Sustainability in roofing

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
Rosemont, Illinois

Cool roofs

Vegetative roofs

Rooftop PV

World Green Building Trends 2021

SmartMarket Report

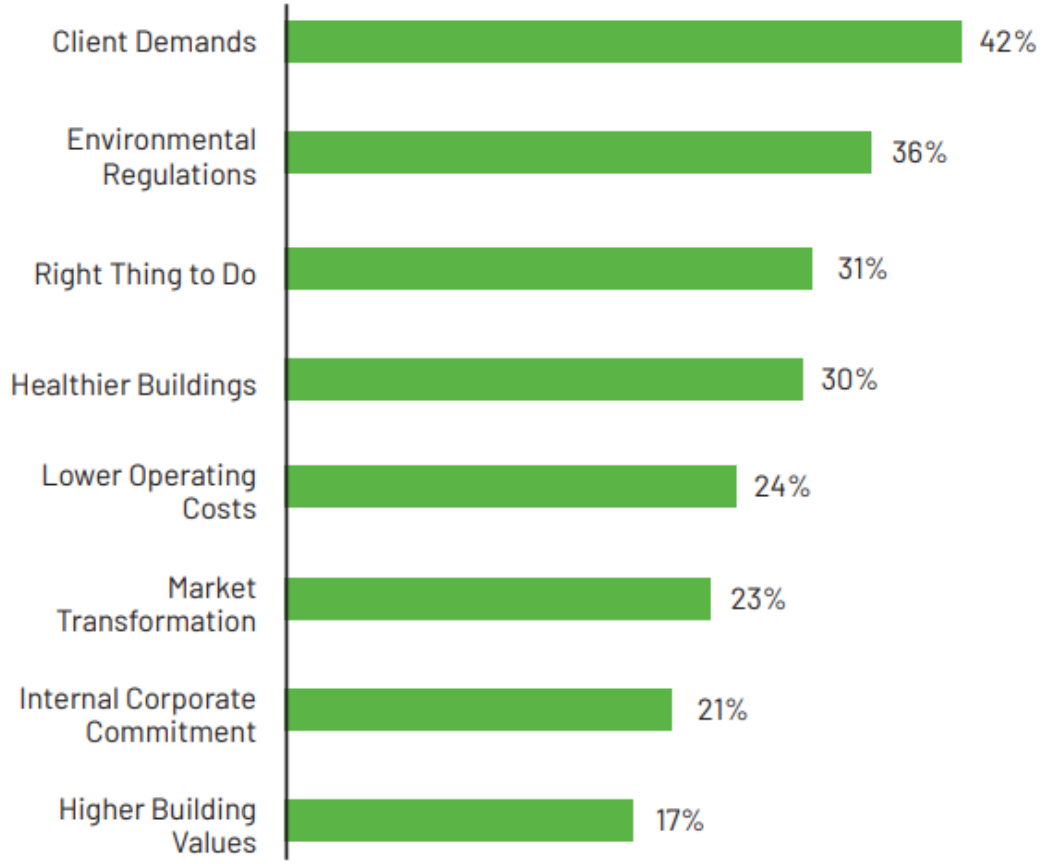
Dodge Construction Network

- Macro Takeaways
- Micro (Product/Granular) Takeaways

Link

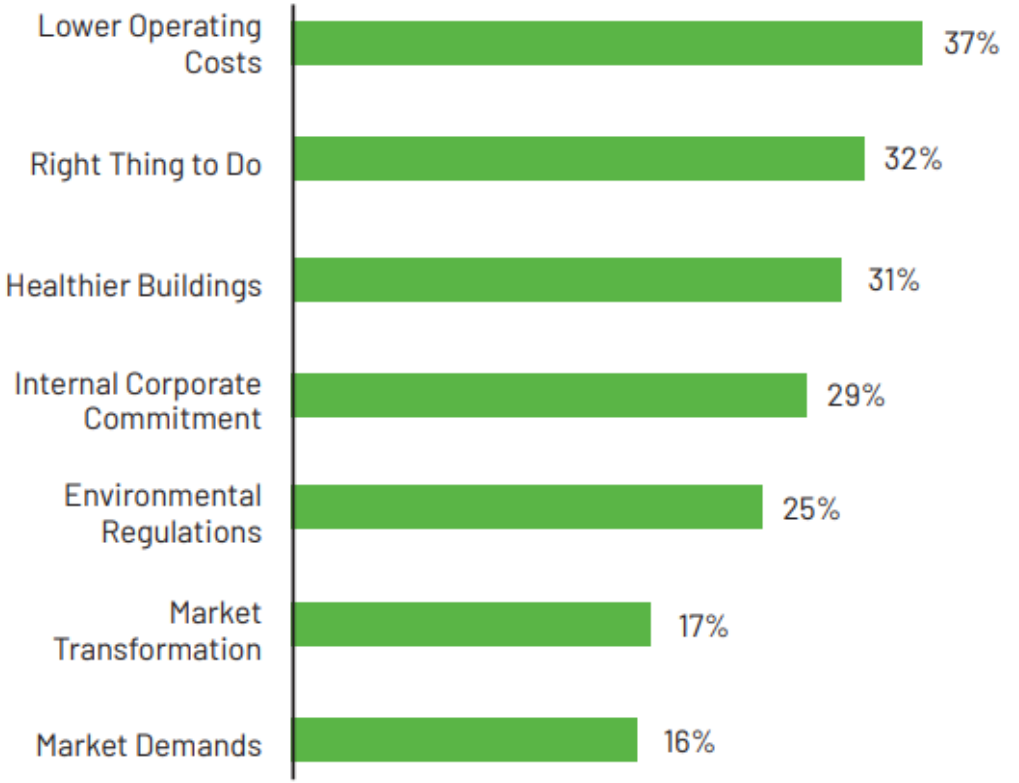
Top Triggers for Green Building (Selected Among the Top Three by Architects, Engineers and Contractors)

Dodge Data & Analytics, 2021



Top Triggers for Green Building (Selected in the Top Three by Owners and Investors)

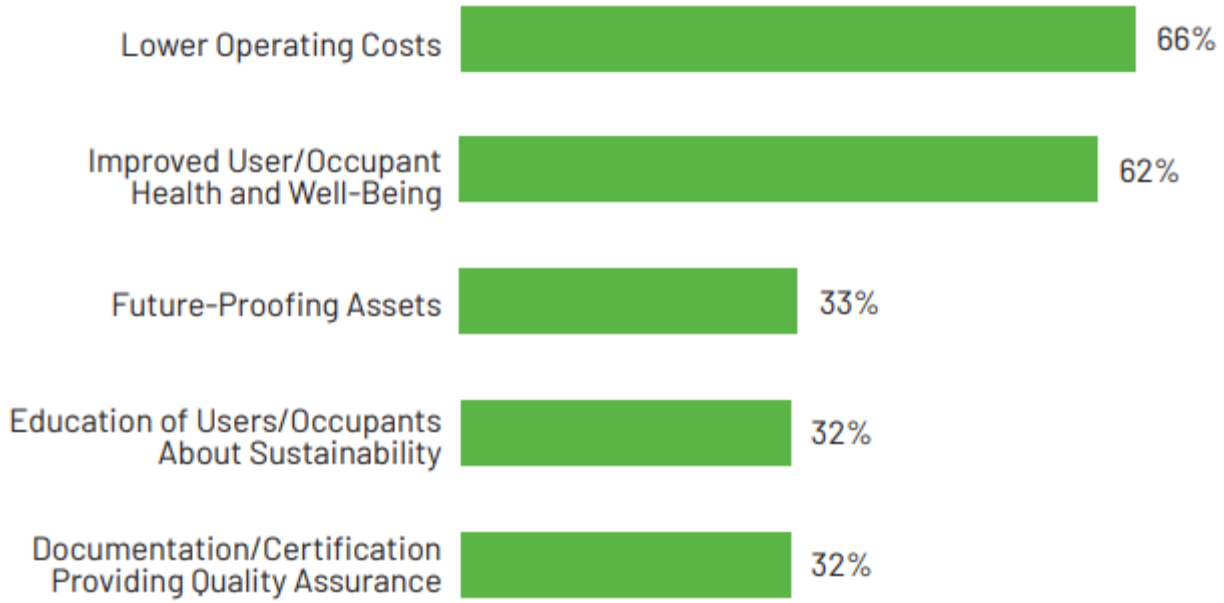
Dodge Data & Analytics, 2021



WHY

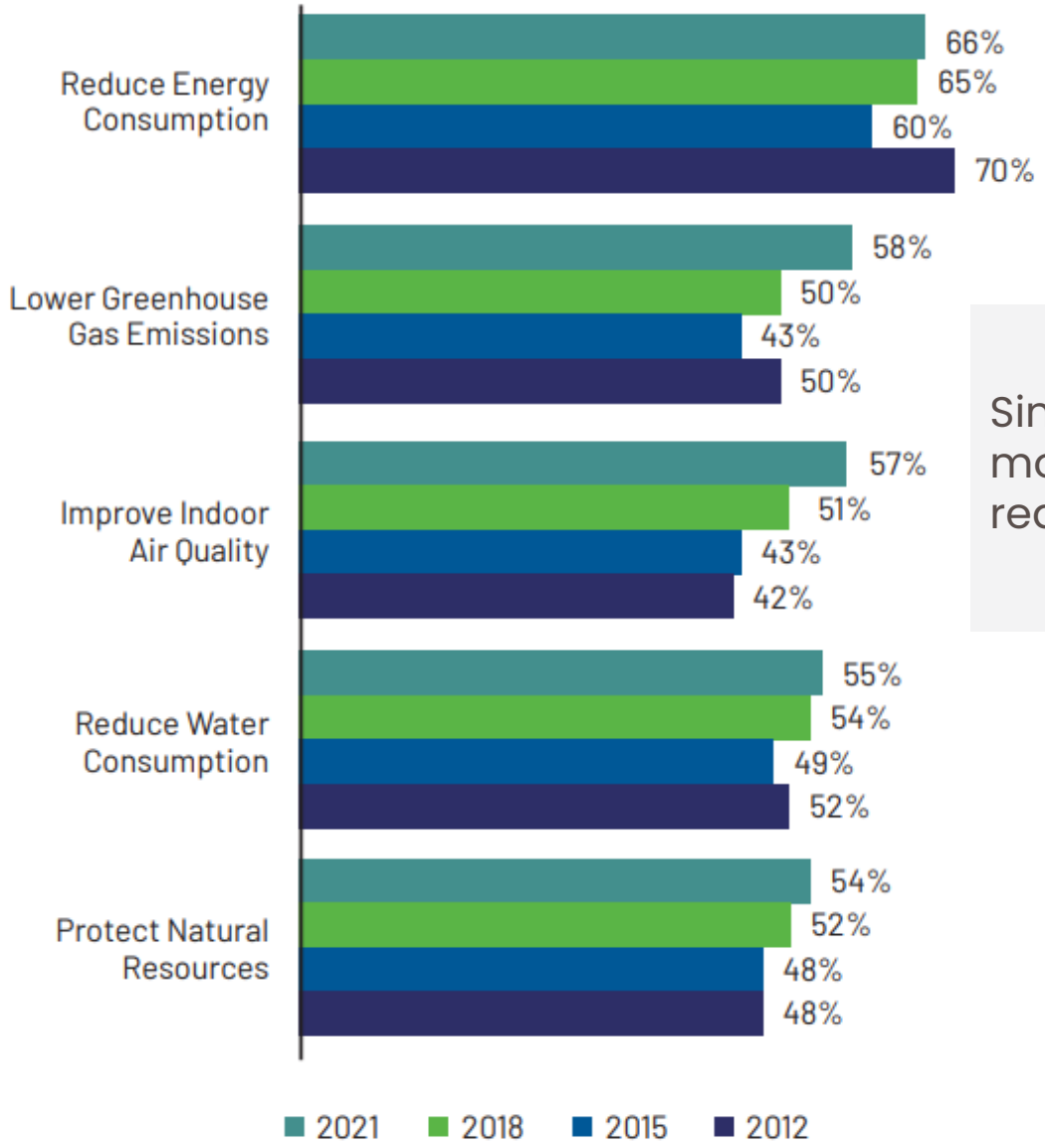
Most Important Business Benefits of Green Building

Dodge Data & Analytics, 2021



Top Environmental Reasons for Building Green (Rated Very Important by Respondents)

Dodge Data & Analytics, 2021

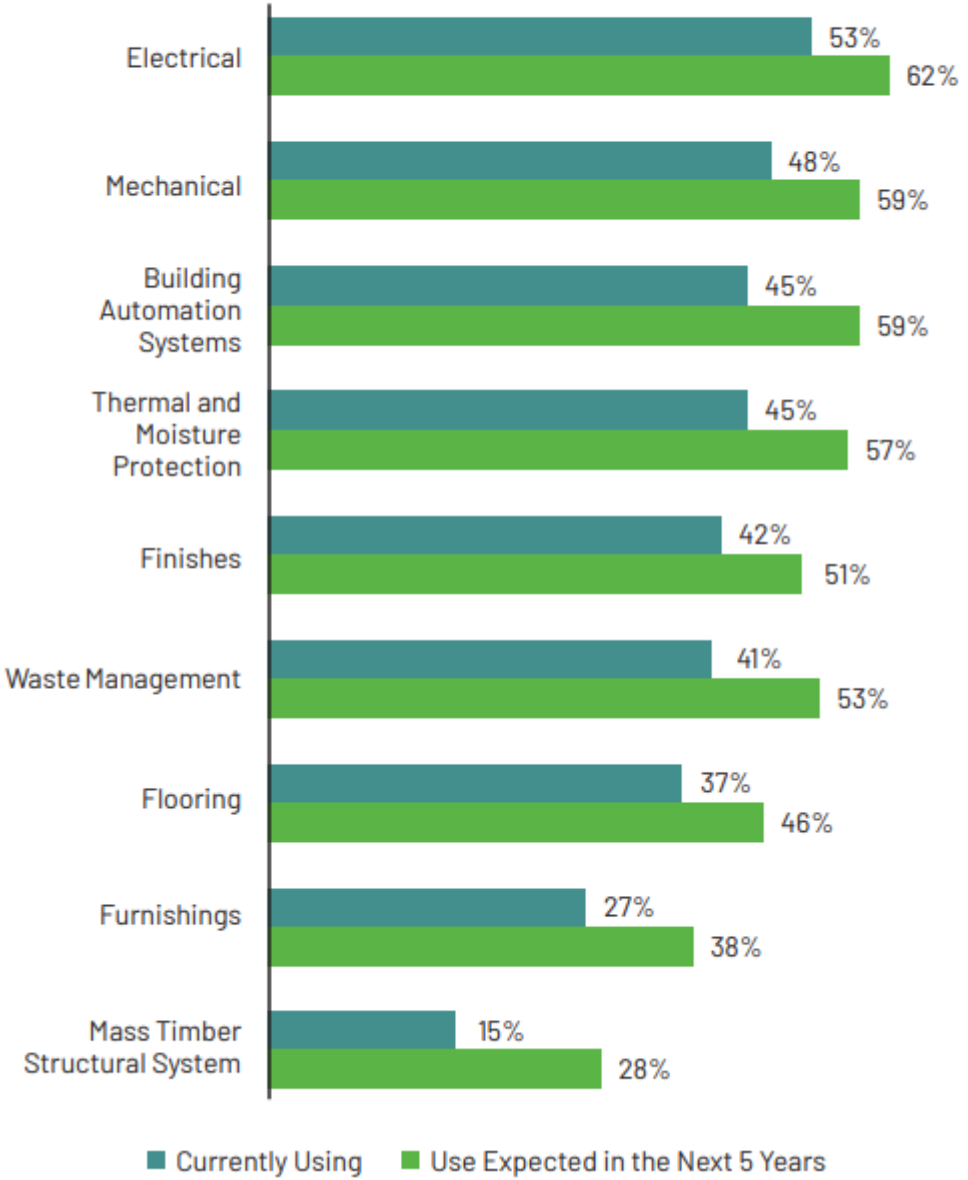


Since 2008, reducing energy consumption is still most frequently selected as a top environmental reason for building green.

WHY

Current and Expected Use of Green Building Products and Systems

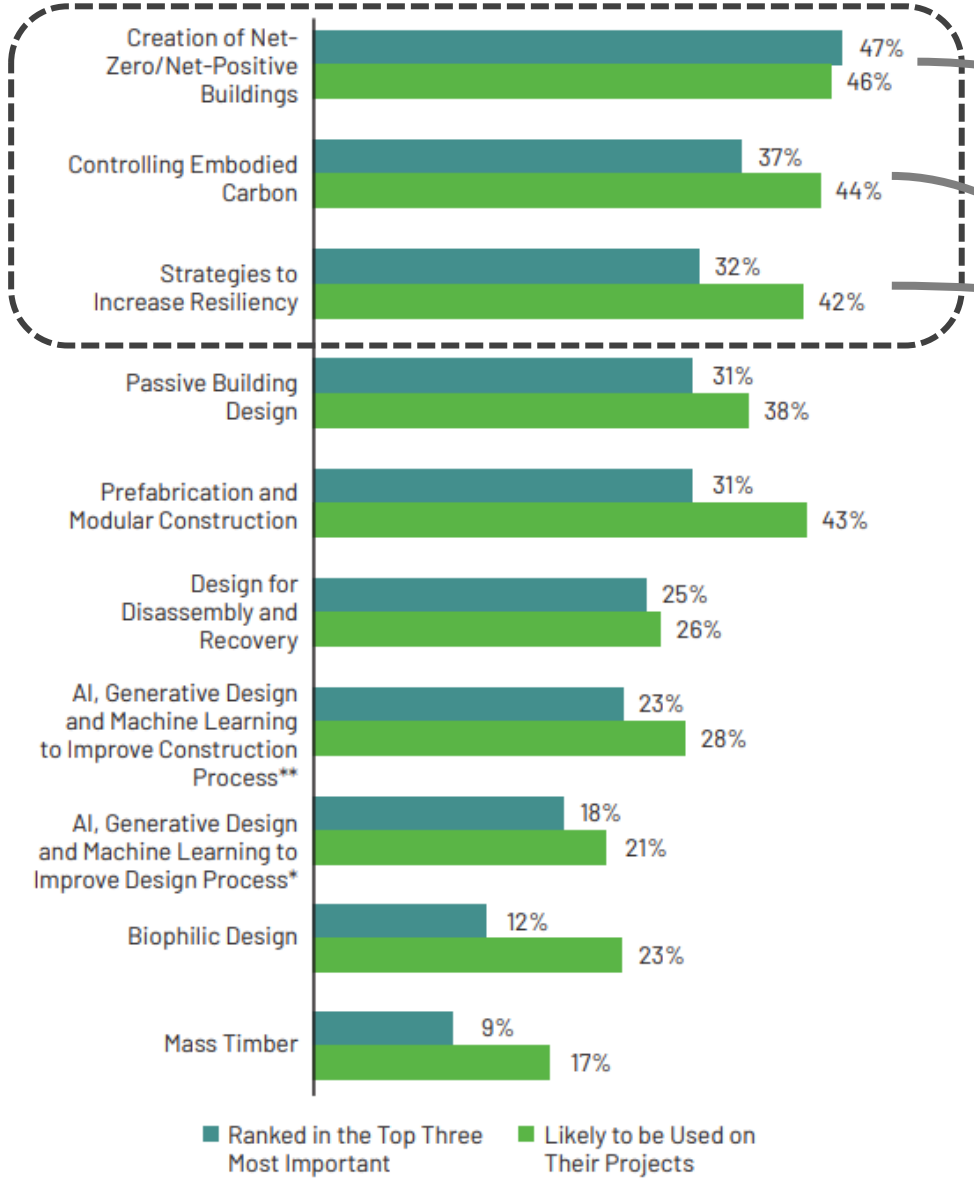
Dodge Data & Analytics, 2021



WHERE

Most Important Approaches to Improve Sustainability in the Design and Construction Industry in the Next 5 Years

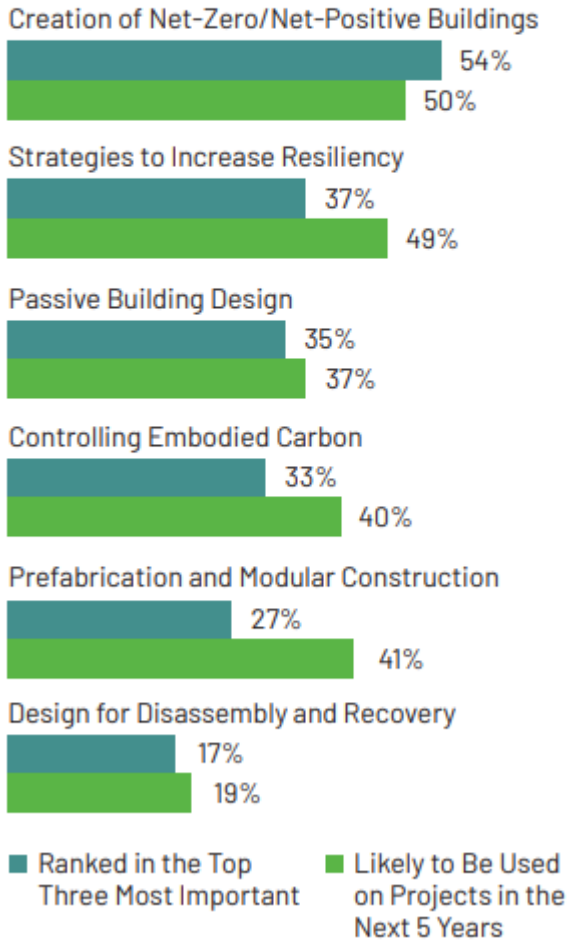
Dodge Data & Analytics, 2021



*According to Architects and Owners
**According to Contractors and Owners

Most Important Approaches to Improve Sustainability (According to Respondents in the US)

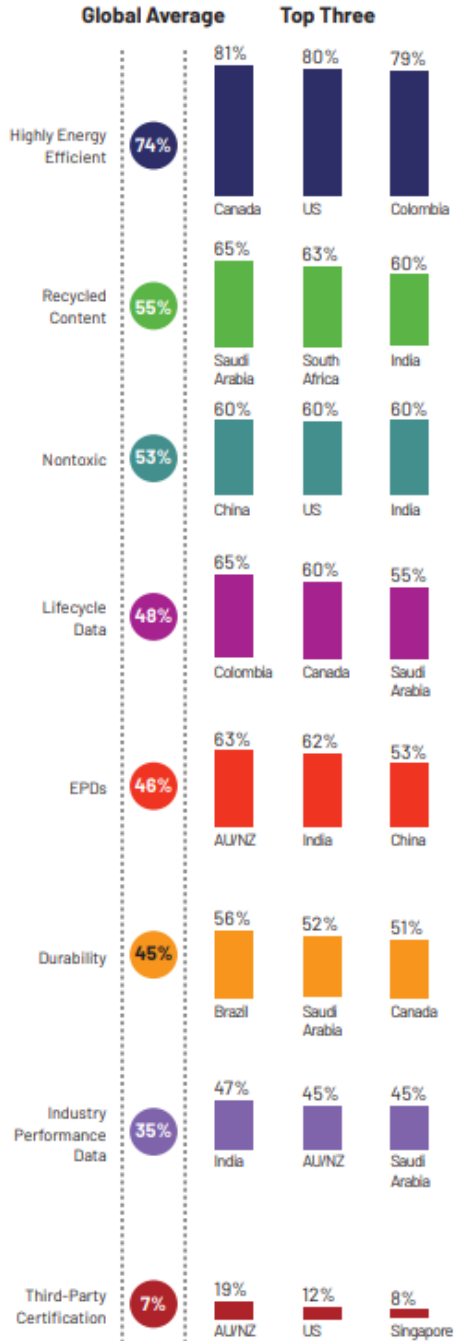
Dodge Data & Analytics, 2021

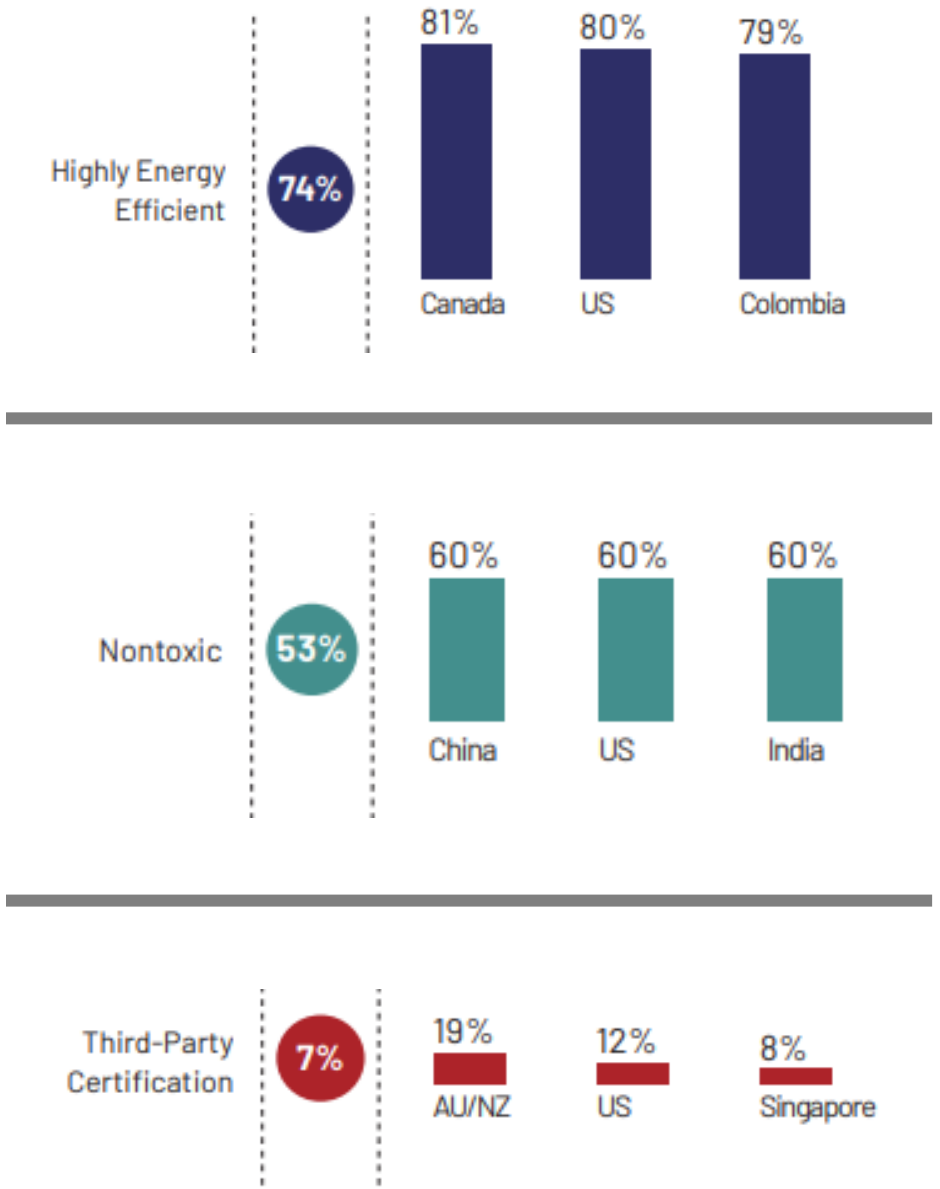


HOW

Criteria Used to Identify Green Products

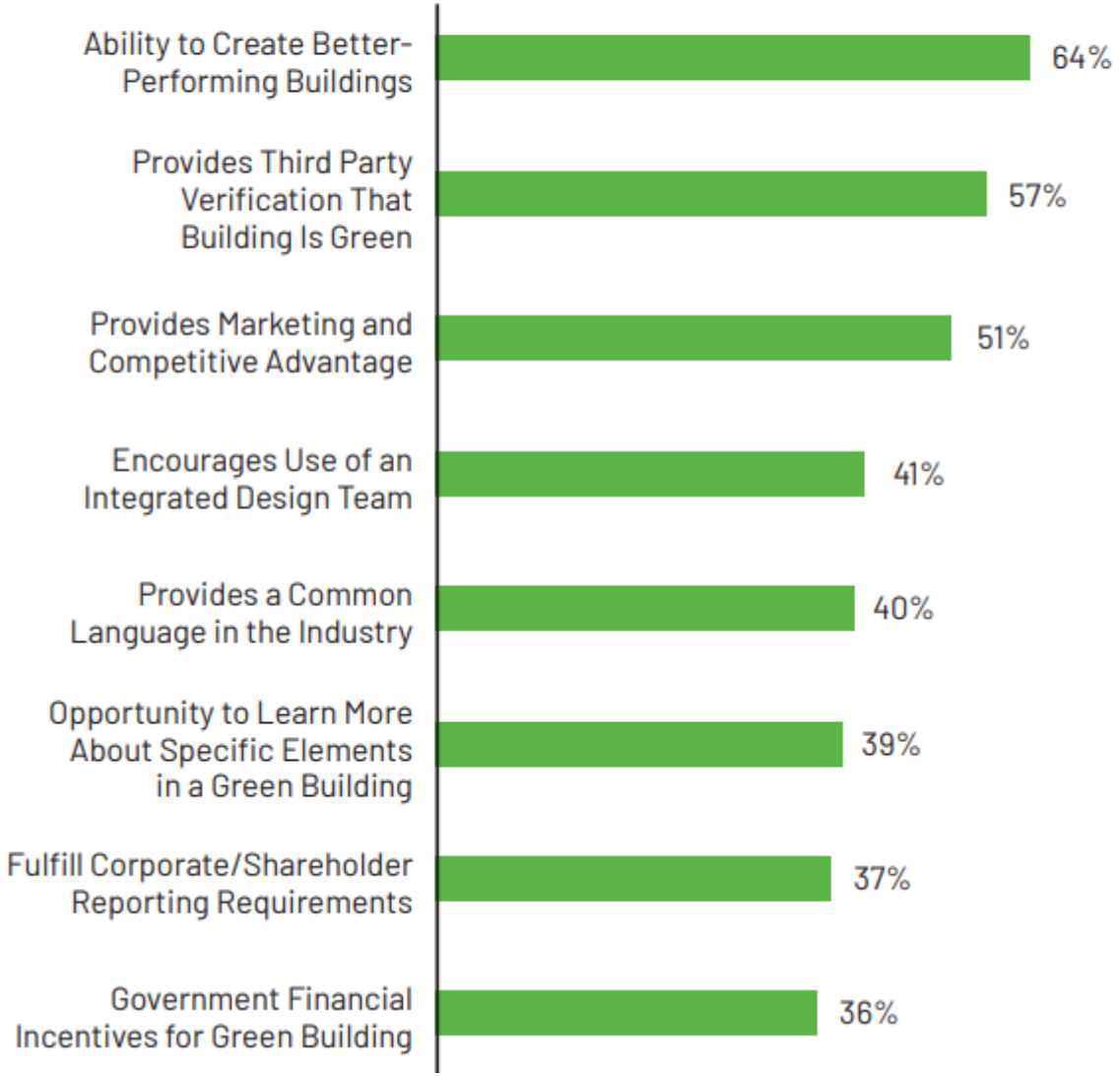
Dodge Data & Analytics, 2021





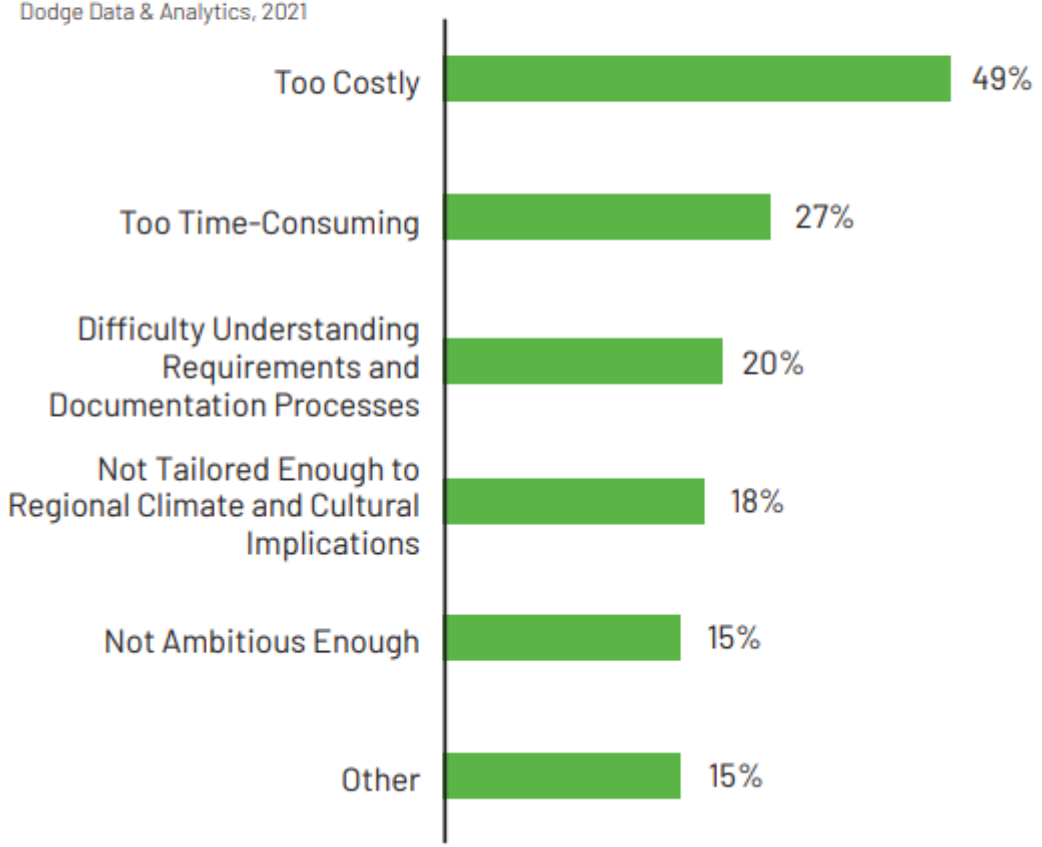
Benefits of Using a Rating System (Percentage Selecting Each Among Their Top 3)

Dodge Data & Analytics, 2021



Factors That Influence the Decision to Not Use a Rating System for a Green Project (Percentage Selecting Each Among Their Top 3)

Dodge Data & Analytics, 2021



Environmental, Social and Governance (ESG)


Environmental,
Social and
Governance (ESG)
Report
2022
verizon

Link

TABLE OF CONTENTS

A MESSAGE FROM JM'S CHIEF EXECUTIVE OFFICER

Johns Manville (JM) has focused on well-balanced efforts in sustainability that benefit our stakeholders as well as our business. Our focus is a natural evolution of JM's four Core Values—People, Passion, Perform and Protect—which drive the *JM Experience*. Recently, we have learned that our journey is not without twists and turns, some of them unpredictable and unforeseen. Events related to the global pandemic, racial injustice, climate change and economic volatility have provided greater reason for why sustainability is so important. We must continue our journey in sustainability with intention and a renewed pledge to build a better tomorrow.

Executing on such a pledge starts with our holistic view of sustainability that embraces the concepts of the triple bottom line: people, planet and profit. Our longevity also gives us unique perspective as we peer into a more sustainable future.

JM started as a small roofing business 163 years ago. Since then, JM has transformed into a company that employs nearly 8,000 individuals through 49 manufacturing facilities and technical/service centers in communities across North America, Europe and China. As we've grown, we've stayed focused on our employees, customers, suppliers and communities.

At JM, financial strength is crucial in empowering sustainability. We must grow profitably in order to continue delivering sustainable value. It is imperative that we manufacture products that people want and also help to solve global challenges. For example, our insulation, filtration, roofing, battery storage and lightweighting products have sustainability designed in from the beginning, making them integral solutions for a more sustainable world. JM products save exponentially more energy throughout their usable life in comparison to the amount of energy required to manufacture them.

We go even further by protecting environmental resources, preserving our water resources, seeking additional energy efficiency in our manufacturing process and innovating new ways to eliminate waste, increase our use of recycled materials and reduce our carbon footprint.

Social responsibility is just as essential. We strive to be an Employer of Choice through an emphasis on inclusivity and diversity, training and career development along with health and wellness. We aim to promote resiliency in everything we do, support the communities where our employees live and work and build on our excellent record of safety.

There is no doubt, the challenges are many and they are intense. Yet at JM, we are passionate about our ability to succeed in this endeavor. By doing good, we will do well. It's all part of the balance of sustainability that powers us in building a better tomorrow.

Bob Wamboldt
President & Chief Executive Officer

Link

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

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.

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

PRODUCT CATEGORY RULES FOR PREPARING
AN ENVIRONMENTAL PRODUCT DECLARATION
FOR PRODUCT GROUP

1.1 | GOAL AND SCOPE

This PCR document specifies rules, requirements, and guidelines for developing EPDs for Asphalt Shingles and Bituminous Membrane Roofing and underlying requirements of related Life Cycle Analysis (LCAs). These PCR are valid for, and provide requirements for, both Business-to-Business (BtoB) and Business-to-Consumer (BtoC) EPDs. An EPD prepared under these PCR will present data that has been aggregated over some or all of the following phases of the life cycle depending on whether the EPD is BtoB or BtoC:

- raw materials acquisition,
- manufacturing,
- transportation,
- installation,
- use and maintenance, and
- disposal/reuse/recycling.

A reference service life (RSL) shall be stated in a BtoC EPD to take account of the maintenance and replacement impacts over an assumed building service life. A RSL shall be stated for a BtoB EPD if a use phase scenario is included in the EPD. A RSL must be based on a verifiable performance history as per Section 6.2.

Link

6.0 Requirements for the Underlying LCA

The underlying LCA shall be conducted in accordance with ISO 14040 and ISO 14044.

6.1 | FUNCTIONAL AND DECLARED UNIT

The functional unit of a product provides the quantitative normalization for comparing products of equivalent function (functional unit) or equivalent specification. A functional unit is defined for EPDs covering the complete cradle-to grave life cycle or the cradle-to-gate life cycle with a use stage scenario.

A declared unit is defined for EPDs covering only the cradle-to-gate or cradle-to-gate plus end-of-life stages (see Section 6.2). If the intended use of the EPD is for comparison purposes between different building products, the entire life cycle shall be included, including the use and end-of-life stages. In such situations the functional unit shall be used as the reference, not the declared unit.

For Asphalt Shingles and Bituminous Membrane Roofing, the declared unit shall be 1 m^2 [10.8 ft^2]. A weighted average thickness or other applicable aspects of the product shall be stated when the EPD deals with a generic or representative product group with different thicknesses. The weights shall reflect the relative production volumes for the relevant materials.

The functional unit shall be 100 m^2 [1076.4 ft^2] of constructed area using the product, including all layers required to achieve the expected performance. Explanation of the selected functional unit shall be stated clearly, including the reference service life, installation methods and all ancillary materials such as ballasting, fasteners and adhesives.

The reference service life shall refer to the declared technical and functional quality of the product in the building. It shall be established in accordance with the ISO 15686-1, -2, -7, and -8 standards.

6.2 | SYSTEM BOUNDARIES

Figure 1 shows the life-cycle stages and individual modules that shall be included within the LCA system boundary, depending on whether the EPD is BtoB or BtoC.

FIGURE 1 Life-Cycle Stages and Modules

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			
al		ng		ess		e		t	nt	ergy	ater	ion		sing	

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 [a]) 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);

- 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;

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.

Published Environmental Product Declarations

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.

- 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 (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)

Link

ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT SHINGLE ROOFING SYSTEM

INSTALLATION: FASTENED

Steep-slope roofing system installed with fasteners and consisting of asphalt shingl underlayment, leak barrier, starter strip, and hip and ridge components.

ATLAS

GAF

OWENS CORNING

TAMKO BUILDING PRODUCTS LLC

certainteed SAINT-GOBAIN

IKO

PABCO 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 promoting 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 UL.COM/EPD

Link

ENVIRONMENTAL PRODUCT DECLARATION

ASPHALT ROOFING MANUFACTURERS ASSOCIATION

ASPHALT SHINGLE ROOFING SYSTEM
INSTALLATION: FASTENED

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

According to ISO 14025 and ISO21930:2017

1. Content of the EPD

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN RD, NORTHBROOK, IL 60062 WWW.UL.COM WWW.SPOT.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	4789862118.111.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m² 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, Built-up Asphalt Membrane Roofing and Modified Bituminous Membrane Roofing EPD Requirements (ULE, 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)
LCI DATABASE(S) & VERSION NUMBER	Managed LCA Content (formerly GaBi databases) CUP 2022.2
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 , CML-IA v4.8, 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	Cooper McCollum, UL Environment *Cooper McCollum*
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	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 typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g., Type 1 certifications, health assessments and declarations, 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 LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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%
Sealant	< 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	25%
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%

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/m²
Weight of products transported (if gross density not reported)		kg
Volume of products transported (if gross density not reported)		m³
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/m² from kg/m³ based on the functional unit due to calculation constraints.

4.4. Product Installation

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.

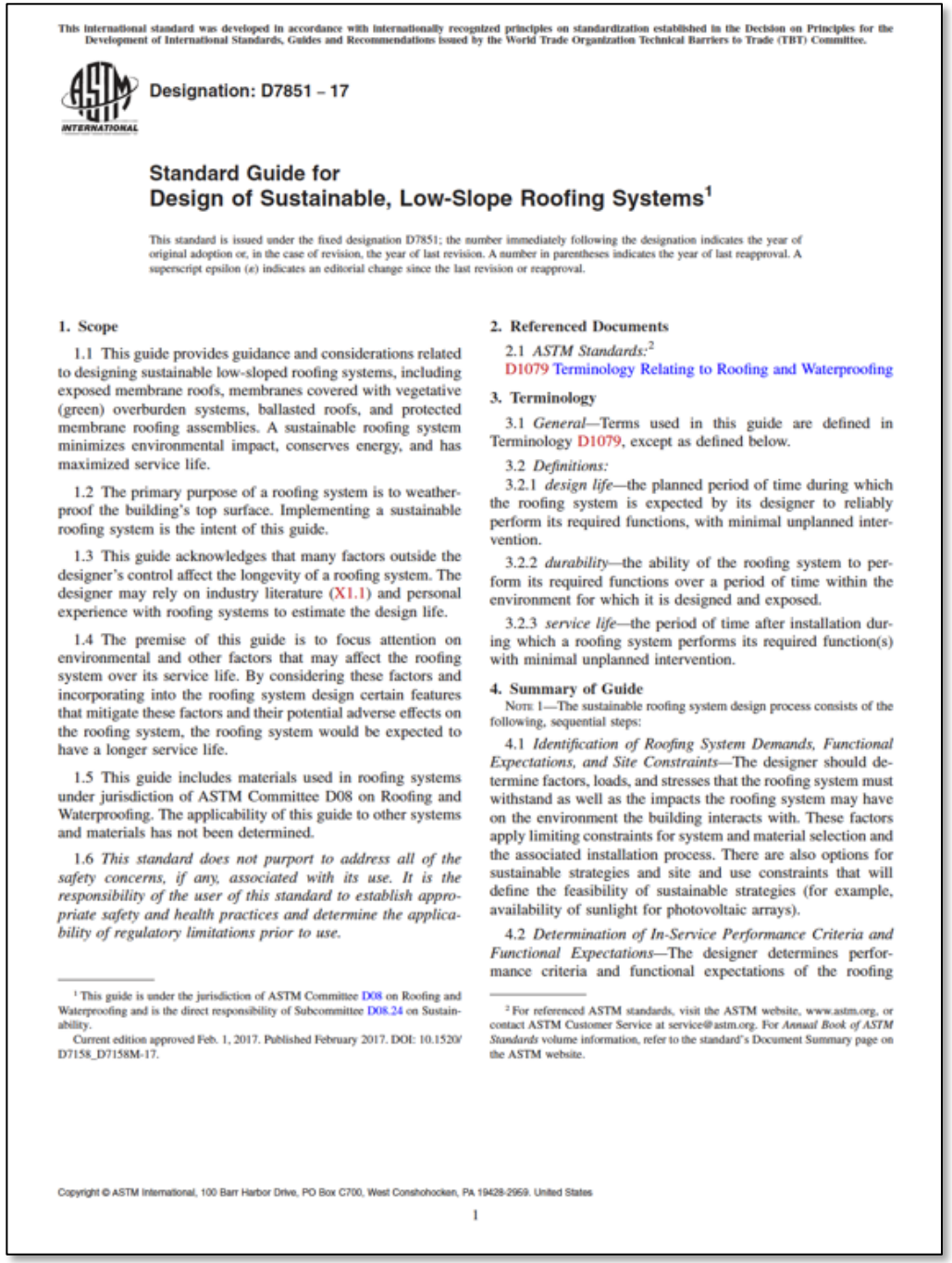
Asphalt shingles provide options for varying levels of reflectivity. The reflectivity is related to the color of the asphalt shingles' mineral granule surfaces. While reflective roofs are an increasingly popular roof option, they represent one of many approaches to help building owners and consumers 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 m^2 of individual component

Impact Category	Units	Shingles	Hip & Ridge	Leak Barrier	Starter Strip	Underlayment	Total
Impact Assessment							
GWP excl biogenic	kg CO_2 eq	3.61E+00	6.72E-02	1.18E-01	3.76E-02	5.45E-01	4.38E+00



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: D7851 – 17

Standard Guide for Design of Sustainable, Low-Slope Roofing Systems[1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide provides guidance and considerations related to designing sustainable low-sloped 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 maximized 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 applicability 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.*

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).

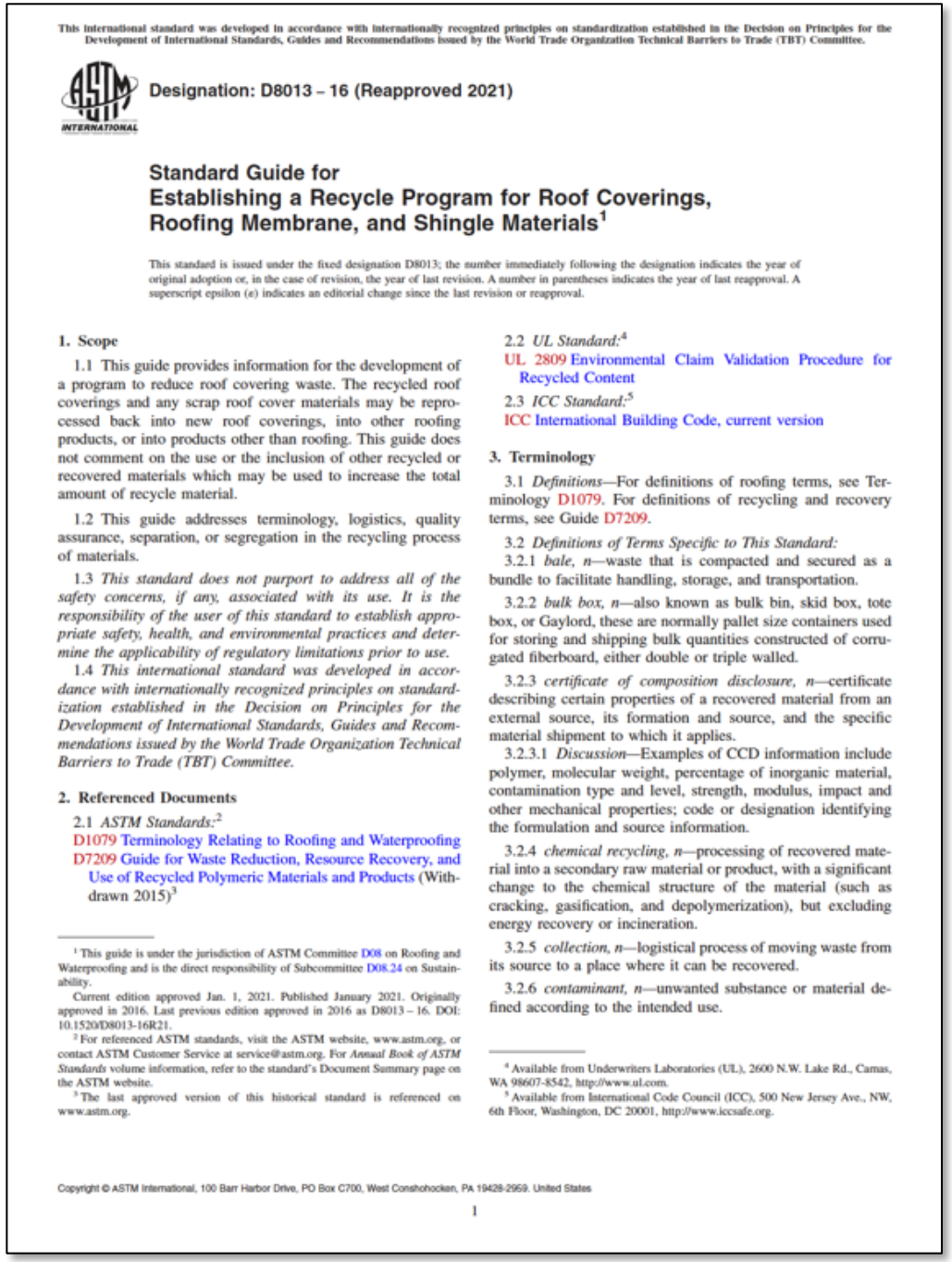
4.2 *Determination of In-Service Performance Criteria and Functional Expectations*—The designer determines performance criteria and functional expectations of the roofing

[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 Sustainability.

Current edition approved Feb. 1, 2017. Published February 2017. DOI: 10.1520/D7158_D7158M-17.

[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"



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: D8013 – 16 (Reapproved 2021)

Standard Guide for Establishing a Recycle Program for Roof Coverings, Roofing Membrane, and Shingle Materials[1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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 recycle 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]

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 *bale, 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*—logistical 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.

[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 Sustainability.

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.

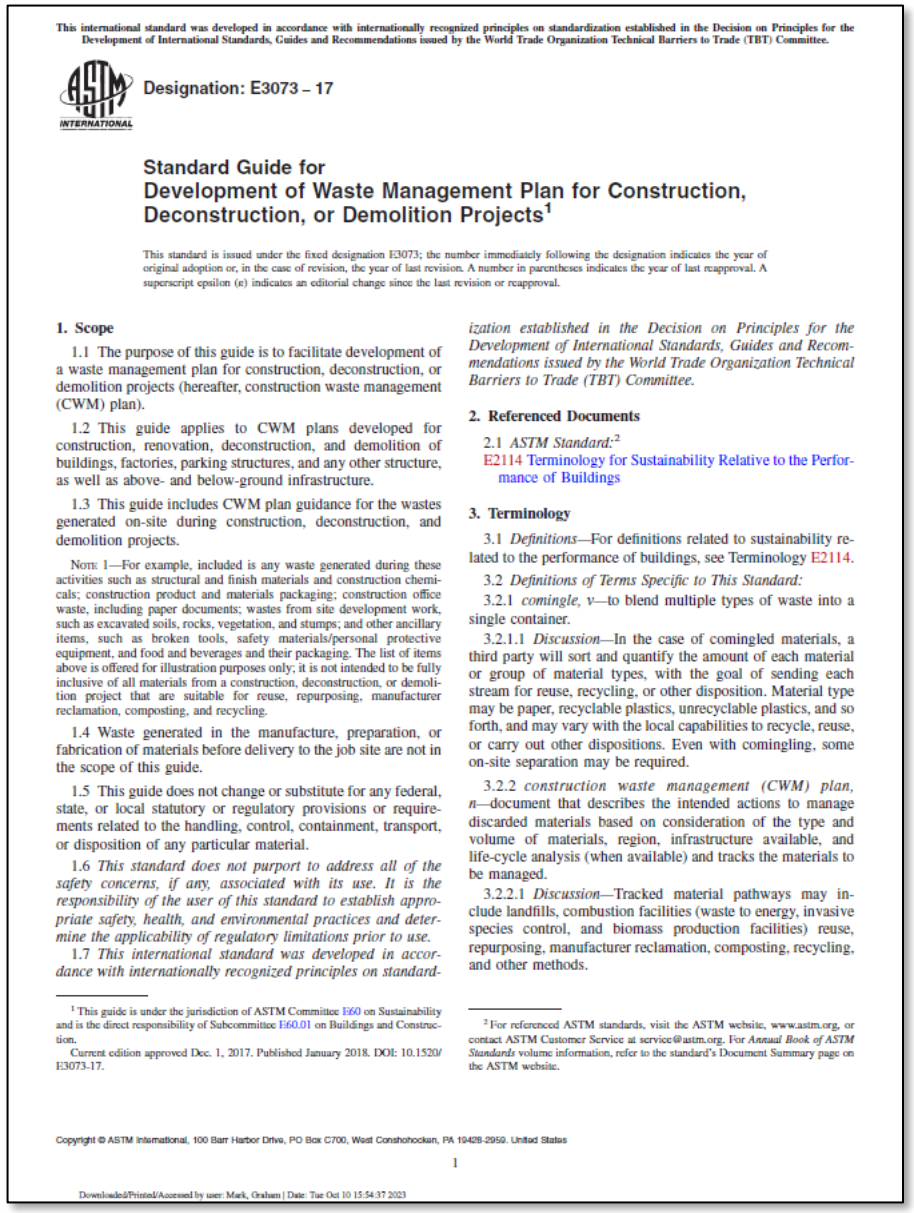
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

[4] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.

[5] Available from International Code Council (ICC), 500 New Jersey Ave., NW, 6th Floor, Washington, DC 20001, http://www.iccsafe.org.

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



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 Projects[1]

This standard is issued under the fixed designation E3073; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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 is any waste generated during these activities such as structural and finish materials and construction chemicals; construction product and materials packaging; construction office waste, including paper documents; wastes from site development work, such as excavated soils, rocks, vegetation, and stumps; and other ancillary items, such as broken tools, safety materials/personal protective equipment, and food and beverages and their 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, repurposing, 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 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 Standard:*[2]

E2114 Terminology for Sustainability Relative to the Performance of Buildings

3. Terminology

3.1 *Definitions*—For definitions related to sustainability related to the performance of buildings, see Terminology E2114.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *comingle, v*—to blend multiple types of waste into a single container.

3.2.1.1 *Discussion*—In the case of comingled materials, a third party will sort and quantify the amount of each material or group of material types, with the goal of sending each stream for reuse, recycling, or other disposition. Material type may be paper, recyclable plastics, unrecyclable plastics, and so forth, and may vary with the local capabilities to recycle, reuse, or carry out other dispositions. Even with comingling, some on-site separation may be required.

3.2.2 *construction waste management (CWM) plan, n*—document that describes the intended actions to manage discarded materials based on consideration of the type and volume of materials, region, infrastructure available, and life-cycle analysis (when available) and tracks the materials to be managed.

3.2.2.1 *Discussion*—Tracked material pathways may include landfills, combustion facilities (waste to energy, invasive species control, and biomass production facilities) reuse, repurposing, manufacturer reclamation, composting, recycling, and other methods.

[1] This guide is under the jurisdiction of ASTM Committee E60 on Sustainability and is the direct responsibility of Subcommittee E60.01 on Buildings and Construction.

Current edition approved Dec. 1, 2017. Published January 2018. DOI: 10.1520/E3073-17.

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

NSF/ANSI 347

Live safer.®

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, end 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
2. Product Manufacturing
3. Membrane Durability
4. Corporate Governance
5. Innovation

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.

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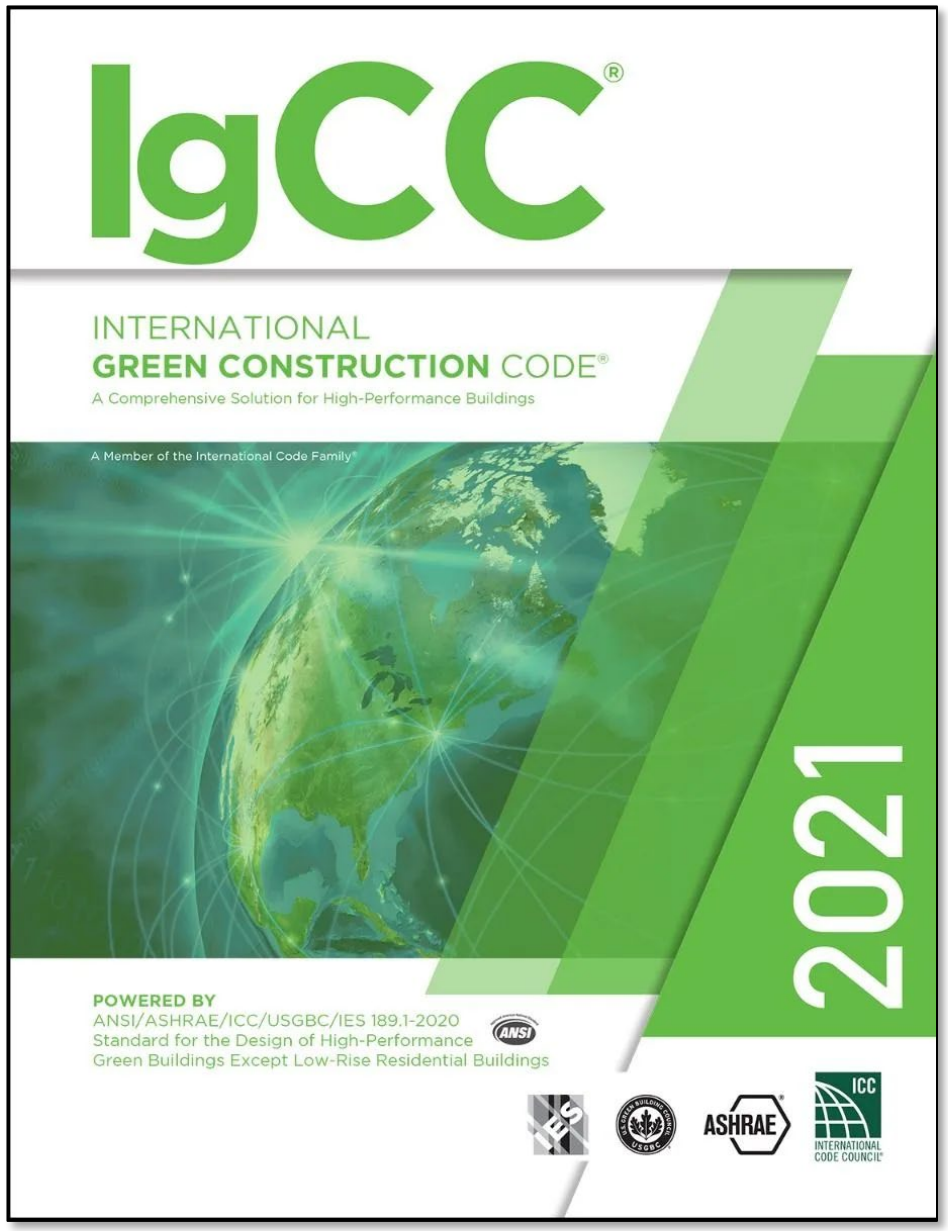
NSF/ANSI 347, “Sustainability Assessment for Single Ply Roof Membranes”



International Green Construction Code, 2021 Edition

--ANSI/ASHRAE/ICC/USGBC/IES 189.1-2020

Link

EPD directories

ASTM: Link

ARMA (asphalt roofing): Link

PIMA (polyisocyanurate insulation): Link

Sustainable Minds Transparency Catalog: Link

Ecomedes: Link

UL Spot: Link

RESEARCH+TECH

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.

Professional Roofing

June 2023

Link

For contractors, most sustainability documentation is a “pass through”, much like project submittals.

However, documentation of construction waste disposal (or recycling) is a challenge.

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

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!

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

One final definition….

green washing:

Questions…

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