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**UNDERWRITERS' LABORATORIES OF CANADA**

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File CR1025

Application No. 78T340

December 7, 1982

## REPORT

on

### SURFACE BURNING CHARACTERISTICS OF RETARDANT AND GENERAL PURPOSE COATINGS

Fire Retardants Inc.,  
123 Columbia Court North • Suite 201  
Chaska, MN 55318

## DESCRIPTION

### MATERIALS COVERED BY THIS REPORT:

Systems consisting of Type 6 (sealer), Type 166 (base coat) and Type 167 (top coat) and Type 129 (base coat) and Type 130 (topcoat) clear varnish type materials.

### GENERAL CHARACTER AND USE:

The materials covered by this Report are clear coatings (paint) intended for application to Douglas Fir lumber surfaces to reduce the spread of flame, development of smoke and contribution of fuel resulting from exposure to fire.

System 1 consisting of the Type 6 sealer and Type 166 base coat, with or without Type 167 top coat, is intended for application to interior combustible surfaces where a flame spread not exceeding 25 is specified.

System 2 consisting of the Type 129 base coat and Type 130 top coat is intended for application to interior noncombustible surfaces and also to interior combustible surfaces where a flame spread rating between 26 and 75 is required. System 2 materials are to be classified as general purpose coatings.

The coatings are intended for use on interior surfaces only as permitted by authorities having jurisdiction.

Details of the formulations are of a proprietary nature and are on file at Underwriters' Laboratories of Canada for use in connection with the Follow-Up Programme.

### MARKING:

Containers of the products will bear labels reading "Underwriters' Laboratories of Canada - Listed - Fire Retardant Coating (or General Purpose Coating)". Details of the surface burning characteristics in terms of flame spread, smoked fuel contributed based on a comparison with untreated red oak as 100 are also included on the label together with the flash point of the product.

### THE INVESTIGATION

The purpose of the investigation was to determine the surface burning characteristics of the coating materials when applied to Douglas Fir lumber and asbestos-cement board surfaces at the coverages indicated below in accordance with the Standard Method of Test for Surface Burning Characteristics of Building Materials CAN4-S102-M80. This method provides a means of classifying materials as to their relative surface burning characteristics when compared with a known "combustible" such as red oak and a known "noncombustible" such as asbestos-cement board as outlined in the following table:

	<u>Surface Burning Characteristics</u>	
	<u>Red Oak (Combustible)</u>	<u>Asbestos-Cement Board (Noncombustible)</u>
Flame Spread	100	0
Smoke Developed	100	0
Fuel Contributed	100	0

### EXAMINATION AND TEST RECORD

A representative of Underwriters' Laboratories of Canada visited the manufacturing plant to witness the mixing processes and to select samples of the finished products for test purposes.

#### **APPLICATION OF COATINGS TO TEST SURFACES:**

##### **DESCRIPTION OF SAMPLES**

The test surfaces to which the materials were applied were prepared from nominal 1 by 4 in. tongue and groove Douglas Fir lumber and 1/4 in. high density asbestos-cement board.

Three sample panels of Douglas Fir each consisting of two 12 ft by 20 in. sections were prepared for each of three series of tests.

Three sample panels of asbestos-cement board each consisting of three 8 ft by 20 in. sections were prepared for one series of tests.

One panel of uncoated Douglas Fir was also prepared.

## METHOD

The application of the coatings to the test surfaces was performed by a representative of the submitter under the observation of a staff member of Underwriters' Laboratories of Canada. The materials were applied by roller and the coverages estimated by weighing the equipment and container before and after application.

## RESULTS

The materials were applied at the estimated coverage rates as indicated below:

### System 1 on Douglas Fir

Type 6 sealer	400 sq ft/US gal
Type 166 base coat	300 sq ft/US gal each of 2 coats
Type 167 top coat	1800 sq ft/US gal

### System 2 on Douglas Fir and Asbestos-Cement Board

Type 129 base coat	300 sq ft/US gal
Type 130 top coat	600 sq ft/US gal

## SURFACE BURNING CHARACTERISTICS

### DESCRIPTION OF SAMPLES

Thirteen test panels each measuring 24 ft by 20 in. as described above were used in the test programme. Panels were conditioned at  $23 \pm 3C$  and  $50 \pm 5$  per cent relative humidity for 42 days prior to testing.

## METHOD

Each sample in turn was placed in the test chamber with a 1 ft by 20 in. section of asbestos-cement board at the end of the chamber behind the igniting tire. The top was then replaced on the chamber and the test conducted in accordance with the requirements of the Standard.

## RESULTS

Flame Spread - For all panels the flame spread only part way along the length of the sample.

With the publication of CAN4-S102-M80 (previously the sixth edition of ULC-S102) the flame spread is calculated by the "GWL" method. The method of flame spread calculation in the first through fourth editions of ULC-S102 is here designated as "F5C75".

The flame spread classification (FSC) is calculated by the GWL method using  $FSC = 0.031 A_T$  where  $A_T$  in s.m. is the total area under the flame spread time distance curve, ignoring any flame front recession.

The second method  $FSC_{75}$  is calculated using the expression  $FSC = 5.128 d$  where  $d$  is the distance of flame travel in feet.

	<u>Maximum Flame Travel</u>			<u>Classification</u>	
	<u>ft</u>	<u>(m)</u>	<u>sec</u>	<u>FSC<sub>75</sub></u>	<u>GWL</u>
Red Oak	19-1/2	(5.94)	330	100	100
<u>System 1 (no top coat)</u>					
Test Panel 1.	4-1/2	(1.37)	570	23.1	15.7
Test Panel 2	4-1/2	(1.37)	585	23.1	15.3
Test Panel 3	4-1/2	(1.37)	540	23.1.	15.7
Classification				<u>25</u>	<u>15</u>
<u>System 1 (with top coat)</u>					
Test Panel 4	5	(1.52)	576	25.6	17.2
Test Panel 5	4-1/2	(1.37)	540	23.1	15.7
Test Panel 6	5	(1.52)	564	25.6	17.1
Classification				<u>25</u>	<u>15</u>
<u>System 2 (on Douglas Fir)</u>					
Test Panel 7	11	(3.35)	570	56.4	45.0
Test Panel 8	11	(3.35)	585	56.4	45.5
Test Panel 9	11-1/2	(3.51)	576	58.9	47.2
Classification				<u>55</u>	<u>45</u>
<u>System 2 (on ACB)</u>					
Test Panel 10	1	(0.31)	60	5.1	5.0
Test Panel 11	1	(0.31)	90	5.1	5.0
Test panel 12	1	(0.31)	60	5.1	5.0
Classification				<u>5</u>	<u>5</u>
Test Panel 13 (Uncoated Douglas Fir)	16-1/2	(5.03)	570	<u>75</u>	<u>70</u>

System 1 coatings blistered by 18 sec, System 2 coatings did not blister. Ignition in each case on Douglas Fir panels occurred by 36 sec. Maximum flame spreads were recorded during the last minute of the tests. After flaming continued for periods up to 45 sec.

Coatings on asbestos-cement board showed no signs of sustained ignition.  
No after flaming was observed.

Smoke-Developed - From the areas under the plotted curves the resultant factors were as follows:

	<u>Classification</u>
Red Oak	100
Asbestos-Cement Board	0
<u>System 1</u>	
Test Panel 1	55
Test Panel 2	46
Test Panel 3	48
Classification	<u>50</u>
Test Panel 4	51
Test Panel 5	30
Test Panel 6	36
Classification	<u>30-50</u>
<u>System 2 (Douglas Fir)</u>	
Test Panel 7	48
Test Panel 8	54
Test Panel 9	50
Classification	<u>50</u>

Zero smoke was recorded for System 2 coatings on asbestos-cement board.

Fuel Contributed - From the areas under the plotted curves the calculated factors were as follows:

	<u>Classification</u>
Red Oak	100
Asbestos-Cement Board	0
<u>System 1</u>	
Test Panel 1	16.9
Test Panel 2	10.5
Test Panel 3	11.6
Classification	<u>15</u>
Test Panel 4	11.9
Test Panel 5	11.0
Test Panel 6	11.1
Classification	<u>10</u>
<u>System 2 (Douglas Fir)</u>	
Test Panel 7	36.9
Test Panel 8	38.7
Test Panel 9	43.4
Classification	<u>40</u>

Zero fuel was recorded for System 2 coatings on asbestos-cement board.

FLASH POINT TESTS:**METHOD**

The flash points of the coatings were determined by means of the Pensky Martens Closed Tester (ASTM D93).

**RESULTS**

The following flash points were recorded:

Type 6	26.7°C (80 F)
Type 166	40.6°C (105 F)
Type 167	37.8°C (100 F)
Type 129	37.8°C (100 F)
Type 130	37.8°C (100 F)

MISCELLANEOUS OBSERVATIONS:

Scrubbability Tests - Scrubbability tests were conducted on glass panels coated at the coverage rates used for the preparations of the tunnel test samples. The glass panels were subjected to Scrubbability tests using the Gardner Model 105 Straight Line Washability Machine and the test solution described in Method 125.1 as laid down in Canadian Government Specification 1-GP-71; Schedule of Methods of Testing Paint and Pigments.

Tests were conducted in duplicate and Types 166 and 129 showed only slight signs of softening by 750 cycles. The Type 166 overcoated with The Type 167 showed only slight signs of softening after 1000 cycles. The coatings hardened again after drying.



**CONCLUSIONS**

**SURFACE BURNING CHARACTERISTICS:**

It is judged that the surface burning characteristics of the coating materials applied to Douglas Fir lumber and asbestos-cement board surfaces as described herein warrant the assignment of the following classifications in comparison with uncoated red oak as 100 and asbestos-cement board as zero.

Type 166

<u>Coating System Details</u>	<u>Classification or Rating When Applied to Douglas Fir</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 6 Sealer (Primer) applied in one coat at 400 sq ft/US gal.				
Type 166 (Base Coat) applied in two coats at 300 sq ft/US gal per coat (No Top Coat).	25	(15)	50	15
Type 6 Sealer (Primer) applied in one coat at 400 sq ft/US gal.				
Type 166 (Base Coat) applied in two coats at 300 sq ft/US gal per coat.				
Type 167 (Top Coat) applied in one coat at 1800 sq ft/US gal.	25	(15)	30-50	10

Type 129

<u>Coating System Details</u>	<u>Classification or Rating When Applied to Asbestos-Cement Board</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 129 (Base Coat) applied in one coat at 300 sq ft/US gal.				
Type 130 (Top Coat) applied in one coat at 600 sq ft/US gal per coat (No primer).	5	(5)	0	0

<u>Coating System Details</u>	<u>Classification or Rating When Applied to Douglas Fir</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 129 (Base Coat) applied in one coat at 300 sq ft/US gal.				
Type 130 (Top Coat) applied in one coat at 600 sq ft/US gal per coat (No primer).	55	(45)	50	40

DURABILITY:

The Types 166 and 129 coatings will withstand considerable washing and scrubbing without adverse effects. When overcoated with Types 167 and 130 respectively the surface treatments may be considered as permanent as ordinary interior oil paint surfaces.

PRACTICABILITY:

The coatings are practical for application by ordinary painting methods. No difficulty was experienced in applying the materials to the test surfaces by brush or roller in accordance with the directions for application which appear on each container.

CONFORMITY:

The surface burning characteristics of the coating materials described herein were determined on the basis of their performance in tests conducted in accordance with the Standard Method of Test or Surface Burning Characteristics of Building Materials CAN4-S102-M80.

**LISTING TEXT**

On the basis of the foregoing, revisions to the existing listings under Guide No. 40 U8.5.6 and 40U8.5.7 will be promulgated to include the materials covered by this Report.

The additions to the Listing Texts will be as follows;

Guide No. 40 U8.5.6

December 7, 1982

FILE: CR1025

Fire retardant coating materials intended for application by brush, roller or spray to reduce the surface burning characteristics of Douglas Fir surfaces on interiors of buildings.

The 166 base coat will withstand considerable washing and scrubbing without adverse effects. When overcoated as indicated the surface treatment can be considered as permanent as ordinary interior oil paint surfaces.

Classified as to surface burning characteristics when applied to the indicated surfaces in accordance with the manufacturers instructions at the specified coverages. For commentary on method of reporting Flame Spread Ratings see ULC List of Equipment and Materials, Volume II, under Guide No. 40 U8.

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<u>Coating System Details</u>	<u>Classification or Rating When Applied to Douglas Fir</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 6 (Primer) applied in one coat at 9.8 m <sup>2</sup> /L.				
Type 166 (Base Coat) applied in two coats at 7.4 m <sup>2</sup> /L per coat (No Top Coat).	5	(15)	50	15
Type 6 (Primer) applied in one coat at 9.8 m <sup>2</sup> /L.				
Type 166 (Base Coat) applied in two coats at 7.4 m <sup>2</sup> /L per coat.				
Type 167 (Base Coat) applied in one coat at 44.2 m <sup>2</sup> /L.	25	(15)	30-50	10

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## Flash Point of Liquid Coatings:

Type 6	26.7°C (80 F)
Type 166	40.6°C (105 F)
Type 167	37.8°C (100 F)

This card replaces Ca1025, Guide No. 40 U8.5.6 dated December 9, 1977.

Guide No. 40 U8.5.7

December 7, 1982

File: CR1025

Coating materials intended for application by brush, roller or spray to interior surfaces.

Classified as to surface burning characteristics when applied to the indicated surfaces in accordance with the manufacturers instructions at the specified coverages. For commentary on method of reporting Flame Spread Ratings see ULC List of Equipment and Materials, Volume II under Guide No. 40 U8.

<u>Coating System Details</u>	Classification or Rating <u>When Applied to Asbestos-Cement Board</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 129 (Base Coat) applied in one coat at 7.4 m <sup>2</sup> /L.				
Type 130 (Top Coat) applied in one coat at 14.7 m <sup>2</sup> /L (No primer).	5	(5)	0	0

<u>Coating System Details</u>	Classification or Rating <u>When Applied to Douglas Fir</u>			
	<u>Flame FSC75</u>	<u>Spread (GWL)</u>	<u>Smoke Developed</u>	<u>Fuel Contributed</u>
Type 129 (Base Coat) applied in one coat at 7.4 m <sup>2</sup> /L.				
Type 130 (Top Coat) applied in one coat at 14.7 m <sup>2</sup> /L (No primer).	55	(45)	50	40

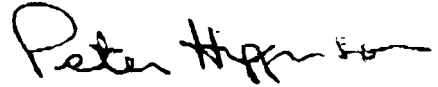
Flash Point of Liquid Coatings:

Type 129	37.8C (100 F)
Type 130	37.8C (100 F)

This card replaces CR1025, Guide No. 40 U8.5.7 dated December 9, 1977.

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