Hot stuff not hot enough, says study

EVT ranges may need revising

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The subjects of interply mopping quantities and quality control have been points of controversy within the BUR industry for some time. For coal tar products, NRCA joined with the Koppers Co. to address these questions with a study that examined the temperature and viscosity relationships of these materials. The next logical step seemed to be an examination of asphalt BUR products.

NRCA combined its efforts with Trumbull Products, a division of Owens-Corning Fiberglas, to study the relationship between heating and application temperatures, application viscosities, and the interply mopping amounts that are used during asphalt built-up roof membrane construction. The object of this study was to explore interply mopping uniformity, evaluate load strain relationships and examine interply voids as they relate to the temperatures used during the controlled construction of test roof sections. Initial results and conclusions from this effort were presented at the NRCA Convention workshop "The Final Analysis: Results of the NRCA/Trumbull Asphalt Study."

The NRCA/Trumbull program was similar to the coal tar study. It consisted of constructing test roof sections under controlled conditions using both hand mopping and mechanical laying techniques. Coupons taken from the test sections were analyzed according to standard ASTM procedures.

EVT too low?

Probably the most important finding from the NRCA/Trumbull study deals with the criteria that defines equiviscous temperature (EVT). EVT is presently defined as the temperature at which asphalt has a viscosity of 125 centistokes. This temperature (± 25 degrees F) describes what should be the optimum asphalt temperature at the point of application. But the results from the study demonstrated that the interply mopping rates with the least variance, the least amount of average interply voids and the best load strain performance were obtained at application temperatures above the EVT as it is presently defined. This finding would indicate that the current EVT temperatures may be too low for present-day, mechanized applications. Parallel findings were obtained from the NRCA/Koppers study on coal tar BUR.

As a result of these findings, two concepts are being considered for altering the present definition of EVT. One consideration would raise the EVT temperature by lowering viscosity from 125 centipoise to 75 centipoise and maintaining the present ± 25 degree F temperature range. The second consideration would increase the EVT temperature by sustaining the viscosity at 125 centipoise, but using this value as the maximum viscosity. This defines the lowest bitumen temperature needed for correct application, rather than the center of the temperature range. Both concepts would have the same net effect of increasing the mopping temperature at the point of application. Each concept has advantages and disadvantages that warrant further investigation.

Varied results found

Another of the study's findings confirmed the industry's suspicions about the test cut methods themselves. Researchers found that individual test cut sampling and testing procedures don't indicate the overall quality of the installed membrane. Even though the sections of roofing being studied were prepared under superbly controlled application conditions, the results from the test cuts varied widely for samples taken only a few feet apart. Furthermore, many of the test cuts—if taken individually—would have failed to meet application tolerances in present industry documents in spite of the fact that the average results taken from the roof sections were often within acceptable limits. This discrepancy duplicates the findings of the NRCA/Koppers study on coal tar BUR, which also illustrated a wide

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variation among individual samples taken from identical roof sections. Both studies support NRCA's *Quality Control* document in its opposition to the use of test cut analysis to decide the acceptability of newly installed BUR.

Other findings

The NRCA/Trumbull study also showed that glass felt samples had higher load strain properties than organic felt samples, but that there was no apparent correlation between load strain and asphalt type, application temperature, or interply mopping weight. In addition, the study's results revealed that there were generally fewer voids within glass felt samples as compared to those found within organic felt samples, and within machine-applied as compared to hand-mopped samples. Researchers also found that hand mopping, on the whole, resulted in thinner interply moppings and narrower variances than did mechanical application.

One of the study's more interesting conclusions concerns the differences found between unsurfaced samples and samples surfaced with an asphalt flood coat and aggregate. Samples taken from unsurfaced areas showed a substantially larger number of voids than samples taken just a few feet away where an asphalt flood coat and aggregate surfacing had been applied. The flood coat and aggregate application apparently reduced the void content within the sample. The added heat of the asphalt flood coat and the weight of the cover aggregate may have caused this reduction of void content.

More tests needed

A final report on the joint NRCA/Trumbull test work is being prepared. Trumbull Products and NRCA are now considering further tests that may include studying actual roofs under construction. These tests would verify and confirm the information obtained from the initial tests and would examine the new questions this study has uncovered. Obviously, many aspects of jobsite control, ambient conditions and material behavior influence asphalt application temperatures and roofing installation qualities. All of these aspects must be thoroughly explored before the preliminary recommendations from this study can be justifiably considered.