Are labels always accurate?

NRCA's study of asphalt package labeling reveals some asphalt may be labeled inappropriately

by Mark S. Graham

NRCA recently has conducted a limited study of mopping asphalts commonly used in built-up and polymer-modified bitumen membrane roof systems. The study's purpose was to determine whether mopping asphalts are consistent with asphalt producers' package labeling. Following are the research's findings.

Background

In 1999, NRCA conducted a survey regarding asphalt producers' package labeling. The survey revealed several asphalt producers use preprinted labels. Also, several producers represent their equiviscous temperature (EVT) and flash-point temperature values as relatively broad temperature ranges, or minimum and maximum temperatures.

NRCA is concerned with such product labeling practices because it appears some asphalt producers provide package labeling information that applies to multiple lots or production runs of asphalt. As a result, the values provided on these labels may not accurately represent the asphalt contained in a specific carton or package.

Also, such labeling practices may result in asphalt applicators receiving inadequate information regarding proper heating temperatures or preferred application temperatures for the specific mopping asphalt used.

In 2000, NRCA met with the asphalt producers in question to share its concerns and request they provide applicators with more specific, accurate labeling and temperature information. Generally, the meetings were constructive, and several producers already have improved their package labeling procedures.

Based on the survey results, a logical continuation of this study was to determine whether mopping asphalts actually are consistent with asphalt producers' product labeling information.

Sampling and testing

NRCA obtained samples from 20 lots of Type III mopping asphalt from throughout the United States. Samples were given to NRCA by members of NRCA's technical committees and procured through typical distribution sources with their package labels intact.

NRCA then confirmed by the package labels that the samples were Type III mopping asphalts and recorded information from the labels. A summary

Terms to know

Softening point: A measure of an asphalt's tendency to flow at elevated temperatures that commonly is used to classify asphalts determined according to ASTM D 36, "Test Method for Softening Point of Bitumen (Ring-and-Ball Method)."

Penetration: A measure of an asphalt's consistency or firmness. Lower penetration values indicate harder consistency determined according to ASTM D 5, "Test Method for Penetration of Bituminous Materials."

Equiviscous temperature: The temperature at which a specific bitumen should be applied for proper built-up membrane installation. For mopping applications, this is defined as the temperature at which asphalt's viscosity is 125 centipoise (cps) (0.125 Pa•s); for mechanical-spreader application, it is 75 cps (0.075 Pa•s).

Flash point: A measure of a bitumen's tendency to form a flammable mixture under specific conditions. It generally is understood in the roofing industry that asphalt should not be heated in excess of 25 degrees Fahrenheit (14 degrees Celsius) below its flash point determined according to ASTM D 92, "Test Method for Flash and Fire Points by Cleveland Open Cup."

Sample No.	Package labeling			
	Equiviscous temperature (EVT)		Flash point	
	Preprinted	Marking	Preprinted	Marking
1	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	Mop EVT = 420 F Mechanical EVT = 445 F	540 F minimum	575 F average
2	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	Mop EVT = 410 F Mop EVT = 440 F	540 F minimum	580 F
3	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
4	None provided	None provided	None provided	None provided
5	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
6	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
7	125 cps* = 385 F to 455 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
8	None provided	None provided	None provided	None provided
9	None provided	Mop EVT = 395 F Mechanical EVT = 425 F	None provided	580 F
10	None provided	None provided	None provided	None provided
11	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
12	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
13	None provided	None provided	475 F minimum	None provided
14A	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
14B	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
14C	125 cps* = 385 F to 435 F 75 cps* = 405 F to 455 F	None provided	540 F minimum	None provided
15	None provided	M = 442 F S = 449 F	None provided	550 F average
16	None provided	Mop EVT = 425 F Mechanical EVT = 500 F	None provided	550 F minimum
17	Mop EVT = 450 F Mechanical EVT = 475 F	None provided	525 F+	None provided

*cps = centipoise
Note: *Celsius conversions were not provided on the package labels.*

Figure 1: *A summary of applicable package labeling information.*

of applicable package labeling information is provided in Figure 1.

The asphalt samples then were blind-labeled, and information identifying the asphalts' producers, types and physical properties was removed. The blind-labeled samples were submitted to a nationally recognized testing laboratory known for its asphalt testing expertise.

The laboratory analyzed the asphalt samples for compliance with the U.S. material standard for roofing asphalt, ASTM D 312, "Standard Specification for Asphalt Used in Roofing." The laboratory analyses conducted included tests for softening point, penetration and flash point according to the methods defined in the standard.

Also, samples' EVTs were determined according to an accepted industry method; EVT determination is not specifically defined in ASTM D 312.

The number and specific locations of specimens taken from the asphalt samples were determined according to ASTM D 140, "Standard Practice for Sampling Bituminous Materials."

Results

A review of the results reveals 10 of the 19 analyzed samples do not specifically meet the physical requirements for Type III asphalt as defined by ASTM D 312. Results of the laboratory analysis are provided in Figure 2.

Samples 2, 4, 7, 8, 10, 13 and 15 have softening-point values that are in excess of the value range permitted for Type III asphalt, which is 185 F to 205 F (85 C to 96 C). These samples do not comply with the requirements for Type

Laboratory findings				
Sample No.	Softening point (ASTM D 36)	Penetration at 77 F (25 C) (ASTM D 5)	Equiviscous temperature	Flash point (ASTM D 92)
1	205 F (96 C)	15	at 125 cps* = 405 F (207 C) at 75 cps* = 440 F (227 C)	630 F (332 C)
2	209 F (98 C)	20	at 125 cps* = 415 F (213 C) at 75 cps* = 445 F (229 C)	630 F (332 C)
3	200 F (93 C)	13	at 125 cps* = 430 F (221 C) at 75 cps* = 465 F (241 C)	640 F (338 C)
4	213 F (101 C)	22	at 125 cps* = 435 F (224 C) at 75 cps* = 465 F (241 C)	610 F (321 C)
5	205 F (96 C)	18	at 125 cps* = 415 F (213 C) at 75 cps* = 445 F (229 C)	620 F (327 C)
6	200 F (93 C)	28	at 125 cps* = 390 F (199 C) at 75 cps* = 415 F (213 C)	590 F (310 C)
7	210 F (99 C)	19	at 125 cps* = 430 F (221 C) at 75 cps* = 460 F (238 C)	600 F (316 C)
8	208 F (98 C)	13	at 125 cps* = 430 F (221 C) at 75 cps* = 460 F (238 C)	590 F (310 C)
9	205 F (96 C)	20	at 125 cps* = 410 F (210 C) at 75 cps* = 435 F (224 C)	610 F (321 C)
10	211 F (99 C)	15	at 125 cps* = 430 F (221 C) at 75 cps* = 460 F (238 C)	610 F (321 C)
11	204 F (96 C)	18	at 125 cps* = 430 F (221 C) at 75 cps* = 465 F (241 C)	590 F (310 C)
12	199 F (93 C)	17	at 125 cps* = 430 F (221 C) at 75 cps* = 465 F (241 C)	610 F (321 C)
13	207 F (97 C)	19	at 125 cps* = 440 F (227 C) at 75 cps* = 470 F (243 C)	615 F (323 C)
14A	204 F (96 C)	17	at 125 cps* = 430 F (221 C) at 75 cps* = 460 F (238 C)	595 F (313 C)
14B	197 F (92 C)	18	at 125 cps* = 425 F (218 C) at 75 cps* = 455 F (235 C)	590 F (310 C)
14C	197 F (92 C)	17	at 125 cps* = 425 F (218 C) at 75 cps* = 455 F (235 C)	595 F (313 C)
15	210 F (99 C)	14	at 125 cps* = 420 F (216 C) at 75 cps* = 455 F (235 C)	590 F (310 C)
16	203 F (95 C)	11	at 125 cps* = 425 F (218 C) at 75 cps* = 455 F (235 C)	585 F (307 C)
17	204 F (96 C)	13	at 125 cps* = 430 F (221 C) at 75 cps* = 465 F (241 C)	595 F (313 C)
*cps = centipoise				

Figure 2: *Results of a laboratory analysis of asphalt samples.*

III asphalt; they have softening-point values consistent with Type IV asphalt.

Samples 3, 8, 16 and 17 have penetration values in excess of the value range permitted for Type III asphalt, which is 15 to 35. Samples 3, 8 and 17 have values consistent with Type IV asphalt; sample 16 has a value for penetration entirely outside ranges defined by ASTM D 312.

Review of EVT data reveals samples 11, 12 and 14A have values in excess of the relatively broad ranges indicated on the asphalt producers' package labeling. These samples likely would require additional heating to attain proper viscosity for mechanical-spreader application.

All the samples had flash-point values more than what was identified on their package labels. Thirteen samples had actual values for flash points 50 F (28 C) or more than the minimum flash points indicated on their labels. Samples 3 and 13 had flash-point values 100 F (56 C) or more.

The study's results are representative of only the specific samples and production lots of mopping asphalt analyzed. The results may not be representative of all mopping asphalt or mopping asphalt from specific producers.

Conclusions

Based on the limited study's findings, it is apparent asphalt producers'

In defense of built-up roofing

by **Tom Bollnow**

Despite recent concerns about asphalt labeling, bitumen fume exposure and fire hazards, there are many reasons to be encouraged about the state of the built-up roofing (BUR) industry.

In the current business environment, many things are evaluated relative to an arbitrary high-tech scale, and in the roofing industry, BUR systems rarely are considered to be high-tech. But reports about problems with BUR systems often are exaggerated and inaccurate.

A truly high-tech roof system should be based on state-of-the-art research and development and possess long-term performance attributes. BUR systems fit this definition.

Market share

It is a tribute to the BUR industry that BUR continues to maintain a strong position in the low-slope roofing market. NRCA's annual market surveys reveal that BUR has maintained a steady 20 percent or more share of total U.S. low-slope roofing sales during the past several years.

So why does BUR continue to hold its market position if it is perceived as antiquated and plagued with negative environmental issues, such as bitumen fumes and fire hazards? The answer is that it continues to perform well.

System performance

BUR system performance is measured according to the National Bureau of Standards Building Science Series (NBS BSS) No. 55, *Preliminary Performance Criteria for Bituminous Membrane Roofing*, which was published in 1974. *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, lists the 20 performance attributes contained in NBS BSS No. 55. There is no significance to the order in which the criteria are listed.

NBS BSS No. 55 Section 6.1 states that a BUR membrane should have a tensile strength of not less than 200 lbf/in (35 kN/m) in the weakest direction when tested at 0 F (-18 C). The BUR industry has applied this principle successfully for the past 25 years. Although tensile strength is the most commonly referenced performance criteria, it is not necessarily the most important. It also is not necessarily true that tensile strength values significantly above 200 lbf/in (35 kN/m) equate proportionately to increased service life.

The minimum membrane tensile strength criterion was developed during a period when insulation was attached to steel decks with hot asphalt or cold adhesive. Insufficient insulation attachment to roof decks resulted in membranes splitting and pulling away from roof edges, parapets or penetrations. The use of fiberglass-reinforced ply sheets and the FM Global requirement for mechanically fastening insulation to steel decks have made the incidence of BUR membrane splitting a rare occurrence.

Roof membrane elongation also is necessary to help relieve the tension produced when a membrane cools and wants to contract more than the substrate to which it is secured. The elongation properties of a properly installed BUR system are more than adequate to prevent splitting caused by thermal movement.

All the performance attributes in NBS BSS No. 55 act together to determine a BUR system's quality. BUR systems possess a unique redundancy provided by multiple layers of bitumen or cold adhesive and reinforcement plies that create a membrane's characteristics. The performance criteria coupled with the Asphalt Roofing Manufacturers Association/NRCA *Quality Control Guidelines for the Application of Built-Up Roofing* have helped to improve BUR systems to the point where they are more reliable than ever.

Composition today

Current BUR systems are composed of four components: reinforcement ply sheets, weatherproofing bitumens, surfacings and flashings. Fiberglass- and organic-reinforced ply sheets are the most common reinforcements. Surfacings and flashings generally are prescribed for each specific BUR system.

ASTM D 2178, "Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing," requires Type IV felt to have a minimum tensile strength of 44 lbf/in (7.7 kN/m) and Type VI felt to have a minimum tensile strength of 60 lbf/in (10.5 kN/m) measured in the weakest direction. The Midwest Roofing Contractors Association tested Type IV fiberglass-reinforced ply sheets in 1980, 1981, 1984 and 1987 and Type IV and Type VI ply sheets in 1997 according to ASTM D 2178 and NBS BSS No. 55. The research prompted a marked improvement of fiberglass-reinforced ply sheets that eventually all but eliminated splitting as a performance concern.

Coal-tar-pitch roof systems use coal-tar-saturated organic felt or coal-tar-coated fiberglass-reinforced ply sheets. There are some BUR systems available that use nonwoven polyester with hot asphalt, as well as other types of polyester mats with liquid-applied asphalt. These systems may provide increased service life but at a relatively higher cost.

The weatherproofing components used to adhere reinforcing plies to each other and, in some instances, to substrates are referred to as bitumens. Standard asphalts, Type I coal-tar-pitch, polymer-modified asphalt, and cold-applied coal-tar and solvent-based asphalts are used in BUR systems. Polymer-modified bitumens most often are used in specialized BUR systems. Asphaltic-based liquid adhesives can be rolled, squeegeed or sprayed for interply applications.

BUR has evolved from a crude combination of bitumen, felt and surfacing to a relatively sophisticated combination of bitumen, reinforcement and surfacing. When combined in various configurations, the resultant roof systems can be efficient and high-performing.

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package labeling does not consistently, accurately reflect the physical properties of the mopping asphalt contained in the packaging.

In most instances, it appears asphalt producers take a relatively conservative approach to package labeling. For example, they may label mopping asphalt as being Type III even though it may have some physical properties of Type IV asphalt, such as a high softening point. Or EVT may be labeled to fall within a broad range of values instead of a specific value for a specific lot or production run of mopping asphalt.

However, in some instances, such a conservative approach to package labeling may adversely affect the applicators of roof membrane systems.

For instance, sample 12 has a labeled flash-point temperature of a minimum of 540 F (282 C). Therefore, following industry guidelines, this asphalt should only be safely heated to 515 F (268 C). If this asphalt were used to mop-apply a polymer-modified bitumen membrane roof system that required a relatively high asphalt application temperature at the point of contact, only minimal asphalt temperature loss would be acceptable between the asphalt kettle and application point.

However, because the asphalt's flash point actually is 610 F (321 C), following industry guidelines, it can be safely heated up to 585 F (307 C).

This additional allowable asphalt heating temperature substantially would increase the likelihood of getting a proper asphalt temperature at the point of contact when installing mop-applied polymer-modified bitumen membrane roof systems.

Closing thoughts

Asphalt producers need to improve the information listed on their package labels. Asphalt package labeling should accurately reflect the appropriate American Society for Testing and Materials (ASTM) designation and type, EVT and flash-point temperature for the specific asphalt contained in each package. Because these values typically vary, they cannot conceivably be preprinted on asphalt package labels. Asphalt producers should provide this data on a lot-to-lot basis, such as by individual package stencil labeling, as previously was done and recognized in the roofing industry.

Also, asphalt producers should provide values for EVT and flash-point temperatures as individual temperature values and not ranges or minimum or maximum temperature values. This would provide applicators with the specific information needed for proper application. Manufacturers, designers and contractors are encouraged to use asphalt from producers who provide such proper labeling on their asphalt packaging.

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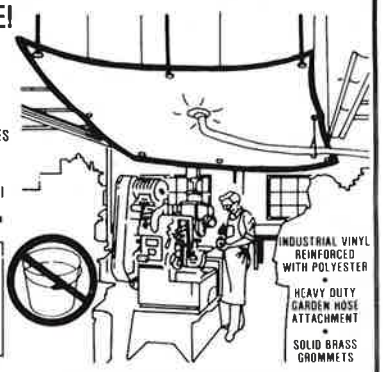


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