

Docket Number 50-346
License Number NPF-3
Serial Number 2744
Attachment 1
Page 1 of 1

Davis-Besse Nuclear Power Station

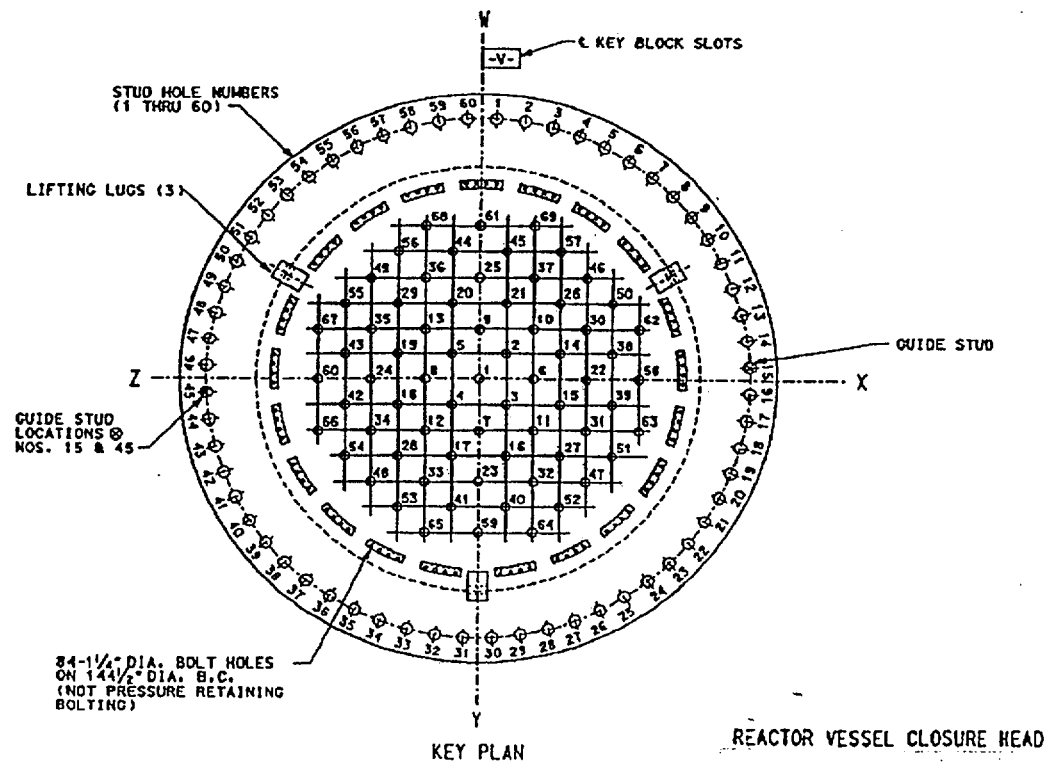
**Results of Visual Examination of Reactor Head CRDM Nozzle Penetrations
Performed in 1996, 1998, and 2000**

(46 Pages Follow)

Davis-Besse NPS

Results of Visual Examination of Reactor Head CRDM nozzle penetrations Performed in 1996, 1998, and 2000

■ Nozzle Arrangement – 69 CRDM Nozzles



Nozzle No.	Core Locat.	Quadrant	1996 Inspection results	1998 Inspection results	2000 Inspection results
			See Note 1.0		
1	H8	1		Flange Leak Evident	Flange Leak Evident
2	G7	4		Flange Leak Evident	Flange Leak Evident
3	G9	1		Flange Leak Evident	Flange Leak Evident
4	K9	2		Flange Leak Evident	Flange Leak Evident
5	K7	3		Flange Leak Evident	Flange Leak Evident
6	F8	1		Flange Leak Evident	Flange Leak Evident
7	H10	2		Flange Leak Evident	Flange Leak Evident
8	L8	3		No Leak Observed	No Leak Observed
9	H6	4		No Leak Observed	No Leak Observed
10	F6	4		No Leak Observed	No Leak Observed
11	F10	1		Flange Leak Evident	Flange Leak Evident
12	L10	2		No Leak Observed	No Leak Observed
13	L6	3		No Leak Recorded	No Leak Observed
14	E7	4		Flange Leak Evident	Flange Leak Evident
15	E9	1		Flange Leak Evident	Flange Leak Evident
16	G11	1		Flange Leak Evident	Flange Leak Evident
17	K11	2		No Leak Observed	No Leak Observed
18	M9	2		No Leak Recorded	No Leak Observed
19	M7	3		No Leak Observed	No Leak Recorded
20	K5	3		No Leak Observed	No Leak Observed
21	G5	4		No Leak Observed	No Leak Observed
22	D8	1		Flange Leak Evident	Flange Leak Evident
23	H12	2		No Leak Observed	No Leak Observed
24	N8	3		No Leak Recorded	No Leak Recorded
25	H4	4		No Leak Recorded	No Leak Observed
26	E5	4		No Leak Recorded	No Leak Observed
27	E11	1		Flange Leak Evident	Flange Leak Evident
28	M11	2		No Leak Recorded	No Leak Observed
29	M5	3		No Leak Recorded	No Leak Observed
30	D6	4		No Leak Observed	No Leak Observed
31	D10	1		Flange Leak Evident	Flange Leak Evident
32	F12	1		Flange Leak Evident	Flange Leak Evident
33	L12	2		No Leak Recorded	No Leak Observed
34	N10	2		No Leak Recorded	No Leak Observed
35	N6	3		No Leak Recorded	No Leak Recorded
36	L4	3		No Leak Recorded	No Leak Observed
37	F4	4		No Leak Recorded	No Leak Observed
38	C7	4		No Leak Recorded	Flange Leak Evident
39	C9	1		Flange Leak Evident	Flange Leak Evident
40	G13	1		Flange Leak Evident	Flange Leak Evident
41	K13	2		No Leak Recorded	No Leak Observed
42	O9	2		No Leak Recorded	No Leak Recorded
43	O7	3		No Leak Recorded	No Leak Recorded
44	K3	3		No Leak Recorded	No Leak Observed
45	G3	4		No Leak Recorded	No Leak Observed
46	D4	4		No Leak Recorded	No Leak Observed
47	D12	1		Flange Leak Evident	Flange Leak Evident

Nozzle No.	Core Locat.	Quadrant	1996 Inspection results	1998 Inspection results	2000 Inspection results
48	N12	2		No Leak Recorded	No Leak Observed
49	N4	3		No Leak Recorded	No Leak Observed
50	C5	4		No Leak Recorded	No Leak Observed
51	C11	1		Flange Leak Evident	Flange Leak Evident
52	E13	1		No Leak Recorded	Flange Leak Evident
53	M13	2		No Leak Recorded	No Leak Observed
54	O11	2		No Leak Recorded	No Leak Observed
55	O5	3		No Leak Recorded	No Leak Recorded
56	M3	3		No Leak Recorded	No Leak Observed
57	E3	4		No Leak Recorded	No Leak Observed
58	B8	1		No Leak Recorded	Flange Leak Evident
59	H14	2		No Leak Recorded	No Leak Observed
60	P8	3		No Leak Recorded	No Leak Recorded
61	H2	4		No Leak Recorded	No Leak Observed
62	B6	4		No Leak Recorded	No Leak Observed
63	B10	1		No Leak Recorded	Flange Leak Evident
64	F14	1		No Leak Recorded	Flange Leak Evident
65	L14	2		No Leak Recorded	No Leak Observed
66	P10	2		No Leak Recorded	No Leak Recorded
67	P6	3		No Leak Recorded	No Leak Recorded
68	L2	3		No Leak Recorded	No Leak Observed
69	F2	4		No Leak Recorded	No Leak Observed

Filed as h/RCS leakage issues/nozzle review Table

Notes:

- 1 In 1996 during 10 RFO, 100% of nozzles were inspected by visual examination. Since the video was void of head orientation narration, each specific nozzle view could not be correlated by nozzle number. Nozzles 1,2,3, and 4 which do not have sufficient interference gap were excluded. The remaining 65 nozzles did not show any evidence of leakage.

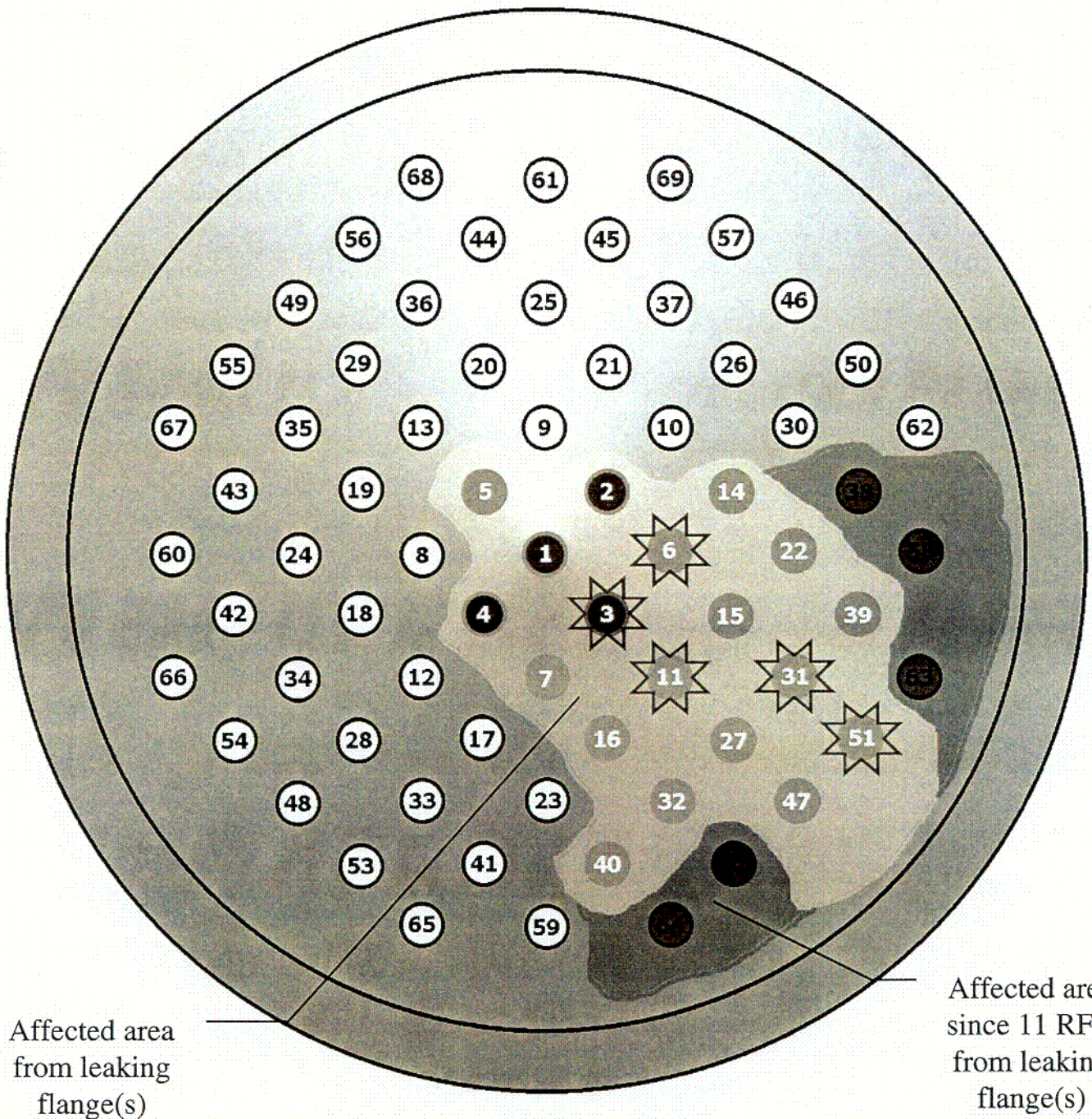
Bold letters indicate leaking CRDM bolting flanges discovered and repaired during 12 RFO (April 2000).

No Leak Observed = Visual Inspection Satisfactory, No Video Record Required.

No Leak Recorded = Nozzle inspection recorded on videotape

Italicized text indicates nozzles that are not expected to show leakage due to insufficient gap.

RPV Head 11 & 12 RFO Inspection Results



- ⑥① - No leakage identified
- - Evaluated not to have sufficient gap to exhibit leakage
- ★ - Insufficient gap with leaking flange
- ⑤ - Nozzle obscured by boron
- ★ - Nozzle obscured by boron with leaking flange
- - Newly affected, since 11 RFO, by leaking flange(s)

FENOC RESTRICTED INFORMATION

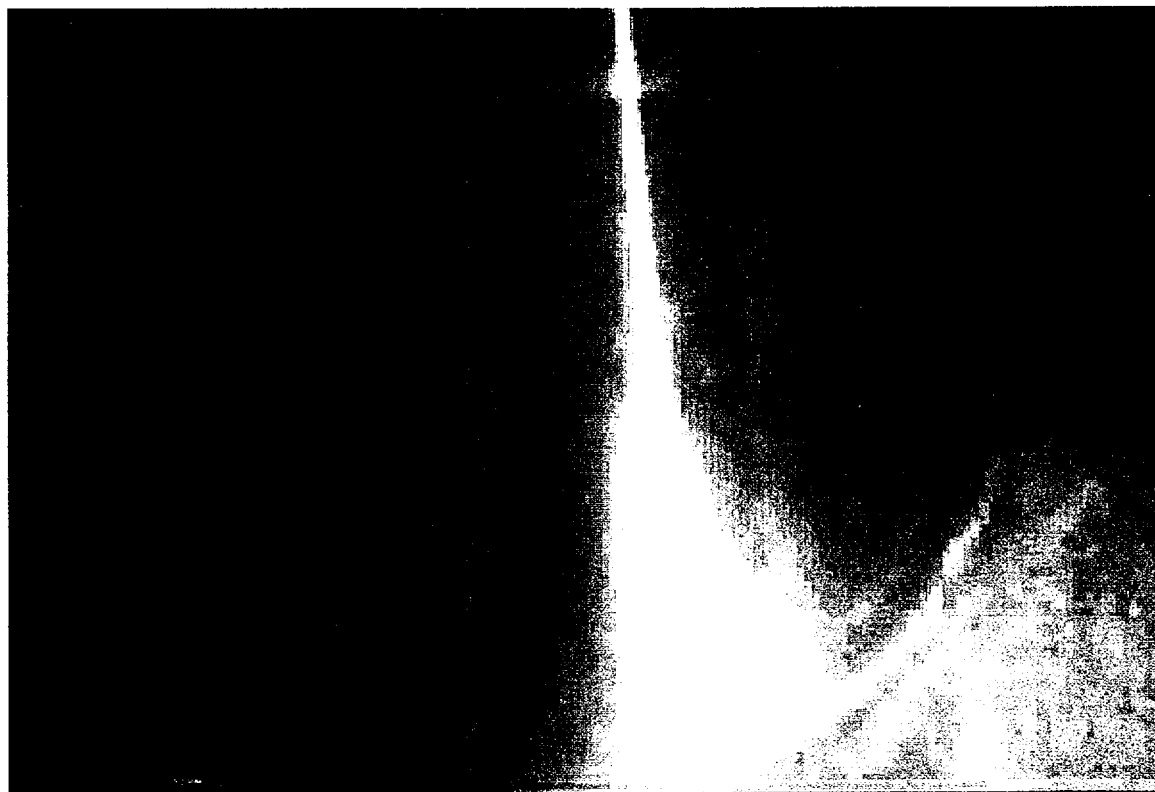
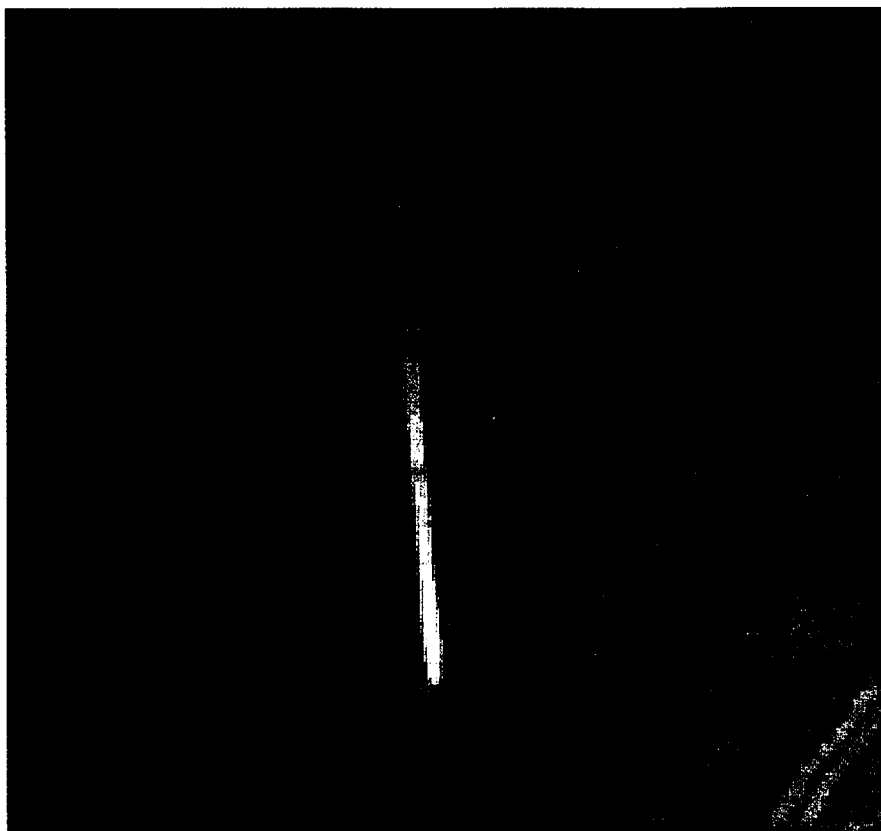
C01

Spring 1996 Inspection

1996 Inspections

The following pictures are representative of the head in the Spring 1996 Outage. The head was relatively clean and afforded a generally good inspection.





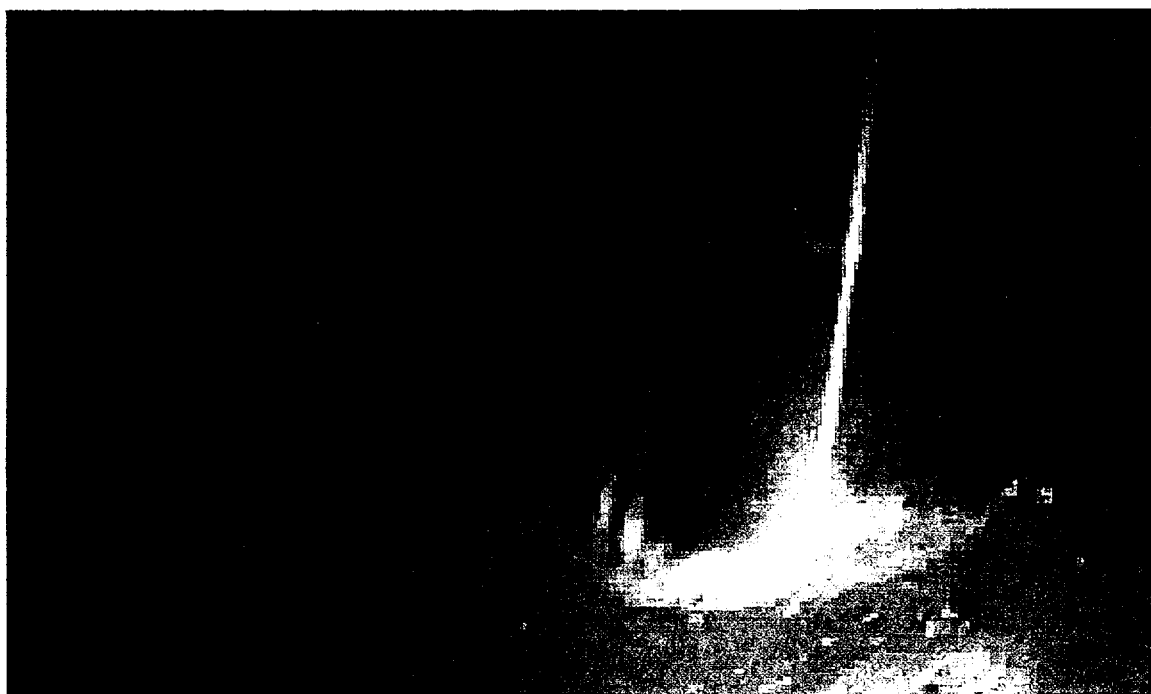
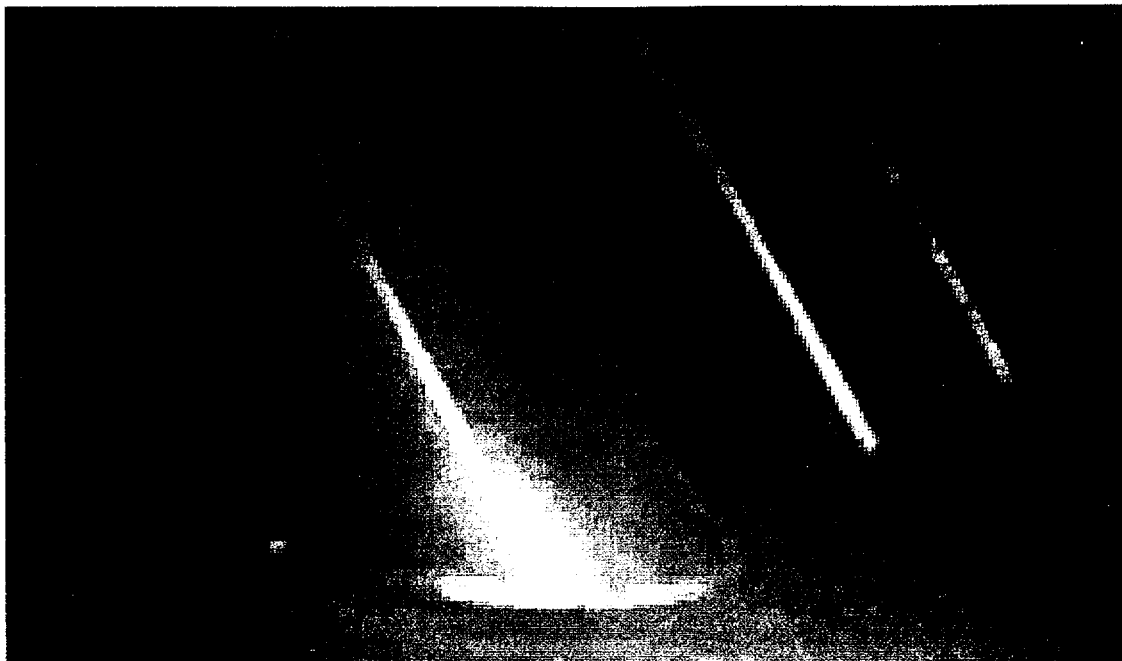


Some boron piles were observed at the top of the head in the vicinity of previous leaking flanges. Because of its location on the head, it could not be removed by mechanical cleaning but was verified to not be active or wet and therefore did not pose a threat to the head from a corrosion standpoint. Additionally, since these drives are not credited with leaking, that further ratifies that the boron is from previous flange leakage. The boron was heaviest beneath the mirror insulation seams.



Hole 2





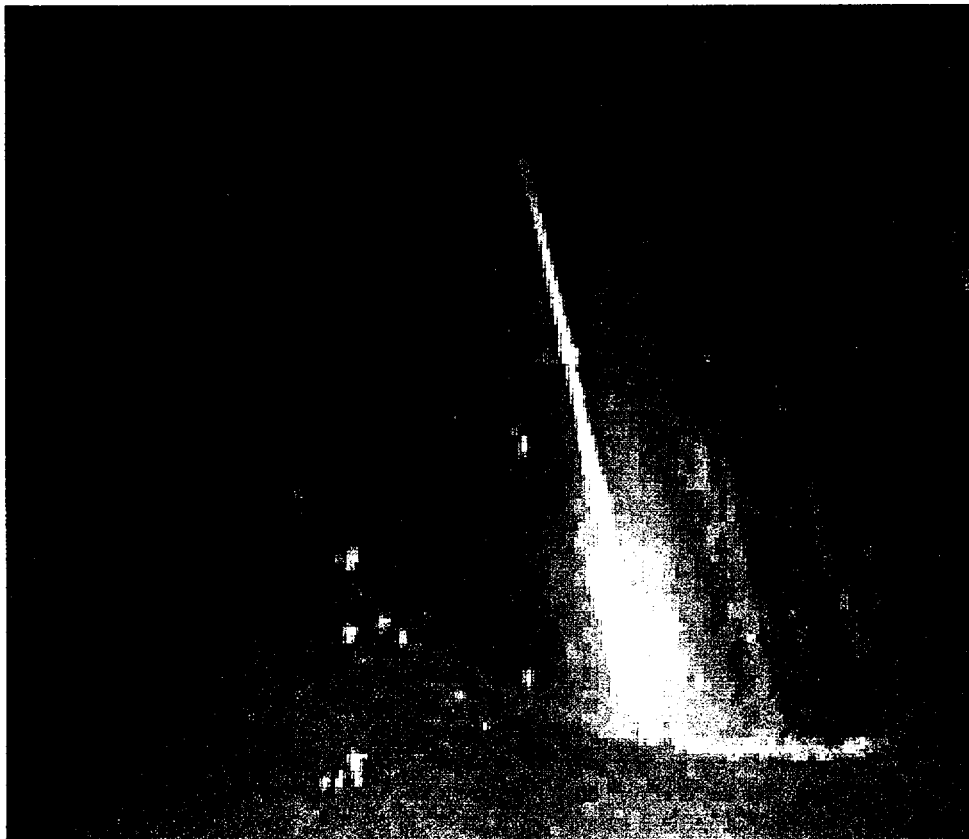
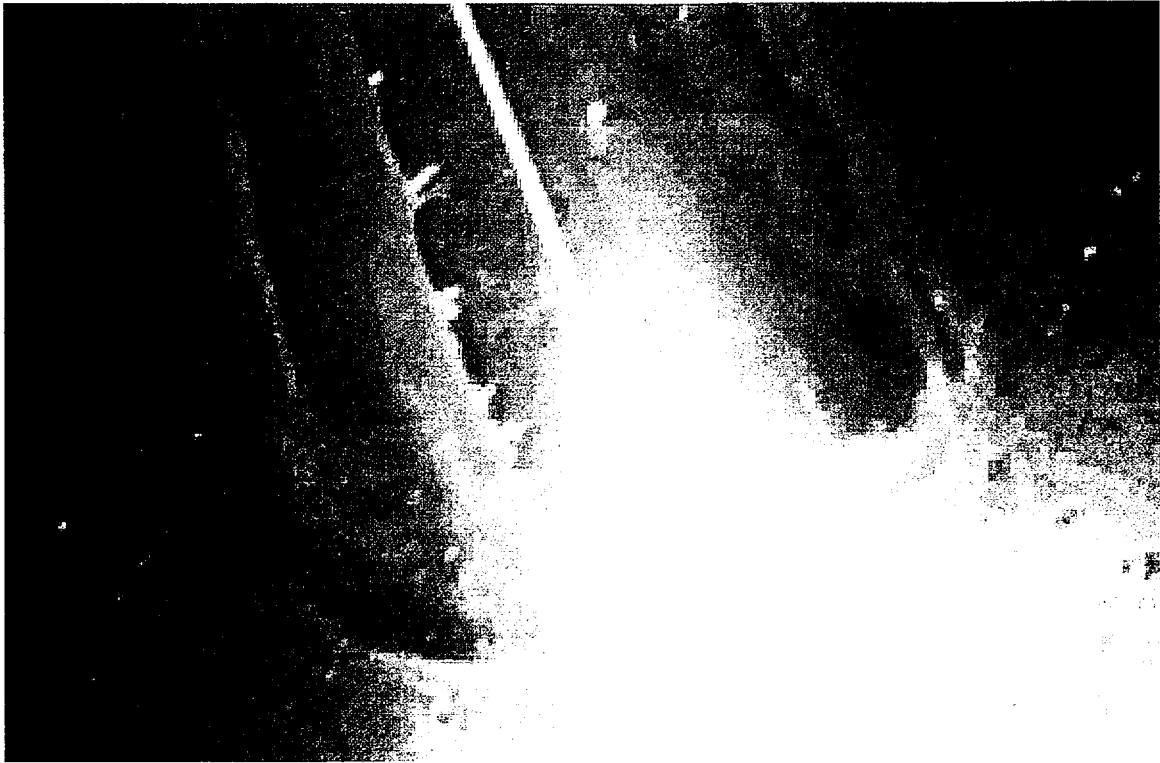




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1996 Inspections

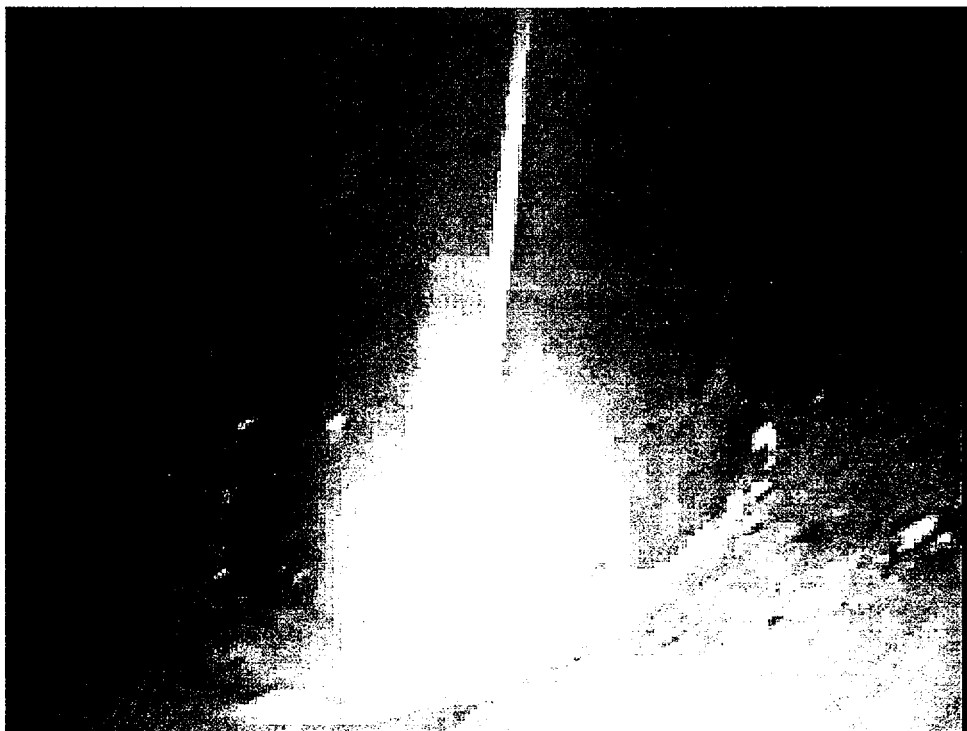
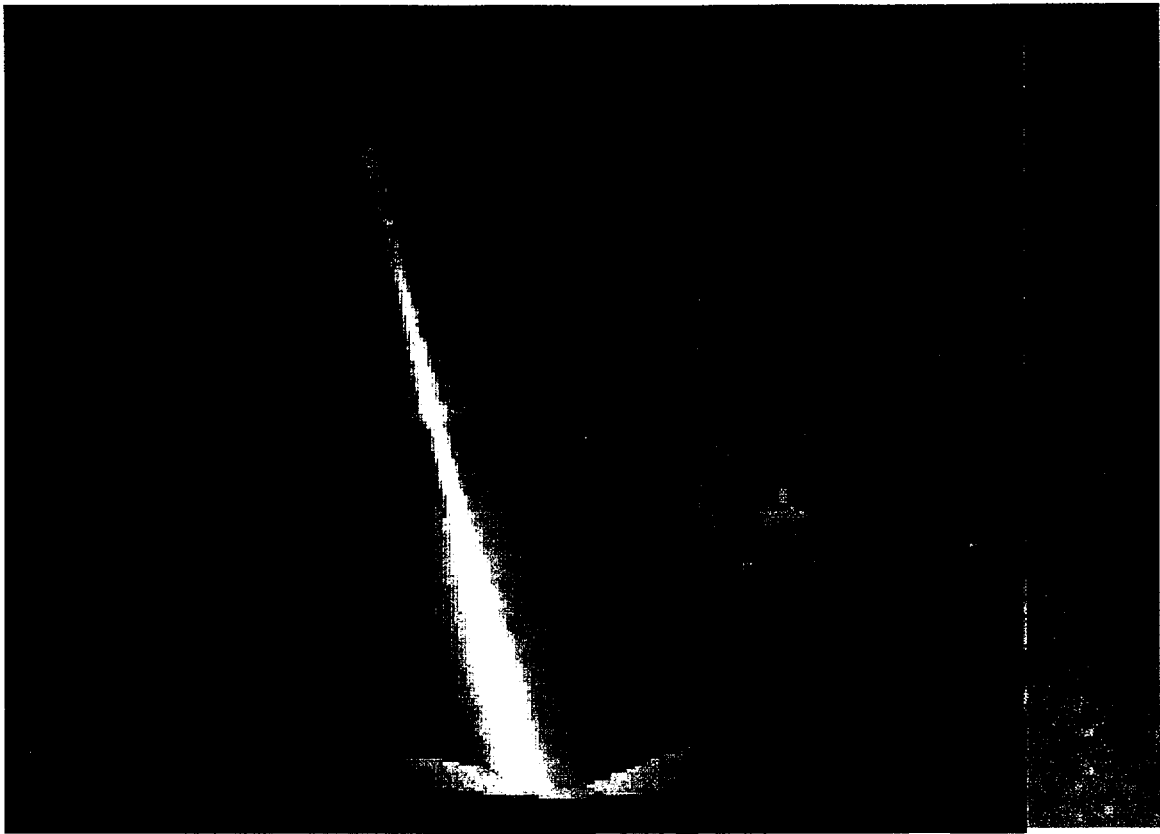
Hole 44-45



FENOC RESTRICTED INFORMATION

1996 Inspections

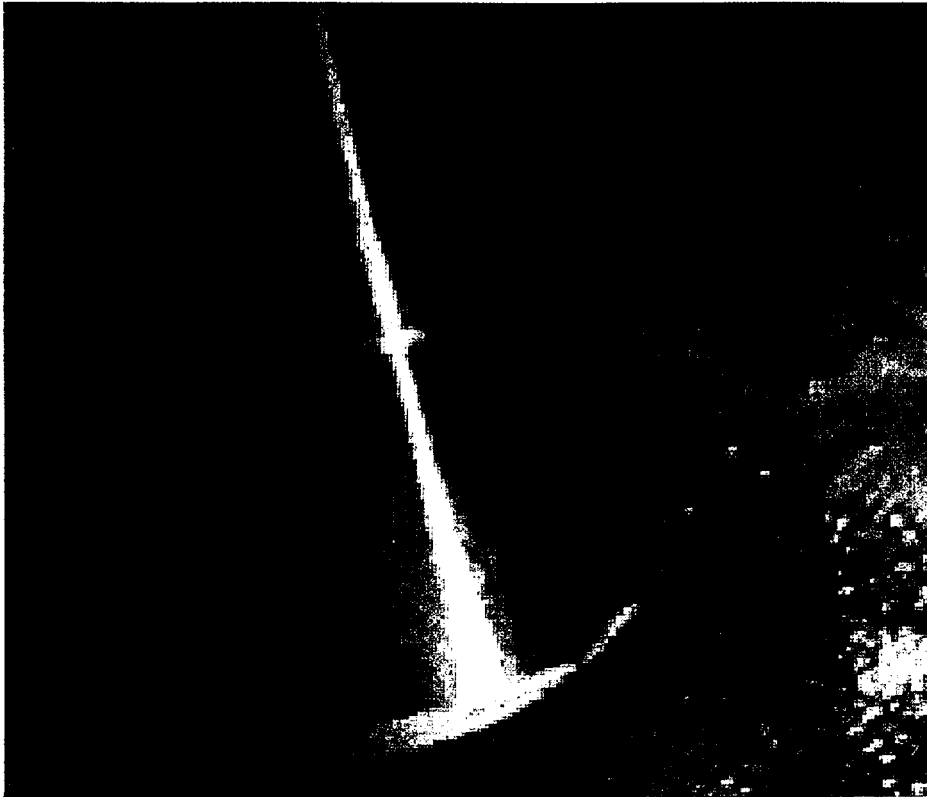
Hole 37-38



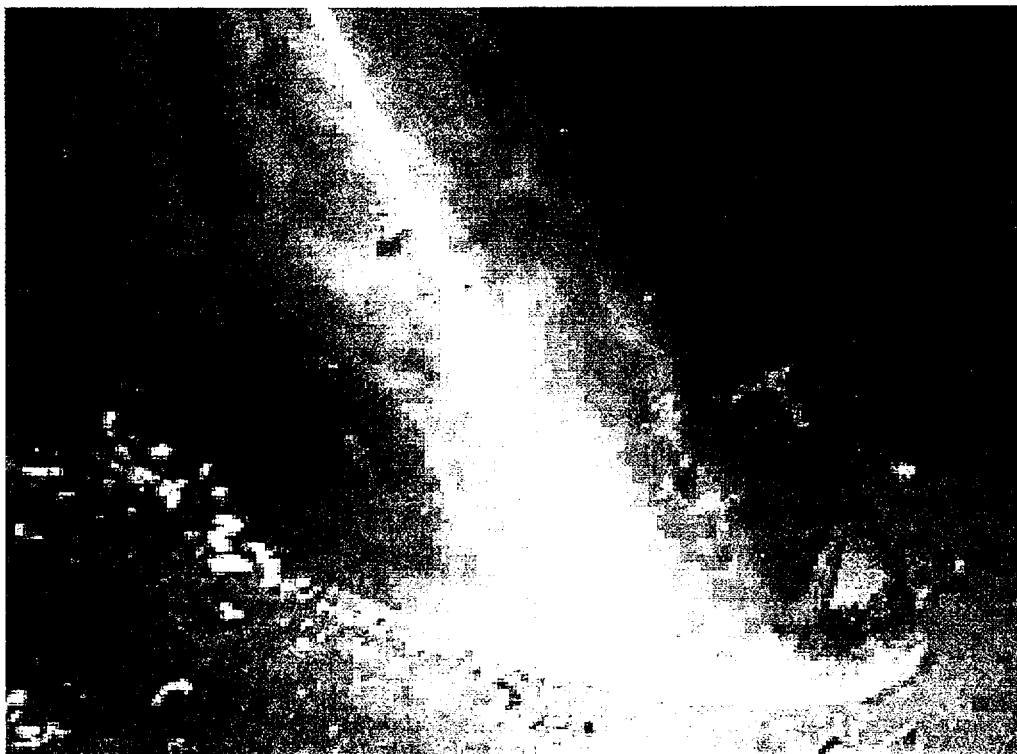
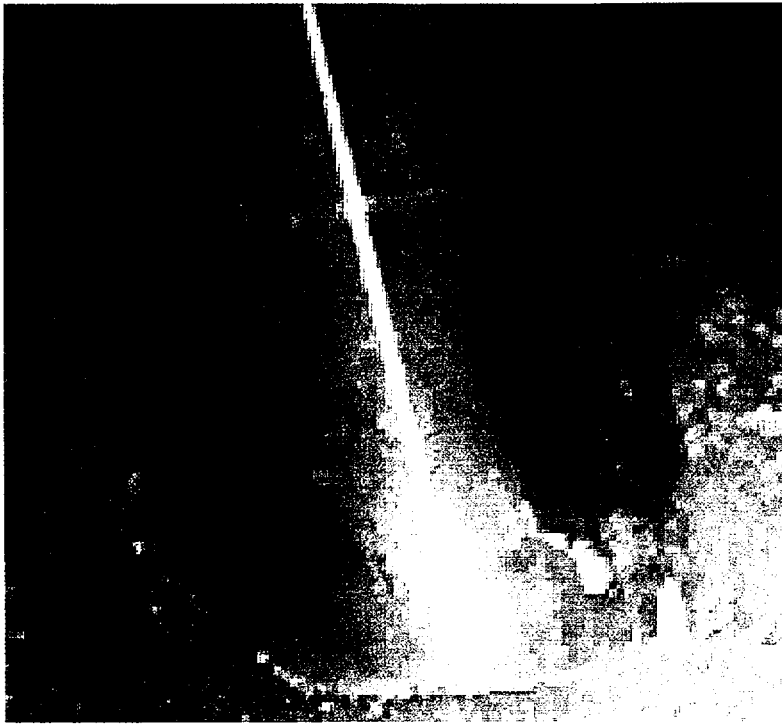
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1996 Inspections

Hole 33-34



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Hole 29-30

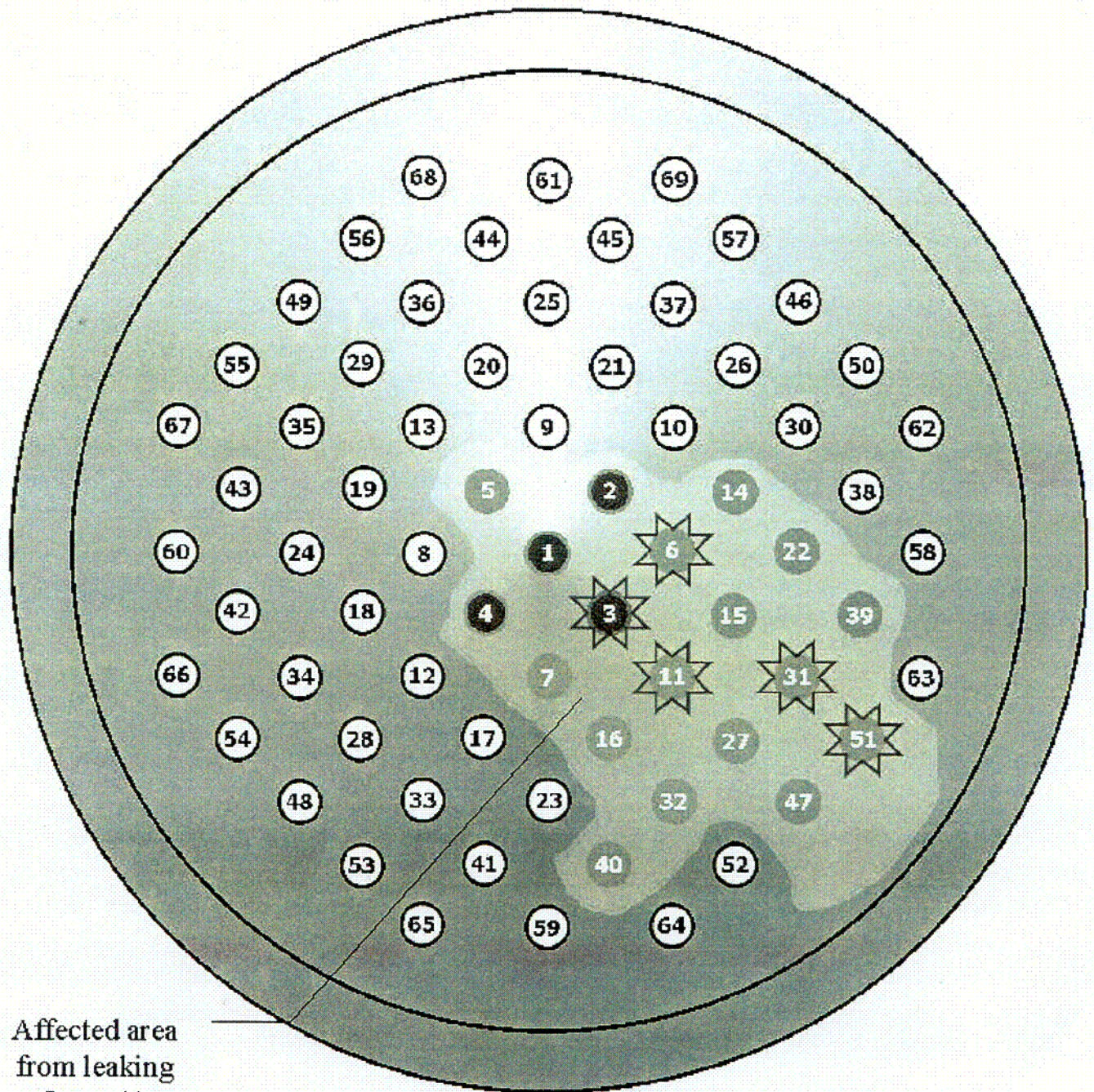


The boron deposits uphill of the CRDM drive below and to the right was reviewed from several angles and definite trails of born could be seen streaming from above the mirror insulation. This coupled with no boron on the bottom (downhill) edge of the CRDM penetration and the fact that boron will grow but not flow uphill allowed us to call this penetration as a non-leaker.



Spring 1998 Inspection

RPV Head 11 RFO Inspection Results



Affected area
from leaking
flange(s)

- ⑥① - No leakage identified
- ④ - Evaluated not to have sufficient gap to exhibit leakage
- ★③ - Insufficient gap with leaking flange
- ⑤ - Nozzle obscured by boron
- ★⑥ - Nozzle obscured by boron with leaking flange

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C02

No.53



NO. 65



The following pictures are from access hole #9. They were clipped from video taken in the Spring of 1998. Although much more boron dusting was present in 1998 than in 1996, a good video inspection was able to be performed for those 50 drives that were not obscured by boron from leaking CRDM flanges. Although much more video can be viewed, these attached pictures are representative of the condition of the drives and the heads. We attempted to capture in still photographs all of the outer most drives since they are the most susceptible to circumferential cracking based upon finite element analysis which showed them to have the highest stresses on the uphill and downhill slopes of the penetration.

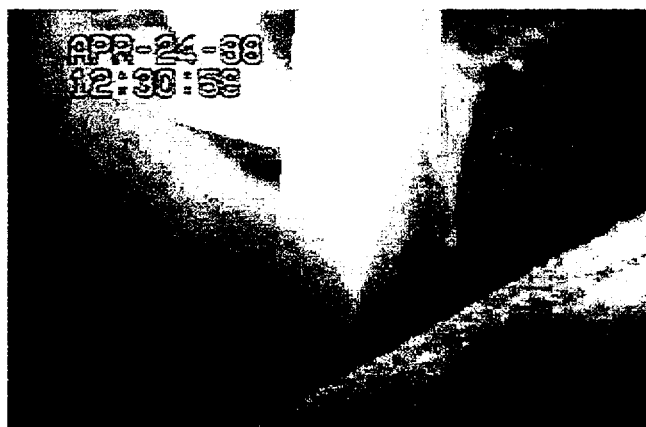
What can also be seen in many of the photos is the staining of the underside of the mirror insulation by boron trails. This corresponds to the boron found on top of the mirror insulation in the vicinity of the leaking CRDM flanges.



No. 41



No. 33



No.48

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No. 65

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The two pictures to the left are examples of some drives where we had to view them from several angles to ascertain that the boron adjacent to the drives was actually boron that flowed or tumbled down from higher up on the head and came to rest against the uphill side of the CRDM nozzle. Sometimes this was ascertained by comparing the pictures at the left to video of the vacuuming that was performed later which showed the boron to very loose and not a crystalline mass. Additionally, there were no boron deposits on the downhill penetration seam, which is contrary, to what industry experience has shown us to be true at plants that have identified leakers. Because of the tight tolerances of the penetrations, any leakage through the penetration will encircle the drive with the largest accumulation being on the downhill edge because of gravity flow to that location.



No. 69



No. 62



No. 38

Note the loose boron clumps to the left which were not in the immediate vicinity of the nozzle penetrations. These clumps appeared to have accumulated further up on the head and then rolled or tumbled to their resting spots as shown. Note also the boron traces around the mirror insulation penetrations.



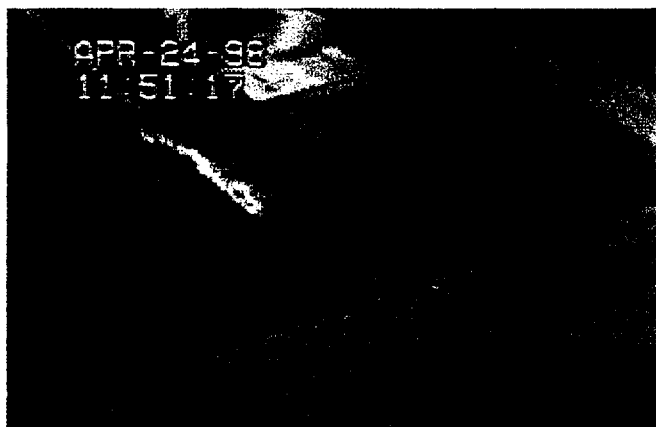
No. 50



No. 58



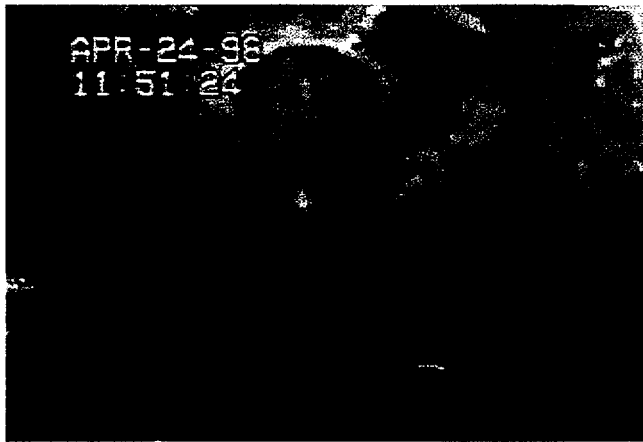
No. 63



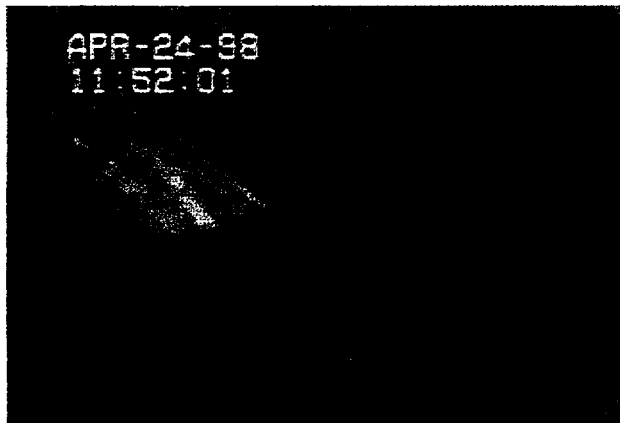
No.35



No. 42



No. 13



No. 43



No. 60

FENOC RESTRICTED INFORMATION



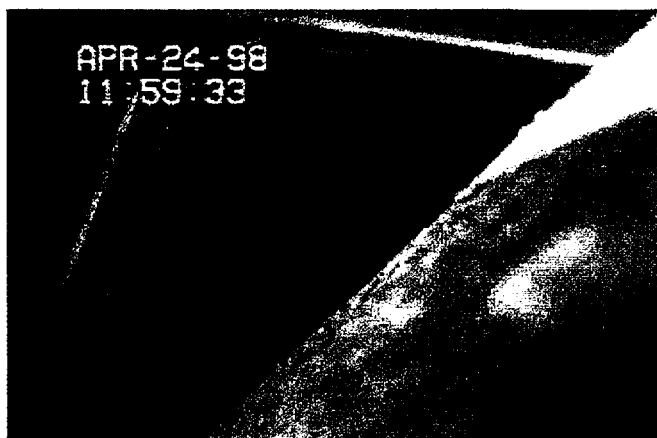
No. 24



No.43



No. 67



No. 48, 54, 66



No. 67

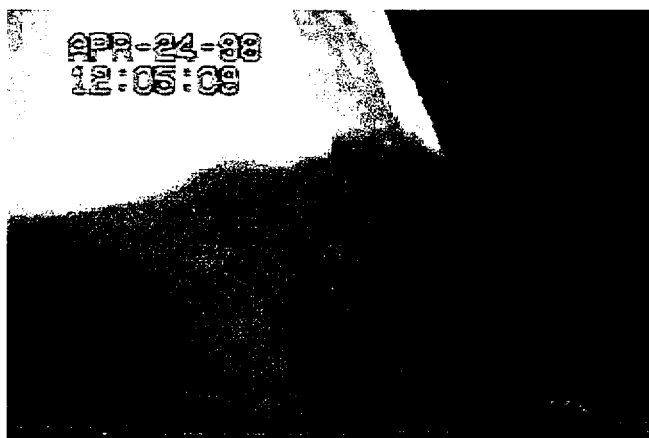


CRDM Penetrations as viewed from
inspection opening #7

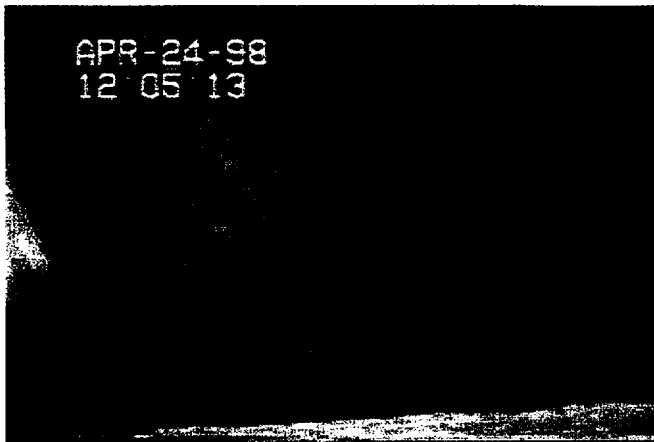
No. 56



No. 29



No49 side



No. 55



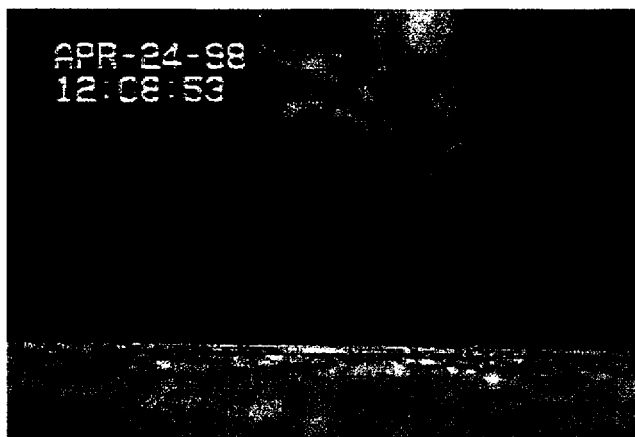
No. 49 front



No.36



No. 68



No. 44



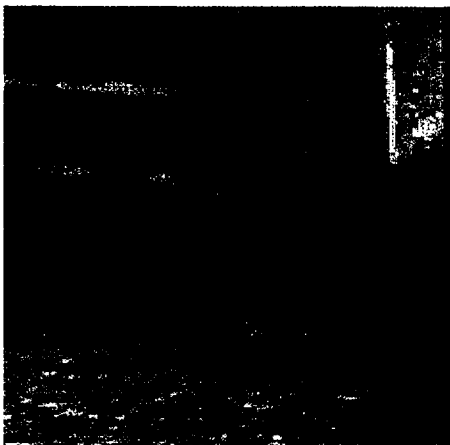
No. 61



No. 25



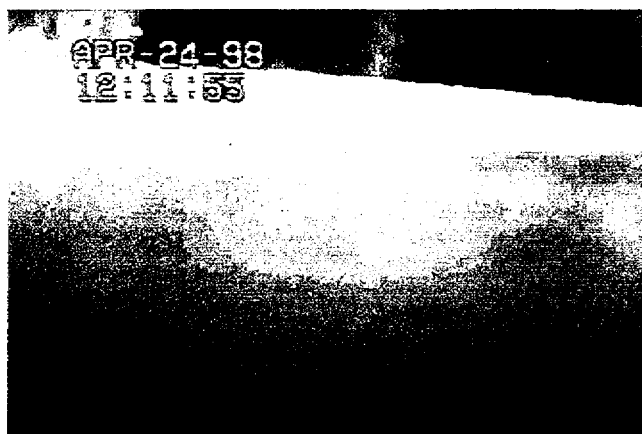
No. 61



No. 25



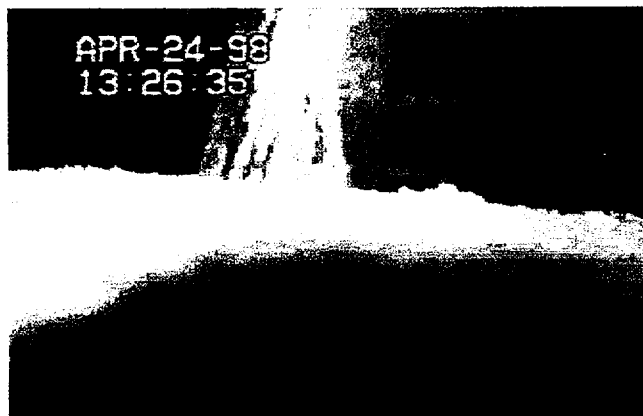
No. 68



No. 69 and No. 45 in the middle on the back



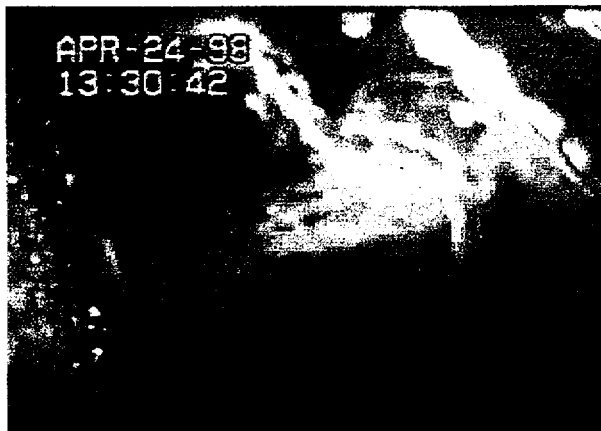
No. 57



No. 46



No. 57



No. 37



No. 26



No. 48

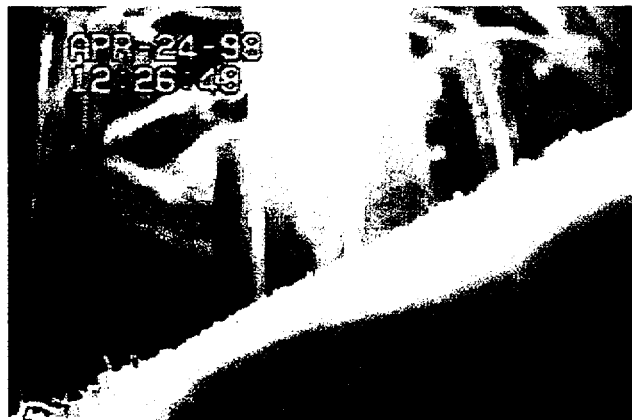
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No. 34



Same as above No. 34 on the right



No. 28



No. 48



No. 66



No. 18



No. 59



No. 59



No. 52



No. 59

Spring 2000 Inspection

Affected area from leaking

- ④ - No leakage identified
- ④ - Evaluated not to have sufficient gap to exhibit leakage
- ③ - Insufficient gap with leaking flange
- ⑤ - Nozzle obscured by boron
- ⑥ - Nozzle obscured by boron with leaking flange

C03



No. 67



No. 43



No. 35

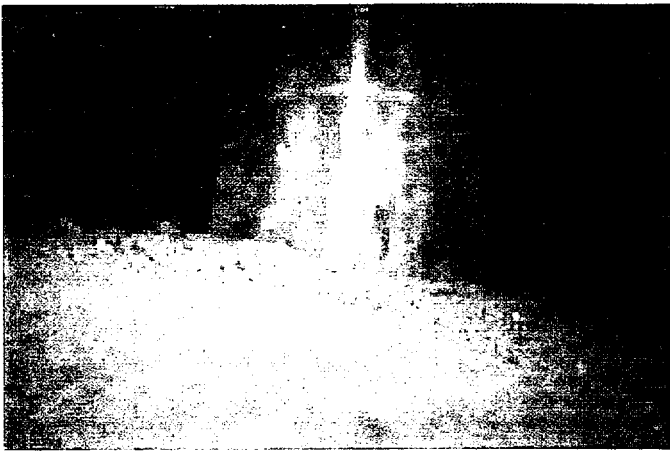
These photos were taken from our 2000 spring outage videotapes.

The lighting and video camera optics created an orange coloration of all of the pictures. However, deposits of boron are visually discernable as shown by the scattered pieces of boron.

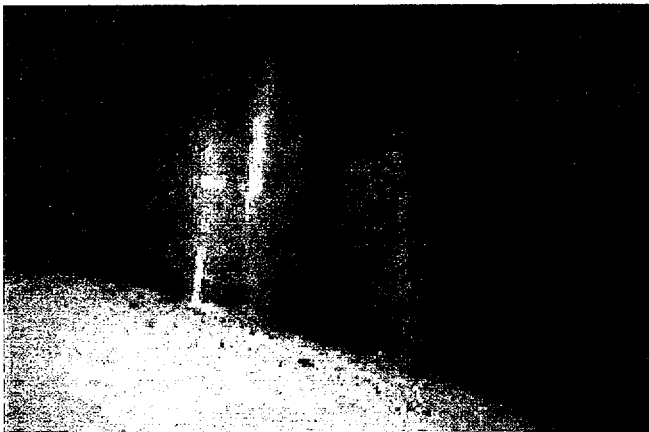
No 67 has no buildup around its penetration and the boron debris shown in the picture for No. 43 are scattered well away from the penetration.

These drives were video taped because they had boron deposits in the vicinity of the CRDMs. Completely clean drive penetrations are not depicted here.

The photo for No. 19 depicts in the background the extent of boron buildup on the head and is the reason no credit is taken for being able to visually inspect the remainder of the drives.



No. 60

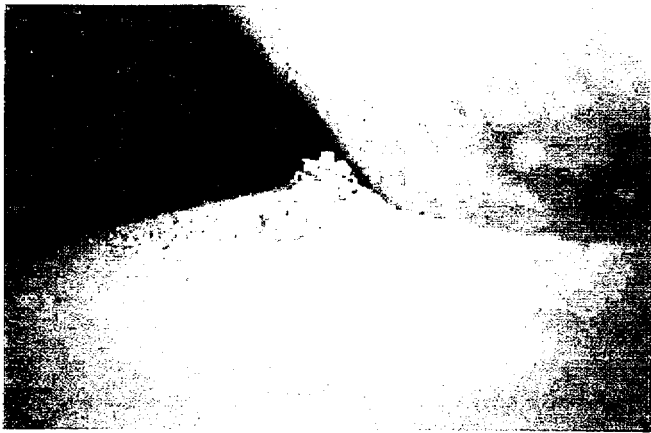


No. 24



No. 19

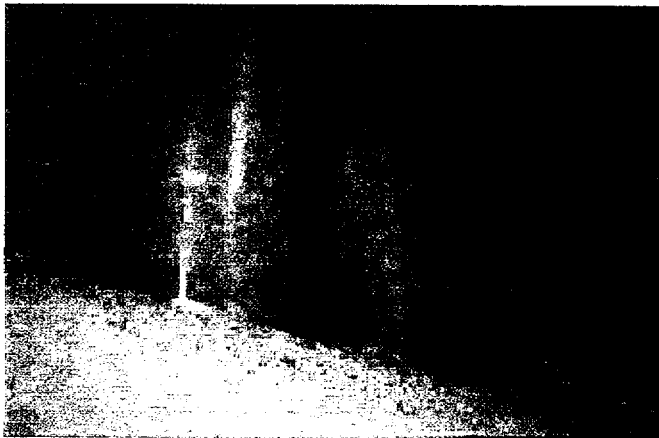
The debris piled up against the uphill side of No. 66 on the next page is indicative of loose debris that has fallen down the slope of the head and came to rest on the drive. It does not resemble "popcorn" deposits witnessed at other plants. There were also no signs of boron anywhere else on the drive penetration opening.



No. 66



No. 66

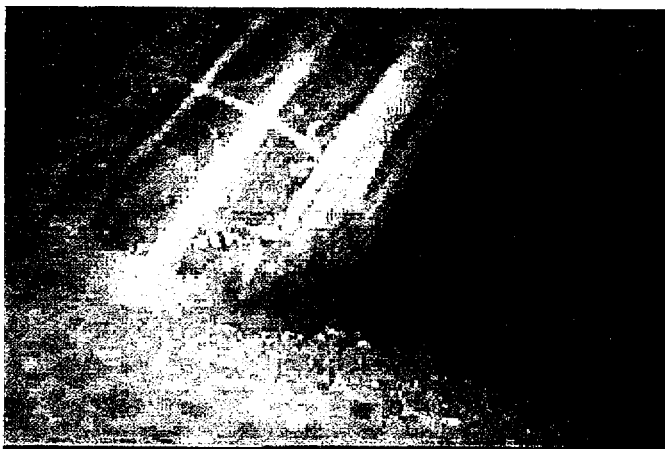


No. 42



No. 19

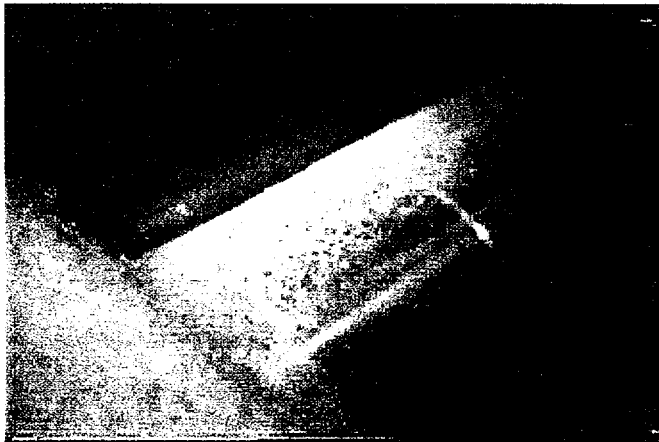
No. 24



No. 35



No. 35



No. 55



No. 29