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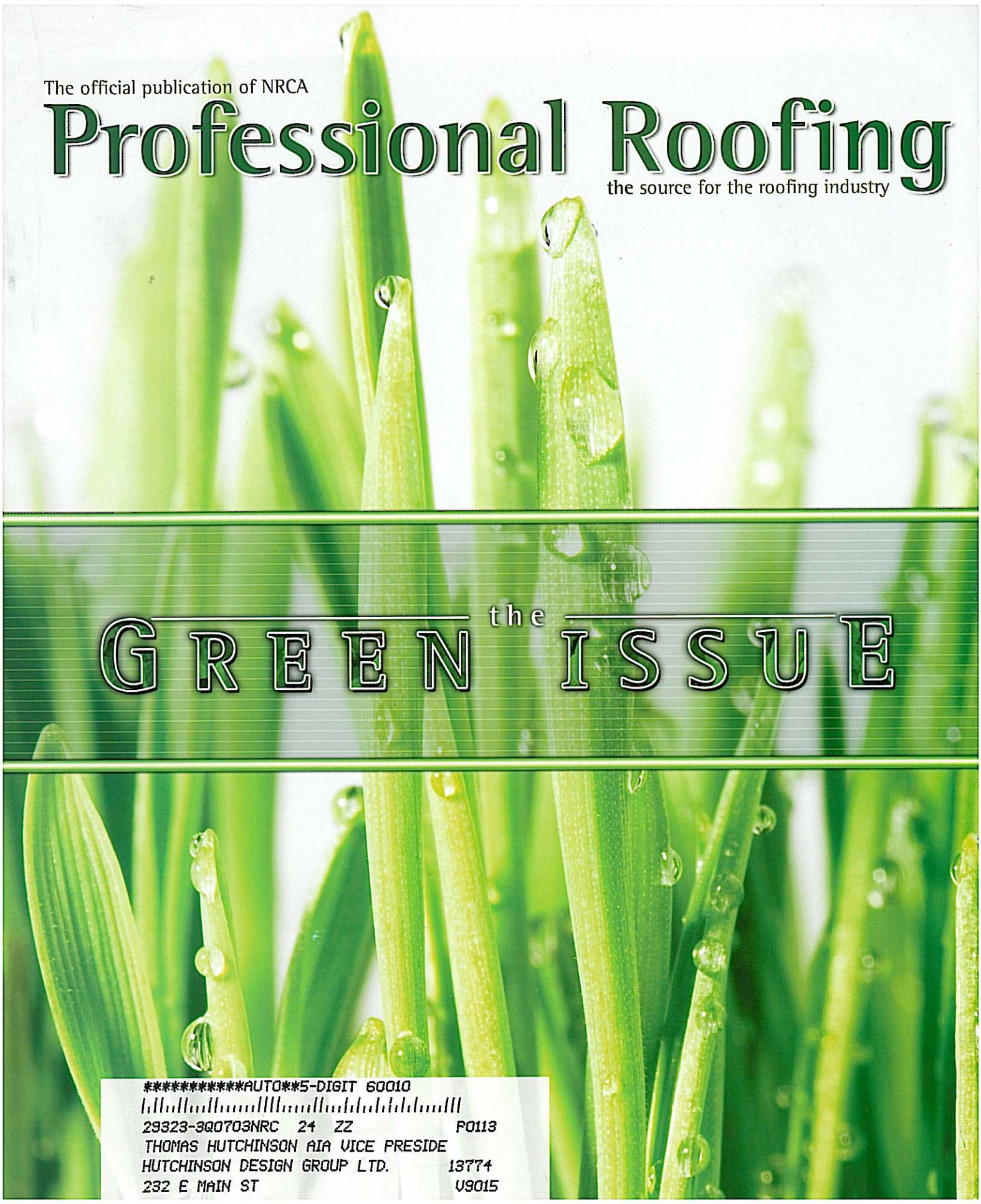

the GREEN ISSUE

Waste not

An EPDM recycling initiative explores the environmental potential of EPDM

by Thomas W. Hutchinson, AIA, RRC, FRCI

Construction waste management quickly is becoming a significant concern not only for the construction industry but for roofing contractors. According to *Engineering News-Record*, 136 million tons of construction debris are created annually and the cost of virgin materials continues to increase.

For this reason, the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System,™ the green building movement and code changes are pressuring the construction industry to plan for the reuse, recycling and reconstitution of excess materials from construction sites.

In response to this, during 2006, the EPDM Roofing Association (ERA) launched an EPDM recycling initiative to determine the possibilities of recycling used, in-place EPDM roof membranes and identify a potential market for using the byproduct.

An EPDM industry task force was established to investigate the possibilities and consists of Ed Kane, division manager—technology of Firestone Building Products Co., Indianapolis; Dick Gillenwater, manager of Advanced Products and Green Roof Systems for Carlisle SynTec Inc., Carlisle, Pa.; and myself.

Background

Code mandates affect how the roofing and construction industries do business. A statewide ban on landfill deposits for most construction and demolition waste materials, including asphalt pavement, brick, concrete, metal and wood, was implemented in Massachusetts July 1, 2006. Chicago code mandates implemented on Jan. 1, 2006, required recycling 25 percent of construction waste. That rose to 50 percent Jan. 1, 2007. In the future, all construction waste in Chicago most likely will have to be recycled, as currently required in Toronto by an initiative prohibiting construction waste in landfills.

Additionally, the roofing industry increasingly recognizes its obligation to reduce the effects of its materials and processes on the environment. There also may be potential economic gain for owners, contractors, manufacturers and suppliers because EPDM can provide longevity and resist the effects of ultraviolet light.

The task force established three goals to address the EPDM recycling initiative:

- To provide a recycling option for EPDM membranes currently reaching the end of their service lives, as well as for excess EPDM materials from new construction job sites
- To provide roof system designers motivation for specifying EPDM and procuring LEED points (For more information, see "Green buildings standard," September 2003 issue, page 30)
- To determine potential for reuse: What is the market demand for a product? What would be the potential continuous stream of materials coming into the recycling process? What is a final determination for the end-use products?

Getting started

The task force's first step was to meet with a grinder of EPDM and rubber products, Midwest Elastomers Inc. (MEI), Wapakoneta, Ohio. On Sept. 23, 2005, the task force and MEI representatives met to review concepts and goals. We discussed the EPDM recycling process; how the materials should be packaged and delivered; and potential impediments to the success of recycling aged, post-in situ EPDM roof membranes, such as dirt, foreign contaminants, quality of the grind, cost of recycling, continuity of the material source and need of the end product by users.

We agreed that to fully define the potential for success and evaluate the impediments involved, pilot projects needed to be conducted.

Pilot project No. 1

Cookson Elementary School in Troy, Ohio, was selected for the first pilot project. The 40,000-square-foot ballasted EPDM roof system was installed in 1988. Command Roofing Co., Dayton, Ohio, agreed to participate, and roof system removal and replacement began during late May 2006. Those involved with the project considered the required removal of the ballast, cutting out of seams and flashings, material storage on pallets (which then needed to be bound in place) and need for all material to be secured on-site until it could be moved to a grinder, among other topics. During the project, task force representatives visited the site, observing the process.

The ballast on the EPDM roof was shoveled into linear rows of piled material and removed by shovel to waiting trash bins, which were taken to clean landfill sites where debris does not have to be treated and/or covered.

When the EPDM membrane was being removed, the crew carefully removed debris from the top of the membrane, including stones, vegetation and tree debris. The area was broomed to dry the material from the previous night's dew or rain and remove minor contaminants that remained on the membrane.

Next, the adhered flashings were removed from the perimeter locations along the gravel stop. Lap seams were cut out from the field sheets. The EPDM membrane then was folded and carried to waiting pallets on the rooftop. About 200 squares were removed within 15 minutes. Command Roofing removed the remaining insulation layers to expose the roof deck before installing a vapor retarder.

This process continued for about six weeks with the used EPDM membrane being stacked on pallets for delivery to MEI. Following removal of the EPDM membrane, ERA arranged transportation of the materials to MEI's headquarters, which was located about 20 miles away.

The grind

On Aug. 29, 2006, the task force and MEI representatives observed the grinding of the pilot project's EPDM material. The material was lifted by forklift and placed into a container box. At the end of the container box there was a hydraulic ram that pushed the roofing material toward the open end of the container box where a large hydraulically driven steel plate sliced the membrane into smaller sections so it could be pulled apart and inspected by MEI employees, who searched for contaminants. Employees removed the contaminants, including screws, plates, sealants and insulation pieces, by hand.

The sliced sections of EPDM membrane then passed under a metal detector for additional contamination inspection and moved onto a sloped conveyor belt,

which transferred the material to the granulator. The granulator had 18 rotating fly knife blades that reduced the membrane to about ⅜-inch-wide and -long material pieces. As the ground material was moved by conveyer toward container boxes of about 1,600 to 1,700 pounds per box, talc was added to prevent agglomeration. This first grind was called a "work in progress."

Observing the process and discussing it with work crews revealed several unique conditions. For example, though the task force believed there was a large amount of screws, rocks and miscellaneous debris removed from the material, the work crews sorting the materials indicated the amount of debris was typical of debris received on any type of recycled material.

This first grind resulted in a product that was about ⅜-of-an-inch wide. About 5 to 7 percent of the ground material was dirt. This amount of dirt would hinder the packing process, as well as taking the process to the next stage, which is a second grind. Because contaminated material would be a less desirable material to end users and may even render it useless the task force and MEI representatives discussed the possibility of a wash cycle in the future before putting the material through the grinder for the first time.

The first-grind material was put through a second grinder. This resulted in a 20-mesh product and revealed additional information. For example, during the grinding process, a vacuum hood removes the light dirt particles and foreign contaminants that may become airborne. During this process, almost all the dirt product found in the first-grind product was removed, revealing material of fairly good quality so a prewash didn't appear to be necessary. The 20-mesh product was given to Carlisle SynTec and Firestone Building Products, as well as additional representatives, so it could be examined, evaluated and tested for potential use in their products.

Pilot project No. 2

The first pilot project revealed various concerns, such as on-site packaging and storage of the material, debris inclusion and surface foreign contaminate buildup, that could be addressed during the second pilot project. The second pilot project, the 809 Building in Milwaukee, was developed in association with the City of Milwaukee Department of Fleets.

The pilot project was scheduled for fall 2006 but has been delayed until this spring because of weather conditions and concerns about green roof plantings. F.J.A. Christiansen Roofing Co. Inc., Milwaukee, a Tecta America company, was the successful bidder for this project.

The building's ballasted EPDM roof system was installed in 1985. The replacement roof system specifications called for recycling all existing materials being removed, including metal fascias and copings, ballast rock, EPDM roofing, expanded polystyrene insulation and wood blocking. The specifications called for the gravel rock to be vacuumed and relocated to a clean landfill, as well as power washing the EPDM membrane. This will determine whether the slight

cleaning of the membrane would result in a cleaner end product. Instead of being ground, the EPDM membrane from the 809 Building project will be sent to AdVac Elastomers, where it will be resynthesized into virgin EPDM product for reuse.

The future

The task force realizes there is great potential for this recycling initiative and the recycled product, but the uses must be clearly defined and understood. The current cost of processing EPDM must be reduced, and the potential for recycling both fully adhered and reinforced membranes must be investigated. Representatives from companies that provide synthesizers and grinders indicate they must know the volume of anticipated product during the coming years and develop a market for the product so they can promise a certain amount of material.

According to NRCA, EPDM roofing materials account for more than 1 billion square feet of new roof coverings in the U.S. each year, with more than 500,000 warranted roof installations on more than 20 billion square feet of EPDM currently in place. The qualities that make EPDM membrane popular in the roofing industry—its flexibility and resistance to various climatic conditions, including ultraviolet radiation—should make it an attractive recycled material option.

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