




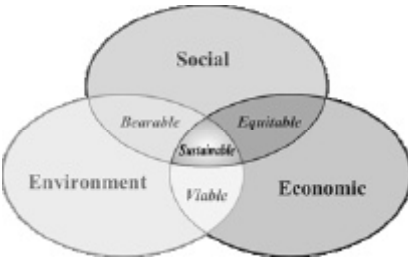


	<h2 style="text-align: center;">Sustainable Hardscape Design: LEED</h2>
<p>NECMA Continuing Education System</p>	<p style="text-align: center;">Program Code: FTHSDL</p>
<p style="text-align: center;">1</p>	 <p style="text-align: right; font-size: small;">NEW ENGLAND CONCRETE MASONRY ASSOCIATION</p>

	<h2 style="text-align: center;">AIA Disclaimer Notice</h2>
<p>Continuing Education System</p> <p style="text-align: center;">2</p>	<p>The New England Concrete Masonry Association is a registered provider with the American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of completion for non-AIA members are available on request.</p> <p>This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.</p>

	<h2 style="text-align: center;">Learning Objectives</h2>
<p>Continuing Education System</p> <p style="text-align: center;">3</p>	<ul style="list-style-type: none"> ▪ The meaning and importance of “sustainable building” practices ▪ How the U.S. Green Building Council’s LEED system functions ▪ How concrete masonry and hardscape products apply to LEED-registered projects ▪ What tools are available to you ▪ Future trends in sustainable building

	<h2>Sustainable Building</h2>
<p>Continuing Education System</p>	<p>Sustainable development — meet needs of the present without compromising the ability of future generations to meet their own needs.</p> <p>Green building — provides specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional, and global ecosystems both during and after its construction and specified service life. A green building optimizes efficiencies in resource management and operational performance; and, minimizes risks to human health and the environment.</p> <p style="text-align: right;"><i>Ref. ASTM E2114 06</i> <small>Standard Terminology for Sustainability Relative to the Performance of Buildings</small></p>

	<h2>Sustainable Design Goals</h2>
<p>Continuing Education System</p>	 <p style="text-align: right;"><small>Author: Johann Dreo</small></p>

	<h2>Buildings' Influence on the Environment</h2>
<p>Continuing Education System</p>	 <p style="text-align: right;"><small>Source: U.S. Green Building Council (USGBC) GreenSource 2008</small></p>

Buildings' Influence on the Environment

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MATERIAL RESOURCES

ENERGY

WATER

MATERIAL ACQUISITION
Raw Material Acquisition
Manufacturing
Products / Assemblies

BUILDING CONSTRUCTION (manufacturing)
OCCUPANCY (use, reuse, maintenance)

DEMOLITION / DISPOSAL
Products / Material
Recycle / Reuse
Waste Management

EMISSIONS TO: AIR

WATER

LAND

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Hardscapes' Influence on the Environment

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The Heat Island Effect

Late afternoon temperature (°C)

Rural Suburban Commercial Downtown Urban Park Suburban Rural
Residential Residential Residential Farmland

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Achieving Sustainable Projects

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- US Green Building Council's **LEED**
- Use **LEED** without applying for certification
- Green Building Initiative's **Green Globes**
- Set your own goals


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What is LEED?

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Our Mission
 To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life.

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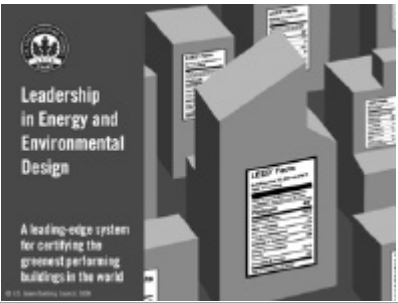
What is LEED?

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Leadership in Energy and Environmental Design

A leading-edge system for certifying the greenest performing buildings in the world

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What is LEED?

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What is Green Building?

Site Planning, Water Conservation, Energy, Water Management

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Some Current LEED Rating Systems

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LEED 2009

- LEED – NC : new construction and major renovations
- LEED – EB : existing buildings operations & maintenance
- LEED – CI : commercial interiors
- LEED – CS : core and shell
- LEED – S : schools
- LEED – H : homes

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The Next Generation of LEED

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LEED 2009

- Total of 100 possible points (up from 69)
- Points redistributed within categories, based on key environmental and human health impacts
- Reduce confusion about which rating system to use
- Scheduled to roll out in March 2009

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LEED 2009

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Category	Percentage
Energy & Atmosphere	35%
Sustainable Sites	26%
Indoor Environmental Quality	15%
Materials & Resources	14%
Water Efficiency	10%

Plus:
 4 Region-specific bonus credits
 6 Innovation & Design credits

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LEED 2009

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TRACI
Tool for the Reduction & Assessment of Chemical and other Environmental Impacts

- **Climate Change**
- Resource Depletion
- Human Health Criteria
- Water Intake
- Human Health / Cancerous
- Ecotoxicity
- Eutrophication
- Habitat Alteration
- Human Health / Non-cancerous
- Smog Formation
- Acidification
- Indoor Air Quality
- Ozone Depletion

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LEED 2009

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100 - total possible points

80 - platinum

60 - gold

50 - silver

40 - certified

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The USGBC Certifies...

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Building projects



not building materials



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Can I Earn a Point for Using CM Products?

NO

- All of the points related to masonry require that the *entire building* be considered in the calculation.
- Sustainably-harvested wood is the only credit where using a single material can earn 1 point.

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Can CM Products Contribute Towards Points?

YES

Concrete masonry and hardscape products can contribute to credits in:

- Sustainable Sites
- Energy & Atmosphere
- Materials & Resources
- Innovation & Design

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Potential LEED Points



Category	Masonry	All
Sustainable Sites	5	14
Water Efficiency	0	5
Energy & Atmosphere	10	17
Materials & Resources	4	13
Indoor Environmental Quality	0	15
Innovation & Design	4	5


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	<h2 style="text-align: center;">Concrete: It's Sustainable!</h2>
<p>Continuing Education System</p> <p style="text-align: right;">22</p>	<p>Background:</p> <ul style="list-style-type: none"> - Concrete is as old as the Romans - It's a simple mixture of readily available ingredients - It's stable, durable, and flexible - It addresses today's concerns about saving energy, using resources wisely and being good stewards of the environment - It can be recycled - It can be used anywhere -from buildings, to roads, to hardscape surfaces, to defining landscapes in decorative ways

	<h2 style="text-align: center;">Hardscape Surfaces</h2>
<p>Continuing Education System</p> <p style="text-align: right;">23</p>	<p>Concrete versus Asphalt:</p> <ul style="list-style-type: none"> - Asphalt <ul style="list-style-type: none"> • Petroleum based product - Concrete <ul style="list-style-type: none"> • Made from readily available materials <ul style="list-style-type: none"> - Water - Aggregate - Portland Cement • It's stronger and lasts longer • Better reflectivity for heat island effect reduction




	<h2 style="text-align: center;">SRW's, Hardscape and LEED</h2>
<p>Continuing Education System</p> <p style="text-align: right;">24</p>	




	<h2 style="text-align: center;">Sustainable Sites in Context</h2>
<p>Continuing Education System</p> <p style="text-align: center;">25</p>	<ul style="list-style-type: none"> • Buildings and engineered sites have an inherent relationship with their surrounds <ul style="list-style-type: none"> - We need to be good stewards of the environment • Development affects ecosystems in a variety of ways: <ul style="list-style-type: none"> - Can encroach on wildlife habitat - Increased impervious surface can disrupt natural water flows/ground water recharge - Sedimentation runoff and buildup can effect aquatic ecosystems - Increased lighting can disrupt nocturnal ecology - Increase heat island effect • Development affects people's daily life <ul style="list-style-type: none"> - Travel to and from for work, play and shopping results in emissions to air and water




	<h2 style="text-align: center;">Sustainable Sites - 14 points</h2>
<p>Continuing Education System</p> <p style="text-align: center;">26</p>	<p>Prereq 1 - Construction Activity Pollution Prevention</p> <p>Credit 1 - Site Selection</p> <p>Credit 2 - Development Density & Community Connectivity</p> <p>Credit 3 - Brownfield Redevelopment</p> <p>Credit 4 - Alternative Transportation</p> <p>Credit 5 - Site Development</p> <p>Credit 6 - Stormwater Design</p> <p>Credit 7 - Heat Island Effect</p> <p>Credit 8 - Light Pollution Reduction</p> <div style="text-align: right;">  </div>

	<h2 style="text-align: center;">Sustainable Sites</h2>
<p>Continuing Education System</p> <p style="text-align: center;">27</p>	<p>Prerequisite 1: Construction Activity Pollution Prevention</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>


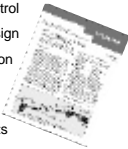
	<h2>Sustainable Sites</h2>
<p>Continuing Education System</p>	<p>Credit 2 : Development Density & Community Connectivity Credit 5 : Site Development 5.2 - Maximize Open Space</p> <div style="display: flex; justify-content: space-around;">   </div>
<p>28</p>	

	<h2>Sustainable Sites</h2>
<p>Continuing Education System</p>	<p>Credit 6 : Stormwater Design 6.1 Quantity Control</p> <div style="display: flex; justify-content: space-around;">   </div>
<p>29</p>	


	<h2>Sustainable Sites</h2>
<p>Continuing Education System</p>	<p>Credit 6 : Stormwater Design 6.2 Quality Control</p> <div style="display: flex; justify-content: space-around;">   </div>
<p>30</p>	

	<h2>Sustainable Sites</h2>
	<p>Continuing Education System</p> <p>Credit 7 : Heat Island Effect 7.1 Non-Roof</p> <div style="display: flex; justify-content: space-around;">   </div>

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	<h2>Sustainable Sites</h2>
	<p style="text-align: center;">Check out NCMA TEK Section 11</p> <p> 11-9A Articulated Concrete Block for Erosion Control 11-12 Articulating Concrete Block Revetment Design 11-13 Articulating Concrete Block (ACB) Installation </p> <p>As well as ICPI Tech Specs</p> <p>2 Construction of Interlocking Concrete Pavements</p> <p>8 Concrete Grid Pavements</p> <p>9 Guide Specification for the Construction of Interlocking Concrete Pavement</p> <p>10 Application Guide for Interlocking Concrete Pavements</p> <p>16 Achieving LEED Credits with Segmental Concrete Pavement</p> 

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	<h2>Materials & Resources In Context</h2>
	<p>Continuing Education System</p> <ul style="list-style-type: none"> • Construction and demolition waste accounts for 40% of the total solid waste stream in the United States <ul style="list-style-type: none"> - 136 million tons annually - If it's not recycled, it goes to a landfill <ul style="list-style-type: none"> • If it's not organic, it doesn't break down • The amount of embodied energy to construct a new 250,000 ft² office building: <ul style="list-style-type: none"> - 3.75 million gallons of gasoline <ul style="list-style-type: none"> • 15 gallons of gasoline per square foot • The amount of embodied energy in an existing building: <ul style="list-style-type: none"> - Between 5 to 15 gallons of gasoline per square foot • Embodied Energy, what is it: <ul style="list-style-type: none"> - Simply, the energy required to extract, process, manufacture, transport, and install building materials.

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	Materials and Resources - 13 Points
	<p>Continuing Education System</p> <p>Prereq 1 - Storage and Collection of Recyclables</p> <p><i>Credit 1 - Building Reuse</i> Credit 2 - Construction Waste Management Credit 3 - Materials Reuse Credit 4 - Recycled Content Credit 5 - Regional Materials</p> <p>Credit 6 - Rapidly Renewable Materials Credit 7 - Certified Wood</p>


	Materials and Resources
	<p>Continuing Education System</p> <p>Credit 2 - Construction Waste Management</p> <p>Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.</p> <p>Credit 3 - Materials Reuse</p> <p>Use salvaged, refurbished or reused materials</p>

	Materials and Resources
	<p>MR Credit 4 - Recycled Content</p> <ul style="list-style-type: none"> • Goal: Increase demand for materials that incorporate recycled materials. • Strategy: Use salvaged, refurbished or reused materials. • Requirements: Sum of all post-consumer + ½ the pre-consumer recycled content is at least 10% (20%) of the total <i>value</i> of the materials in the project.

	<h2 style="text-align: center;">Materials and Resources</h2> <h3 style="text-align: center;">MR Credit 4 – Recycled Content</h3>
<p style="font-size: small;">Continuing Education System</p> <p style="text-align: right; font-size: x-small;">37</p>	<p>Post consumer: material which has been used directly by consumers, recycled, and then reused for another purpose.</p>  <p>Examples: crushed concrete from demolition, recycled bottle glass</p>

	<h2 style="text-align: center;">Materials and Resources</h2> <h3 style="text-align: center;">MR Credit 4 – Recycled Content</h3>
<p style="font-size: small;">Continuing Education System</p> <p style="text-align: right; font-size: x-small;">38</p>	<p>Pre-consumer (post-industrial): material that is diverted from the waste stream during the manufacturing process</p> <p>Examples: fly ash, slag cement, bottom ash</p> <p>Manufactured fine aggregate?</p>

	<h2 style="text-align: center;">Materials and Resources</h2> <h3 style="text-align: center;">MR Credit 4 – Recycled Content</h3>
<p style="font-size: small;">Continuing Education System</p> <p style="text-align: right; font-size: x-small;">39</p>	<p>The <i>producer</i> reports % post-consumer and % pre-consumer, based on weight:</p> <p>% post-consumer = $\frac{\text{Weight of Post-Consumer Recycled Content}}{\text{Total Material Weight}}$</p> <p>% pre-consumer = $\frac{\text{Weight of Pre-Consumer Recycled Content}}{\text{Total Material Weight}}$</p>



Materials and Resources MR Credit 4 – Recycled Content


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The *project team* determines the recycled content value for the project as a whole.

For *each material* in the project:
 Recycled content % = All post-consumer + ½ pre-consumer
 Recycled content value = Recycled content % x Material Cost

For the *project as a whole*:
 Recycled content % = $\frac{\text{Sum of all recycled content values}}{\text{Total materials cost}}$

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Materials and Resources MR Credit 4 – Recycled Content

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Sand and Gravel	2,030 lb	
Bottom Ash	1,000 lb	<div style="border-top: 1px solid black; border-bottom: 1px solid black; height: 40px; margin: 0 auto;"></div>
Portland Cement	400 lb	
Fly Ash	70 lb	
Total	3,500 lb	
Pre-consumer Recycled Content	1,070 lb	<div style="border-top: 1px solid black; border-bottom: 1px solid black; height: 20px; margin: 0 auto;"></div>
	30.6% by weight	

LEED Credit for Recycled Material = 15%

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Materials and Resources MR Credit 4 – Recycled Content

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Component:	Virgin Materials		Recycled Materials				Totals	
	Weight, lb		Pre-consumer Weight, lb	Pre-consumer %	Post-Consumer Weight, lb	Post-Consumer %	lb	%
Sand and gravel	1,800		0	0.0%	0	0.0%	1,800	59.2%
Other aggregate	50		0	0.0%	0	0.0%	50	1.6%
Portland cement	50		0	0.0%	0	0.0%	50	1.6%
Fly ash			80	2.6%	0	0.0%	80	2.6%
Other cement replacement			0	0.0%	0	0.0%	0	0.0%
Water ¹	0		0	0.0%	26	0.9%	26	0.9%
Slag			500	16.4%	0	0.0%	500	16.4%
Bottom ash			300	9.9%	0	0.0%	300	9.9%
Glass			0	0.0%	55	1.8%	55	1.8%
Crushed returns			80	2.6%	0	0.0%	80	2.6%
Ready-mix returns			100	3.3%	0	0.0%	100	3.3%
Other			0	0.0%	0	0.0%	0	0.0%
Total							3,041	100.0%

Both of these percentages: Pre-consumer: 34.9% Post-consumer: 7.7%
 and the total cost for CMU are to be reported to the design team.

User-entered weights

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 Continuing Education System	<h2>For More Information</h2>
	<p>National Concrete Masonry Association www.ncma.org</p> <p>U.S. Green Building Council Leadership in Energy and Environmental Design www.usgbc.org</p> <p>Environmental Council of Concrete Organizations www.ecco.org</p> <p>Sustainable Buildings Industry Council www.sbicouncil.org</p>

 Continuing Education System	<h2>Questions</h2>
	<p style="text-align: center;">Thank you for your time!</p> <p style="text-align: center;">This concludes the American Institute of Architects Continuing Education Systems Program.</p> <div style="text-align: center;">  </div> <p style="text-align: center;"> P.O. Box 448 9 Main Street, Suite 2B-2 Manchaug, Massachusetts 01526-0448 Phone 508-476-3466 Fax 508-476-3467 www.necma.com </p>
