



Roofing Technical Update

presented by

Mark S. Graham

Vice President, Technical Services
National Roofing Contractors Association (NRCA)



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The image is a screenshot of a webpage from the Asphalt Roofing Manufacturers Association (ARMA). At the top, there is a navigation bar with the ARMA logo and the tagline "Asphalt. The Roofing Solution." Below the navigation bar, a red banner contains the headline "ARMA Releases Third Quarter 2023 Report on Asphalt Roofing Product Shipments". Underneath the banner, there is a "Media Contact" section listing "Amie Gosinski". The main content area features a table titled "Asphalt Roofing Product Shipments" with the following data:

Shipments (squares)	Q3 2023	Q3 2022	% Change	YTD 2023	YTD 2022	% Change
Shingles – U.S. (including individual shingles)	45,717,847	39,434,939	15.9%	131,259,101	127,883,943	2.6%
BUR base, ply, and mineral cap sheets – U.S. (not including saturated felts)	1,490,014	1,819,677	-18.1%	4,673,675	5,657,202	-17.4%
Modified Bitumen – U.S.	11,390,159	9,639,903	18.2%	33,093,908	30,955,689	6.9%
Shingles – Canada (including Individual shingles)	1,901,659	3,084,236	-38.3%	7,693,984	10,540,155	-27.0%

Below the table, there is an "About ARMA:" section with a short paragraph describing the association's role. At the bottom right of the page, there is a blue "Link" button.

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ABC: Construction Input Prices Decrease 1.2% in October, Driven by Lower Energy, Lumber and Steel Prices
November 6, 2023 | Construction Economics, Materials Prices, News Release 2023

Producer Price Index, October 2023

	1-Month % Change	12-Month % Change	Change Since Feb 2020
Inputs To Industries			
Inputs to construction	-1.2%	-1.1%	39.6%
Inputs to multifamily construction	-0.9%	0.8%	38.7%
Inputs to nonresidential construction	-1.1%	-0.7%	40.4%
Inputs to commercial construction	-0.7%	-0.3%	40.2%
Inputs to healthcare construction	-0.7%	-0.2%	39.8%
Inputs to industrial construction	-0.9%	1.1%	36.3%
Inputs to other nonresidential construction	-1.2%	-0.9%	40.5%
Inputs to maintenance and repair construction	-1.3%	-2.0%	37.7%
Commodities			
Adhesives and sealants	0.1%	1.8%	33.8%
Brick and structural clay tile	0.2%	5.6%	25.2%
Concrete products	0.7%	9.7%	36.0%
Construction machinery and equipment	0.0%	6.0%	26.8%
Copper wire and cable	-1.3%	2.7%	27.9%
Crude petroleum	-2.9%	-3.0%	76.6%
Fabricated structural metal products	0.6%	-0.7%	52.7%
Gypsum products	0.6%	-1.2%	42.5%
Hot rolled steel bars, plates, and structural shapes	0.1%	-10.3%	52.7%
Insulation materials	-0.3%	1.6%	36.6%
Iron and steel	-2.3%	-6.1%	51.3%
Lumber and wood products	-0.3%	-6.5%	24.8%
Natural gas	10.9%	-54.9%	54.1%
Plumbing fixtures and fittings	0.5%	1.4%	18.4%
Prepared asphalt, tar roofing and siding products	0.7%	3.9%	41.6%
Structural plastics	-1.2%	11.0%	31.0%
Steel mill products	-2.5%	-9.9%	62.1%
Switchgear, switchboard, industrial controls equipment	0.2%	6.3%	37.9%
Unprocessed energy materials	-0.3%	-16.2%	86.3%

Source: U.S. Bureau of Labor Statistics

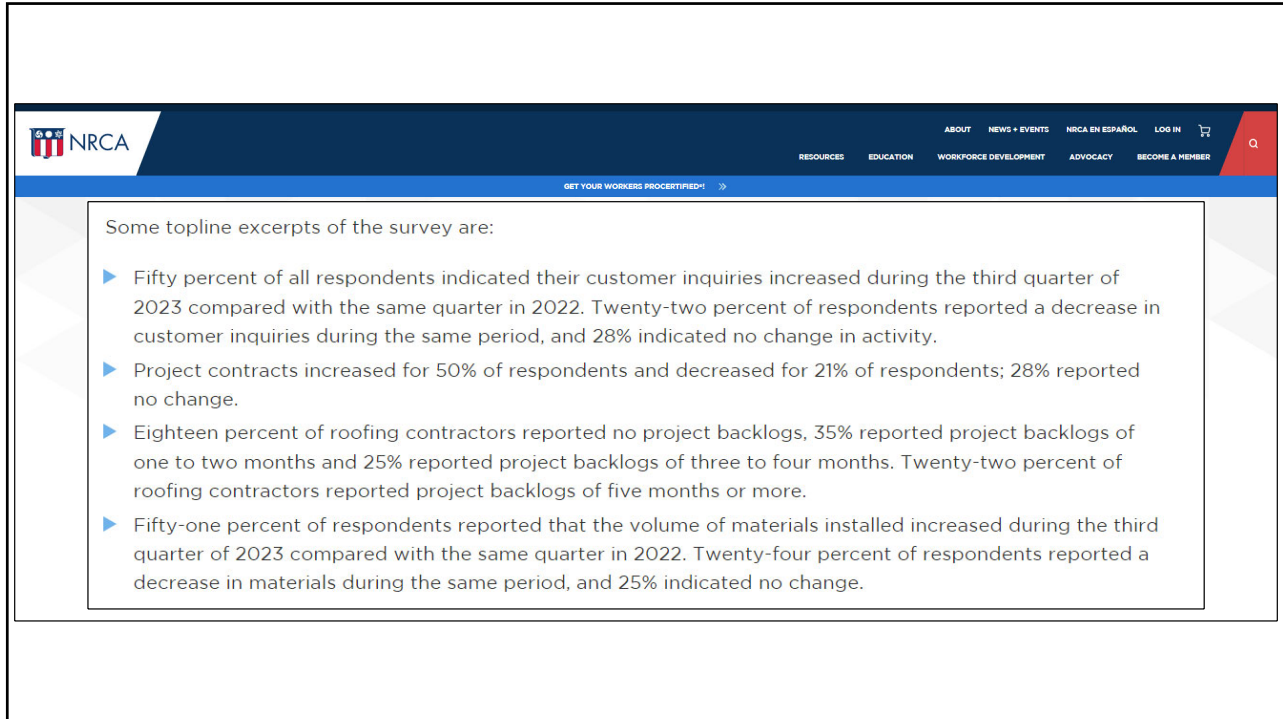
[Link](#)

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Market Index Survey for REROOFING

ASPHALT ROOFING MANUFACTURERS ASSOCIATION | CFFA CHEMICAL FABRICS & FILM ASSOCIATION, INC. | CRCA CANADIAN ROOFING CONTRACTORS ASSOCIATION | ERA20 EPDM ROOFING ASSOCIATION | IBEC INTERNATIONAL INSTITUTE OF BUILDING ENCLOSURE CONSULTANTS | MCA METAL CONSTRUCTION ASSOCIATION | MRA METAL ROOFING ALLIANCE | NRCA NATIONAL ROOFING CONTRACTORS ASSOCIATION | NWR NATIONAL WOMEN IN ROOFING | PIMA POLYISOCYANURATE INSULATION MANUFACTURERS ASSOCIATION | RCMA ROOF COATINGS MANUFACTURERS ASSOCIATION | SPRI SINGLE PLY ROOFING INDUSTRY

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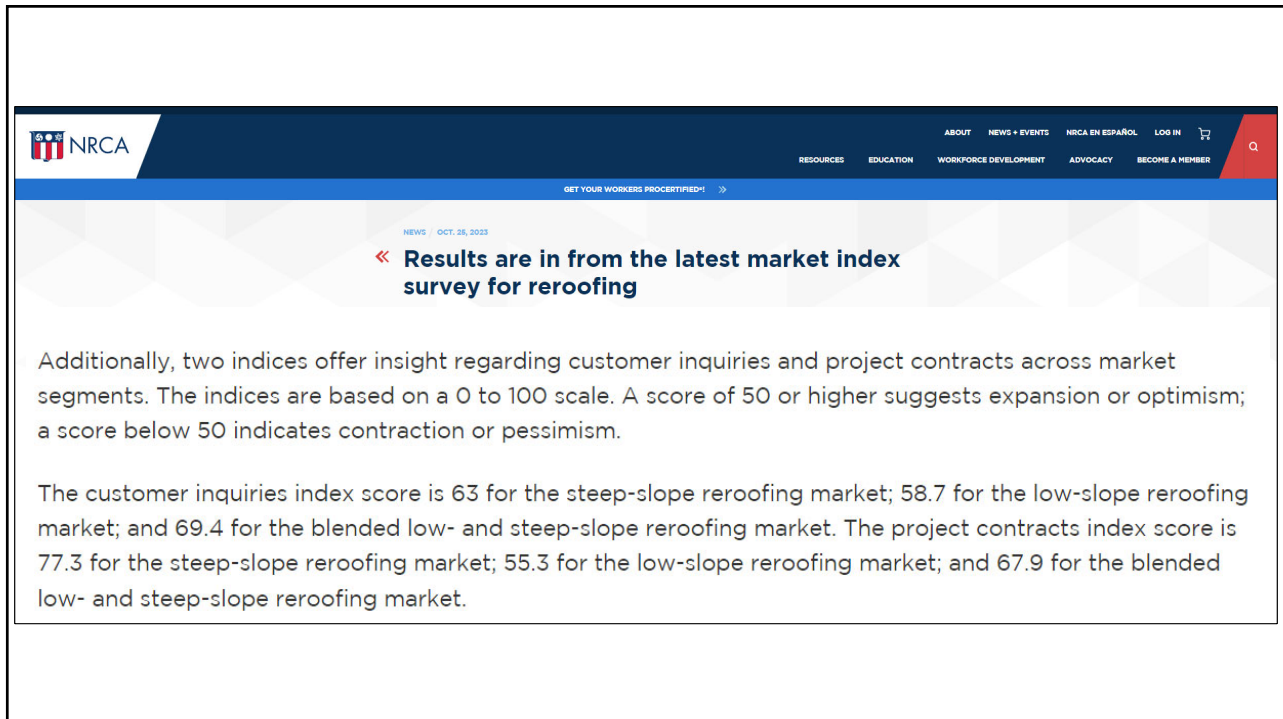


The screenshot shows the NRCA website header with the logo on the left and navigation links (RESOURCES, EDUCATION, WORKFORCE DEVELOPMENT, ADVOCACY, BECOME A MEMBER) on the right. Below the header is a blue banner with the text "GET YOUR WORKERS PROCEPRTIFIED!". The main content area features a white box with the heading "Some topline excerpts of the survey are:" followed by a bulleted list of four survey findings.

Some topline excerpts of the survey are:

- ▶ Fifty percent of all respondents indicated their customer inquiries increased during the third quarter of 2023 compared with the same quarter in 2022. Twenty-two percent of respondents reported a decrease in customer inquiries during the same period, and 28% indicated no change in activity.
- ▶ Project contracts increased for 50% of respondents and decreased for 21% of respondents; 28% reported no change.
- ▶ Eighteen percent of roofing contractors reported no project backlogs, 35% reported project backlogs of one to two months and 25% reported project backlogs of three to four months. Twenty-two percent of roofing contractors reported project backlogs of five months or more.
- ▶ Fifty-one percent of respondents reported that the volume of materials installed increased during the third quarter of 2023 compared with the same quarter in 2022. Twenty-four percent of respondents reported a decrease in materials during the same period, and 25% indicated no change.

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The screenshot shows the NRCA website header and navigation. Below the header is a blue banner with the text "GET YOUR WORKERS PROCEPRTIFIED!". The main content area features a white box with the heading "NEWS / OCT. 26, 2023" and a sub-heading "« Results are in from the latest market index survey for reroofing". The text below discusses two indices: customer inquiries and project contracts, providing scores for different market segments.


NEWS / OCT. 26, 2023

« **Results are in from the latest market index survey for reroofing**

Additionally, two indices offer insight regarding customer inquiries and project contracts across market segments. The indices are based on a 0 to 100 scale. A score of 50 or higher suggests expansion or optimism; a score below 50 indicates contraction or pessimism.

The customer inquiries index score is 63 for the steep-slope reroofing market; 58.7 for the low-slope reroofing market; and 69.4 for the blended low- and steep-slope reroofing market. The project contracts index score is 77.3 for the steep-slope reroofing market; 55.3 for the low-slope reroofing market; and 67.9 for the blended low- and steep-slope reroofing market.

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To participate: [Link](#)

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Nailbase insulation considerations

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Nailbase insulation considerations

- Double layer design and application
- Taped joints can control vapor leaks/underlayment wrinkling at board joints
- Pressure-tested and FRT nailbase are not good ideas for nailbase

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Fastener concerns

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ACE SCREWS
ADD ACE FASTENERS TO YOUR FM NAV NUMBERS & YOUR SUPPLY CHAIN

*The following are FM Approved Products: Ace #15, Ace #12, 2-3/8" Barbed Seam Plate, 3" WW Insulation Plate, 3" BE Insulation Plate

MANUFACTURERS
We are working with manufacturers to include Ace Fasteners in their FM NAV numbers

DISTRIBUTORS
Add our FM approved fasteners to your Generics, or simply let us private label** for you!

**Private Labeling with FM Logo must go through the proper FM PLA Process

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RoofNav

Help · Support · Training

mgraham · My Profile · Reset Password · Logout

Enter Assembly #

MY PROJECTS | PRODUCT SEARCH | SYSTEM SEARCH | ASSEMBLY SEARCH | RATINGS CALCULATOR | REFERENCE MATERIALS

Search Criteria | Search Results

Found: 7 records

Trade Name ↑	Company Name	Approved Use
2-3/8" Barbed Seam Plates	Ace Screws LLC	Fastening (Stress Plate)
3" WW Insulation Plates	Ace Screws LLC	Fastening (Stress Plate)
3" BE Insulation Plates	Ace Screws LLC	Fastening (Stress Plate)
ACE #12	Ace Screws LLC	Fastening (Fastener)
ACE #15	Ace Screws LLC	Fastening (Fastener)
ACE-FS12-INS	Ace Screws LLC	Fastening (Fastener)
ACE-FS15-INB	Ace Screws LLC	Fastening (Fastener)

20 items per page | 1 - 7 of 7 items

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Assembly #	Manufacturer	Material
SSSP34990	Ace Screws LLC Bitec Inc	ACE-FS15-INB Imperfast 3" Bulls Eye Insulation Plate
SSSP34992	Ace Screws LLC Bitec Inc	ACE-FS12-INS Imperfast 3" Bulls Eye Insulation Plate
SSSP34993	Ace Screws LLC Bitec Inc	ACE-FS12-INS Imperfast 3" Wagon Wheel Insulation Plate
SSSP35290	Ace Screws LLC Duro-Last LLC	ACE-FS15-INB Duro-Last Cleat Plate A
SSSP35292	Ace Screws LLC Duro-Last LLC	ACE #12 Duro-Last Insulation Plate WW
SSSP35293	Ace Screws LLC Duro-Last LLC	ACE-FS12-INS Duro-Last Insulation Plate WW
SSSP35294	Ace Screws LLC Duro-Last LLC	ACE-FS15-INB Duro-Last Insulation Plate BE
SSSP35295	Ace Screws LLC Duro-Last LLC	ACE-FS12-INS Duro-Last Insulation Plate BE

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Some considerations

Fastener concerns

- Purchase membrane and insulation fasteners supplied by the roof system manufacturer
- Listen for feedback from field applicators
- Contact NRCA Technical Services with questions or concerns

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“Frankenstein roofs”

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FM Approvals’ RoofNav

www.RoofNav.com

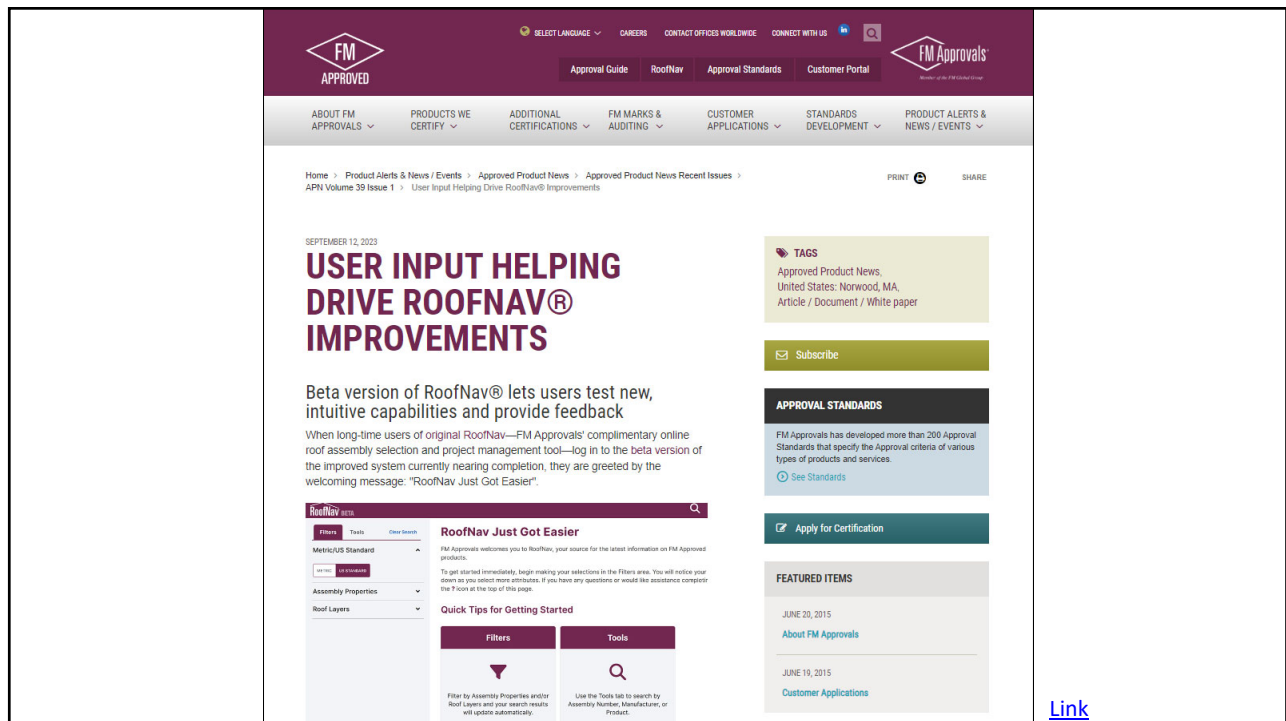
There are 1,114,558 approved roof assembly configurations in FM Approvals’ RoofNav

--As of December 12, 2023

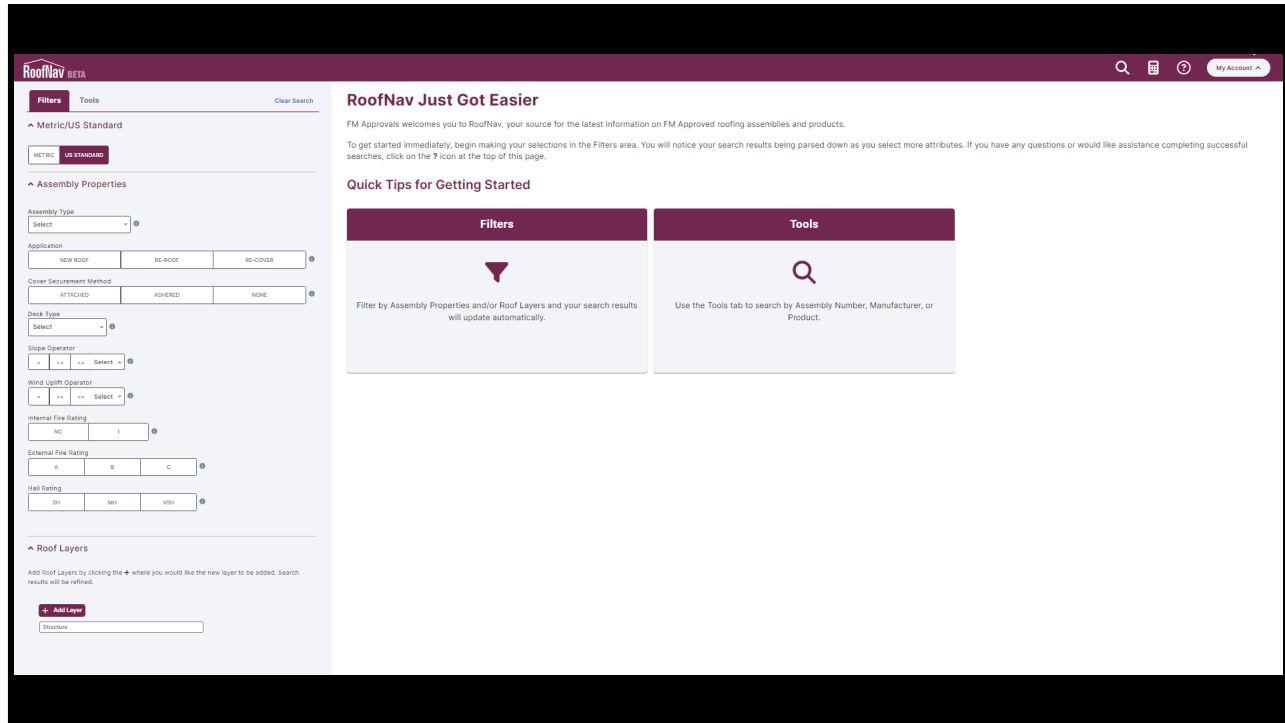
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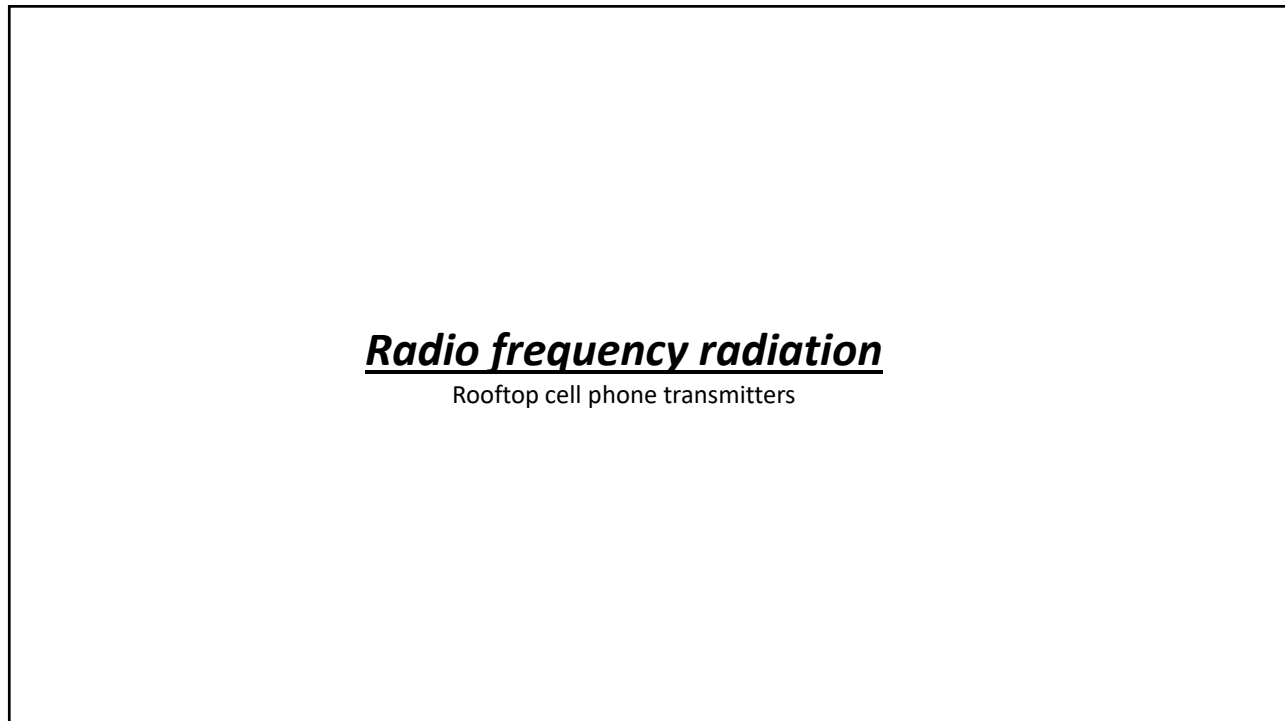
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Rooftop cell phone transmitters



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CRCA
COMMERCIAL ROOFING ASSOCIATION

Advisory Bulletin 

JUNE 2023

Radiofrequency Radiation and Electromagnetic Fields

The increased number of cellular antennas and other communication equipment that generates radiofrequency radiation (RF) and electromagnetic fields (EMF) may be exposing roofers and other contractors to harmful levels of radiations when working on rooftops, sides of buildings and other locations where RF generating antennas are located. This bulletin will focus on radiation types, safety limits and mitigating exposure.

With the ever-increasing use and development of communication technology, there is an increased risk for those working in and around communication devices and equipment that emit radiofrequency electromagnetic fields (EMF) such as smart meters, cell phone towers and equipment using 5G technology. Roof areas are often prime locations for this type of equipment and anyone accessing these roof areas for any reason should be aware of the Occupational Health and Safety requirements and the Safety Code 6. Consult with provincial and/or federal authorities having jurisdiction for further information/guidance for most stringent requirements.

What is Radiofrequency (RF) Radiation?

There are two types of radiation – ionizing radiation and non-ionizing radiation. Both are forms of electromagnetic energy, but ionizing radiation has more energy than non-ionizing radiation. Ionizing radiation, like x-rays or gamma rays, has enough energy to cause chemical changes by breaking chemical bonds. Sources of this type of radiation can be found in hospitals, nuclear energy plants, and nuclear weapons facilities. Non-ionizing radiation causes molecules to vibrate, which generates heat. RF radiation is a type of non-ionizing radiation and is the energy used to transmit wireless information. RF radiation is invisible and power levels of equipment and amount of RF radiation can fluctuate without warning.

About Safety Code 6

Health Canada publishes Safety Code 6¹ which sets out recommended safety limits for human exposure to radiofrequency electromagnetic fields (EMF) in the frequency range from 3 kHz to 300 GHz. This range covers the frequencies used by communications devices and equipment that emit radiofrequency EMF such as: Wi-Fi, cell phones, smart meters, cell phone towers, those using 5G technology.

Safety Code 6 is reviewed on a regular basis to confirm that it continues to provide protection against all known potentially adverse health effects. If new scientific evidence were to show that exposure to radiofrequency EMF below the levels found in Safety Code 6 poses a risk, the Government of Canada would take steps to protect the health of Canadians.

¹ <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html>


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CRCA Advisory Bulletin

June 2023

[Link](#)

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How protect yourself from RF radiation
 The risks associated with RF radiation increases with the number of devices present, the closer a worker is to the equipment/device(s), and the more time that is spent in the area. Workers can protect themselves by the following:

How protect yourself from RF radiation
 The risks associated with RF radiation increases with the number of devices present, the closer a worker is to the equipment/device(s), and the more time that is spent in the area. Workers can protect themselves by the following:


- Complete a visual assessment of the area to determine if cellular antennas or other RF radiation generating antennas are present. If you are not sure, ask your supervisor, the building owner, or the property manager if RF-generating antennas are present where you need to work. The building owner or property manager should have the information, or know whom to contact for information about antennas, their locations, and the RF radiation levels.
- Look for warning signs posted near RF antennas; the signs should identify the hazard and tell you where to get more information.
- Contact the building owner/manager and the antenna licensee to have the equipment temporarily powered down or moved.

The opinions expressed herein are those of the CRCA National Technical Committee. This Advisory Bulletin is circulated for the purpose of bringing roofing information to the attention of the reader. The data, commentary, opinions and conclusions, if any, are not intended to provide the reader with conclusive technical advice and the reader should not act only on the roofing information contained in this Advisory Bulletin without seeking specific professional, engineering or architectural advice. Neither the CRCA nor any of its officers, directors, members or employees assumes any responsibility for any of the roofing information contained herein or the consequences of any interpretation which the reader may take from such information.

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Recognize the signage



Photos courtesy of Peter Shackford—Hettrick, Cyr & Associates, Inc.

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How protect yourself from RF radiation
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- Look for warning signs posted near RF antennas; the signs should identify the hazard and tell you where to get more information.
- Contact the building owner/manager and the antenna licensee to have the equipment temporarily powered down or moved.

If work needs to be performed within a potentially hazardous area:

- Check the site survey or roof plan for potential exposure levels
- Pre-plan work tasks and travel routes so you can limit trips through the RF field and time spent on tasks there – the goal is to get in and out as quickly as possible.
- Avoid standing directly in front of or close to an antenna. As a rule of thumb, stay 1.5 m (6 feet) away from a single antenna and 3 m (10 feet) away from a group of antennas.
- Use a personal RF monitor. The monitor will warn you if you are in an area where RF radiation is at a dangerous level. There are several handheld EMF personal safety monitors available on the market that measure exposure and allow workers to work in an exposed area for a limited time. Use personal monitors and protective clothing while work is being performed and if an alarm sounds, stop work and leave the area immediately.

the reader may take from such information.

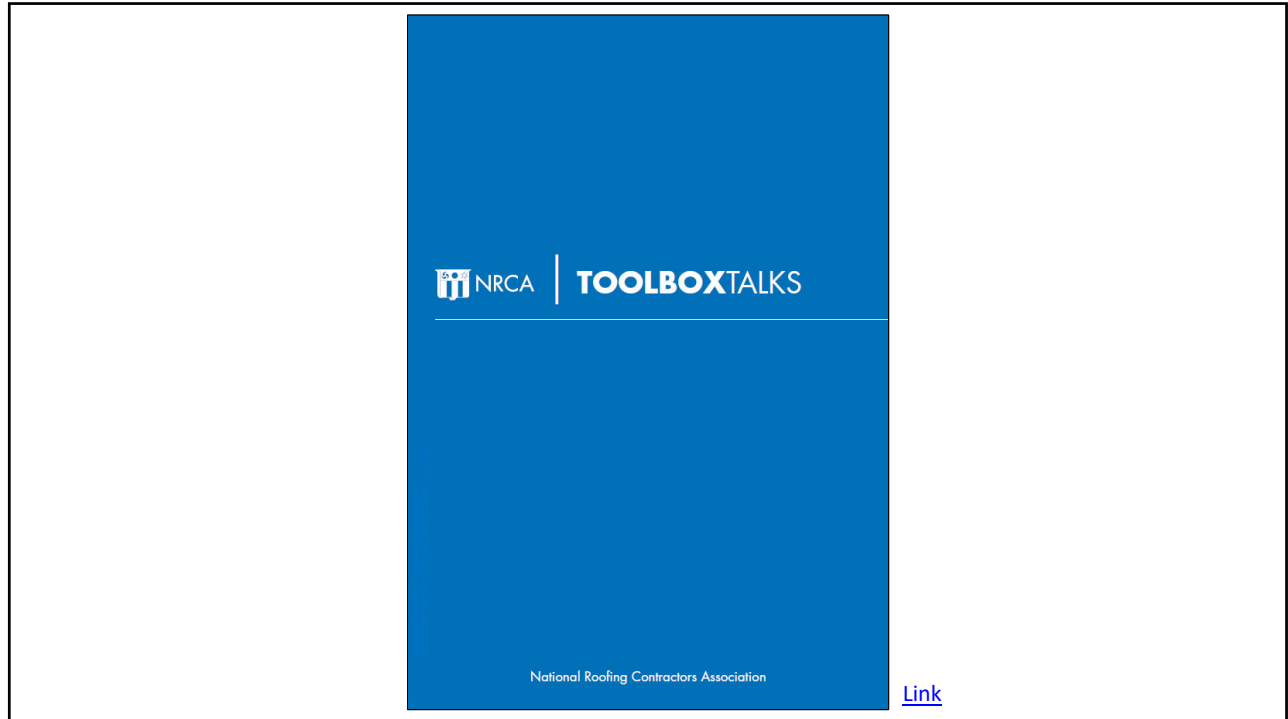
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Some useful references


- CRCA Advisory Bulletin ([Link](#))
- Health Canada's Safety Code 6 ([Link](#))
- Federal Communications Commission ([Link](#))
- Center for Construction Research and Training ([Link](#))

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National Roofing Contractors Association
 No further reproductions authorized, Dec. 13, 2023.


TOOLBOXTALKS

Radio frequency (RF) hazards

According to the Federal Communications Commission (FCC), radio waves and microwaves emitted by transmitting antennae are one form of electromagnetic energy that harm people. Harm from RF exposure will vary according to power levels, length of exposure time and distance from the antennae. Sources of RF energy on a rooftop often are not obvious and usually are not properly marked or defined as danger zones by warning signs. In many cases, antennae are hidden by building elements so workers may not be aware of their presence. Here are some important facts about RF energy and things that you can do to avoid it:

- High levels of RF may heat body tissue and increase body temperature, causing tissue damage because the body cannot cool quickly enough to prevent damage. This is called RF's thermal effects, and your eyes are the most vulnerable part of your body. Actual contact may cause a shock or burn.
- At lower, nonthermal levels of RF exposure, nervous system and immune system problems, kidney damage, neurological disorders and even some cancers may occur.
- Become familiar with what RF transmitters or antennae look like and the dangers of working near them. Be aware that warning signs for RF transmitters may not always be present on a roof.
- Your employer must inquire as to the presence of RF equipment and whether it may be shut down or shielded or other barrier device installed for the duration of the work period roofing workers will be in proximity to the transmitter.
- Symptoms of RF exposure often seem the same as physical exertion and can become heat exhaustion or heat stroke. Removing a worker from the area and cooling the body is important. Trained, professional medical care of the symptoms is critical.



National Roofing Contractors Association
TOOLBOXTALKS
www.nrca.net
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QualityMark™ Program Quarterly Conformance Report
Reporting Period: Q1 2023 (January – March 2023)
Last updated on October 2, 2023

About:
The QualityMark Program is a voluntary program for manufacturers of polyisocyanurate roof insulation in the United States and Canada. The program enables participants to obtain third-party certification of long-term thermal resistance (LTTR) values for insulation products independently selected from manufacturing locations. Additionally, the program provides third-party verification of thermal resistance values (R-values) tested in accordance with the ASTM C518 standard for full thickness products independently selected from



LTTR-value Certification for Products Selected from Manufacturing Locations:
Samples for LTTR-value certification are selected from manufacturing locations by independent third parties. The testing is performed by approved laboratories to obtain LTTR-values for 2.0", 3.0", and 4.0" product. Participating manufacturers are required to obtain an initial certification for each manufacturing location, which are then recertified every 3 years. The certification is used to validate the LTTR-values published by participating manufacturers.

R-value Verification for Products Selected from Distribution:
Samples for R-value verification (ASTM C518) are selected on a quarterly basis from distribution locations by an independent third party. A sample is selected for each participating manufacturing location. After selection, the samples are held at laboratory conditions and tested at full thickness 180-days after the date of manufacture. A manufacturing location is deemed to conform to the program requirements when the measured R-value at 180-days is equal to or greater than the published LTTR-value for the product at the same labeled thickness. Manufacturing locations that receive non-conforming R-value verification results in consecutive quarters (inclusive of the current reporting period) are not in compliance with the program requirements.

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QualityMark Program Quarterly Conformance Report ¹ Reporting Period: Q1 2023 (January – March 2023)		
Manufacturing Location		Manufacturer
City	State/Province	
High River*	Alberta	IKO Industries Ltd.
Phoenix	Arizona	Atlas Roofing Corporation
Vancouver	British Columbia	Atlas Roofing Corporation
Northglenn	Colorado	Atlas Roofing Corporation
Bristol	Connecticut	Holcim Building Envelope
Jacksonville	Florida	Holcim Building Envelope
Jacksonville	Florida	Johns Manville
Lake City	Florida	Carlisle Construction Materials
LaGrange	Georgia	Atlas Roofing Corporation
Statesboro	Georgia	GAF
Florence	Kentucky	Holcim Building Envelope
East Moline	Illinois	Atlas Roofing Corporation
Franklin Park	Illinois	Carlisle Construction Materials
Bremen	Indiana	Johns Manville
Fernley	Nevada	Johns Manville
Montgomery	New York	Carlisle Construction Materials
Cornwall	Ontario	Johns Manville
Toronto	Ontario	Atlas Roofing Corporation
Camp Hill	Pennsylvania	Atlas Roofing Corporation
Hazleton	Pennsylvania	Johns Manville
New Columbia	Pennsylvania	GAF
Smithfield	Pennsylvania	Carlisle Construction Materials
Youngwood	Pennsylvania	Holcim Building Envelope
Drummondville	Quebec	SOPREMA
Corsicana	Texas	Holcim Building Envelope
Diboll	Texas	Atlas Roofing Corporation
Gainesville	Texas	GAF
Terrell	Texas	Carlisle Construction Materials
Cedar City	Utah	GAF
Salt Lake City	Utah	Holcim Building Envelope
Tooele	Utah	Carlisle Construction Materials
Puyallup	Washington	Carlisle Construction Materials
DeForest	Wisconsin	Holcim Building Envelope

Last updated on October 2, 2023. Current report available at www.polyiso.org/QUALITYMARK.

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Table Note 1:
The manufacturing locations listed below have recently been brought on-line. The time represented by the current reporting period was prior to the date the location either started commercial production or completed its initial LTRR-value certification. Results for these plants will be included in future reporting periods.

- Hagerstown, Maryland – IKO Industries Ltd.
- Hillsboro, Texas – Johns Manville
- Sikeston, Missouri – Carlisle Construction Materials

Questions:
For questions regarding the QualityMark Program, please contact PIMA using the "Contact Us" form on the website [here](#).

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Recommendations

- Watch for updates to PIMA’s Quarterly Conformance Report
- Consider asking polyiso. manufacturers to certify their current compliance
- Be careful to represent/sell insulation on its thickness, not by its R-value

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RESEARCH+TECH



Updating PIMA's QualityMarkSM

Revisions provide increased credibility
by Mark S. Graham

The Polyisocyanurate Insulation Manufacturers Association recently updated its QualityMark program, which has been in existence since 2004 and addresses the long-term thermal resistances of polyisocyanurate insulation used in low-slope roof systems.

What it is
PIMA's QualityMark is a voluntary program for manufacturers of rigid board polyisocyanurate roof insulation manufactured in the U.S. and Canada. The program allows manufacturers to obtain and use third-party certification of long-term thermal resistance values, commonly referred to as LTRs, for their products. Additionally, the program provides third-party verification of R-values.

The following polyisocyanurate insulation manufacturers participate in the program:

- Atlas Roofing Corp., Meridian, Miss.
- Carlisle Construction Materials, Carlisle, Pa.
- GAF Parsippany-Troy Hills, N.J.
- Holcim Building Envelope, Nashville, Tenn.

28 professionalroofing.net JULY/AUGUST 2023

Professional Roofing

July/August 2023

[Link](#)

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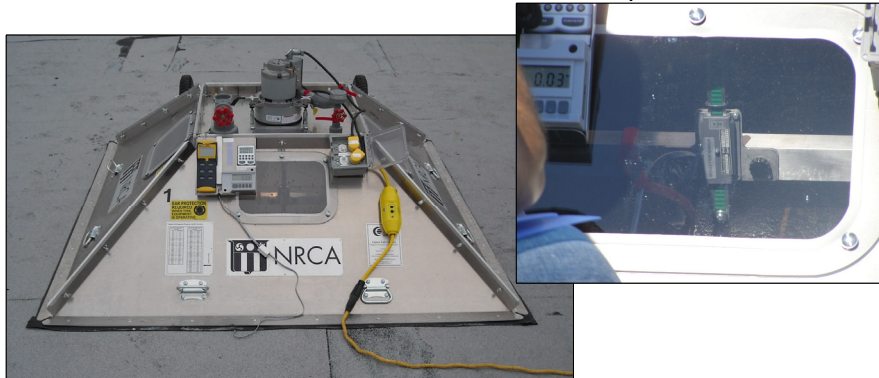
Field wind-uplift testing

Putting the field wind-uplift test to the test

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Field wind-uplift testing

- ASTM E907, “Standard Test Method for Field Testing Uplift Resistance for Adhered membrane Roofing Systems”
- FM 1-52, “Field Verification of Roof Wind Uplift Resistance”



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INDUSTRY ISSUE UPDATE
 NRCA Member Benefits

Field-uplift testing
 ASTM E907 and FM 1-52 tests continue to be problematic

June 2015

NRCA continues to receive a significant number of reports from roofing contractors, manufacturers and designers regarding the use of and problems associated with field uplift tests as pre-installation quality assurance measures for membrane roof systems. NRCA has addressed these testing issues a number of times during the years. Following is a summary of NRCA's previous discussions, as well as updated information and recommendations.

ASTM E907/FM 1-52
 There are two recognized field test methods for determining adhered membrane roof systems uplift resistance: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Wind Uplift Resistance."

Both test methods are similar and provide for affixing a 5- by 5-foot dome-like chamber to a roof surface's up-side and applying a defined negative (uplift) pressure inside the chamber to the roof system's exterior side surface using a vacuum pump (see photo). During the test, membrane surface deflection inside the chamber is visually monitored and measured to determine whether a roof system passes or is "suspect."

Using ASTM E907, a roof system is considered to be suspect if the deflection measured during the test is 25 mm (about 1 inch) or greater. During FM 1-52 testing, a roof system is suspect if the measured deflection is between 1/8 of an inch and 3/8 of an inch depending on the maximum test pressure: 1 inch where a thin topping board (lower board) is used, or 2 inches where a thin cover board or flexible, mechanically attached insulation is used.

If an ASTM E907 or FM 1-52 test yields a suspect result, a test cut should be taken in the test area to determine whether failure has occurred and the specific failure mode.

ASTM E907 and FM 1-52 differ notably in their test cycles and maximum test pressures for determining roof system deflections and whether a roof system passes or is suspect. ASTM E907 testing is conducted in 15-second per square foot (psf) pressure intervals up to the calculated design wind (uplift) pressure for the specific roof system being evaluated. FM 1-52 testing is conducted using an initial 15-second psf pressure followed by 7.5-second psf increments up to a maximum test pressure of 1.25 times the design uplift pressure for the specific roof system being evaluated.

Considering maximum test loading and allowable test deflections in combination, FM 1-52 requires 25 percent higher test loads, yet only allows as little as 1/8 the test deflection of ASTM E907. The said FM 1-52 is a significantly more stringent test than ASTM E907.

ASTM E907 originally was published as a recognized consensus standard in 1983, and it was revised in 1996, in 2003, ASTM withdrew ASTM E907 because a consensus could not be reached regarding necessary revisions—most significantly defining the test methods' pressures and base (maximum) ASTM E907-06 still is available for use and can be obtained directly from ASTM's website, www.astm.org.

FM 1-52 is an FM Global proprietary evaluation method and not a recognized industry-consensus test standard. FM 1-52's scope indicates it only is intended to confirm acceptable wind-uplift resistance on completed roof systems in hurricane-prone regions, where a partial blow-off has occurred or where inferior roof system construction is suspected or known to be present.

FM 1-52 originally was published by FM Global in October 1970. The negative-pressure uplift test was added in August 1986 and has been revised several times. The current edition is dated July 2012 and includes an option for "visual construction observation (VCO)" as an alternative to negative-pressure uplift testing. VCO provides for full-time, third-party monitoring of a roof system application to verify roof system installation in accordance with contract documents.

NRCA “Industry Issue Update,” June 2015


NRCA members’ experience:

- Most tests not conducted in accordance with ASTM E907 or FM 1-52.
- No correlation between field test vs. lab. results/classifications
- NRCA survey: 55% passing

[Link](#)

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RESEARCH+ TECH



Revisiting field uplift testing
NRCA's long-standing concerns continue with this issue
by Mark S. Graham

I have been a while since I have written about NRCA's concerns with field uplift testing, which sometimes is inappropriately used as a way to assess the quality of an adhered membrane roof system installation. Despite the time that has passed, NRCA continues to have reservations about field uplift testing, and the test procedure has not yet been revised to address NRCA's concerns.

ASTM E907
In 2018, ASTM International withdrew its consensus-based test method for field uplift testing, ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems."
ASTM International requires its test method standards to include a precision statement addressing two things:

- Known within-laboratory variability, referred to as "repeatability"
- Relative variability of test results obtained from different laboratories, referred to as "reproducibility"

Test methods also are required to include an estimate of bias in test results.

24 professionalroofing.net DECEMBER/JANUARY 2022-23

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ASTM Interlaboratory study (ILS)

"Testing the test"

- Built three identical test decks allowing for 24 tests total
- FM Class 90 roof system (FM tested to 90 psf)
- 8 testing entities conducted 3 test each
- Each test run at 15 psf increments up to 90 psf classification
- Membrane deflection is measured
- ASTM ILS staff planned the study and analyzed the test results
- At FM Global's research center in Glocester, RI

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ILS results

“Testing the test”

- Statistical outliers 15-, 30-, 45-, 60- and 90-psf test increments
- Outlier data excluded at 30-, 45- and 90-psf test increments
- 16 of the 24 specimens exhibited failure before completing the 90-psf test increment.
- 5 results at the 45-psf increment and all the tests’ results at 60, 75- and 90-psf test increments exceeded FM 1-52’s maximum allowable deflection.

All specimens should have exceeded 90 psf

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RESEARCH+TECH



Putting the test to the test
Substantial variability has been found in field-uplift testing
by Mark S. Graham

NRCRA participated in an ASTM International interlaboratory study to evaluate the accuracy and precision of the field-uplift test method. The study provides some useful data and information for evaluating the appropriateness and effectiveness of field-uplift testing.

Field-uplift testing
There are two recognized field test methods for determining adhered membrane roof systems' uplift resistances: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Uplift Resistance." In each of these test methods, a vacuum is created inside a test chamber mounted on a roof surface and membrane deflections resulting from the induced negative uplift pressures inside the chamber are measured.

ASTM E907 has been a consensus-based standard since it was originally published in 1998. ASTM International withdrew the standard in 2013 because it lacked a precision statement, which is required for all ASTM International test methods.

22 professionalroofing.net SEPTEMBER 2023

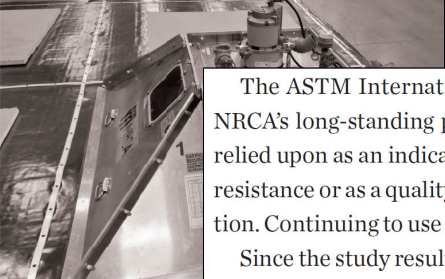
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RESEARCH+TECH



Putting the test to the test
Substantial variability has been found in field-uplift testing
by Mark S. Graham

Test Method for PCM Testing Uplift Resistance of Adhered Membrane Roofing Systems" and FM Global Loss Prevention Data Sheet 1-52, FM 1-52, "Field Verification of Roof Uplift Resistance." In each of these test methods, a vacuum is created inside a test chamber mounted on a roof surface and membrane deflections resulting from the induced negative uplift pressures inside the chamber are measured.
ASTM D907 has been a consensus based standard since it was originally published in 1992. ASTM International withdrew the standard in 2013 because it lacked a precision statement, which is required for all ASTM International test methods.


22 professionalroofing.net SEPTEMBER 2013

The ASTM International interlaboratory study clearly illustrates NRCA's long-standing position that field-uplift testing should not be relied upon as an indicator of an adhered roof assembly's in situ uplift resistance or as a quality-assurance measure of roof assembly installation. Continuing to use it as such is irresponsible.

Since the study results were released, NRCA's Technical Operations Committee has asked FM Global to immediately discontinue use of FM 1-52's field-uplift test as a quality-assurance measure for roof assembly installation. 🌱🌿🍃

[Link](#)

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Roof deck loading considerations

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Some examples of roof loading

- Pallet of asphalt shingles (42 bundles): 2,500 to 4,200 lbs.
- Pallet of TPO membrane rolls: 1,400 to 3,450 lbs.
- Pallet of MB cap sheet (20 rolls): About 2,500 lbs.
- Pallet of glass-faced gypsum board (4 x 4): 1,600 to 2,400 lbs.
- Pallet of bonding adhesive (45 pails): 1,800 lbs.
- Bundle of polyiso. (4 x 8): 250 to 500 lbs.

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University of Massachusetts – Amherst

Draft report: “Roof Live Loads for Low-Slope Roofs”

Joint research

Metal Building Manufacturers Association

National Roofing Contractors Association

Steel Deck Institute

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Some initial considerations

Roof deck loading concerns

- Roofing operations may exceed live load capacity
- Note joist/framing orientation
- Consider avoiding adjacent load placement
- Position loads across joists/framing
- Consider added dunnage across framing
- Also consider rooftop equipment weight

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Other topics and your questions

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CRA
COLORADO ROOFING ASSOCIATION
Aurora, Colorado -- December 13, 2023

Sustainability in roofing

presented by

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association (NRCA)



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Cool roofs

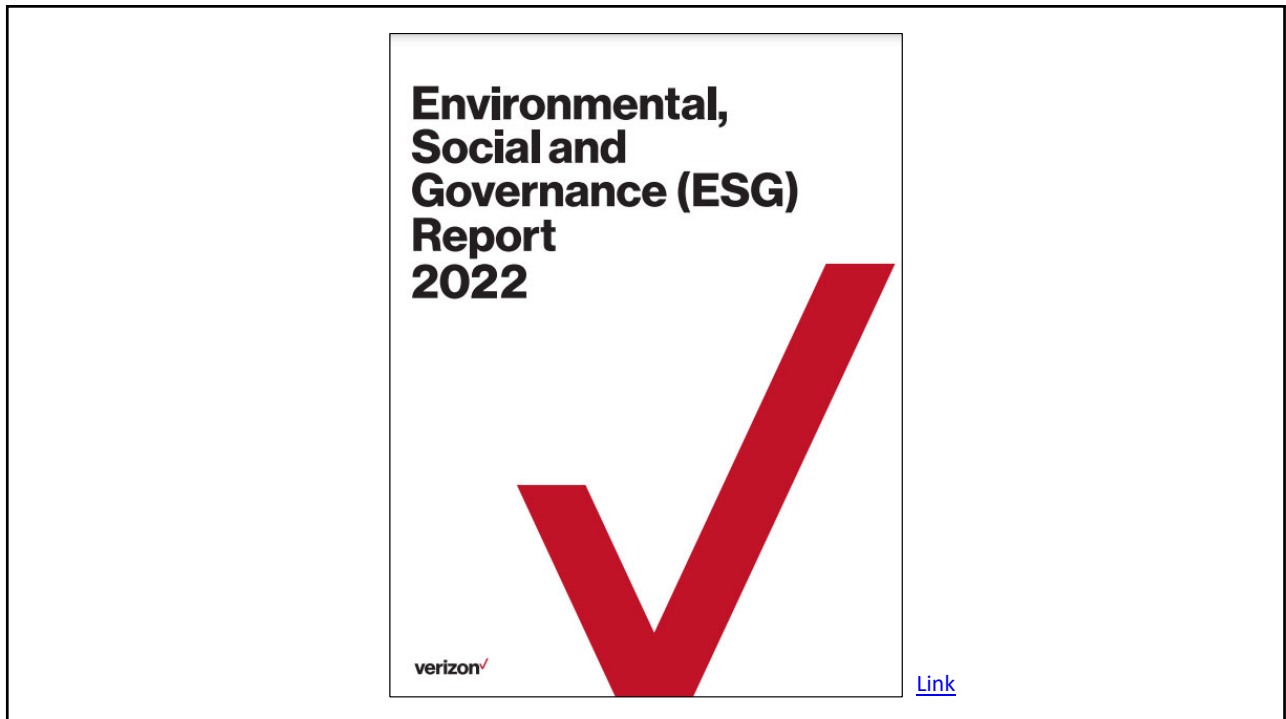
Vegetative roofs

Rooftop PV

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The image shows a screenshot of the 2021 JM Sustainability Report. The top section is titled 'TABLE OF CONTENTS' and lists various sections such as 'A Message From JM's Chief Executive Officer (CEO)', 'Building a Better Tomorrow', 'The JM Experience', '2019 - 2020 Highlights', 'JM Sustainability Goals', 'Organizational Profile', 'Operations Map', 'JM Global Procurement & Logistics', 'Valuing Our Stakeholders', 'Understanding Our Impacts', 'WE ARE PEOPLE CHAMPIONS', 'WE PERFORM AT A SUPERIOR LEVEL', and 'WE PROTECT TODAY TO ENSURE TOMORROW'. The second section is titled 'A MESSAGE FROM JM'S CHIEF EXECUTIVE OFFICER' and features a portrait of John Manville (JM) and a letter from him. The letter discusses JM's history, its commitment to sustainability, and its focus on people, planet, and profit. The bottom of the page shows the report's title '2021 JM SUSTAINABILITY REPORT' and the 'BUILDING A BETTER TOMORROW' logo.

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A definition...

sustainability: “...to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations.”

--National Environmental Policy Act of 1969

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product category rule (PCR): “...a set of specific rules, requirements and guidelines for developing environmental declarations for one or more products that can fulfill equivalent functions.”

CAN/CSA ISO 14025-07 (R2022), “Environmental Labels and Declarations –Type III Environmental Declarations–Principles and Procedures”

PCRs determine what information should be gathered and how that information should be evaluated for an environmental declaration.

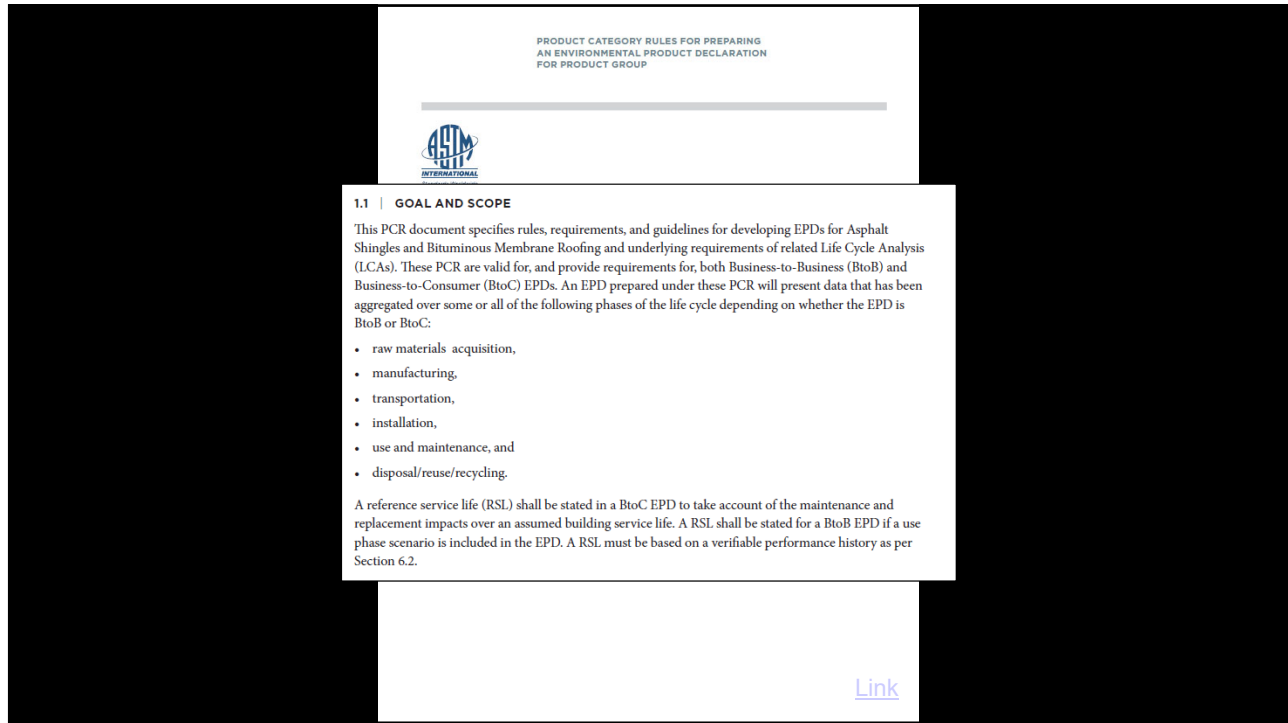
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ASTM International has published the following PCR.

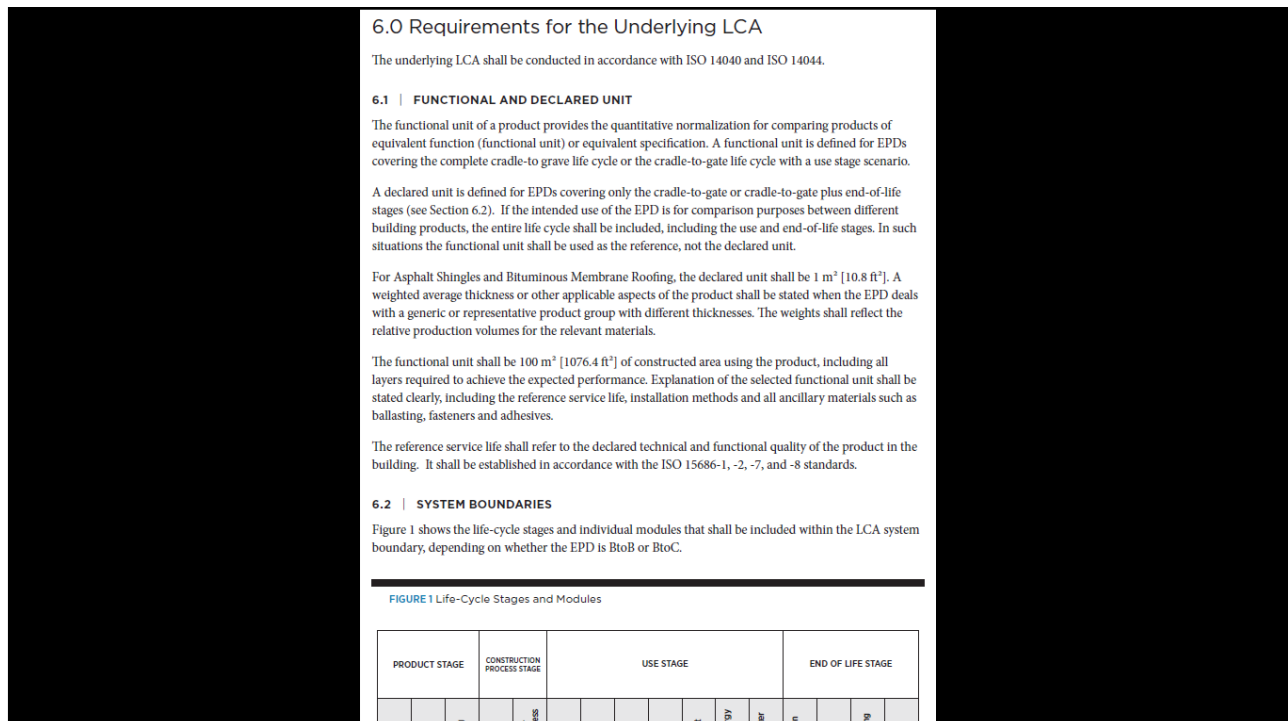
- PCR for Asphalt Shingles, Built-up Asphalt Membrane Roofing and Modified Bituminous Membrane Roofing
- PCR for Clay Brick, Clay Brick Pavers, and Structural Clay Tile
- PCR for Construction Aggregates: Natural Aggregate, Crushed Concrete, and Iron/Steel Furnace Slag
- PCR for Decorative Overlays for Use on Composite Wood Panels
- PCR for Expanded Shale, Clay, and Slate Lightweight Aggregate
- PCR for Glass Mat Gypsum Panels
- PCR for Interior Architectural Wood Door Leaves
- PCR for Manufactured Concrete and Concrete Masonry Products
- PCR for North American Pressure-Treated Wood Products
- PCR for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic Stucco Cements
- PCR for Power-Operated Pedestrian Doors and Revolving Doors
- PCR for Precast Concrete
- PCR for Segmental Concrete Paving Products
- PCR for Single Ply Roofing Membrane
- PCR for Slag Cement
- PCR for Spray-applied Fire-Resistive Materials (SFRM)
- PCR for Water-Resistive and Air Barriers

[Link](#)

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11.0 Content of the EPD	
The following demonstration of verification shall be completed and included with the EPD. Note that third-party verification is optional for BtoB EPDs, but mandatory for BtoC EPDs.	
Demonstration of Verification	
PCR review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the programme operator >	
Independent verification of the declaration and data, according to ISO 14025: internal external	
(Where appropriate *) Third party verifier: <name of third party verifier>	
Optional for business to business communication, mandatory for business to consumer communication.	
All Type III environmental declarations in a product category shall follow the format and include the parameters as identified in this PCR. The following general information shall be declared in the EPD: Name and address of the manufacturer(s);	
<ul style="list-style-type: none"> • Product identification by name (including, for example, production code) and a simple visual representation of the product; • Description of the building product's use and the functional or declared unit of the product to which the data relates; • Description of the application (installation) of the building product where relevant; • Detailed list of the substances, by weight, that make up the building product; • Data from LCA or LCI or information modules as per ISO 14025, clause 7.2.2; • Additional environmental information (see Section 9); • Statement of whether the EPD is cradle to gate or cradle to grave; • Statement that EPDs from different programs (using different PCR) may not be comparable; • Statement that the EPD represents an average performance in cases where an EPD declares an average performance for a number of products, with the standard deviation of the product's performance with respect to the average stated; 	

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environmental product declaration (EPD): provide quantifiable environmental data to compare products that fulfill the same function.


To create comparable EPDs, organizations must follow the rules and guidelines called for in an associated PCR. EPDs created under different PCRs generally are not comparable.

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	<p>Published Environmental Product Declarations</p> <p>An Environmental Product Declaration (EPD) provides quantifiable environmental data to compare products that fulfill the same function. In order to create comparable EPDs, they must follow the rules and guidelines called for in the associated PCR.</p> <ul style="list-style-type: none"> • Athena Sustainable Materials Institute (Athena) EPD Calculator for Concrete • Cement Sustainability Initiative (CSI) EPD Generator for Cement and Concrete • Climate Earth CarbonCLARITY EPD Generator - Concrete Masonry • Climate Earth CarbonCLARITY™ EN 15804 EPD Generator-Concrete • Climate Earth Enterprise (CEE) EPD Generator for Ready Mix Concrete • DEP du SOPRA-XPS - panneau isolant en polystyrène extrudé de SOPREMA (Version française) • EPD Optimization Credit for USG Mars Healthcare (80.35) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars Healthcare High NRC (80.40) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars Healthcare High NRC (85.35) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars Healthcare High NRC (90.30) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars High NRC (80.35) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars High NRC (80.40) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars High NRC (85.35) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars High NRC (85.35) Acoustical Ceiling Panels • EPD Optimization Credit for USG Mars High NRC (90.30) Acoustical Ceiling Panels • EPD Optimization Credit for USG Sheetrock Brand EcoSmart Mold Tough Firecode X • EPD for 711 Materials (EPDs are generated using an enterprise software tool) 	<p>Link</p>
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ENVIRONMENTAL PRODUCT DECLARATION
ASPHALT SHINGLE ROOFING SYSTEM
 INSTALLATION: FASTENED



ATLAS
GAF
OWENS CORNING
TAMKO

certainteed
JKO
BABCO Roofing Products

ASPHALT ROOFING MANUFACTURERS ASSOCIATION


The Asphalt Roofing Manufacturers Association (ARMA) is a trade association representing North America's asphalt roofing manufacturing companies and their raw material suppliers. The association includes the majority of North American manufacturers of asphalt shingles and asphalt low slope roof membrane systems. Information that ARMA gathers on modern asphalt roofing materials and practices is provided to building and code officials, as well as regulatory agencies and allied trade groups. Committed to advances in the asphalt roofing industry, ARMA is proud of the role it plays in providing asphalt roofing to those in the building industry and to the public.

ARMA's vision and mission is to be an association committed to the long-term sustainability of the asphalt roofing industry and to advocate and advance the interests of the asphalt roofing industry by leveraging the collective expertise of its members.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

[Link](#)


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ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT SHINGLE ROOFING SYSTEM
INSTALLATION: FASTENED

According to ISO 14025 and ISO 21930:2017



1. Content of the EPD

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Praeger St, Northbrook, IL 60062 www.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Asphalt Roofing Manufacturers Association, 2331 Rock Spring Road, Forest Hill, MD 21050
DECLARATION NUMBER	47898218.111.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m ² of Asphalt Shingle Roofing System (Installation: Fastened)
REFERENCE PCR AND VERSION NUMBER	Part A: Life Cycle Assessment Calculation Rules and Report Requirements (UL Environment, 2022); Part B: Asphalt Shingles, Bulk-up Asphalt Membrane Roofing and Modified Bituminous Membrane Roofing EPD Requirements (UL, 2021)
DESCRIPTION OF PRODUCT APPLICATION/USE	Asphalt Shingle Roofing System (Installation: Fastened)
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	July 1, 2023
PERIOD OF VALIDITY	5 Years
EPD TYPE	Industry-average
RANGE OF DATASET (VARIABILITY)	2014 - 2021
EPD SCOPE	Cradle to gate with options (construction, and end-of-life (EoL) stages)
YEAR(S) OF REPORTED PRIMARY DATA	2019
LCA SOFTWARE & VERSION NUMBER	LCA for Experts v10.7 (formerly GaBi Professional) (Sphera, 2023)
LCA DATABASE(S) & VERSION NUMBER	Managed LCA Content (formerly GaBi databases) CUP 2022.2
LCA METHODOLOGY & VERSION NUMBER	IPCC AR5, CML-IA v4.0, and TRACI 2.1

The PCR review was conducted by:

UL Environment
PCR Review Panel
epd@ul.com

This declaration was independently verified in accordance with ISO 14025: 2006.

INTERNAL EXTERNAL

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:


Cooper McCollum, UL Environment
Sphera
Thomas P. Gloria, Industrial Ecology Consultants

Limitations
 Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not account for the unquantified environmental impacts of the material extraction, nor do they result in basing human health toxicity. EPDs are comparative and cannot replace laws and certifications that are designed to address these impacts and/or set performance thresholds – e.g., Type I certifications, health assessments and restrictions, environmental impact assessments.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCA datasets may lead to differences in results for equivalent or downstream of the life cycle stages declared.


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ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT SHINGLE ROOFING SYSTEM
INSTALLATION: FASTENED

According to ISO 14025 and ISO 21930:2017




systems are primarily used to protect residential and light commercial construction from the weather. Asphalt shingles provide a winning combination of beauty, affordability and reliability. They are available in a variety of colors, textures and styles to fit many unique designs, and offer a long service life. Asphalt shingle roofing systems provide protection against wind, rain, snow and extreme temperatures.

2.5. Material Composition

Table 2 shows the percent (%) composition (by weight) of the components of the built-up asphalt roofing system. Percentage values provided in the parenthesis for components represent the weight % of these components in the overall installed roofing system, which also includes the weight of installation materials. Therefore, the sum of the % values in parenthesis might not add up to 100% due to the weight of installation materials in the overall installed system.

Table 2: Average material inputs for asphalt shingle, underlayment, leak barrier, starter strip, and hip and ridge manufacturing

MATERIAL INPUTS	WEIGHT PERCENTAGE IN INDIVIDUAL COMPONENT
Asphalt Shingle (89% of representative roofing system)	
Mineral stabilizers	34%
Mineral granules	27%
Asphalt	18%
Headlap	11%
Sand	7%
Fiberglass mat	2%
Laminating adhesive	1%
Grout	< 1%
Styrene butadiene styrene (SBS) polymer	< 1%
Underlayment (5% of representative roofing system)	
Organic felt (paper, cardboard)	47%
Asphalt	53%
Leak Barrier (2% of representative roofing system)	
Asphalt	43%
Mineral stabilizers	26%
Mineral granules	15%
Sand	6%
Fiberglass mat	5%
Styrene butadiene styrene (SBS) polymer	4%
Polyolefin film	2%
Starter Strip (1% of representative roofing system)	
Mineral stabilizers	36%
Mineral granules	29%

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ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT SHINGLE ROOFING SYSTEM
INSTALLATION: FASTENED

According to ISO 14025 and ISO 21930:2017



oxidized asphalt. The product is cooled and wound into rolls and packaged for shipment.

Leak Barrier

Leak barrier manufacture involves impregnating and coating a fiberglass mat with a polymer-modified asphalt. The polymer-modified asphalt is produced by mixing appropriate proportions of polymer, non-oxidized or lightly oxidized asphalt, and limestone or other suitable mineral stabilizer. A fine mineral or film surfacing is applied to one side and a removable release liner to the other side. Some products incorporate a narrow strip of permanently attached or removable film along one edge to facilitate connection to overlapping sheets during installation. The product is cooled, wound into rolls, and packaged for shipment.

4.2. Packaging

Adhesive, pallets, plastic film, corrugated core packaging material are used. It's assumed that pallets are reused 20 times. Packaging materials are assumed to be disposed based on region specific disposal rates mentioned in the fact sheet from the EPA (EPA, 2020).

Table 5: Packaging disposal rate assumptions from the EPA, 2020

Product	RECYCLED	INCINERATED	LANDFILLED
Paper packaging	81%	4%	15%
Plastic packaging	14%	17%	69%
Wood packaging	27%	14%	59%

4.3. Transportation

Production-weighted averages for the transportation distances and modes of transport associated with each participating company are included for the transport of the raw materials to production facilities and the transport of the finished products to distribution centers. As defined by the Part B PCR, the transport of finished products from the point of manufacture to the construction site is assumed to be 497 miles (800km) and the waste transport distance from the construction site to landfill is 100 miles (161km) (ULE, 2021).

Table 6: Transport to the building site (A4)

Name	Value	Unit
Fuel type	Diesel	
Liters of fuel	2.21	l/100km
Vehicle type	Truck	
Transport distance	497	miles
Capacity utilization (including empty runs, mass-based)	75	%
Gross density of products transported	12.39	kg/m ³
Weight of products transported (if gross density not reported)		kg
Volume of products transported (if gross density not reported)		m ³
Capacity utilization volume factor (factor =1 or <1 or >1 for compressed or nested packaging products)		-

* The unit of gross density is changed to kg/m³ from kg/m² based on the functional unit due to calculation constraints.

4.4. Product Installation

Environment

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ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT SHINGLE ROOFING SYSTEM
INSTALLATION: FASTENED

According to ISO 14025 and ISO 21930:2017



7. Additional Environmental Information

7.1. Shingle Recycling and Incineration

Asphalt shingle recycling is economically viable, convenient where available, and saves valuable resources from being sent to a landfill. Asphalt shingle recycling can create jobs for recycling locations and reduce costs for products that utilize recovered materials. Recycling shingles also allows homeowners to make a positive environmental contribution. Asphalt shingles are most commonly recycled into pavement, which offsets the need for new asphalt and aggregate. When recycled into pavement the shingles are ground and screened to remove any auxiliary debris, such as nails. The ground product is mixed with aggregate prior to being blended with virgin paving asphalt binder, thus displacing virgin asphalt binder and aggregate.

Uses beyond asphalt paving are developing, including use of recovered components into asphalt roofing and other products. Because these processes are new and emerging on a commercial scale during creation of this EPD, they are not accounted for in the LCA results presented in this EPD.

Due to inherent impurities, asphalt shingles cannot be combusted in standard incineration plants and thus are combusted in cement kilns, replacing alternative fuels such as refinery fuel gas.

7.2. Reflective Roofs

Reflective roofs are defined as roofing products with high solar reflectance. Many in the construction industry define "cool roofs" as roofing products with high solar reflectance and high thermal emittance. Asphalt-based products have the inherent property of having high emittance, regardless of their reflective properties. Asphalt roof systems typically have thermal emittance values greater than 0.80. Reflectance is a deliberate product characteristic, and varies based on the surfacing used.

There are reflective roof options available for virtually any roof and any building. Because of asphalt roofs' longevity, asphalt-based products provide excellent value for homeowners and building owners by delivering superior durability and sustainability at reasonable cost.

Asphalt shingles provide options for varying levels of reflectivity. The reflectivity is related to the color of the asphalt shingles' mineral granule surfaces. While reflective roofs are an increasingly popular roof option, they represent one of many approaches to help building owners and consumers reduce building energy use and address contemporary environmental concerns.

7.3. Individual Component Results

Table 15 presents non-zero cradle-to-gate results for environmental impacts, resource use, output flows and waste, and carbon emissions and removals associated with each individual component of the steep slope roofing system. It should be noted that the impacts presented in Table 15 are for production stage (A1-A3) only and do not include impacts associated with construction (A4-A5) and EoL stages (C1-C4).

Table 15: Production stage (A1-A3) impact results for each system component, per 1 m² of individual component


IMPACT CATEGORY	Units	SHINGLES	HEP & ROOF	LEAK BARRIER	STARTER STRIP	UNDERLAYMENT	TOTAL
GWP excl biogenic	kg CO ₂ e	3.61E+00	6.72E-02	1.18E-01	3.79E-02	5.45E-01	4.38E+00

Environment

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Designation: D7851 – 17

Standard Guide for Design of Sustainable, Low-Slope Roofing Systems¹

This standard is issued under the fixed designation D7851; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last superseded. A superscript symbol (e) indicates an editorial change since the last revision or approval.

1. Scope

1.1 This guide provides guidance and considerations related to designing sustainable low-slope roofing systems, including exposed membrane roofs, membranes covered with vegetative (green) overburden systems, ballasted roofs, and protected membrane roofing assemblies. A sustainable roofing system minimizes environmental impact, conserves energy, and has maximum service life.

1.2 The primary purpose of a roofing system is to weather-proof the building's top surface. Implementing a sustainable roofing system is the intent of this guide.

1.3 This guide acknowledges that many factors outside the designer's control affect the longevity of a roofing system. The designer may rely on industry literature (X1.1) and personal experience with roofing systems to estimate the design life.

1.4 The premise of this guide is to focus attention on environmental and other factors that may affect the roofing system over its service life. By considering these factors and incorporating into the roofing system design certain features that mitigate these factors and their potential adverse effects on the roofing system, the roofing system would be expected to have a longer service life.

1.5 This guide includes materials used in roofing systems under jurisdiction of ASTM Committee D08 on Roofing and Waterproofing. The application of this guide to other systems and materials has not been determined.

1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

¹ This guide is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.24 on Sustainable.

Current edition approved Feb. 1, 2017. Published February 2017. DOI: 10.1520/D7851-17.

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2. Referenced Documents

2.1 *ASTM Standards*²

D1079 Terminology Relating to Roofing and Waterproofing

3. Terminology

3.1 *General*—Terms used in this guide are defined in Terminology D1079, except as defined below.

3.2 *Definitions*:

3.2.1 *design life*—the planned period of time during which the roofing system is expected by its designer to reliably perform its required functions, with minimal unplanned intervention.

3.2.2 *durability*—the ability of the roofing system to perform its required functions over a period of time within the environment for which it is designed and exposed.

3.2.3 *service life*—the period of time after installation during which a roofing system performs its required function(s) with minimal unplanned intervention.

4. Summary of Guide

Note 1—The sustainable roofing system design process consists of the following, sequential steps:


4.1 *Identification of Roofing System Demands, Functional Expectations, and Site Constraints*—The designer should determine factors, loads, and stresses that the roofing system must withstand as well as the impacts the roofing system may have on the environment the building interacts with. These factors apply limiting constraints for system and material selection and the associated installation process. There are also options for sustainable strategies and site and use constraints that will define the feasibility of sustainable strategies (for example, availability of sunlight for photovoltaic arrays).

4.2 *Determination of In-Service Performance Criteria and Functional Expectations*—The designer determines performance criteria and functional expectations of the roofing system.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

ASTM D7852, “Standard Guide for Design of Sustainable, Low Slope Roofing Systems”

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Designation: D8013 – 16 (Reapproved 2021)

Standard Guide for Establishing a Recycle Program for Roof Coverings, Roofing Membrane, and Shingle Materials¹

This standard is issued under the fixed designation D8013; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last superseded. A superscript symbol (e) indicates an editorial change since the last revision or approval.

1. Scope

1.1 This guide provides information for the development of a program to reduce roof covering waste. The recycled roof coverings and any scrap roof cover materials may be reprocessed back into new roof coverings, into other roofing products, or into products other than roofing. This guide does not comment on the use or the inclusion of other recycled or recovered materials which may be used to increase the total amount of recycled material.

1.2 This guide addresses terminology, logistics, quality assurance, separation, or segregation in the recycling process of materials.

1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the *Decision on Principles for the Development of International Standards, Guides and Recommendations Issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee*.

2. Referenced Documents

2.1 *ASTM Standards*²

D1079 Terminology Relating to Roofing and Waterproofing

D7209 Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products (Withdrawn 2015)³

¹ This guide is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.24 on Sustainable.

Current edition approved Jan. 1, 2021. Published January 2021. Originally approved in 2016. Last previous edition approved in 2016 as D8013 – 16. DOI: 10.1520/D8013-16R21.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

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2.2 *UL Standard*⁴

UL 2809 Environmental Claim Validation Procedure for Recycled Content

2.3 *ICC Standard*⁵

ICC International Building Code, current version

3. Terminology

3.1 *Definitions*—For definitions of roofing terms, see Terminology D1079. For definitions of recycling and recovery terms, see Guide D7209.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *bulk*, *n*—waste that is compacted and secured as a bundle to facilitate handling, storage, and transportation.

3.2.2 *bulk box*, *n*—also known as bulk bin, skid box, tote box, or Gaylord, these are normally pallet size containers used for storing and shipping bulk quantities constructed of corrugated fiberboard, either double or triple walled.

3.2.3 *certificate of composition disclosure*, *n*—certificate describing certain properties of a recovered material from an external source, its formation and source, and the specific material shipment to which it applies.

3.2.3.1 *Discussion*—Examples of CCD information include polymer, molecular weight, percentage of inorganic material, contamination type and level, strength, modulus, impact and other mechanical properties, code or designation identifying the formulation and source information.

3.2.4 *chemical recycling*, *n*—processing of recovered material into a secondary raw material or product, with a significant change to the chemical structure of the material (such as cracking, gasification, and depolymerization), but excluding energy recovery or incineration.

3.2.5 *collection*, *n*—logical process of moving waste from its source to a place where it can be recovered.

3.2.6 *contaminant*, *n*—unwanted substance or material defined according to the intended use.

⁴ Available from Underwriters Laboratories (UL), 2000 N.W. Lake Rd., Cinn., WA 99013-9298, http://www.ul.com.

⁵ Available from International Code Council (ICC), 500 New Jersey Ave., NW, 4th Floor, Washington, DC 20001, http://www.icccod.org.

ASTM D8013, “Standard Guide for Establishing a Recycle Program for Roof Coverings, Roof Membrane and Shingle Materials”

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This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: E3073 – 17

Standard Guide for Development of Waste Management Plan for Construction, Deconstruction, or Demolition Projects¹

This standard is listed under the final designation E3073, the number immediately following the designation indicates the year of original approval or the year of last revision. A number in parentheses indicates the year of last approval. A superscript symbol (s) indicates an editorial change since the last revision or approval.

1. Scope

1.1 The purpose of this guide is to facilitate development of a waste management plan for construction, deconstruction, or demolition projects (hereafter, construction waste management (CWM) plan).

1.2 This guide applies to CWM plans developed for construction, renovation, deconstruction, and demolition of buildings, factories, parking structures, and any other structure, as well as above- and below-ground infrastructure.

1.3 This guide includes CWM plan guidance for the wastes generated on-site during construction, deconstruction, and demolition projects.

Note 1—For example, included in any waste generated during these activities such as structural and finish materials and construction waste, such as excavated soils, rocks, vegetation, and stump, and other ancillary items, such as broken tools, safety, manufacturing, protective equipment, and roof and HVAC air duct packaging. The list of items above is offered for illustration purposes only; it is not intended to be fully inclusive of all materials from a construction, deconstruction, or demolition project that are suitable for reuse, reprocessing, manufacturer reclamation, composting, and recycling.

1.4 Waste generated in the manufacture, preparation, or fabrication of materials before delivery to the job site are not in the scope of this guide.

1.5 This guide does not change or substitute for any federal, state, or local statutory or regulatory provisions or requirements related to the handling, control, containment, transport, or disposition of any particular material.

1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.


1.7 This international standard was developed in accordance with internationally recognized principles on standardization.

This guide is under the jurisdiction of ASTM Committee E09 on Sustainability and the direct responsibility of Subcommittee E09.01 on Building and Construction.


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ASTM E3073, “Standard Guide for Development of Waste Management Plan for Construction, Deconstruction, or Demolition Projects”



NSF/ANSI 347



Live saferSM

Sustainability Assured for Single Ply Roofing Membranes

NSF/ANSI 347 Sustainability Assessment for Single Ply Roofing Membranes is the leading consensus standard for evaluating and certifying sustainable attributes of single ply roofing membranes over their entire product life cycle.

NSF Sustainability provides certification to the NSF/ANSI 347 standard. Single Ply Roofing Membranes, as defined by this standard, include, but are not limited to, membranes produced from EPDM (Ethylene Propylene Diene Terpolymer), KEE (Ketone Ethylene Ester), PVC (Poly Vinyl Chloride), TPO (thermoplastic polyolefin), and PIB (Polyisobutylene) products. This U.S. national standard was developed through a consensus-based public process by a multi-stakeholder group of manufacturers, suppliers, regulatory agencies, customers, and users, academia and other industry participants under NSF's facilitation. The purpose of this standard is to communicate accurate and verifiable information about the environmental and social impacts associated with the production and use of Single Ply Roofing Membranes. Sustainability assessment standards inform and encourage the demand for and supply of products that cause less stress on the environment and society. The result is continuous market-driven improvement.

Standard 347 Overview

Based on life-cycle assessment principles, NSF/ANSI 347 employs an easy-to-use point system to evaluate roofing membrane products against established prerequisite requirements, performance criteria and quantifiable metrics in five key areas:


1. Product Design	4. Corporate Governance
2. Product Manufacturing	5. Innovation
3. Membrane Durability	

For example, Product Design criteria require a prerequisite of an environmental assessment program that considers environmental attributes and impacts of products and packaging across the entire product life cycle (e.g., raw material extraction, manufacturing, use, and end of life). Criteria examples in Product Manufacturing include environmental management systems, energy conservation, waste minimization, water conservation and greenhouse gas reductions. Certification is based on point totals to achieve a Conformant, Silver, Gold, or Platinum level.

Manufacturers certified by NSF are authorized to use the NSF Sustainability Certified Mark on their products and in their advertising. Monitoring and periodic reevaluation is required to maintain certification.

(over)

NSF/ANSI 347, “Sustainability Assessment for Single Ply Roof Membranes”



International Green Construction Code, 2021 Edition
--ANSI/ASHRAE/ICC/USGBC/IES 189.1-2020

[Link](#)

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EPD directories

ASTM: [Link](#)

ARMA (asphalt roofing): [Link](#)


PIMA (polyisocyanurate insulation): [Link](#)

Sustainable Minds Transparency Catalog: [Link](#)

Ecomedes: [Link](#)

UL Spot: [Link](#)

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The image shows a snippet from the June 2023 issue of Professional Roofing. At the top left, it says "RESEARCH+TECH". Below this is a photograph of a small white house with a red roof, a green lightbulb with a leaf inside, and a solar panel. To the right of the photo, the title "Professional Roofing" is underlined, followed by "June 2023". Below the photo, the article title is "Sustainable thinking" with the subtitle "The roofing industry has made significant progress in sustainability" and author "by Mark S. Graham". The main text discusses sustainability in the roofing industry, mentioning the National Environmental Policy Act of 1969 and the importance of sustainable practices. At the bottom left of the snippet, it says "22 professionalroofing.net JUNE 2023". To the right of the snippet, there is a blue "Link" button.

Professional Roofing
June 2023

Sustainable thinking
The roofing industry has made significant progress in sustainability
by Mark S. Graham

The issue of sustainability in the construction industry, including the roofing industry, comes up frequently in conversations among building owners, designers, manufacturers, distributors, contractors, and representatives from standards-setting organizations and regulatory and code groups. Sustainability is an important issue, and the roofing industry has put forth several efforts to address it.

What is sustainability?
The concept of sustainability is not new. The National Environmental Policy Act of 1969 committed the U.S. to sustainability, declaring it a national policy "to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations."

In the years since, the public's interest in sustainability has broadened. In addition, sustainability practitioners are becoming more ambitious in their sustainability efforts and are sharing best practices to ensure the greatest environmental, economic and social impact.

[Link](#)

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For contractors, most sustainability documentation is a “pass through”, much like project submittals. However, documentation of construction waste disposal (or recycling) is a challenge.

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CITY COUNCIL ORDINANCE NO. 07-18

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF IRVINE ADDING TITLE 6, DIVISION 7, CHAPTER 9 RELATING TO THE DIVERSION OF CONSTRUCTION AND DEMOLITION WASTE TO THE MUNICIPAL CODE, AND AMENDING TITLE 6, DIVISION 7, CHAPTER 2 OF THE MUNICIPAL CODE BY ADDING SECTION 6-7-204 RELATING TO UNAUTHORIZED BINS

WHEREAS, under California law as embodied in the California Integrated Waste Management Act of 1989 (California Public Resources Code Sections 40000 et seq., hereafter "AB939") the City of Irvine ("City") is required to prepare, adopt and implement source reduction and recycling plans to reach landfill diversion goals, to regulate the volume of waste materials going to landfills and to otherwise remain in compliance with AB939;

WHEREAS, in order to meet these mandates the City must continue to promote the reduction of solid waste, reduce the stream of solid waste going to landfills, and implement appropriate measures to deter unauthorized waste haulers from operating in the City and delivering waste to landfills;

WHEREAS, the City Council of the City has adopted Resolution No. 07-95 supporting a "Zero Waste California" and adopted Zero Waste as a long-term goal in order to eliminate waste and pollution in the manufacture, use, storage and recycling of materials;

WHEREAS, waste from construction, demolition, and renovation of buildings represents a significant portion of the volume of waste presently coming from the City of Irvine and much of this waste is suitable for recycling and reuse;

WHEREAS, the City's commitment to the reduction of waste includes the establishment of programs for recycling and salvaging of construction and demolition waste;

WHEREAS, certain types of projects are exempt from these requirements;


NOW, THEREFORE, the City Council of the City of Irvine does ORDAIN as follows:

SECTION 1. Chapter 9, addressing the diversion of construction and demolition waste from landfills, is hereby added to Title 6, Division 7 of the City of Irvine Municipal Code to read as follows:

CHAPTER 9 RECYCLING AND DIVERSION OF CONSTRUCTION AND DEMOLITION WASTE

[Link](#)

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PUBLIC WORKS
Environmental Programs

**CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING PROGRAM
WASTE MANAGEMENT PLAN**

INSTRUCTIONS

Under the City of Irvine's Construction and Demolition (C&D) Recycling Ordinance (Ordinance No. 07-18), all new construction, demolition, and renovation projects are required to recycle or reuse 75% of concrete or asphalt, and at least 65% of all other debris generated.

To obtain a building or demolition permit, you must complete the Waste Management Plan (WMP) form to provide estimates of the amount of debris to be generated at your project, determine the amount of debris you will need to divert from the landfill through recycling and/or reuse, identify the authorized waste hauler(s) that will collect waste from your project, and identify the disposal, material recovery, or recycling facilities they will deliver the collected material to.

DIVERSION REQUIREMENTS:

1. At least 75% of all asphalt and concrete generated by the project must be diverted.
2. At least 65% of all other debris generated by the project must be diverted to comply with code requirements.

In addition to completing this WMP form, you must pay a related fee deposit equal to \$1.00 per square foot as determined by the City's plan checker (maximum \$50,000) before you can obtain your building or demolition permit. You can qualify for a refund of the fee deposit upon completion of the project by submitting to the City a Final Report and Compliance Form along with receipts or other acceptable documentation demonstrating full implementation of the approved WMP, including the required levels of reuse, recycling, or other waste diversion from landfills through City authorized waste haulers or City approved contractor self-hauling.

Your completion of this form represents your submittal of the required WMP. After completing the form, and unless you are advised otherwise, by successfully clicking on the "Finalize & Submit" button your WMP will be deemed complete and automatically approved by our system. Your compliance will then be conveyed to the City's building Permit Assistance Center in the Community Development Department.

NOTE: The "Finalize & Submit" button will not work until you have provided all information required to complete the WMP.

The Construction and Demolition Recycling Ordinance can be viewed online at the City's website:
cityofirvine.org/environmental-programs/construction-and-demolition-recycling

For questions regarding Waste Management Plan requirements, please call the City's Environmental Programs Division at 949-724-7669 or email WMP@cityofirvine.org.

**After completing this project, in order to qualify for a refund of your related fee deposit, you must submit a completed Final Report and Compliance Form including weight receipts or other acceptable documentation demonstrating full compliance with Ordinance No. 07-18 and implementation of the WMP as approved. A completed Final Report and Compliance Form sample can be downloaded at the City's website:
cityofirvine.org/environmental-programs/ordinance-and-requirements**

Thank you for your cooperation in helping the City of Irvine meet its waste reduction goals!

FORM 50-86 REV 04/19

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Some recommendations

- Understand what sustainability will mean for your company
- Begin to prepare your company for sustainability goals and requirements
- Get ahead of this... instead of being reactionary

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One final definition....

green washing:



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Questions...

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