

# OFFICE MEMORANDUM

MICHIGAN  
STATE HIGHWAY DEPARTMENT



JOHN C. MACKIE, COMMISSIONER

328

August 31, 1960

To: W. W. McLaughlin  
Testing and Research Engineer

From: E. A. Finney

Subject: Inspection of Fiberglass Reinforced Plastic Overhead Sign Support Structure. Research Project 54 G-73. Report No. 341.

This report constitutes the second of a series of inspections and observations of the fiberglass reinforced plastic overhead sign support structure erected on May 7, 1958, at the intersection of M 78 and US 16.

The first inspection of this structure was made on February 27, 1959, and reported in a letter to W. W. McLaughlin on March 20, 1959. This first inspection revealed cracks in three of the four joint fittings between the top horizontal member and the vertical tubes, and short longitudinal cracks occurring in the main chord members at the points where the sign support clamps are mounted.

The structure was inspected on June 1, 1960, and again on June 20, 1960. The reinspection of June 20 was prompted by a storm on June 16, for which winds of 50 to 60 mph were reported in the East Lansing area.

A considerable number of new cracks have developed in various parts of the structure, especially after the severe wind storm occurred. The location, description, and dates of observation of these cracks in the three inspections of the structure, are tabulated in Figure 1. Photographs of these cracks are shown in Figure 2.

The following is a summary of the observations of the recent inspections as reported by R. Hooper:

1. There appears to have been no further cracking or deterioration of the cracked joint fittings between the top horizontal member and the vertical tubes.
2. There appears to have been no further cracking or enlargement of the longitudinal cracks occurring in the main chord members at points where the sign clamps are mounted.
3. As can be seen from Figure 1, new longitudinal hairline cracks have formed in the main chords and secondary members of the structure, as well as three circumferential cracks in the fillets between the chord and joint connections, and a group of three circumferential cracks in one of the vertical struts.

W. W. McLaughlin

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The presence of the additional longitudinal hairline cracks in the main chords and secondary members, in their present state, is not believed to be of any serious structural consequence. The newly formed circumferential cracks--especially the one at the center of the back chord, being normal to the line of direct stress in the chord--coupled with the stress concentration at the joint connection and brittle nature of the fiberglass material, are of structural significance.

The majority of the cracks appear to have occurred in the tube's outer layer of epoxy resin. At this time, in their present condition, the cracks have not sufficiently impaired the design capacity of the sign support to the point of being unsafe.

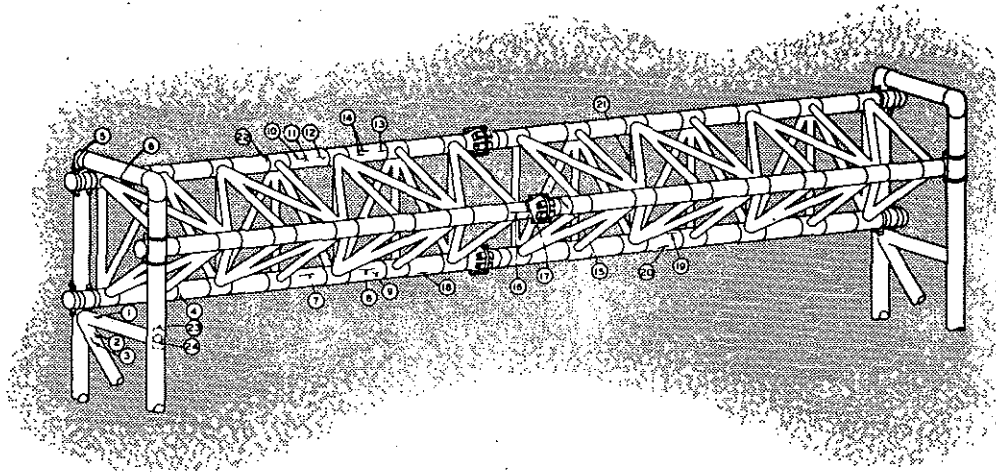
If it is deemed advisable to continue the performance testing of this experimental fiberglass sign support structure under service conditions, then we feel that inspections must be made at least every two months and after every incidence of strong wind to ensure that certain of the cracks reported have not progressed or widened to the point where they will affect the strength of the structure and make it unsafe. An alternate solution would be to replace the present structure with an aluminum one, and then erect the fiberglass sign structure with a sign test load at some point where a possible structural failure would not endanger the traveling public.

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director  
Research Laboratory Division

EAF:GC:js

cc: H. G. Bauerle  
H. J. Rathfoot  
H. R. Puffer



Crack No.	Date* Observed	Length in.	Width, in.	Location
1	6-1-60	1.6	0.010	S column, middle horizontal member (longitudinal)
2	6-20-60	2.5	0.008	S column, top diagonal near SW tube (longitudinal)
3	6-20-60	3.0	0.011	Same as 2
4	6-20-60	2.5	hairline	Bottom chord, 1st joint from S column (circumferential)
5	2-27-59	---	seam split	Top horizontal member at junction with S column (SW tube)
6	2-27-59	---	seam split	Same as 5 (SE tube)
7	2-27-59	7.6	hairline	Bottom chord, at 2nd sign clamp from S column (longitudinal)
8	2-27-59	4.6	hairline	Bottom chord, at 3rd sign clamp from S column (longitudinal)
9	2-27-59	1.6	hairline	Same as 8
10	2-27-59	6.0	hairline	Top chord, at 2nd sign clamp from S column (longitudinal)
11	2-27-59	2.1	hairline	Same as 10
12	6-1-60	1.4	hairline	Top chord, between 2nd sign clamp and 5th vertical strut from S column (longitudinal)
13	6-1-60	3.4	hairline	Top chord, at 6th vertical strut from S column (longitudinal)
14	2-27-59	1.5 & 2.0	hairline	Top chord, at 3rd sign clamp from S column (longitudinal)
15	6-20-60	3.5	hairline	Back chord, in fillet north of center casting (circumferential)
16	6-20-60	---	seam split	Back chord, south of center casting (longitudinal)
17	6-20-60	11.0	hairline	Same as 15 (S casting)
18	2-27-59	3.0	hairline	Bottom chord, at 4th sign clamp from S column (longitudinal)
19	2-27-59	4.3	hairline	Bottom chord, top at 7th sign clamp from S column (longitudinal)
20	2-27-59	3.3	hairline	Same as 19 (chord bottom)
21	6-20-60	1.8, 1.0, 0.5	hairline	10th vertical strut from S column (group of 3, circumferential)
22	6-1-60	2.3	hairline	Top chord, at 4th vertical strut from S column (circumferential)
23	6-20-60	0.8	0.020	S column, top of fillet at junction of middle horizontal member & SE tube
24	6-20-60	0.8	0.015	Same as 23 (at bottom of fillet)
25	6-20-60	2.0	hairline	S column, bottom horizontal member

\* Structure erected 5-7-58.

Figure 1. Location and description of cracks.  
Sign clamps not shown. South column at left.

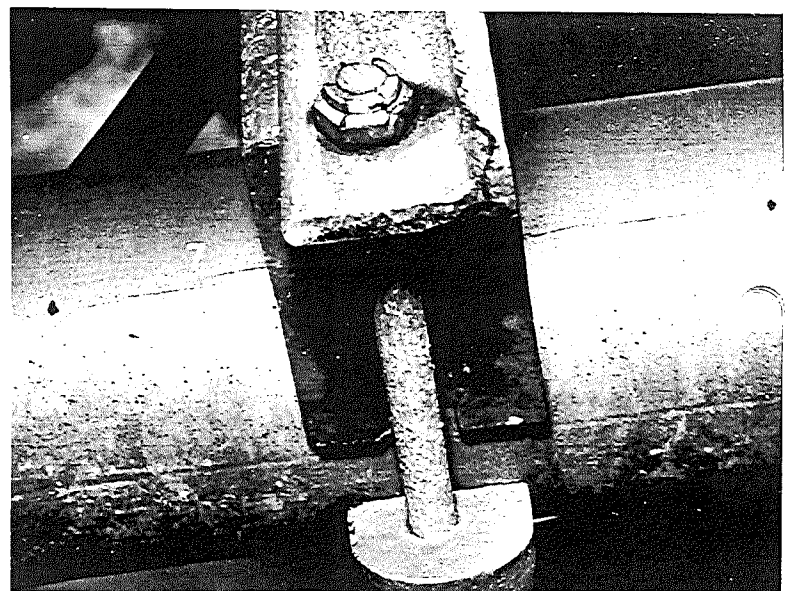
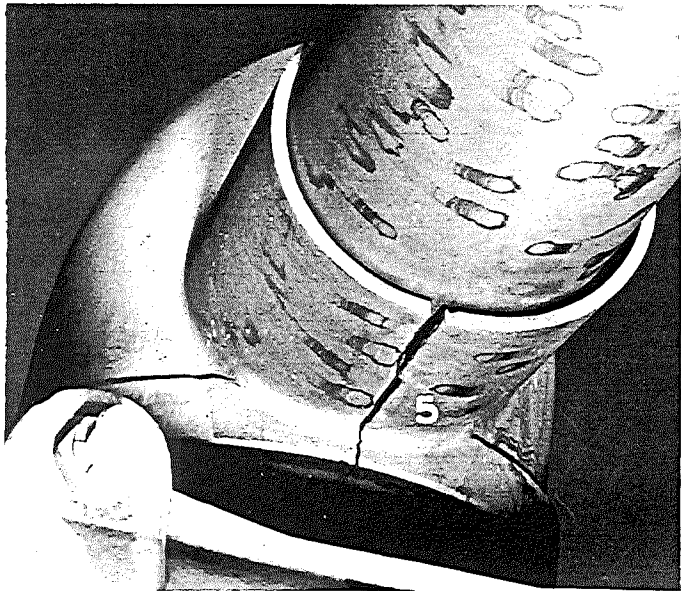
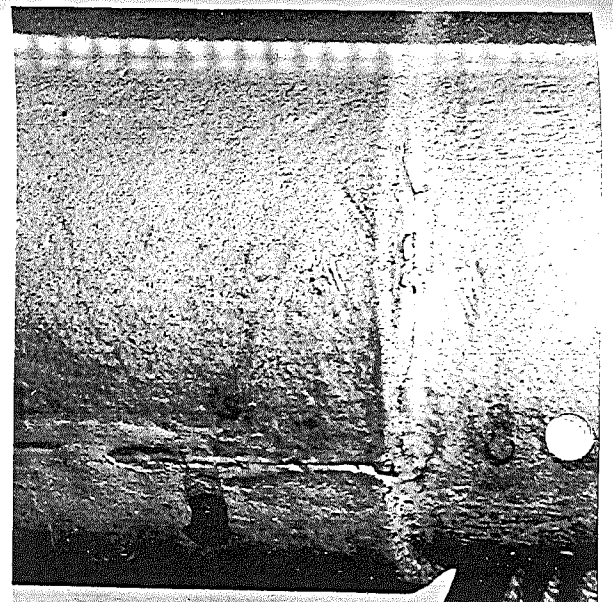
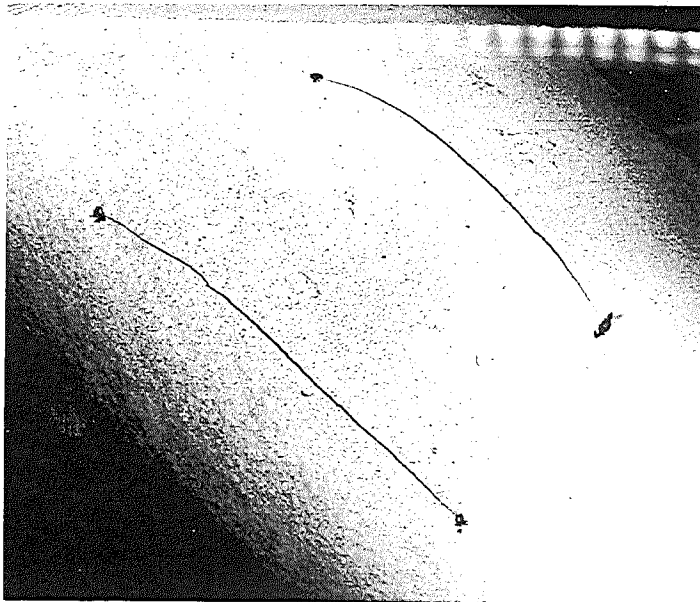
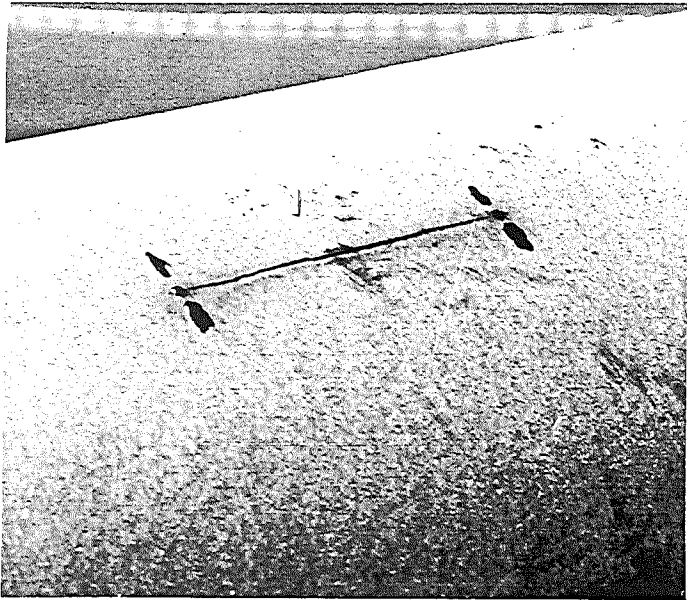


Figure 2. Views of cracks numbered according to Figure 1. Paint dots mark crack extremities.



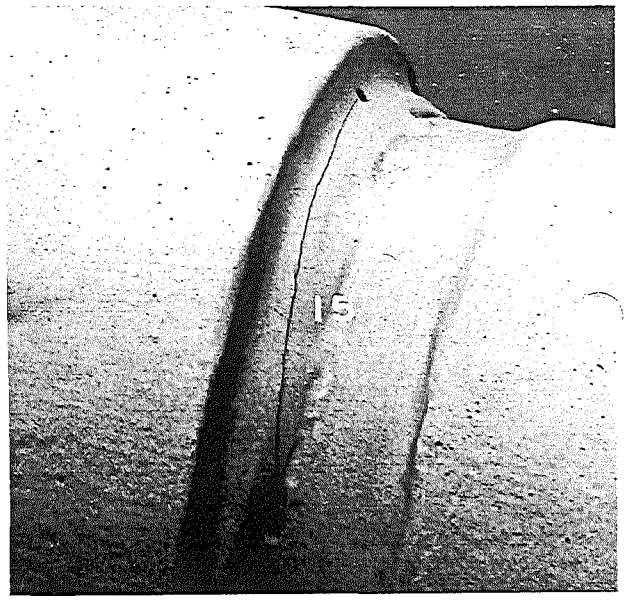
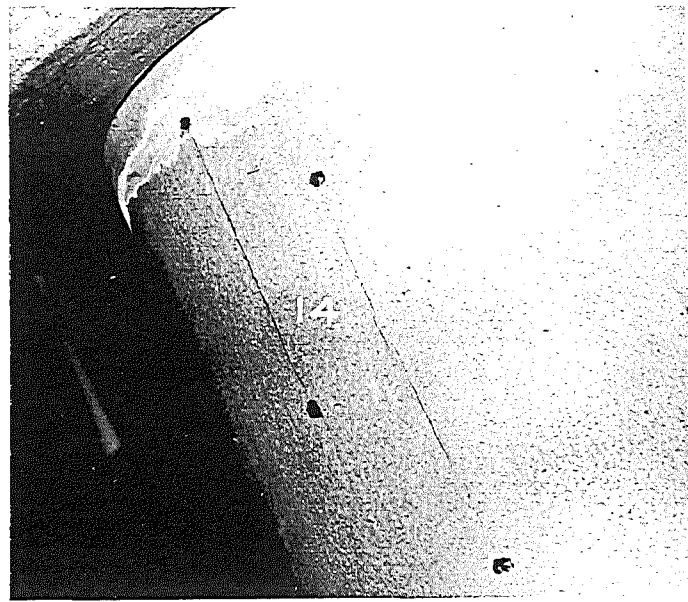
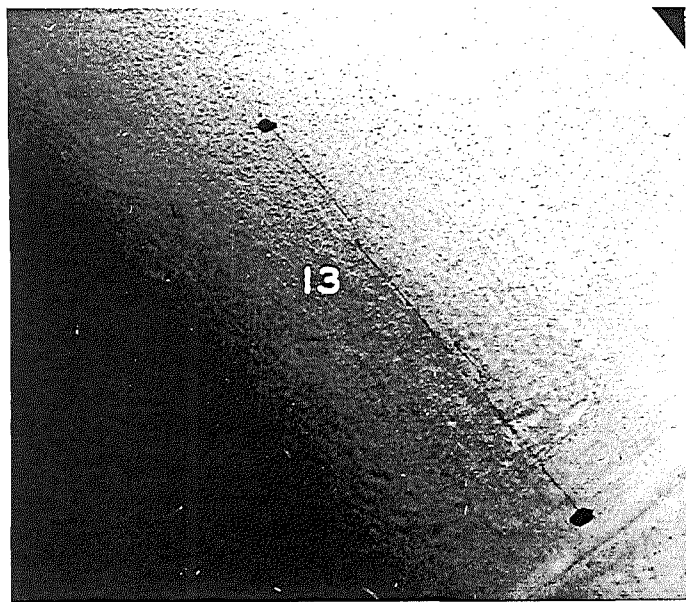
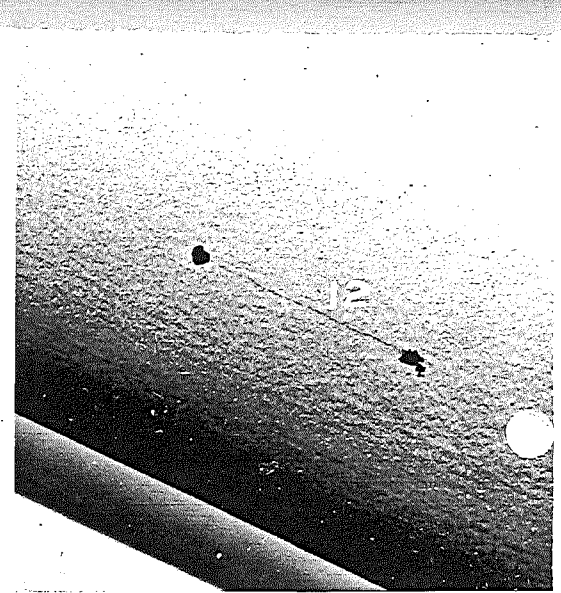
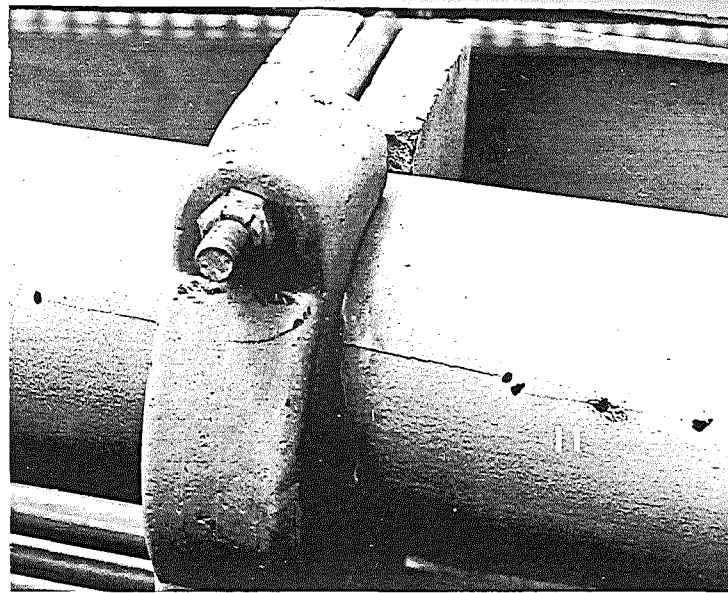
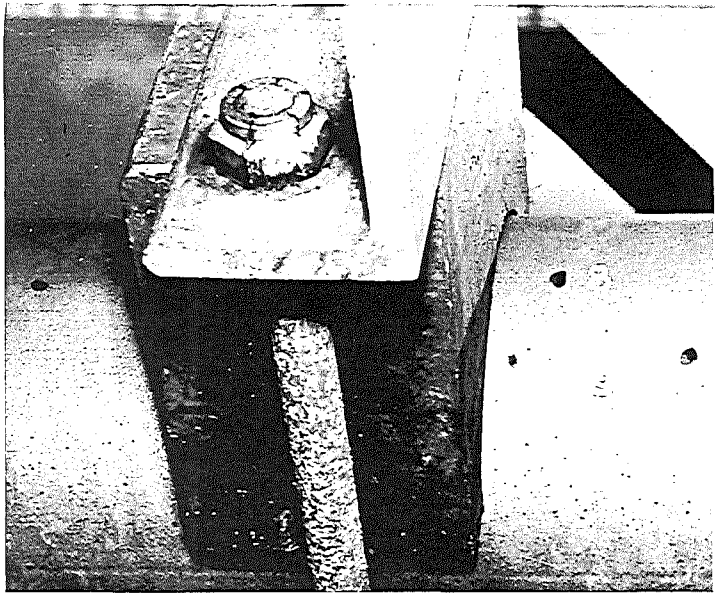


Figure 2 (cont.). Views of cracks numbered according to Figure 1.  
Paint dots mark crack extremities.

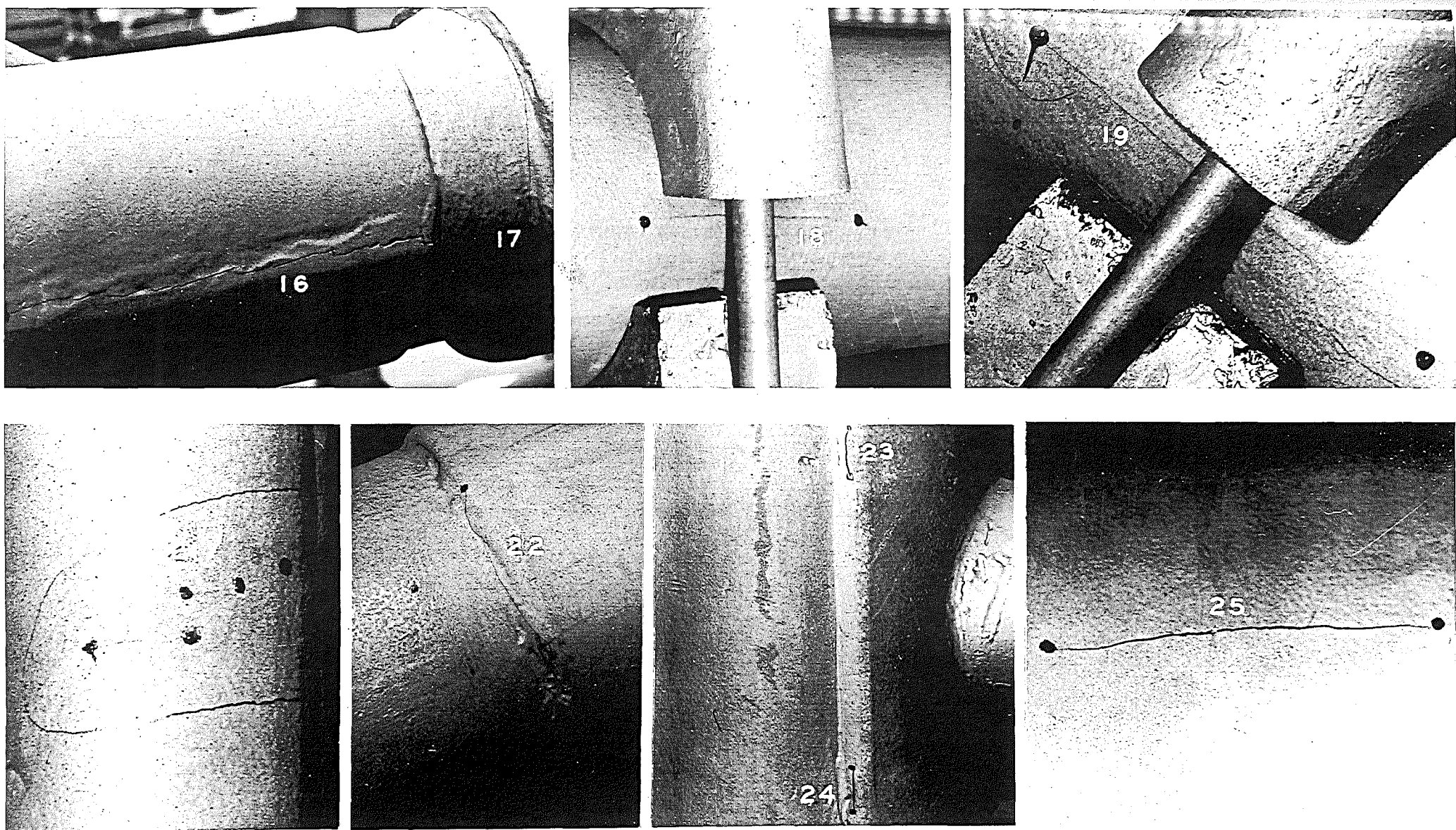


Figure 2 (cont.). Views of cracks numbered according to Figure 1.  
Paint dots mark crack extremities.