



Wyle Laboratories, Inc.
 7800 Highway 20 West
 Huntsville, Alabama 35806
 Phone (256) 837-4411 • Fax (256) 830-2109
 www.wyle.com

REPORT NO.: T70274-01
 WYLE JOB NO.: T70274
 CLIENT P.O. NO.: 91150512
 CONTRACT: N/A
 TOTAL PAGES (INCLUDING COVER): 38
 DATE: August 1, 2012

TEST REPORT
ENVIRONMENTAL AND DYNAMICS TESTING
ON TWO
RUGGEDIZED CASES (TYPE 4000)
FOR
B&W INTERNATIONAL
WYLE REPORT NO. T70274-01

B&W International
Junkendiek 5
Ibbenbueren, Germany D-49479

STATE OF ALABAMA }
 COUNTY OF MADISON }

David R. Bailey, Department Manager, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted testing and is to the best of his knowledge true and correct in all respects.

David R. Bailey

SUBSCRIBED and sworn to before me this 1st day of August, 2012
Patricia A. Phillips
 Notary Public in and for the State of Alabama at Large

My Commission expires January 6, 2013

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

TEST BY: Tory Jones 8-2-12
 Tory Jones, Project Engineer Date

APPROVED BY: Randy Hooper 8/2/12
 For Anthony Murks, Engineering Supervisor Date

WYLE Q.A.: Raul Terceno 8/1/12
 For Raul Terceno, Quality Assurance Manager Date
 (pap)

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	2
1.1 Scope.....	2
1.2 References.....	2
1.3 Test Specimen Description	2
1.4 Summary.....	2
2.0 TEST PROCEDURES AND RESULTS	3
2.1 Low Temperature Test.....	3
2.2 Dry Heat Test.....	3
2.3 Sinusoidal Vibration Test (K).....	4
2.4 Impact Test (Vertical).....	5
3.0 TEST EQUIPMENT AND INSTRUMENTATION.....	5
4.0 QUALITY PROGRAM.....	6

ATTACHMENTS

ATTACHMENT A - PHOTOGRAPHS.....	A-1
ATTACHMENT B - LOW TEMPERATURE TEST DATA.....	B-1
ATTACHMENT C - DRY HEAT TEST DATA	C-1
ATTACHMENT D - SINUSOIDAL VIBRATION (K) TEST DATA.....	D-1
ATTACHMENT E - IMPACT TEST DATA	E-1
ATTACHMENT F - INSTRUMENTATION EQUIPMENT SHEETS.....	F-1

1.0 INTRODUCTION

1.1 Scope

This report documents the test procedures followed and the results obtained during an Environmental and Dynamics Test Program performed on two Ruggedized Cases (Type 4000) for B&W International. The Environmental Test Program consisted of Low Temperature and Dry Heat Testing. The Dynamics Test Program consisted of Sinusoidal Vibration (K) and Impact Testing. The Cases were received at Wyle Laboratories on June 19, 2012. The receiving inspection revealed the Cases were in good condition. The receiving inspection also revealed that the Cases arrived with no Serial Number Identification. Wyle personnel assigned two Serial Numbers (T70274-001 and T70274-002) for traceability purposes only. Testing was performed at Wyle Laboratories' Huntsville, Alabama, Test Facility from June 19 through June 27, 2012.

1.2 References

- B&W International Purchase Order No. 91150512
- Wyle Laboratories' Quotation No. 542/054667/MT, dated January 20, 2012
- Wyle Laboratories' Quality Manual, Latest Revision
- DEF STAN 81-41
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment"

1.3 Test Specimen Description

The specimens tested were two Ruggedize Cases (Type 4000) identified by Serial Numbers T70274-001 and T70274-002. Both Cases measured approximately 16.5 inches long by 13 inches wide by 7.13 inches high and weighed approximately 5 pounds.

1.4 Summary

The Ruggedized Cases, were subjected to Low Temperature, Dry Heat, Sinusoidal Vibration (K), and Impact Testing in accordance with Wyle Quote No. 542/054667/MT, dated January 20, 2012. All Pre- and Post-Test Visual Inspections were conducted by Wyle Representatives. One Ruggedized Case (Serial No. T70274-001) showed evidence that its right latch was in the Open position after being subjected to the Dry Heat Test. However, there were no visible signs of damage, degradation or other physical damages to the Case. The Case opened and closed without difficulty. The Ruggedized Cases were successfully subjected to the Environmental and Dynamics Test Program. The Ruggedized cases were returned to B&W International's North American Facility at the completion of testing.

1.0 INTRODUCTION (Continued)

1.4 Summary (Continued)

The test results contained herein apply only to the Ruggedized Cases identified in this report.

2.0 TEST PROCEDURES AND RESULTS

2.1 Low Temperature Test

One Ruggedized Case (Serial No. T70274-001) was subjected to a Low Temperature Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Ruggedized Case was subjected to the Low Temperature Test as follows:

The Ruggedized Case was placed inside a Temperature Chamber in its storage configuration. A Pre-Test Visual Inspection was conducted on the Case. No defects were noted. One thermocouple was placed on the Case to monitor its temperature characteristics and aide in temperature stabilization. A second thermocouple was used to monitor and record chamber conditions.

With the Case in its storage configuration, the chamber temperature was transitioned to $-40 \pm 2^{\circ}\text{C}$ ($-40^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained for a maximum of 16 hours upon reaching temperature stabilization.

The chamber temperature was transitioned to $20 \pm 10^{\circ}\text{C}$ ($68 \pm 18^{\circ}\text{F}$). A Post-Test Visual Inspection was conducted on the Case. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Low Temperature Test.

A photograph of the test setup is presented in Attachment A. The Low Temperature Test Data is presented in Attachment B. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.2 Dry Heat Test

One Ruggedized Case (Serial No. T70274-001) was subjected to a Dry Heat Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

2.0 TEST PROCEDURES AND RESULTS (Continued)

2.2 Dry Heat Test (Continued)

The Ruggedized Case was subjected to the Dry Heat Test as follows:

The Ruggedized Case was placed inside a Temperature Chamber in its storage configuration. A Pre-Test Visual Inspection was conducted on the Case. No defects were noted. One thermocouple was placed on the Case to monitor its temperature characteristics and to aide in temperature stabilization. A second thermocouple was used to monitor and record chamber conditions.

With the Case in its storage configuration, the chamber temperature was transitioned to $25 \pm 10^{\circ}\text{C}$ ($77^{\circ}\text{F} \pm 18^{\circ}\text{F}$) and 45 to 75% Relative Humidity at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained for a maximum of 16 hours.

The chamber temperature was transitioned to a High Temperature of $55 \pm 2^{\circ}\text{C}$ ($131 \pm 3.6^{\circ}\text{F}$) at a maximum transition rate of 3°C per minute. This condition was held for 48 hours upon reaching temperature stabilization. The chamber temperature was transitioned back to $25 \pm 10^{\circ}\text{C}$ at a maximum transition rate of 3°C per minute.

A Post-Test Visual Inspection was conducted on the Case. It was observed that the right latch was in the open position; however, no damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Dry Heat Test.

A photograph of the test setup is presented in Attachment A. The Dry Heat Test Data is presented in Attachment C. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.3 Sinusoidal Vibration Test (K)

One Ruggedized Case (Serial No. T70274-002) was subjected to a Sinusoidal Vibration Test (K) in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Case was installed on an electro-dynamic shaker that was, in turn, placed in a Temperature Chamber in its storage configuration. See photographs of the test setup in Attachment A. A Pre-Test Visual Inspection was conducted on the Case. No damages were noted. One control accelerometer was placed on the shaker to monitor vibratory input levels. The chamber temperature was transitioned to $25 \pm 10^{\circ}\text{C}$ ($77^{\circ}\text{F} \pm 18^{\circ}\text{F}$) and 45 to 75% Relative Humidity at a maximum transition rate of 3°C (5°F) per minute. This condition was maintained until the Case reached temperature stabilization (approximately one hour).

2.0 TEST PROCEDURES AND RESULTS (Continued)

2.3 Sinusoidal Vibration Test (K) (Continued)

The Case was then subjected to a Sinusoidal Vibration Test at an amplitude of ± 0.23 inch peak (0.46 DA) from 5 to 9 Hz, then to a ± 2 g peak from 9 to 350 Hz, at a sweep rate of 0.75 ± 0.25 octave per minute, for two hours in each of three mutually perpendicular axes (Top-to-Bottom, Front-to-Back and Side-to-Side, respectively). A Post-Test Visual Inspection was conducted after each axis of test. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Sinusoidal Vibration Test (K).

A photograph of the test setup is presented in Attachment A. The Sinusoidal Vibration Test (K) Data is presented in Attachment D. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

2.4 Impact Test (Vertical)

One Ruggedized Case (Serial No.T70274-002) was subjected to an Impact Test in accordance with Wyle Quote No. 542/054667/MT dated January 20, 2012. DEF STAN 81-41 was used as a guide only.

The Ruggedized Case was subjected to the Impact Test as follows:

A Pre-Test Visual Inspection was conducted on the Ruggedized Case. No damages were noted. The Case was attached to a quick-release hook and dropped on a non-deformable surface from a height of 39.4 ± 2 inches. The Bottom, Top, Left, Right, Near and Far Sides were sequentially subjected to this test. A Post-Test Visual Inspection was conducted after each impact. No damages were noted. No anomalies were recorded. The Ruggedized Case was successfully subjected to the Impact Test (Vertical).

A photograph of the test setup is presented in Attachment A. The Impact Test Data is presented in Attachment E. The Instrumentation Equipment Sheet for the test setup is presented in Attachment F.

3.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Program, which complies with the requirements of ANSI/NCSL Z540-1 and ISO 10012-1. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

4.0 QUALITY PROGRAM

All work performed on this test program was completed in accordance with Wyle Laboratories' Quality Program.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001:2008 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).