



# Sustainability and Pavement Preservation



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**VP Quality Assurance & Technical Support**



# The Agenda



- Quick presentation of COLAS SA
  - R & D in COLAS
- Ecologiciel
- In place recycling & treatment
- How to implement innovations or new techniques
- Conclusions



# COLAS (COLd ASphalt) in 2008



## ● ID Card

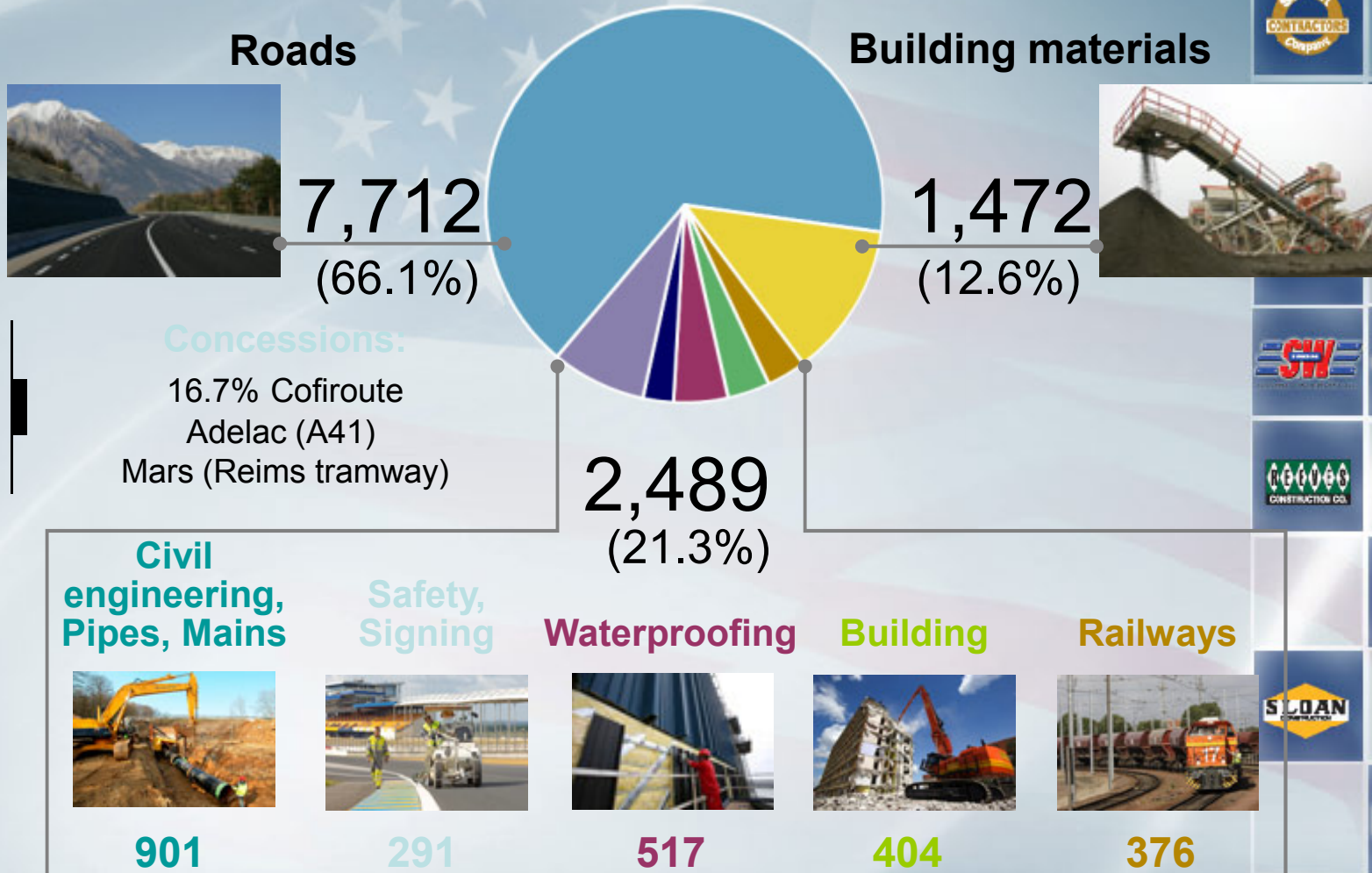
- Turn Over 12.8 Billion Euros / 19 Billion \$
- 74 000 personnel in 40 countries
  - 8000 in North America
- Aggregates 118 Mt
- HMA 52 Mt
- Emulsion 1.5 Mt



# Breakdown of Group activity



in millions of €



**Roads**



**7,712**  
(66.1%)

**Building materials**



**1,472**  
(12.6%)

**Concessions:**

- 16.7% Cofiroute
- Adelac (A41)
- Mars (Reims tramway)

**2,489**  
(21.3%)

**Civil engineering, Pipes, Mains**



**901**

**Safety, Signing**



**291**

**Waterproofing**



**517**

**Building**

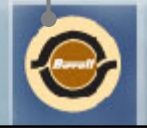


**404**

**Railways**



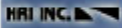
**376**



**1,400** profit centers in **40+** countries  
**110,000** projects around the world



# Scientific & Technical Campus South West of Paris



# Research and Development



- Applied research network:
  - 1,000 engineers, research specialists and technicians worldwide
    - 250 in North America
- 1 Campus for Science and Techniques, certified ISO 9001 and ISO 14000



# Some examples of products





# European Approach



- More and More Performance based compared to the USA
- Innovations are part of the business
- Some owners promote it
- Patents, trademarks,...



# Environment is part of our business



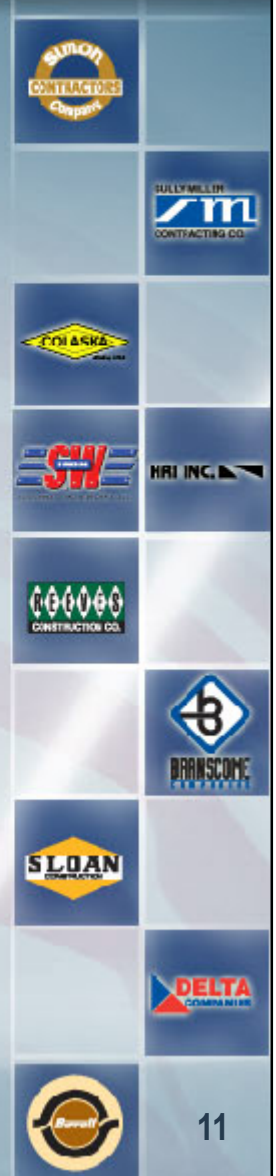
- Thin and ultra thin overlay
- No more tar use even for fuel resistant properties
- Noise abatements systems
  
- Quarries
- HMA plants
- Emulsion plants
  
- Recycling



# What about recycling?



- Cold in place recycling
- RAP
- Recycling centers (PCC, ballast, ...)

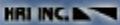


# Positive actions



- What do we do?

- Step by step
- Contractor versus market
- Recycling (no paper tools, RAP, PCC,...)
- Ambassadors in every company in North America
- Cars policy
- Tracking of energy (fuel, gas, natural gas,...)
- Training to save energy (moisture in ACP plant)



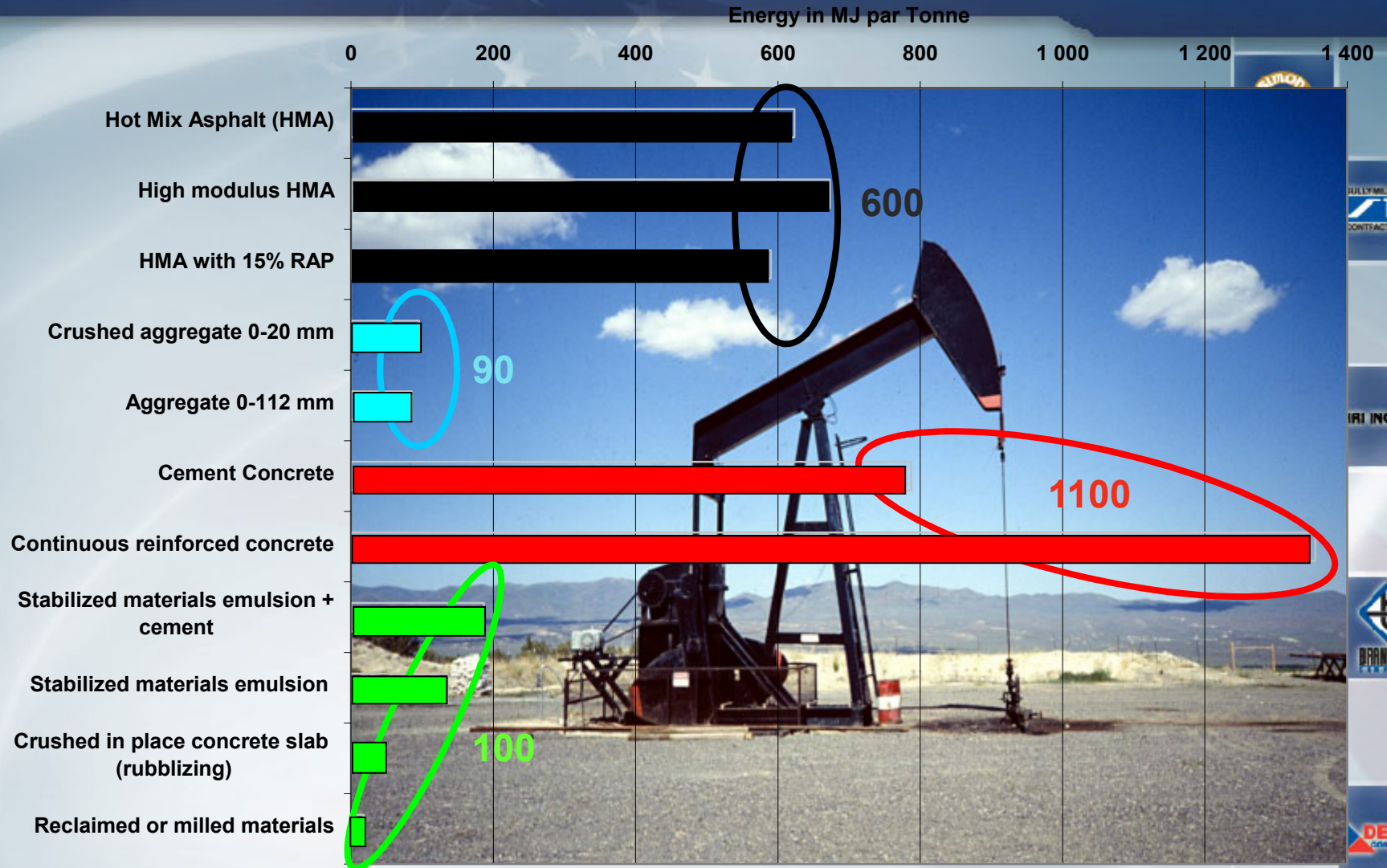
# How to evaluate the effect of recycling?



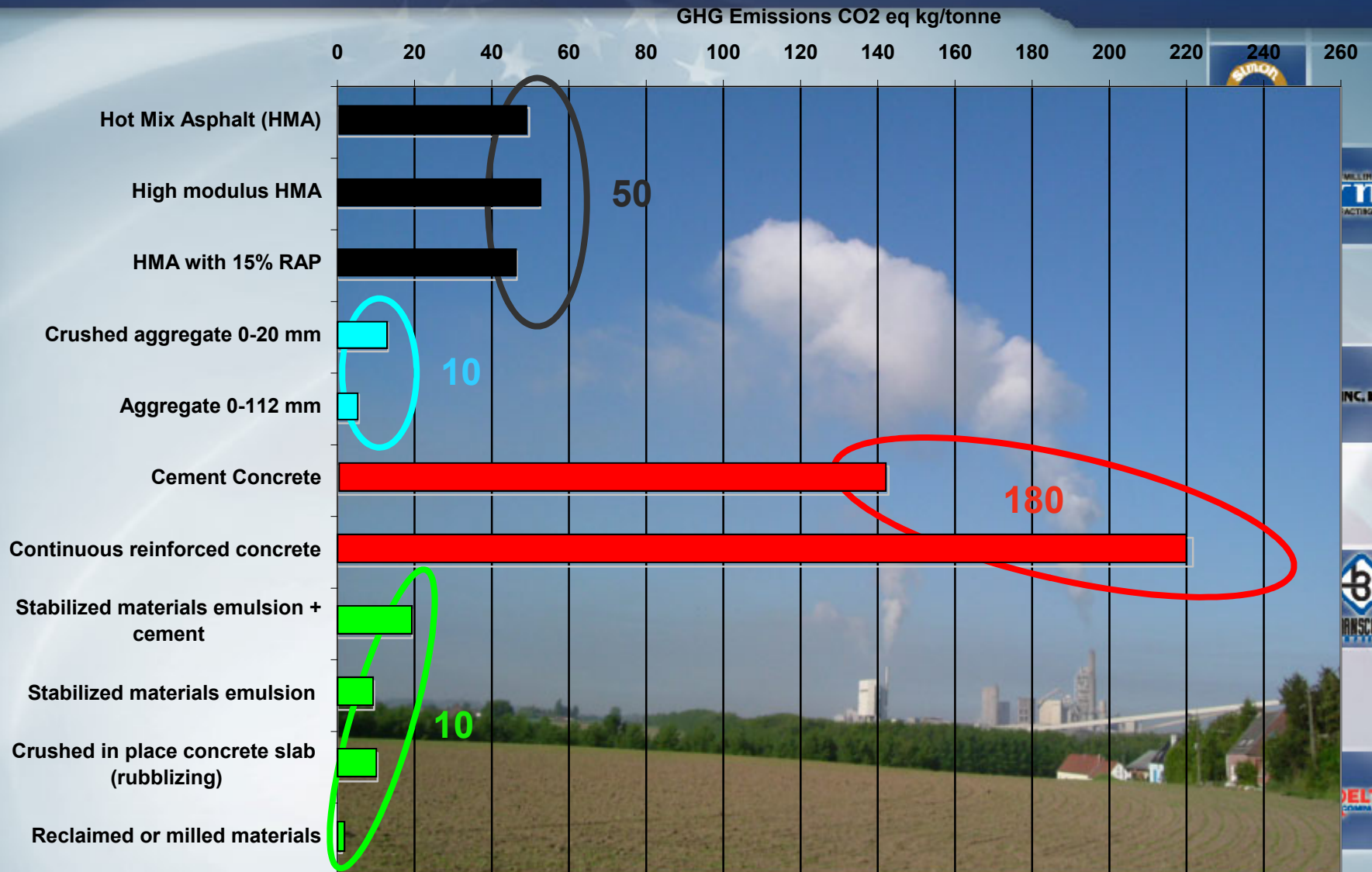
- 2003
- Paper on the environmental road for the future
  - Comparisons between techniques
- PIACR Durban



# Energy Consumption for the Manufacturing and placement of Main Road Technologies



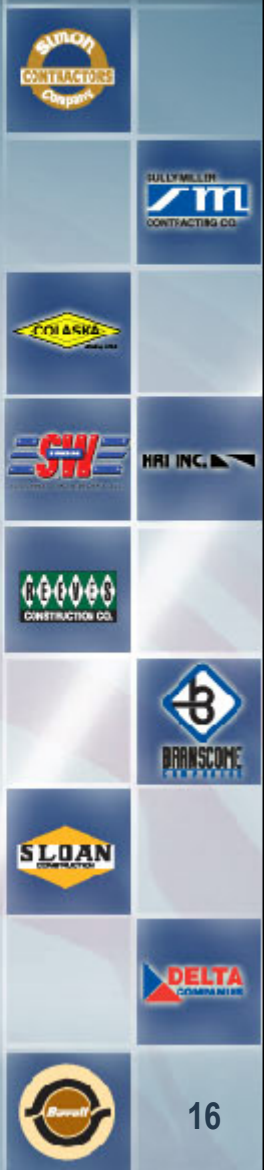
# GHG Emissions during Manufacture and Placement of Main Road Technologies



# How to evaluate the effect of recycling?



- 2006
- Internal software ECOLOGICIEL
  - Eco alternatives
  - Optimization of RAP
  - CO<sub>2</sub> eq





# Energy Consumption in MJ per m<sup>2</sup> For the construction of the Pavement for 100,000 AADT over 30 years

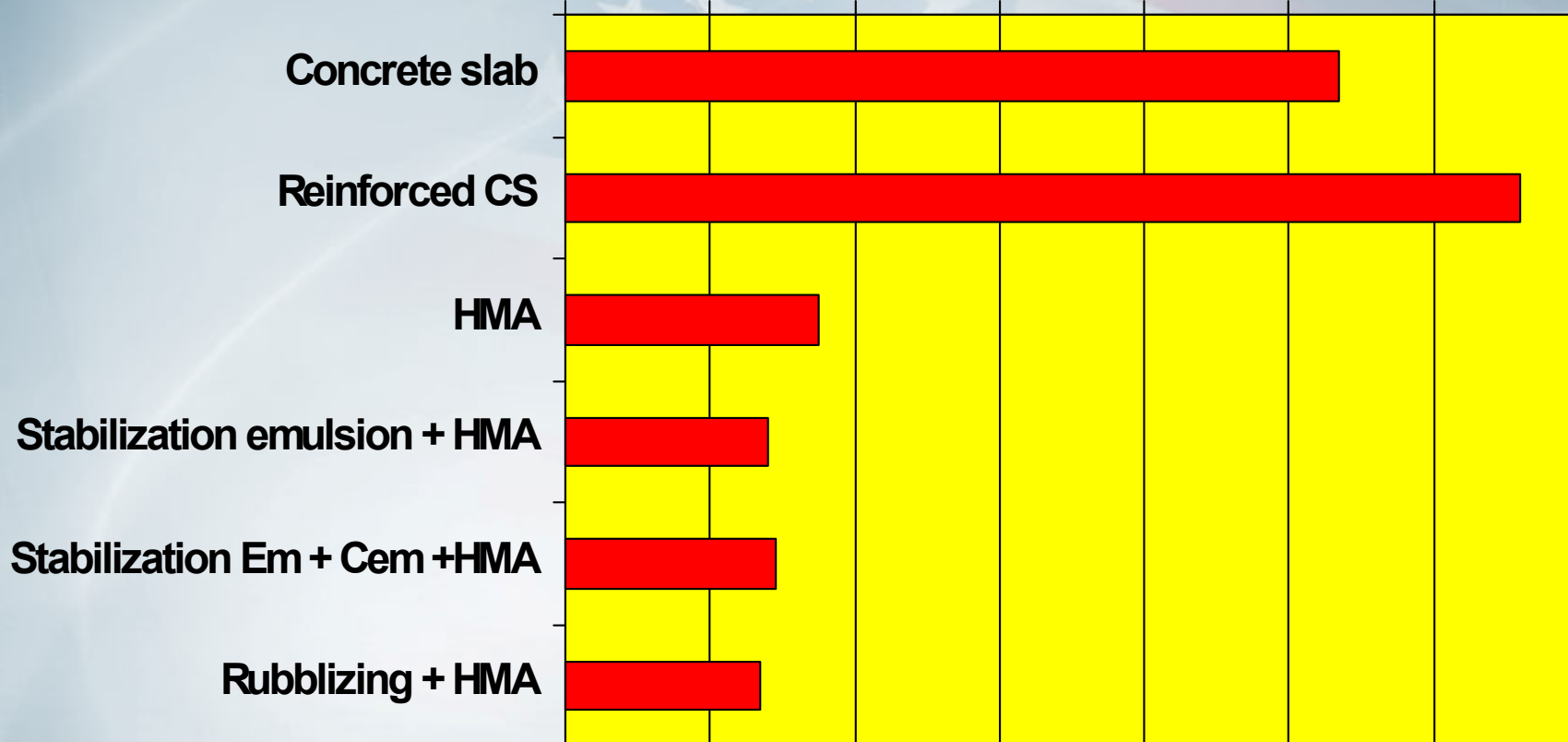


# GHG Emission in CO<sub>2eq</sub> per m<sup>2</sup> For the construction of the Pavement for 100,000 AADT over 30 years



kG of CO<sub>2</sub> / m<sup>2</sup> of pavement

0 20 40 60 80 100 120 140



# Energy Efficiency and Innovative Construction Practices



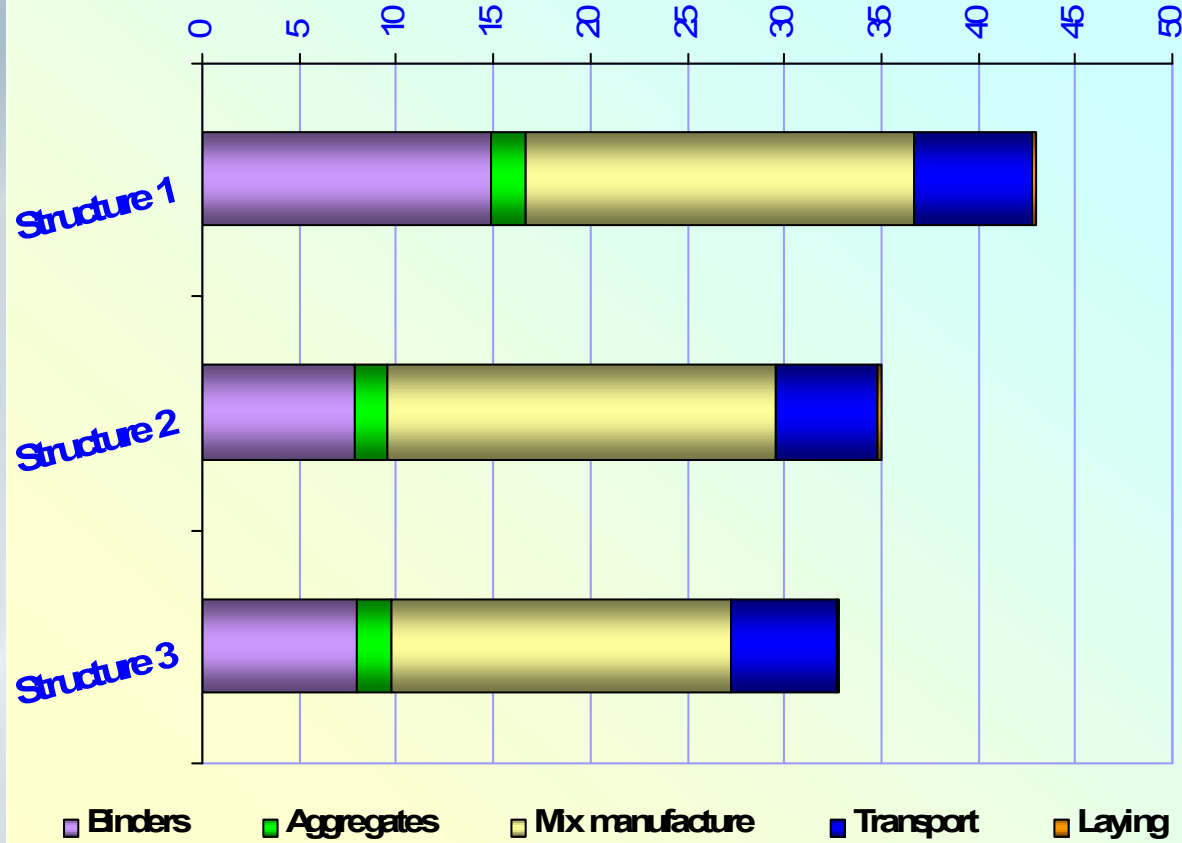
- What do we do?
  - Step by step
  - Analyze road structures
    - Paper done in 2003 PIACR in Durban
    - The environmental road of the future
    - Recycling in place is the best technique
  - Ecologiciel
    - Calculation per m<sup>2</sup> of two criteria
    - CO<sub>2</sub> and Energy consumption



# Per ton of HMA applied



GHGenission per pavement structure in equivalent CO<sub>2</sub> (kg/m<sup>2</sup>)

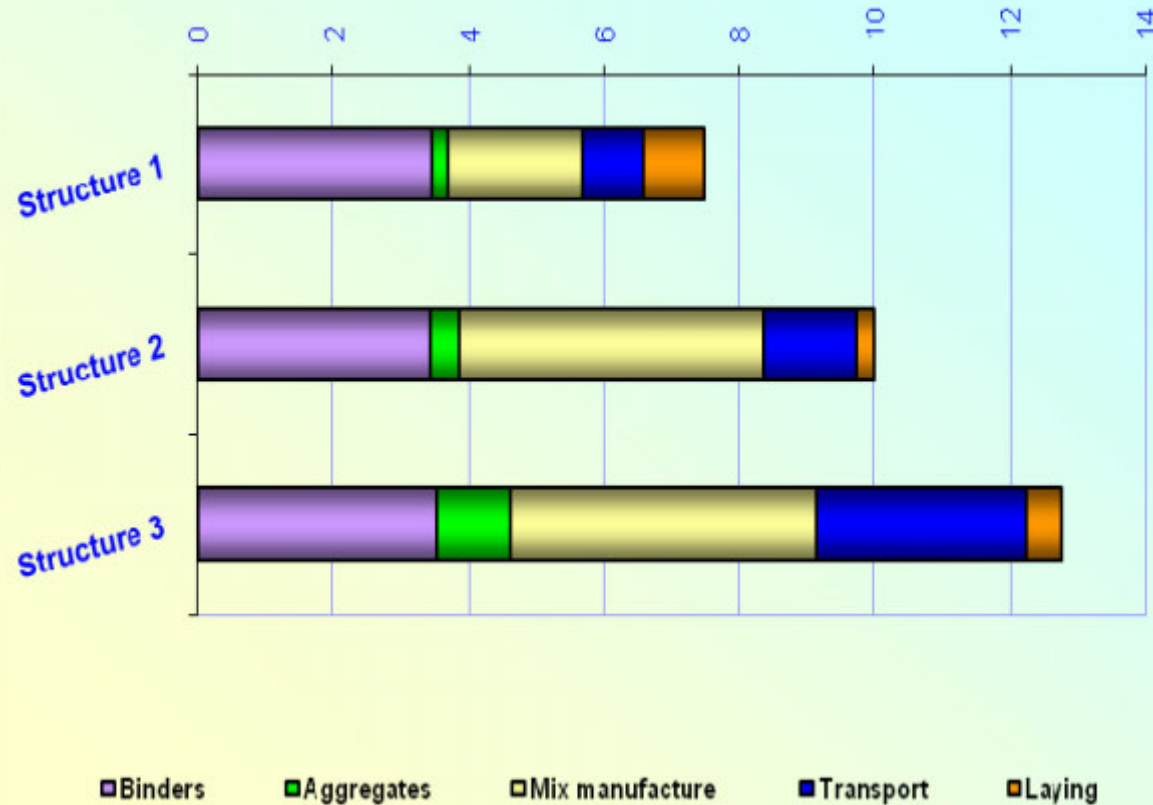


1. Virgin HMA
2. 25%RAP HMA
3. 25% RAP WMA

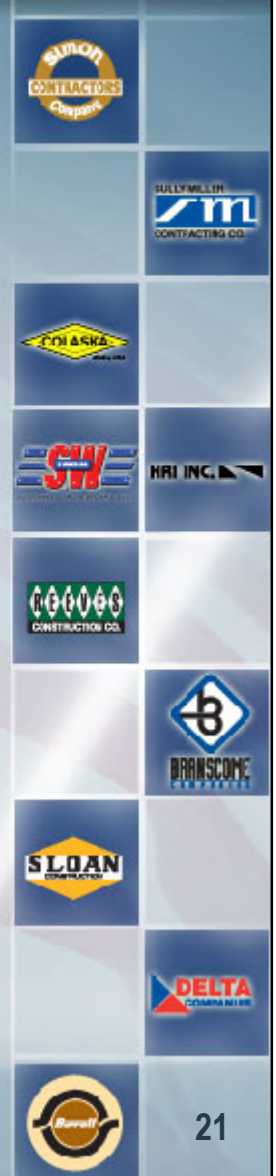
# Per ton of HMA applied



GHG emission per pavement structure in equivalent CO<sub>2</sub> (kg/m<sup>2</sup>)



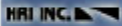
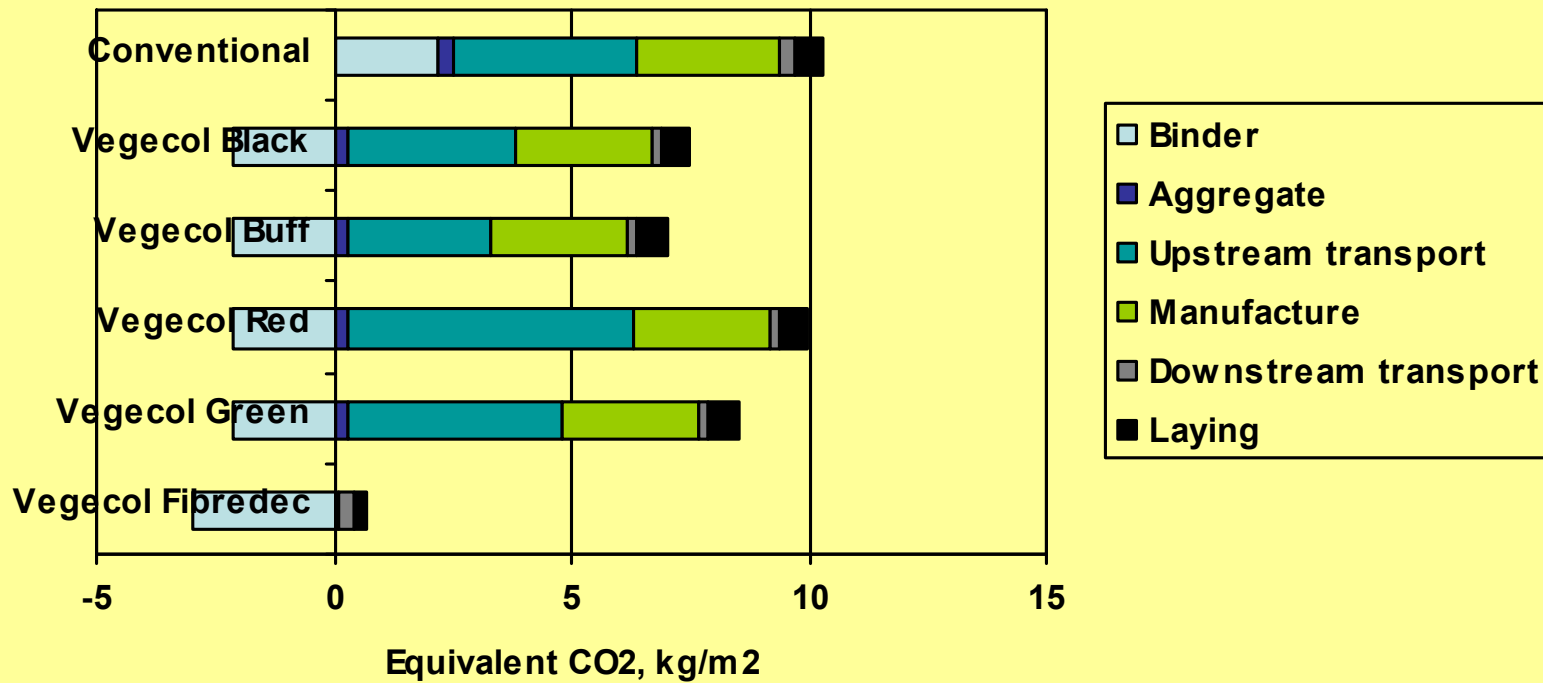
1. 1 ½" HMA+ 5" CIR
2. 3 ½" HMA
3. 3 ½" HMA + 6" GB



# Another example



### Comparison of Greenhouse Gas Emissions



# First approaches



- Eco alternatives
  - Alternatives represent 5-8% of the tenders
  - Using a design software and properties of components
  - To show the gain in GHG per sy on a job
- The owner must be involved
- How to implement innovations or new techniques



# How to implement innovations or new techniques?



## ● In Europe

- Create the needs
  - Contest tenders
  - Performance based tender
  - Technical response to issues
  - Charter for innovations with funding

## ● In Canada

- Value engineering (after the tender)
- Specific demands to answer issues
- 5-7 years warrantee projects (design included) per m2
- Promote actively a technique (environmentally friendly)





# How to implement innovations or new techniques?



- In Europe and elsewhere
  - Industry promote also R&D labs,.....
  - Long term commitment in a new technique
    - High investment (CIR, FDR, ...)
    - Difficult to invest for one job
  - Training to various PP techniques
  - Performance based contracts
    - Technical monitoring
    - Training
    - Training



# Initiatives



- Washington State
- New York State
- LEED for Building
- Green Highway
- PPP



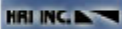
# GREEN ROADS



**more sustainable roads for a better transportation future**

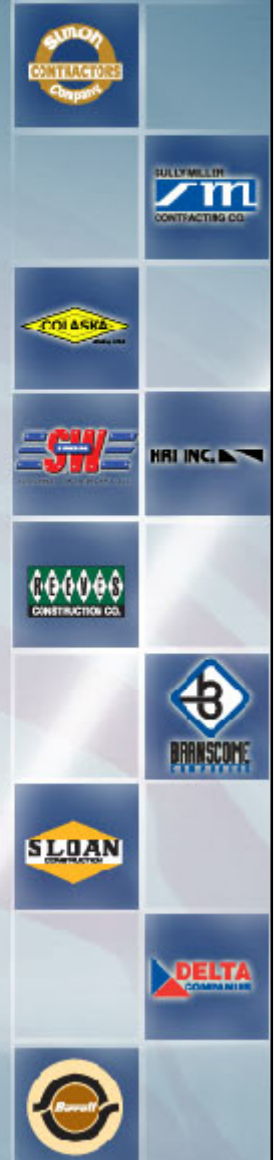
Green Roads is a rating system designed to distinguish high-performance sustainable new or redesigned/rehabilitated roads.

It awards credits for approved sustainable choices/practices and can be used to certify projects based on point value.



## Green Roads Categories

Category	Goal	Credits
<b>Sustainable Design</b>	Reduce impacts due to alignment of the road.	10
<b>Material &amp; Resources</b>	Reduce impacts from material extraction, processing and transport.	11
<b>Stormwater Management</b>	Reduce impacts of polluted stormwater and treatment devices.	8
<b>Energy &amp; Environmental Control</b>	Improve human and wildlife health.	12
<b>Construction Activities</b>	Reduce impacts from construction activities.	9
<b>Innovation</b>	Encourage innovation in design.	4
<b>Total</b>		<b>54</b>



## GREEN ROADS CATEGORY

### Materials & Resources (MR)

Description	Credits
Construction Waste Management	1
Reuse of Pavement	2
Recycled Content	4
Pavement Life Cycle Analysis	3
Regionally Provided Material	1
<b>Total Credits Available</b>	<b>11</b>



## Example MR Credit

### Recycled Content

### 4 Credits

**One credit:** Use recycled content to a minimum of 20% in the HMA/PCC and 40% of the total material in the structure if base course is included in the project.

**Two credits:** Use recycled content to a minimum of 30% in the HMA/PCC and 50% of the total material in the structure if base course is included in the project.

**Three credits:** Use recycled content to a minimum of 40% in the HMA/PCC and 60% of the total material in the structure if base course is included in the project.

**Four credits:** Use recycled content to a minimum of 50% in the HMA/PCC and 70% of the total material in the structure if base course is included in the project.

23



## Certification Levels

Green Road  
certified



19-25 credits

Green Road  
certified



SILVER

26-31 credits

Green Road  
certified



GOLD

32-37 credits

Green Road  
certified

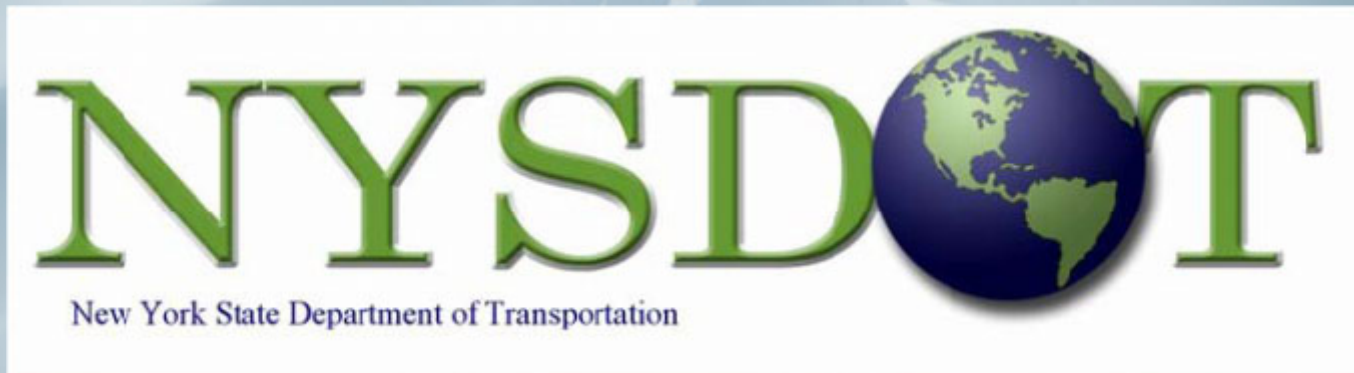


EVERGREEN

38+ credits



# Green LITES Labelling – *NYSDOT* 9/25/08



## Green LITES *Project Design Certification Program*

Recognizing Outstanding Leadership In  
Transportation and Environmental  
Sustainability

September 2008

\* \* \* \* \*

**Certification Program for NYSDOT Designs  
Meeting Criteria for Sustainable Transportation  
Infrastructure using Environmentally Friendly  
Practices**





# Industry Response - HMA



## ASPHALT *The Sustainable Pavement*



ENERGY & RECYCLING



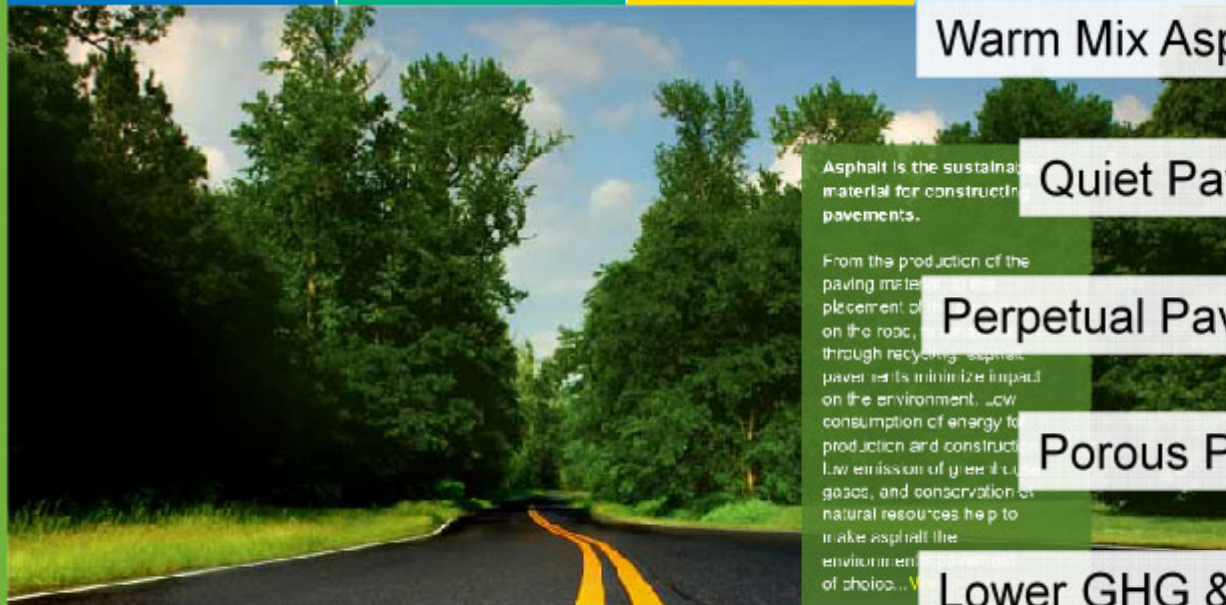
PERFORMANCE



WATER QUALITY



CLEAN AIR & COOL CITIES



Asphalt is the sustainable material for constructing pavements.

From the production of the paving materials to the placement of asphalt on the road, through recycling, asphalt pavement helps minimize impact on the environment. Low consumption of energy for production and construction, low emission of greenhouse gases, and conservation of natural resources help to make asphalt the environmentally friendly choice.

Leading America in Recycling

Warm Mix Asphalt

Quiet Pavement

Perpetual Pavement


Porous Pavement

Lower GHG & fuel

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# Industry Response - Concrete



**NRMCA** NATIONAL READY MIXED CONCRETE ASSOCIATION



Home | About NRMCA | Ethics | Newsroom | GreenReady Mixed Concrete | Contact Us | Member Login

## PROMOTION & APPLICATIONS

[Click Here for Concrete Features Favored by Mother Nature](#)

### Pervious Concrete

National Access Program | Search and Buy | Concrete Business Solutions | Concrete Promotion Resources | Management | Local and Global Concrete | Concrete Contractors | Access to Local Concrete | Concrete Information Alerts

#### Environmental Properties of Concrete

Concrete is in tune with the environment. From homes to office buildings to highways, using concrete as a construction material actually helps protect our natural resources and affords unique benefits to consumers. From an environmental standpoint, concrete has a lot to offer.

Concrete is environmentally friendly in a variety of ways. The ingredients of concrete (water, aggregate, and cement) are abundant in supply and take a lot less toll in their extraction than other construction materials. Quarries, the primary source of raw materials, can be easily reclaimed for recreational, residential, or commercial use. Or they can be restored to their natural state.

As a ready-made material, concrete is an ideal medium for recycling waste or industrial byproducts. Many materials that would end up in a landfill can be used instead to make concrete. Blast furnace slag, recycled polystyrene, and fly ash are among materials that can be incorporated in the recipe for concrete and further enhance its appeal. Waste products such as scrap tires and mill dust are used to fuel the manufacture of cement. And even old concrete itself can be reborn as aggregate for new concrete mixtures.

Another environmental plus for concrete is energy efficiency. From manufacture to transport to construction, concrete is modest in its energy needs and generous in its payback. The only energy-intensive demand on the manufacturing process is cement, typically a 10-15% component of concrete. Since the materials for concrete are so readily available, concrete products and ready-mixed concrete can be made from local resources and processed near a jobsite. Local shipping minimizes fuel requirements for handling and transportation.

Concrete Answers for Architects, Engineers and Developers:

- Concrete Architecture.org
- Concrete Parking.org
- Pervious Pavement.org
- Concrete Buildings.org
- Flowable Filling.org
- Green Roof Tents.org
- Self-Consolidating Concrete.org

**LEED Reference Guide**

**ONLINE BUYERS' GUIDE**

**Self-Consolidating Concrete**

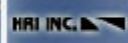
Membership  
Certifications  
Conferences and Events  
Advocacy  
Promotion  
Research and Engineering  
Codes and Standards  
Operations, Safety and Environment  
Training and Education  
Ready-Mix Concrete Business

Site Search:

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Webinars  
Membership Benefits  
Plant Certification  
Concrete in Practice  
Grassroots Website  
Industry Links  
Update Your Member Profile



# Industry Response – AEMA

- Emulsion techniques
  - may be handled safely
  - no odors, fumes, smoke or dust
  - preserve the environment
    - protects air quality
    - recyclable
  - low cost techniques
    - quick application time
    - low energy consumption
  - many pavement preservatio



DELTA  
CONTRACTING



SULLY MILLER  
CONTRACTING CO.



# Industry Response – ISSA



## ● ISSA Outlook

- “Environmentalists, taxpayers and legislators will be pleased to know that ISSA member contractors are responsible for making their roads last longer, keeping them safer, and requiring the use of fewer raw materials”.



# Industry Response - *ARRA*

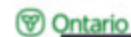


## ● ARRA techniques

- most environmental friendly flexible pavement rehabilitation technique.
- reuse existing non-renewable material
- heating of material is not required
- haulage of material on or off site is not required, i.e. less disturbance to traffic

## Environmental Benefits

- Per 2-lane km, CIR/CIREAM emits approximately 50% less GHG, consumes 62% less aggregates, and costs 40-50% less when compared to a conventional mill and overlay treatments
  - Since the implementation of CIR/CIREAM contracts, MTO has reduced GHG emissions by:
    - 54,000 t of CO<sub>2</sub>
    - 440 t of NO<sub>x</sub>
    - 9,400 t of SO<sub>2</sub>
- And saved 740,000 tonnes of aggregates



Ministry of Transportation  
Ministère des Transports



5 101

# Pavement Preservation



“long-term strategy that enhances pavement performance by using an integrated cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations”

	Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
	New Construction	X	X	X	X
	Reconstruction	X	X	X	X
	Major (Heavy) Rehabilitation		X	X	X
	Structural Overlay		X	X	X
Pavement Preservation	Minor (Light) Rehabilitation			X	X
	Preventive Maintenance			X	X
	Routine Maintenance				X
	Corrective (Reactive) Maintenance				X
	Catastrophic Maintenance				X

Table 1- Pavement Preservation Guidelines

The **Right** treatment, to the **Right** road at the **Right** time



# Conclusions



- Environment should be more than permits
  - Included in the pre tender or engineering approach
  - Consultants?
- Numerous initiatives in the USA
  - In place recycling should be more used!
  - Promotion of innovations / training (DOT and Industry)
- Industry needs long term commitment
- Quality must be there
  - Needs for the road networks
  - Budget



# Conclusions



- Vegetal binders at 250F



- FDR in the UK





# Conclusions

