CIR In NY State Case Study

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

Map of New York State showing locations of contractors:
- Midland Asphalt
- Gorman Brothers
- Suit-Kote
- NY Bituminous
- Kingston Reclamation

Locations:
- Buffalo
- Rochester
- Syracuse
- Watertown
- Plattsburgh
- Albany
- Binghamton
- NYC
SELECTION CRITERIA

NYSDOT 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
- ½” 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 30th 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
- ½ The Bid Price – (~$500,000)
Rush To Put In Rumble Strips
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 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. CO₂ (Carbon dioxide) emissions in kg,
3. Water consumption in kg,
4. NOₓ (Nitrogen oxides) emissions in kg,
5. PM₁₀ (particle size less than 10 micrometer) emissions in kg,
6. SO₂ (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 additive 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

Tom Kane
Materials Bureau – NYSDOT
518-457-4287
tkane@dot.state.ny.us