

# CIR In NY State Case Study



Northeast & Mid-Atlantic States  
In-Place Recycling Conference -  
August 24-26, 2010



New York State  
Department of Transportation

# OUTLINE

- History of use – Quantity Performed
- Project Selection – Recommend Practice
- Basic Design Practices / Top Course
- Specification Requirements
- Selected Projects
- NYSDOT Performed Research
- NYSDOT Future Use

# HISTORY OF USE

- First Used In Early 1990's
- NYSDOT Completed Approximately 200 Jobs
- Approximately 1000 Center Line Miles
- Typically Perform 10+ Jobs Per Year



# CONTRACTOR AVAILABILITY



# SELECTION CRITERIA

## NYS DOT COMPREHENSIVE PAVEMENT DESIGN MANUAL

- Distress Level
  - ▣ Medium-High Severity Cracking
  - ▣ Rutting
  - ▣ Drop Off
  - ▣ Raveling
  - ▣ Infrequent Heaves



# SELECTION CRITERIA

## Required Conditions

- 1" Thickness Below Recycled Depth
- Adequate Drainage
- Few Manholes or Other Utilities
- Less Than 4000 AADT Per Lane
- Less Than 10% Trucks
- 5 Million ESAL Loose Limit

# TYPICAL CONDITIONS





# HOW IT'S BID / ESTIMATED?

## ■ THREE ITEMS

- Square Yards To Be Recycled
- Additional Stone
- Liquid

## ■ ESTIMATING

- Depth of Cut (3" or 4")
- 20% Add Stone of Milled Volume To Be Recycled
- 3% Emulsion Content / 2% PG Binder



# ADD STONE / GRADATION

- State Provides Core Information
- Use Of Add Stone To Meet Binder Gradation
- 1/2" to 1" Stone



# SAMPLING

## TYPICAL CORING



## ALTERNATIVE - MILLING



# SPECIFICATION REQUIREMENTS

## Design Parameters

- 3" or 4" Nominal Option
- Typically HFMS-2
- Additive Usage
- Reclaimed Material Pass 2"
- Add Stone & Emulsion  
Based on Mass of Millings
- Add Stone 20% - To Meet  
Gradation Requirements

## Design Gradations

Sieve	Min	Max
▪ 1½	100	-
▪ 1	95	100
▪ ½	70	85
▪ ¼	48	68
▪ ⅛	32	54
▪ 20	15	30
▪ 40	8	22
▪ 80	4	14
▪ 200	2	8



# UP-STATE BIRD - REDBIRD

Native Habitat



Blanket Of Nuclear Security





# SPECIFICATION REQUIREMENTS

## Construction

- Minimum of 45 Degrees
- Last Saturday of September
- Gradation Check
- Steel Wheel and Pneumatic Roller
- Target Density Used To Establish Roller Pattern
- Reclaim 6" When Creating Longitudinal Joint

## Finish Tolerance

- Longitudinal Joint  $3/16"$
- $3/8"$  in 10' Perpendicular To The Lane
- $3/8"$  in 15' Parallel to Centerline
- 10 Day Cure Period
- Fog Seal

# SELECTED PROJECTS

## Recent Work

- ROUTE 104B – OSWEGO COUNTY 2009
- ROUTE 8 – WARREN COUNTY – BRANT LAKE 2008
- ROUTE 1390 – LIVINGSTON COUNTY 2009

## Work From The Past



# ROUTE 104B-OSWEGO CO. 2009

- Very "GREEN" – WMA Overlay
- QA – Liquid Values / Turnaround Time
- Ride / Tolerance / T&L





June 30<sup>th</sup> in Oswego Co.





# Rte 104b

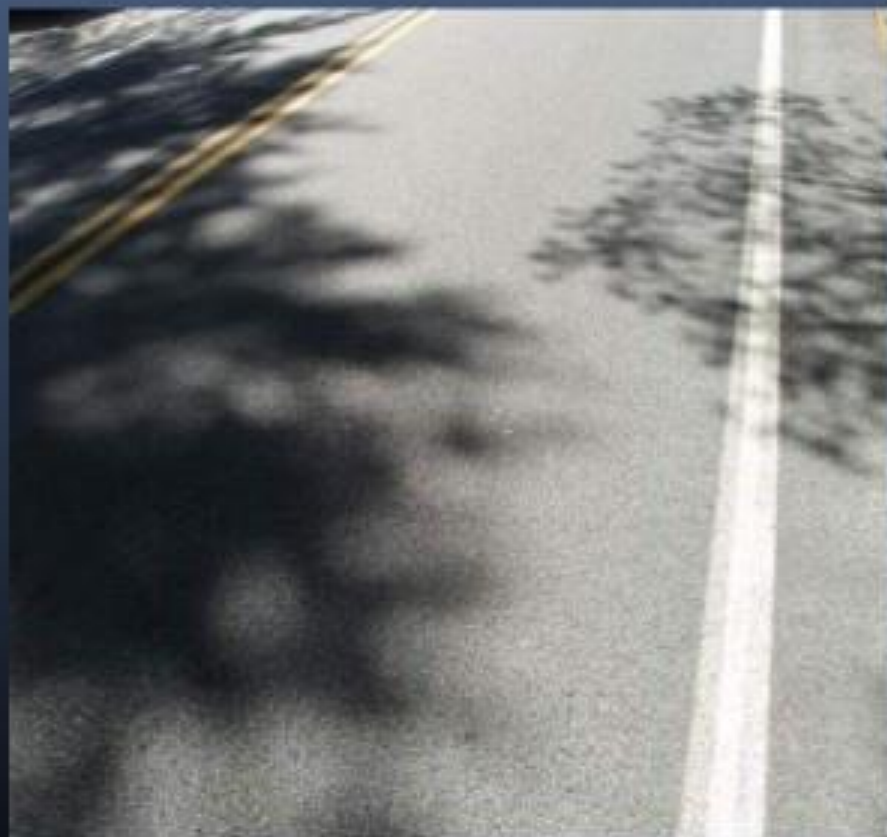


# ROUTE 8 – WARREN COUNTY – BRANT LAKE 2008

- Low Traffic
- Late(r) Season
- Shade



# Near Noon @ Brant Lake





# Route 8 Near Brant Lake...





# SHOULDER WORK – I390 REHAB



# RTE I390 – LIVINGSTON CO 2009

- Shoulder In Poor Condition
- Passing Lane Shoulder – Very Poor Material
- Originally A Mill & Fill, With HMA Overlay
- Converted To Cold Recycle with Chip Seal
- 1/2 The Bid Price – (~\$500,000)



# Rush To Put In Rumble Strips





# Slurry Fix





# LEAVING IT HIGH





# NYSDOT RESEARCH

CHESNER ENGINEERING –  
STEPHEN CROSS – OKLAHOMA STATE

- Recently Completed - 2007-2010
- Long History – Little Change
- Trying To Determine Patterns of Success
- Move Forward With A Comprehensive Design Process

# What It Turned Into

- Database of All NYSDOT Projects 1990-2007
- Evaluation of Factors Affecting The  $\frac{4}{5}$  Long Term Performance Of Cold In Place Recycled Pavements In New York
- Best Practice Guidelines
  - Mix Design
  - Specification



# What Else It Turned Into

- Life Cycle Environmental Analysis For The Evaluation Of Pavement Rehabilitation Options
- How We Score Pavements
- Comparative Analysis
  - TCO
  - MF
  - Cold Recycle

# What it Showed

- Comparative Analysis – Comparable Performance
- PaLATE – FHWA Sponsored , Cal Berkley Model
  - Economic and Environmental Highway Construction & Maintenance Activities

# PaLATE

- Using a Battleship To Kill A Mosquito
- VERY COMPLEX
- Layers Of Assumptions
  - Material Production
  - Material Transportation
  - On Site Equipment



# Environmental Analysis

- 1. Energy consumption in MJ,
- 2. CO<sub>2</sub> (Carbon dioxide) emissions in kg,
- 3. Water consumption in kg,
- 4. NO<sub>x</sub> (Nitrogen oxides) emissions in kg,
- 5. PM<sub>10</sub> (particle size less than 10 micrometer) emissions in kg,
- 6. SO<sub>2</sub> (Sulfur dioxide) emissions in kg,
- 7. CO (Carbon monoxide) emissions in kg,
- 8. Hg (Mercury) emissions in g,
- 9. Pb (Lead) emissions in g,
- 10. RCRA (Resource Conservation Recovery Act) hazardous waste generated in kg,
- 11. HTP (human toxicity potential cancerous) in g,
- 12. HTP (human toxicity potential non-cancerous) in kg.



# Assumptions – Changes – Right?

- Several Adjustments
- Most Influential - % of Energy Required For Asphalt
- Two Course Overlay – Longer Life
- Shoulders Are Ignored

# Analysis – Life Cycle Costs

- CIPR-3 and TCO are comparable life cycle cost options.
- Treatment life is the most critical parameter when comparing the CIPR and TCO options.
- When deciding between TCO and CIPR as treatment options, the deciding factor should be based on the structural requirements and functional distresses exhibited by the pavement.
- The MF options are the least cost effective of the treatments evaluated.

# Analysis – Environmental Impact

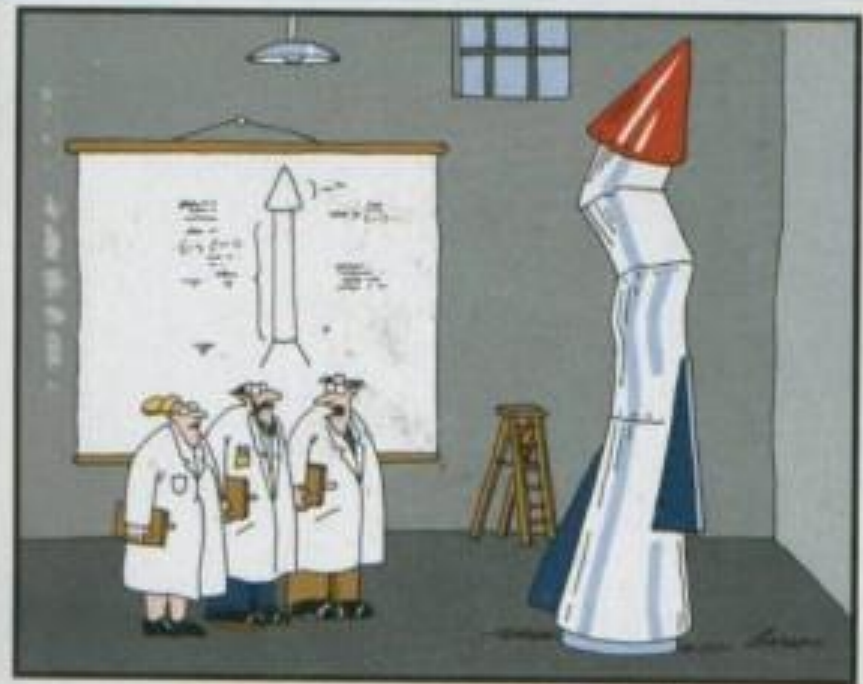
- The CIPR maintenance options of CIPR-3, CIPR-4 and CIPR-3-AS, from a life cycle environmental perspective, are the best treatment options.
- The TCO maintenance option is similar to CIPR-4 if add-stone is included in the mix (CIPR-4-AS).
- The MF options exhibit the highest life cycle environmental burdens, when compared to the CIPR and TCO options.

# Future Use of Cold Recycling

ART vs. SCIENCE

- Long Established Track Record – Happy Engineers
- Cost
- Expand Use To Higher Traffic Volumes – ESALS
- Optimize Mix Performance – Without Over Engineering The Product

Rock Science Not Rocket Science



"It's time we face reality, my friends. ...  
We're not exactly rocket scientists."



# EASY QUESTIONS ONLY

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