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May 6, 1991

EDE LTR #91-259

U.S. Nuclear Regulatory Commission
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Licensee Event Report #88-018-1, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a(2)(i)(B). This supplemental report is submitted to provide the final results of Unit 2 1988 refuel outage primary containment local leak rate testing.

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

(ZDVR/201)

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LICENSEE EVENT REPORT (L

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
Dresden Nuclear Power Station, Unit 2	0 5 0 0 0 2 3 7	1 of 1

Title (4) Leak Rate Limits Exceeded in Drywell Head Seal and MSIV 2-203-1D Tests Due to Misalignment and Seat Wear

Event Date (5)			LER Number (6)			Report Date (7)			Other Facilities Involved (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
									N/A	0 5 0 0 0
1 0	3 0	8 8	8 8	--- 0 1 8	--- 0 1	1 1	2 9	8 8	N/A	0 5 0 0 0

OPERATING MODE (9)	N
POWER LEVEL (10)	0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		Other (Specify in Abstract below and in Text)
	20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER
	AREA CODE
J. Geiger, Technical Staff Engineer Ext. 2610	8 1 5 9 4 2 - 2 9 2 0

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	N H	V S L	C 3 1 0	Y					
X	S B	I S V	C 6 6 5	Y					

SUPPLEMENTAL REPORT EXPECTED (14)		Expected Submission Date (15)	Month	Day	Year
X Yes (If yes, complete EXPECTED SUBMISSION DATE)	NO		0 6	0 3	8 9

ABSTRACT (Limit to 1400 spaces, i.e, approximately fifteen single-space typewritten lines) (16)

On October 30, 1988, at 1935 hours, with Unit 2 in a refueling outage during the performance of primary containment local leak rate testing, the drywell head seal was discovered to have an "as found" leak rate which exceeded the Technical Specification (TS) 3.7.A.2.b.(2)(a) limit. Subsequently, on November 3, 1988, inboard Main Steam Isolation Valve (MSIV) 2-203-1D was determined to have a leakage which exceeded the TS 3.7.A.2.b limit. Other unsatisfactory leakages were also identified. The cause of the excessive drywell head seal leakage has been attributed to improper seating of the outer gasket due to an installation procedure deficiency. The MSIV leakage has been attributed to seating surface wear. Prior to Unit startup, the drywell head was reinstalled with a new gasket, and the 2-203-1D MSIV was repaired and reassembled. Both the 2-203-1D MSIV and the drywell head double gasketed seal were satisfactorily retested. Appropriate repairs and testing were also performed concerning the other identified unsatisfactory leakages. The safety significance of this event was minimal since the drywell head was properly seated on the full circumference of the inner gasket, redundant outboard MSIV 2-203-2D was verified to comply with the 11.5 scfh limit, and the remaining unsatisfactory leakages were not excessive in terms of actual through leakage which would be expected to occur under design basis accident conditions. A previous occurrence of exceeding the leak rate limit is outlined in Licensee Event Report #88-004 on Docket #050249.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Leak Rate Limits Exceeded During Testing of the Drywell Head Seal and Main Steam Isolation Valve 2-203-1D Due to Misalignment and Seat Wear.

A. CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: October 30, 1988 Event Time: 1935 hours

Reactor Mode: N Mode Name: Shutdown Power Level: 0%

Reactor Coolant System (RCS) Pressure: 0 psig

B. DESCRIPTION OF EVENT:

On October 30, 1988, at 1935 hours, with Unit 2 in a refueling outage during the performance of Dresden Technical Staff Surveillance (DTS) 1600-15, Local Leak Rate Testing of Double Gasketed Seals, the drywell head seal [NH] was discovered to have an "as found" leak rate of 491.37 scfh. This brought the total "as found" leak rate using the maximum pathway method for Type B and C testing to 623.917 scfh. This exceeded the Technical Specification 3.7.A.2.b.(2)(a) limit of 488 scfh.

Subsequently, on November 3, 1988, at 1030 hours while performing local leak rate testing in accordance with DTS 250-1, Main Steam Isolation Valve (MSIV) [SB] Local Leak Rate (Dry) Test (LLRT), a leak rate of 21.27 scfh was measured from a test volume comprised of inboard MSIV 2-203-1D and outboard MSIV 2-203-2D. In order to identify the source of leakage, DTS 250-3, MSIV Local Leak Rate (Wet) Test, was then performed. It was then concluded that inboard MSIV 2-203-1D had a through leakage of 12.99 scfh. This exceeded the Technical Specification 3.7.A.2.b limit of 11.5 scfh for any individual MSIV.

In addition to the Drywell Head gasket and MSIV 2-203-1D, nine type C tests required repairs and adjustments due to unsatisfactory leakage rates. These test volumes and their corresponding "as found" leakage rates are listed below:

Test Volume	System	"As Found" Type B and C (Maximum Pathway) Leakage Rate (scfh)	"As Found" Type A (Minimum Pathway) Leakage Rate (scfh)
2-220-57A,62A	Feedwater [SJ]	Undetermined	1.2
2-220-57B,62B	Feedwater	Undetermined	5.4
2-1599-61,62	LPCI [BM]	487.9	244.0 (1)

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

Test Volume	System	"As Found" Type B and C (Maximum Pathway) Leakage Rate (scfh)	"As Found" Type A (Minimum Pathway) Leakage Rate (scfh)
2-1601-23,24,60 61,62,63	Containment [BB] Vent and Purge	Undetermined	Undetermined (2)
2-1699-56A,58A	Torus Drain	56.7	28.4 (1)
2-2301-45,74	HPCI [BJ]	124.5	124.5 (3)
2-2599-2B,23B	Containment Atmosphere Dilution [IP]	38.5	19.3 (1)
2-8501-5A	Containment Air Sampling [IK]	129.4	0.1
2-9207A, 9207B	Containment Air Sampling	362.8	324.4 (4)

Notes: (1) The true minimum pathway leakage is undetermined due to simultaneous repairs on both valves. The noted leakage is a conservative estimate of the minimum pathway leakage calculated by taking half of the maximum pathway leakage.

(2) The minimum pathway leakage is undetermined due to the simultaneous replacement of inboard and outboard isolation valves as part of a modification to provide improved leakage integrity. As noted in Section E of this report, it was concluded that majority of the leakage was past valve 2-1601-24; therefore, minimal actual through leakage would have occurred under design basis accident conditions.

(3) For this volume, the maximum pathway leakage is the same as the minimum pathway leakage. Since valve 2-2301-74 is a stop check valve which is tested with the handwheel closed, no credit can be taken for this valve.

(4) This piping is attached to a normally isolated sampling system.

C. APPARENT CAUSE OF EVENT:

The apparent cause of the excessive drywell head seal leakage has been attributed to improper seating of the outer gasket between the drywell head and the drywell head flange. This was caused by the outer gasket not being fully inserted in the drywell head flange groove prior to installation of the drywell head. The root cause of the outer gasket not being fully inserted is attributed to a procedure deficiency. No other inoperable components or systems were found to have contributed to this event.

The arrangement of the drywell head, gaskets, and drywell head flange are shown in Figure 1. Rounded "knife edges" on the drywell head are designed to seat on the inner and outer gaskets on the drywell head flange. The endless gaskets used are 3/4" wide by 1/2" thick.

The drywell head was installed beginning March 24, 1987, at the end of the 1986-1987 refueling outage. Work was performed in accordance with instructions contained in Work Request 53321 and Dresden Maintenance Procedure (DMP) 1600-5, Drywell Head Replacement and Installation of Shield Blocks. A review of the work package and gasket purchase orders verified that the proper gasket material, Garlock 8364, was used. The work package included a statement that the southeast section of the drywell head was pushed inward using a jack to permit the drywell head to seat properly (knife edges in the drywell head flange grooves). It should be noted that use of a jack in this manner is permitted by DMP 1600-5. The LLRT using DTS 1600-15 following installation resulted in an "as left" leak rate of 0.1335 scfh.

DMP 1600-5 implements the manufacturer's instructions for tightening the drywell head bolts in order to achieve metal to metal contact between the drywell head and the drywell head flange. With metal to metal contact achieved, the knife edges on the drywell head would extend 5/16" into the grooves holding the gaskets.

Following removal of the drywell head on October 31, 1988, a continuous impression from the inner knife edge was seen on the inner gasket for the full circumference of the drywell head flange. Examples of normal gasket seating are illustrated in Figure 2. No damage to either knife edge was observed and the gasket material was found to be pliable.

However, for approximately six inches of the outer gasket, the knife edge was beside rather than atop the outer gasket, and a portion of the gasket material appeared to have been forced into the normally empty volume between the two knife edges. This improper gasket seating is illustrated in Figure 3. It was concluded that the leakage path was caused by this improperly seated outer gasket.

Improper seating of the outer gasket is believed to have resulted from the intermediate cause of that section of the outer gasket not being fully inserted in the drywell head flange groove prior to installation of the drywell head. As shown in Figure 1, the knife edges are rounded with a 1/8" radius. Therefore any section of the gasket extending more than approximately 1/8" above the drywell head flange would have been caught by the knife edge when the southeast section of the drywell head was jacked inward to allow the knife edges to seat into the grooves. This conclusion is further supported by the fact that the improperly seated length of outer gasket was located in the southeast section of the drywell head flange.

The low leakage rate observed following installation is evidence that the inner gasket provided a tight seal and that the outer gasket initially made sufficient contact with the knife edge to provide a tight seal. The six inch section of the outer gasket apparently pulled away from the side of the knife edge due to the thermal cycling of the drywell head flange during operation and subsequent cooldown, thus providing the leakage path.

DMP 1600-5 was reviewed and found to contain inadequate instructions for ensuring that the gaskets were properly inserted into the grooves prior to installation of the drywell head. The root cause of the drywell head seal leakage was therefore attributed to procedure deficiency.

The cause of the inboard MSIV 2-203-1D leakage was due to a degraded pilot valve. Inspection of the valve packing during the initial LLRT verified no leakage past the packing. When the valve was disassembled and the internals inspected, it was observed that the pilot was not seating correctly.

For the remaining Type C tests which exhibited an excessive leakage rate, a summary table of the root causes and corresponding corrective actions is contained in Section E of this report.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of the drywell head seal outer gasket failure is considered minimal since the drywell head was properly seated on the full circumference of the inner gasket. Each gasket is designed to withstand design basis accident pressure. In addition, no abnormal nitrogen makeup [LK] requirements for drywell inerting were observed during the last operating cycle. Therefore, the "through" leakage representing actual potential containment leakage under accident conditions is believed to have been minimal.

There have been no previous events of significant drywell head seal leakage at Dresden Nuclear Power Station. The only drywell head seal failures found in a search of the Nuclear Power Reliability Data System (NPRDS) data base were attributed to use of a material other than the Garlock 8364 specified by the drywell head manufacturer (discussed in Section G, Component Failure Data). For these reasons, this instance of excessive leakage is judged to be an isolated case and does not pose any generic concerns.

The safety significance of the inboard MSIV 2-203-1D local leak rate test failure is mitigated by the fact that the redundant outboard MSIV 2-203-2D did not exceed the MSIV leak rate limit of 11.5 scfh.

As described in Sections B and E of this report, the unsatisfactory leakages identified during completion of Type B and C testing are not excessive in terms of actual potential through leakage which would be expected to occur under design basis accident conditions. The Technical Specification Section 3.7 bases state that dose calculations suggest that the accident leak rate could be allowed to increase to approximately 3.2%/day (approximately 1628 scfh) before the guideline thyroid doses given in 10CFR100 would be exceeded. As shown in Section B of this report, the actual potential through leakage (Type A minimum pathway leakage) is not believed to have approached this order of magnitude.

The safety significance is also mitigated by the fact that Emergency Core Cooling Systems (ECCS) were available throughout the previous operating cycle in accordance with Technical Specification requirements. In addition, the integrity of secondary containment was maintained and the standby gas treatment systems was available.

E. CORRECTIVE ACTIONS:

Immediate corrective action included inspection of the drywell head knife edges and the drywell head flange and gaskets following removal of the drywell head on October 31, 1988. A multidisciplinary task force met on October 31, 1988, to plan further investigation and to review previous drywell head seal problems at Quad Cities Nuclear Power Station. On November 1, 1988, photographs of the drywell head flange and gaskets were taken to document the improper seating observed on the outer gasket. On November 2, 1988, two samples of the outer gasket were removed and later photographed on November 4, 1988. The multidisciplinary task force met again on November 2, 1988, to plan long-term corrective actions.

Prior to Unit 2 startup, DMP 1600-5 was revised to require a Quality Control inspection to ensure that the gaskets are properly inserted into the grooves in the drywell head flange prior to installing the drywell head. DTS 1600-15 was also revised to include troublehsooting guidance should a double gasketed seal show significant leakage during an LLRT (237-200-88-13102). Gaskets for the drywell head flange which were in stock were also verified to be of the proper material. The drywell head gasket was then replaced and the drywell head reinstalled on February 11, 1990. The subsequent LLRT on the gasketed seal yielded a satisfactory leakage of 0.09 scfh.

MSIV 2-203-1D was disassembled and rebuilt per Work Request 72601. Upon inspection of the valve internals, it was discovered that the internal pilot valve was not seating properly. The pilot was replaced and all seating surfaces for the pilot and the main valve were subsequently cleaned and successfully blue checked. After complete reassembly of the valve, an LLRT was performed on November 3, 1989 yielding a satisfactory leakage of 4.8 scfh.

A table is provided below to summarize the repairs and adjustments performed on the 9 type C tests which had exhibited unsatisfactory leakage rates.

Test Volume	Repairs and Adjustments
2-220-57A, 62A	Feedwater check valve 2-220-62A was disassembled and inspected per Work Request 79702. The inspection revealed a worn seat and a degraded O ring. The disc/seat assembly and the O ring were replaced. The final LLRT yielded a satisfactory leakage of 4.2 scfh.
2-220-57B, 62B	Feedwater check valve 2-220-62B was disassembled and inspected per Work Request 80121. Some slight wear was observed on the valve seat and O ring. The valve/seat assembly was removed, the O ring was replaced and the valve/seat assembly was thoroughly cleaned. The final LLRT yielded a satisfactory leakage of 28.6 scfh.
2-1599-61, 62	Valve 2-1599-61 was disassembled and inspected per Work Request 81467. Small spots of erosion were observed on the valve disc. The disc/stem assembly was then replaced with a new assembly and the valve repacked during reassembly. Valve 2-1599-62 was also repacked under the direction of Work Request 79996. The final LLRT yielded a satisfactory leakage of 3.7 scfh.
2-1601-23, 24, 60, 61, 62, 63	During the initial LLRT, efforts were made to determine which valve of this test volume was leaking. Since no leakage was detected past the inboard isolation valves 2-1601-23, 60, 61 and 62, and since no repairs or adjustments were made to outboard valve 2-1601-63 prior to the final LLRT, it was concluded that the initial leakage was past valve 2-1601-24. Subsequent to the initial LLRT, valves 2-1601-23, 24, 60 were replaced with Henry Pratt Butterfly valves as part of a modification to provide improved LLRT performance for this volume. Due to the valve replacements, the exact "as-found" through leakage could not be determined. The final LLRT yielded a satisfactory leakage rate of 5.4 scfh.
2-1699-56A, 58A	Valves 2-1699-56A and 58A were disassembled and inspected per Work Requests 79622 and 79621. Upon disassembly, no degradation of the valves were observed. The valve internals were cleaned and the valves were reassembled. The final LLRT yielded a satisfactory leakage rate of 0.4 scfh.
2-2301-45, 74	Check valve 2-2301-45 was disassembled and inspected per Work Request 79750. Upon disassembly it was observed that the valve seat was corroded and pitted. The valve was then replaced with another Mission duo-disc check valve. The final LLRT yielded a satisfactory leakage rate of 10.2 scfh.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

2-2599-2B, 23B	Lift check valve 2-2399-23B was disassembled and inspected per Work Request 79715. Upon disassembly, the valve plug was found stuck in the open position. The valve internals were then thoroughly cleaned and proper operation of the valve plug verified prior to reassembly. The final LLRT yielded a satisfactory leakage rate of 0.3 scfh.
2-8501-5A	Valve 2-8501-5A was disassembled and inspected per Work Request 80052. Upon disassembly, foreign material was found on the seating surface. The valve seat was lapped and the valve internals cleaned. Upon valve reassembly, a final LLRT was performed yielding a satisfactory leakage rate of 0.2 scfh.
2-9207A, 2-9207B	Both valves were disassembled and inspected per Work Request 79910 and 79909. The seating area for both valves was found to be dirty. Both valves were thoroughly cleaned and then reassembled. Final adjustments were made to the stroke of valve 2-9207A. The final LLRT yielded a leakage rate of 0.0 scfh for valve 2-9207A, and 3.2 for valve 2-9207B.

After all repairs and adjustments were made and the final LLRTs were performed, the total "as left" maximum pathway leakage rate was calculated to be 418.2 scfh. The total minimum pathway leakage rate, which is a more accurate representation of actual potential containment "through" leakage under accident conditions, was calculated to be 184.4 scfh. Both these totals are well within the Technical Specification Limit of 488 scfh for all Type B and C tests.

F. PREVIOUS OCCURRENCES:

The most recent occurrences in which the Primary Containment Type B and C leakage totals exceeded the Technical Specification limit of 488 scfh are documented in the following Licensee Event Reports. A previous event involving an MSIV local leak rate testing failure is also listed below. No previous occurrences involved significant leakage through the drywell head seal.

LER Number/Docket Number	Title
88-004/050249	Type B and C Local Leak Rate Test Limit Exceeded Due to Leakage Through Primary Containment Isolation Valve. Atmosphere Containment and Dilution System [LK] purge check valve 3-2599-23B leaked 192.66 scfh. Corrective action included cleaning and lapping the valve.
87-004/050237	Unit 2 Primary Containment Type B and C Local Leak Rate Test Limit Exceeded Due to Excessive Leakage Through Primary Containment Isolation Valve. The torus [BS] to condenser [SG] drain valve A02-1599-61 leaked 135.985 scfh. Corrective action included cleaning and lapping the valve.
86-030/050237	Leakage in Excess of Technical Specification 3.7.A.2.b Limit Found on MSIV 2-203-2B Due to Packing Leak. The 2-203-2B MSIV was then repaired and retested satisfactorily.

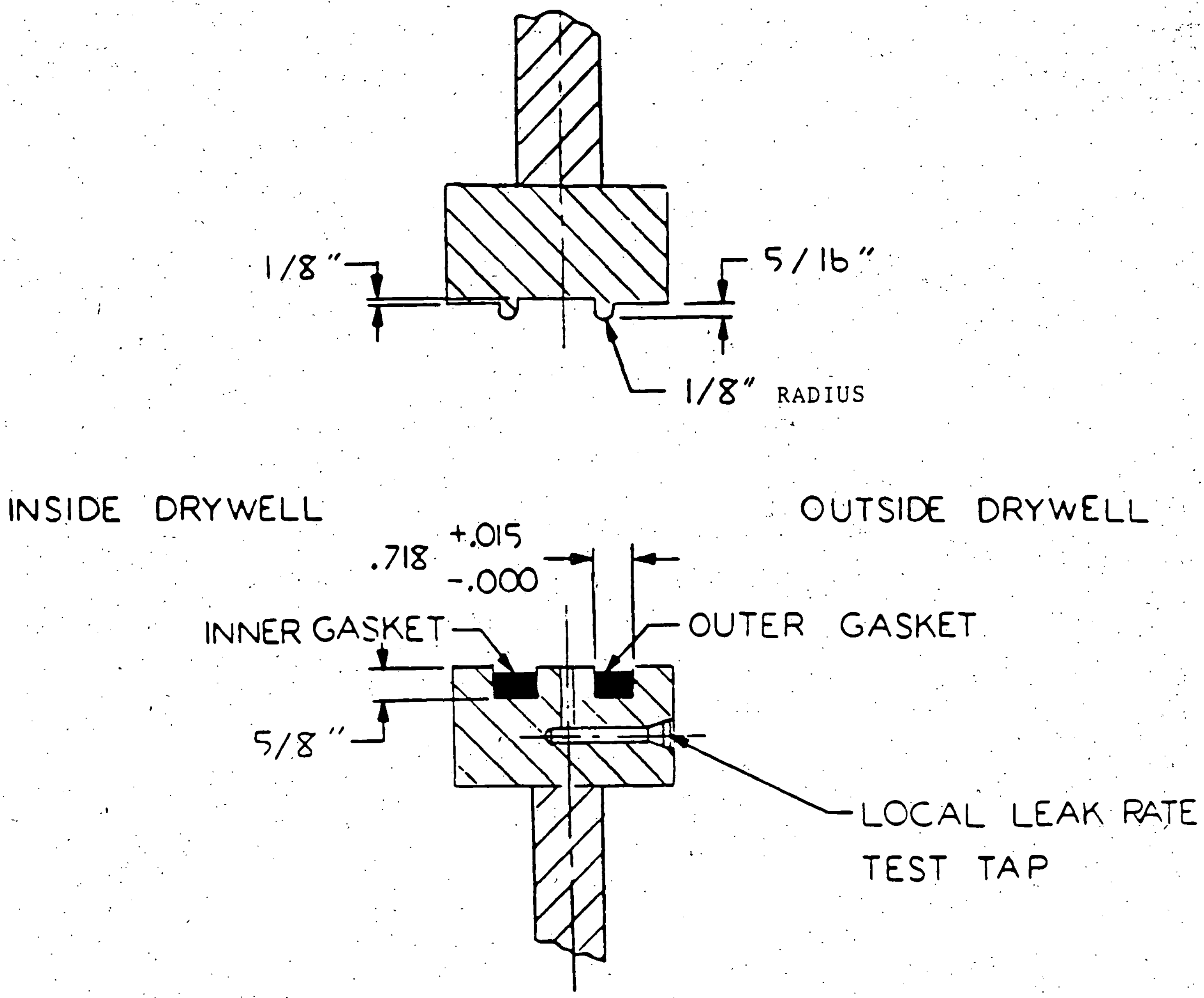
G. COMPONENT FAILURE DATA:

A search of the NPRDS data base revealed that the only previously reported failures of drywell head seals are for Quad Cities Nuclear Power Station; the same drywell head seal design is used for the Dresden and Quad Cities units. Those failures involved a different gasket material than the Garlock 8364 material specified by the drywell head manufacturer, and the corrective action included returning to the use of Garlock 8364. No significant "as found" leakage has been measured during three drywell head seal LLRT's performed at Quad Cities Nuclear Power Station subsequent to the return to the use of Garlock 8364 (one operating cycle for Unit 1 and two operating cycles for Unit 2).

Manufacturer	Nomenclature	Model Number	MFG. Part Number
Crane Co.	Inboard MSIV 2-203-1D	DR34289-20" Y Pattern Globe Valve	N/A

An industry-wide data base search regarding leak rate testing failures of this type of MSIV listed 40 LLRT failures. Repairs included seating surface machining and packing adjustment/replacement.

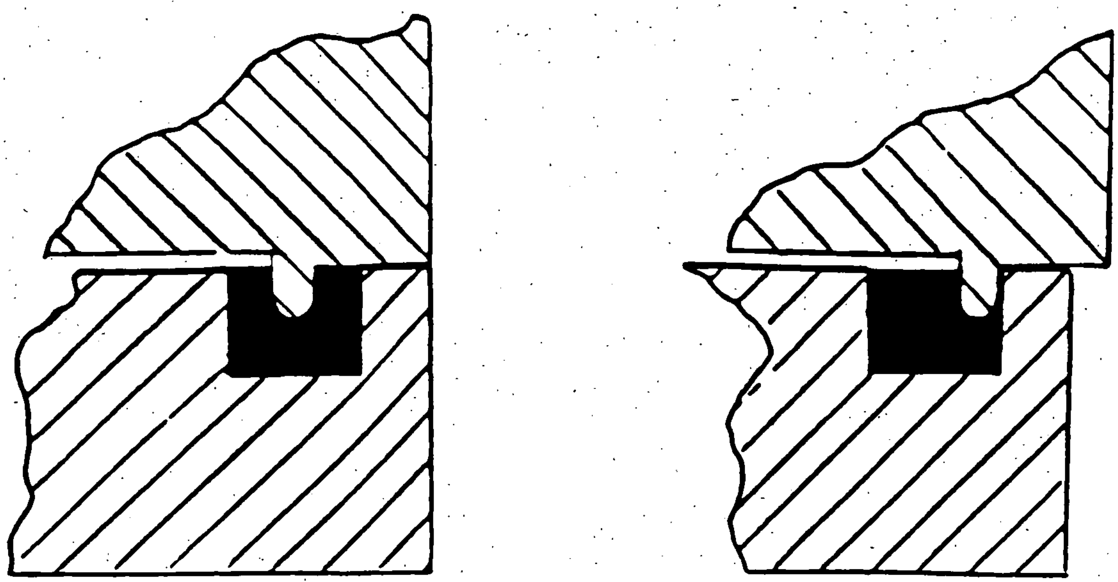
TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]



DOUBLE—GASKETED DRYWELL HEAD SEAL

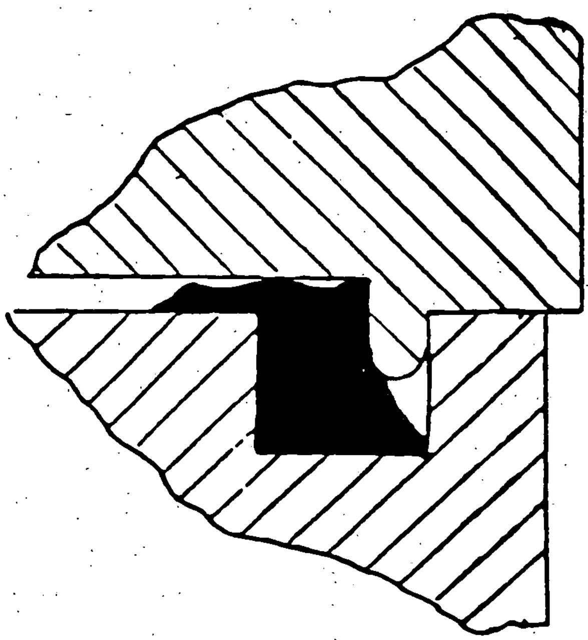
Figure 1

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]



NORMAL GASKET SEATING EXAMPLES

Figure 2



IMPROPER GASKET SEATING EXAMPLE

Figure 3