A presentation by
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Introduction

Throughout the 1980s cellulose probably qualified as "the sleepy backwater" of the insulation industry. There were few significant changes in the products, in the markets for cellulose insulation, and in the ranks of major cellulose insulation producers.

By the end of that decade, however, there were definite signs of stirrings in the cellulose segment of the insulation industry. The new light density mills that are now standard were coming into use; improved wall cavity spray products and the material that has come to be known as "stabilized cellulose" opened new opportunities in conventional home building and manufactured housing; growing public interest in and awareness of so called "green" products all combined to create a favorable environment for cellulose insulation.

There were relatively few changes among the largest and best-known cellulose manufacturers in the 1985-90 period, but there was considerable attrition and consolidation among smaller cellulose companies. In November 1991 the Cellulose Insulation Standards Enforcement Program (CISEP), predecessor organization of CIMA, listed 61 active cellulose insulation producers, as compared with over 200 producers eight years earlier.

During this consolidation period cellulose seems to have retained its overall market share. As a result, the 61 companies of 1991 were financially stronger and had greater technical and marketing sophistication than the "typical" cellulose producer of the early 1980s.

The final element that positioned the cellulose segment of the insulation industry to take a more active role in the affairs of the industry occurred on July 1, 1992, when CISEP adopted new bylaws restructuring itself as a trade association and changed its name to the Cellulose Insulation Manufacturers Association. This created a mechanism that that permitted cellulose insulation producers to take united action on matters of general interest and concern. The result has been beneficial to the entire insulation industry and the entire building community.

Research

The first official act of CIMA was to enter into a three-party Cooperative Research And Development Agreement (CRADA) with Oak Ridge National Laboratory and Tennessee Technological University. Under this research contract Oak Ridge and TTU have studied a number of different aspects of cellulose insulation. At this point none of the results have been published, but in the near future scientific papers based on the research conducted under the CIMA-ORNL-TTU CRADA will begin to appear.

CIMA has also supported research that should improve the methodology for testing the thermal resistance of cellulose insulation, and the association is part of a consortium that is investigating the practicality of a degrees of combustibility test methodology based on the cone calorimeter.

Recently CIMA signed a proof of concept contact to begin investigating one of the most controversial issues in building science -- the question of vapor retarders in cellulose-insulated cathedral ceilings and walls.

This research program, and the even more comprehensive and significant projects that are anticipated in the future, could not have been conducted without the unifying effect and coordinating mechanism of CIMA.

Current Cellulose Products and Their Application

Cellulose insulation has been widely regarded as a fairly low-tech material. The fact is most current cellulose products represent extremely sophisticated technology.

This technical sophistication starts with the production process, which now employs mills designed especially for making cellulose insulation. In virtually every plant, computers control most stages of the process, including the chemical feed system. Most producers test the product continuously and adjust the process controls to assure uniformity.

In the area of specific product categories, the newest growth area is low dust cellulose. There are actually two types of low dust products. The latest type of low dust cellulose insulation is loose-fill material especially formulated to produce low dust levels during pneumatic installation. These products, which are marketed by several manufacturers under various brand names, typically include an oil or oil-like additive in the formula. This type of low dust cellulose is installed just as any loose-fill insulation would be. No special techniques or equipment is required

The other type of low-dust cellulose insulation is so-called stabilized cellulose, which use a very small amount of water during the application process. The primary purpose of the water mist is to activate an adhesive that stabilizes the material at a lighter density than conventional low density loose-fill cellulose insulation. This added moisture has the additional effect of greatly reducing the dust level.

Some stabilized cellulose products require proprietary application equipment, but most can be installed using standard blowing machines along with a water nozzle and water flow controls at the machine end of the hose. The water mist is added at the machine so the mixing action that occurs within the hose will distribute the moisture uniformly.

Cellulose wall cavity spray is not a new material. It has actually been available for about 20 years. It is new, however, in the sense that it has recently been one of the high growth areas for cellulose insulation, and a number of improvements in application techniques and the products themselves have been introduced in the last five years.

The biggest difference between today's wall cavity spray products and those of 20 years ago, or even 10 years ago, is the moisture add-on level. The older products were often called "wet-spray" cellulose, and for good reason. The material was typically sprayed with a 50 or 60% moisture content. It was not uncommon for water to be observed running out of walls after installation.

Contemporary wall sprays are significantly different. The term "damp-spray" is now used because the moisture add-on may be half of what was typically found just a few years ago. The recently published CIMA technical bulletin "Standard Practice for the Installation of Sprayed Cellulosic Wall Cavity Insulation" calls for a moisture add-on as low as 30%.

As with stabilized cellulose, some wall spray products require proprietary application equipment, but most can be installed using standard hardware.

There have recently been significant improvements in wall spray installation equipment. One of the most important developments is two-hopper blowing machines designed especially for cellulose wall cavity spray. These machines overcome a major problem that occurs with conventional single hopper equipment.

For efficiency and economy most installers recycle oversprayed material by collecting it and running it through the installation equipment again. Since water has already been added to this recovered material maintaining the correct moisture level is a difficult task that requires considerable experience and judgment. The new machines eliminate this problem by providing a hopper for dry insulation right from the bag and a separate hopper for recovered overspray that already contains moisture. Thus, the operator does not have to make constant adjustments to compensate for the water-containing insulation that is being recycled.

Codes, standards, regulations and specifications

One of the difficult challenges for people not directly involved in the building industry -- and often for many people who are -- is making sense of the often long list of material specifications, regulations, code references, and other items that apply to building materials. The fact that many of these things change on a regular basis complicates the challenge.

For cellulose insulation all requirements start with the Consumer Products Safety Commission standard 16 CFR 1209 and 1404. This federal regulation applies to all cellulose insulation that is marketed as a consumer product, regardless of where in the building it is used or how it is installed. Loose fill cellulose, stabilized cellulose, and cellulose wall cavity spray all must conform with the CPSC standard.

The CPSC standard covers smoldering combustion, surface burning, and corrosiveness. No local or state jurisdiction or other federal agency can adopt or enforce regulations that conflict with the CPSC standard with regard to these performance characteristics. Cellulose insulation that conforms with the CPSC standard can be legally installed in any attic or wall in the United States. Building officials can enforce this standard, if the local building code empowers them to do so.

Because of a number of changes in the model building codes over the past few years there is now widespread confusion as to exactly what the codes do require with regard to cellulose insulation. Here is the exact language of the current versions of the National Building Code, published by Building Officials and Code Administrators International (BOCA); the Standard Building Code, published by the Southern Building Code Congress International (SBCCI); the Uniform Building Code, published by the International Conference of Building Officials (ICBO); and the One and Two Family Dwelling Code, published by the Conference of American Building Officials (CABO).

BOCA National Building Code
723.5 Cellulose loose-fill insulation: Cellulose loose-fill insulation shall meet the requirements of CPSC 16 CFR Parts 1209 and 1404, listed in Chapter 35, and

shall have a smoke-developed rating of 450 or less when tested in accordance with ASTM E84 listed in Chapter 35.

723.5.1 Labels: Each package of cellulose loose-fill insulation shall be clearly labeled in accordance with CPSC 16 CFR Parts 1209 and 1404 listed in Chapter 35.

This language was adopted by the members of BOCA at the 82nd Annual Conference, held September 29-October 2, 1997, in Norfolk, Virginia.

ICBO Uniform Building Code
707.3 Insulation, Cellulose loose-fill insulation shall comply with CPSC 16 CFR Parts 1209 and 1404. All other insulation materials, including facings, such as vapor barriers or breather papers installed within floor-ceiling assemblies, roof-ceiling assemblies, walls, crawl spaces or attics shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard 8-1.

This language was adopted by the members of ICBO at the 74th Annual Education and Code Development Conference, held September 8-13, 1996, in Saint Paul, Minnesota.

SBCCI Standard Building Code
708.8 Cellulose loose fill insulation. Cellulose loose-fill insulation shall comply with meeting the requirements of CPSC 16 CFR Parts 1209 and 1404. Each package of such insulating material shall be clearly labeled as meeting the requirements of CPSC 16 CFR Parts 1209 and 1404.

This language was adopted by the members of SBCCI at the 1996 Annual Conference, held October 27-31, 1996, in Birmingham, Alabama.

CABO One and Two Family Dwelling Code
319.3 Cellulose loose-fill insulation. Cellulose loose-fill insulation shall comply with CPSC 16 CFR Parts 1209 and 1404. Each package of such insulation material shall be clearly labeled in accordance with CPSC 16 CFR Parts 1209 and 1404.

319.4 Exposed attic insulation All exposed insulation materials installed on attic floors shall have a critical radiant flux not less than 0.12 watts per square centimeter.

319.5 Testing. Tests for critical radiant flux shall be made in accordance with ASTM E 970.

This language was adopted in the 1996-1997 amendments to the CABO One and Two Family Dwelling Code.

The latest working draft of the 2000 International Building Code, which will replace the BOCA, ICBO, and SBCCI codes has the following language with regard to cellulose insulation:

> *717.6 Cellulose Loose-Fill Insulation. Cellulose loose-fill insulation shall comply with CPSC 16 CFR Parts 1209 and 1404. Each package of such insulating material shall be clearly labeled in accordance with CPSC 16 CFR Parts 1209 and 1404.*

The insulation industry, working within ASTM Technical Committee C16, has determined that in addition to the performance requirements of the CPSC standard cellulose insulation should meet several other criteria. These requirements cannot be enforced by law, but buyers and specifiers can and should incorporate them in specifications and procurement documents. The General Services Administration has done that in its procurement specification for loose-fill cellulose insulation. This document, HH-I-515E, requires conformance with ASTM C739, the loose-fill cellulose insulation standard.

ASTM C739-97, which completed the balloting process earlier this year, adds four product attributes to the four covered by CPSC -- odor, fungi resistance, moisture vapor sorption, and R-factor. The -97 version of the standard omits a starch test, which has been determined to be unnecessary. It also substitutes a reference to E-970-89 for an internal critical radiant flux test that has been in the standard.

ASTM C1149-97 is the current version of the ASTM Standard Specification for Self-Supported Spray Applied Cellulosic Insulation. This standard, which was also reapproved earlier this year, defines three different types of spray-applied cellulose. Type I material is intended for either exposed or enclosed application. This is type of cellulose insulation is often known as "commercial spray." Type II material is intended only for enclosed installation. Wall cavity spray is Type II self-supported cellulosic insulation. Type III material is intended for attic floor application.

The significant change from previous versions of C1149 is the addition of the Type III category. The requirements for Type III contained in the standard adequately address safety issues, but the standard is not totally adequate for stabilized cellulose since it does not directly address settlement. It is, however, a useful interim standard until a material specification specifically for stabilized cellulose is available.

Recently, in response to requests from contractors, specifiers, and government CIMA has published "Standard Practice for the Installation of Sprayed Cellulosic Wall Cavity Insulation." This document, which is designated as CIMA Technical Bulletin No. 3, is written in a form suitable for referencing by designers and specifiers. In fact, the Department of Housing and Urban Development is proposing to replace a very voluminous use of materials bulletin, UMB 80, with a greatly simplified UMB 80A, which will just reference ASTM C1149 and CIMA Technical Bulletin No. 3.

Current Issues and Future Developments

There are signs that a new cooperative atmosphere is developing within the insulation industry. In ASTM C16 a number of issues that have been stalled for years have begun to move forward again fairly rapidly. The reapproval of both ASTM cellulose standards this year is an example of this. C16 committee members from the cellulose segment have begun working on an effective fire retardancy permanency test method, and the first very preliminary laboratory results were presented to the task group in October. A test method for installed thickness of all types of loose-fill insulation has been developed. Progress is again being made on a guideline for loose-fill coverage chart development.

Industry cooperation is also developing outside ASTM. CIMA, the North American Insulation Manufacturers Association, and several individual insulation companies are members of the Industries Council of the Energy Efficient Building Association and work cooperatively in that organization toward the mutual goal of greater energy efficiency. CIMA has recently published an installation guideline for wall cavity spray. The impetus for this guideline was a request from the Insulation Contractors Association of America. CIMA is now working on an installation guideline for stabilized cellulose insulation, and is considering developing an association material specification for this class of products.

In response to another request from the contractors organization, CIMA has encouraged its members to add an as-blown thickness guideline column to their coverage charts. This non-mandatory information aids contractors in installing the right amount of insulation. 20 of CIMA's 24 members have responded affirmatively to this request.

In terms of products and applications the outlook for the immediate future is largely an extension of current trends. Cellulose producers expect to see increased acceptance of wall cavity spray in new construction, but there will be strong competition from spray-applied fiber glass materials. The dry application methods employing various retainers will also be a factor in new walls. All these products will challenge batts for the walls market.

Stabilized cellulose should continue to have a strong presence in the manufactured housing market, and the expectation is that stabilized cellulose and the new low-dust loose-fills will create growth opportunities in new attics in conventional construction.

A totally new growth area for cellulose insulation is fire blocking. Currently only one cellulose manufacturer has an approved fire block material, but, most cellulose products could probably be approved, if their manufacturers presented adequate test data to the National Evaluation Service, or the evaluation services of the three regional code organizations. Undoubtedly several more manufacturers will qualify their products for fire blocking applications in the near future.

The Presenter

Daniel Lea has been executive director of the Cellulose Insulation Manufacturers Association since the association was established on July 1, 1992. Prior to that he was

administrator of the Cellulose Industry Standards Enforcement Program, the predecessor organization of CIMA. He served in that position from 1984 until 1992. He has also served as communications director of the Urethane Foam Contractors Association.

Lea is a member of ASTM Committees C16 (Thermal Insulation) and E5 (Fire Standards), the Building Environment and Thermal Envelope Council of the National Institute of Building Sciences, Building Officials and Code Administrators International, the Southern Building Code Conference International, and the International Conference of Building Officials. He serves on the Industry Advisory Committee of the International Codes Council, and is a representative to the Industries Council of the Energy Efficient Building Association.

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