

End may be in sight for aged R-value controversy

Polyisocyanurate and polyurethane roof insulations have a tendency to lose insulation value after they leave the factory. This is, perhaps, the only point on which representatives of NRCA, the Midwest Roofing Contractors Association (MRCA) and the Roof Insulation Committee of the Thermal Insulation Manufacturers Association (RIC/TIMA) agree. It is generally recognized by members of these groups that as the fluorocarbon gas that is originally trapped in the cells of these plastic foam insulations is replaced by air, the products become less effective insulators. As of yet, however, there is still no consensus on how much insulation value is lost or whether this thermal drift stops at some point during the product's lifetime.

MRCA publishes a paper

Resolving this controversy is vitally important to everyone concerned. Ever since this phenomenon was first noted, MRCA, RIC/TIMA and NRCA have been working together and individually to evaluate the problem and propose solutions. MRCA's work resulted in a position paper, which was reprinted in full in the April 1986 issue of *Roofing Spec* as part of an article titled "NRCA responds to MRCA's position on aged R-values," (pages 33-35).

MRCA stated in its paper that the R-value (a measure of insulation value) of these insulations continues to decrease for several years after these products are installed. At its 1985 convention, MRCA backed its position with information it had gathered from polyisocyanurate and polyurethane roof insulations installed in test roofs. MRCA's tests indicated that the R-value of these products had drifted below 6.25, which is the design value the American Society of Heating, Refrigerating and Air Conditioning Engineers lists for roofing insulation in its *Fundamentals Handbook* (table 3A, chapter 23). This is a significant drop from the R-values these products possessed when first manufactured, which in some cases were as high as 9.09.

**Finally,
groups
seem
to
be
working
together**

by Bob LaCrosse, NRCA
associate executive
director

MRCA's paper broke an uneasy truce that had been established between the contractors and the manufacturers in 1981. At that time, RIC/TIMA had developed an aging procedure that it said would allow the insulations' aged R-value to be measured in the laboratory. Using this procedure, manufacturers were to test these insulations after they had been allowed to age for six months in a controlled environment with a constant temperature. RIC/TIMA recommended that its manufacturer members subject their products to this aging procedure and publish the aged R-values in their literature.

MRCA claimed in its position paper that the information obtained from the RIC/TIMA aging procedure can only represent the products' insulation value at the time of application. After several years in place, the insulation would probably have a lower R-value, according to MRCA. The products that were installed in MRCA's test roofs had published aged R-values varying from 7.69 to 6.25. When sections of these roofs were removed and tested, their R-values had drifted significantly lower.

MRCA says that its findings indicate the need for further in-place testing of polyisocyanurate and polyurethane insulations. To help resolve the situation, the Midwest group suggests the following actions:

- Until new guidelines are established, the roofing industry and the design profession should use only those polyisocyanurate and polyurethane insulations that publish insulation values based on, and in conformity with, RIC/TIMA's aging procedure.
- As an interim procedure, specifiers should consider these products' in-service R-value to be 5.56 per inch.

MRCA claims the RIC/TIMA aging procedure represents the insulation value at the time of application.

■ A national independent laboratory should be enlisted to help establish realistic guidelines for in-service R-values based on the testing of field samples with known in-service lives.

MRCA also detailed the procedures that should be followed when specifying roof insulation to meet a certain required heating and/or cooling criteria. First, the specifier should use a foamed insulation thickness that will provide the desired R-value for the insulation only. The correct thickness can be calculated by assuming the product has an R-value of 5.56 per inch. Dividing the desired R-value by 5.56 will yield the number of inches of polyisocyanurate or polyurethane insulation required. This figure should be rounded off to the next higher 1/10th of an inch, or up to the next available manufactured size.

Thickness to the nearest 1/10 of an inch.

Example no.	Desired System resistance "R" value determined for insulation	Thickness in inches of insul. based on an "R" = 5.56 inches = R/5.56	Call for thickness rounded up to nearest 1/10 of an inch
(1)	18.52	3.33" ----	3.4"
(2)	14.08	2.53" ----	2.6"
(3)	10.00	1.79" ----	1.8"

For interim in-service values, specify the thickness and brands acceptable on the basis of the interim criteria of R-value $\frac{1}{4}$ 5.56 per inch as outlined.

A more detailed description of these recommendations may be found in the April *Roofing Spec* article already cited.

NRCA takes action

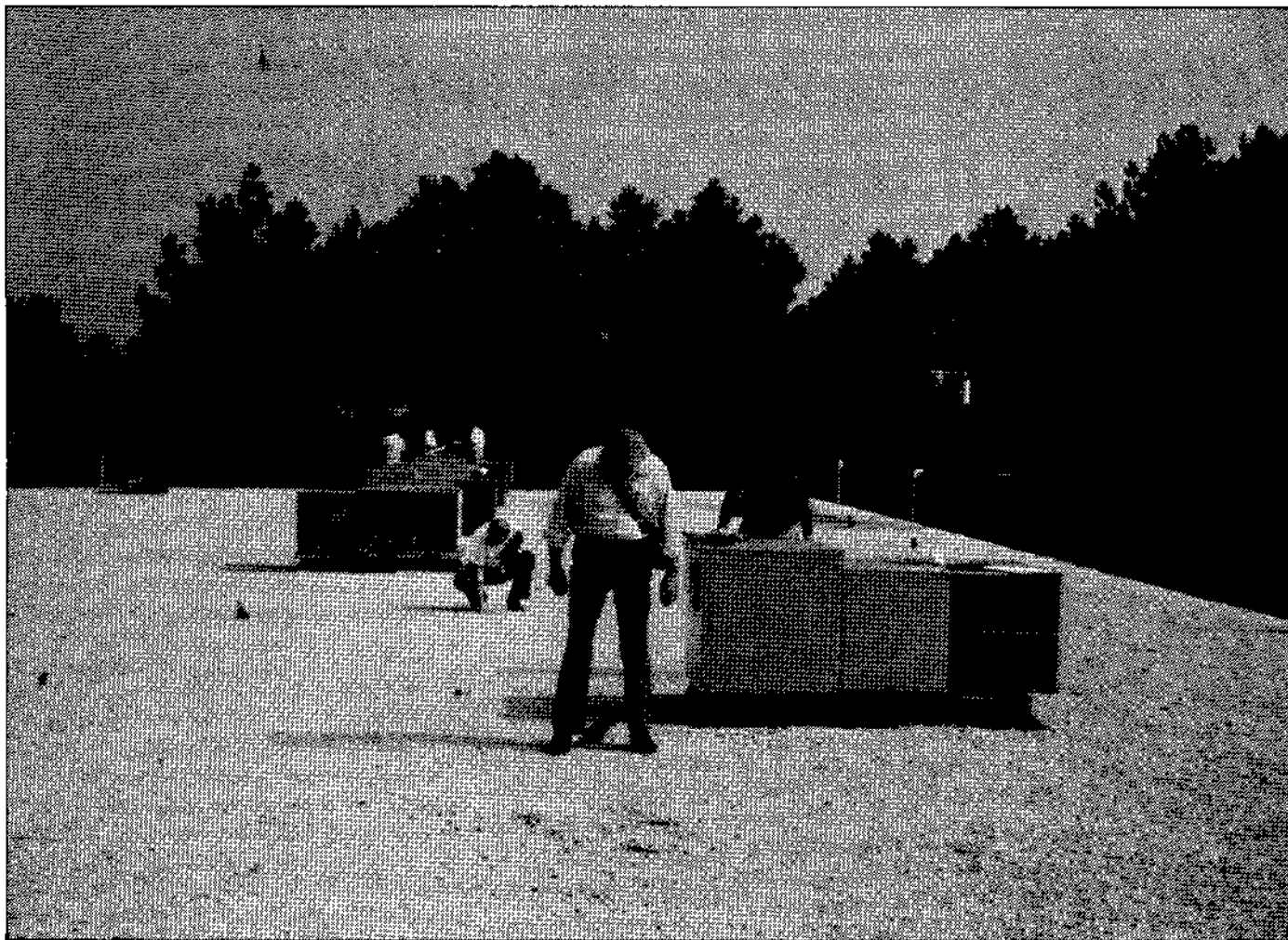
After publishing its paper, MRCA asked NRCA to help resolve this issue. The National Association told MRCA that it does not have the independent testing data it needs to take a position regarding the need for an interim in-service R-value, let alone what that value might be. However, the National's leadership did agree to work with MRCA and RIC/TIMA to find a common solution.

In March 1986, a round of meetings began that brought representatives of all three groups together to discuss MRCA's position paper and devise a plan of action. Little progress was made at this first meeting even though NRCA encouraged the other groups to engage in a joint test program to provide more technical data on this issue. Both MRCA and RIC/TIMA resolved to proceed according to their own plans. RIC/TIMA said its members would continue to publish aged R-values based on the Committee's established aging procedures, and it would continue its own in-situ thermal test programs. MRCA stood on its findings and the values given in its position paper.

Representatives of all three groups did agree that a joint research program was needed. RIC/TIMA invited MRCA and NRCA as well as the Society of Plastics Industry and others to participate in its in-situ test programs. The Committee offered to prepare a proposal that would outline the test program's procedures. At the March meeting, MRCA and NRCA representatives agreed that a joint test program with RIC/TIMA was desirable, but that such a program should have a thorough review to make sure that test results pertinent to this issue are obtained within two years. RIC/TIMA representatives reported that its present and proposed testing programs would not yield conclusive results for five years.

Joint test program considered

The idea of a joint test program funded by MRCA, NRCA and RIC/TIMA was also discussed in April at a meeting of the joint NRCA-RIC/TIMA Roofing Insulation Technical Committee (RITC). The recommendations for a joint program that came out of this meeting included a provision that the test results be obtained in two years and that the in-service R-values of all other roof insulations be investigated later in the program for comparison. RIC/TIMA was asked to develop a proposal for a joint test program following these recommendations. RITC also unanimously agreed that a credible and legally supportable insulation value should be found, which manufacturers of polyisocyanurate and polyurethane roof insulations could be asked to certify that their products meet.



NRCA's Technical Operations Committee (TOC) also got into the act after discussing the actions taken at the April RITC meeting. TOC asked that the test program be limited to investigating polyisocyanurate and polyurethane roof insulations. TOC also recommended that a minimum of three laboratories be contacted and asked to outline the questions and problems presently being encountered with polyisocyanurate and polyurethane insulations. These labs should also be asked to propose programs that could help answer the questions raised by MRCA's position paper.

RIC/TIMA eventually brought its proposal for a joint program before a meeting of TOC, which was also attended by representatives of MRCA. RIC/TIMA said the program should:

- seek in-situ heat flow data for all roof insulations under varying thermal conditions;

- include two new test sites, one in a cold location, and one in a hot and humid climate;
- establish industry standard thermal values;
- use BUR and EPDM membranes;
- measure initial steady-state thermal data using ASTM procedures prior to installation, and do heat flow measurements three times a year for a minimum of three years;
- give RIC/TIMA product control and the authority to administer the program funds; and
- be sponsored by groups such as NRCA, MRCA, SPI, Oak Ridge National Laboratories, the National Bureau of Standards and RIC/TIMA's chemical suppliers, in addition to RIC/TIMA.

RIC/TIMA researchers examine the Committee's first test roof in Powder Springs, Ga. Another test roof has been constructed in Colorado Springs.

The Dynatech study may put to rest the controversy over foam roof insulation aging.

Ad-hoc committee takes over

An interim ad-hoc committee was then formed to proceed with the development of the joint program. Members of this committee were asked to develop procedures that would help determine the aged insulation value of polyisocyanurate insulations. This step was seen as an interim solution. The ad-hoc committee was also asked to recommend an objective research and testing program that could measure the effects of aging on these products. As a final task, committee members were to recommend procedures that would allow comparison of samples that were aged and tested in a certified laboratory, at a test installation and on an actual roof.

The establishment of an ad-hoc committee seemed to satisfy everyone concerned. Prior to the TOC meeting where this committee was formed, MRCA representatives had told NRCA that the Midwest group had prepared a field test program of its own. This program would involve testing samples of existing roofs that had been constructed with polyisocyanurate and polyurethane insulations throughout the United States. NRCA was invited to cosponsor this program if RIC/TIMA proposed a program that would not find a solution to the problem in a reasonable length of time. With the formation of the ad-hoc committee, however, the MRCA representative decided to hold off on their test program until the committee had a chance to act.

Members of the ad-hoc committee chose to attack the problem in two phases. The first phase would be a jointly sponsored literature search to review all the technical information that now exists concerning thermal drift in polyisocyanurate and polyurethane foam insulations. It was decided to seek proposals for this research from a minimum of three qualified laboratories. Along with the literature search, candidates were also requested to prepare

recommended procedures for determining the aged value of these products based upon the data obtained in the literature search.

While the ad-hoc committee was proceeding with its work, RIC/TIMA was reorganized. NRCA has been informed that RIC/TIMA's objective is to represent virtually all commercial roof insulation materials, and that a new group would be formed to represent only polyisocyanurate and polyurethane foam insulations. In spite of this change, RIC/TIMA said it was still obligated to financially support its portion of the literature search.

After reviewing different laboratories' proposals, the ad-hoc committee chose Dynatech R/D Co. to conduct the literature search. This phase of the program should be finished later this month or in early February, and Dynatech's findings will be submitted to the ad-hoc committee for its review. Based on Dynatech's research, a laboratory and field study will be developed. Overall sponsorship of this phase of the program is to be negotiated.

End may be in sight

Since the 1981 release of the NRCA bulletin No. 10, "NRCA-RIC/TIMA Position on Aged Thermal Value of Urethane Roof Insulation," and NRCA bulletin No. 11, "NRCA Recommendation on Selecting Urethane Roof Insulation," there has been much controversy over the issue of foam roof insulation aging. Many segments of the industry have tended to go their own ways in programs.

The Dynatech study that is now underway could be one way the industry can come together to find a definitive answer to this problem. At last some definite progress is being made. With everyone's cooperation, we can find solutions and establish criteria that in the long run can only improve the roofing industry.