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FATIGUE LIFE OF IWRC WIRE ROPE.(U)
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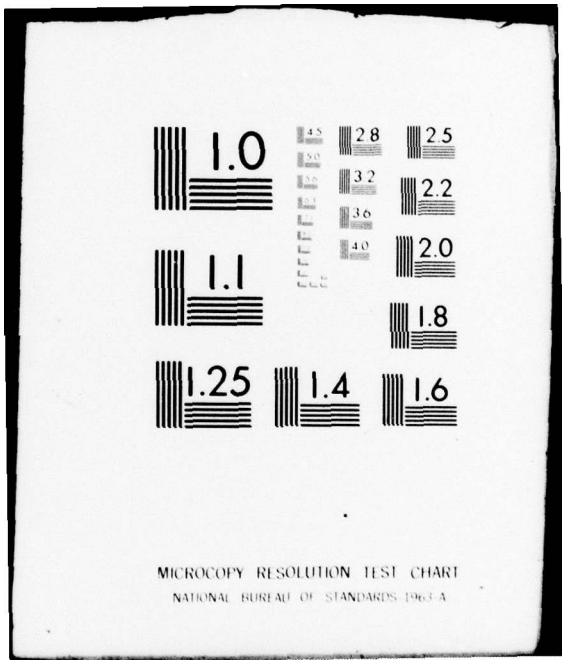
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MICROCOPY RESOLUTION TEST CHART
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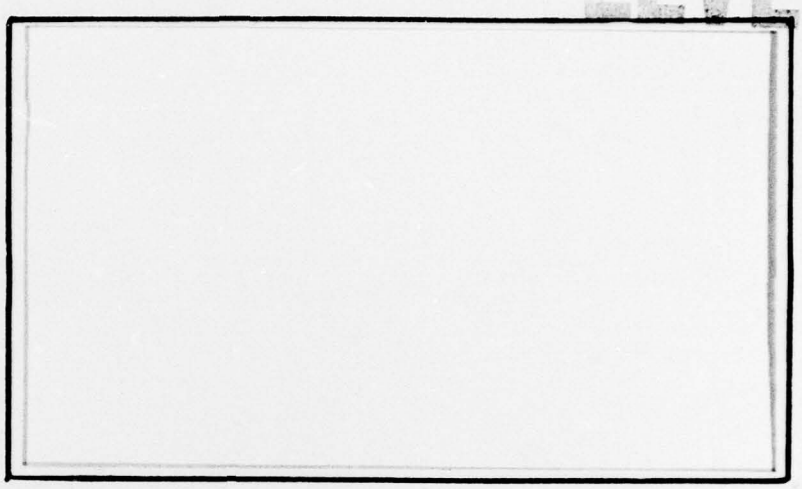
(1) LEVEL II



TECHNICAL MEMORANDUM

U.S. NAVAL APPLIED SCIENCE LABORATORY
FLUSHING & WASHINGTON AVES.
BROOKLYN, NEW YORK 11251

(14) NASL-9300-54-TM-4

(6)

FATIGUE LIFE OF IWRC WIRE ROPE.

SF 101 03 20, Task 8366

Lab. Project 9300-54, Technical Memorandum #4

(11) 9 MAR 67

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MATERIAL SCIENCES DIVISION

(9) Technical memo.

(12) 8p.

Approved: D. H. KALLAS
Associate Technical Director

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FLUSHING AND WASHINGTON AVENUES
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ADMINISTRATIVE INFORMATION

Ref: (a) NASL Program Summary for SF 101-03-20, Task 8366 of 1 Nov 1966
(b) FONECON btwn USL personnel (Mr. S. Rapinski, Code 933) and NASL personnel (Mr. R. O. Foernsler, Code 938) of 3 Mar 1966
(c) USL Spdltr 3900, 1-650-06-00, Ser 933.2-290 of 14 Apr 1966
(d) NASL Report, Lab. Project 9400-96, Technical Memo #1 of 26 Nov 1965
(e) NASL Report, Lab. Project 6344-1, Final Report of 4 Jan 1963
(f) FONECON btwn USL personnel (Mr. S. Rapinski, Code 933) and NASL personnel (Mr. P. J. Rubilotta, Code 938) of 7 Sep 1966

1. In conjunction with the program on VDS component development described in reference (a) and as requested in references (b) and (c), the U.S. Naval Applied Science Laboratory has conducted an investigation to determine the fatigue life of a $1\frac{1}{4}$" diameter, 6x19 IWRC wire rope. This rope is being considered for the strength member of the NAVUWTRSOUNDLAB minimum-width VDS towline which is intended for use on a shipboard machine that maintains the towed body at a constant depth. It should be noted that on the occasion of reference (b), it was planned to evaluate a $1\frac{1}{4}$ inch 6x25 IWRC wire rope, while reference (c), states that tests should be conducted on a 6x36 wire rope. Further, the wire rope actually submitted for test was a $1\frac{1}{4}$ inch 6x19 IWRC wire rope. However, after consultation between NAVUWTRSOUNDLAB personnel and NASL personnel, it was decided to subject the 6x19 wire rope to the test specified in reference (c). This report confirms the information reported in reference (f).

OBJECT

2. The object of the evaluation was to determine the fatigue life of a $1\frac{1}{4}$ inch diameter 6x19 IWRC wire rope when subjected to repeated cycles of operation over a 50 inch pitch diameter sheave while under a tensile load of 12,000 pounds. As requested in reference (c), this wire rope was to be subjected to test until either 3 million cycles of operation had been completed, or until failure of the wire rope was noted. Failure was considered to occur when the first outer armor wire break was noted. It should be noted that current state of the art precludes the determination of inner armor wire breaks, while under use conditions.

PROCEDURE

3. As requested by NAVUWTRSOUNDLAB under reference (c), the fatigue test was conducted in the fairing collar test machine shown on Figures (1) and (2).

This is the identical machine referred to in references (d) and (e), in which previous tests for fatigue testing of wire ropes were reported.

4. The sample rope was subjected to repeated cycles of operation over a 50 inch pitch diameter sheave, at a rate of 23 cycles per minute, while under a direct tensile load of 12,000 pounds. Visual and tactile examinations of the rope were made twice daily for signs of broken wires. No lubrication was applied to the rope during the test.

RESULTS

5. At approximately 1,000,000 cycles of operation, the first sign of failure was noted. One outer wire on the side of the rope making contact with the sheave groove broke within the one-foot length which alternately contacted and left the bottom portion of the sheave. The test was continued, and upon examination at 1,134,848 cycles two more wires had broken on the side of the rope making contact with the sheave groove within the one-foot length which alternately contacted and left the top portion of the sheave. Photographs of these wire breaks are shown in Figures (3), (4) and (5). Examination of the rope after disassembly revealed that none of the inner wires had broken during the test.

CONCLUSIONS

6. The fatigue life of the sample 6x19 wire rope under conditions of operation described herein, is at least 1,000,000 cycles.

7. The results of test, of paragraph 5 above, appear to substantiate the conclusions of reference (d), wherein the 6x19, IWRC, wire rope is considered more suitable as the strength member in the minimum-width towline, than lock coil wire rope.

RECOMMENDATIONS

8. Since this investigation was conducted at the request of NAVUWTRSOUNDLAB solely to determine fatigue life of the wire rope, and since NASL has no knowledge as to the number and rapidity of cycles of the strength member, when used with the constant depth machine, no recommendations regarding the suitability of this wire rope, for CDM use, are made.

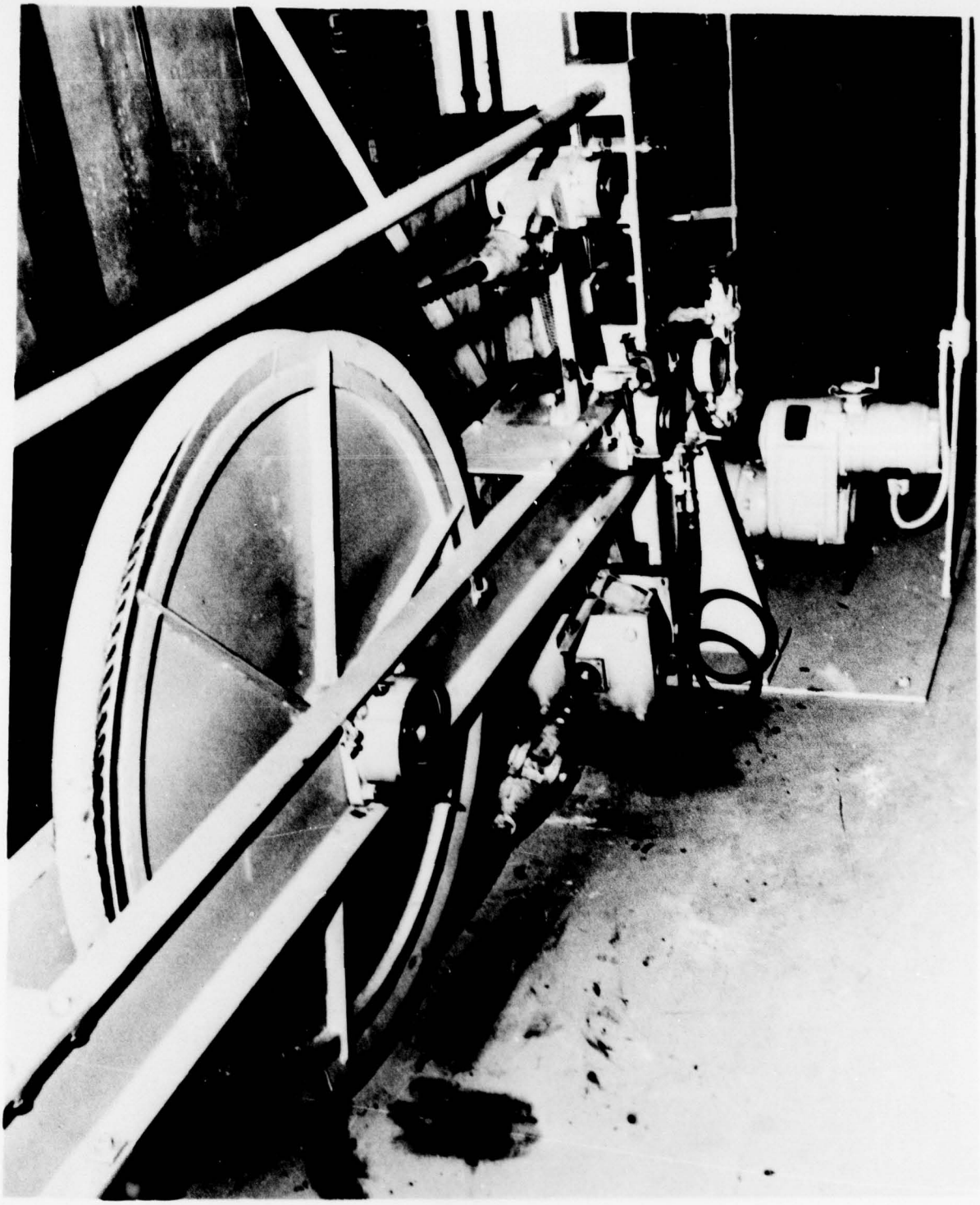

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FIGURE 1 McKIERNAN-TERRY FAIRING COLLAR TEST MACHINE. LEFT FRONT ANGLE VIEW

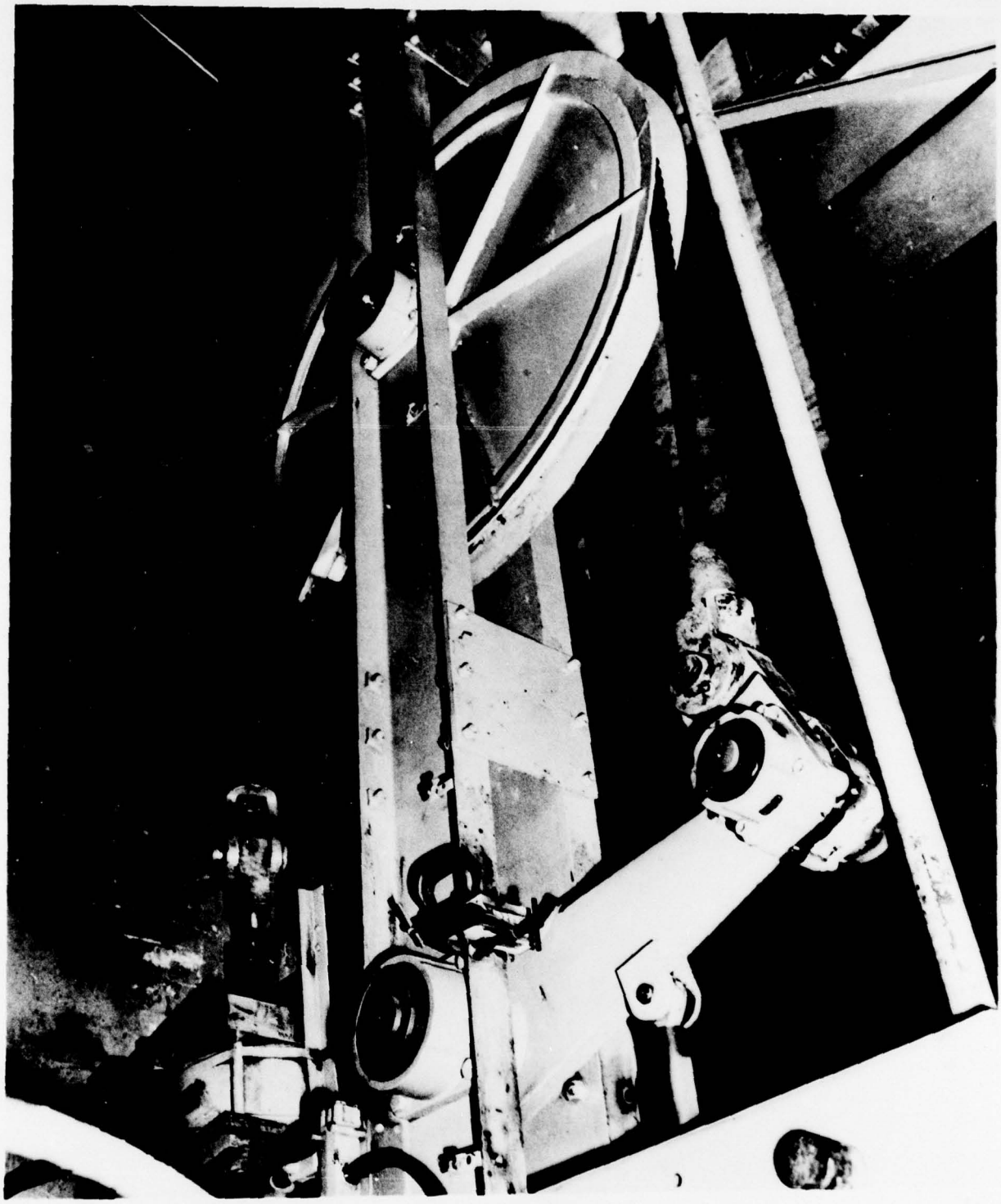

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FIGURE 2 - McKIERNAN-TERRY FAIRING COLLAR TEST MACHINE. RIGHT FRONT ANGLE VIEW

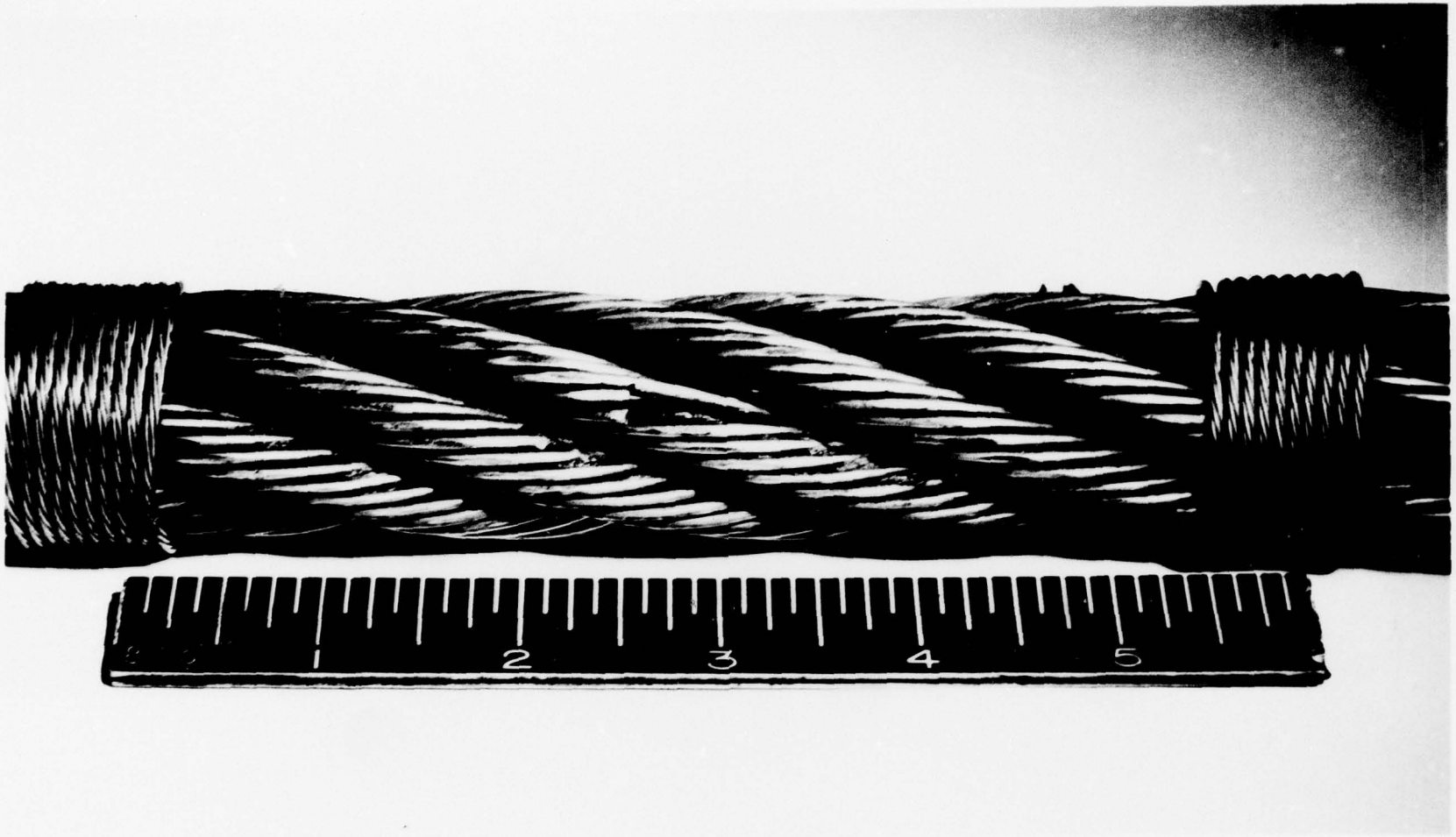

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FIGURE 3 - INITIAL BREAK AND WORN AREAS ON 1½" 6x19 (IWRC) WIRE ROPE, AFTER 1,000,000 CYCLES OF OPERATION

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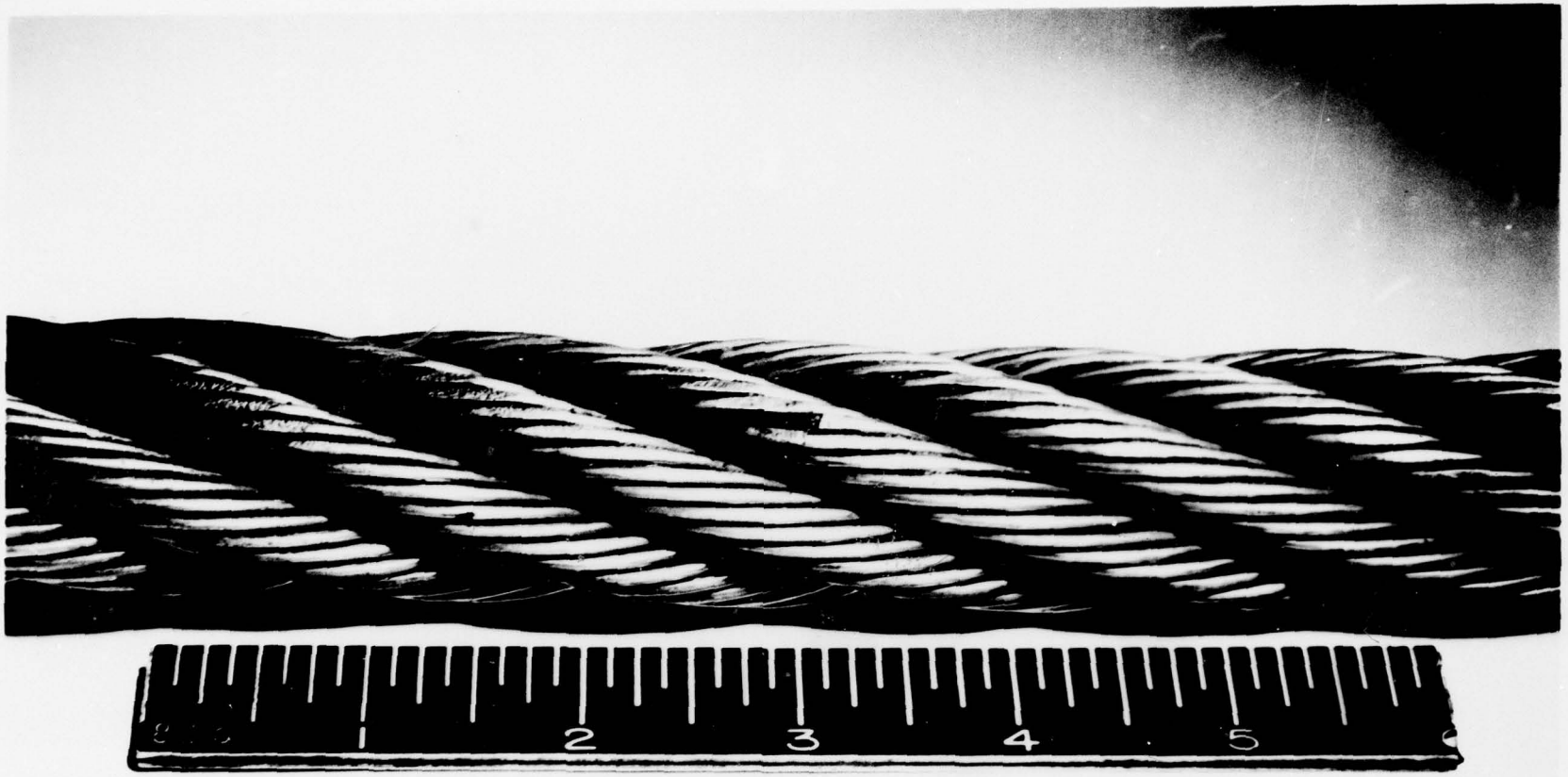

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FIGURE 4 - SECOND BREAK AND WORN AREAS ON 1¼" 6x19 (IWRC) WIRE ROPE, AFTER 1,134,848 CYCLES OF OPERATION

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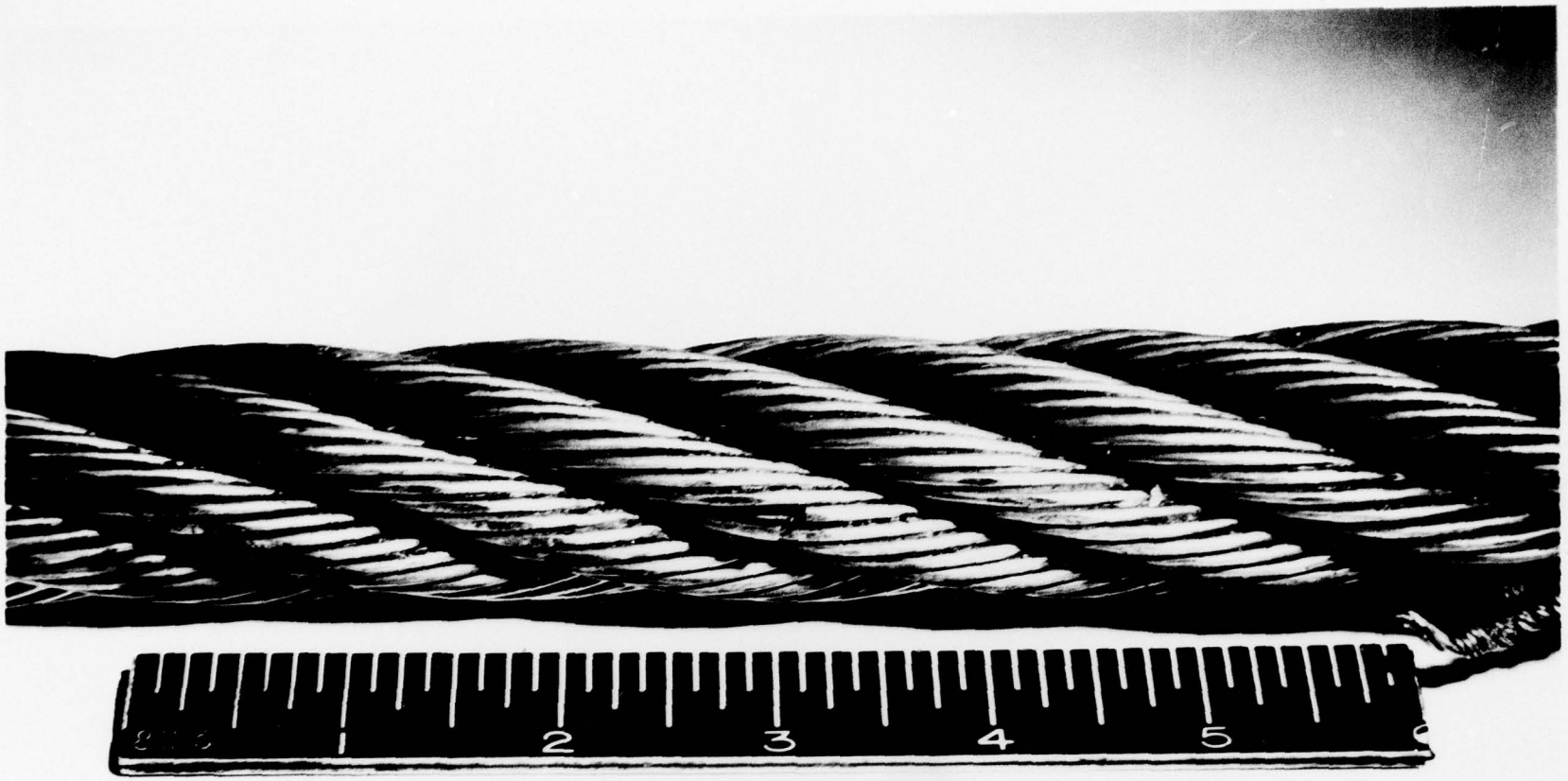

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FIGURE 5 - WIRE BREAK AND WORN AREAS ON
1" 6x19 (EIPS) WIRE ROPE, AFTER
1,134,848 CYCLES OF O...ATION

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