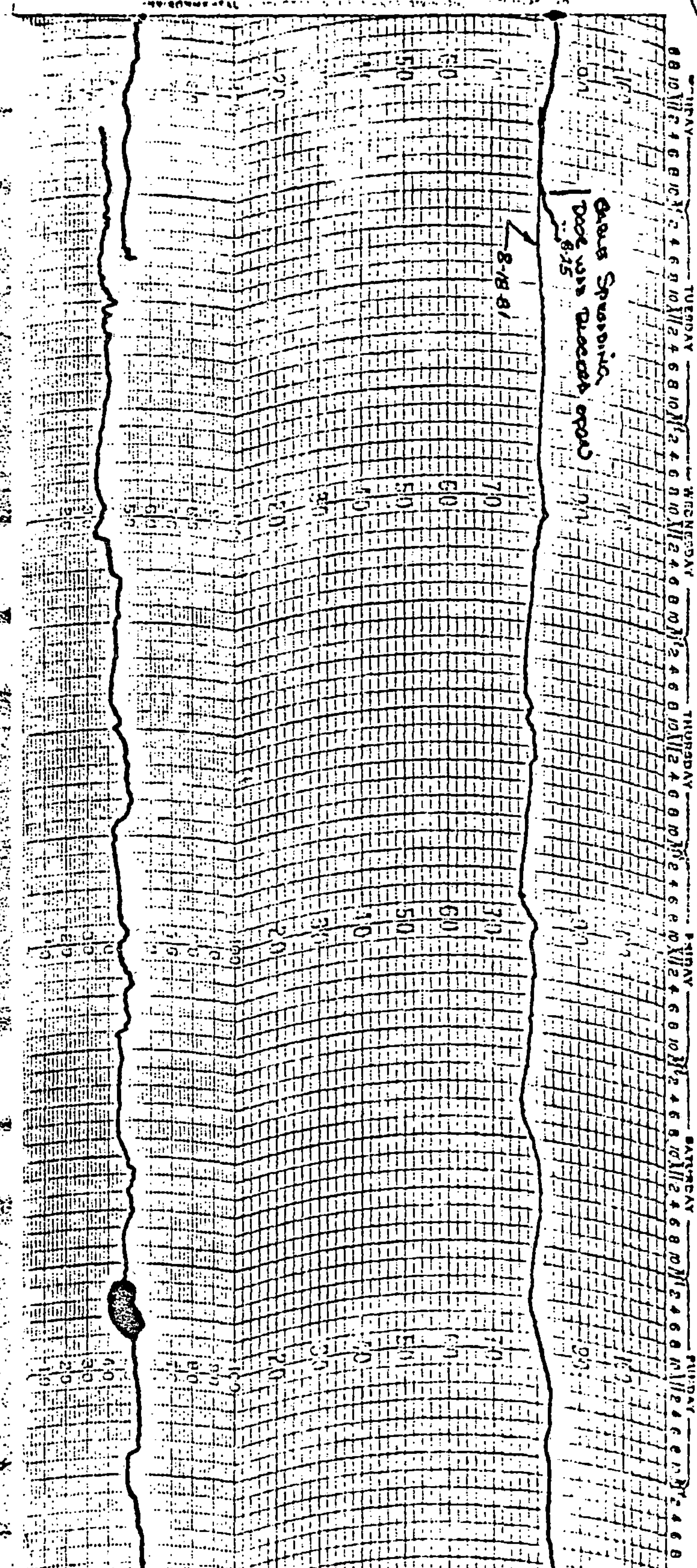


Peak = 87
Usual Avg = 84

INSTRUMENT NO. 3428-00899 STATION [illegible] D21B DATE [illegible]/17/81

REMARKS SWITCHGEAR ROOM

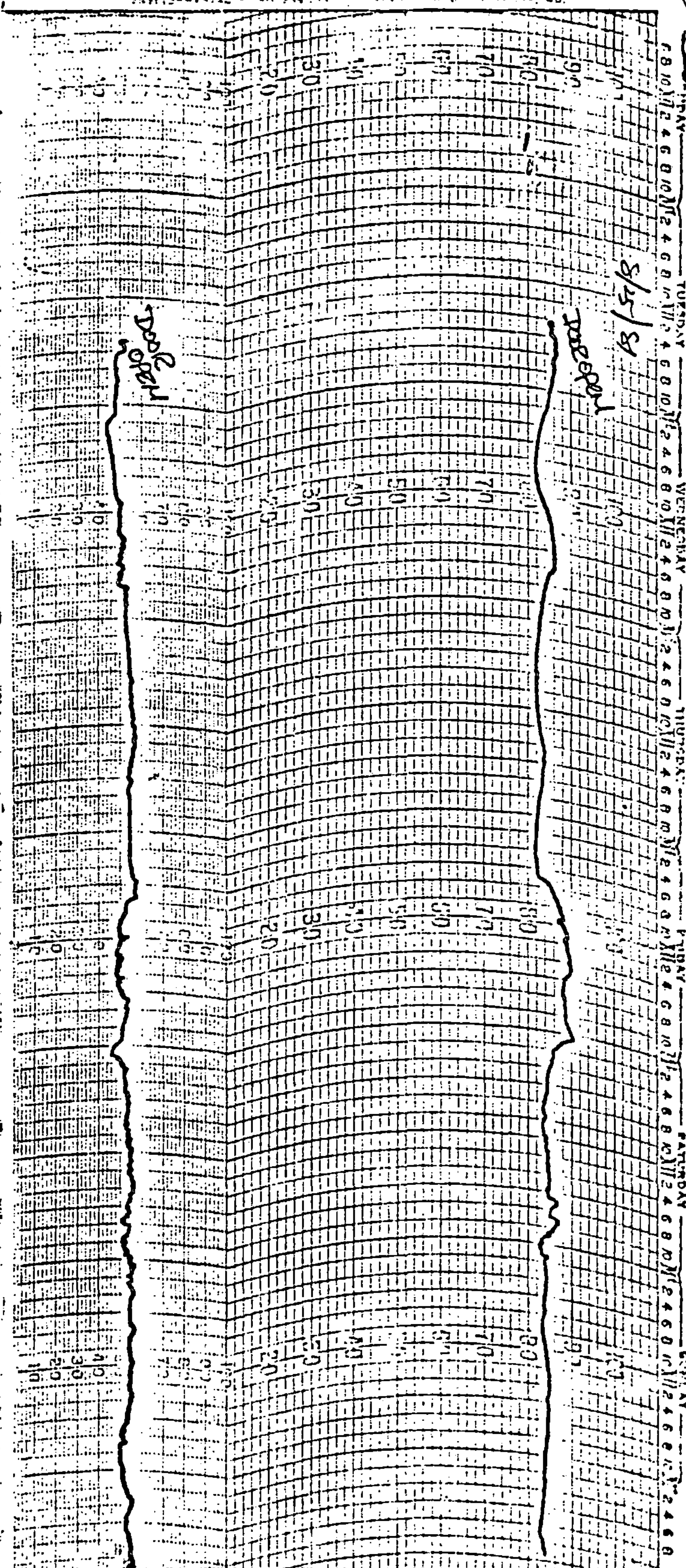
HYGRO-THERMOGRAPH
CHART NO. 207-WB
BENDIX



INSTRUMENT 8728-00899 STATION Exhaust Duct DATE 8-25-81

REMARKS ABOVE D21B

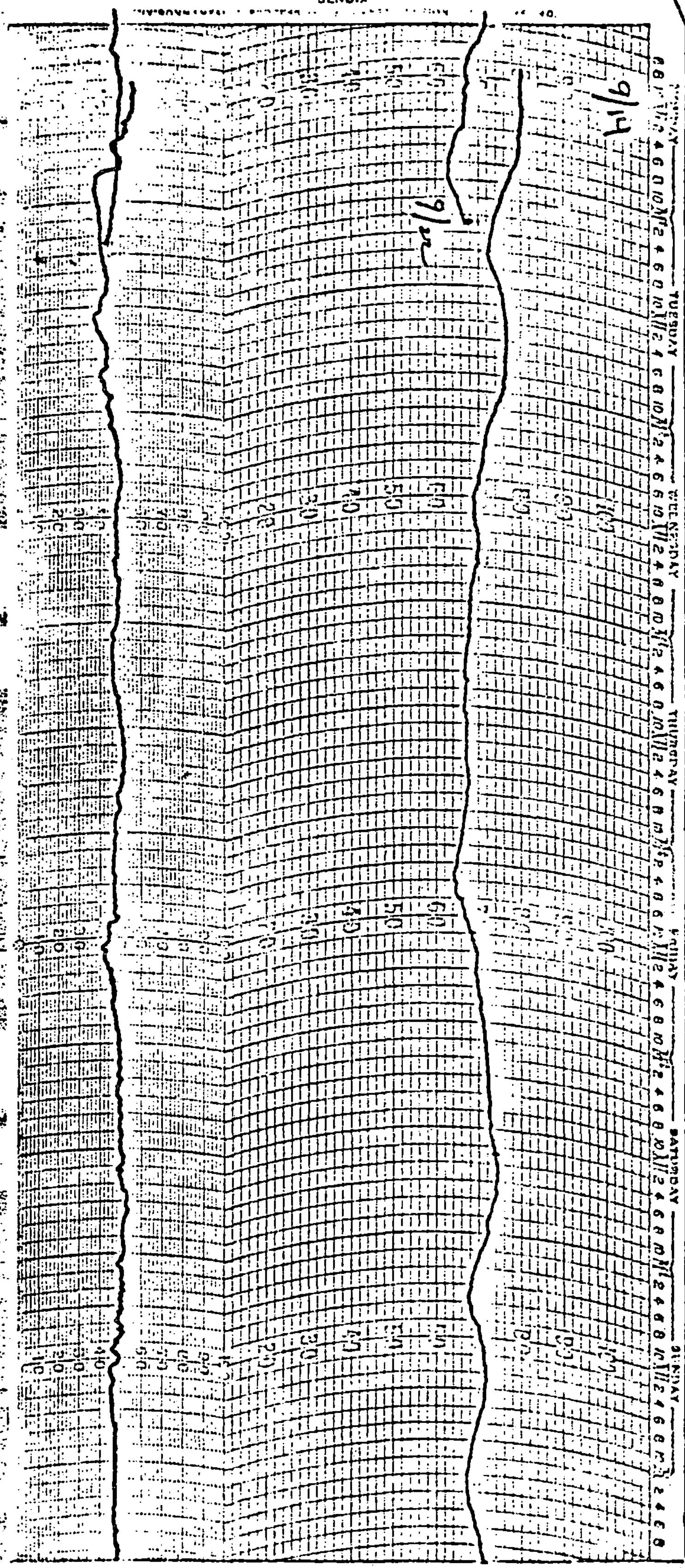
HYGRO-THERMOGRAPH
CHART NO. 207-W8
BENDIX



INSTRUMENT # 848-0899 STATION ______ DATE 8/31/81

REMARKS ABAE PNL 721B

HYGRO-THERMOGRAPH
CHART NO. 207-W8
BENDIX



INSTRUMENT NO. 8428-0079 STATION ________ DATE 9/22/81

REMARKS ABOVE PNLD2.1B