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## FIRE PERFORMANCE EVALUATION IN ACCORDANCE WITH PART 5 OF ANNEX 1 OF THE 2010 IMO FTP CODE, *TEST FOR SURFACE FLAMMABILITY*

**MATERIAL ID: AQ200**

**FINAL REPORT**  
Consisting of 10 Pages

**SwRI® Project No.: 01.24104.19.103**  
**Test Date: December 20, 2018**  
**Report Date: January 7, 2019**

**Prepared for:**

**Royal Coatings, Inc.**  
**2705 Concord Rd.**  
**Belle Chasse, LA 70037**

*This test was conducted in accordance with the applicable standard; and to the best of our knowledge, it contains no errors, omissions, or false statements.*

Submitted by:



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Approved by:



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## 1.0 INTRODUCTION

This report describes a fire performance evaluation conducted for Royal Coatings, Inc. in accordance with Part 5, *Test for Surface Flammability*, of annex 1 of the International Maritime Organization (IMO), *International Code for Application of Fire Test Procedures* (2010 FTP Code). Testing was conducted at Southwest Research Institute's (SwRI) Fire Technology Department, located in San Antonio, Texas.

This test method should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all the factors that are pertinent to an assessment of the fire hazard of a particular end use.

This report describes the testing of the assembly tested and the results obtained. The results presented in this report apply specifically to the material tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

## 2.0 SAMPLE DESCRIPTION

SwRI received the coating on December 3, 2018. The samples were applied over a 1/8" steel substrate on December 18, 2018, per the installation instructions provided by the client. The samples were conditioned to a constant mass at an ambient temperature of 73°F ± 5°F (23°C ± 3°C) and a relative humidity of 50% ± 5%. Constant mass was achieved on December 20, 2018. The samples are described below in Table 1.

**Table 1. Sample Description.**

<b>Material ID</b>	<b>Nominal Tested Dimensions*</b>	<b>Description*</b>	<b>Nominal Received Mass*</b>	<b>Color</b>
AQ200	800 × 155 × 4 mm	Marine grade rubberized coating	3,175 g**	White

\* Assessed by SwRI personnel.

\*\*Includes substrate.

### 3.0 TEST SETUP

Part 5 of the annex to the 2010 FTP Code is used primarily for determining the surface burning characteristics of bulkhead, wall, ceiling, floor, and primary deck covering materials. The burning characteristics are determined by heat release and flame front propagation measurements. A specimen measuring 800 mm × 155 mm is exposed to a graded radiant flux field supplied by a gas-fired radiant panel using the apparatus described in ISO 5658-2, except the equipment for measuring heat release. The lateral flame spread rate over the specimen surface is determined by measuring the time for the flame front to advance in 50-mm increments. The specimen is located under an exhaust stack that is instrumented with a thermopile to measure the heat release rate.

### 4.0 TEST RESULTS

Based on the test results for IMO Part 5, the material identified as AQ200 **meets** the acceptance criteria for all applications types. Part 5 states that an exemption from part 2 requires that surface materials and primary deck coverings with both the total heat release ( $Q_t$ ) of not more than 0.2 MJ and the peak heat release rate ( $Q_p$ ) of not more than 1.0 kW are considered to comply with the requirements of part 2 of annex 1 without further testing. No further testing for IMO Part 2 was required for this test program. A summary of the test results is provided below in Table 2. The detail test results can be found in Appendix A and photographic documentation is presented in Appendix B. A copy of the calibration record sheet is on file.

**Table 2. IMO Part 5 Summary of Averaged Test Results.**

IMO Part 5 Surface Flammability Criteria	Bulkhead, wall and ceiling linings	Floor coverings	Primary deck coverings	AQ200
Average Critical Flux at Extinguishment (CFE):	≥ 20.0 kW/m <sup>2</sup>	≥ 7.0	≥ 7.0	32.10 kW/m <sup>2</sup>
Average Heat for Sustained Burning ( $Q_{sb}$ ):	≥ 1.5 MJ/m <sup>2</sup>	≥ 0.25	≥ 0.25	9.65 MJ/m <sup>2</sup>
Average Total Heat Release ( $Q_t$ ):	≤ 0.7 MJ	≤ 2.0	≤ 2.0	0.0 MJ
Average Peak Heat Release Rate ( $Q_p$ ):	≤ 4.0 kW	≤ 10.0	≤ 10.0	0.0 kW
Burning droplets	Not produced	No more than 10 burning drops	Not produced	None
<b>Considered to comply with IMO Part 2 without further testing</b>	<b><math>Q_t \leq 0.2</math> MJ and <math>Q_p \leq 1.0</math> kW</b>			<b>Yes</b>

**APPENDIX A**  
**DETAIL TEST RESULTS**  
**(CONSISTING OF 3 PAGES)**

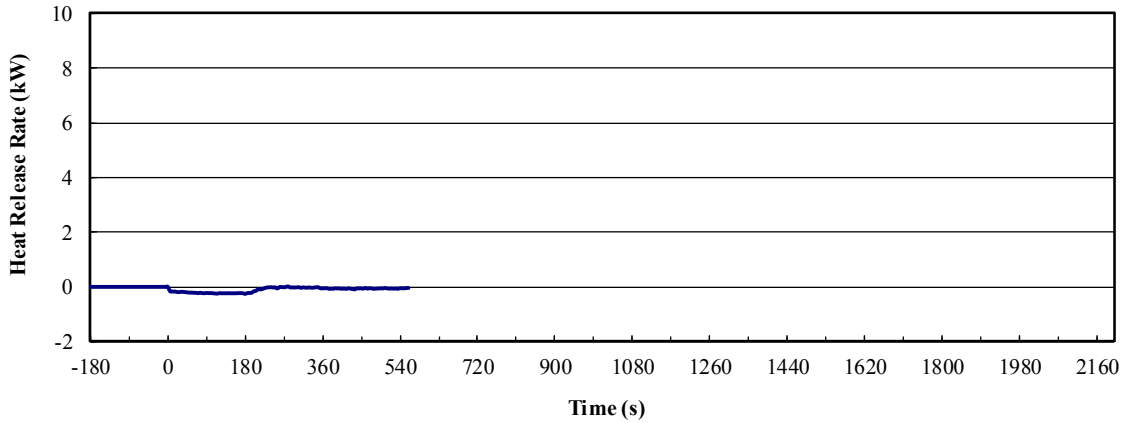
**SOUTHWEST RESEARCH INSTITUTE**  
**2010 IMO FTP Code Part 5 - Surface Flammability Test Report**

Material ID: *AQ200*  
 Filename: 18-354Roy1  
 Sample ID: 641490

SwRI Project No.: 01.24104.19.103  
 Test Date: 20-Dec-2018  
 Time of Test: 2:30 PM  
 Calibration Heat Flux Reading: 24.3 kW/m<sup>2</sup>  
 350-mm Heat Flux Reading: 24.0 kW/m<sup>2</sup>

Distance (mm)	Calibration Heat Flux (kW/m <sup>2</sup> )	Flame Front Arrival Time (s)	Heat for Sust. Burning (MJ/m <sup>2</sup> )
50	49.7	187	9.30
100	49.7	188	9.36
150	47.2	216	10.17
200	42.7	233	9.96
250	37.0	287	---
300	30.7	---	---
350	24.3	---	---
400	18.3	---	---
450	13.2	---	---
500	9.1	---	---
550	6.2	---	---
600	4.4	---	---
650	3.4	---	---
700	2.7	---	---
750	1.5	---	---

**Run 1**



<b>CFE:</b> 35.1 kW/m <sup>2</sup>	<b>Time to Ignition:</b> 136 s
<b>Q<sub>sb</sub>:</b> 10.07 MJ/m <sup>2</sup>	<b>Heat for Ignition:</b> 10.2 MJ/m <sup>2</sup>
<b>Q<sub>i</sub>:</b> 0.0 MJ	<b>Extinguishment Location:</b> 265 mm
<b>Q<sub>p</sub>:</b> 0.0 kW	<b>Extinguishment Time:</b> 371 s

**NOTES AND OBSERVATIONS:** Smoke at 15 s, charring at 30 s.

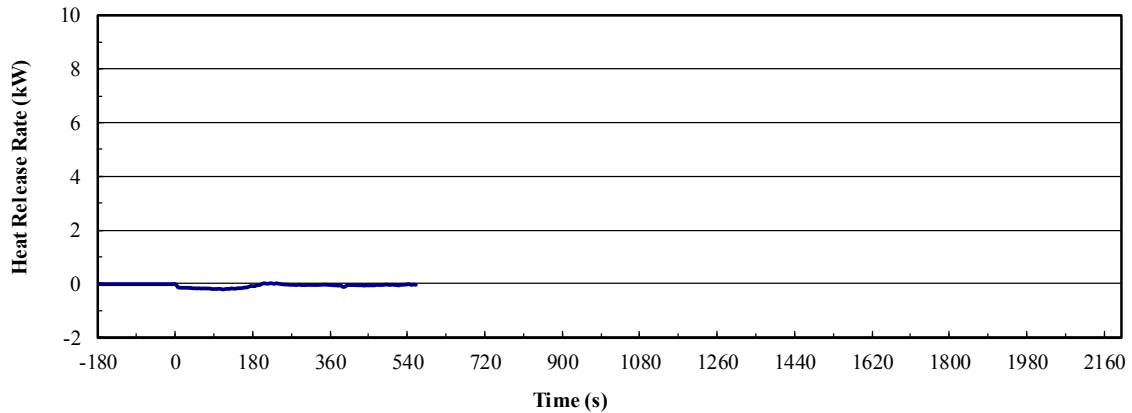
**SOUTHWEST RESEARCH INSTITUTE**  
**2010 IMO FTP Code Part 5 - Surface Flammability Test Report**

Material ID: AQ200  
 Filename: 18-354Roy2  
 Sample ID: 641490

SwRI Project No.: 01.24104.19.103  
 Test Date: 20-Dec-2018  
 Time of Test: 2:55 PM  
 Calibration Heat Flux Reading: 24.3 kW/m<sup>2</sup>  
 350-mm Heat Flux Reading: 24.1 kW/m<sup>2</sup>

Distance (mm)	Calibration Heat Flux (kW/m <sup>2</sup> )	Flame Front Arrival Time (s)	Heat for Sust. Burning (MJ/m <sup>2</sup> )
50	49.7	149	7.41
100	49.7	161	7.98
150	47.2	193	9.12
200	42.7	214	9.13
250	37.0	---	---
300	30.7	---	---
350	24.3	---	---
400	18.3	---	---
450	13.2	---	---
500	9.1	---	---
550	6.2	---	---
600	4.4	---	---
650	3.4	---	---
700	2.7	---	---
750	1.5	---	---

**Run 2**



CFE:	38.2 kW/m <sup>2</sup>	Time to Ignition:	114 s
Q <sub>st</sub> :	9.13 MJ/m <sup>2</sup>	Heat for Ignition:	9.1 MJ/m <sup>2</sup>
Q <sub>i</sub> :	0.0 MJ	Extinguishment Location:	240 mm
Q <sub>p</sub> :	0.0 kW	Extinguishment Time:	371 s

NOTES AND OBSERVATIONS: Smoke at 2 s, charring at 30 s.

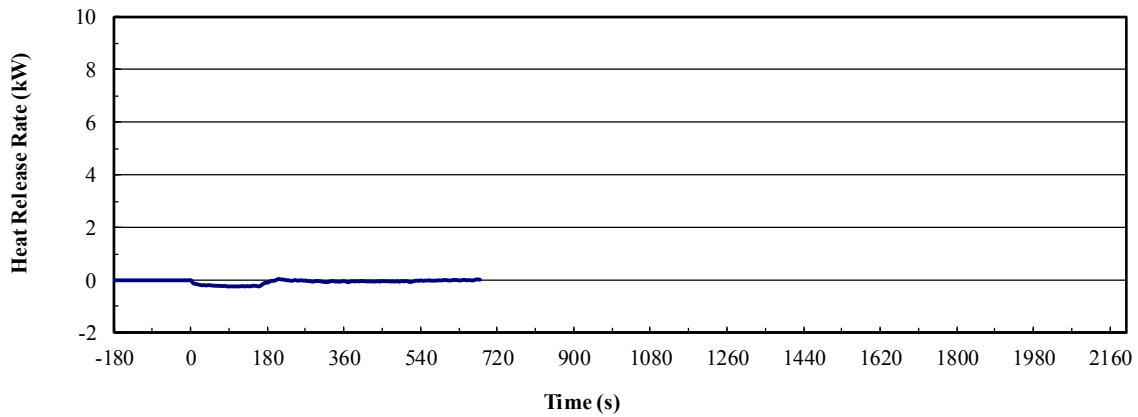
**SOUTHWEST RESEARCH INSTITUTE**  
**2010 IMO FTP Code Part 5 - Surface Flammability Test Report**

Material ID: *AQ200*  
 Filename: 18-354Roy3  
 Sample ID: 641490

SwRI Project No.: 01.24104.19.103  
 Test Date: 20-Dec-2018  
 Time of Test: 3:15 PM  
 Calibration Heat Flux Reading: 24.3 kW/m<sup>2</sup>  
 350-mm Heat Flux Reading: 24.1 kW/m<sup>2</sup>

Distance (mm)	Calibration Heat Flux (kW/m <sup>2</sup> )	Flame Front Arrival Time (s)	Heat for Sust. Burning (MJ/m <sup>2</sup> )
50	49.7	157	7.78
100	49.7	158	7.87
150	47.2	167	7.87
200	42.7	248	10.60
250	37.0	292	10.80
300	30.7	---	---
350	24.3	---	---
400	18.3	---	---
450	13.2	---	---
500	9.1	---	---
550	6.2	---	---
600	4.4	---	---
650	3.4	---	---
700	2.7	---	---
750	1.5	---	---

**Run 3**

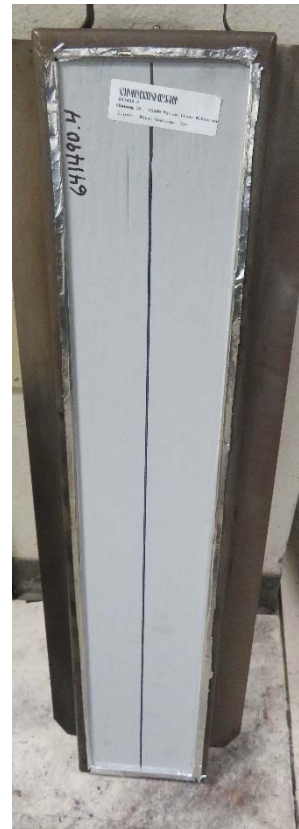


<b>CFE:</b>	32.0 kW/m <sup>2</sup>	<b>Time to Ignition:</b>	134 s
<b>Q<sub>st</sub>:</b>	9.76 MJ/m <sup>2</sup>	<b>Heat for Ignition:</b>	7.9 MJ/m <sup>2</sup>
<b>Q<sub>i</sub>:</b>	0.0 MJ	<b>Extinguishment Location:</b>	290 mm
<b>Q<sub>p</sub>:</b>	0.0 kW	<b>Extinguishment Time:</b>	492 s

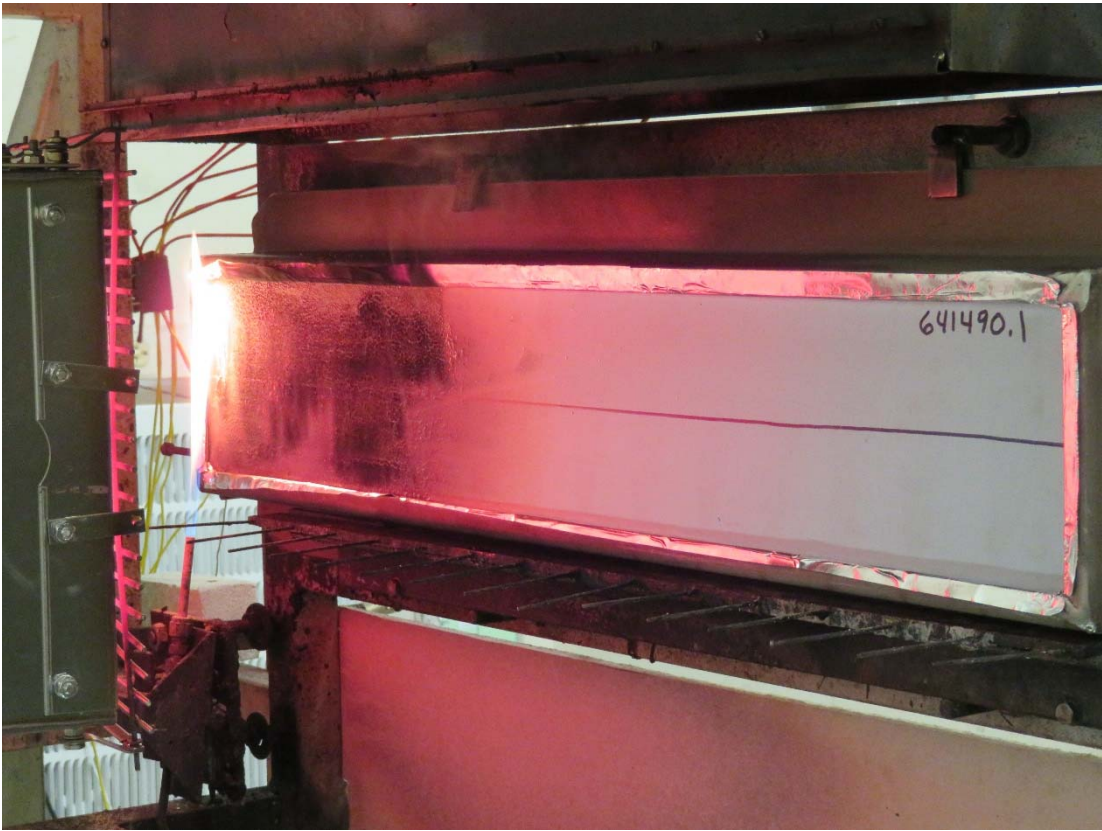
**NOTES AND OBSERVATIONS:** Smoke at 15 s, charring at 30 s.

**APPENDIX B**  
**PHOTOGRAPHIC DOCUMENTATION**  
**(CONSISTING OF 2 PAGES)**





**Figure B-1. Tests 1 - 3 (left to right) before fire exposure.**



**Figure B-2. Test 1 during fire exposure.**



**Figure B-3. Tests 1-3 (left to right) after fire exposure.**