Firestone Building Products
Leadership in Energy and Environmental Design (LEED®)
Guide Book

03/20/2009

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The following guide gives a brief summary of the Leadership in Energy and Environmental Design program. Specifically it gives an overview of the standards set by LEED and how Firestone can contribute to a LEED certified project. It is important to note that the roofing system is only a part of the entire process. LEED encompasses the entire building envelope for certification. For additional information please refer to www.usgbc.org.

WHAT IS LEED?

Leadership in Energy and Environmental Design (LEED) Green Building Rating Program™ is a nationally recognized standard for the design, construction, and performance of green buildings. LEED provides building owners with the tools that they need to have an immediate and measurable impact on their building performance. Promoting a "whole-building" design approach to sustainability, LEED recognizes performance in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

HOW WAS LEED CREATED?

The LEED was created in an effort to transform the building environment and shift the focus to sustainability by providing consistent standard for what constitutes green buildings. These standards were created using an open, consensus based process that has made LEED the green building choice for most Federal agencies and state and local governments.

WHAT IS LEED CERTIFICATION?

To earn certification, a building must meet certain requirements and performance benchmarks that relate to the buildings environmental performance. Projects are awarded either a Certfied (26 points required), Silver (33 points required), Gold (39 points required) or Platinum (52 points required) certification depending in the number of credits they achieve. These credits are achieved by meeting the criteria set forth in their standards.

WHAT TYPE OF BUILDING DOES THE LEED PROGRAM INCLUDE?

LEED provides standards and benchmarks for the following building types:

- New Construction and Major Renovations
- Existing Building Operations and Maintenance
- Commercial Interiors Projects
- Core and Shell Development Projects
- Guidelines for Multiple Buildings and On-Campus Building Projects
- Neighborhood Development
- LEED for Schools
- LEED for Retail
- Homes

WHAT IS LEED-NC VERSION 2.2?

First published in 1998, LEED for New Construction and Major Renovation is a green building rating system that was designed to establish a standard for high-performance commercial and institutional projects. Common buildings associated with this system are: Schools, Multi-unit residential buildings, manufacturing plants, laboratories, and many others. Version 2.2 is the most current system released by LEED incorporating the best available science and technology.

WHAT IS COVERED IN LEED-NC VERSION 2.2?

There are six categories dealing with environmental and energy design that is covered in LEED-NC. These are:

- Sustainable Sites (SS) – Max. 14 points
- Energy and Atmosphere (EA) – Max. 17 points
- Innovation and Design Process (ID) – Max. 5 points
- Water Efficiency (WE) – Max. 5 points
- Indoor Environmental Quality (EQ) – Max. 15 points
- Materials and Resources (MR) – Max. 11 points

HOW DO FIRESTONE ROOFING PRODUCTS RELATE TO A NEW CONSTRUCTION PROJECT?

Typically Firestone Roofing Products can be associated with the following sections of LEED-NC.

- **SS Credit 6.1 – Storm water Management**
- EA Credit 1 – Optimize Energy Performance.
- MR Credit 3 – Resource Re-use
- MR Credit 5 – Regional Materials
- **SS Credit 7.2 – Heat Island Effect**
- MR Credit 2 – Construction Waste Management
- MR Credit 4 – Recycle Content
- EQ Credit 4 – Ozone Protection

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LEED-NC VERSION 2.2 SYNOPSIS

In the LEED-NC Version 2.2 manual there are two specific section where the Firestone Roofing System can directly relate to the achieving a LEED credit. These two sections are SS 6.1 for storm water management and SS 7.2 relating to the Heat Island Effect. Should the architect correctly specify the proper system a maximum of two (2) points can be awarded to the project.

Six other categories, as listed above, factor roofing into the specification however do not solely Rely on the roofing components for certification. The roofing components simply contribute to The overall benchmark that could lead to a point(s) being awarded to a project.

SUSTAINABLE SITES

•SS CREDIT 6.1 – Stormwater Management: Quality Control (1 pt.)

The intent of SS Credit 6.1 is to limit the disruption of natural water by reducing or eliminating pollution from storm water runoff. By specifying vegetated roofs, the stormwater can be retained on the roof and prevent increased pollution from stormwater run-off.

Firestone Solution – Firestone Fully Adhered RubberGard EPDM or UltraPly TPO systems can be used in conjunction with the LiveRoof Pre-Vegetative Modular Roof System to create Vegetative Roof Gardens. For Additional information please refer to the Firestone Technical Database Garden at www.firestonebpco.com.

•SS CREDIT 7.2 : Heat Island Effect: Roof (1 pt.)

The intent of SS Credit 7.2 is to reduce the heat islands to minimize the impact on the environment.

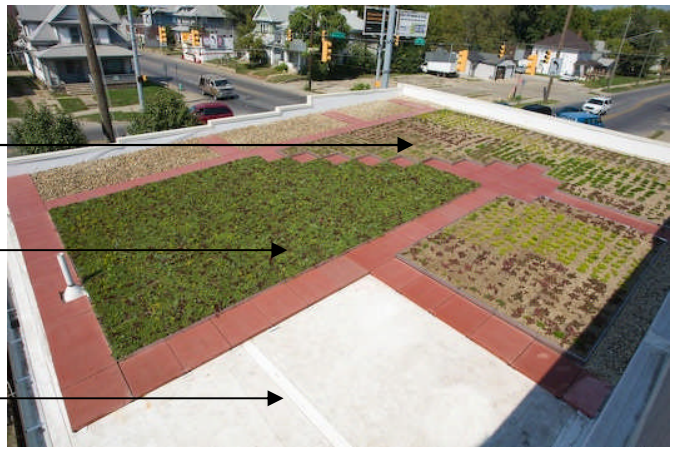
There are three options to fulfill this requirement as follows:

Option 1: Use Roofing Materials have a Solar Reflective Index (SRI) equal or greater than the following table for 75% of the roof surface:

Roof Type	Slope	SRI
Low Sloped Roof	≤ 2:12	78
High Sloped Roof	> 2:12	29

Option 2: Install a Vegetated Roof for at least 50% of the roof area

Option 3: Install high albedo and vegetated roof surface that meet the following criteria (Area of SRI Roof / 0.75) + (Area of vegetated Roof / 0.50) ≥ Total Roof Area



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Solar Reflective Index:

The Solar Reflective index is a measure of the constructed surface's ability to reflect solar heat. To calculate the SRI for a given material, you must obtain the reflectance (ASTM E 903) and Emittance (ASTM E 408) values for a specific product. Once these values have been determined The SRI can be calculated using ASTM E 1980.

Please refer to tables 2 and 2A for a listing of Firestone Roofing products that have been tested by the Cool Roof Rating Council. Table 2 products qualify for Low Slope Roofing and Table 2A qualify for Steep Slope Roofing:

- UltraPly TPO – White
- ReflexEON UltraPly TPO – White
- UltraPly TPO XR – White
- Acylitop PC-100 Top Coat
- SBS Metal Flash AL
- Metals

Cool Roof Rating Values

(Table 2)

Product Name and Product ID*	Solar Reflectance	Thermal Emittance	Solar Reflective Index
ReflexEON TPO White (0608-0014)	0.84	0.83	105
UltraPly TPO White (0608-0008)	0.79	0.85	98
UltraPly TPO Tan (0608-0015)	0.60	0.81	69
UltraPly TPO XR White (0608-0016)	0.79	0.78	96
Acrylitop PC-100 White (0608-0003)	0.82	0.87	102
Acrylitop PC-100 Tan (0608-0002)	0.53	0.88	62
Acrylitop PC-100 Gray (0608-0001)	0.32	0.88	34
Acrylitop PC-100 Base (0608-0006)	0.60	0.88	71
SBS Metal Flash AL (0608-0009)	0.81	0.44	92
RubberGard EcoWhite EPDM (0608-0014)	0.80	0.84	99
Aluminum Fibered Coating (0608-0013)	0.67	0.38	66
APP 180 White (0608-0011)	0.31	0.87	32
APP 180 FR White (0608-0019)	0.31	0.89	33
APP 180 COOL White (0608-0020)	0.30	0.88	31
APP 180 FR COOL White (0608-0018)	0.32	0.87	33
APP Premium White (0608-0017)	0.32	0.88	34
SBS Granule White (0608-0012)	0.31	0.88	32
SBS FR Cap (0608-0026)	0.31	0.89	33
SBS Premium White (0608-0024)	0.30	0.88	31
SBS Premium FR White (0608-0023)	0.29	0.88	30
SBS Torch White (0608-0022)	0.31	0.88	32

Product Name and Product ID	Solar Reflectance	Thermal Emittance	Solar Reflective Index
SBS FR Torch White (0608-0021)	0.31	0.88	32
SBS Premium FR Torch (0608-0025)	0.32	0.88	34
Fluropon Sandstone 0806-0007	0.51	0.84	58
Fluropon Bone White 0806-0006	0.70	0.84	85
Fluropon Regal White 0806-0008	0.70	0.85	85
Fluropon Cityscape 0806-0004	0.35	0.84	36
Fluropon Solar White 0806-0003	0.70	0.85	85
Fluropon Stone White*	0.57	0.86	67
Fluropon Almond*	0.57	0.86	67
Fluropon Sierra Tan*	0.35	0.86	37
Fluropon Terra Cotta*	0.34	0.87	36
Fluropon Regal Red*	0.42	0.84	45
Fluropon Classic Copper*	0.42	0.86	46
Fluropon Champagne Metallic*	0.37	0.83	38
Fluropon Silver Metallic*	0.59	0.77	67

NOTE: Solar Reflectance and Emittance Values were taken from Energy Star and Cool Roof Rating Council.
**** Indicates Energy Star values.***

ENERGY AND ATMOSPHERE

•EA CREDIT 1: Optimize Energy Performance (1-10 pts)

The intent of EA Credit 1 is to achieve higher levels of energy performance throughout the entire building to reduce the environmental impacts for Energy overuse. In order to comply with this credit and to achieve the maximum number of points, the building must show a percentage increase in energy savings per ASHREA/ESNA.

Firestone Solution: The use of Firestone ISO 95+ roofing insulation can significantly add to the overall performance of the building's energy savings. In addition, the use of a Reflective or Vegetative Roof Systems can also increase the overall efficiency of the building.

Note: It is important to consider that Northern States may benefit from RubberGard EPDM due to the increased heating days.

MATERIALS AND RESOURCES

•MR CREDIT 2.1: Construction Waste Management: Divert 50% from Disposal (1 pt.)

The intent of MR Credit 2.1 is to Divert construction debris from disposal in landfills by recycling resources back into the manufacturing process. The goal of this credit is to recycle or salvage at least 50% of construction or demolition debris.

•MR CREDIT 2.2: Construction Waster Management: Divert 75% from Disposal (2 pts.)

The intent of MR Credit 2.1 is to divert construction debris from disposal in landfills by recycling resources back into the manufacturing process. The goal of this credit is to recycle or salvage at least 75% of construction or demolition debris.

Firestone Solution: Firestone currently has embarked on an EPDM recycling program. This program includes the Recycling of Ballasted or Mechanically Attached EPDM. For addition information please contact Firestone Building Products at 1-800-428-4511.

•MR CREDIT 3.1: Material Reuse: 5% (1 pt.)

The intent of MR Credit 3.1 is to reuse building materials in order to reduce waste. Salvaged materials should constitute a minimum of 5% based on cost of the total value of materials on the project.

•MR CREDIT 3.2: Material Reuse: 10% (2 pts.)

The intent of MR Credit 3.1 is to reuse building materials in order to reduce waste. Salvaged materials should constitute a minimum of 10% based on cost of the total value of materials on the project.

Firestone Solution: Firestone suggests opportunities in re-using ballast, insulation (non wet or damaged).

•MR CREDIT 4.1 Recycle Content: 10% (1 pt.)

The intent of MR Credit 4.1 is to increase the demand for building products that incorporate recycle content. Recycled material should constitute at least 10% based on the total value of the materials on the project.

•MR CREDIT 4.2 Recycle Content: 20% (2 pt.)

The intent of MR Credit 4.1 is to increase the demand for building products that incorporate recycle content. Recycled material should constitute at least 20% based on the total value of the materials on the project.

Firestone Solution: Firestone, in a an effort to meet this requirement uses the following amounts of post industrial and post consumer waste: (metals may have more accurate percentages given if requested at time of order placement)

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MR CREDIT 4.1 AND 4.2: RECYCLED CONTENT
(Table 3)

Firestone Product	Post Industrial Waste	Post Consumer Waste
ReflexEON TPO White	15%	0%
UltraPly TPO White	15%	0%
UltraPly TPO Tan	15%	0%
UltraPly TPO XR White	15%	0%
Acrylitop PC-100 White	0%	0%
Acrylitop PC-100 Tan	0%	0%
Acrylitop PC-100 Gray	0%	0%
Acrylitop PC-100 Base	0%	0%
SBS Metal Flash AL	0%	0%
Aluminum Fibered Coating	0%	0%
APP 180 White	0%	6%
APP 180 FR White	0%	6%
APP 180 COOL White	0%	6%
APP 180 FR COOL White	0%	6%
APP Premium White	0%	6%
SBS Granule White	0%	4%
SBS FR Cap	0%	4%
SBS Premium White	0%	5%
SBS Premium FR White	0%	5%
SBS Torch White	0%	3%
SBS FR Torch White	0%	3%
SBS Premium FR Torch	0%	5%
RubberGard EPDM	0%	0%
ISO 95+ Insulation	Average 19% (thickness dependant)	Average 15% (thickness dependant)
Steel (Galvanized and Galvalume)	7.3%	23%
Aluminum Painted (3xxx)	Up to 100% scrap between the two	
Aluminum Anodized (5005)	30 – 60% varies between the two	
Copper	82 – 95%	
Zinc (total recycle content)	30 - 40%	
If more accurate recycle content is required contact Firestone Building Products prior to order placement.		

Note: a) Please understand that this is only a small amount of Firestone materials that may be used on a Roofing assembly.
b) For further recycled contents please refer to the corresponding Technical Information Sheet (T.I.S.) located at www.firestonebpco.com.
c) True recycle content of a metal order may be requested at time of order placement and the information specific to that metal coil will be furnished. Some limitations apply, contact Firestone Building Products.

MR CREDIT 5.1: Regional Materials: 10% Regional Manufacturing (1 pt.)

The intent of MR Credit 5.1 is to increase demand for local products and reducing the environmental impacts from transportation. This credit is achieved by using a minimum of 10% of the materials of the total sum of the building that have been manufactured within 500 miles of the project.

MR CREDIT 5.2: Regional Materials: 10% Regional Manufacturing (2 pts.)

The intent of MR Credit 5.2 is to increase demand for local products and reducing the environmental impacts from transportation. This credit is achieved by using a minimum of 20% of the materials of the total sum of the building that have been manufactured within 500 miles of the project.

Firestone Solution: Firestone currently has 21 manufacturing plants across the country in order to bring the highest quality products close to home.

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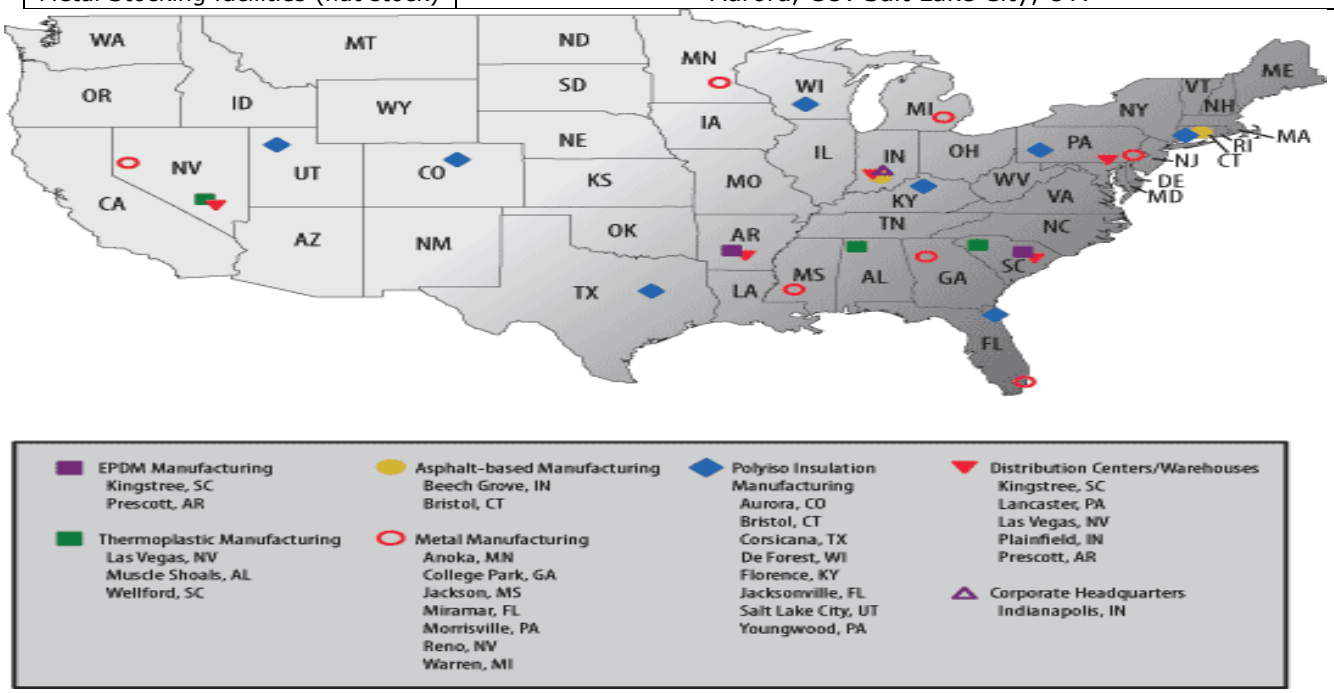
MR CREDIT 5.1 AND 5.2: RECYCLED CONTENT
(table 4)

Firestone Product	Manufacturing Location
ReflexEON TPO White	Muscle Shoals, AL
UltraPly TPO White	Muscle Shoals, AL; Wellford, SC; Las Vegas, NV
UltraPly TPO Tan	Muscle Shoals, AL; Wellford, SC; Las Vegas, NV
UltraPly TPO XR White	Muscle Shoals, AL
Acrylitop PC-100 White	Garland, TX; Huntington Park, CA; Barlow, FL
Acrylitop PC-100 Tan	Garland, TX; Huntington Park, CA; Barlow, FL
Acrylitop PC-100 Gray	Garland, TX; Huntington Park, CA; Barlow, FL
Acrylitop PC-100 Base	Garland, TX; Huntington Park, CA; Barlow, FL
SBS Metal Flash AL	San Juan, PR
Aluminum Fibered Coating	Detroit, MI
APP 180 White	Beech Grove, IN
APP 180 FR White	Beech Grove, IN
APP 180 COOL White	Beech Grove, IN
APP 180 FR COOL White	Beech Grove, IN
APP Premium White	Beech Grove, IN
SBS Granule White	Beech Grove, IN
SBS FR Cap	Beech Grove, IN
SBS Premium White	Beech Grove, IN
SBS Premium FR White	Beech Grove, IN
SBS Torch White	Beech Grove, IN
SBS FR Torch White	Beech Grove, IN
SBS Premium FR Torch	Beech Grove IN
RubberGard EPDM	Prescott, AR; Kingstree, SC
ISO 95+ Insulation	Aurora, IL; Bristol, CT; Corsicana, TX; Florence, KY; Deforest, WI; Jacksonville, FL; Salt Lake, UT; Youngwood, PA
FiberTop Woodfiber	International Falls, MN; Jarrat, VA; Marrero, LA; Sunbury, PA; Danville, VA
Metal Roofing Products Plants	Anoka, MN; College Park, GA; Jackson, MS; Morrisville, PA; Miramar, FL; Reno, NV; Warren, MI
Metal Stocking facilities (flat stock)	Aurora, CO: Salt Lake City, UT:



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Conclusions :

It is important to remember that the roofing assembly plays a minimal part in the overall certification of a LEED certified project. However everyone from Architects, real estate professionals, facility managers, engineers, construction managers and manufactures play a integral part in obtaining LEED certification. Firestone is committed to assist anyone who is interested in obtaining any further information on our products listed above.

For further information please refer to the following links:

www.firestonebpco.com	Firestone Building Products Main page
http://manual.fsbp.com/technicalresources	Firestone Building Products Technical Database
http://www.usgbc.org/	U.S. Green Building Council
www.coolroofs.org	Cool Roof Rating Council

Note: LEED is a registered trademark of the U.S. Green Building Council

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