50-237

Commonwealth Edison Company

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Dresden Nuclear Power Station
R. R. #1
Morris, Illinois 60450
October 2, 1972

Mr. A. Giambusso
Deputy Director for Reactor Projects
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

SUBJECT: LICENSE DPR-19, DRESDEN NUCLEAR POWER STATION - UNIT #2

Dear Mr. Giambusso:

This is to inform you of the results of our investigation into the reduction in flow on the "B" main steam line of Dresden Unit 2. (Ref. letter September 7, 1972).

Unit 2 was shutdown September 7, 1972 to allow further investigation into the cause of the flow blockage.

An additional check was made on the operability of the "B" steam line isolation valves on September 8, 1972, with a Crane Valve representative present. No abnormalities were found.

A radiography program, initiated on September 8, 1972, revealed that the downstream cone of the "B" steam line flow restrictor was missing. Further radiography revealed that the downstream cone was lodged in the inlet of the inboard Main Steam Isolation Valve (MSIV). The cone was found to be in one piece.

Visual examination, through the use of a boroscope, of the failed "B" steam line flow element revealed weld discontinuities (lack of penetration, slag, and porosity) in the weld joining the recovery cone to the throat section. The mode of failure was determined to be fatigue originating at the locations of lack of weld penetration.

Visual examination of the same cone-to-throat section weld on the A, C and D line flow elements, over their inside and outside surfaces, show no indications of surface cracking with the exception of a shiny linear indication along the subject weld on the outer surface of the "A" flow element which from the limited visual accessibility appears to be a crack. A review of the radiographs of "A" flow element did not confirm the existence of a weld crack.

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In order to provide further assurances for the safe operation of the A, C and D lines, a design modification (see attached) has been made to add axial and lateral supports to the recovery cones on each element. The lateral supports prevent movement due to vibration, and the axial pins prevent the cone from moving downstream in the event the weld were to fail.

This design precludes pin failure because one pin alone can withstand the stresses envolved. In addition, the type of weld failure seen does not result in loose pieces of weld material. Because of these, material will not reach the Main Steam Isolation Valves and their continued operability will not be compromised.

The modifications to the Main Steam Line flow elements have been accomplished in accordance with all code requirements. Further, the modifications have added a margin of safety beyond that originally installed by providing means for preventing or accommodating another mode of failure. The modification does not affect existing safety analyses and the design basis and safety evaluation on the pin modification justifies the pin integrity itself, which precludes the need for any new safety analysis on the overall facility. Therefore, there are no unreviewd safety concerns.

Based on these evaluations, the plant is assured of safe partial power operation. On September 20, 1972, Dresden 2 was returned to service at approximately 75% power with both "B" main steam line isolation valves closed (to assure line isolation in event of further failure and movement of a main steam flow element) for an interim period until replacement flow elements can be obtained and plans for their installation completed.

Current operations are restricted to $\leq 2.45 \times 10^6$ lb/hr in any steam line; this is equivalent to approximately 98 percent of design flow. A surveillance program has been initiated to monitor steam line flow and identify unusual flow imbalances. If such an imbalance is confirmed, an orderly shutdown will be made within 8 to 16 hours of the initial detection of such imbalance

It should be noted that throughout the investigation of the steam line flow anomoly, the plant was operated within all requirements of DPR-19.

Sincerely,

Fred S. Morris
for W. P. Worden
Superintendent
Dresden Nuclear Power Station

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Attachment

DESIGN MODIFICATION

1. The Dresden II main steam flow element is modified by installing three (3) pins at 120° apart downstream of the recovery cone, with a clearance of .020" minimum to take care of the differential thermal expansion between pipe (carbon steel) and flow element cone (stainless steel) as shown on Figure 1, attached. Based on the assumption that the throat-to-recovery-cone weld on the A, C & D lines fail these pins are designed to prevent the recovery cones from moving down stream into the MSIV. These pins will also prevent any vibration of the downstream recovery cone that may exist during operation. Stress analyses show that if the downstream cone should fail and be held by only one pin, the pin shear stress will be 13,866 psi if 100 psid exists across the restrictor. This assumption is very conservative because normal operating differential is approximately half of this. The allowable stress for this emergency condition is 90% of yield strength, or 27,800 psi (Note: S_m - 18,600). Since the maximum stress with only one pin carrying the load is 13,866 psi, the design of the pins is more than adequate.

   Area replacement was also considered in designing these pins, based on ASME-Section III, 1971, Paragraph NE-3643.3 - Reinforcement for Openings.

   Area removed = 1.389 in^2 / Area Available = 1.688 in^2

   Combined stress in 1½" pin weld is 9,259 psi. Includes pressure and temperature stress plus the stress due the cone resting on one pin. Allowable stress is 18,600 psi.

   A retaining clamp, or "belly band", has been installed around these pins as indicated on Figure 1A attached. Because the pins are not threaded into the pipe, this was added to prevent expulsion of the pins in the unlikely event that the welds were to fail.

2. Figure 2 shows the design of the 3-½"-13 UNC bolts installed at the upstream end of the recovery cone, 120° apart. These bolts will prevent any vibration of the cone, in case of failure at the weld adjacent to the three bolts, hence no effect on the differential pressure signal. Material, welding rod, examinations of weld, and exact location and clearances are as shown on the attached Figure 2.

3. The initial pin weld passes were visually inspected and the final passes were inspected by liquid penetrant. The 1½" bolts were ultrasonically inspected following installation to ensure integrity of the weld, pin, and pipe. The final installation was then hydrostatically tested at 1000 psig cold.

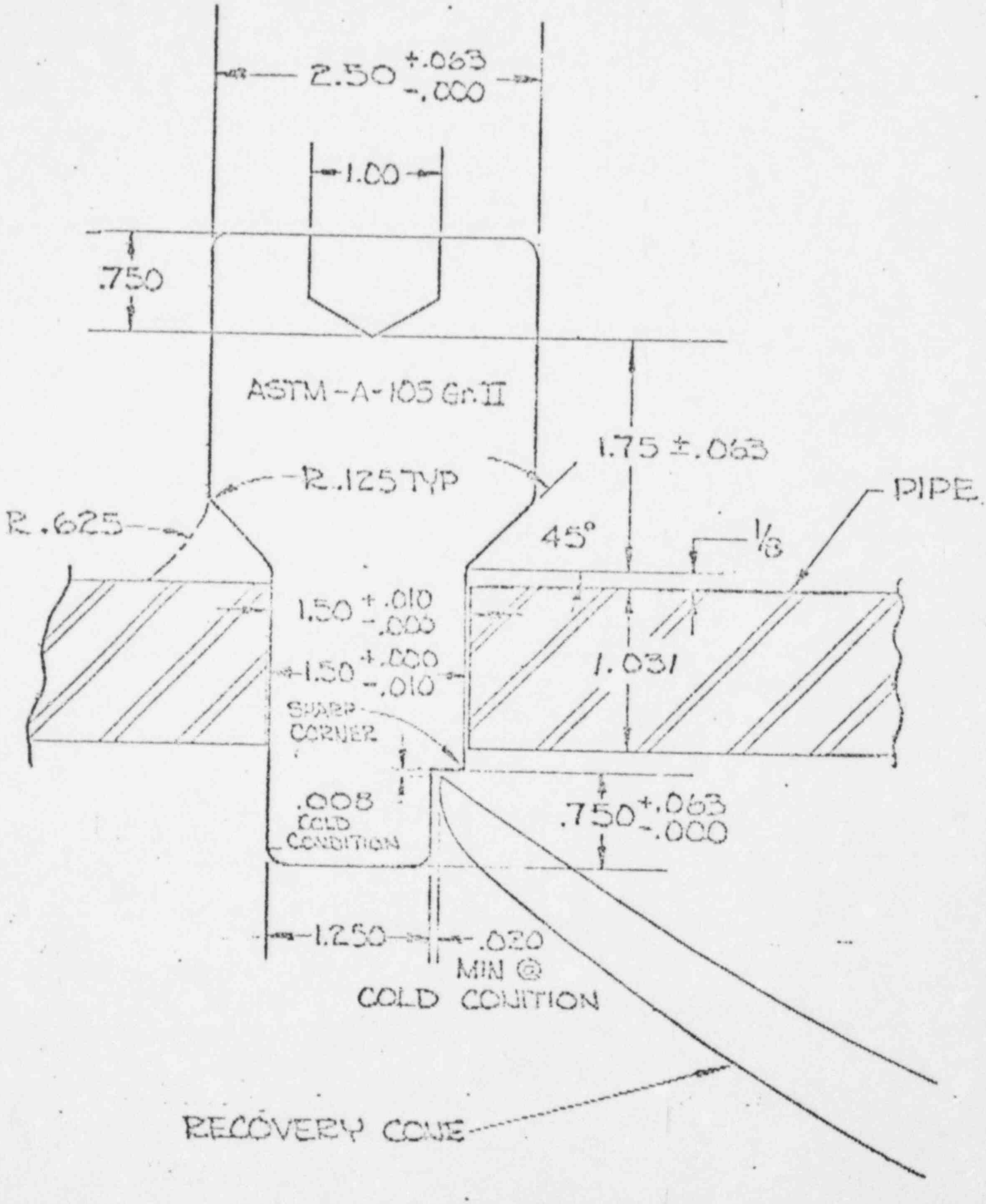
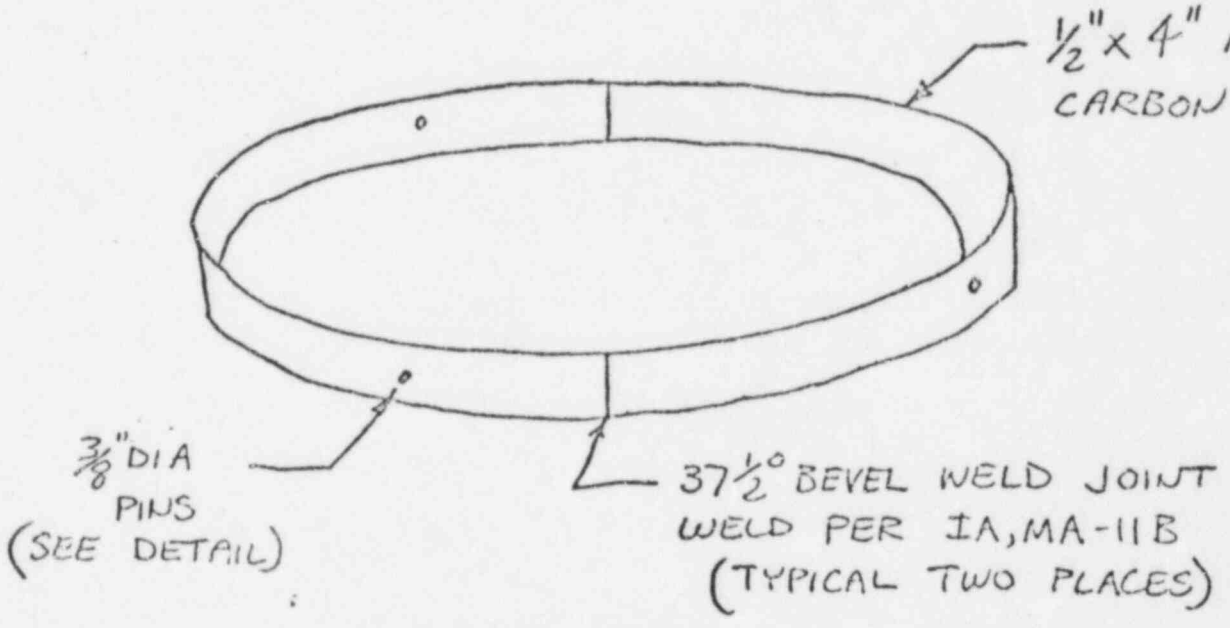
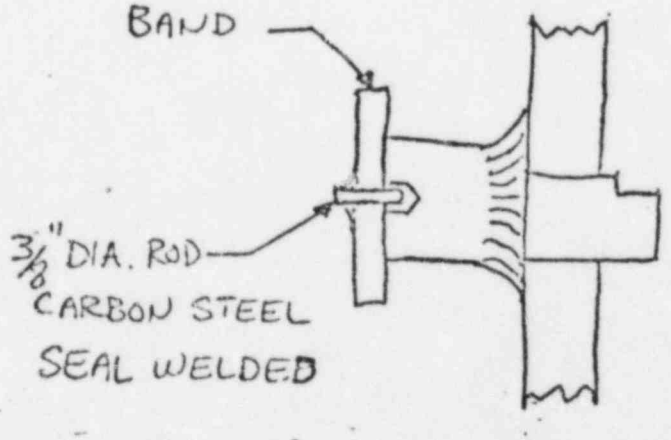


FIG. 1

Approval: [illegible]

RETAINER CLAMP FOR 1½" PINS





(TYPICAL THREE PLACES) 120° APART AROUND PIPE

FIG. 1A

RECOVERY CONE PIN

MATERIAL: ASTM-A-193
GR B8 cc A-479 TYP 304

TOTAL REQUIRED: 3 @ 120° APART (EACH LINE)
FINGER TIGHT