DYNAMIC RESPONSE AND SAFETY OF OFFSHORE PLATFORMS USING THE RANDOM DECREMENT TECHNIQUE

by

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ABSTRACT

Title of Thesis: Dynamic Response and Safety of Offshore Platforms Using the Random Decrement Technique

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Thesis directed by: Dr. Jackson C. S. Yang
Professor of Mechanical Engineering

An experimental study was performed on a 1:13.8 scale offshore platform model. The natural frequencies of the structure were obtained both experimentally by performing a sine sweep, and numerically using the NASTRAN finite element computer program.

The platform was fatigue cracked and the feasibility of using the Random Decrement Technique to detect structural damage was investigated. The results were analyzed and prove the technique to be useful , and to possess potential for development in a variety of safety related applications.

The response of the platform model to different static loads was also investigated experimentally and numerically to provide some insight on the behavior of the platform. No detailed analysis was performed on these results, but they are included for future reference and consideration.

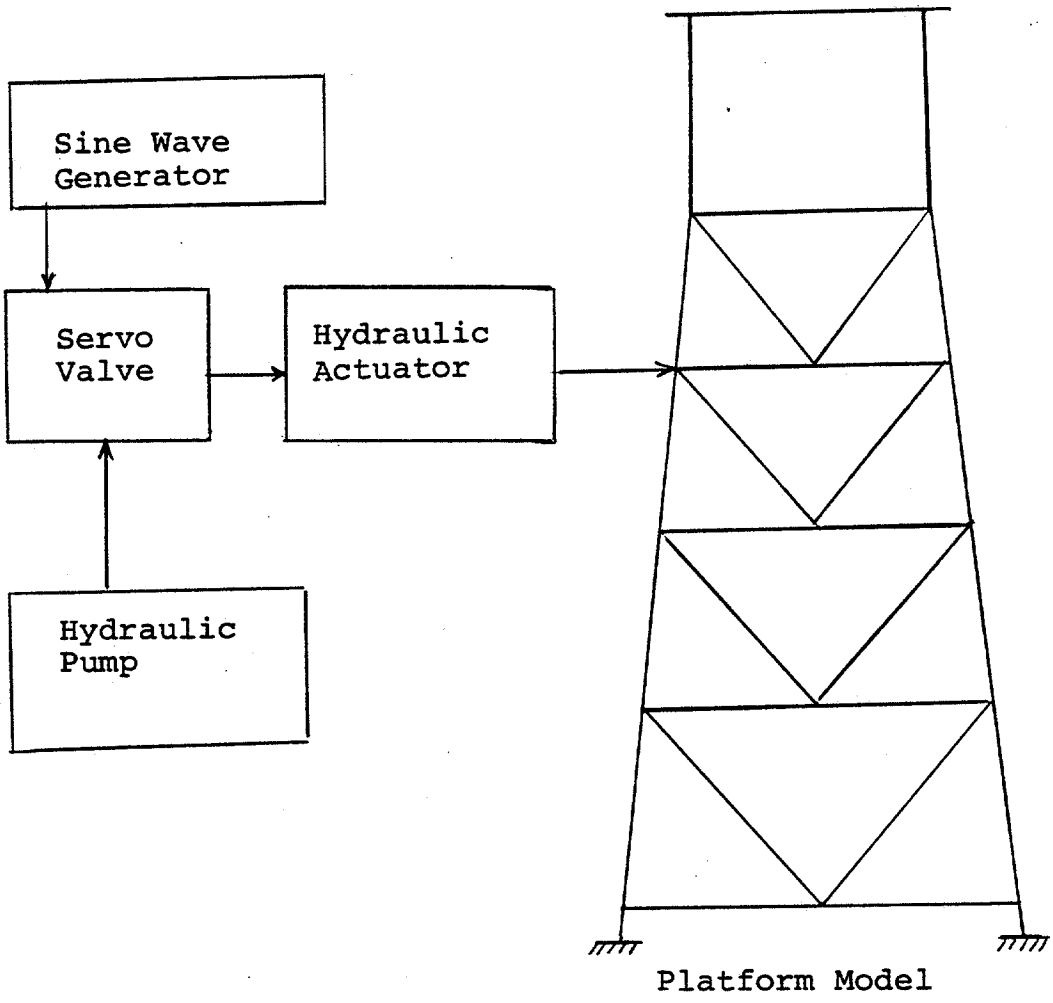


Figure 6. Servo-control Hydraulic Fatigue System

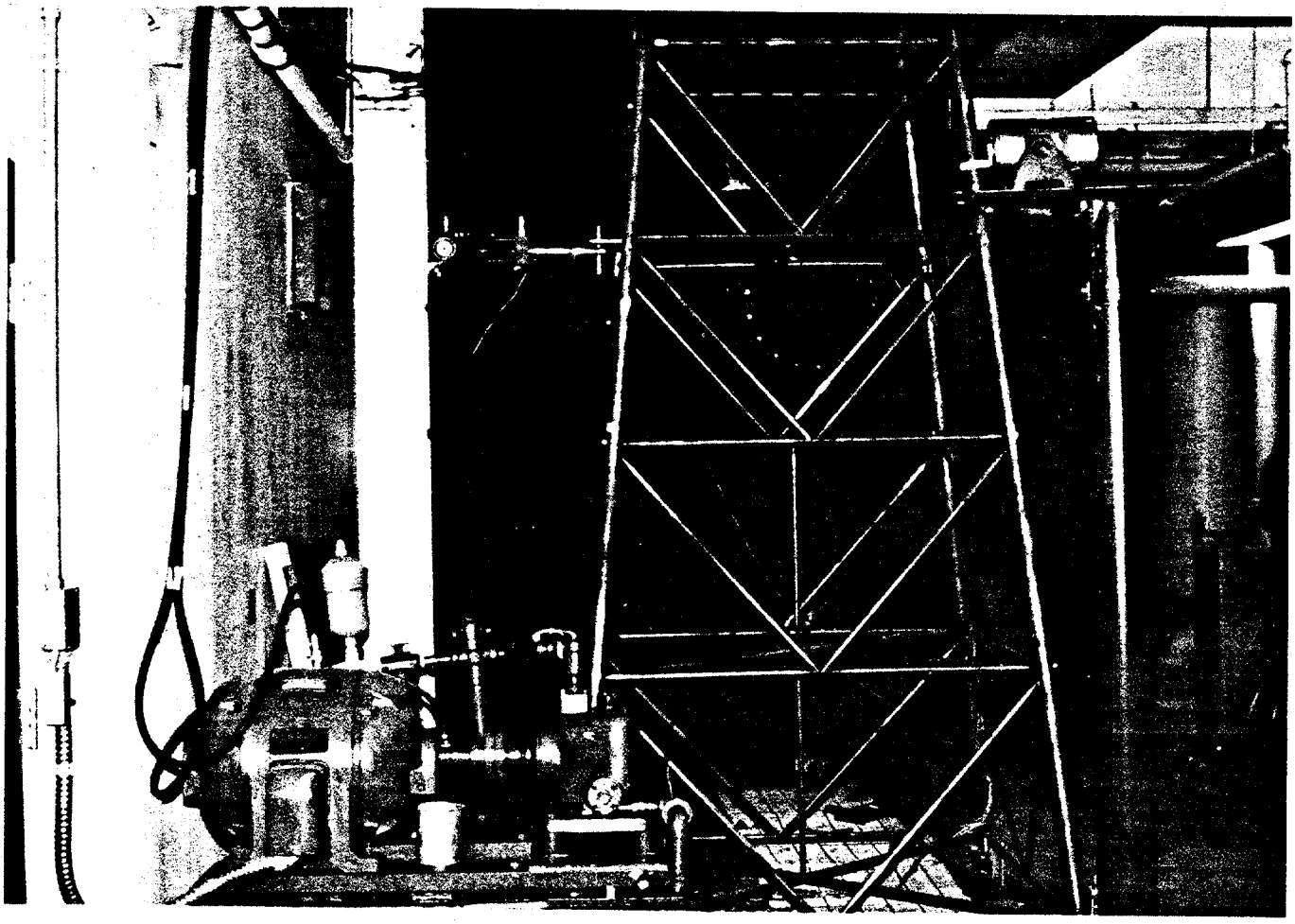
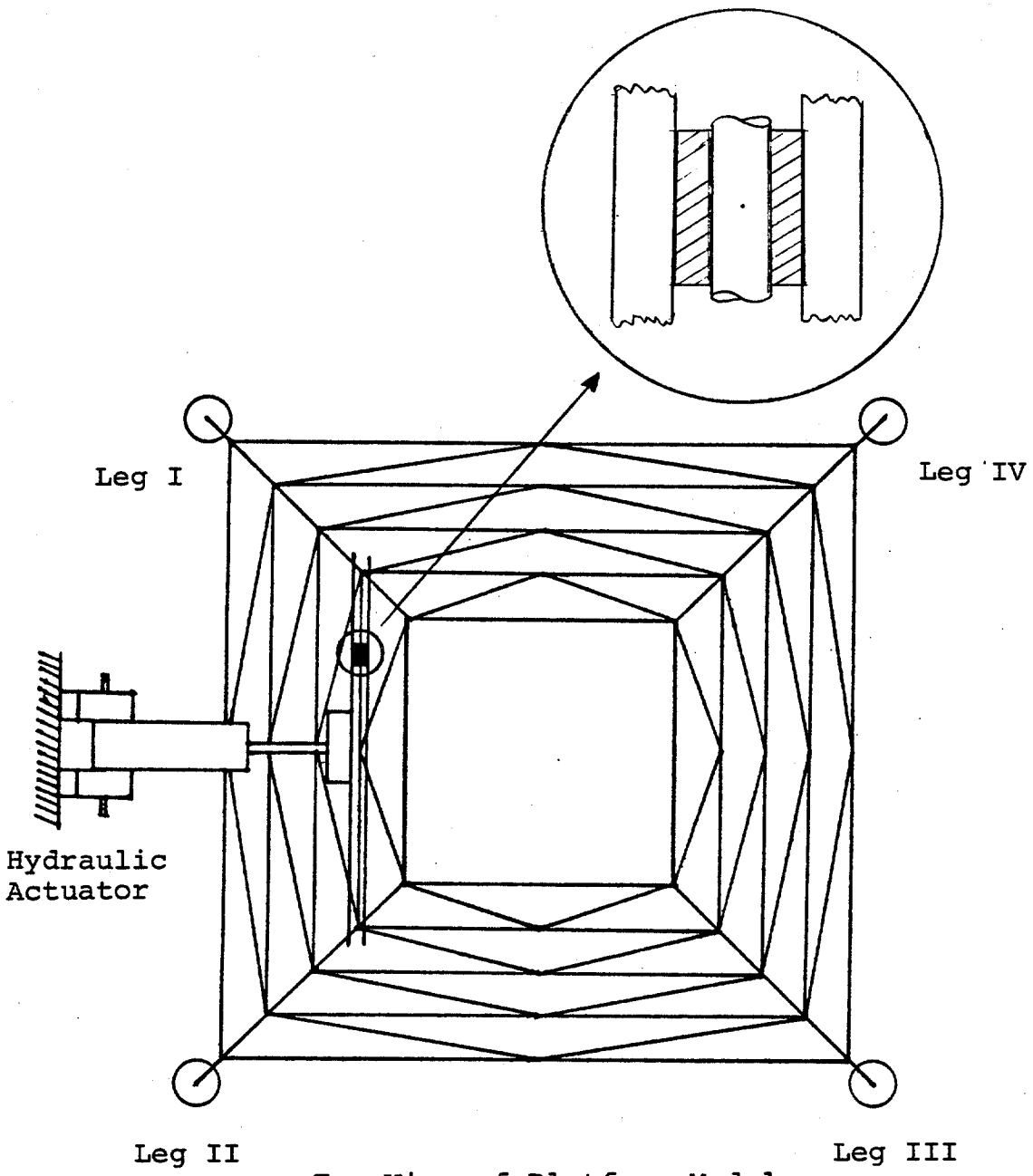


Figure 7. Platform Model Fatigue Test Experimental Set Up



Top View of Platform Model

Figure 8. Fatigue Load Application Point

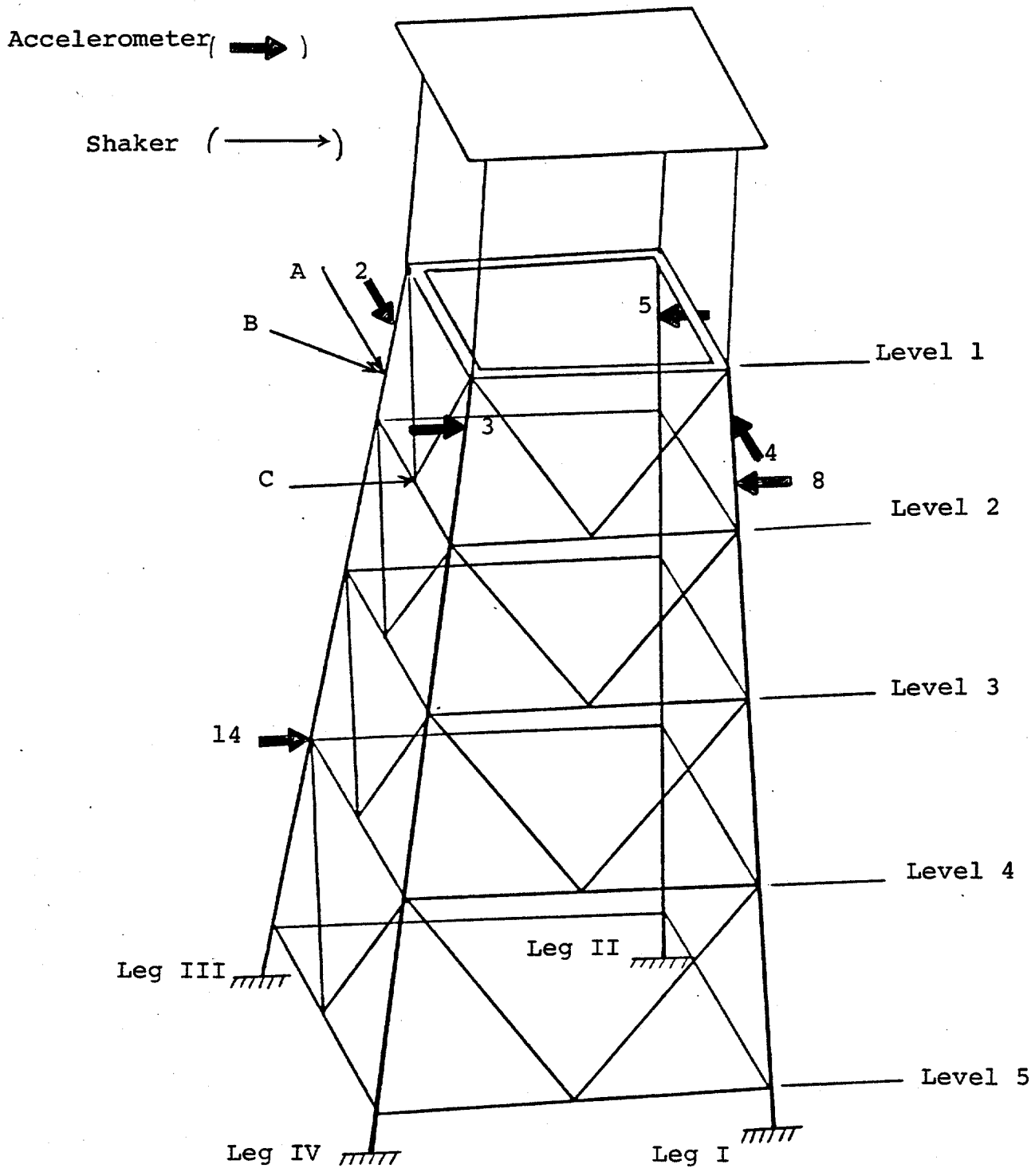


Figure 9. Accelerometer and Shaker Locations for the Fatigue Test

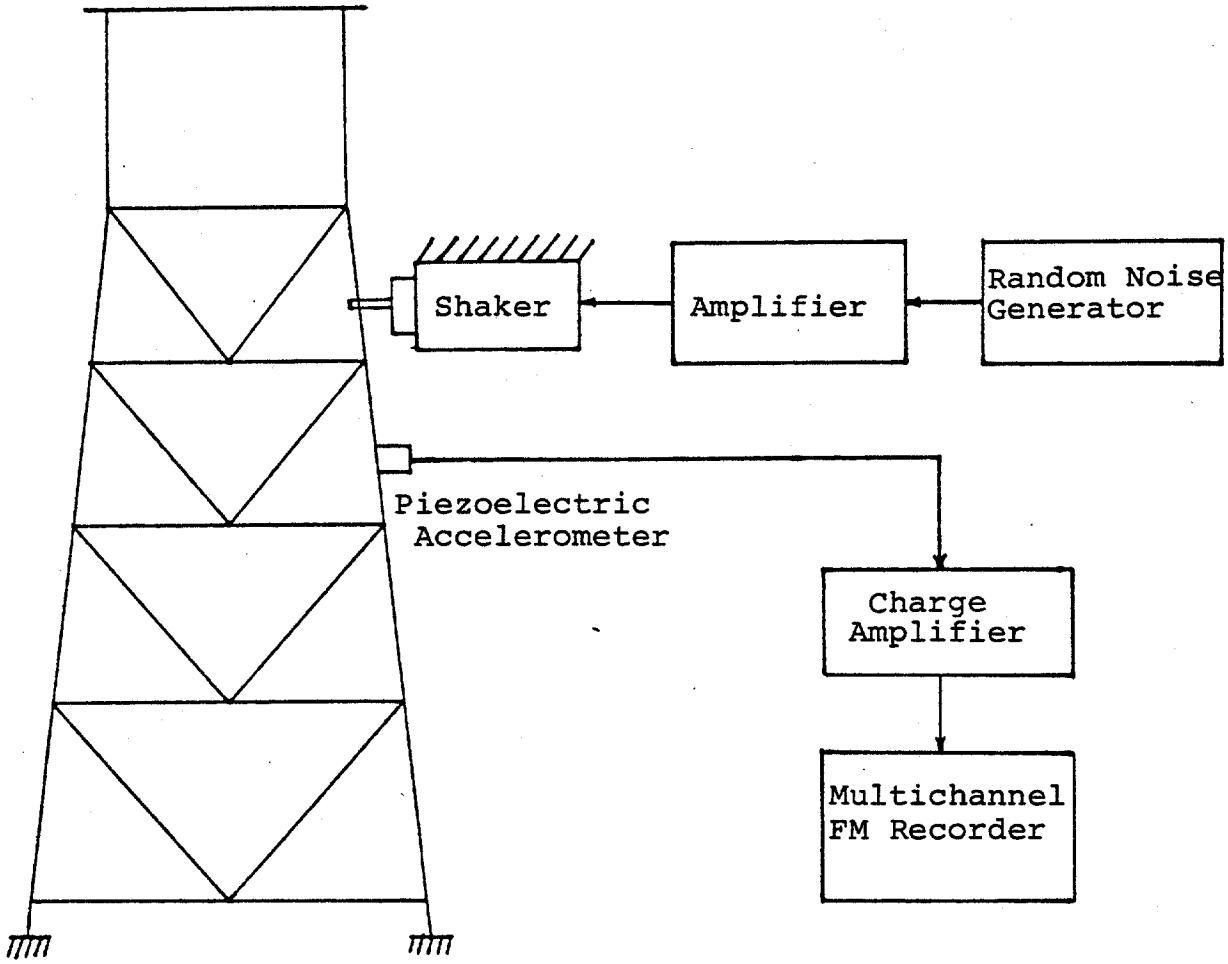
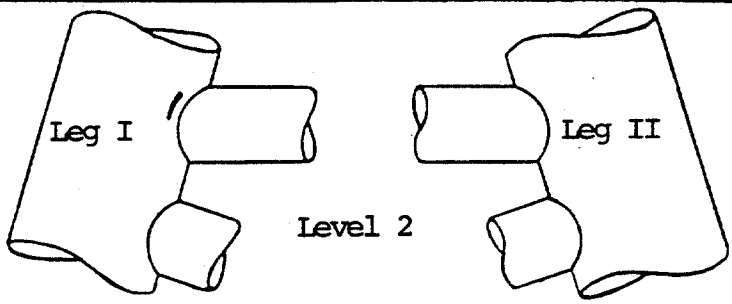
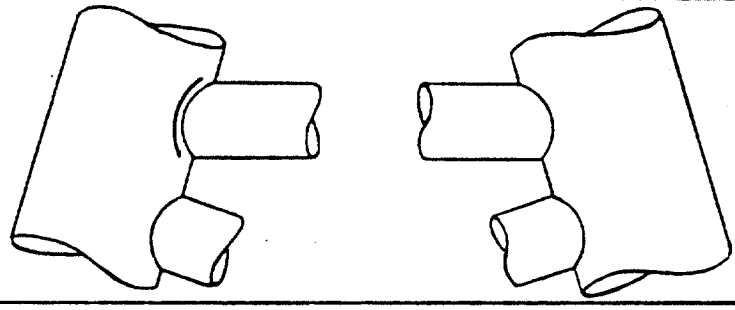
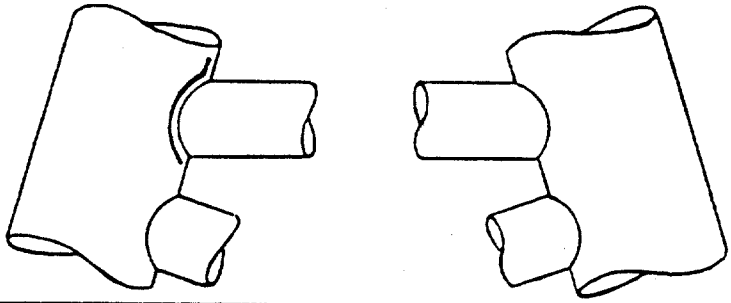
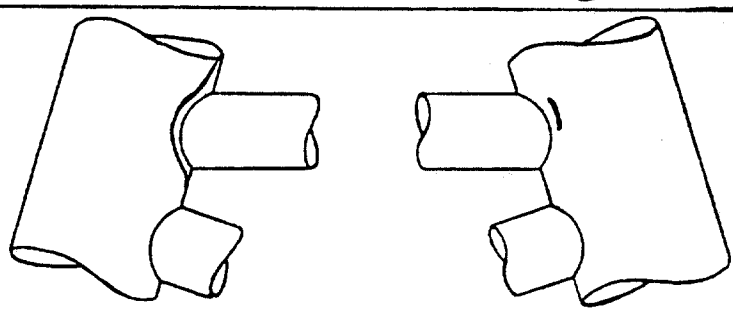
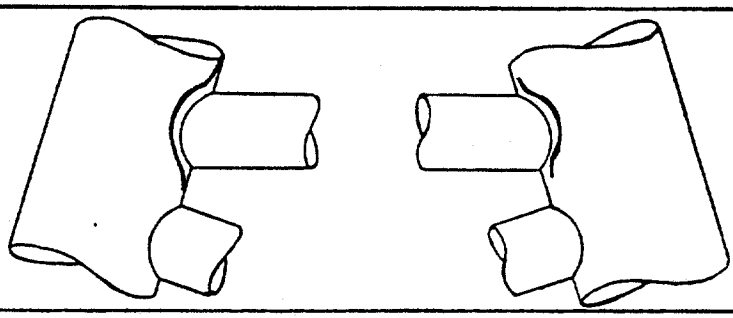


Figure 10. Random Noise Excitation and Response Signal Recording

Table 3. Fatigue Crack Growth in the Platform Model

Post Crack Recording Number	Number of Fatigue Cycles	Fatigue Crack Growth
1	497,500	
2	507,500	
3	529,400	
4	580,400	
5	640,400	

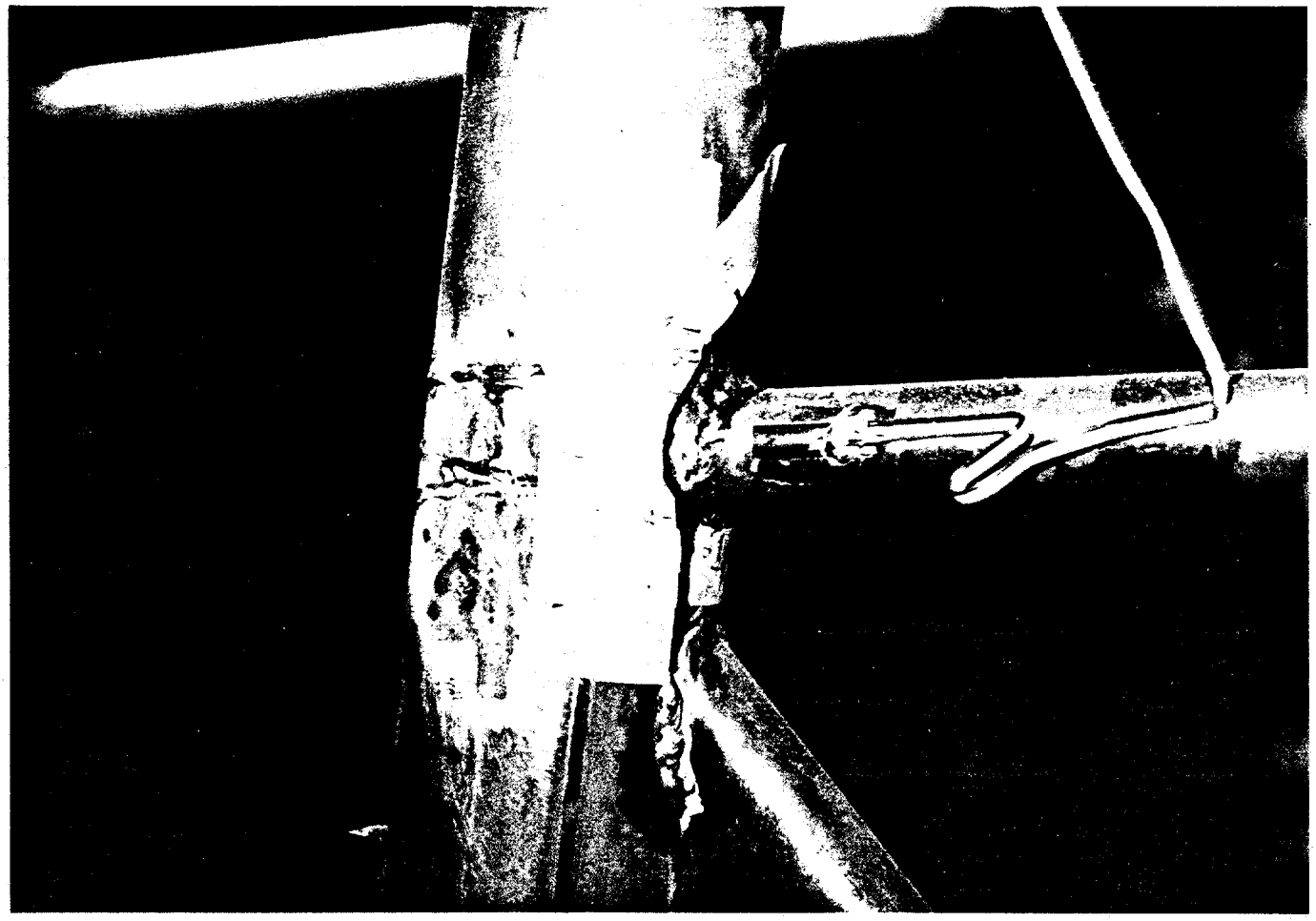


Figure 21. Fatigue Crack in Platform Model (Leg I, Level 2)

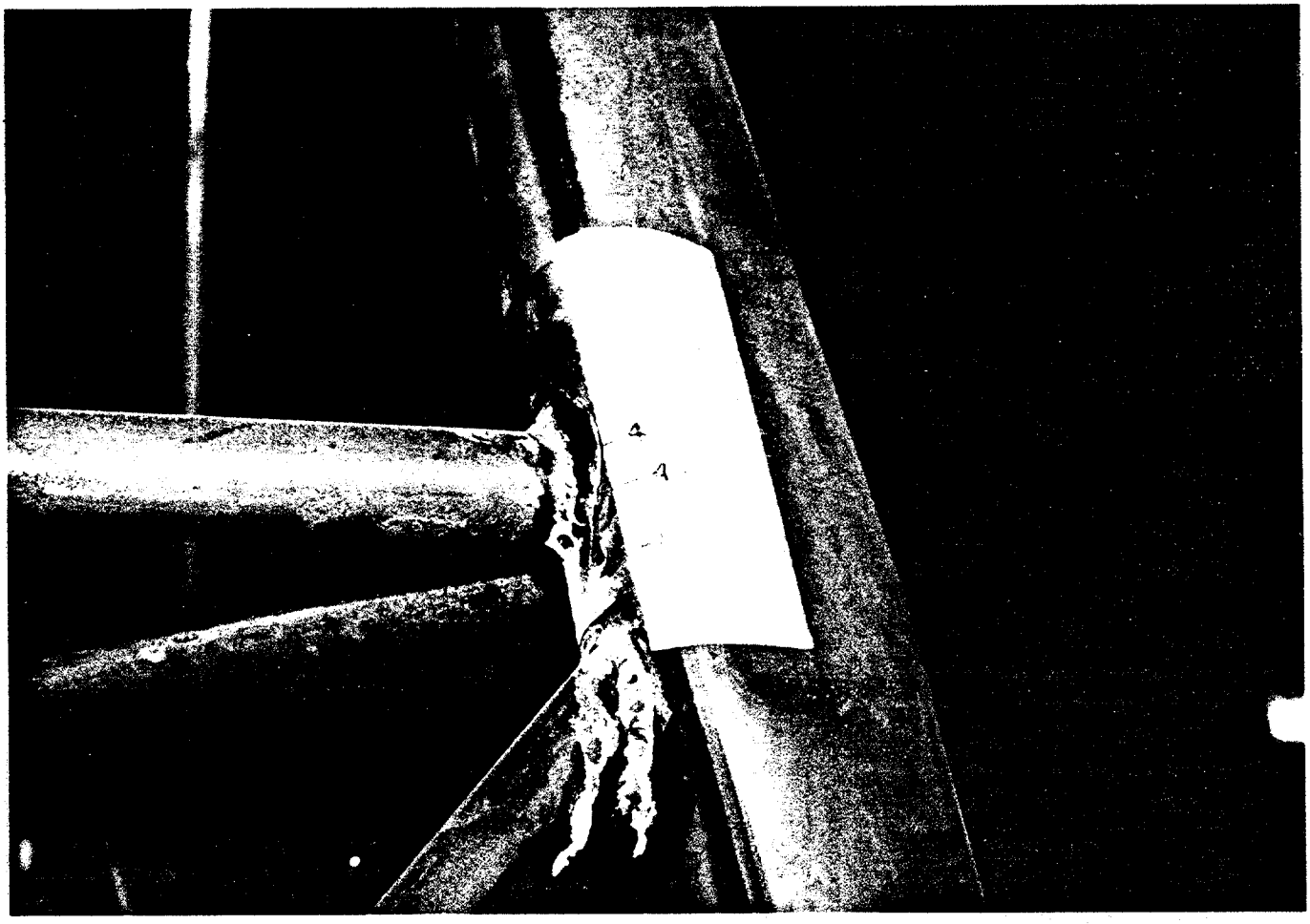


Figure 22. Fatigue Crack in Platform Model (Leg II, Level 2)

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