

U.S. roofing research falling behind European efforts

For all practical purposes, the amount of roofing research being conducted in the United States today adds up to zero.

The programs that are underway in some government laboratories, such as the National Bureau of Standards (NBS), the Construction Engineering Research Laboratory, the Cold Regions Research and Engineering Laboratory and more recently, the Department of Energy-supported work at the Oak Ridge National Laboratory are only token efforts. As far as we know, little if any roofing research, other than some product development work, is underway in the manufacturers' laboratories.

Because of this situation, it is not surprising that the roofing industry has given us so few standards in spite of the fact that we must depend on this multi-billion dollar business to protect our homes, schools and workplaces. Standards don't just happen! They must be backed by the data and technical information that are the products of the research process.

Although several groups in this country are actively developing standards, very little progress has been made that will have a significant impact on the roofing industry or the public it serves. Considering the roofing industry's size, it is difficult to believe that it cannot supply the resources needed to improve its products' stature. If just a small fraction of the advertising and promotion budgets were allocated to research efforts, the payoff in improved design, materials and construction practices would be large indeed.

William Cullen is a research associate with NRCA's Technical Department. He recently visited Britain's Building Research Establishment laboratories, touring the Building Research Station in Garston and the Princes Risborough Laboratory in Buckinghamshire. In 1984, he toured the Centre Scientifique et Technique du Batiment laboratories in France.

Token U.S. efforts no match

by William C. Cullen

In the meantime, the absence of composite built-up membrane and single-ply standards in the United States has sometimes resulted in the marketing and application of unacceptable materials. Even though this has frequently led to customer dissatisfaction and litigation, it seems that many of us are satisfied to have things remain at the status quo for the foreseeable future.

The European approach

The roofing industry in Europe, on the other hand, approaches the issues of research and standards differently. I have had the opportunity to work side-by-side with European technical committees and have seen firsthand the nature and results of their testing and research activities. Based on the evidence I have gained from my contacts with European colleagues, I can categorically state that Europe's activities in this area far outdistance research and testing activities in the United States.



The author (far right) on a tour of the Building Research Establishment's (BRE) Princes Risborough Laboratory in Buckinghamshire, England. Joining him on the tour are (from left): John Beech, of BRE's Flat Roof and Sealant Section; Walter Rossiter, a research chemist with the National Bureau of Standards; and Bob LaCrosse, director of NRCA's Technical Department.

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One example of Europe's greater commitment to research and testing may be seen in the work of France's Centre Scientifique et Technique du Batiment (CSTB). Researchers in CSTB's laboratories outside of Paris and in the field take great pains to evaluate roofing materials, design and applications, and their findings are often quite influential. The decision to accept or reject a roofing material for use in France may be based on CSTB's test results.

Important roofing research is also being conducted at the Building Research Establishment (BRE), a government laboratory in the United Kingdom. At two of BRE's facilities researchers evaluate the more practical aspects of material performance such as durability and in-service life. They also study water, heat and moisture transfer.

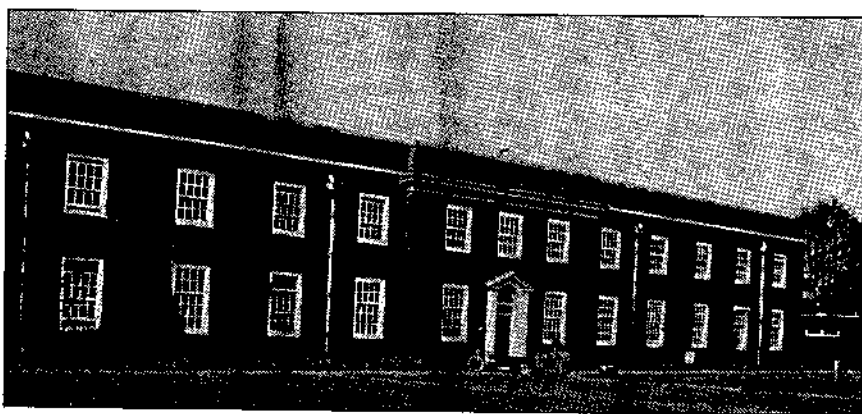
European roofing research isn't limited to France and England, however. Studies are being conducted all across the Continent. The Bundesanstalt für Materialprüfung in West Germany, the Bouwcentrum of Holland, and the Industrializzazione e la Tecnologia Edilizia of Italy, as well as facilities in Denmark, Spain, Portugal, Austria and Belgium, all sponsor roofing-related programs.

The widespread availability of roofing research has allowed many countries in Europe to formulate significant national roofing industry standards. More often than not, these standards are prescriptive in nature. Each country has an organization quite similar to this country's American Society for Testing and Materials (ASTM) that uses the laboratories' test results to prepare and circulate consensus standards for materials, test methods and construction practices. In France the Association Francaise de Normalisation is the official standards organization. It is non-governmental, but a substantial portion of its operation is publicly funded. The independent, non-profit British Standards Institute is the nationally recognized standards organization in Britain. The Deutsches Institut für Normung is the private, non-profit standard-writing group of West Germany.

A standard complement

By working cooperatively, European countries have also been able to develop performance documents to complement their prescriptive standards. Most of this work has been accomplished under the auspices of the European Union of Agreement (UEAtc).

UEAtc membership includes organizations from Britain, West Germany, France, Holland, Austria, Italy, Denmark, Belgium, Spain and Portugal and an observer representative from Erie. Each of these countries has established a national authority for the testing and evaluation of building materials and construction methods. These national authorities test, evaluate and certify construction products to ensure their safe and effective use. They award "Agreement Certificates" to products that demonstrate an acceptable standard of performance during testing. UEAtc's major objectives are to coordinate the activities of these organizations and to ensure that "Agreement Certificates" issued by different members are equivalent.



BRE's Pilgrimage Research facility in Buckinghamshire, England, where much of the organization's roofing research takes place.

Command performance

UEAtc has been very active in developing roofing performance guidelines. In January 1983, UEAtc member organizations issued a general directive for the assessment of roof waterproofing systems. The directive's approach is related to the in-service performance of the roofing membrane. Unlike efforts in the United States, the directive does not prescribe standards, which may describe good PVCs, good rubbers, good bituminous felts and so on, without describing good or even acceptable roofing membranes. The UEAtc document provides evaluation guidelines that use the classic performance approach to assess roofing systems with any type of membrane, whether built-up or single-ply. Neither generic materials nor their method of manufacture or application are referenced in the directive.

A straightforward guide

The general directive is a straightforward, realistic guide to assessing the quality of a roofing system. The information it contains is written in easy-to-understand, non-scientific language. First, it provides guidelines for the classification of roof systems. According to the document, systems may be classified by:

- the type of membrane;
- the accessibility of the roof;
- the roof slope; and
- the method of membrane attachment.

Next, the document details the quantitative requirements that must be met for:

- safety;
- fitness for use;
- durability;
- workability; and
- maintenance.

The directive also describes a series of test methods to be used to assess roofing products' on-the-roof performance. These basic test methods apply to all membranes regardless of type. They are designed to test a membrane's:

- fire resistance;
- water resistance;
- wind uplift resistance;
- thermal shock resistance;
- peel strength;
- dimensional stability;
- static indentation;
- dynamic indentation;
- slippage;
- cyclic movement; and
- water vapor permeance.

The directive also requires further tests to evaluate a material's resistance to tearing and low temperature flexibility. These properties are related to a membrane's ability to withstand handling at the jobsite.

Single-ply membranes must be subjected to an additional series of tests, according to the directive. These tests evaluate a single-ply system's seam strength, its resistance to seam leakage and its durability in the presence of high temperatures or water.

The general directive was supplemented with three special directives in 1984. These special directives give specific guidelines for the assessment of PVC and SBS- and APP-modified bitumen sheets, dictating specific requirements for the components of the sheet materials, their application parameters and durability. It is interesting to note that these tests are not only for the sheet materials themselves, but also for field-formed laps and seams.

Europe takes the lead

In the area of research and performance standards, our European colleagues have a clear advantage. In private- and public-sector laboratories all over Europe, scientists are engaged in basic, applied and problem-solving roofing research, and their findings are being used to develop performance-oriented directives such as UEAtc's. More importantly, these directives are being used to evaluate materials, so that only quality products will be accepted for use. These performance directives are complemented by each country's prescriptive standards, which describe generic materials.

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By comparison, roofing research activity in the United States seems insignificant. Most of the token projects being conducted in this country are in the problem-solving category. In light of this situation, it is not surprising that the development of performance or prescriptive standards in the United States has been a slow process.

In this country, there are no standards available for the composite built-up membrane, although prescriptive component standards have been available for decades. And while ASTM has been attempting to develop standards for the newer materials since the late 1970s, its only success to date has been the adoption in 1985 of a prescriptive standard for PVC sheet materials. Nonetheless, some progress is being made; a standard for rubber-like membrane materials is nearing completion. But the development of modified bitumen membrane standards is still a few years away.

The only performance standards developed in the United States have been the preliminary performance criteria NBS published for bituminous roofing membranes in 1974 and the MRCA recommended performance criteria documents for PVC, elastomeric and modified bituminous membranes, which were published in 1981, 1982 and 1983 respectively. These documents have found little acceptance in the roofing industry in spite of the efforts of NBS and the Midwest Roofing Contractors Association. The information contained in these documents has certainly not been used to evaluate materials.

Studying abroad

Perhaps we in the United States can learn from the experiences of our European colleagues over the past decade and apply them to our own methods. This is not to suggest that everything is perfect in the European roofing industry. Each European country has its share of problems and litigation resulting from faulty design, material and construction practices. However, these problems are being addressed constructively and cooperatively through research and the development of performance and prescriptive standards.

But before we can profit from the European roofing industry, we must know where the roofing industry in this country wants to go. The following are the needs of the U.S. roofing community that I believe must be addressed:

- The industry must have the resources to conduct realistic, applied research at public, academic and independent laboratories.
- The industry must increase and accelerate its progress in the development of prescriptive standards under the auspices of ASTM and the American National Standards Institute.
- The industry must initiate and pursue the development of performance-oriented documents similar in nature to the UEAtc directives to complement its prescriptive standards.
- The industry must develop standards information into some sort of acceptance process to give designers, materials manufacturers, contractors and owners confidence in the quality, service and performance of the products they design, apply, buy and sell.