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SUBJECT: Forwards response to Phase II of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." Items discussed include stop plugs, vessel cavity plugs, dryer separator pool stop plugs, fueling stop plugs & auxiliary hoist.

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Washington Public Power Supply System
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July 13, 1983
G02-83-614

Docket No. 50-397

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
RESPONSE TO NUREG-0612 - PHASE II
CONTROL OF HEAVY LOADS; SUBMITTAL OF

Reference:
a) Report "Control of Heavy Loads at Nuclear Power Plants, Washington Nuclear Project No. 2 (Phase II--Interim) Docket No. 50-397, Author B. W. Dixon, EG&G, Idaho.
b) Letters, G. D. Bouchey (SS) to A. Schwencer (NRC), "Response to NUREG-0612, Control of Heavy Loads", dated January 13, 1982, and October 4, 1982

The attached report represents the Supply System's response to questions received in reference a) and as discussed in the conference call of 6/27/83 between J. Ridgley (NRC), B. Dixon (EG&G), E. Fredenburg (SS), P. Powell (SS) R. Nelson (SS) and J. Hedges (SS).

Should you have any further questions, please contact Mr. R. M. Nelson, Manager, WNP-2 Licensing.

Very truly yours,

G. C. Sorensen, Manager (Acting)
Nuclear Safety and Regulatory Programs

JWH/tmh
Enclosures

cc: R Auluck - NRC
WS Chin - BPA
B Dixon - EG&G
J Ridgley - NRC
A Toth - NRC Site

B030
1/1

Supply System Response to Report:
"Control of Heavy Loads at Nuclear Power Plants"
Washington Nuclear Project No. 2
(Phase II - Interim)
Docket No. 50-397

The following are the Supply System's responses to the recommendations made in the subject report:

Report Item 2.3.1.B - Step Plugs

The applicant indicated on safe load path drawing notes that lifts of the shield plugs would be handled by a non-single-failure-proof sling system. Therefore, these loads fall under the criteria of NUREG-0612 section 5.1.4(2) and should be so addressed.

The referenced note reads "All loads other than shield plugs, lifted with conventional lifting apparatus shall utilize redundant rigging or maintain a safety factor of ten (10). Shield plugs will only be moved when reactor head, RPV space frame and drywell head are in place over the reactor with a lifting apparatus factor of safety of 5 maintained."

Vessel Cavity Plugs

The vessel cavity plugs (6 plugs - max. weight 108 tons) are lifted using 4 separate wire rope slings rated at 39.6 tons working load each with a 5:1 safety factor. A failure of any one of these slings or its attaching shackle will not result in a load drop. Simple model studies show that if a single sling or shackle failed the load would be shifted to two slings connecting diametrically opposed corners of the plug to the main hook. The safety factor would be reduced to a value of over 2 1/2:1 but this would permit controlled lowering of the load in an emergency.

It should be noted that the likelyhood of any one of the four slings being stressed to failure is virtually precluded by the overload protection provided by the main hoist load cell which is set to stop the hoist at 102% of the 125 ton crane-load ratings; further, the maximum loading occurs when the plugs are being "broken loose" from the vessel cavity and any fall would be contained by the vessel cavity walls.

Dryer Separator Pool Step Plugs

The top dryer separator pool step plug weighs 60 tons and is lifted using the same four 39.6 ton rated slings that are used on the vessel cavity plugs. The path of travel is directly to the refueling floor and not over the vessel cavity and a single sling or shackle failure would not result in dropping the step plug.

The bottom three dryer separator pool plugs weigh 37 tons each and are lifted using two 39.6 ton rated slings. A failure of one sling-shackle assembly would still permit carrying the load with a 5:1 safety factor. These lifts are guided by the step plug slots during the initial and most critical stages of lifting and are thus "contained" from any fall into the vessel cavity at that time.

Fueling Slot Plugs

The four (4) fueling slot plugs - 8 tons maximum weight - are lifted using two 1" diameter slings rated at 10 tons safe working load with a 5:1 safety factor. A failure of one sling-shackle assembly would still permit carrying the load with a 5:1 safety factor. These lifts are also guided by the step plug slots during the initial and most critical stages of lifting and are thus "contained" from any fall into the vessel cavity or spent fuel pool at that time.

Based upon the foregoing, it is the Supply Systems position that the lifting arrangements for step plugs are single-failure-proof and thus comply with the requirements of NUREG-0612 5.1.4.(1).

Report Item 2.3.1.B - "Auxiliary Hoist"

"Currently the applicant has not indicated compliance to either of NUREG-0612 Section 5.1.4(1) or 5.1.4(2) for the auxiliary hoist. While the increased safety factor for this hoist does provide additional assurances against load drop, it does not provide single-failure-proof status per NUREG Appendix C nor does it necessarily meet the load drop probability allowable values outlined in NUREG-0612 Section 5.2."

The auxiliary hoist of the Reactor Building crane does not meet all the NUREG-0554 (0612 Appendix C) guidelines: (5) Design of the wire rope reeving system should include dual wire ropes and (8) the hoisting drum(s) should be protected against dropping should its shaft or bearings fail. To compensate for these two deficiencies, the auxiliary hoist has been de-rated to 7 1/2 tons to increase the safety factor to 10:1 for critical lifts.

Two known "heavy" loads will be handled using the auxiliary hoist: The RPV stud tensioning carrousel and the new fuel handling basket.

The RPV stud tensioning carrousel weighs an estimated 1500 lbs. and is only transported with the RPV head in place. A free fall of the carrousel from maximum hook height could not penetrate the RPV load. Travel over the spent fuel pool is prevented by the electrical interlocks on the Reactor Building crane.

The new fuel handling basket weighs an estimated 8900 lbs. when loaded with eight (8) fuel assemblies. Once the plant is operational the majority of new fuel will be brought to the new fuel storage pit with the RPV closed and the step plugs in place. Transportation over the spent fuel pool is prevented by the crane electrical interlocks. In the rare case when new fuel is brought in with the vessel cavity open, it will travel over the separator/dryer storage cavity as controlled by Plant Procedure 6.2.3.

Report Item 2.3.1.B - Travel Limitations for MT-CRA-2 on Spent Fuel Pool

"The applicant should provide more information on the method of travel limitation for the MT-CRA-2 hoists over the fuel storage pool."

The Reactor Building crane travel and hoisting systems are totally stopped (de-energized) through an array of bridge and trolley track mounted limit switches when the crane trolley (main hook centerline) comes within 6' of the north, south and west side and within 2' of the east side of the spent fuel pool - except directly over the cask handling area. Electrically the schematic for the limit switches and relay interlocks are shown on Whiting Crane drawings

U-69050 and U-69051. Exhibit 1 shows a relevant part of these drawings. The ability of these interlocks to function is tested on surveillance test 7.4.9.6 which states "Interlocks shall be demonstrated operable within 7 days prior to use and at least once per 7 days during crane operation.

Report Item 2.3.2.B

"The applicant has not addressed the Turbine Building Travelling Bridge Crane MT-CRA-1."

The Turbine Building crane does not conform to the single-failure-proof guideline of section 5.1.6 of NUREG-0612. As previously committed a procedure has been prepared (PPM-10.17.5) which established a safe load path for this crane during plant operation. A copy of the safe load path is attached as exhibit 2 to this response.

Loads will be carried well below the shield wall - approximately 5' off the 501 floor level during north-south travel and raised up over the shield walls during east-west travel. During much of the east-west travel, the turbine is "sheltered" by the moisture separator-reheater. The safe shutdown equipment that could be affected by a dropped load over the high pressure turbine are 1) the stop and throttle valve limit switches whose contacts open up when the valve closes 10% from the full open position. This opening de-energizes relays which, when coupled with the closure of one other valve in a second loop, will result in a reactor shutdown and 2) the governor valve fast closure switches which, on a rapid loss of DEH hydraulic fluid pressure on one valve in each loop, combine to shut the reactor down.

The system as designed and built is "fail safe". Any dropped load that would knock off the throttle valve limit switches or impact the throttle valves interrupting DEH oil supply to the valves results in automatic spring closure of the valve.

The governor valve DEH pressure switches are actually located on the 471' level below the turbine pedestal and through a 4' thick structural wall and are thus safe from impact. The hydraulic lines from the governor valves to these switches could be damaged in a drop - this again is fail safe because a reactor shutdown would result from loss of oil pressure as a result of a ruptured sensing line.

Report Item 2.3.2.B

"Applicant should examine the cranes listed in section A above per criteria of NUREG-0612 section 5.1.5(1) (c). A number of these cranes probably meet these criteria without further modification, although an insufficient amount of information has been provided EG&G to verify this position. Some cranes may require additional analysis or load handling restrictions due to transport of loads from one train over components in the redundant trains."

Each of the hoists and cranes listed, except MT-H01-6, only service one piece of ECCS equipment and therefore do meet the requirements of 0612 Section 5.1.5(1) (c). Per standard Technical Specifications redundant systems must be proven operable if a piece of ECCS equipment is inoperable or the plant must be shut down in a definite period of time.

As suggested in the phone coversation of 6/27/83 a physical stop will be installed on the monorail supporting MT-H01-6 to prevent moving RHR - Loop A or Loop B components over the equipment left in service.

Report Item 2.3.3.B

"The applicant has not indicated whether special lifting devices used in conjunction with the Reactor Building crane meet the requirements of ANSI N14.6 Section 6 as required in NUREG-0612 Section 5.1.6(1) (a)."

As discussed on 6/27/83, the head strongback, the dryer/separator sling, stud tensioner carrousel and the service platform sling conform to ANSI N14.6 - 1978 and Section 5.1.1(4) of NUREG-0612. All of these devices attach to the load at four (4) points and a single failure will not result in an uncontrolled drop.

Report Item 2.3.3.B

"The applicant also has not indicated compliance with 5.1.6(3) of NUREG 0612."

The interfacing lifting points on the steam dryer, the moisture separator, the RPV cavity step plugs, the dryer separator slot upper plug, the insulation head, and the service platform are in compliance with 5.1.6(3).

The reactor pressure vessel head lifting lugs were designed and built to the following criteria; "Either pair of diametrically opposed lugs must be capable of supporting top head plus 4 KIPS of portable equipment."

The drywell head design is based on two of the four lugs carrying the entire weight in any of three directions acting simultaneously, with a minimum factor of safety of 2.5:1.

The bottom three (3) dryer/separator plugs can be supported on one lifting lug - the permanently installed shackle is rated at 35 ton capacity and the minimum calculated safety factor is greater than 4:1.

The fuel slot plugs have only one lifting lug, but have been designed with a safety factor of at least 10:1.

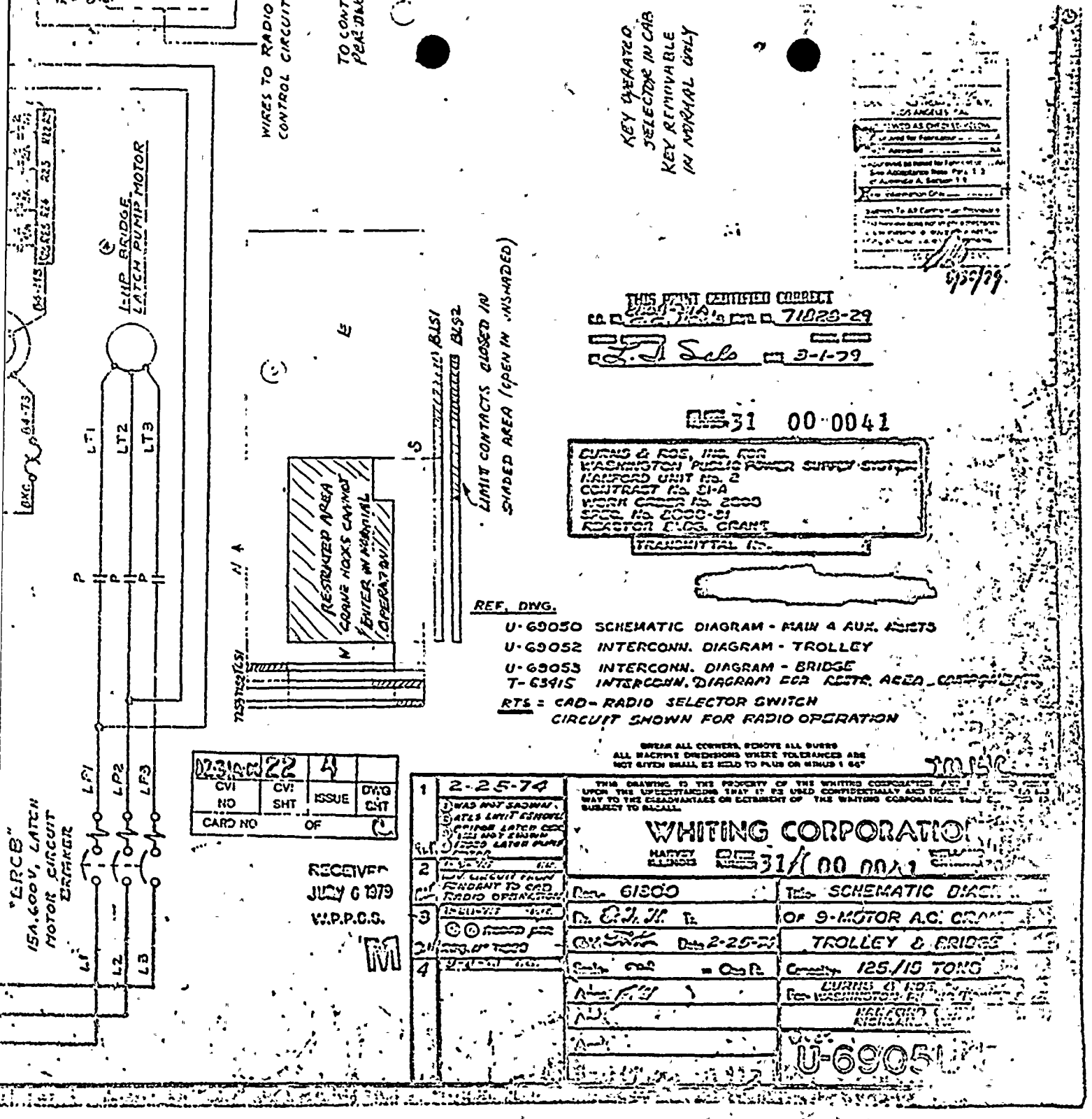
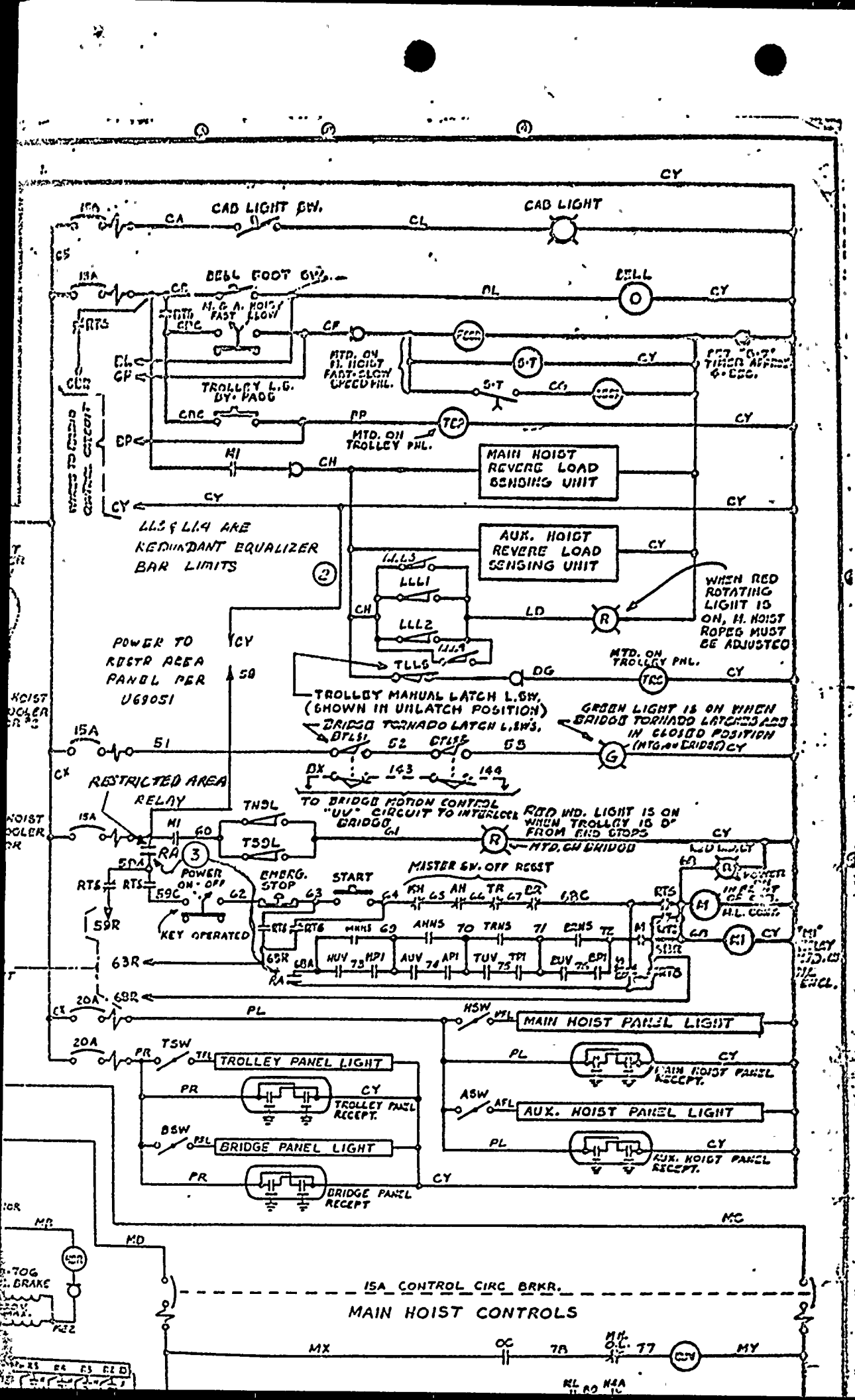
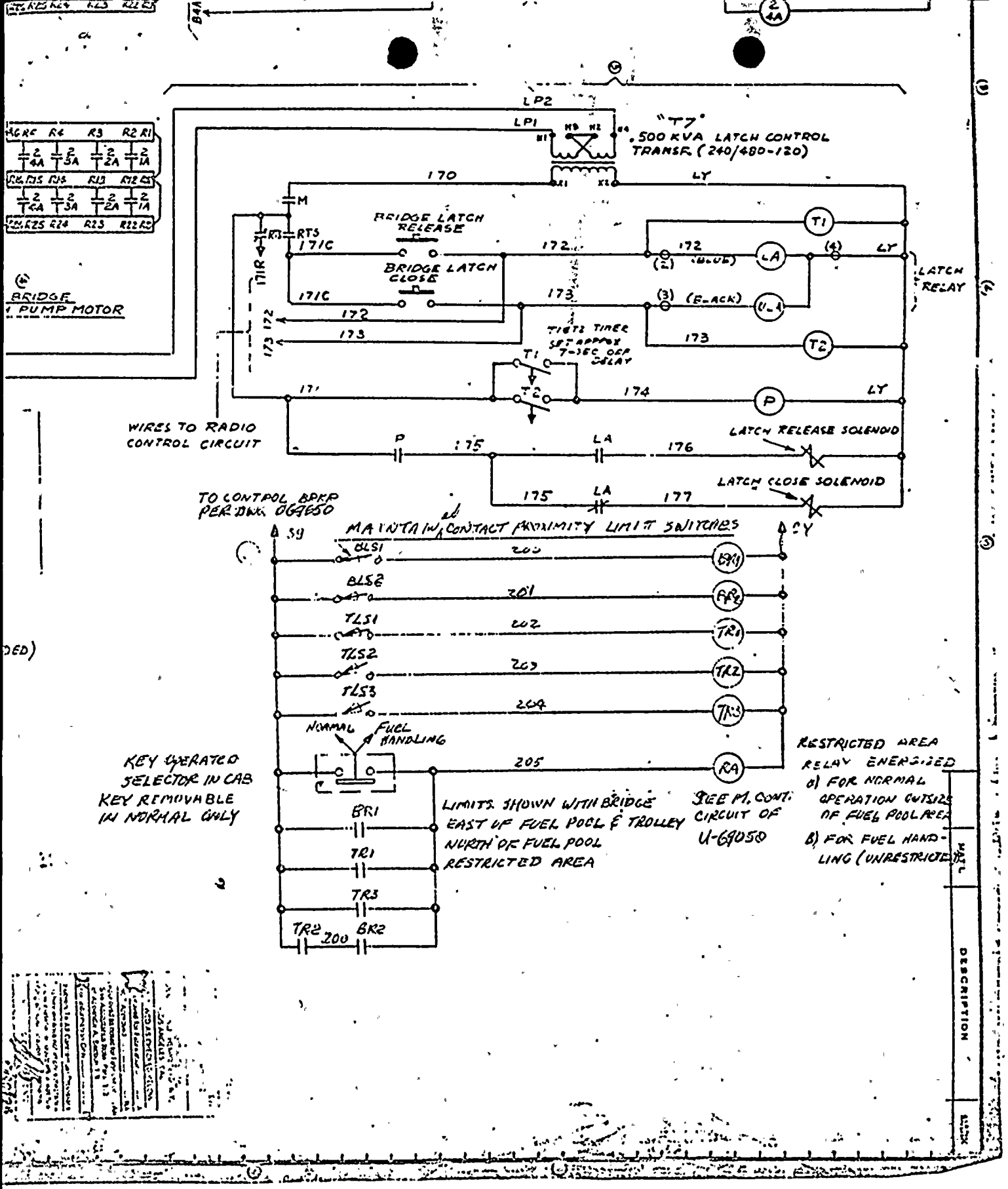

WIRES TO RADIO CONTROL CIRCUIT
TO CONT PER DWG
KEY OPERATED SELECTOR IN CAB
KEY REMOVABLE IN NORMAL ONLY
1/4HP BRIDGE LATCH PUMP MOTOR
LT1
LT2
LT3
64-73
RESTRICTED AREA
CRANE HOOKS CANNOT ENTER IN NORMAL OPERATION
LIMIT CONTACTS CLOSED IN SHADED AREA (OPEN IN UNSHADED)
BLS1
BLS2
REF. DWG.
U-69050 SCHEMATIC DIAGRAM - MAIN & AUX. CKTS
U-69052 INTERCONN. DIAGRAM - TROLLEY
U-69053 INTERCONN. DIAGRAM - BRIDGE
T-63415 INTERCONN. DIAGRAM ECD
RTS = CAB-RADIO SELECTOR SWITCH
CIRCUIT SHOWN FOR RADIO OPERATION
"LRCB" 15A, 600V, LATCH MOTOR CIRCUIT BREAKER
LP1
LP2
LP3
L1
L2
L3
RECEIVED
JULY 6 1979
W.P.P.C.S.
2-25-74
WHITING CORPORATION
HARVEY ILLINOIS
61300
SCHEMATIC DIAG
OF 9-MOTOR A.C. CRANE
TROLLEY & BRIDGE
125/15 TONS
U-69051

Exhibit 1


CY
CAB LIGHT SW.
CAB LIGHT
CA
CL
BELL FOOT SW.
BELL
CP
DL
M.C.A. HOIST FAST SLOW
RTS
TROLLEY L.G. BY PADG
MTD. ON H. HOIST FAST-SLOW SPEED PNL.
S-T
TIMER ADJUST 4 SEC.
MTD. ON TROLLEY PNL.
MAIN HOIST REVERS LOAD SENSING UNIT
AUX. HOIST REVERS LOAD SENSING UNIT
LL3 & LL4 ARE REDUNDANT EQUALIZER BAR LIMITS
WHEN RED ROTATING LIGHT IS ON, H. HOIST ROPES MUST BE ADJUSTED
POWER TO RESTR AREA PANEL PER U69051
TROLLEY MANUAL LATCH L.SW. (SHOWN IN UNLATCH POSITION)
BRIDGE TORNADO LATCH L.SW'S.
GREEN LIGHT IS ON WHEN BRIDGE TORNADO LATCHES ARE IN CLOSED POSITION (INTO ANY BRIDGE)
TO BRIDGE MOTION CONTROL "UV" CIRCUIT TO INTERLOCK BRIDGE
RESTRICTED AREA RELAY
RED IND. LIGHT IS ON WHEN TROLLEY IS 0" FROM END STOPS
MTD. ON BRIDGE
POWER ON-OFF
KEY OPERATED
EMERG. STOP
START
MASTER SW. OFF RESET
MAIN HOIST PANEL LIGHT
TROLLEY PANEL LIGHT
TROLLEY PANEL RECEPT.
BRIDGE PANEL LIGHT
BRIDGE PANEL RECEPT
AUX. HOIST PANEL LIGHT
AUX. HOIST PANEL RECEPT.
MAIN HOIST PANEL RECEPT.
15A CONTROL CIRC BRKR.
MAIN HOIST CONTROLS


LP2
LP1
"T7"
.500 KVA LATCH CONTROL TRANSF. (240/480-120)
170
LY
M
BRIDGE LATCH RELEASE
BRIDGE LATCH CLOSE
171C
172
173
T1
T2
TIGHT TIMER SET APPROX 7-SEC OPR DELAY
LA
P
LATCH RELAY
WIRES TO RADIO CONTROL CIRCUIT
LATCH RELEASE SOLENOID
LATCH CLOSE SOLENOID
175
176
177
TO CONTROL BRKR PER DWG. 064650
MAINTAIN CONTACT PROXIMITY LIMIT SWITCHES
BLS1
BLS2
TLS1
TLS2
TLS3
200
201
202
203
204
205
NORMAL
FUEL HANDLING
KEY OPERATED SELECTOR IN CAB KEY REMOVABLE IN NORMAL ONLY
BR1
TR1
TR3
TR2
BR2
LIMITS SHOWN WITH BRIDGE EAST OF FUEL POOL & TROLLEY NORTH OF FUEL POOL RESTRICTED AREA
SEE M. CONT. CIRCUIT OF U-64050
RESTRICTED AREA RELAY ENERGIZED
a) FOR NORMAL OPERATION OUTSIDE OF FUEL POOL AREA
b) FOR FUEL HANDLING (UNRESTRICTED)
BRIDGE PUMP MOTOR
DESCRIPTION

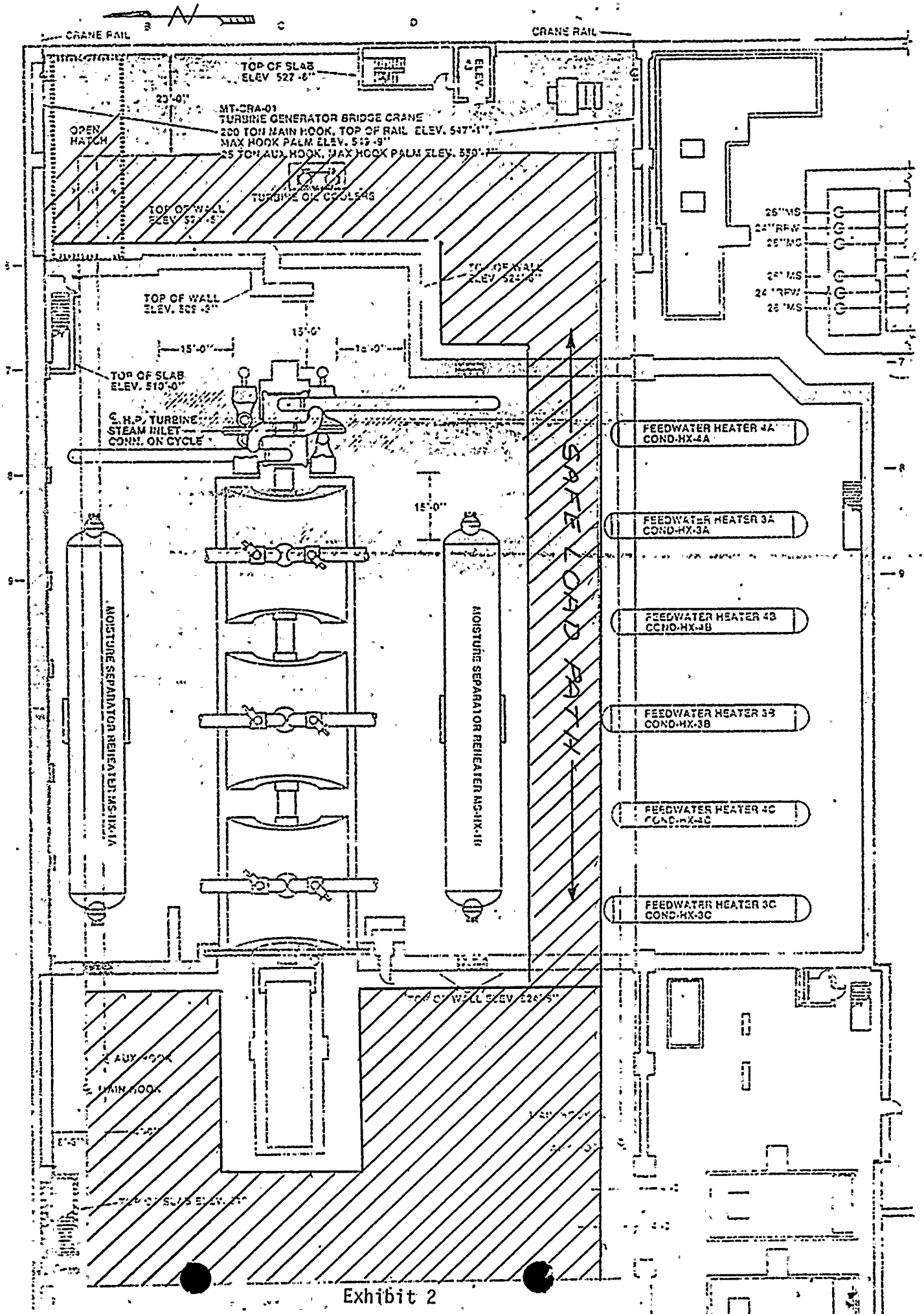

CRANE RAIL
CRANE RAIL
TOP OF SLAB ELEV. 527'-6"
MT-CRA-01
TURBINE GENERATOR BRIDGE CRANE
200 TON MAIN HOOK, TOP OF RAIL ELEV. 547'-1"
MAX HOOK PALM ELEV. 515'-9"
25 TON AUX. HOOK, MAX HOOK PALM ELEV. 550'-1"
OPEN HATCH
TURBINE OIL COOLERS
TOP OF WALL ELEV. 525'-6"
TOP OF WALL ELEV. 509'-9"
TOP OF SLAB ELEV. 510'-0"
H.P. TURBINE STEAM INLET CONN. ON CYCLE
15'-0"
MOISTURE SEPARATOR REHEATER MS-HX-1A/1B
MOISTURE SEPARATOR REHEATER MS-HX-1B
FEEDWATER HEATER 4A COND-HX-4A
FEEDWATER HEATER 3A COND-HX-3A
FEEDWATER HEATER 4B COND-HX-4B
FEEDWATER HEATER 3B COND-HX-3B
FEEDWATER HEATER 4C COND-HX-4C
FEEDWATER HEATER 3C COND-HX-3C
TURBINE CENTERLINE
TOP OF WALL ELEV. 524'-6"
AUX HOOK
MAIN HOOK
TOP OF SLAB ELEV. 510'-0"
26" MS
24" RFW
26" MS
26" MS
24" RFW
26" MS

Exhibit 2