June 11, 1942 NRL Report No. B-1884

NAVY DEPARTMENT FR-1884

Report of Test

on

Gun Firing Transformer Type
GF, 200 V. A.

Submitted by

The Standard Transformer Company

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Authorization: BuShips ltr. S71-8(355) of March 22, 1942

Date of Test: May - June 1942

Prepared by:
J. S. Bryant, Senior Engineering Aide.

Reviewed by:
G. K. C. Hardesty, Asst. Electrical Engineer
Section Chief.

W. B. Roberts, Associate Electrical Engineer,
Division Superintendent.

C. L. Ashley, Lieutenant Commander, USNR.

Approved by:
H. G. Bowen, Rear Admiral, USN, Director

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APPENDICES

AUTHORIZATION FOR TEST

1. This problem was authorized by reference (a) and other references pertinent to this problem are listed as references (b), (c), and (d).

Reference: (a) BuShips ltr. S71-8(355) of March 22, 1942.
(b) Specification 17-I-19 (INT) of June 15, 1939.
(c) Specification 17-E-13 (INT) of March 1, 1942.

OBJECT OF TEST

2. The object of this test was to determine the conformance of the sample type GF transformer with specification, reference (b), and its suitability for Naval use. A high intensity shock test in accordance with specification, reference (c), was also conducted as orally requested by the Bureau, Code 665.

3. The sample transformer was set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the specification. Following an inspection to determine compliance in the matter of materials, design, and workmanship, the sample was subjected to the high intensity shock test. The test was concluded with an examination to ascertain the damage resulting from shock and a check against drawing, Plate 3.

CONCLUSIONS

(a) The sample type GF transformer complied with all electrical performance requirements of specification, reference (b) and its insulation resistance and dielectric strength were satisfactory. As the nameplate gave the supply voltage as 120 while the specification requires 115, the characteristics of the transformer were determined at both voltages. The values complied with the specification, within the estimated limits of measurement errors.

(b) The following features were noted as being undersirable although several are not definite violations of the specification.

1. The cork composition gasket was cemented to both contacting surfaces. It was badly injured during the removing of the cover but was capable of maintaining a watertight seal throughout the watertightness test.

2. There is no adequate protection against the shorting together of adjacent terminals. As received, the secondary of the transformer was shorted at the rear of the terminal strip from this cause.

3. The core is not actually clamped between the steel pads and securing clamps as described in paragraph 6 of this report and as is obviously intended. Instead, as the pads welded into the back of the case are too thin by approximately 3/16", they do not contact or support the transformer core but but allow the winding to contact the rear wall of the case.

4. The core and winding assembly was dislodged and the terminal strip was broken by the second horizontal blow of the H. I. shock test. Prior to this, the transformer had withstood two side blows in addition to the first horizontal blow. Following two vertical blows, the upper left mounting screw sheared off. The enclosing case sustained no damage.

5. The specification of 10 gauge steel given on manufacturer's drawing, Plate 3, does not check with the 0."108 thickness of the cover or the 0."112 of the case.

RECOMMENDATIONS

(a) It is recommended that approval of this sample transformer be held in abeyance pending the correction of the deficiencies outlined herein and its submission for examination and a satisfactory high intensity shock test, specification reference (c).

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample transformer tested was manufactured by The Standard Transformer Company , Warren, Ohio, as a type G. F. Torpedo and Gun Firing Transformer. The following data appear on the nameplate: KVA .200, Serial 26344, Cycle 60, Type GF, Pri. volts 120, Sec. volts 20, date 5/12/42.

5. The transformer is of the dry type, having a core made up of separately punched thin laminations. The core supports a primary and secondary winding, insulated from each other and the core, and impregnated with an insulating varnish after assembly.

6. The assembled transformer core is clamped into the case by two clamps of 1/8" x 1/2" steel stock, secured with four 12-24 fillister head steel machine screws which thread into 1/2" x 5/8" steel pads welded into the back of the case. Extensions of these clamps support the 1/8" phenolic terminal block on which the terminal studs and stamping to identify the primary and secondary are located. Four solderless type terminal lugs (Burndy QA No. 8) are furnished.

7. The welded case is of 0."112 copper bearing steel and has three 3/4" I.P.S. terminal tube bases located at the lower part of the case. The four case mounting lugs (drilled for 3/8" mounting screws) are extensions of two 1/4" by 7/8" flat steel strips welded to the rear of the case. The case is flanged and has two "U-shaped" hinge clips welded to it, just behind the upper flange.

8. The flat cover (of 0."108 steel) is hinged to the case by two 3/8" bolts which tap into the hinged pins. Eight 5/16" hexagonal headed bolts with flat and lock washers secure the cover to the case flange. A 1/8" cork composition gasket is clamped between the case and cover to assure watertightness. An etched and stamped nameplate is secured with four 6-32 plated brass round head machine screws to a steel pad which is welded to the cover.

9. Further details of the design of the transformer are given by photographs, Plates 1 and 2 and outline drawing Plate 3.

METHOD OF TEST

10. The resistances of the windings were first measured at room temperature (28° C.) with a Kelvin bridge that was accurate at low resistance values and eliminated errors due to test lead resistance.

11. The transformer was then placed in a compartment where the temperature was maintained at 40°C. After the transformer had reached the temperature of the compartment, as indicated by resistance readings, the rated load, 200 V. A. - 1.0 P. F., was applied for 1 hour.

12. At the end of the 1-hour run, the voltage regulation and efficiency were determined and the resistances of the windings were measured.

13. After allowing the transformer to cool to 40°C., the secondary was short-circuited for a period of 15 seconds. Immediately following this, (within 5 seconds) the insulation resistances between windings and between windings and ground were measured with a 500-volt "megger".

14. The shock test of 20-250 foot-pound blows was next applied with the transformer mounted on a standard Bureau of Engineering shock stand, six inches below the point of impact.

15. The transformer was heated again by a one-hour run at rated load and subjected for one minute to a 60-cycle, alternating potential of 2500 volts between primary and secondary and between primary and core and 1250 volts between secondary and core. The insulation resistance was again measured with a 500-volt "megger".

16. Following a watertightness test, with winding and core assembly removed, the transformer was assembled and subjected to the HI shock test outlined in specification, reference (c). The extent of damage was determined visually but the insulation resistance was again checked with a "megger" following the test.

17. The test was concluded with an inspection of the Materials and a check against drawing, Plate 3.

RESULTS OF TEST

18. The following results were obtained when the sample transformer was tested in the manner required by the specifications.

Requirements	Test Values	
Primary Voltage: 115 volts 60 Cycle, Single phase.	115 volts supplied	120 volts supplied.
Secondary voltage: Not over 20 volts at no load.	19.3 volts	20.1 volts
Efficiency: Shall be not less than 85 percent at rated load: 200 V.A. at 1.0 P. F.	91.0 percent	91.0 percent

Requirements	Test Values
Temperature rise: Shall not exceed 50°C after 1 hour period at rated load.	29.37°C. Primary 28.0°C Secondary Above 40°C. (Ambient)
Short circuit test: Transformer shall withstand a short circuit on the secondary for 15 seconds, with 115 volts on the primary.	Complied.
Insulation resistance: Shall be not less than 100 meghoms by 500 volt megger, immediately following the short circuit test.	Complied
Voltage regulation: Secondary voltage shall be not less than 18 volts at 200 V.A., at 1.0 P. F.	18.0 volts 18.8 volts
Shock integrity: Shall withstand 20 shocks of 250 foot-pounds each.	Complied. (Tested with cover on).
Dielectric strength: Shall withstand 2500 volts between primary and secondary and between primary and core and 1250 volts between secondary and core while transformer is hot.	Complied. (Tested at 60 cycles, following a 1-hour full load run at 40°C.)
Watertightness: No leaks shall occur when case is immersed in water to a depth of 3 feet for a period of 12 hours.	Complied.
Terminal block: Shall be of approved phenolic material having terminals and suitable markings.	* Terminal block too weak. Great possibility of terminals shorting. Voltages not marked.
Transformer mounting: Bosses shall be provided inside of case.	* Steel pad provided in lieu of bosses is too shallow. See "Conclusions".
Bosses for terminal tubes: Shall be provided as specified.	Three bosses provided.
Case construction: The case shall be of aluminum alloy, 3/16" thick, and shall be provided with a 1/4" square rubber gasket and a V-edge.	Steel substituted for aluminum as desired by Bureau. Gasket of flat cork composition.

Dimensions: Shall not exceed 6x12x6 inches.	6."0x10."6 x4."7
Weight: Shall not exceed 18-1/2 lbs.	18 lbs. 2 oz.
Painting: Primming coat of zinc chromate followed by two coats of aluminum paint. Inside to be finished with two coats of insulating varnish and outside to be followed with two coats of battleship gray oil paint.	* Outside - dark grey. Inside black insulating varnish. Red Primming coat used.

No load characteristics: Not specified.

Primary volts.	115 V.	120 V.
Amps.	0.355 A.	0.415 A.
Watts	13.7 W	14.9 W.
P. F.	29.9%	33.7%

Resistance of windings: Not specified - (ohms).	Primary 1.40 ohm Secondary 0.049 ohm at 28°Cent.
High Intensity shock: Two blows in each of 3 planes, side, horizontal, and vertical.	* Transformer damaged. See "Conclusions".

* Denotes failure to comply with specifications.

CONCLUSIONS

19. The sample type GF transformer complied with all electrical performance requirements of specification, reference (b), and its insulation resistance and dielectric strength were satisfactory. As the nameplate gave the supply voltage as 120 while the specification requires 115, the characteristics of the transformer were determined at both voltages. The values complied with the specification, within the estimated limits of measurement errors.

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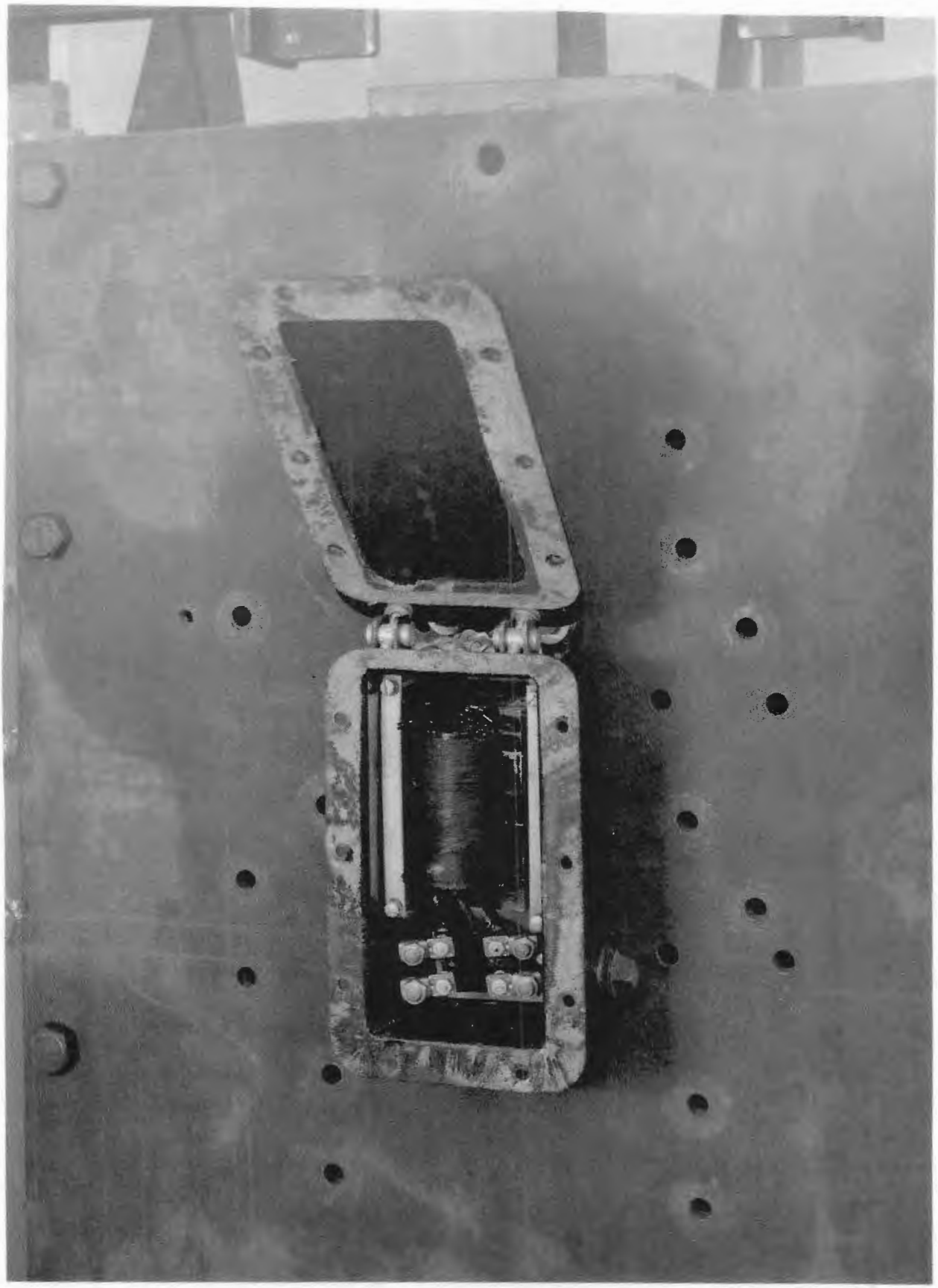

PLATE 1

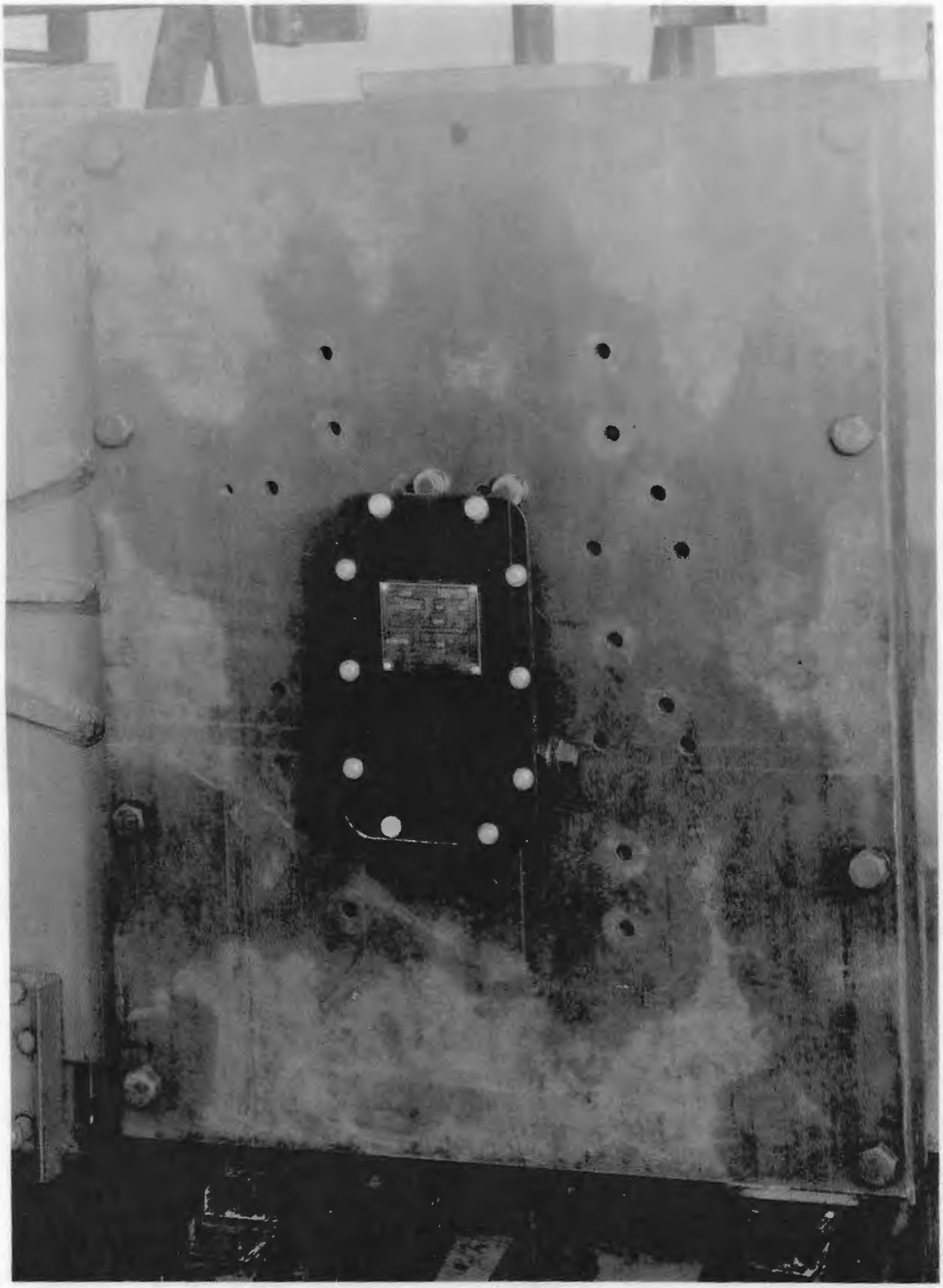

PLATE 2