THREE MILE ISLAND NUCLEAR STATION
UNIT 1

REACTOR CONTAINMENT BUILDING
RING GIRDER SURVEILLANCE TEST
TWO YEARS AFTER S.I.T.

September 17, 1976

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METROPOLITAN EDISON COMPANY
Subsidiary of General Public Utilities, Corp.

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1.0 SYNOPSIS

The Three Mile Island Nuclear Station Unit 1 (TMI-1) ring girder section of the reactor building was subjected to a surveillance test during the period from April 21, 1976 through July 2, 1976. The purpose of this test was to demonstrate continued confidence in ring girder construction and repair, in accordance with TMI-1 Technical Specification 4.4.2.2., two years after the Structural Integrity Test (S.I.T.).

The stresses in those reinforcing bars being monitored by strain gages do not exceed the allowable tensile stress and have not changed appreciably since the last test.

None of the observed concrete cracks are greater than 0.009 inch wide and most are less than 0.005 inch wide. However, seven concrete voids have been found adjacent to reactor building dome tendon bearing plates. These voids occurred during the pouring of the concrete, and although previous surveillances were performed, the voids were discovered after the one year surveillance test.

Collection of data from the reinforcing bar strain gages and inspection of the concrete cracks and voids was performed by Metropolitan Edison Company.

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2.0 INTRODUCTION

The objective of the ringer girder surveillance test was to establish the stress in selected reinforcing bars in the ring girder, to

inspect the crack patterns in selected white wash areas on the ring girder, to inspect for cracks in the concrete around all of the dome tendon bearing plates, and to inspect for gaps between bearing plates and adjoining concrete. Information was obtained during the test to be compared with similar information collected during the prestressing operation and the Structural Integrity Test and to form base information for future tests. The test was performed as the third inspection -two years after the Structural Integrity Test.

Testing was performed in accordance with procedural requirements as set forth in Reference 1.

Results of prior ring girder surveillance tests during prestressing are contained in Reference 2, those during the S.I.T. are in Reference 3, those six months after S.I.T. are in Reference 4, and those one year after S.I.T. in Reference 5.

This present surveillance test conforms with the commitments of the "Report on Containment Ring Girder Construction and Repair, and its subsequent addenda, originally filed December 3, 1971 with the Directorate of Licensing of the United States Atomic Energy Commission and complies with the requirements of TMI-1 Technical Specification 4.4.2.2.

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3.0 ACCEPTANCE CRITERIA AND CONCLUSIONS

3.1 ACCEPTANCE CRITERIA

Acceptance criteria established prior to the test and specified by the TMI-1 Technical Specification 4.4.2.2 and the TMI-1 Surveillance Test (Reference 1) are:

a. The difference or deviation between reinforcing bar stresses, for the same strain gage, shall not exceed ± 11,500 psi when a comparison is made between the current readings and the data obtained immediately after full prestress. Any deviations in reinforcing bar stresses which exceed the acceptance criterion shall be reported to the Station/Unit Superintendent for evaluation and resolution.

b. Any crack width greater than 0.010 inch in the four 6 ft x 12 ft whitewash areas shall be reported to the Station/Unit Superintendent for evaluation and resolution.

c. Any crack width greater than 0.010 inch in the concrete around all dome tendon bearing plates shall be reported to the Station/Unit Superintendent for evaluation and resolution.

3.2 CONCLUSIONS

Data collected during the present test substantiates that the ring girder is fulfilling its design function.

a. Deviation between reinforcing bar stresses, for the same strain gage, does not exceed ± 11,500 psi and is acceptable. The largest deviation, for the same strain gage, is-3000 psi. For a "sister bar" strain gage the largest deviation is-8500 psi.

b. Cracks in the concrete surface in the four whitewash areas at azimuths 20, 175, 320, and 350 degrees are all less than 0.010 inch wide and are acceptable. None of the cracks observed are greater than 0.009inch wide, and most are less than 0.005 inch wide.

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c. Cracks in the concrete surface around all accessible dome tendon bearing plates, with the exception of the concrete voids, are less than 0.005 inch wide which is less than the acceptance criteria of 0.010 inch and is acceptable.

d. The Seven Concrete voids were reported to the unit superintendent for evaluation, upon discovery. The seven voids were evaluated, and it was found that they did not decrease the safety factor to which the plant was built. Immediate filling of the voids is not considered to be necessary, however, they will be filled as soon as practicable.

4.0 TEST PROCEDURE

4.1 STRAIN GAGE READINGS AROUND RING GIRDER

Strain measurements were made at fourteen locations on both hoop and vertical reinforcing bars (see Figure 1). Readings were also taken on the "sister bars" in accord with Reference 1, Section 6.3.1.1.

For detailed account of the procedure see Appendix II of Reference 4. Table 2 presents Strain Gage Data.

Stresses (Table 1) have been computed using the formula:

$$\sigma = E \times \varepsilon$$

where

σ = Stress (psi)

E = Modulus of Elasticity (29×10^6 psi)

ε = Strain (in/in). The strain listed in Table 2 is micro-strain, of that value times 10^{-6} (i. e., microstrain listed as $66 = 10^{-6}$ in/in).

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Portable strain indicator, BHL Model 120C, was used to measure strain. A General Radio Megohm Bridge Model GR-1644A was used for ground readings. External temperature readings were taken with an Amprobe Fastemp Temperature Indicator Model T151.

4.2 VISUAL INSPECTION FOR CRACKS AND GAPS IN CONCRETE

An optical comparator was used to measure the cracks in the concrete. Only those cracks 0.005 inch wide, or larger, were measured to be recorded. All visible gaps between bearing plates and the adjoining concrete are noted on the data sheets.

4.2.1 Crack Patterns in Selected Whitewash Areas

During the previous tests the four 6 ft x 12 ft areas between elevations 439 ft and 451 ft and centered on azimuths 20, 175, 320, and 350 degrees, had been whitewashed and plotted in a 1-foot grid. For the purposes of the present test no new whitewash was applied. All presently visible cracks were measured and charted on appropriate data sheets (see Figures 2, 3, 4 and 5).

The number of cracks between 0.005 and 0.009 inch wide was compared with information collected during the prestressing operation, Structural Integrity Test, Ring Girder Surveillance Test six months After S.I.T., and Ring Girder Surveillance Test One Year After S.I.T.

4.2.2 Cracks and Voids in Concrete Around Dome Tendon Bearing Plates

All of the visible cracks around the accessible dome tendon bearing plates were visually inspected, and a description of their location, direction, and size was entered on a data sheet (see Tables 3, 4, 5 and 6). The concrete voids which were found were also inspected and evaluated in order to ascertain the structural integrity of the building.

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5.0 DISCUSSION OF RESULTS

5.1 RESULT OF STRAIN GAGE READINGS

As theorized in Reference 1, Section 6.3.1.1, some of the strain gages have become inoperable, or have questionable readings. On the main bars, of the 23 functioning strain gages at full prestress, 8 have meaningful readings for this test. "Sister bar" data was used for calculating the stress in nine reinforcing bars, as noted in Table 1, giving meaningful readings for approximately 74% of the original 23 functioning gages. This indicates that less information will be available in future tests.

Stress values selected for Table 1 were based on ground readings from Table 2 and Reference 3, Appendix I, Table I. None of the deviations in stress between this test and after full prestress is greater than ± 8,500 psi. By deleting the data for the "sister bar", the largest deviation is +2600 psi,-3000 psi. This data is well within the acceptance criterion of ± 11,500 psi.

5.2 RESULTS OF CRACK INSPECTION IN WHITEWASH AREAS

None of the cracks observed in the whitewash areas of the ring girder are greater than 0.009 inch wide. Most are less than 0.005 inch wide. The cracks are random in pattern and characteristic of shrinkage cracks with the lack of any stress cracking.

Comparing the plotted cracks in Figures 2, 3 4, and 5 with those plotted for the One Year After S.I.T. test, the following comments apply:

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Area No.	Comments
120 (Fig. 2)	8 Additional cracks and 3 crack extensions between Elev. 439 ft and 451 ft, total length approximately 44. inches. One old crack has decreased in width to less than .005 inch.
131 (Fig. 3)	2 additional cracks between Elev. 439 ft. and 451 ft., total length approximately 10 inches.
132 (Fig. 4)	8 additional cracks and 1 crack extension between Elev. 439 ft and 451 ft, total length approximately 37 inches. One Old crack has decreased in width to less than .005 inch.
133 (Fig. 5)	19 additional cracks and 6 crack extensions between elev. 439 ft and 451 ft, total length approximately 50 inches. One old crack has decreased in width to less than .005 inch.

(Section 5.3 discusses cracks around dome tendon bearing plates.)

The additional cracks represent approximately a 4% increase in hairline cracking of the white-washed areas. New cracks are less than 0.005 inch wide.

For this test, the quantity of cracks in the range of 0.005 to 0.009 inch has decreased as shown in the following table:

Period	No. Cracks 0.005" to 0.009"
After Full Prestress	0
S.I.T. - 30 psi	0
S.I.T. - 63.3 psi	3
S.I.T. - Depressurized to 0 psi	0
Six months After S.I.T.	9
One Year After S.I.T.	6
Two Years After S.I.T.	3

These surface shrinkage cracks are less than 0.010 inch and do not impair the ability of the concrete to function as intended in the design.

5.3 RESULT OF CRACK AND VOID INSPECTION AROUND DOME TENDON BEARING PLATES

The cracks observed in the concrete surface around the accessible dome tendon bearing plates are less than 0.005 inch wide. Tables 3, 4, 5, and 6 give the locations of these cracks.

As is characteristic of shrinkage cracks, these cracks are random in location with respect to the tendon and lack stress cracking.

The previous tests inspected the area around the dome tendon bearing plates and no cracks were noted over 0.005 inch wide, except for one case described in Reference 4, Section 5.3 (Tendon D-303, southeast quadrant).

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Cracks exist in the concrete of 179 dome tendon bearing areas. During the One Year After S.I.T. test, 124 areas had cracks. In the

284 observed areas, there are 19.4% more dome tendon bearing areas with cracks at the end of this inspection period. As previously noted, these are less than 0.005 inch wide and characteristic of shrinkage cracks.

Of the seven concrete voids (shown in Figures 6-12), Void #7 on the tendon bearing plate D-141 in the Southwest Quadrant is the largest in terms of area of exposed backing. The void entrance is located at the bottom of tendon D-141-SW bearing plate and is approximately 1 inch wide by 1/2 inch high. Average depth of the void is approximately 4 inches; maximum measured depth, 5 inches; average height, approximately 1-1/2 inches; maximum width, 10-1/4 inches. Volume of the void is approximately 0.03 ft^3. Approximately 6 in^2 (approximately 3/4 by 8 miches) of bearing area behind the bearing plate is lost due to the void. Figure 12 is a sketch of the void.

Section 1.0 of Addendum 1 to "Report on Containment Building Ring Girder Construction and Repair" (Reference 6) states the following regarding prestressing and structural integrity testing:

> "Initial prestressing and structural integrity test pressure place the ring girder under the most severe load conditions normally expected and therefore will provide clear indication of the effects of repair on the ring girder behavior."

Initial prestressing stressed the tendon to 80 percent of guaranteed ultimate tensile strength (GUTS) prior to lockoff at 70 percent of GUTS. During the structural integrity test (SIT), the internal pressure of the containment structure was raised to 63.3 psig. Tendon D-115 has experienced initial prestressing and SIT loads with no sign of structural distress.

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The TMI-1 Final Safety Analysis Report (FSAR), Reference 7, states that the calculated ration of allowable to actual bearing stress is 1.08 at 70 percent of GUTS (1394 kips, tendon force). Due to the expected losses in tendon force, the present tendon force is approximately 1260 kips.

Considering the loss of bearing area, described, and the reduced tendon force, the ratio of allowable to actual bearing stress was calculated to be 1.17. This ratio indicates a nine percent increase in the margin above the code allowable bearing stress. During the life of the plant, tendon force will continue to decrease, resulting in a corresponding increase in the safety factor.

6.0 PROBLEM AREAS AND DEFICIENCIES

The following problem areas and deficiencies were encountered during the surveillance test.

a. Ten (10) dome tendon bearing areas are blocked from inspection by the vent stack at buttress no. 5, and therefore cannot be inspected for cracks, Therefore, 97% of the 294 dome tendon bearing areas were inspected for concrete cracks, which provides a good representation of all bearing areas. This has been noted in Reference 4.

b. Strain gage readings from seventeen (17) main reinforcing bars are questionable due to low ground values. The "sister bar" is still available for nine of these. This indicates an inaccurate ground

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reading or an electrical short in the leads and/or strain gages. As stated in Met-Ed's letter of May 31, 1972 to Mr. A. Giambusso, Directorate of Licensing, U. S. Atomic Energy Commission, "It should be pointed out that every effort will be made to read the strain gages; however, we have no guarantee that the gages will continue to operate throughout the duration of the program." This has been noted in Reference 4.

7.0 REFERENCES

1. Metropolitan Edison Co., "Ring Girder Surveillance Program", TMI Surveillance Test No. 1303-8.2, December 1973.
2. Metropolitan Edison Co., "TMI-1 Reactor Building Ring Girder Surveillance Report", November 12, 1973.
3. Gilbert Associates, Inc., "TMI-1 Reactor Containment Building Structural Integrity Test", Report No. 1838, Metropolitan Edison Co., June 15, 1974.
4. Gilbert Associates, Inc., "Reactor Containment Building Ring Girder Surveillance Test Six Months After S.I.T." Report No. 1855, Metropolitan Edison Co., November 8, 1974.
5. Gilbert Associates Inc. "Reactor Containment Building Ring Girder Surveillance Test One Year After S.I.T." Report No. 1872, Metropolitan Edison Co., July 9, 1975.
6. "Report on Containment Buildi-g Ring Girder Construction and Repair, TMI-1", Addendum 1, Metropolitan Edison Company, January 21, 1972.
7. Three Mile Island Nuclear Station, Unit 1 Final Safety Analysis Report, Docket No. 50-289, Metropolitan Edison Co.

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Reactor Building

Ring Girder Reinforcing Bar Stresses (KSI)

Strain Gage Location	Elevation	Azimuth	Full Vertical	Vertical Plus Full Dome	Column 1 Full Prestress	Column 2 6 Month	Column 3 Deviation Col 2 - Col 1	Column 4 12 Month	Column 5 Deviation Col 4 - Col 1	Column 6 24 Month	Column 7 Deviation Col 6 - Col.	Column 8 36 Month	Column 9 Deviation Col 8 - Col 1	Column 10 at 63.3 psig
Date			6-6-73	7-5-73	9-18-73	10-2-74		6-9-75		7-2-76				3-9-76
			During Prestress			After Acceptance Test								S.I.T.
52 HOOP	435'	108°	0.9	-0.5	4.2	1.9	-2.3	2.8	-1.4	3.5(3,5)	-.7			6.1
52 VERT	435'	108°	6.2	3.8	1.5	2.1(3,5)	0.6	3.1 (3,5)	1.6	-(6)	-			2.8
53 HOOP	435'	245°	0.5	0.6	4.7	-(6)	-	-(6)	-	-(6)	-			5.9
53 VERT	435'	245°	5.7	3.3	0.8	-4.2(3,5)	-5.0	-2.3 (3,5)	-3.1	-4.0(3,5)	-4.8			1.0
54 HOOP	435'	352°	1.3	-0.3	5.7	3.4	-2.3	7.3	1.6	8.3	2.6			7.2
54 VERT	435'	352°	7.3	4.4(3,5)	1.6(3,5)	-	-	-	-	2.0(3,5)	+.4			-
55 HOOP	440'	108°	-0.1	1.1	3.2	-(6)	-	-(6)	-	(6)	-			3.7
55 VERT	440'	108°	1.0	0.0	-0.6	-2.1	-1.5	-4.1 (3,5)	3.5	-4.4(3,5)	-3.8			-1.0
56 HOOP	440'	245°	-0.1	1.0	4.0	-0.6	-4.6	5.7 (7)	1.7	3.4	-.6			4.3
56 VERT	440'	245°	0.5	-0.5	-5.1	-11.0(3,5)	-5.9	-11.7 (3,5)	-6.6	-13.6(3,5)	-8.5			-5.9
57 HOOP	440'	352°	1.4	-1.4	3.9	-2.5(3,5)	-6.4	5.9 (7)	2.0	4.5(3,5)	.6			4.8
57 VERT	440'	352°	-.1(3,5)	.5(3,5)	-1.0(3,5)	-	-	-	-	(6)	-			-
58 HOOP	446'	108°	-	-	-	-	-	-	-	-	-			-
58 VERT	446'	108°	3.8	4.8	4.7	4.6	-0.1	7.7	3.0	7.0	2.4			5.0
59 HOOP	446'	245°	0.4	2.6	4.4	1.8	-2.6	4.5	0.1	3.3	-1.1			-
59 VERT	446'	245°	-0.8	2.5	1.9	0.5	-1.4	9.7 (3,5)	7.8	.2(3,5)	-1.7			1.1
60 HOOP	446'	352°	-0.4	1.9	4.4	-(6)	-	-(6)	-	-(6)	-			3.8
60 VERT	446'	352°	4.2	5.4	5.1	-(6)	-	-(6)	-	-(6)	-			4.9
129 HOOP	446'	80°	-	-	-	-	-	-	-	-	-			-
129 VERT	446'	80°	1.2	2.7	3.8	-(6)	-	-(6)	-	-(6)	-			3.7
130 HOOP	446'	320°	0.1	2.3	5.0	2 2	-2.[illegible]	3.6(7)	-1.4	-(6)	-			4.6
130 VERT	446'	320°	0.3	2.7	3.0	0 0	-3.0	2.1	-0.9	-(6)	-			2.9
61 HOOP	452'	108°	0.0	2.3	2.4	1 2	-1.[illegible]	0.3	-2.3	.8	-1.8			2.7
61 VERT	452'	108°	1.6	1.4	1.9	2 2	0.[illegible]	2.1	0.2	1.6	-.3			1.7
62 HOOP	452'	245°	0.1	1.9	2.4(3,5)	-	-	-	-	1.2(3,5)	-1.2			-
62 VERT	452'	245°	4.2	3.6	3.[illegible]	5 0	1.[illegible]	5.2	1.5	.7	-3.0			4.5
63 HOOP	452'	352°	0.0	2.3	2.[illegible]	0 6	-2.[illegible]	2.5	-0.3	2.0	-.8			2.9
63 VERT	452'	352°	2.3	2.5	3.[illegible]	3 7	0.[illegible]	3.0	-0.1	10.7(3,5)	7.6			2.0

Sign Convention: + Tension, - Compression

SPECIAL NOTES;

1. Complete information on strain gage readings is given in Table 2.
2. Conversion of strain to stress assumes E steel = 29,000,000 psi.
3. Stress for "sister bar".
4. S.I.T. determined this gage was not operating. (See Table 2).
5. Unuseable reading for main bar due to low ground reading or inoperable gage.
6. Unuseable reading for both main and "sister" bar due to low ground reading or inoperable gages.
7. Stress for main bar with questionable ground reading.

TABLE 1

POOR ORIGINAL

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TABLE 2

THREE MILE ISLAND UNIT 1
RING GIRDER REINFORCING BAR STRAIN GAGE READINGS, 4/21 - 7/2, 1976
(ADJUSTED FOR THE INITIAL ZERO TO THE PRIOR-TO-PRESTRESS CONDITIONS OF MAY 13, 1973)

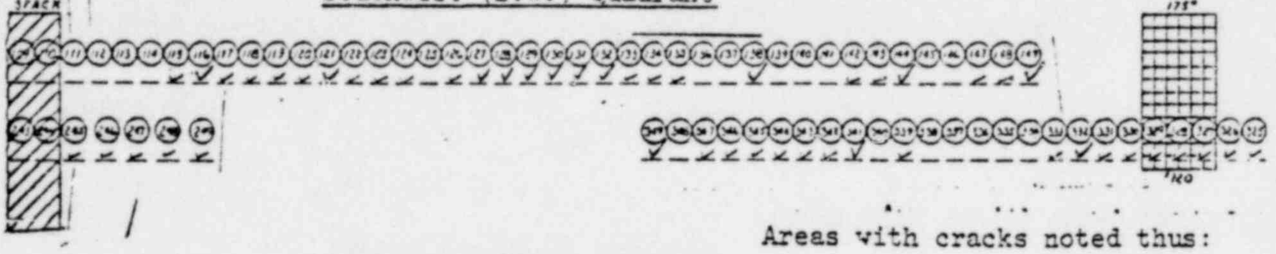
STRAIN GAGE LOCATION	ELEVATION (FT)	AZIMUTH (o)	STRAIN (μ INCH/INCH)		GROUND (OHMS)		TEMPERATURE (°F)			TIME	
							EXTERNAL		INTERNAL		
			REBAR	SISTER BAR	REBAR	SISTER BAR	AIR	SKIN	AIR	DAY	HOUR
52 HOOP	435	108	67D	121	25M	∞	81	84	126	6-22	1530
52 VERT	435	108	114D	161D	45K	20M	81	84	126	6-22	1530
53 HOOP	435	245	282D	C	30K	52M	87	87	126	6-15	1435
53 VERT	435	245	-103D	-137	10M	∞	87	87	126	6-15	1435
54 HOOP	435	352	286	297	∞	∞	78	72	79	4-21	1100
54 VERT	435	352	C	67	∞	∞	71	72	79	4-22	0900
55 HOOP	440	108	+ 17D	-17E	230K	∞	81	84	126	6-22	1530
55 VERT	440	108	319E	-152	∞	∞	81	84	126	6-22	1530
56 HOOP	440	245	89D	370	10M	∞	77	78	126	6-15	1435
56 VERT	440	245	-499D	-468	20M	∞	77	78	126	6-16	1040
57 HOOP	440	352	189D	156E	1M	∞	74	74	79	4-22	1345
57 VERT	440	352	B	428D	F	60M	74	74	79	4-22	1355
58 HOOP	446	108	A	A	A	A	A	A	A	A	A
58 VERT	446	108	242	-102	∞	∞	89	91	126	6-23	1300
59 HOOP	446	245	115	84	∞	∞	80	82	126	6-18	1130
59 VERT	446	245	439D	-7	960K	∞	79	82	126	6-16	1325
60 HOOP	446	352	627D	1102D	1.6M	4M	72	73	79	4-22	1430
60 VERT	446	352	668D	722D	6M	1.4M	72	73	79	4-22	1430
129 HOOP	446	80	A	A	A	A	A	A	A	A	A
129 VERT	446	80	-67D	-860D	5.7M	17M	90	94	126	6-24	1015
130 HOOP	446	320	297D	131D	1.5M	14M	76	78	126	6-25	0905
130 VERT	446	320	198D	61D	3.5M	30M	76	78	126	6-25	0930
61 HOOP	452	108	28	C	∞	∞	83	86	126	6-23	1515
61 VERT	452	108	55	50	∞	∞	94	89	126	6-23	1445
62 HOOP	452	245	-56D	-41	250K	∞	70	72	126	6-22	1330
62 VERT	452	245	23	B	∞	F	80	82	126	6-18	1130
63 HOOP	452	352	69	-55	∞	∞	73	73	79	4-22	1130
63 VERT	452	352	117	-105	∞	∞	73	73	79	4-22	1135

NOTES:
A. NO GAGE INSTALLED AT THIS LOCATION.
B. GAGE DESTROYED DURING CONSTRUCTION.
C. GAGE INOPERATIVE.
D. READING QUESTIONABLE DUE TO LOW GROUND.
E. ALTHOUGH GOOD GROUND READING FOR THIS TEST, READING QUESTIONABLE DUE TO LOW GROUND IN PAST TESTS.
F. GROUND READING NOT MEANINGFUL DUE TO B.

TABLE 3

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS

Southwest (S.W.) Quadrant



Areas with cracks noted thus:

LEGEND FOR CRACK LOCATION

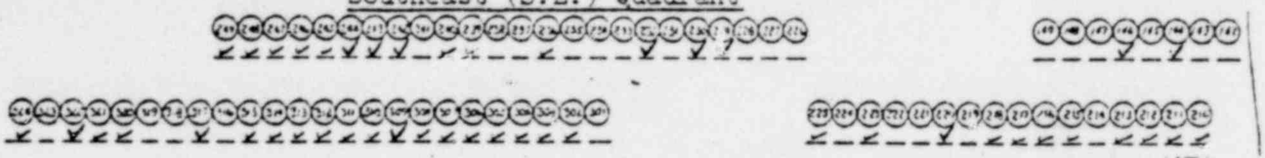
1st Letter	2nd Letter	3rd Letter
H = Horizontal	L = Lower	R = Right
V = Vertical	C = Center	L = Left
C = Across Corner	U = Upper	C = Center

Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks
109		(Note 3)	133	HUR		325	CLL,VLC,VLR,VUR	
110		(Note 3)	134	VUC		326	CLL,VLL,VLC,VLR,VUR	
111	-		135	VUC,VLL,VUL		327	VUR,VLL,HLR,VUC	
112	-		136	-		328	VLL,VLC,VUR,VUC	
113	-		137	-		329	VUR,VLL	
114	-		138	CUR		330	VLL,VLC,CLR,VUR	
115	VLL	(Note 4)	139	-		331	CLL,VLC,VLR	
116	CUL		140	-		332	CLR,VLC,VLR	
117	VLR,VLL		141	-	(Note 4)	333	VLL,VLC,VLR,CUR	
118	VUR,VLR,HUL		142	VLL	(Note 4)	334	-	
119	VLR,VUR,CLR		143	CUR,VUC		335	-	
120	VUR		144	HUR		336	-	
121	VUR		145	-		337	-	
122	VLR,VUR		146	-		338	-	
123	VUR,VLR,VUC		147	HUR		339	CUL	
124	VUL,VLR,VUC, VLL,HLL,CUR		148	HUR		340	-	
125	-		149	CUR,VUR		341	HUL,CUR	
126	VUL,VLL		243		(Note 3)	342	CUL,VUC	
127	VUL		244		(Note 3)	343	HUL,VLR	
128	VUL		245	HLR,HCR		344	HUL,VUC,VLR	
129	CUL		246	HLR,HUR,VUC		345	HUL,VUR,VLR	
130	VUL		247	HCR,HUR, VUC,HLR	(Note 5)	346	HUL,CUR,VLR	
131	CUL,HUR		248	HUR,HLR	(Note 5)	347	CUL,VUR	
132	VUL		249	HUR,HCR		348	-	
						349	CLR	

Notes
1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Bearing area blocked from inspection by vent stack.
4. Voids Discovered. (All Voids are shown on Figures 6-12).
5. D 247SW & D248SW have very narrow gaps (unmeasurable) between the bottom of the bearing plate and the adjoining concrete.

TABLE 4
CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS

Southeast (S.E.) Quadrant



Areas with cracks noted thus:

LEGEND FOR CRACK LOCATION

1st Letter	2nd Letter	3rd Letter
H = Horizontal	L = Lower	R = Right
V = Vertical	C = Center	L = Left
C = Across Corner	U = Upper	C = Center

Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks
142	-		226	-		301	-	
143	CUL		227	-		302	HUR,HLR,HCR,HLL	
144	VUR		228	-		303	HUR,VRL	
145	-		229	CUR		304	VUR,HCR,HLR,VLR,VLC	
146	CUL		230	CUR		305	CUR,HLR	
147	-		231	-		306	HLR,HCR,HUR	
148	-		232	CUR		307	VUR,VUL	
149	-	(Note 4)	233	-		308	HUR,HCR,VLR,VUC	
210	CUR		234	-		309	CUR,VUC,CLR	
211	CUR		235	-		310	CUR,VVC	
212	CUR		236	VUR		311	CUR,HLR	
213	CUR		237	-		312	CUR,VUC,HCR,CLR,VLC	
214	-		238	-		313	CUR,HCR,HLL	
215	HUR		239	VLR		314	CUR,VUC,CLL,VLC,HLR	
216	HUR		240	CUR		315	HUR	
217	CUR		241	-		316	-	
218	CUR		242	CUR		317	CUL	
219	-		243	HUL,VLR		318	-	
220	HUR		244	CUL		319	-	
221	-		245	CLL,HUL		320	CUR,CUL	
222	-		246	HUL,CUR		321	CUR	
223	VUL		247	HUL,CUR		322	VCC,VUC	
224	-		248	HUL		323	-	
225	VUR,VUC	(Note 4)	249	CUL		324	CLL,CUR	

Notes

1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. No gaps were noted between concrete and bearing plates.
4. Small cavities found. (approximately 1" deep and 1 in. ^{3}in volume)

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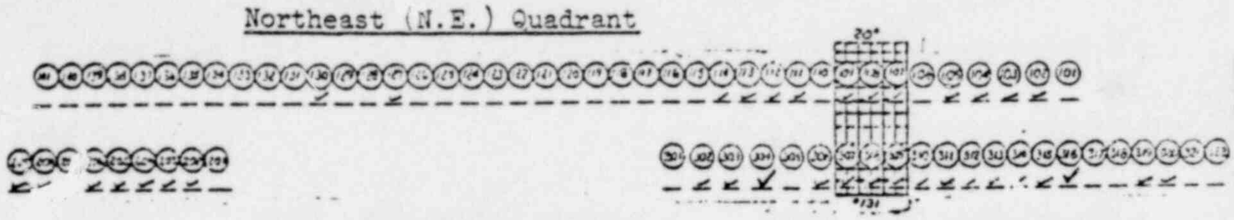
POOR ORIGINAL

TABLE 5

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS

Northeast (N.E.) Quadrant



LEGEND FOR CRACK LOCATION

Areas with cracks noted thus:

1st Letter	2nd Letter	3rd Letter
H = Horizontal	L = Lower	R = Right
V = Vertical	C = Center	L = Left
C = Across Corner	U = Upper	C = Center

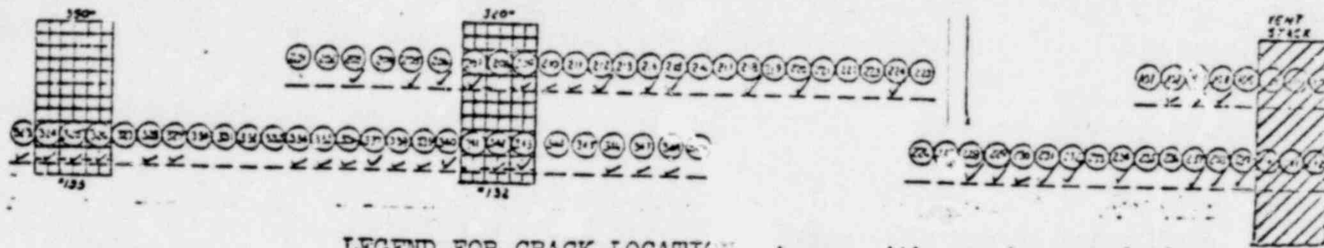
Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks
101	-		125	-		208	HUR,VLC	
102	CUR,VLR		126	-		209	VLC,VLR,VLL,CUR	
103	VLL,CUL		127	CUR		301	-	
104	VUL		128	-		302	HUL,VUL	
105	CUR		129	-		303	HUL	
106	-		130	VUL,HUR,HUL		304	CUL	
107	CUR,VLL,VLR,VUL		131	-		305	-	
108	VUC		132	-		306	HUL,VUR,VLL	
109	HUR		133	-		307	HUL,HUR	
110	-		134	-	(Note 5)	308	HUL,CLR	
111	VLL,VUL		135	-		309	HUL,VLL,VUR	
112	VLL		136	-		310	HUL,VLL,VLR,HLR	
113	VUR,VLL		137	-		311	VUL,VLR	(Note 3)
114	VUL		138	HUL		312	VUL	(Note 4)
115	-		139	-	(Note 5)	313	HUL,VLL	
116	-		140	-		314	HUL	
117	-	(Note 5)	141	-		315	VUL,HUR	
118	-		142	-		316	HLL	
119	-		202	CUR,VLR,CUL		317	-	
120	-		203	CUR,VLR,CUL,VUC		318	-	
121	-		204	HUR		319	VUR	
122	-		205	CUR,VLR		320	VUR	
123	-		206	HUR,CLL,HUL		321	-	
124	-		207	CUR,CUL,VLL		322	-	

Notes

1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Five cracks less than 0.005 inc. radiate down from the bottom of the bearing plate, spaced approximately five inches on centers and terminating about one inch from the edge of the bearing plate.
4. Four cracks -- similar to those described in Note 3.
5. Void Discovered. (All Voids are shown on Figures 6-12)..

TABLE 6
CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS

Northwest (N.W.) Quadrant



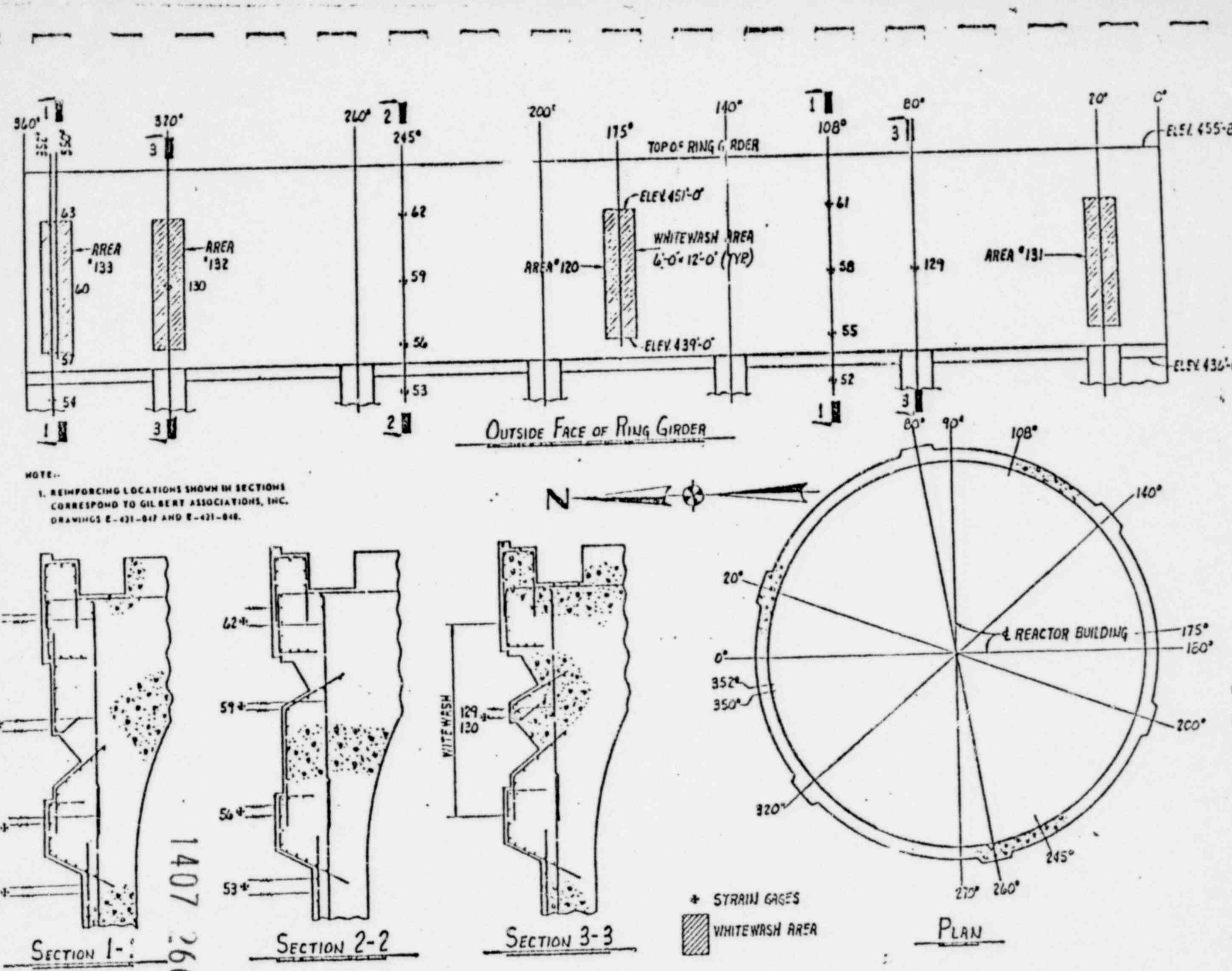
LEGEND FOR CRACK LOCATION Areas with cracks noted thus:

1st Letter	2nd Letter	3rd Letter
H = Horizontal	L = Lower	R = Right
V = Vertical	C = Center	L = Left
C = Across Corner	U = Upper	C = Center

Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks	Tendon No.	Crack Location	Remarks
101	-		219	-		325	VUL,VUR,VLL	
102	CUR,HUL		220	CLL		326	VUC,VLL	
103	VUR		221	-		327	-	
104	VUR,HUL		222	-		328	VUL,HUL	
105	-		223	-		329	VUL,HUL	
106		(Note 3)	224	VUR		330	-	
107		(Note 3)	225	-		331	-	
108		(Note 3)	226	-		332	-	
201	-		227	-		333	-	
202	-		228	VUC		334	HUR	
203	HUL		229	VUC		335	CUR,VLR	
204	-		230	CUR		336	CUR	
205	CUL		231	CUR		337	VUL	
206	CUR		232	CUR,VUC		338	HUR,VLC	
207	HUL,VUR		233	-		339	HUR,VLC	
208	-		234	HUR		340	CUR	
209	CLL,VUC		235	-		341	-	
210	CUL		236	-		342	HUR,VUC	
211	CUL		237	CUR		343	HUR,CLR	
212	VUR,CUL		238	CUR		344	-	
213	-		239	HUR		345	HUR	
214	VUR,CUL		240		(Note 3)	346	HUR	
215	VUR		241		(Note 3)	347	HUR,HUL,VUR	
216	-		242		(Note 3)	348	CUR,HLL	
217	-		323	VUR,VUL,VLL		349	-	
218	HUL		324	HUL,VLL				

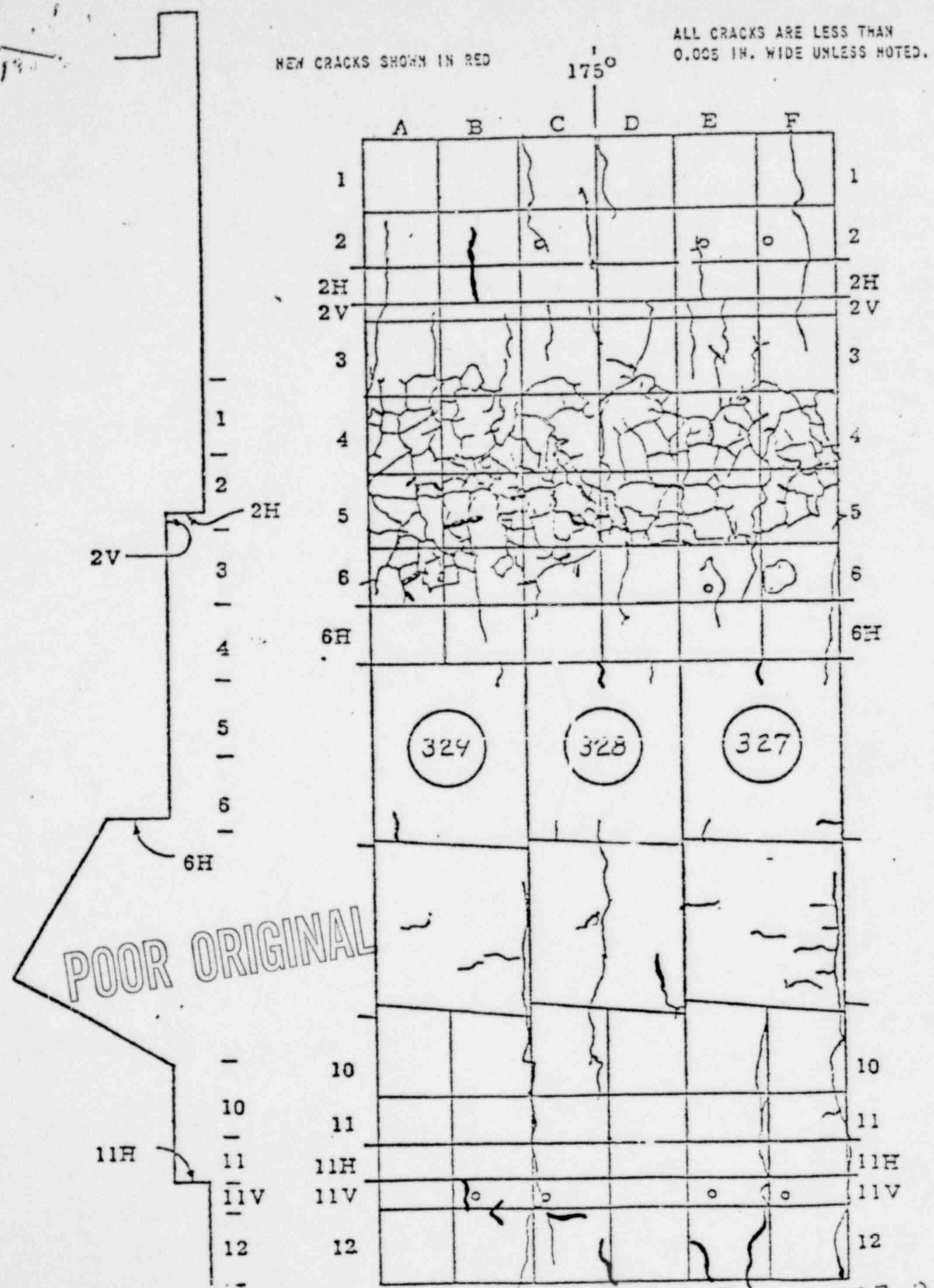
Notes:

1. All cracks are less than 0.005 in. wide
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Bearing area blocked from inspection by vent stack.
4. Void Discovered. (All Voids are shown on Figures 6-12).



RING GIRDER SURVEILLANCE

FIGURE 1



CRACK PATTERN AREA AT AZIMUTH 175°
AREA NO. 120

FIGURE 2

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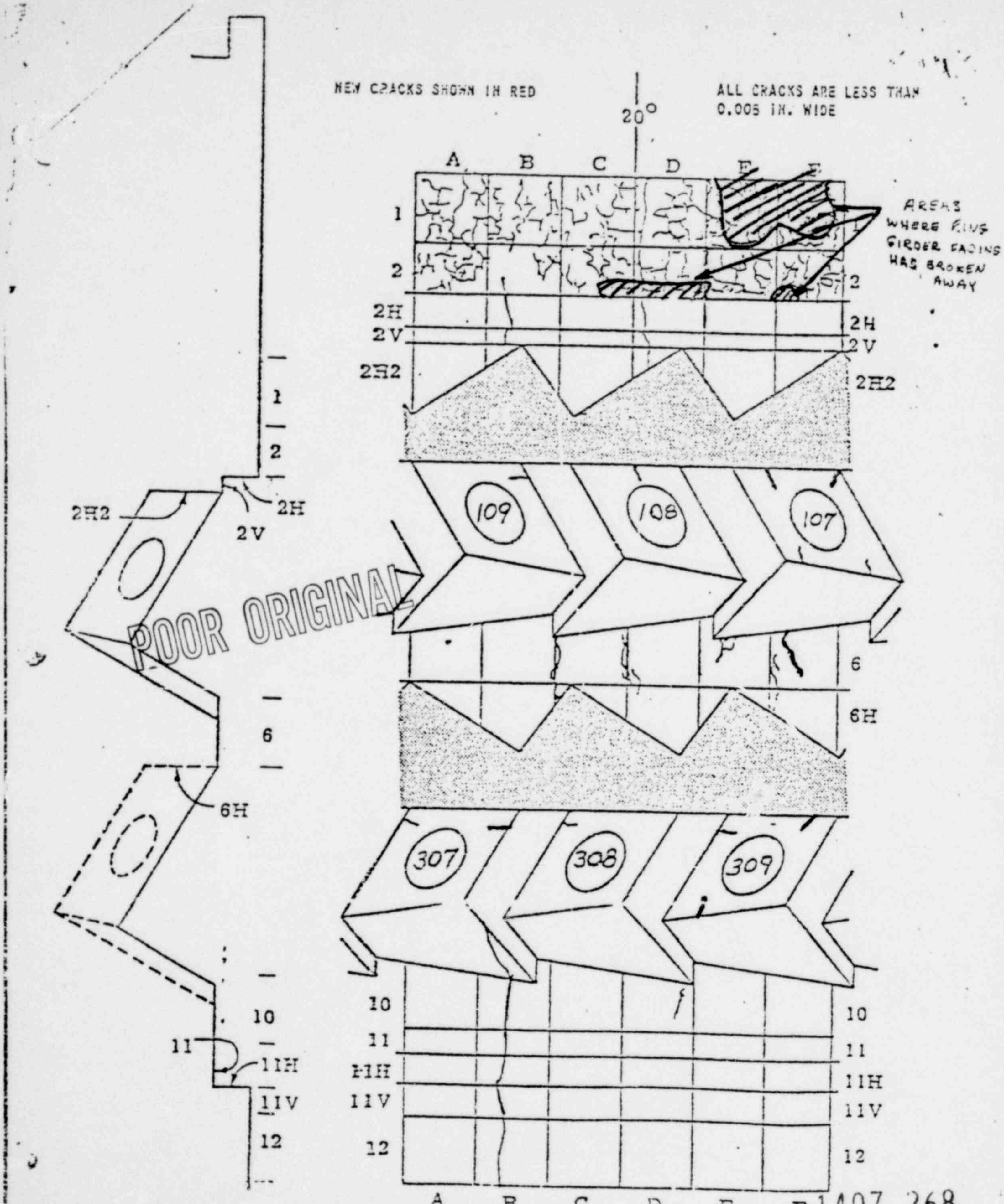


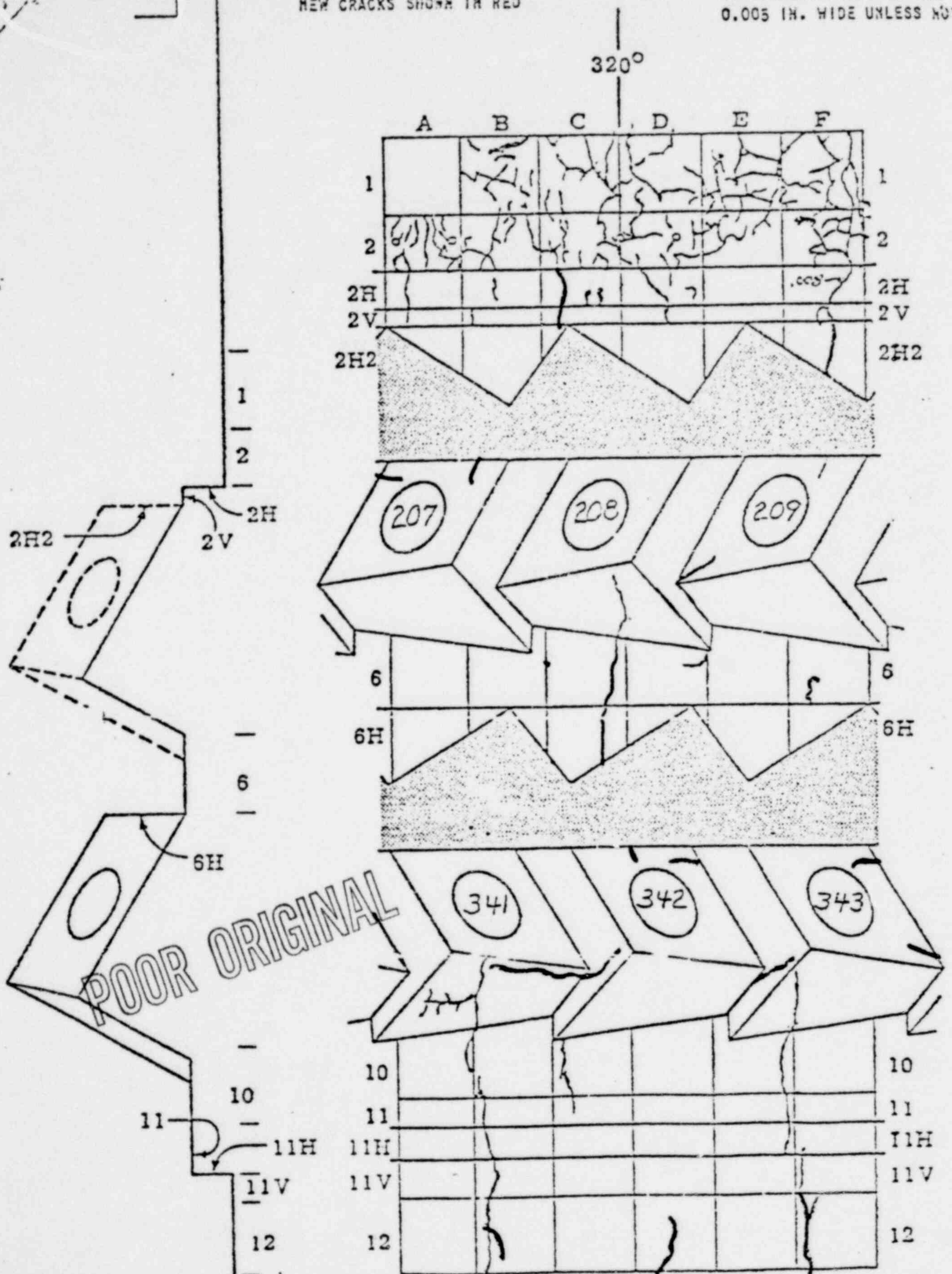
1407 268

CRACK PATTERN AREA AT AZIMUTH 20°
AREA NO. 131

FIGURE 3

NEW CRACKS SHOWN IN RED

ALL CRACKS ARE LESS THAN 0.005 IN. WIDE UNLESS NOTED.



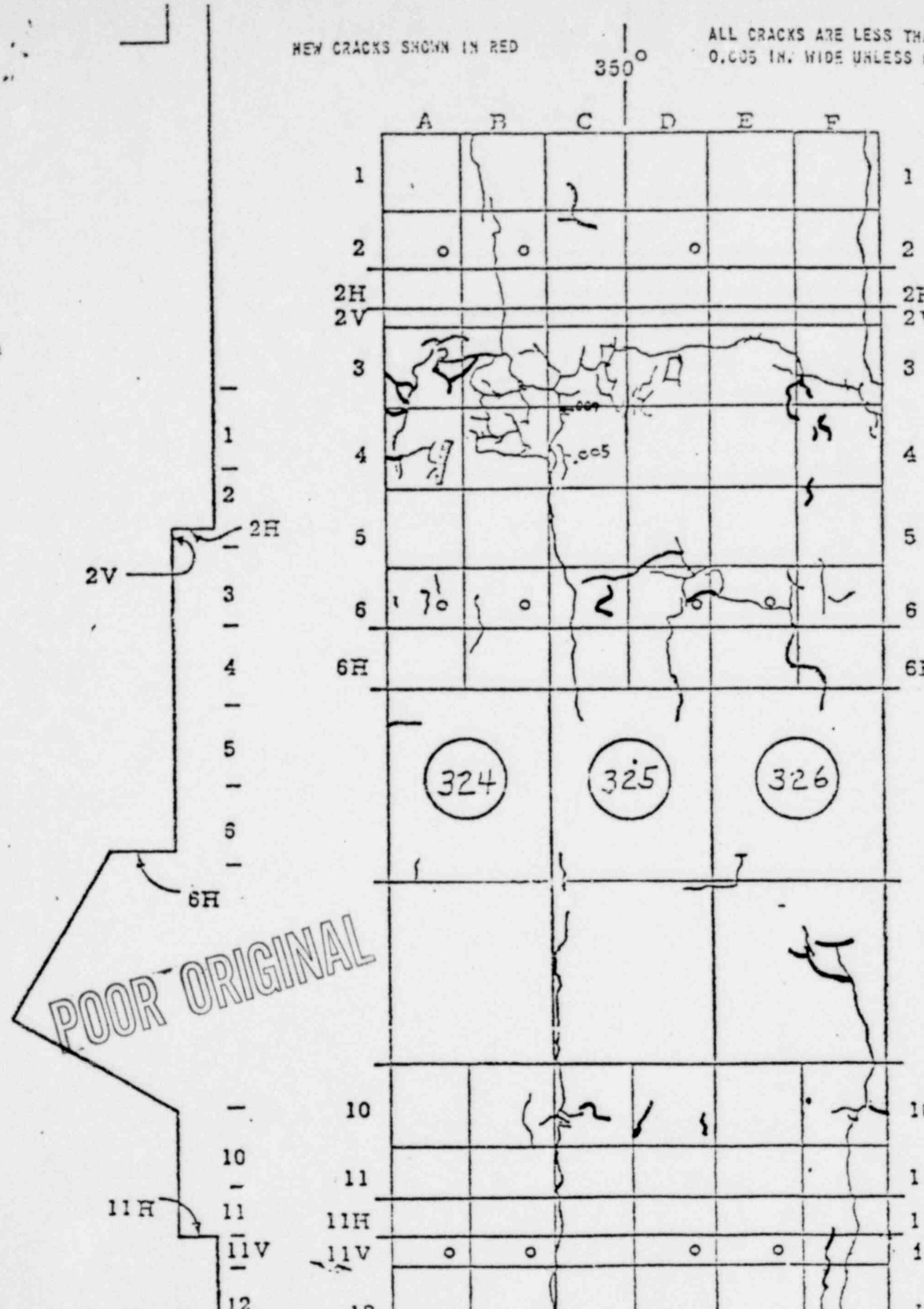
CRACK PATTERN AREA AT AZIMUTH 320°
AREA NO. 132

1407 269

FIGURE 4

NEW CRACKS SHOWN IN RED

ALL CRACKS ARE LESS THAN 0.005 IN. WIDE UNLESS NOTED.

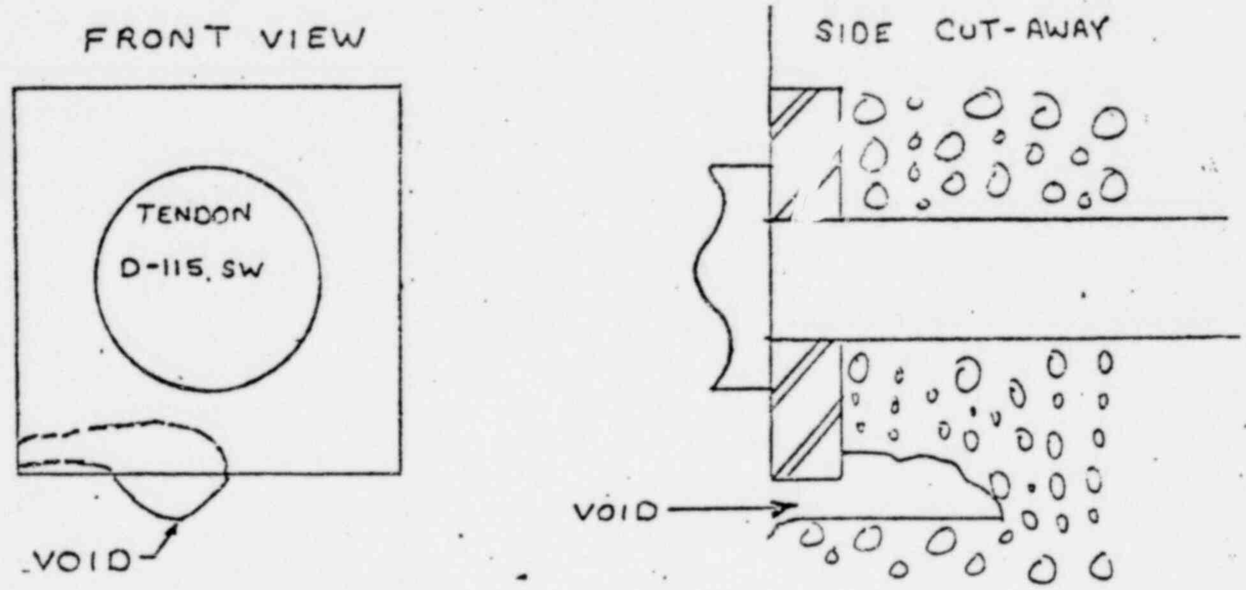


CRACK PATTERN AREA AT AZIMUTH 350°
AREA NO. 133

FIGURE 5

1407 270

REACTOR BUILDING VOID #1



EST. VOLUME OF VOID – 90 IN^3

REAR SURFACE AREA EXPOSED – 4 IN^2

OPENING AREA – 12 IN^2

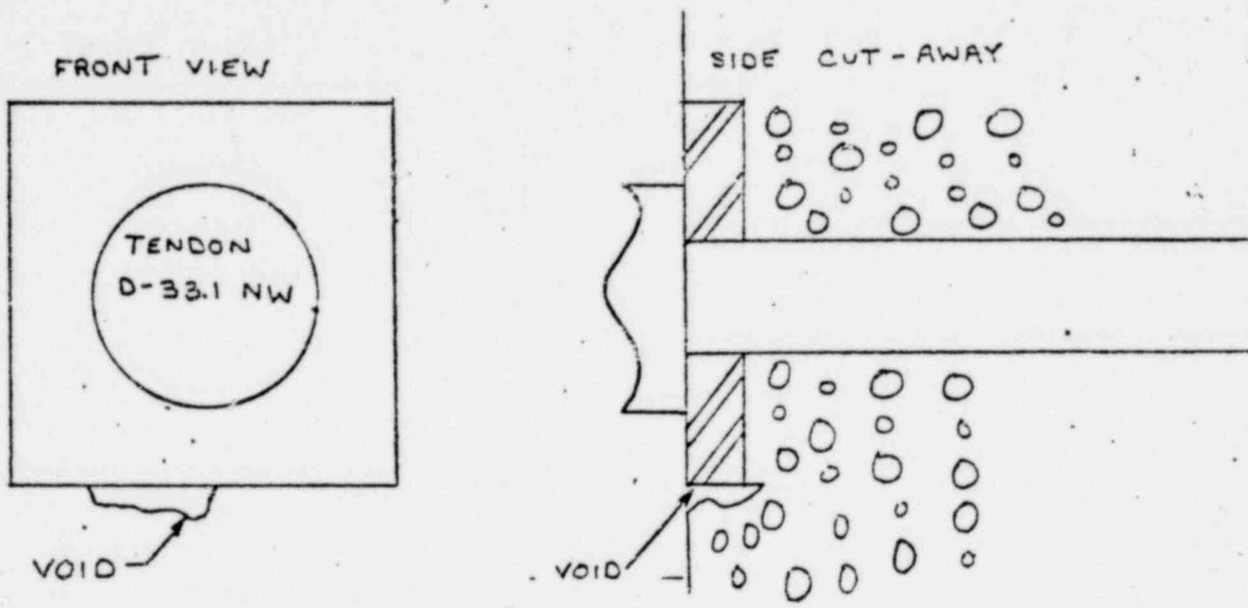
DEPTH OF VOID – 12 IN

1407 271

FIGURE-6

RING GIRDER VOID AT DOME TENDON D-115 S.W. QUADRANT

REACTOR BUILDING VOID #2



EST. VOLUME OF VOID - 40 IN^3

REAR SURFACE AREA EXPOSED - 0

OPENING AREA - 3 IN^2

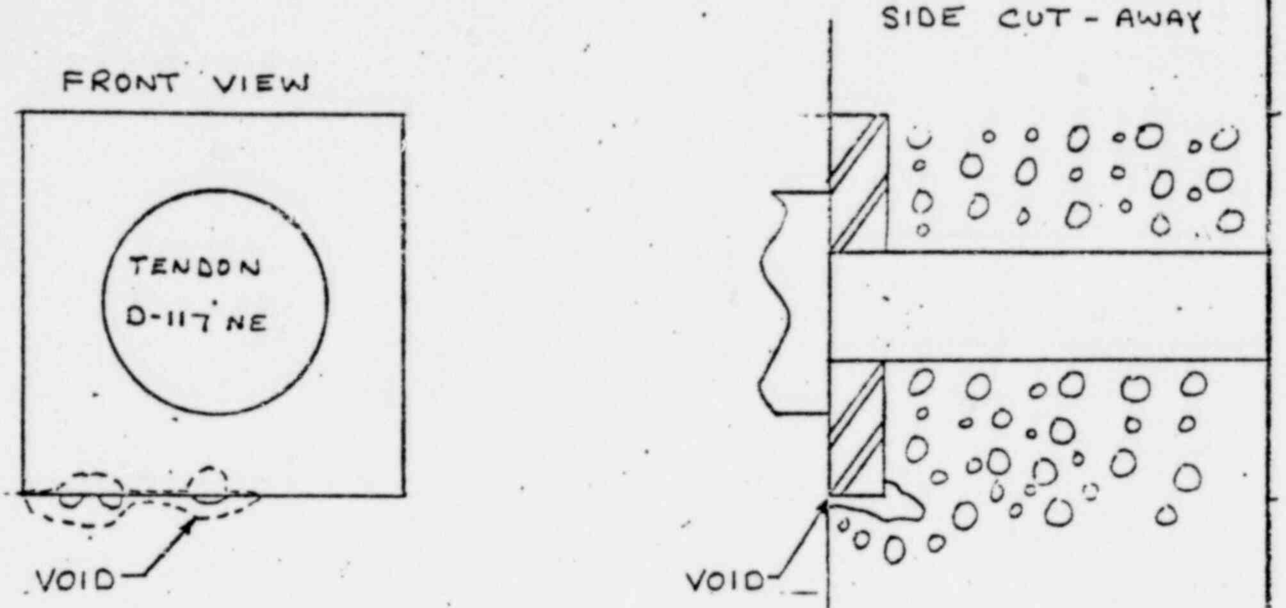
DEPTH OF VOID - 4 IN

1407 272

FIGURE-7

RING GIRDER VOID AT DOME TENDON D-331 N W QUADRANT

REACTOR BUILDING VOID #3



EST. VOLUME OF VOID - 22 IN^3

REAR SURFACE AREA EXPOSED - 3 IN^2

OPENING AREA - 1 IN^2

DEPTH OF VOID - 6¼ IN

1407 273

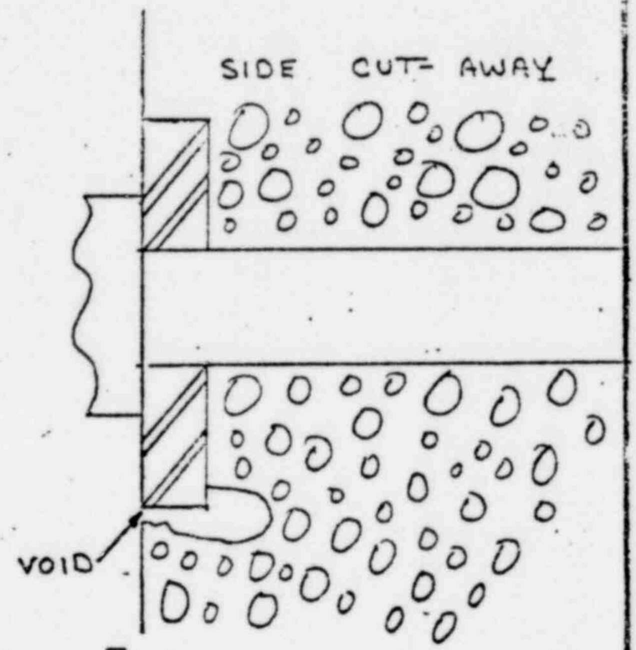
FIGURE 8

RING GIRDER VOID AT DOME TENDON D-117 N.E. QUADRANT

REACTOR BUILDING VOID #4

FRONT VIEW

SIDE CUT-AWAY



EST. VOLUME OF VOID-6 IN^3

REAR SURFACE AREA EXPOSED-3 IN^2

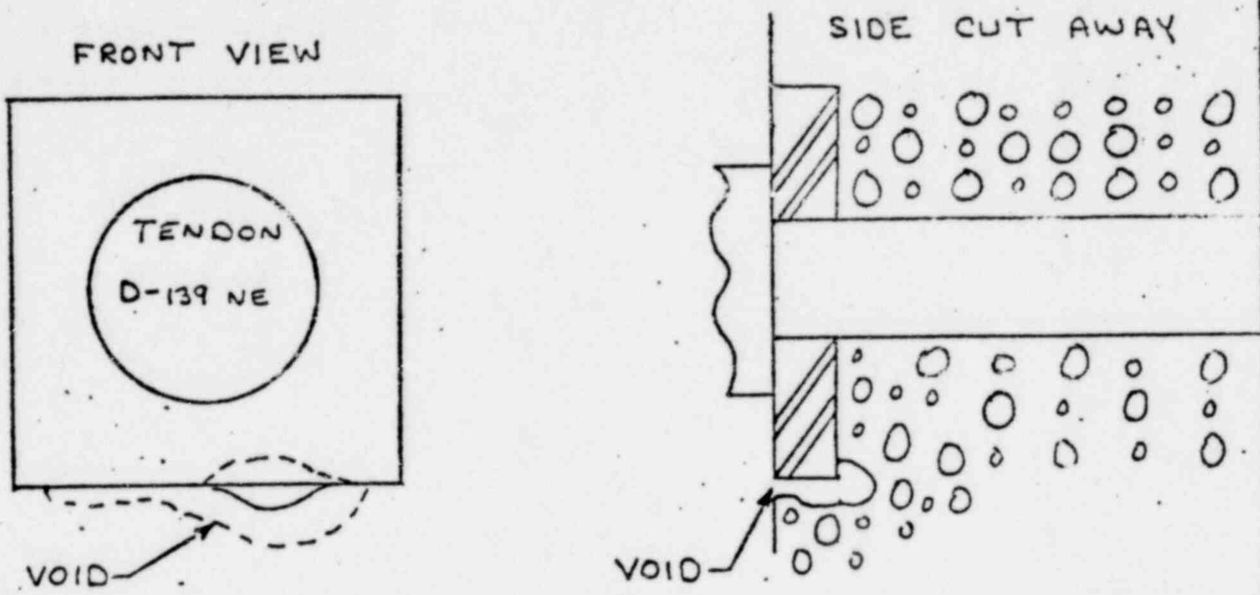
OPENING AREA-1 IN^2

DEPTH OF VOID-6 IN

1407 274

FIGURE-9
RING GIRDER VOID AT
DOME TENDON D-134
N.E. QUADRANT

REACTOR BUILDING VOID #5



EST. VOLUME OF VOID – 50 IN^3

REAR SURFACE AREA EXPOSED – 2 IN^2

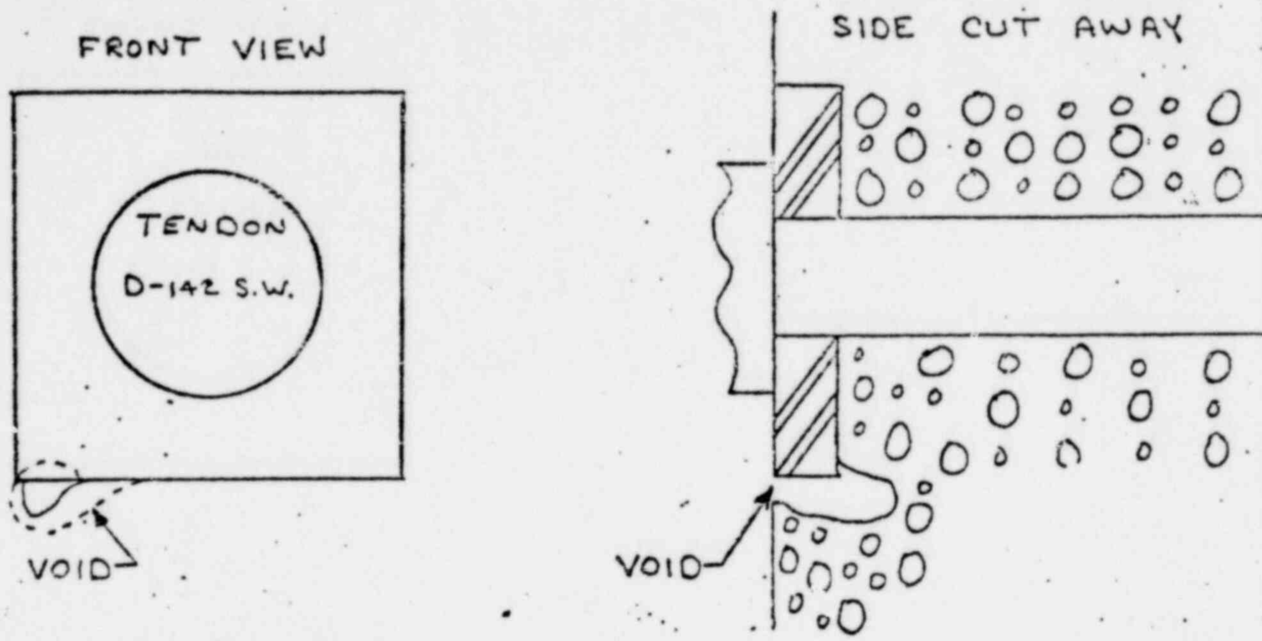
OPENING AREA – 1½ IN^2

DEPTH OF VOID – 5 IN

1407 275

FIGURE-10
RING GIRDER VOID AT
DOME TENDON D-139
N.E. QUADRANT

REACTOR BUILDING VOID #6



EST. VOLUME OF VOID - 40 IN^3

REAR SURFACE AREA EXPOSED - 1 IN^2

OPENING AREA - 2 IN^2

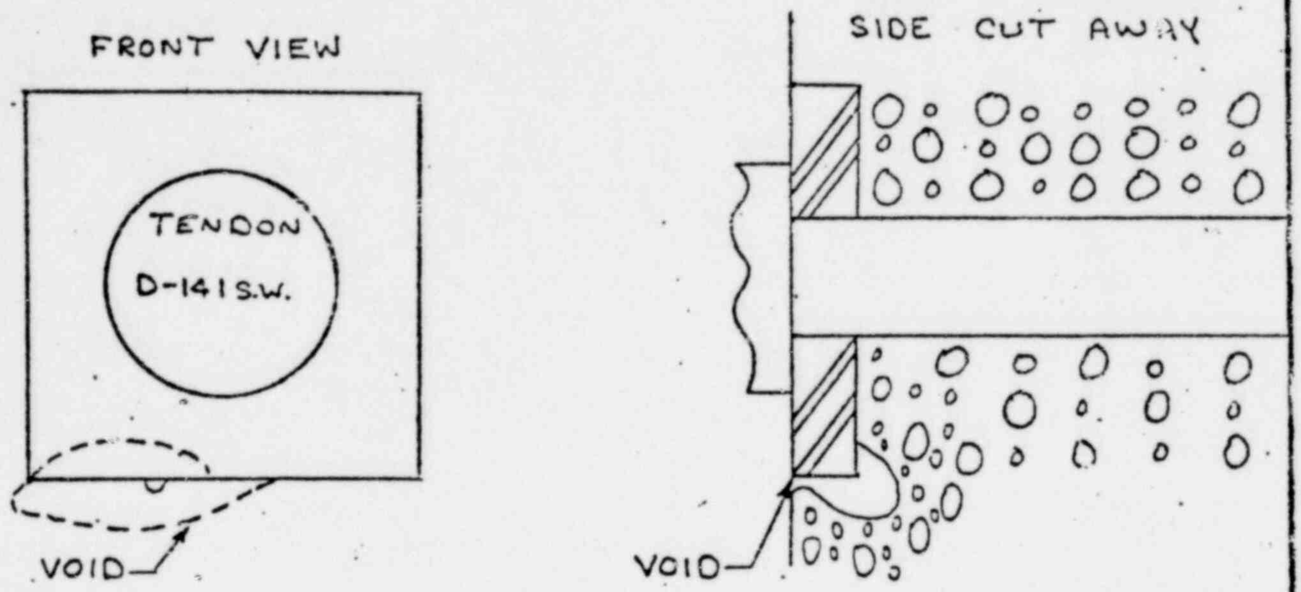
DEPTH OF VOID - 5½ IN

1407 276

FIGURE - 11

RING GIRDER VOID AT DOME TENDON D-142 S.W. QUADRANT

REACTOR BUILDING VOID #7



EST. VOLUME OF VOID - 50 IN^3

REAR SURFACE AREA EXPOSED - 6 IN^2

OPENING AREA - ½ IN^2

DEPTH OF VOID - 5 IN

1407 27-

FIGURE - 12
RING GIRDER VOID AT
DOME TENDON D-141
S.W. QUADRANT