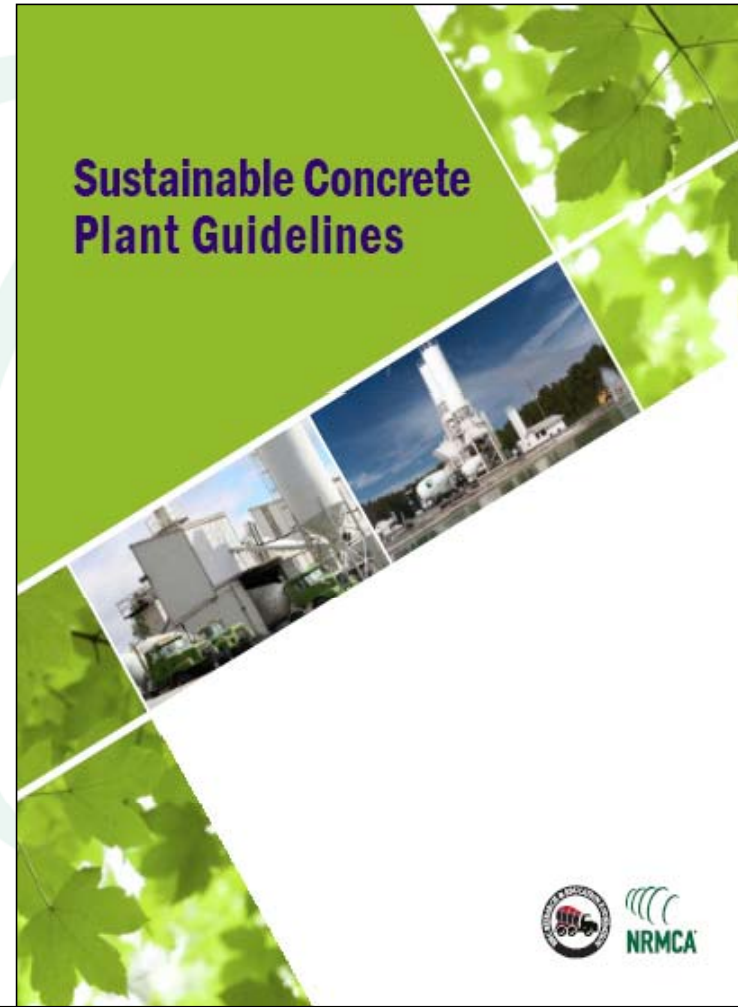

Sustainable Concrete Plant Certification

Lionel Lemay, PE, SE, LEED AP
Sr. VP, Sustainable Development

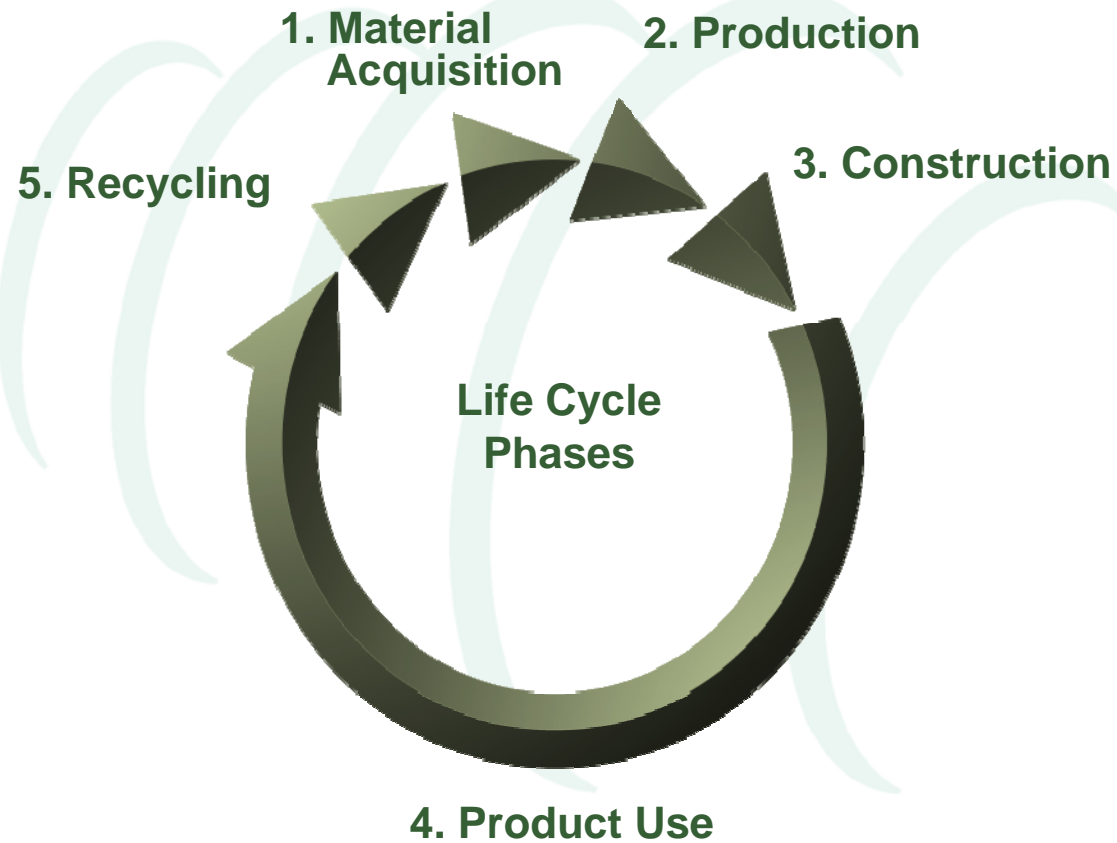


Sustainable Concrete Plant Guidelines

- Voluntary program
- Provides guidance to producers
- Measures concrete plant sustainability
- Verifies implementation
- Provides recognition
- Applicable Worldwide



Credit Categories



Impact Categories



Embodied Energy



Carbon Footprint



Water Use



Waste

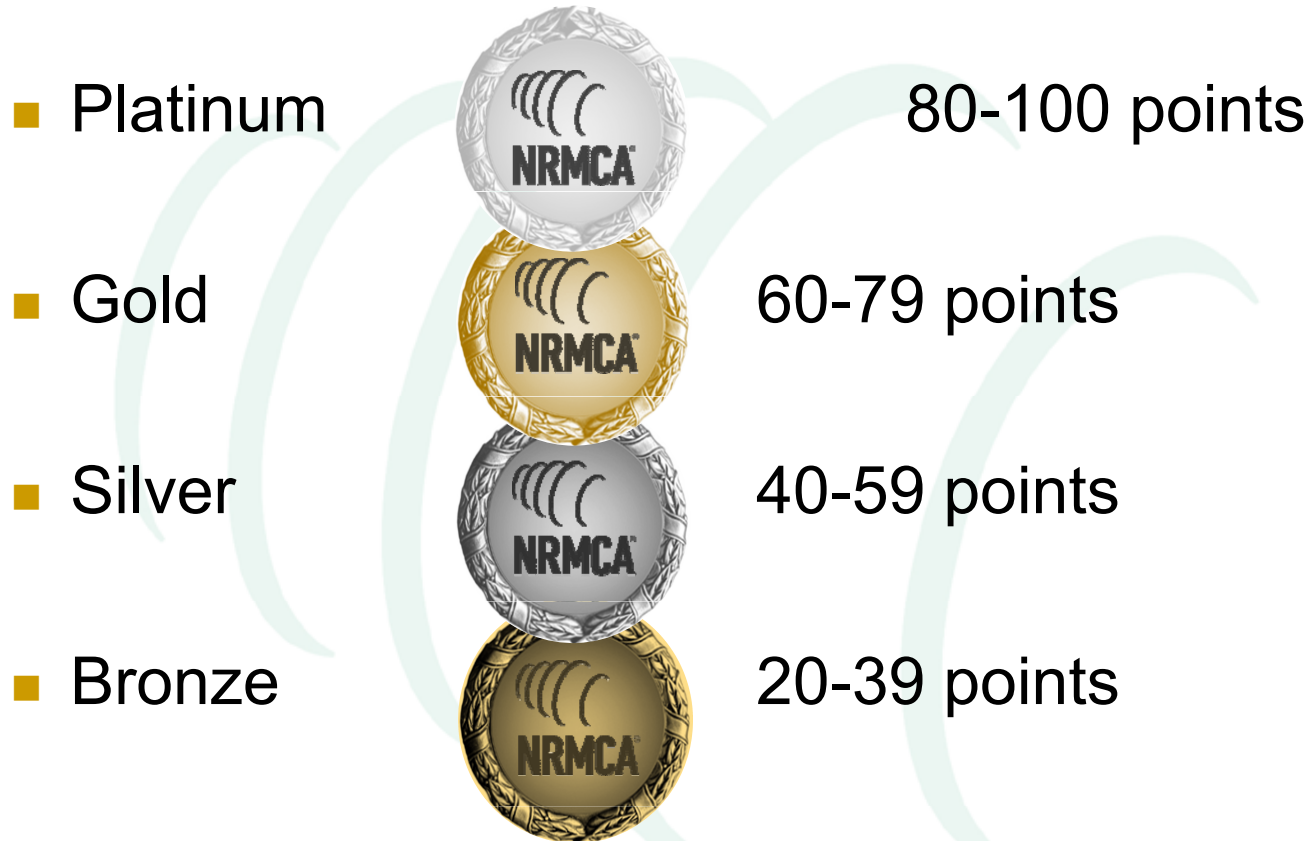


Recycled Content



Social Concerns and Human Health

Sustainability Levels



Sustainability Credits

Category	Points
Prerequisites	0
Material Acquisition	16
Production	52
Construction	13
Product Use	6
Recycling	8
Additional Points	5
Total Points	100

Prerequisites

Prerequisite 1: Comply with federal, state, and local environmental regulations

0

Prerequisite 2: Environmental Management System (EMS) implemented: NRMCA Green-Star, ISO 14001

0

Prerequisite 3: Energy audit by independent party or regional utility

0

Prerequisite 4: Indicate measures taken by plant to mitigate, control, or contain environmental hazards

0

1. Material Acquisition

Credit 1.1: Recycled Aggregate	4
Credit 1.2: Optimized Portland Cement Use	6
Credit 1.3: Materials Transportation Analysis	4
Credit 1.4: Sustainable Purchasing Plan	2

2. Production

Credit 2.1: Process Dust Emissions Control	3
Credit 2.2: Fugitive Dust Emissions Suppression	3
Credit 2.3: Reduction of Fresh Water Use in Plant Operations	4
Credit 2.4: Reduction of Fresh Water Use in Batching	3
Credit 2.5: Process Water Collection and Treatment	3
Credit 2.6: Stormwater Management	4
Credit 2.7: Proper Storage of Chemical and Petroleum Products	2
Credit 2.8: Secondary Containment of Chemical and Petroleum Products	2

2. Production (cont'd)

Credit 2.9: Employee Training Plan & Emergency Response Procedures	2
Credit 2.10: Reduced Carbon Footprint	6
Credit 2.11: Reduced Annual Operating Energy	6
Credit 2.12: Renewable Electricity Use	4
Credit 2.13: Noise control	2
Credit 2.14: Employee Transportation	2
Credit 2.15: Biodiversity	3
Credit 2.16: Worker Safety	3

3. Construction

Credit 3.1: Fuel Efficiency Improvement	4
Credit 3.2: Fleet Emissions Reduction	5
Credit 3.3: Driver Training	2
Credit 3.4: Green Building Products	2

1. Pervious concrete.
2. Self consolidating concrete (SCC).
3. Flowable fill.
4. Insulated concrete forms (ICFs), insulated tilt-up walls or insulated removable forms.
5. Using “cool” pavements with solar reflectivity index greater than 29.
6. Using concrete to support green roofs (vegetated roofs).
7. High early strength concrete, greater than 4,000 psi at 72 hours..
8. High strength concrete, greater than 8,000 psi.

4. Product Use

Credit 4.1: Green Building Education for Staff	3
Credit 4.2: Green Building Education for Specifiers	2
Credit 4.3: Sustainability Advocacy	1

5. Material Reuse & Recycling

Credit 5.1: Excess Concrete Reduction	3
Credit 5.2: Diversion of Returned Concrete from Disposal	3
Credit 5.3: Other Recycling Initiatives	2

6. Additional Points

Credit 6.1: Additional Points

5

1. Exemplary performance in an existing Guideline credit.
2. Evaluate 50% of mix designs to lower environmental footprint.
3. Sustainable landscaping, only captured rainwater for irrigation.
4. R&D to develop innovative sustainable concrete products.
5. Organized community involvement.
6. Achieving recognition for sustainable practices.
7. Maintaining quality standards - NRMCA Certified Production Facility certification.
8. Other innovative sustainability strategies.

Metrics and Documentation

- Equations
- Worksheets
- Carbon Footprint Calculator (Partial LCA)

Credit 1.1 Recycled Aggregate Credit

$$\text{recycled aggregate (\%)} = \frac{\text{recycled aggregate used (t)}}{\text{total aggregate used (t)}} \times 100$$

≥ 2% recycled aggregate	1 point
≥ 4% recycled aggregate	+1 point
≥ 6% recycled aggregate	+1 point
≥ 8% recycled aggregate	+1 point

Credit 2.1: Process Dust Emissions Control

Complete Process Emissions Worksheet

≥ 50% weighted process emission controls	1 point
≥ 75% weighted process emission controls	+1 point
≥ 90% weighted process emission controls	+1 points

Process Emissions Worksheet

Point source emissions	weight	
Cement delivery to silo*		
Silo top baghouse or silo vented to central vacuum collector system	No	5%
Silo equipped with overfill warning system	No	15%
Silo equipped with high pressure protection system (pinch valve/alarm)	No	5%
SCM delivery to silo*		
Silo top baghouse or silo vented to central vacuum collector system	No	5%
Silo equipped with overfill warning system	No	15%
Silo equipped with high pressure protection system (pinch valve/alarm)	No	5%
Cement/SCM weigh batchers		
Weigh batcher vented to batcher filter vent or vented to central dust collector (direct or indirect)	No	5%
Fines collected in the dust collectors are recycled	No	5%
Coarse and fine aggregate transfer to conveyor		
Transfer underground or transfer point enclosed, or conveyor covered	No	5%
Coarse and fine aggregate transfer to elevated storage		
Plant enclosed or transfer point enclosed	No	5%
Truck loading hopper		
Hopper is surrounded (3 sides) by shroud and is vented to a central dust collector	No	20%
Hopper is equipped with a telescopic boot	No	5%
Spray bar used (in lieu of central dust collector). If central dust collector is present, please mark this "Yes".	No	5%
CONTROLLED PROCESS EMISSION SOURCES	0.00%	

Credit 2.10 Reduced Carbon Footprint

$$\text{CO}_2\text{e (\% below baseline)} = \frac{513 - \text{plant CO}_2\text{e footprint } \left(\frac{\text{kg CO}_2\text{e}}{\text{m}^3} \right)}{513} \times 100$$

Annual CO ₂ e/cy ≥ 5% below baseline	1 point
Annual CO ₂ e/cy ≥ 10% below baseline	+1 point
Annual CO ₂ e/cy ≥ 15% below baseline	+1 point
Annual CO ₂ e/cy ≥ 20% below baseline	+1 point
Annual CO ₂ e/cy ≥ 25% below baseline	+1 point
Annual CO ₂ e/cy ≥ 30% below baseline	+1 point

Carbon Footprint Calculator

■ Input Data

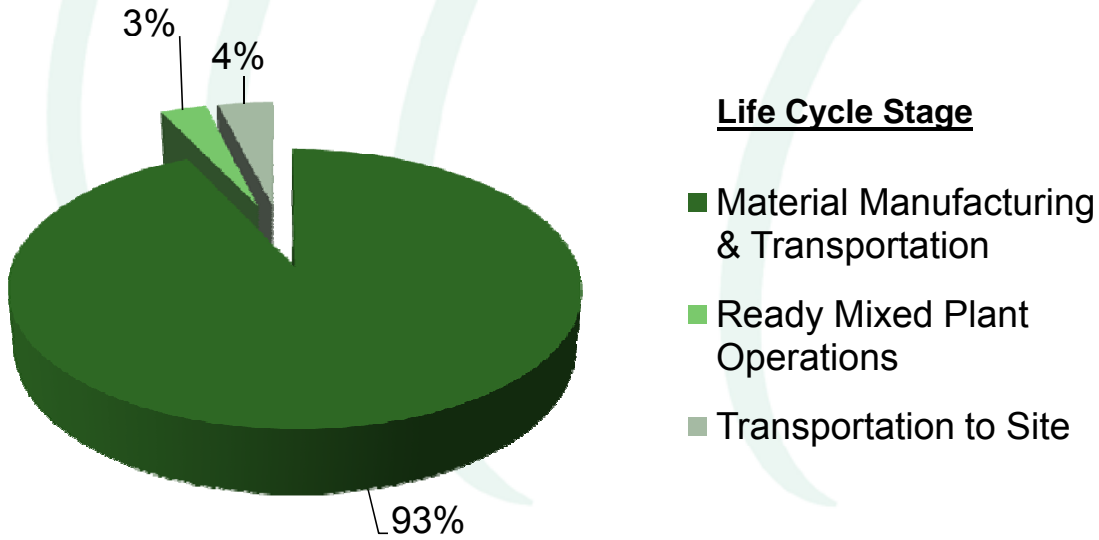
- ❑ Material Purchases
- ❑ Material Transportation
- ❑ Plant Energy Use
- ❑ Fleet Fuel Use

■ Results

- ❑ Plant Annual Carbon Footprint (total and per m³)
- ❑ Plant Annual Energy Use (total and per m³)

SI Units	
Annual Total	Per Unit
17,292 metric tons	452.35 kg/m ³
136,942,629 MJ	3,582.28 MJ/m ³

CO₂e by Life Cycle Stage



$$CO_2e \text{ (\% below baseline)} = \frac{513 - 452.35}{513} \times 100$$

$$CO_2e \text{ (\% below baseline)} = 11.89\%$$

Annual CO ₂ e/cy ≥ 5% below baseline	1 point
Annual CO ₂ e/cy ≥ 10% below baseline	+1 point
Annual CO ₂ e/cy ≥ 15% below baseline	+1 point
Annual CO ₂ e/cy ≥ 20% below baseline	+1 point
Annual CO ₂ e/cy ≥ 25% below baseline	+1 point
Annual CO ₂ e/cy ≥ 30% below baseline	+1 point

This plant would receive 2 points for this credit

Certification Process

- Plant rater (company personnel or consultant) uses guidelines to rate plant
- Collects documentation to demonstrate compliance with credit requirements
- Submits form, claimed rating, documentation and fee to NRMCA
- NRMCA reviews documentation for proper formatting (and returns to submitter for revision)
- Plant personnel corrects submittal and resubmits to NRMCA

Certification Process (cont'd)

- NRMCA sends submittal to auditor
- Auditor reviews documentation for compliance with guidelines (adjusts rating and provides comments)
- NRMCA returns audit to plant rater and resubmits with corrected documentation
- Auditor reviews resubmitted documentation and finalizes the plant rating
- NRMCA awards appropriate certification level

Auditor Qualifications

- Option 1:
 - Registered Professional Engineer
 - NRMCA Certified Environmental Professional
 - Complete 2-hour seminar certification program
- Option 2:
 - 4-year degree in engineering, construction or science
 - 2 years experience in environmental management
 - NRMCA Certified Environmental Professional
 - Complete 2-hour seminar certification program
- Option 3:
 - 5 years experience in environmental management
 - NRMCA Certified Environmental Professional
 - Complete 2-hour seminar certification program

Pilot Program

Rabih Fakhri, Managing Director
Grey Matters Consultancy



Purpose

- Test the guidelines
- Establish if requirements are reasonable
- Explore documentation requirements
- Test third party auditing process

Pilot Results

- 15 plants participated
 - 13 from U.S.
 - 2 from Canada
 - 1 from UAE

- 2 auditors participated
 - One from U.S.A. (Doug Ruhlin)
 - One from UAE (Rabih Fakhri)

Pilot Plants

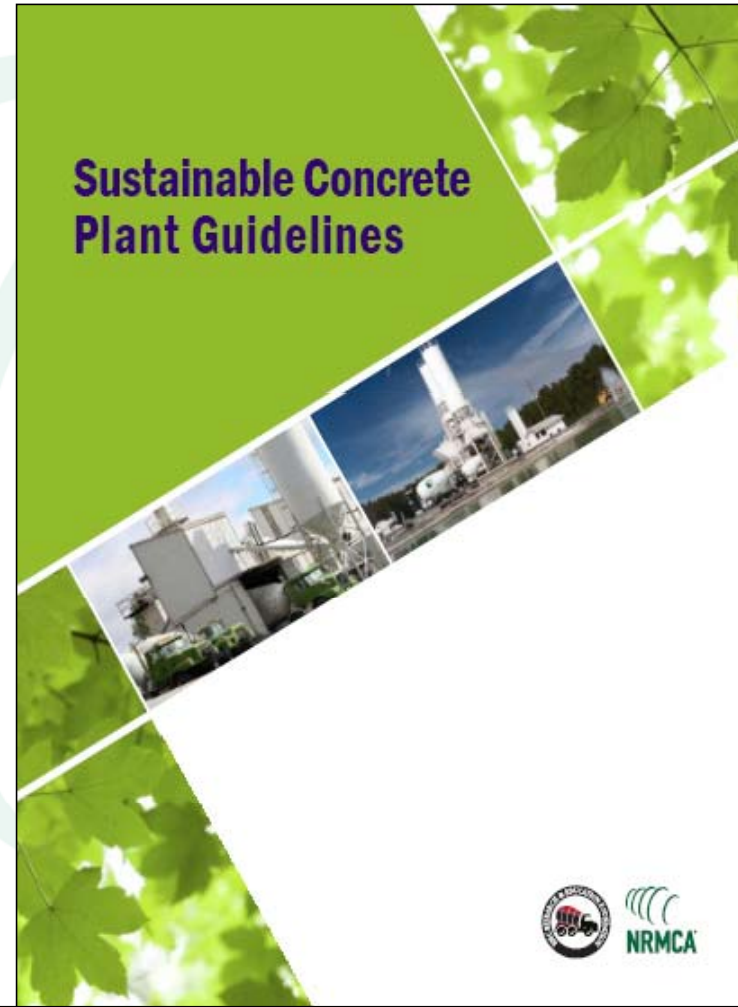
Certification Level	Number of Plants
Not certified (0-19)	0
Bronze (20-39)	5
Silver (40-59)	10
Gold (60-79)	0
Platinum (80-100)	0

Observations

- Documentation requirements must be more specific
- Some credit criteria will need to be adjusted
- Formalize the certification process
- Establish auditor criteria

Next Steps

- Finalize certification process
- Establish auditor criteria
- Launch program in early 2011
- Applicable worldwide



The background is a dark green color with a complex, layered pattern of overlapping geometric shapes, including circles and lines, creating a sense of depth and architectural structure.

www.nrmca.org/sustainability

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