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Evaluation of the Fire Performance of W20115 Paint over Generation 4 Flak Jacket® Coating
Summary of Laboratory Protocols P072717 and P080117
Jeff Linville, Senior Engineer, Industry and Code Activities
August 8, 2017

Introduction

Flak Jacket product manufactured after Dec. 1, 2016 has been associated with formaldehyde emissions. This issue does not affect any of the company's other products. Internally, this coating is referred to as "Generation 4" Flak Jacket.

Weyerhaeuser is working proactively with its customers to address this situation and will cover the cost to either remediate or replace affected joists. The company has halted all production, sales and shipments of the product, and is collecting unused product from customers.

For affected joists that have already been installed, Weyerhaeuser has developed a latex-based paint (designated as W20115) that includes compounds that permanently bind formaldehyde to significantly reduce emissions from samples of TJI® Joists with Flak Jacket® coating. Laboratory tests of remediated specimens demonstrate emissions below 50 parts per billion ("ppb") based on ASTM D6007 small chamber test. This level is below existing California Air Resources Board standard (110 ppb) for medium density fiberboard. The field paint is water-based and contains low-toxicity ingredients and no heavy metals.

This experiment was conducted to evaluate the effect of paint W20115 on the fire resistance of the Flak Jacket coating.

Experimental Design

This experiment was designed to compare the performance of painted samples relative to unpainted controls. All samples consisted of OSB web stock with Flak Jacket® Generation 4 coating applied. One group of specimens was painted with the W20115 paint, and the control group remained unpainted. All specimens were subjected to a laboratory-scale burn test.

This experiment was conducted in two stages. An initial study was completed and reported on July 26, 2017 with four specimens in each of the painted and control groups. The initial study was conducted by Weyerhaeuser with no third-party witnessing. A follow-up study was conducted using matched material with an additional five specimens in each of the painted and control groups with witnessing of the painting and testing by a representative of PFS-TECO.

The experimental design is summarized in **Table 1**.

Table 1. Experimental Design.

	Group	Sample Size	Specimen ID Numbers	Test Description	Specimen Size
Initial Study	Control-No paint	4	32,21,39,40	Laboratory-scale burn test	8 in. x 8 in.
	W20115	4	38,23,31,22		
Follow-up Study	Control-No paint	5	20,8,5,19,10		
	W20115	5	9,3,2,16,1		

Materials and Methods

OSB web stock coated on one side with Flak Jacket® Generation 4 Coating, previously prepared as part of a separate study, was identified as suitable for this study. The Flak Jacket® coating had been prepared and applied to one side of OSB web stock as described in laboratory protocol P052317. The Flak Jacket® coating was applied with a mass application rate similar to production material. The coated web stock was cut into 8 in. x 8 in. squares.

For the painted specimens, paint W20115 was applied to the coated surface with a wet mass application rate of 50 g/ft^2 (0.35 g/ in^2), which corresponds to a wet thickness of approximately 18 mils (0.018 in.). The specimens in the control groups were left unpainted.

After allowing the paint to dry for two days, each specimen was exposed to a controlled flame using a Bunsen burner following standard laboratory procedures. Temperature was monitored at the center of each specimen using two thermocouples placed into holes predrilled from the back to the mid-thickness of the OSB, within ½ in. from the center. The average time for the two thermocouples to reach the target temperature was used to represent the time for the specimen. Painted and unpainted specimens were alternated for testing to prevent bias in the data.

Initial Study
Eight specimens were divided into two groups of four specimens with similar total thickness. One group was painted and the other served as an unpainted control.

Follow-up Study
Ten specimens were divided into two groups of five specimens with similar total thickness. One group was painted and the other served as an unpainted control. A representative from PFS-TECO witnessed the thickness measurements for the specimens, the painting of specimens with W20115, and the tests of the specimens (Report attached).

Results

The burn time results are shown in **Table 2** and in **Figure 1.** The data points from the initial study are identified in **Figure 1** by a black outline.

The results indicate that the application of the W20115 paint did not adversely affect the fire resistance of the Flak Jacket® coating and suggest that the addition of the W20115 paint may have improved the fire resistance.

Table 2. Summary of Results

Study	Treatment	Specimen Number	Specimen Thickness (Before Paint) (in.)	Time to 212 °F (min.)	Time to 300 °F (min.)	Time to 400 °F (min.)
Follow-up	No paint	5	0.579	7.81	18.08	23.74
	No paint	8	0.568	9.50	20.01	27.03
	No paint	10	0.581	10.70	21.05	26.86
	No paint	19	0.565	7.40	15.75	20.09
	No paint	20	0.555	8.04	17.47	23.48
Average			**0.570**	**8.69**	**18.47**	**24.24**
Initial	No paint	21	0.588	8.62	19.83	26.78
	No paint	32	0.585	8.64	22.35	30.37
	No paint	39	0.575	8.08	21.33	29.28
	No paint	40	0.566	no read	21.01	30.50
Average			**0.579**	**8.45**	**21.13**	**29.23**
Average of All Controls			**0.574**	**8.60**	**19.65**	**26.46**
Follow-up	W20115	1	0.566	7.87	18.98	24.26
	W20115	2	0.575	8.45	20.77	25.25
	W20115	3	0.582	9.07	20.58	27.06
	W20115	9	0.578	10.58	21.69	29.27
	W20115	16	0.565	8.86	22.67	27.73
Average			**0.573**	**8.96**	**20.94**	**26.71**
Initial	W20115	22	0.588	9.58	23.20	30.23
	W20115	23	0.588	9.03	20.25	29.91
	W20115	31	0.561	8.79	21.58	28.76
	W20115	38	0.571	8.33	19.47	27.88
Average			**0.577**	**8.93**	**21.12**	**29.20**
Average of All W20115			**0.575**	**8.95**	**21.02**	**27.82**

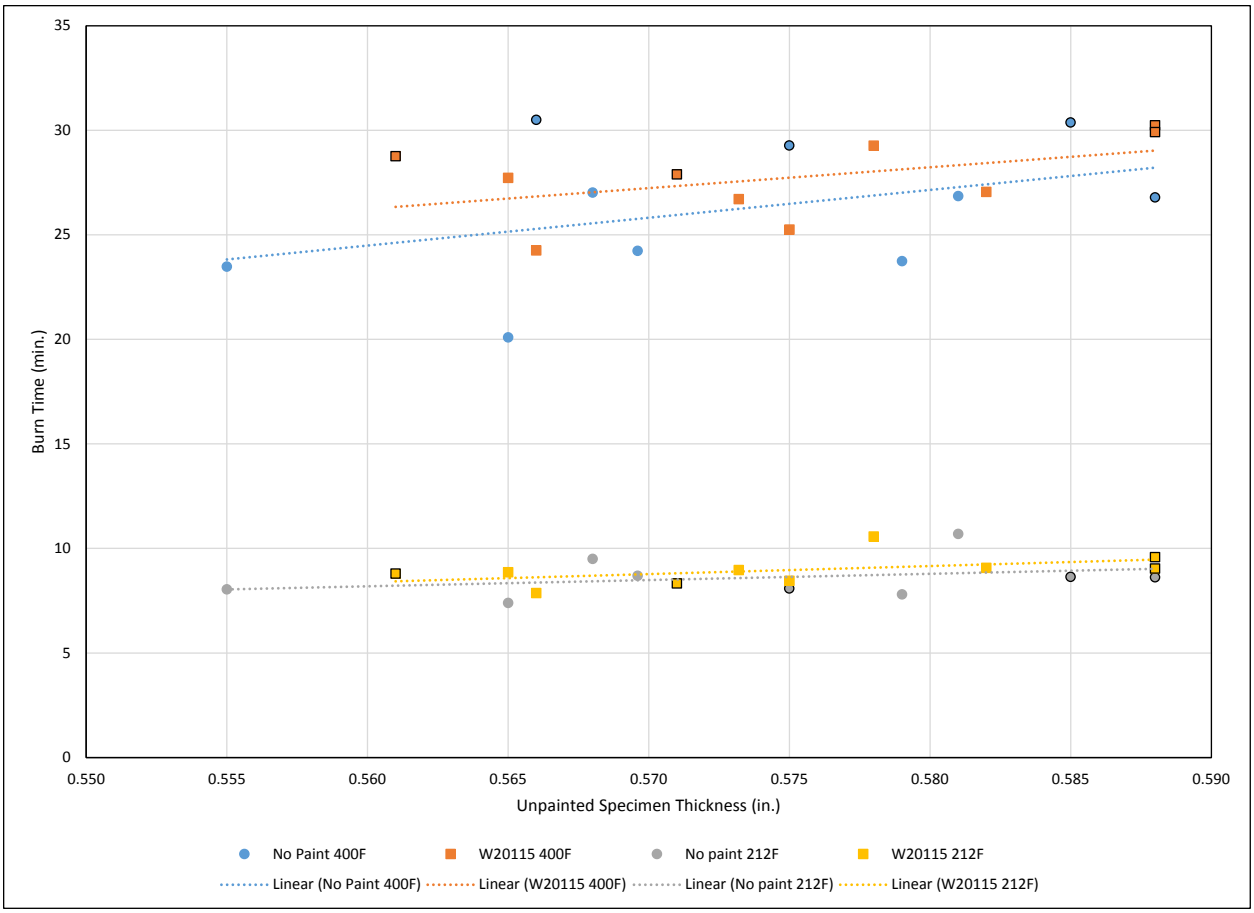

Figure 1. Comparison of burn times to 212 °F and 400°F.

August 4, 2017
Report No. 08042017

WEYERHAEUSER'S
W-20115 FIELD PAINT APPLICATION
AND FIRE ENDURANCE TEST

Purpose – To verify any changes in the fire endurance test times and char height using Weyerhaeuser's field pant W-20115 applied to Flak Jacket coated OSB specimens to that of controls.

Certification – This is to certify that I witnessed and verified the coating, weighing and thickness measurements to five 8.0" x 8.0" x 0.45" (29/64") Oriented Strand Board (OSB) specimens. I also witnessed the thickness measurements of five control specimens. The target mass of the five coated (W20115) specimens was 22.2 grams, see Table 2 for actual mass of each specimen. I then witnessed all specimens in a fire endurance test.
All procedures and testing of the aforementioned specimens were completed at the Weyerhaeuser Technology Center, Federal Way, Washington August 1 and 3, 2017.

The average ambient temperature during coating was 22°C (72°F) with a Relative Humidity of 51%. Temperature of the OSB specimens just prior to the field paint (W20115) coating application averaged 21°C (70°F). The scale used for weighing was an OHAS Model number AV4101 calibrated by INNO November 4, 2016.

Fire Endurance procedure

Two 0.125 inch holes were drilled 5 mm deep opposite sides of `1/2 inch circle center of each specimen on the non-coated side of each specimen. The specimen was placed 3 ¾ inch above a Bunsen burner coated side down. A thermocouple was place in each of the drilled holes. A layer of 6 pound ceramic fiber was placed on the top side of the non-coated side of the specimen. The gas flame was ignited and the time was recorded when the temperature reached 212°F and 400°F. Test was completed at this time, specimen removed from the apparatus, and the char or puff thickness depth from the coated side was measured in millimeters at the center of the specimen, and 3 inches from that center point.
The gas flow rate was controlled so as to bring the temperature of 70°F distilled water to 205°F within 4:45 min/sec to 5:30 min/sec. The gas flow was adjusted to keep within this time frame. This procedure was done every third specimen tested. See Table I for Fire endurance test results.

TABLE I
FIRE ENDURANCE RESULTS
August 3, 2017
8.0" x 8.0" Specimens

Coated Specimens	Specimen Thickness (in)	Time to 212°F min./sec. Thermo. 1/Thermo. 2		Time to 400°F min./sec. Thermo. 1/Thermo.2		Char or Puff Height (mm) Center /3" from
9	0.580	11:46	9:23	29:52	28:40	24/26
3	0.586	8:10	9:58	26:13	27:54	24/24
2	0.579	8:01	8:53	25:56	24:34	22/25
16	0.574	8:43	9:00	27:24	28:03	21/25
1	0.571	7:50	7:54	23:59	24:32	23/27

Control Specimens	Specimen Thickness (in)	Time to 212°F min./sec. Thermo. 1/Thermo. 2		Time to 400°F min./sec. Thermo. 1/Thermo.2		Char or Puff Height (mm) Center /3" from
20	0.555	9:20	6:45	24:43	22:14	21/23
8	0.565	7:51	11:09	26:17	27:46	24/24
5	0.578	7:08	8:29	22:52	24:37	22/23
19	0.559	7:16	7:32	20:05	20:06	17/18
10	0.576	10:55	10:29	26:37	27:06	24/26

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TABLE 2
Measured thickness before applying W20115 field paint

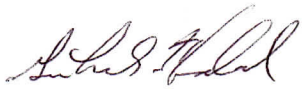
Coated Specimens	Measured Thickness (in)	Field Paint Target Mass (g)	Field Paint Actual Mass (g)
9	**0.578**	**22.2**	**22.3**
3	**0.582**	**22.2**	**22.7**
2	**0.575**	**22.2**	**22.4**
16	**0.565**	**22.2**	**22.7**
1	**0.566**	**22.2**	**22.2**

Control Specimens	Measured Thickness (in)
20	**0.555**
8	**0.568**
5	**0.579**
19	**0.565**
10	**0.581**

Erik Parker, Chemistry Platform Support Group Manager for Weyerhaeuser's Product Engineering Codes and Standards Group supervised the tests.

I have reviewed Weyerhaeuser's results of the procedures and tests and find them to correspond to my witnessed values.

Witnessed by:



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