

Commonwealth Edison Company

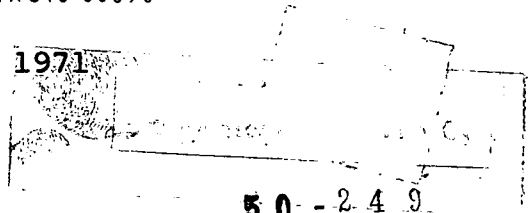
ONE FIRST NATIONAL PLAZA ★ CHICAGO, ILLINOIS

Address Reply to:

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June 28, 1971

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545



50-249

**Subject: Additional Information concerning jet pump
blockage - Dresden Unit 3, DPR-25**

Dear Dr. Morris:

In a telegram dated March 19, 1971, and in a letter dated March 27, 1971, we indicated to you a problem which we had found with the #11 jet pump on Dresden Unit 3. Our March 27 letter indicated that jet pump #11 had been blocked by a welder's purge dam.

The purpose of this letter is to transmit to you Special Report #15 entitled "Jet Pump Flow Blockage on the Dresden 3 Reactor March 15, 1971". This report provides a history of the jet pump blockage, the removal of the debris, and an evaluation of that small amount of material which still may remain in the reactor.

In addition to three signed originals, 19 copies of this report are also submitted.

Very truly yours,

Byron Lee Jr.
Byron Lee, Jr.

Assistant to the President

SUBSCRIBED and SWORN to
before me this 28th day
of June, 1971.

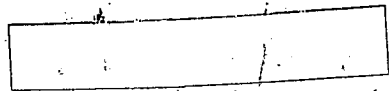
Patricia A. Nelson

Notary Public



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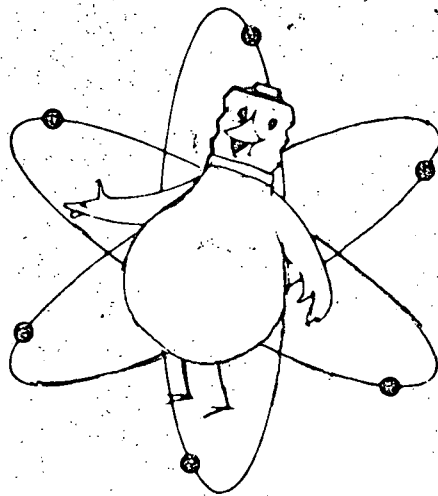


Received w/ Ltr Dated 6-28-71

DRESDEN NUCLEAR POWER STATION UNIT 3

Special Report

June 28, 1971



Commonwealth Edison
Company

REPORT NO. 15

JET PUMP FLOW BLOCKAGE

ON THE

DRESDEN 3 REACTOR MARCH 15, 1971

JUNE 28, 1971

REPORT NO. 15Comments

Description of investigation and corrective action to resolve the Dresden Units jet pump flow blockage.

ResponseSUMMARY OF INITIAL INVESTIGATION

On March 15, 1971 during functional tests of the Recirculation System, subsequent to fuel loading but prior to significant nuclear heating, a low flow indication was observed on recirculation jet pump No. 11. Normal flow indications were recorded up to and including March 14, 1971. The problem was believed to be associated with the flow transmitter.

Initial checks revealed no problems with the flow transmitter or indicators. Subsequent back-flushing of the instrument lines, removal of various components within the system (i.e. instrument excess flow check valves, etc.) and recording of pressure data confirmed that the problem was associated with the jet pump itself. On March 17, the decision was made to remove the reactor head and vessel internals to gain access to the jet pumps.

On March 23, the reactor head, dryer, separator and jet pump 11 ram's horn was removed. Work on the jet pump and subsequent removal of the dam was performed with the water level at approximately 2/3 core height. Radiation levels were approximately 35 mr/hour and the doses to personnel were low. The cause for the reduced flow in jet pump No. 11 was found to be a welding purge dam lodged in the transition casting of the jet pump at a point where the flow is divided from the riser inlet to two nozzles for jet pumps Nos. 11 and 12. The purge dam was lodged against the casting and blocked approximately three-fourths of the flow to jet pump No. 11. Upon removal, the purge dam revealed to be a standard plywood and rubber dam, approximately 16 inches in diameter, commonly used in construction heliarc welding operations. (See figure #1)

It is believed that the purge dam originated in the LPCI system and was swept to a point ahead of the LPCI testable check valve AO 3-1501-25A on December 21, 1970, which was the last time the LPCI system was operated with flow into the vessel.

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The shutdown cooling system returns flow to the vessel through the above valve and it is believed that it carried the purge dam into the reactor recirculation piping on March 14, 1971 when it was operated at full flow during a functional test.

INVESTIGATION RESULTS AND CORRECTIVE ACTION

As described in the summary during Dresden 3 checkout abnormally low flows were indicated for jet pump No. 11. These low flows indicated restricted forward flow or backflow through the jet pump. Due to the construction of the pumps and the instrumentation taps used, either of these conditions indicates a small positive differential pressure.

The possibility of faulty electronics and plugged or broken instrument lines was eliminated by a series of tests and the conclusion was reached that flow blockage was present in the jet pump. Therefore, the decision was made to remove the reactor head, separator and dryer to investigate the blockage.

When the separator and dryer were removed the recirculation pumps were operated and it was verified that backflow was occurring in jet pump No. 11.

Due to the low exposure of the reactor core the radiation level was low and it was possible to lower the reactor level to approximately 2/3 core height for the removal of jet pumps 11 and 12. When the ram's head containing nozzles for jet pumps 11 and 12 was removed, an obstruction of wood, rubber and metal was revealed in the transition casting supplying the jet pumps. Approximately 75% of the available flow area to jet pump #11 was obstructed by the blockage. The transition casting was removed and the obstruction removed and identified as a welder's purge dam which is commonly used in construction for inert gas back purge of pipe closure root welds.

The purge dam consisted of a sandwich of four 3/8" thick plywood semi-circular segments and two circular 1/8" thick red rubber sheets held together by 1/4 - 20 x 1-1/4" stove bolts. Measurements indicated it was intended for use in 16" piping.

One half of the dam was broken in two, the other half was badly fouled, and the two halves were held together by a chain which was normally used as a handle for removal.

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The affected riser piping and the annulus area around it was vacuumed for pieces of wood visually sighted which are believed to have been dropped during removal and transfer operations.

The riser was subsequently flushed into a fine strainer and no further pieces were found.

The bottom plenum area beneath the two removed jet pumps was inspected and no debris noted. The jet pumps were inspected, found to be in excellent condition and re-installed.

All Dresden 3 fuel assemblies were removed for gamma scanning and all were inspected for purge dam material during this program.

From this investigation, it was concluded that the following purge dam pieces were missing and located somewhere in the primary system:

- (1) Rubber - total missing area 30 in.², 1/8" thick, small pieces
- (2) Wood - total approximate area 16 in.², mostly splinters
- (3) Hardware - 4 nut screw combinations 1/4" x 1-1/4", 1 washer 1/4",
1 nut 1/4"

Visual examination from the reactor flange of the dished areas of the fuel support castings in the vicinity where the debris was concentrated revealed no foreign material.

The shutdown pumps were equipped with 1/8" mesh startup strainers and the water circulated at significant flow rates through the identical paths as the recirculation pump discharge. Very little debris other than a few splinters was found.

The LPCI and HPCI testable check valves were disassembled and inspected for foreign materials. No foreign materials were found, therefore, valves were reassembled.

In addition, a visual inspection of the feedwater sparger, surveillance operation of the core spray systems observing correct spray patterns, and operation of the shutdown cooling system at high flows through the LPCI testable check valves, was made to assure that these systems have no blockage which would inhibit their functioning.

REPORT NO. 15EVALUATION AND TESTS OF THE EFFECTS OF THE FOREIGN MATERIALS

General Electric Engineering and CECO. Mechanical and Structural Engineering conducted tests on the samples of the foreign material in a simulated reactor environment (1000 psig and 545⁰F) and obtained very similar results.

The plywood loses strength, takes on a charred appearance and crumbles easily under mechanical or hydraulic agitation. There was no appreciable difference between 18 and 36 hours exposure.

The rubber material weakened quickly to virtually zero strength and would be easily disintegrated by agitation. This condition was reached by 18 hours.

The tape and the cloth each retained virtually zero strength and disintegrated easily after 18 hours.

The rubber was analyzed and showed 140 ppm lead, 98 ppm of chloride and less than 25 ppm fluoride and some minor sulfur content. None of these were deemed harmful in the quantities in question.

TESTING & ACTION TAKEN TO ASSURE OTHER SYSTEMS HAVE NO FLOW BLOCKAGE

A review of the status of other primary and ECCS systems was made and the following conclusions reached:

1. Many of the systems are in frequent operation at normal flows through normal flow paths and these systems would require no further verification.
2. Certain systems would require further verification. These are:
 - a. Inject both core spray systems into the vessel and photograph the spray pattern. This has been done and proper operation verified.
 - b. Inspection of the inside of the feedwater spargers. This was done and no debris was found.

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- c. The HPCI testable check valve was disassembled and the piping near the discharge to the feedwater line was inspected. This was done and no foreign material was found.
- d. The shutdown cooling system has been operated at high flows through the LPCI testable check valves and proper performance noted. In addition, the LPCI testable check valves were disassembled and the piping inspected. No foreign material was found.
- e. Inspection of the reactor lower plenum at four locations throughout the core. Fuel cells 54-15, 06-31, 30-31 and 64-15 were unloaded of fuel elements, poison curtains, control rod drive mechanism, control rod blade, fuel support casting and guide tubes for the inspection of the bottom plenum of the vessel at those locations. The inspection was performed with an underwater TV camera. No foreign material was found at locations 54-15, 06-15 and 06-31, Cell 30-31 which was chosen due to its location near the vessel bottom drain (inlet to reactor cleanup system) contained a 2" x 4" piece of rubber in a spare instrument nozzle near the bottom drain. This piece was retrieved.
- f. Operation of the reactor recirculation pumps at 40-50% speed indicates that all jet pumps are performing properly.

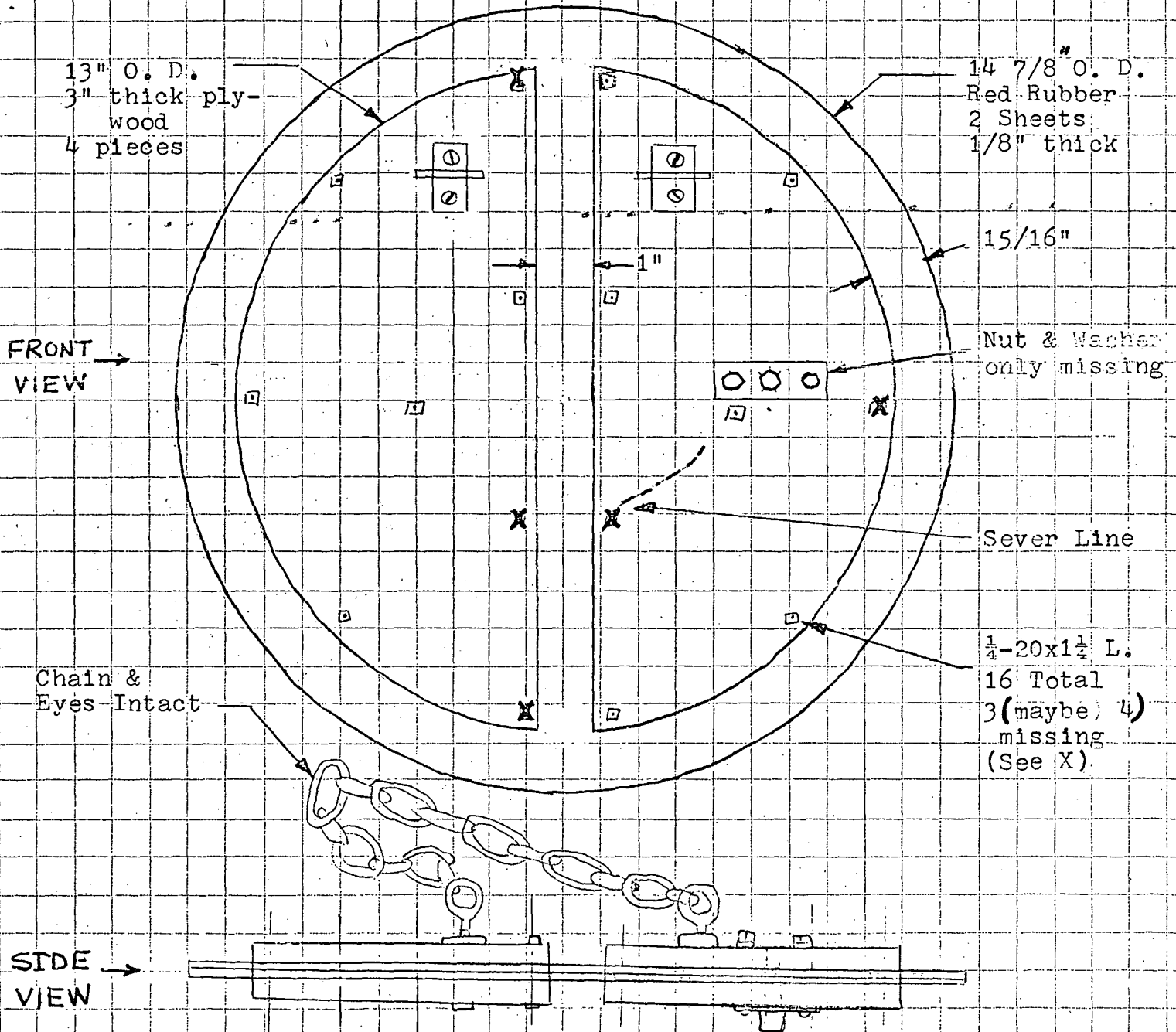
CONCLUSIONS

The reactor will be operated for a total integrated time of three days at nominal rated temperature (540°F) conditions before 10% power is exceeded which will disintegrate most of the small remaining material. The hardware will have been removed by the reactor cleanup system or have settled to the bottom of the reactor vessel where it poses no problem. However, if the hardware works itself into a fuel bundle and fuel damage occurred, the release rates would be well within operating limits.

The complete review and investigation by General Electric and CECO. finds that the corrective action taken removes all operational and safety problems associated with this incident.

FIGURE 1

**Standard Plywood and Rubber
Welder's Purge Dam**



(X) indicates location of missing nut/bolt combinations
note 1 combination recovered as a loose part