

CUTTING UP ON THE JOB



BY JIM D KOONTZ, PE, & VICKIE CRENSHAW

Over the past several years, samples removed from built-up roofs (BUR) have been subject to controversy within the roofing industry. Many have argued the pros and cons of removing and analyzing BUR samples. Obviously, from an owner's perspective, it is a way to ensure compliance with specifications, and provide a greater degree of quality control. Many roofers feel that this laboratory testing has been unnecessary and in some cases, an unfounded question of their integrity. Regardless of the pros and cons of this issue, questions have been raised about the accuracy of the primary procedure used for evaluating BUR samples, method ASTM D 2829. There has also been a question of the

accuracy of the laboratories performing this testing.

A viable argument made by the roofing contractor is that the laboratory and the procedure used should have at least as much accuracy and quality control as the industry expects from the roofer.

WHAT IS ASTM D 2829?

The basic procedure used in the industry is to remove a sample from the completed BUR, including the aggregate and, sometimes, insulation backer. Primarily, the sample used is a 12" x 12" sample, which has been bagged, tagged, boxed and shipped to a laboratory for analysis.

The laboratory uses a destructive method of analysis involving separating the sample into individual

components: aggregate, floodcoat, felt plies and interply bitumen.

Normally, the laboratory technician weighs the entire sample and then measures and/or weighs each component of the sample. This would include the loose aggregate, adhered aggregate, flood coat, number and configuration of felt plies and interply mopping. The mathematics involved in the accounting of the components involves a deductive method.

After the initial weighing, the technician deducts the weight of each component from the total weight of the sample, taking first the loose aggregate, then adhered aggregate and floodcoat. The interply asphalt is calculated by deducting the weight of the felts, the weight of an insulation backer, and then dividing the

remaining weight by the number of plies of felt within the sample.

ROUND ROBIN TESTING

A subcommittee within ASTM D08, under the chairmanship of Don Brotherson, sponsored a Round Robin

CHART I

Sample Weight	0.32%
Total Aggregate (lbs/sq)	2.29%
Adhered Aggregate (lbs/sq)	7.85%
Floodcoat (lbs/sq)	10.02%
Interply (lbs/sq)	4.08%
Felt Plies	0.49%
Felt Headlap	11.02%

testing among laboratories. The purpose of the Round Robin testing was to determine if the ASTM D 2829 procedure is an accurate and valid procedure.

Twenty-four BUR samples were constructed in the laboratory at Roof Engineering, Inc. Each component of the BUR sample, the felt configuration, type of felt, interply bitumen, floodcoat, adhered aggregate, and loose aggregate, was carefully bagged, with loose aggregate bagged separately. The known values were then tabulated and forwarded to Don Brotherson.

Six laboratories received four samples each. The laboratories participating in the Round Robin testing included Construction Consultants, Inc. of Detroit, MI, Inspection of Minneapolis, MN, Law Engineering, Inc. of Houston, TX, Chicago Testing Laboratory representing NRCA, Roof Engineering, Inc. of Hobbs, NM, and Simpson, Gumpertz and Heger of Boston, MA.

The laboratories were asked to analyze samples following the ASTM D 2829 procedure. Factors given to each laboratory were an assumed weight for organic felt (ASTM D 226) of 13 lbs per square, and fiberglass felt (ASTM D 2178, Type IV) of 7 lbs per square. An insulation backer weight was also given to each laboratory.

Each laboratory performed its analysis, and the results were returned to Roof Engineering, Inc. These results were then tabulated next to the known values and the average difference was calculated.

RESULTS

The results for the various categories present some interesting, but not surprising, findings. Chart I shows the average difference from the known weight reported by the laboratories. The greatest chance for error occurs in the areas of adhered aggregate and floodcoat.

This is probably the most difficult area to separate properly in the laboratory analysis. This involves the separation of the floodcoat from the top of the sample, and the separation of all attached floodcoat on adhered aggregate. The technique of removal

include measurement of floodcoat and adhered aggregate.

Some laboratories used a density method of determining aggregate and floodcoat. This particular method uses an assumed number for the density of the bitumen and the density of the aggregate. Other laboratories removed and separated the aggregate from the flood coat by a solvent wash method.

Under ASTM D 2829, a laboratory can use an assumed weight of 4 to 8 lbs of floodcoat remaining on the top surface of the BUR membrane. All of the laboratories had very accurate results on reporting the felt ply cross-sectional configuration. Note that the number of felt plies reported varied by less than 1/2 of 1 percent.

The procedure itself, ASTM D 2829, can provide reliable and accurate results. With any type of testing procedure, the critical factor falls

CHART II

Sample	Actual Quantities	Percent Variability	Range of Results
Sample Weight	650.00 lb/sq	0.32%	647.92 - 652.08
Total Aggregate	400.00 lb/sq	2.29%	390.84 - 409.16
Adhered Aggregate	200.00 lb/sq	7.85%	184.30 - 215.70
Floodcoat	60.00 lb/sq	10.02%	53.99 - 66.01
Interply (lb/sq)	25.00 lb/sq	4.08%	23.98 - 26.02
Felt Plies	4.17 plies	0.49%	4.15 - 4.19
Felt Headlap	2.00 plies	11.02%	1.78 - 2.22

varies somewhat from laboratory to laboratory.

For an example of variance that can occur in a sample, note Chart 2. The interply mopping weights calculated by the laboratories are relatively accurate. If a roofer had installed a 25 lbs/sq interply mopping, the laboratory results could fall within a range of 23.98 to 26.02. The number of felt plies reported in a four-ply system with a 2" head lap could vary from 4.15 to 4.19.

CONCLUSIONS

The basic results of this very initial testing on 24 samples is that the ASTM D 2829 results can provide relatively accurate results. Areas that are in definite need of improvement

upon the technique used by the laboratory and the expertise of the laboratory technician. Owners and roofers deserve, and should receive, accurate results. Some owners and roofers attempt to pre-qualify laboratories. Often, this would provide a great deal of quality control in laboratories performing BUR testing.

Roof Engineering, Inc, would like to thank the laboratories that participated in the Round Robin work. A second survey of Round Robin testing is currently being performed on smooth-surfaced BUR samples. RM

Jim D Koontz, PE, is president of Roof Engineering, Inc. Vickie Crenshaw, associate, is also of Roof Engineering, Inc.