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FROM: Carolina Pwr & Light Co Raleigh, NC ~~E E Utley~~	DATE OF DOC 2-5-76	DATE REC'D 2-7-76	LTR XXXX	TWX	RPT	OTHER
TO: Mr Reid	ORIG one signed	CC	OTHER	SENT NRC PDR XX SENT LOCAL PDR XX		
CLASS / UNCLASS XXX / PROP INFO	INPUT	NO CYS REC'D 1		DOCKET NO: 50-261		

DESCRIPTION:

Ltr re our 5-30-75 ltr...trans the following:

PLANT NAME: Robinson #2

ENCLOSURES:

Information regarding integrity of swing-Check MSIV"S...with regard to postulated steam line breaks associated with dynamic loads.....(40 cys encl rec'd)

FOR ACTION/INFORMATION

ENVIRO 2-9-76 ehf

SAFETY

ASSIGNED AD ______

✓ BRANCH CHIEF Reid (5)

✓ PROJECT MANAGER Bridges

✓ LIC. ASST. Ingram W/ 16 CYS ACRS

ASSIGNED BRANCH CHIEF ______

PROJECT MANAGER ______

LIC ASST. ______ W/ ACRS

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MISCELLANEOUS

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BROOKHAVEN NAT. LAB
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Carolina Power & Light Company

February 5, 1976

File: NG-3514 (R) Serial: NG-76-155

Director of Nuclear Reactor Regulation
Attention: Mr. Robert W. Reid, Chief
Operating Reactors Branch No. 4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Reid:

H. B. ROBINSON UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
INTEGRITY OF SWING-CHECK MSIV'S

Your letter of May 30, 1975, requested information concerning the integrity of the H. B. Robinson Unit No. 2 main steam isolation valves under the dynamic loads associated with postulated steam line breaks. Our letters NG-75-1100 of July 16, 1975, and NG-75-1772 of October 31, 1975, progressively reported the status of our investigations. The evaluation of the Robinson main steam isolation valves and main steam line check valves is now complete and the information requested is provided in an Attachment to this letter.

Analyses have been performed using the "worst case" approach. The trip valve analysis assumed a double-ended pipe break at the check valve outlet. The check valve analysis assumed a similar break at the trip valve inlet. Any other postulated pipe break would be further from the valves and would therefore result in a lower disc velocity and impact energy. The analyses also considered the use of the various steam pressures and steam flows which would be representative of different power levels. A power level of about 53% was finally used in the analyses because it yielded the most conservative results. In all cases, the values assumed for material physical properties were the most limiting. The actual physical properties can be expected to be less limiting.

Both pre-impact and post-impact analyses were performed.

Pre-Impact

The pre-impact analysis considered the centrifugal forces acting on the tail link and rockshaft. It was found that these forces cause the tail link and rockshaft to deflect in the radial direction. In addition,

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there will be sufficient radial deflection to permit the valve disc to contact the valve body just before the disc impacts with the valve seat. Calculations indicate that the disc will rebound slightly after contact with the body and continue on to impact the seat and effect valve closure. Evaluation of the pre-impact analysis indicates that this contact between the valve disc and valve body does not result in loss of function of the disc or body.

Post-Impact

The post-impact analysis conservatively assumed that no energy loss occurs during pre-impact contact between the valve disc and valve body even though such contact can be expected to result in some loss of disc energy. The analysis dealt primarily with the forces and strains generated in the disc, seat, and tail link hub by the impact of the disc on the seat. The post-impact strains occurring in the valve are all less than the minimum ultimate strain capacity for the respective materials involved. The effect on the valve is that the disc and seat will undergo some plastic deformation in the impact areas but will still close to effectively shut off steam flow.

To provide an increased margin of safety, modifications as described in the Attachment are planned for the valves. The modifications are similar to those made on the St. Lucie Unit No. 1 Plant for Florida Power and Light Company. With the modifications, the potential deflection in the rockshaft and tail link is reduced to .25 in. The maximum tail link strain occurs in the tail link hub and is less than 20% of the minimum ultimate strain capacity of the material. The strains in the modified disc and seat are greatly reduced with the maximum strain occurring in an element of the check valve disc. The maximum strain in the check valve is 60% of the strain capacity of the disc material. Also, the use of a larger operating air cylinder will greatly reduce the strains in the air operated trip valve because the velocity of the trip valve disc will be significantly reduced.

A cyclic fatigue analysis of the modified valve internals has been performed and has demonstrated that a satisfactory number of spurious closures during 100% power operation can be accommodated. The modified valves have been found to be satisfactory under all conditions analyzed and will provide a significantly increased performance margin.

Yours very truly,

E. E. Utley
Vice-President
Bulk Power Supply

DBW:mvp

Attachment

ATTACHMENT

1. Analysis

a) Impact energy for postulated double ended rupture of the main steam piping - The maximum calculated impact energy is absorbed by the disc and seat of the check valve and is equal to 3.32×10^6 in-lbs. The maximum calculated impact energy absorbed by the disc and seat of the air operated trip valve is 2.34×10^6 in-lbs.

b) Methods used in the dynamic analysis - The methods used in the dynamic analysis are the same as those described in the analysis for St. Lucie Unit No. 1 which was submitted to the NRC in the St. Lucie FSAR.

c) Summary of the maximum calculated strains

Location	Calculated Generalized Strain	Minimum Ultimate Strain Capacity
Stainless Steel Seat Cladding	20.5%	40%
Carbon Steel Seat Body	19.7%	23%
Stainless Steel Disc Cladding	15.2%	40%
Carbon Steel Disc Body	16.0%	23%

2. Modifications Planned

The following modifications will be made to both the trip valve and the check valve.

a) The rockshaft will be replaced with a rockshaft of larger diameter (2.162 in. vs. 1.625 in.) and of different material with stronger physical properties. A larger diameter bushing will also be added.

b) The tail link will be reinforced to improve its resistance to bending in the hub area (Figures 1 and 2). This is accomplished by adding material to the section between the tail link sleeve and tail link hub as well as increasing the length of the hub.

c) A stainless steel seat ring will be welded to the existing valve seat (Figure 3).

d) The disc will have an increased stainless steel weld overlay added to the area that impacts the valve seat upon closure. The disc will be recessed and tapered to allow the tail link hub to penetrate the disc (Figure 4).

In addition to the above, the operating cylinder for the trip valve will be replaced with a larger diameter (14.0 in.) cylinder with a design pressure of 1000 psig.

3. Schedule

We are presently in the process of finalizing manufacturing drawings for the modified valve internals. The drawings are scheduled to be completed by the first week of February. Pending procurement of materials, we are planning to complete the modifications on the Robinson valves during the fall refueling outage this year.

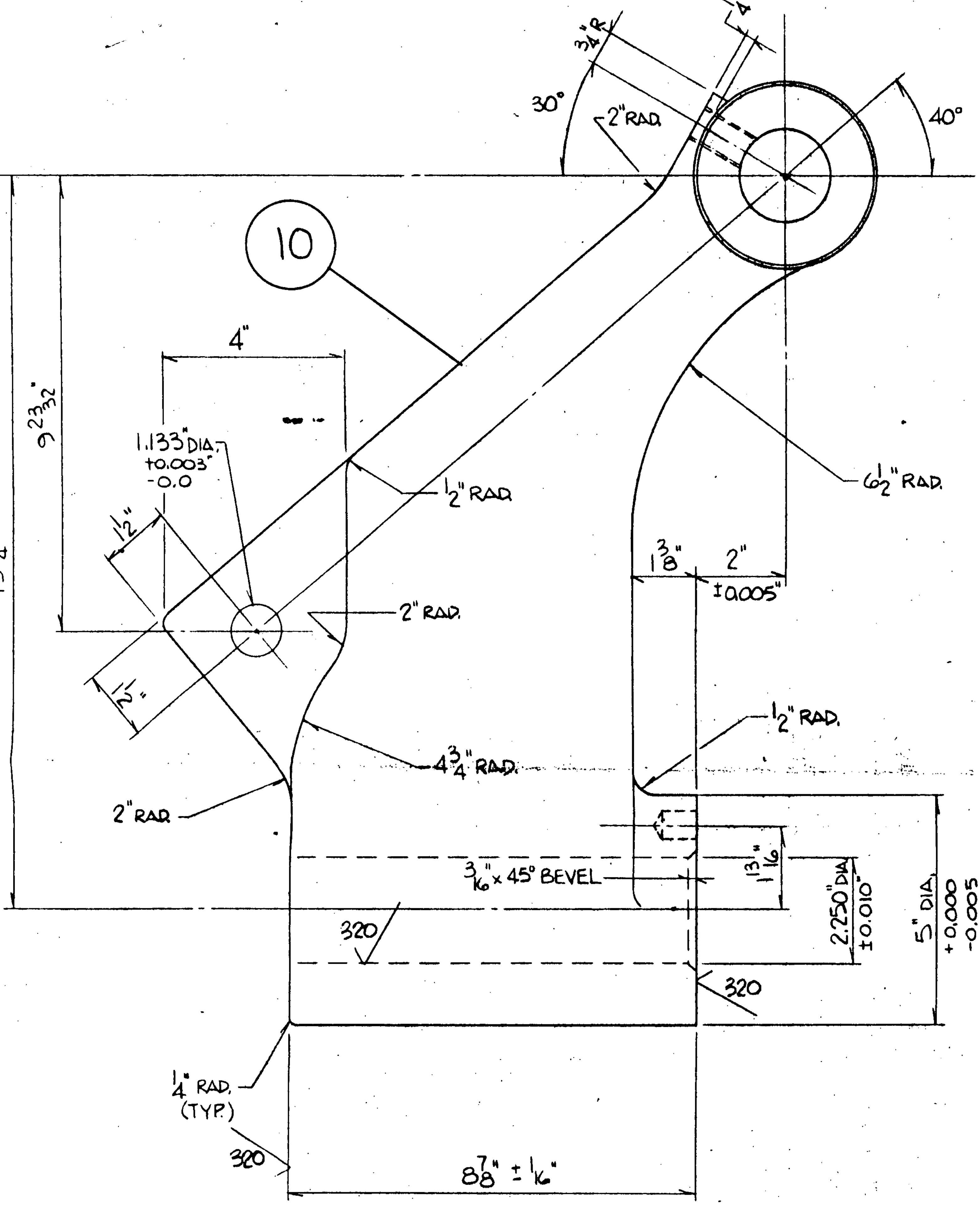

Figure 1. Modified Tail Link-Side View

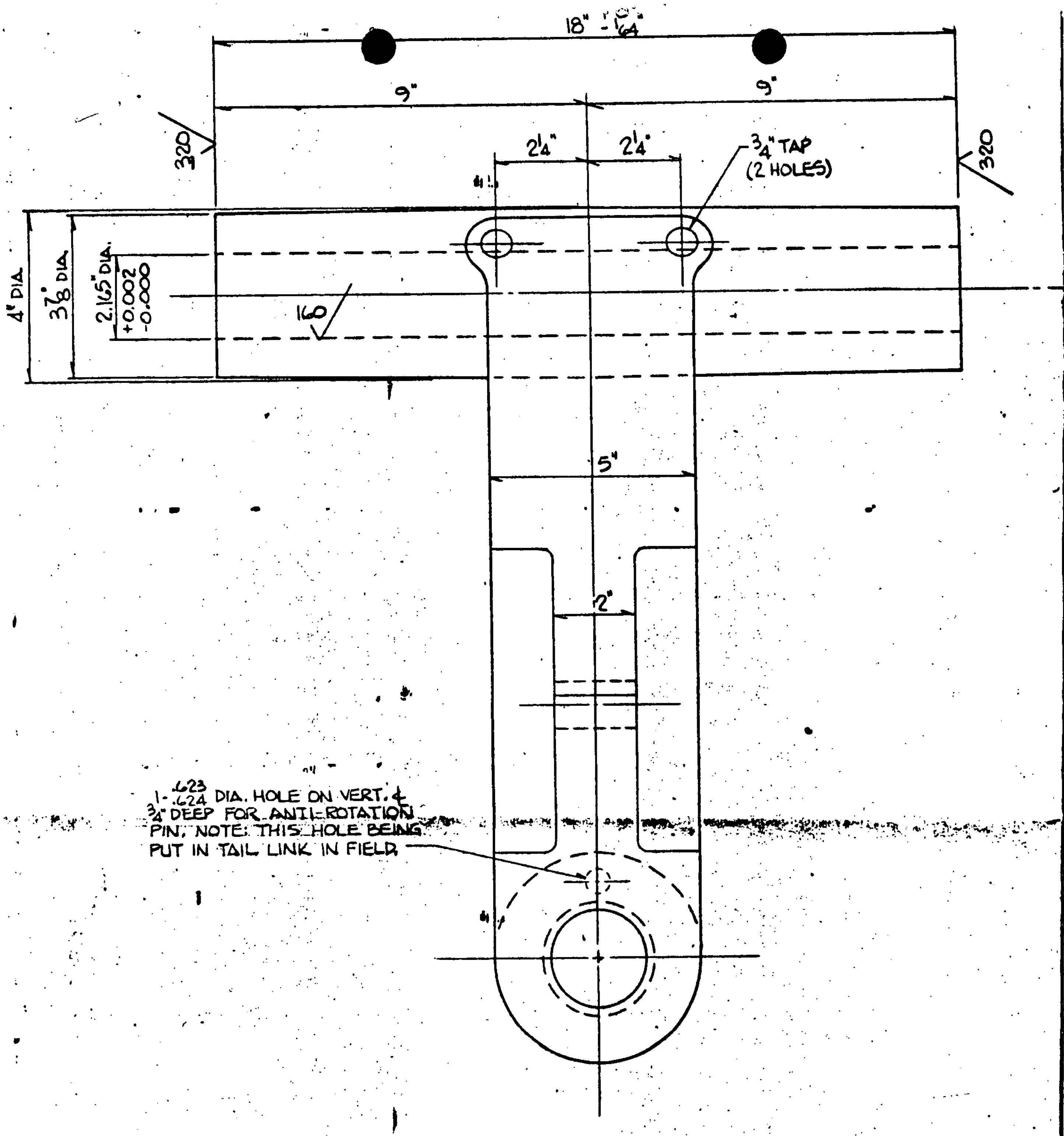

Figure 2. Modified Tail Link-End View

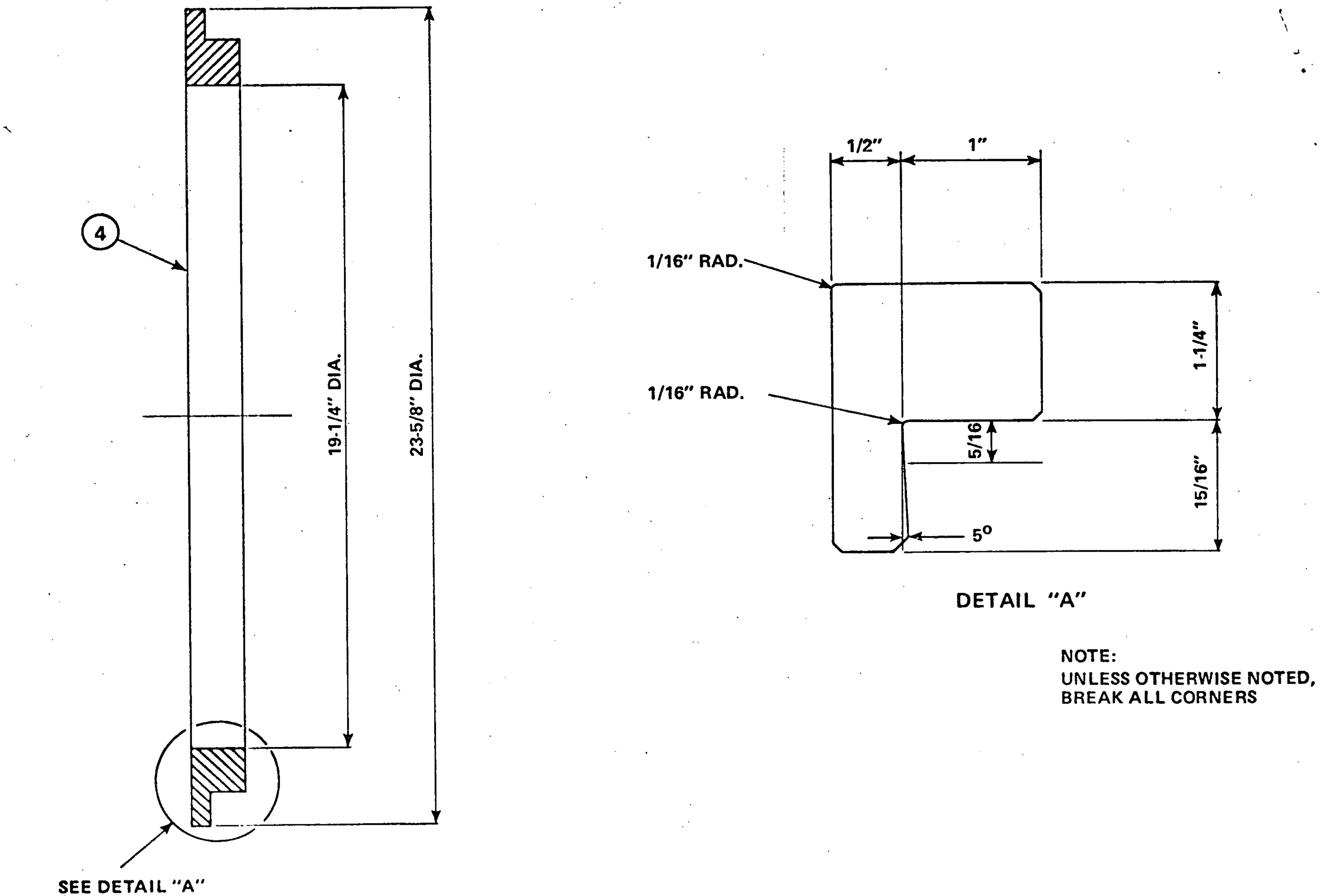

Figure 3. Seat Ring

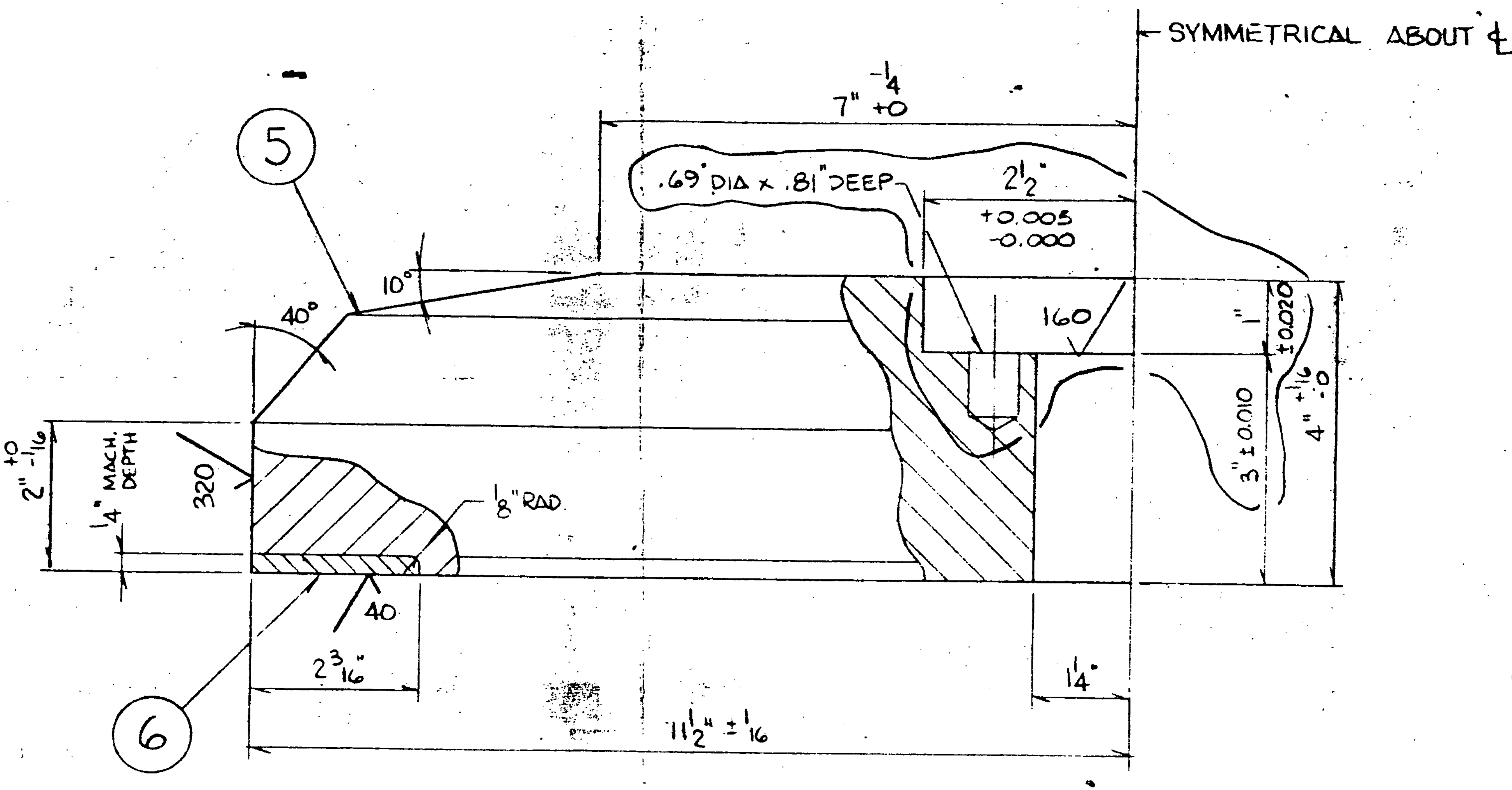

Figure 4. Modified Disc