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Temperature Measurements
of a
500-Watt, Flush Runway-Light Installation

By
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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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1. INTRODUCTION

The results of tests to investigate the rise of temperature of the components of a 500-watt flush-type runway light when it was mounted on a 16-inches-deep base assembly containing the isolating transformer in an installation similar to that used in a regular airfield lighting installation are given in National Bureau of Standards Report 7182. This supplement reports the results of an additional test made using the same type light and transformer, but the installation was made at Willow Creek, California, (approximately 40 miles inland from the Arcata Airport) at the U. S. Forest Service Tish Tang Ranger Station. This test was planned because test number one as identified in report Number 7182 resulted in serious damage to the transformer. The poor thermal conductivity of the soil, which was very dry at the time of the test, was considered to be a major factor in causing the damage to the transformer. The new test was planned to determine if the transformer could be adequately protected by simple means in this type base when installed in soils of poor thermal conductivity and for soil temperatures exceeding those occurring at the Arcata Airport. The Willow Creek area at the end of the summer season has had several months with very little precipitation and the temperatures consistently exceed 90°F. each day.

2. TEST PROCEDURE

The test was made using the same light unit and transformer used in tests number three and four as described in NBS Report 7182 but with a new lamp and deep base assembly. The installation was made in a location where the sun shone on it from about 9:00 a.m. to 5:00 p.m. daily. The base assembly was encased in concrete similar to that of a normal runway lighting installation with a minimum of 6 inches thickness around the sides and bottom and a 30" x 30" top slab. The soil in which the installation was made was sand and boulders and was very dry to the depth of the excavation.

During the test, the lamp was energized at rated current by adjusting the primary current to the test transformer to its rated current. The lamp was energized continuously at rated current for a period of 48 hours.

The temperatures were recorded continuously for several hours after energizing and after turning off the lamp and for five minutes at hourly intervals during the rest of the test.

The test was made with the transformer laid on its side with the primary and secondary leads near the bottom of the base assembly and with a thermal shield of two thickness of aluminum foil(kitchen variety) between the transformer and lamp. The ground was very dry and the ambient air temperature ranged from 36°F. to 92°F.

3. RESULTS

The results of the temperature measurements are given in figures 2 through 8. (See figure one for location of thermcouples.)

4. DISCUSSION

The inside free air temperature attained near the top of the base exceeded that near the bottom of the base by more than 200 degrees Fahrenheit.

The same transformer was used for this test that was used in tests number 3 and 4 of the original report. There was no apparent damage to the transformer or leads except that the portion of the secondary leads above the aluminum foil which was exposed to the direct heat of the lamp became brittle and cracked when bent.

The results of this test and those made previously indicate that simple shielding between the lamp assembly and transformer is a satisfactory method of utilizing the MS-24526, 16-inches-deep base assembly for housing a class B15 flush runway light with a 500-watt lamp and 500-watt isolating transformer for runway lighting use.

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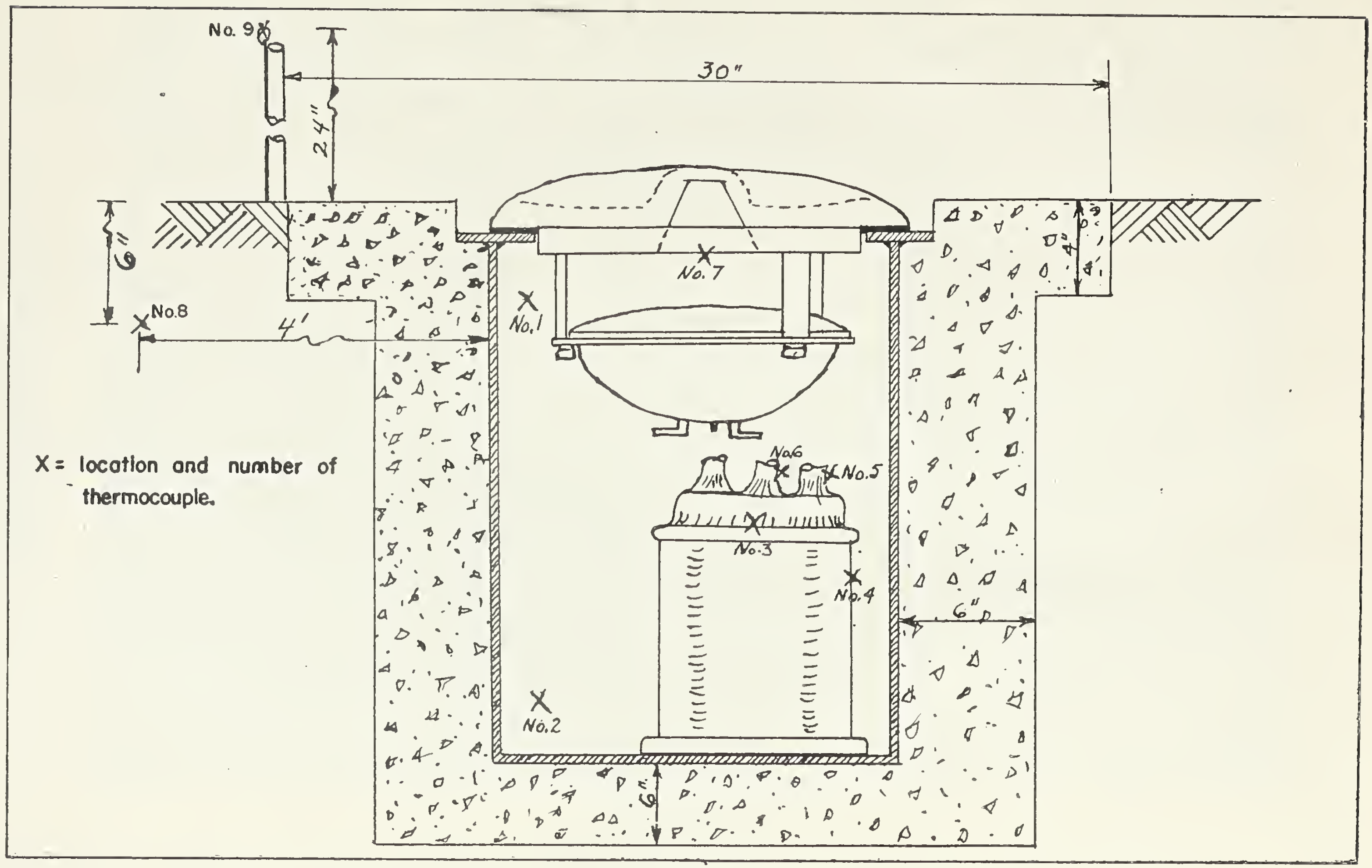

Figure I. *Light installation, showing thermocouple locations.*

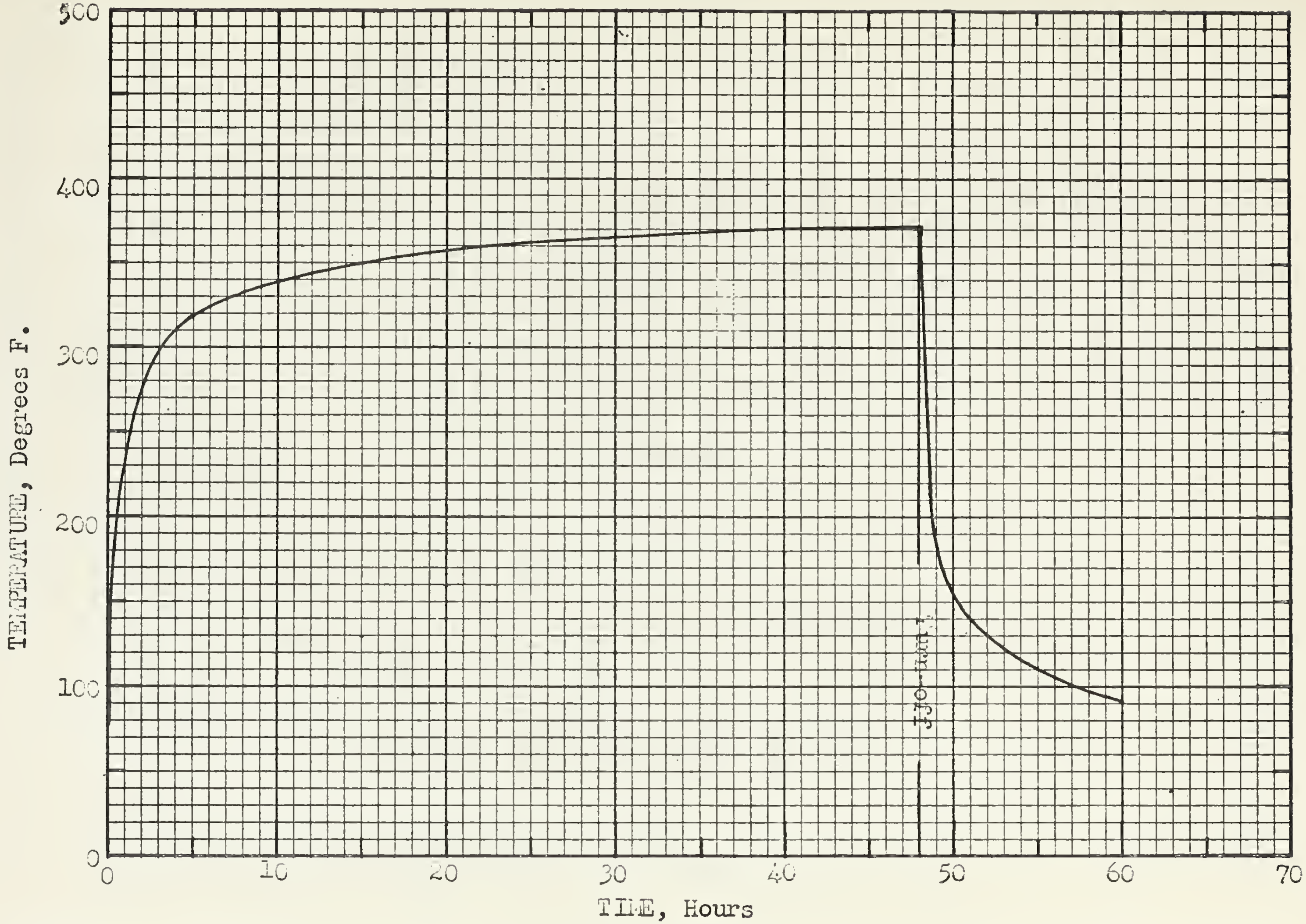

Figure 2. Time-temperature curve of thermocouple No. 1, free air inside base near the top.

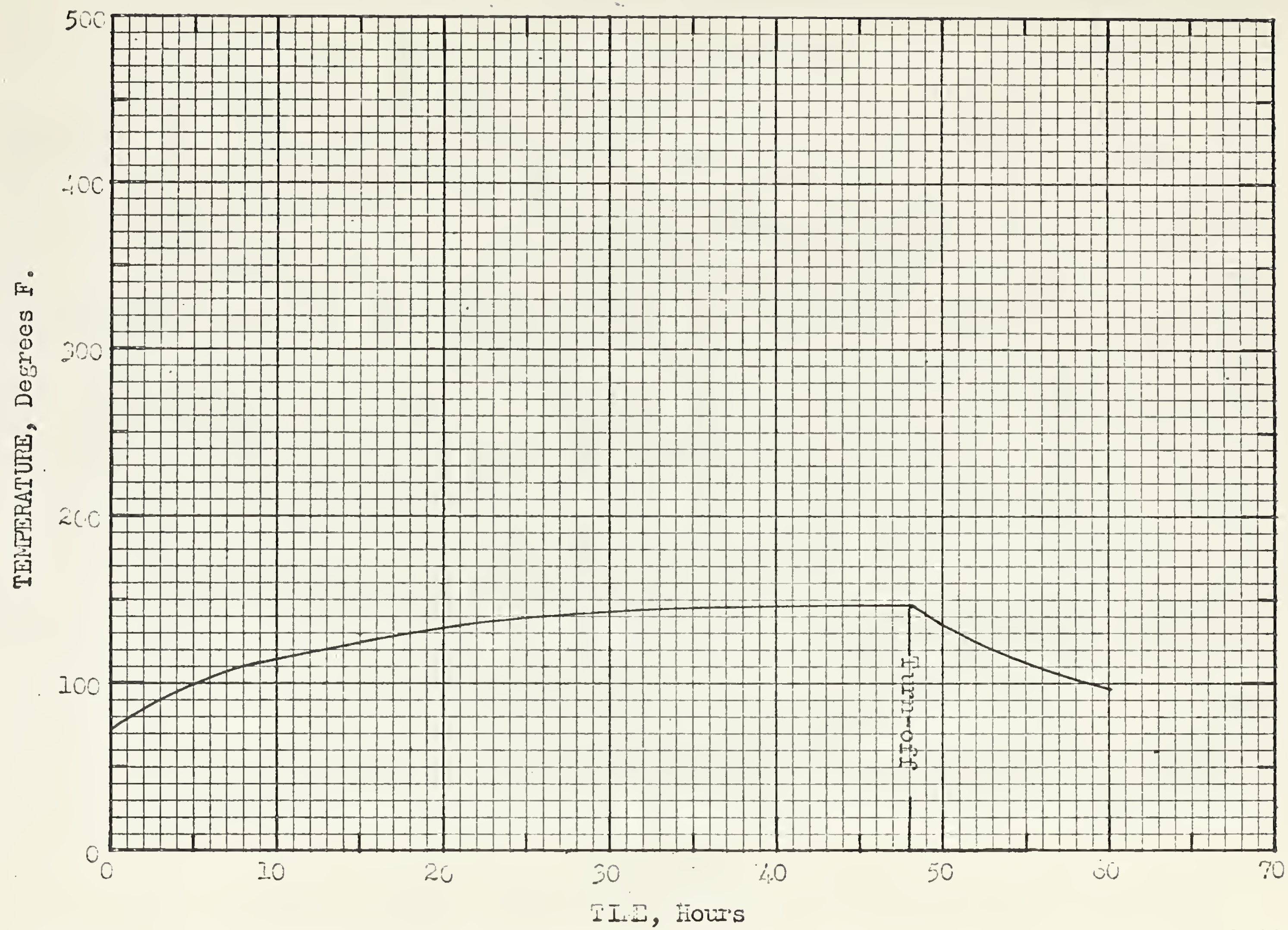

Figure 3. Time-temperature curve of thermocouple No. 2, free air inside base near the bottom.

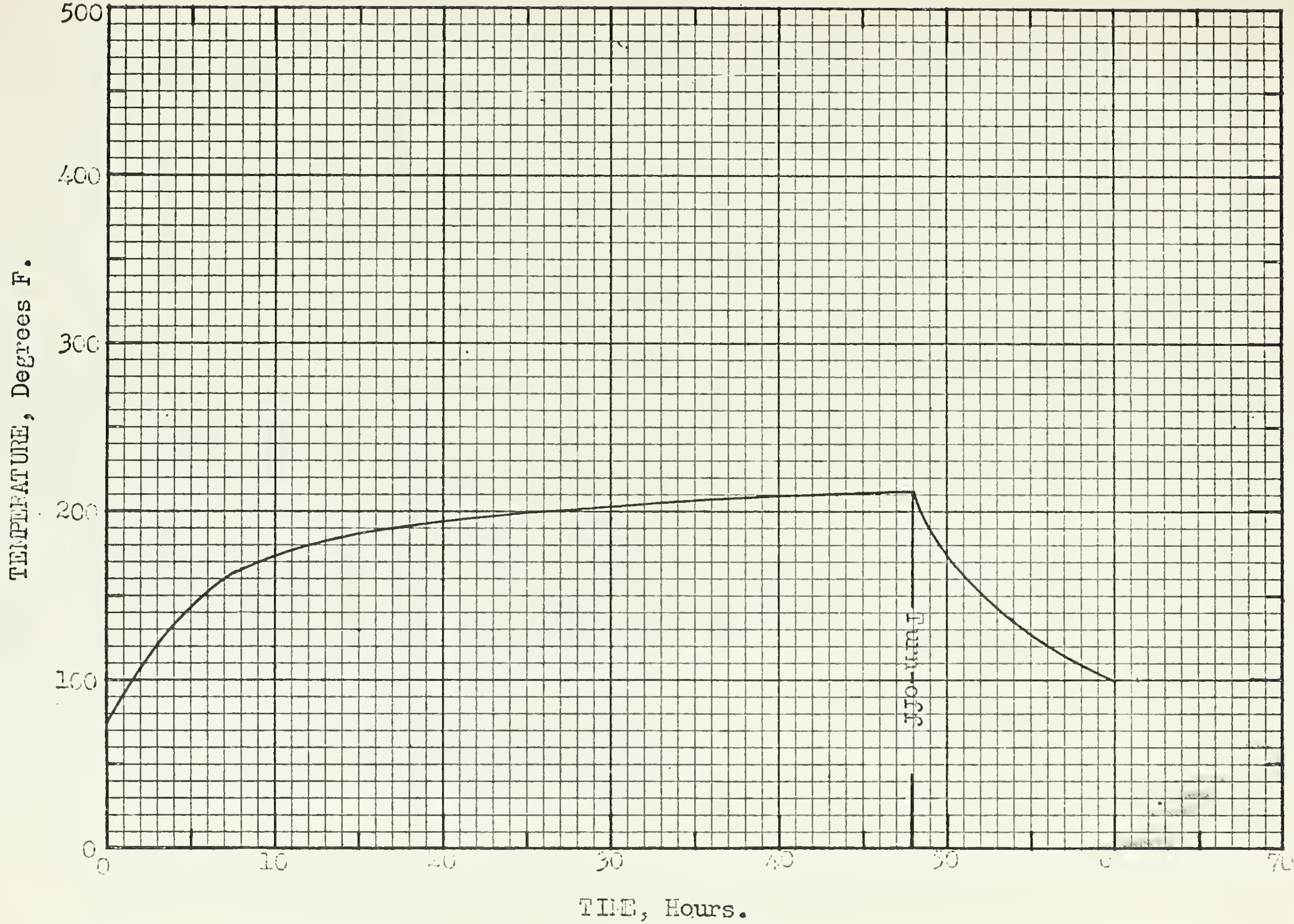

Figure 4. Time-temperature curve of thermocouple No. 3, top of transformer case.

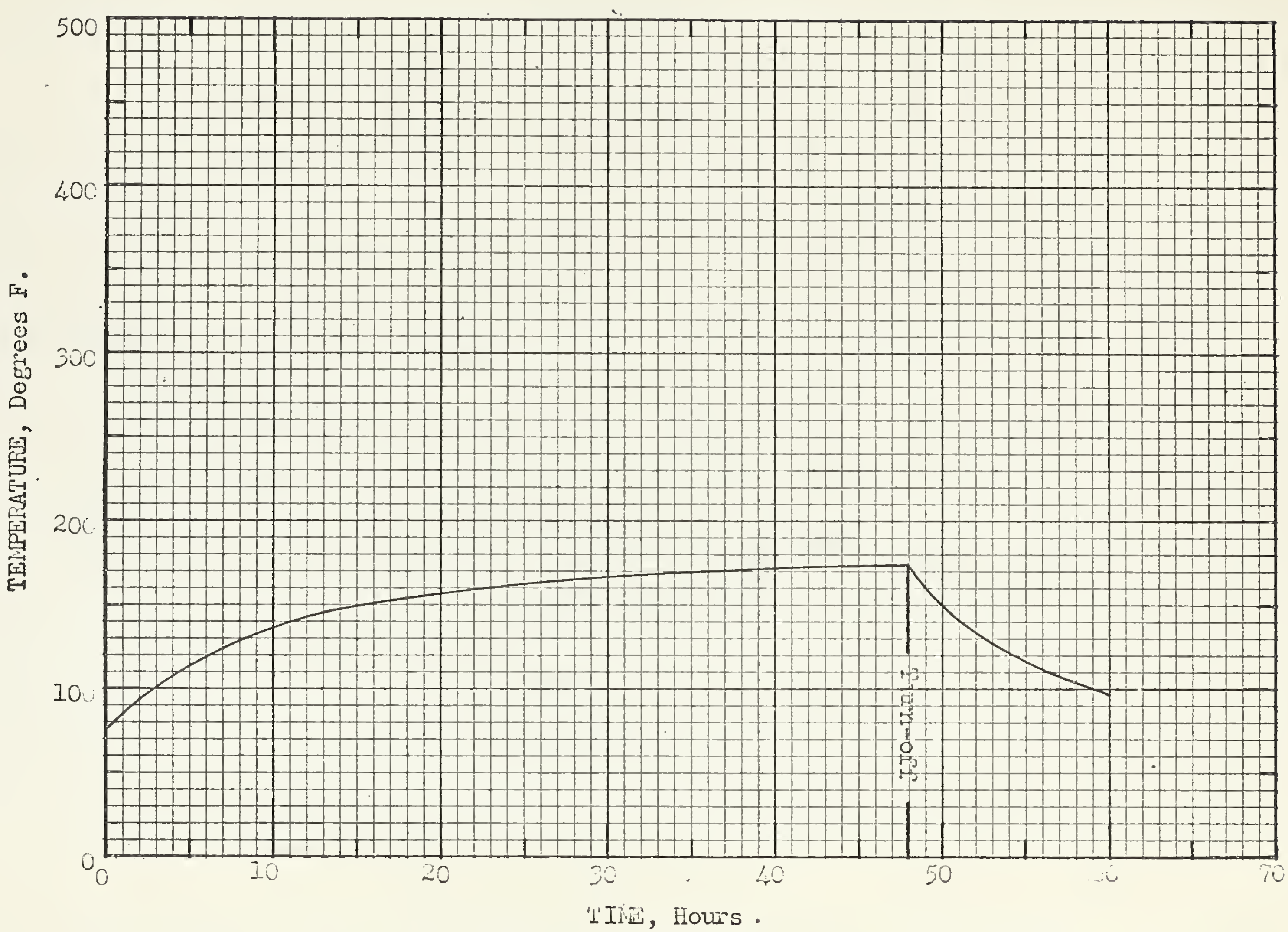

Figure 5. Time-temperature curve of thermocouple No. 4, side of transformer case.

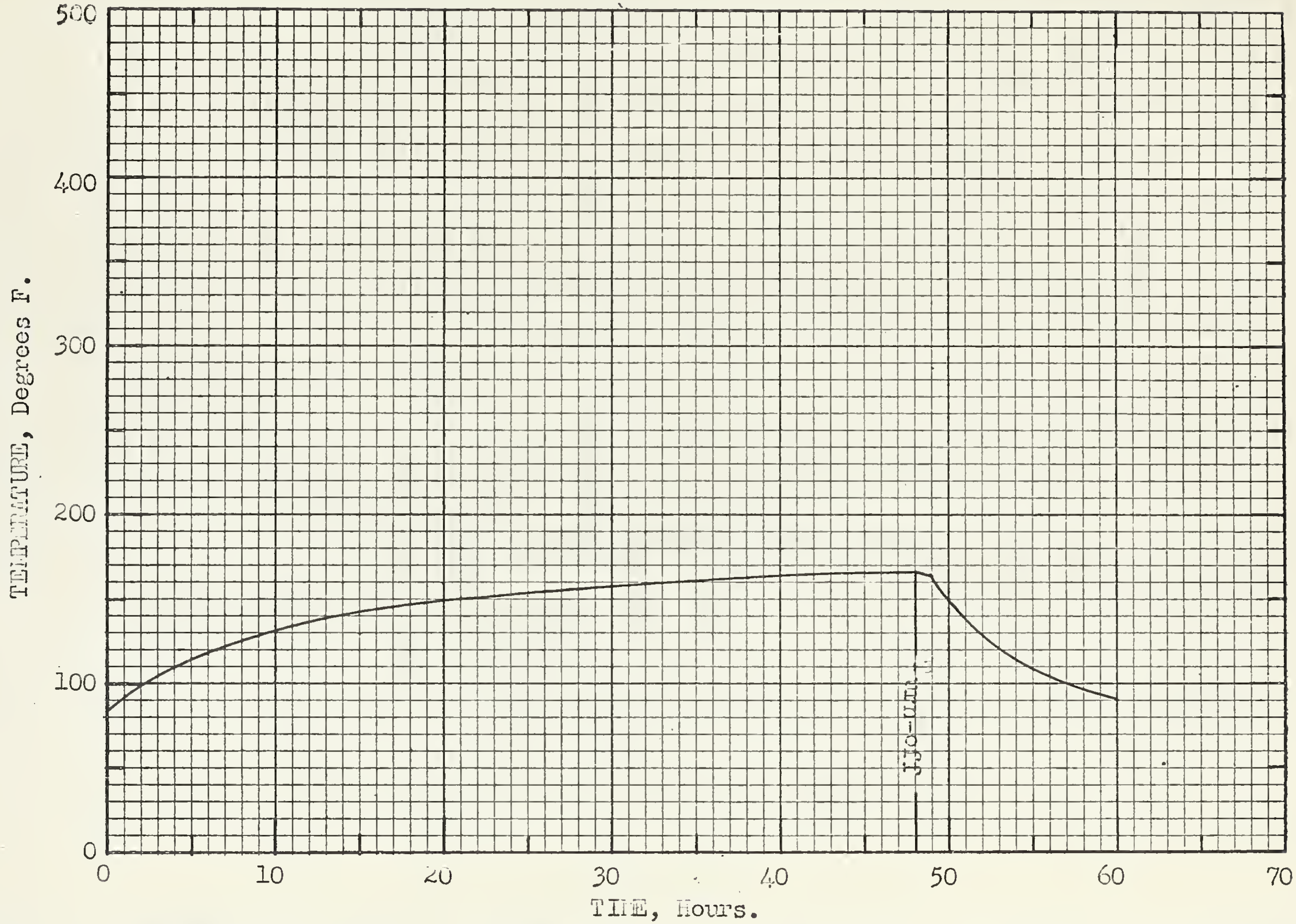

Figure 6. Time-temperature curve of thermocouple No. 5, primary lead of transformer at transformer.

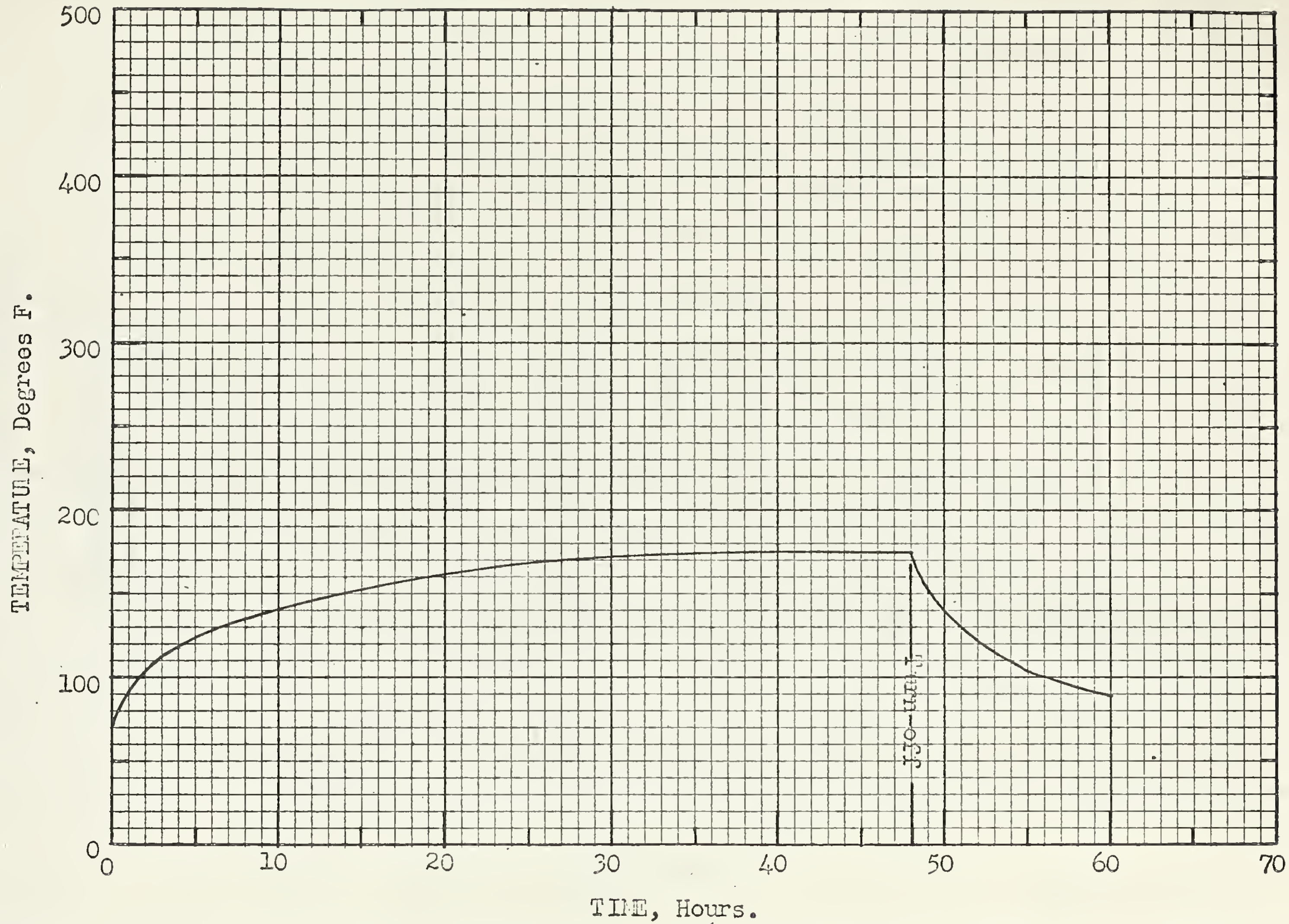

Figure 7. Time-temperature curve of thermocouple No. 6, secondary of transformer at transformer.

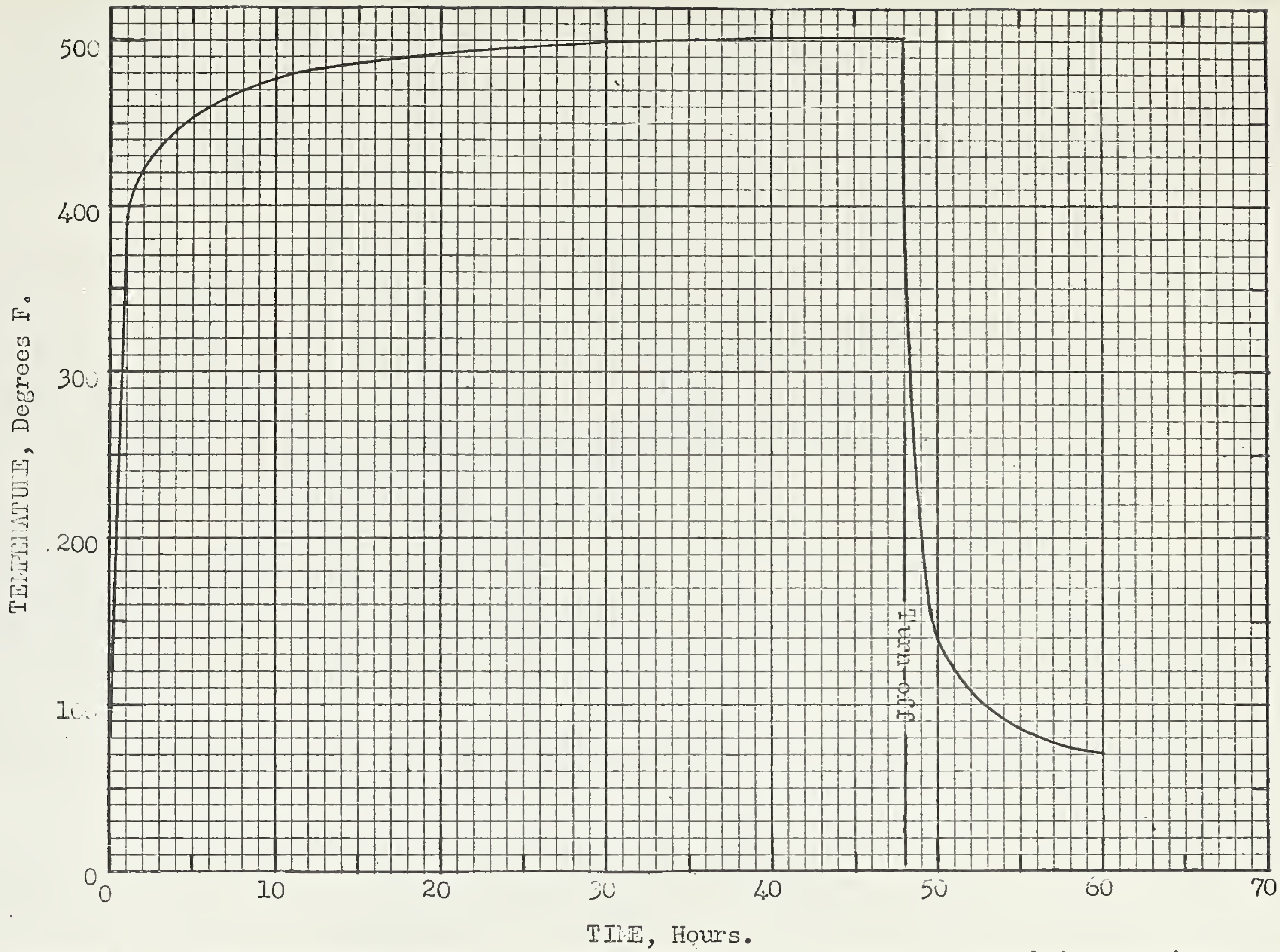

Figure 8. Time-temperature curve of thermocouple No. 7, inside top cover between prisms.