

RESEARCH AND DEVELOPMENT PROGRESS REPORT

Corporate Technical Center
Bird & Son, Inc.

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Project No. 006
Report No. 3
Written by C.J. Patenaude
Date Sept. 24, 1981

Project Title: WORK ON ROOFING REQUIREMENTS

Subject: Architect 80 Shingle

Object: To compare the fire resistance of the Architect 80 Shingle surfaced with #9 white granules with those surfaced with #11 white granules from the July 1981 FK Architect 80 mill trial.

Conclusion:

1. Bird & Son now has Class A approval from Underwriters' Laboratories to produce the Architect 80 shingle with #9 granules.
2. A similar laminated shingle surfaced with #11 white granules failed the U/L Class A spread-of-flame test.

Results:

1. The apparent reason for the Architect 80 shingle surfaced with #11 white granules to just barely fail the U.L. Class A spread-of-flame test with a flame spread of 6-1/2 feet was probably due to the low filler content present in the second asphalt coating of the #2 component. Shingle analysis indicates that the first coating contained 55% FKW dust while the second coating contained 50% rock dust. In the case of the #1 component, the asphalt coating was loaded with almost 52% to 54% rock dust. If the Architect 80 shingle is surfaced with #11 granules, it appears at this time that the asphalt coating should contain at least 55% FKW dust to increase our chances of passing the U/L fire test.

PLAINTIFF'S EXHIBIT

BIR-740

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2. The laminated glass shingle surfaced with #9 white granules which passed the U.L. Class A spread-of-flame with a flame spread of 5-1/2 feet had a coating that was filled with 53% to 55% FKW dust. Logically, it would appear that slightly less rock dust was needed for the Architect 80 shingle surfaced with #9 granules to pass this fire test.

Recommendation:

Bird & Son should continue with its plan to obtain U/L Class A approval at FK to produce the Architect 80 shingle surfaced with #11 white granules. A filler loading of 55% rock dust or more in the asphalt coating is mandatory.

Discussion:

The Fk Architect 80 mill trial produced acceptable shingle components that were produced under U/L supervision. The components were laminated into the Architect 80 shingle and forwarded to Underwriters' Laboratories located at Northbrook, Illinois for Class A fire tests. Also, samples of both types of Architect 80 shingles were sent to BBH for fire tests and shingle analysis.

Mr. Clark (BBQ) witnessed the Class A spread-of-flame test run on these shingles. The laminated shingle surfaced with #9 white granules passed their fire test. It exhibited a flame spread of 5-1/4 feet and 5-1/2 feet. The laminated shingles surfaced with #11 white granules failed the U.L. fire test. The flame spread was 6-1/2 feet. The maximum spread-of-flame allowed by U.L. for a Class A label is 6 feet.

Samples of both types, of Architect 80 shingles were tested for their fire resistance to a Class A burning brand. The procedure followed is described in U.L. 790, "Standard for Tests for Fire Resistance of Roof Covering Materials". The shingle surfaced with #9 white granules showed good resistance to the Class A burning brand on 1/2 inch thick plywood. The flame spread was 9 inches up from the burnt brand area. However, a similar shingle but surfaced with #11 white granules exhibited excessive flame spread from the burning brand. The burnt area extended beyond the edge of the test deck, over 22 inches. Even though both shingles passed the burning brand test, the best performance was obtained with those shingles surfaced with #9 white granules.

A second fire test was run which is the BBH small scale spread-of-flame test. The results indicate that the laminated shingle surfaced with #9 white granules was marginally more fire resistant than those surfaced with #11 white granules. Testing a competitive laminated shingle surfaced with #11 granules, the GAF Glass Timberline shingle from Fontana, California, we found this shingle to demonstrate outstanding fire resistance. It had the lowest spread-of-flame and the lowest coating flow. The asphalt quickly forms a protective crust. Analysis of this particular shingle showed its coating to contain 56.8% rock dust on the face but only 43.6% in the glass mat. GAF impregnates their

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glass mat with a slightly lower filled asphalt followed by coating with a higher filled asphalt that is surfaced with #11 granules. The weight of this product is about 300 lbs./square.

The Architect 80 shingle surfaced with #9 white granules weighed 323 lbs./sq. The components were made with a GAF glass mat that was coated with a single application of filled asphalt. The loading level of the asphalt coating for the #1 component and #2 component was 53% and 55%, respectively.

The Architect 80 shingle surfaced with #11 white granules weighed 321 lbs./square. The components were made with a GAF glass mat that was coated with a single application of filled asphalt in the case of the #1 component. A double coating was applied to the #2 component. The loading level of the asphalt coating for the #1 component was 52% to 54%. But for the #2 component, its first coating contained 55% FKW dust while its second coating contained only 50% FKW dust.

Shingle data and fire test results are summarized in Tables 1, 2 and 3.

References:

Jagocki, R. F., Progress Report, 009, 25 dated Aug. 10, 1981, entitled "To Analyze Competitive Glass Shingles by Standard Laboratory Procedures to see how they compare to Bird Glass Shingles".

Patenaude, C. J. Lab Notebook, BBH 384, pp. 14-18
BBH 387, pp. 1-9

Sutton, K., Memo dated 6/25/81, "FK Architect 80 Mill Trial (7/6/81)"

Sutton, K., Memo dated 7/23/81, "FK Architect 80 Mill Trial, July 1981"

CJP/ac
Attach.

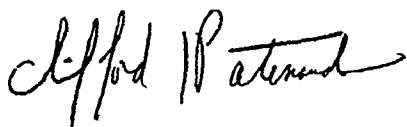


TABLE 1

Shingle Analysis, BBH Class A Burning Brand
Fire Test, and U.L. Class A fire Test run
at Northbrook, Illinois

Architect 80 Shingle, FK
#9 White Granules
July, 1981

#1 Component

Wt. of exposed portion, #9 granules	95.4 lbs/100 ft ²
Wt. of back ctg. & back surfacing	8.9 " " "
Filler Content, coating	53%
Scrub loss	0.4 g

#2 Component

Wt. of exposed portion, #9 granules	97.9 lbs/100 ft ²
Wt. of back ctg. & back surfacing	13.1 " " "
Filler content, coating	55%
Scrub loss	0.4 g

Source of glass mat

G A F Corp. 2

Wt. of G A F mat

2.1 lbs/100 ft²

Asphalt

Exxon Catalyzed 0.225%

S.P.

215°F

Pen @ 77°F

18

Pliability @ 32°F

165 angle of bend

Shingle net weight

323 lbs/square

U.L. Class A spread-of-flame

Passed test (5-1/4 ft., 5-1/2 ft.)

Class A Burning Brand tests on
1/2" thick plywood

Passed Test
(Spread-of flame 9")
(Length of coating flow 6-1/2")
(Depth of char 1/4")

TABLE 1 - Cont.

Shingle Analysis, BBH Class A Burning Brand
Fire Test, and U.L. Class A fire test run
at Northbrook, Illinois

Architect 80 Shingle, FK
#11 White Granules
July, 1981

#1 Component

Wt. of exposed portion, #11 granules	86.5 lbs/100 ft ²
Wt. of back ctg. & back surfacing	15.1 " " "
Filler content, coating	52% to 54%
Scrub loss	0.4 g

#2 Component

Wt. of exposed portion, double coated and surfaced with #11 granules	127.3 lbs/100 ft ²
Wt. of back coating & back surfacing	11.1 lbs/100 ft ²
Filler content, first coating	55%
Filler content, second coating	50%
Scrub loss	0.6 g
Source of glass mat	G A F Corp.
Wt. of G A F mat	2.1 lbs/100 ft ²
Asphalt	Exxon Catalyzed 0.225%
S.P.	215°F
Pen @ 77°F	18
Pliability @ 32°F	165 angle of bend
U.L. Class A spread-of-flame	Failed test (6-1/2 ft., 6-1/2 ft.)
Class A Burning Brand tested on 1/2" thick plywood	Passed test (Spread-of-flame over 22") (Length of coating flow 9") (Depth of char 3/8")

TABLE 1 - Cont.

Shingle Analysis, BBH Class A Burning Brand
Fire Test, and U. L. Class A fire test run
at Northbrook, Illinois

Architect 80 shingle, FK
Oakwood, FK
March 19-29, 1980

#1 Component

Wt. of base, #11 granules	64.4 lbs/100 ft ²
Wt. of thick butt, #11 granules	116.3 " " "
Wt. of back ctg. & back surfacing	6.3 " " "
Filler content, base coating	49.8%
overlay coating	50.3%

#2 Component

Wt. of exposed portion, #11 granules	98.3 lbs/100 ft ²
Wt. of back ctg. & back surfacing	13 " " "
Filler content, coating	49.3%

Source of glass mat	Flintkote
Wt. of Flintkote mat	2.0 lbs/100 ft ²
Asphalt	Exxon catalyzed 0.15%
S.P.	233°F
Pen @ 77°F	15

Shingle net wt.	279 lbs/sq.
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U.L. Class A spread-of flame	Failed test (4 minutes over 6 ft. flame spread)
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TABLE

Laboratory Spread-Of-Flame Test

Wind Speed - 680 Ft/min.
 "Meker" Burner - Natural Gas
 Shingle Samples - Six 6"x12" pieces are laid loosely using a 3" exposure on the 30° sloped wooden asbestos lined stand.
 Ignition Point - 6" from butt edge of first course.

Sample	Time To Begin Coating Flow Seconds	Length of Coating Flow inches	1 min. inches	2 min. inches	3 min. inches	4 min. inches	5 min. inches	6 min. inches	10 min. inches
Arch 80 Oakwood FK Failed U.L. Class A Spread- of-Flame	10	4-11/16	8-1/2	8-1/2	9	8-3/4	9	9-1/2	8-1/2
G A F Glass Timberline, Brown, from Fontana, Calif.	28	1-1/2	-	8	8	8	8	-	7
Arch 80 #9 White Granules Passed U.L. Class A Spread- of-Flame	20	4-7/16	8	8-1/2	8-1/2	8-1/2	9	9	9-1/4
Arch 80 #11 White Failed U.L. Class A Spread- of-Flame	15	4-9/16	8	8-1/2	9	9-1/2	9-1/2	9-1/2	9-1/2

Table 2

GAF Glass Timberline (All amounts in lbs/100 ft²)

	On Face			Granules, % Filler on Face	In Mat			% Filler in Mat	On Back			Scrub Loss, g		
	Total Face Coating	Asphalt	Filler		Total in Asphalt Mat	Asphalt	Filler		Total Back Coating	Asphalt	Filler		Talc	% Filler on Back
GAF Timberline from Fontana, CAL.	68.8	15.8	20.7	32.3	56.8	8.2	4.3	2.3	43.5	3.7	4.9	.8	56.8	22
#1 Component Brown	Totals	Asphalt	Filler	Granules	Mat	Talc	Total							
		27.7	31.3	32.3	2.1	.8	95.0							
#2 Component Brown	75.9	19.7	26.0	30.2	56.8	12.1	9.1	7.0	43.6	4.4	5.7	.8	56.8	14
	Totals	Asphalt	Filler	Granules	Mat	Talc	Total							
		33.2	38.7	30.2	2.1	.8	105.0							

Ref: Jagoecki, R. F., Progress Report 009, 25, dated Aug. 10, 1981

Ref: Jagoe K. R. F., Progress Report 009, 25, dated Aug. 10, 1981

GAF Glass Timberline
(#11 amounts in lbs./100 ft²)

On Face

[illegible]

11

15.7%

2115

Scrub

GAF Timberline
5.0m Fortang, CAL
#1 Component
Gray-Brown

Totals	27.9	91.3
Asphalt	32.6	
Filler	28.6	
Granules	2.1	
Total	91.3	

#2 Component
Gray-Brown --

Totals	Aspirin 16	26.4	4
	Granules	27.6	5
	Wafers	32.0	8
	Total	86.0	17

Ref: Jagocki, R. F., Progress Report, dated Aug. 10, 1981