Buried Treasure Finding Innovative Solutions by Looking Beneath the Surface

CPP - Integrating Engineering, Economics and the Environment

Buried Treasure

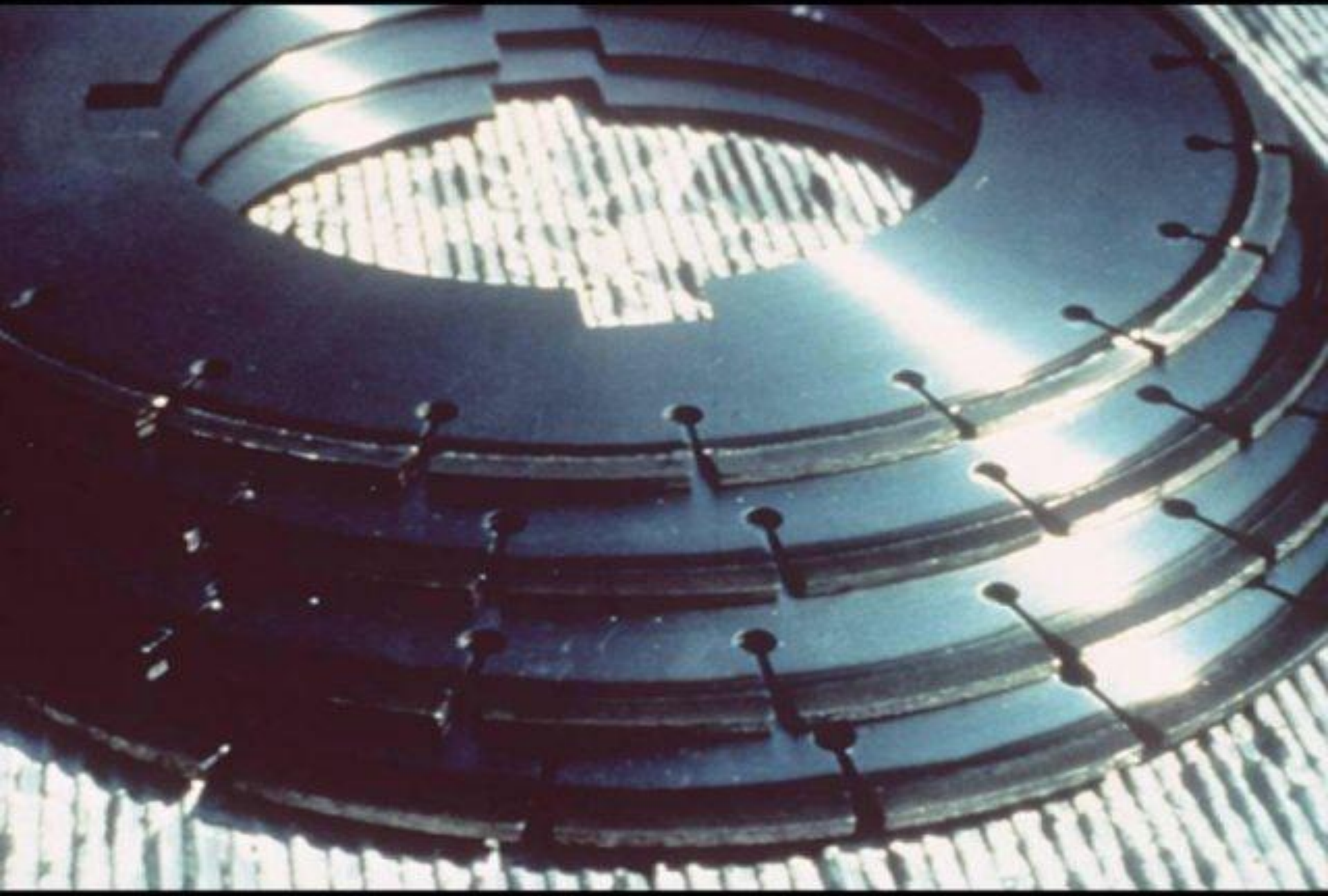
What is Buried Treasure?

- A pavement rehabilitation strategy that uncovers and renews aged PCCP that has been overlaid with asphalt due to functional, not structural issues (noise, ride, friction)
- PCCP must be structurally sound and in relatively good condition
- Asphalt is removed; RAP is recovered and sold to offset project cost
- Pavement is repaired where needed
- Final surface is diamond ground

What is Diamond Grinding?

- Removal of thin surface layer of hardened PCC using closely spaced diamond saw blades;
- Results in smooth, level pavement surface;
- Longitudinal texture with desirable friction and low noise characteristics;
- Frequently performed in conjunction with other CPR techniques, such as full-depth repair, dowel bar retrofit, and joint resealing.
- Comprehensive part of any PCC Pavement Preservation program;

Diamond Grinding



Diamond Grinding

Cutting Head

Diamond Grinding

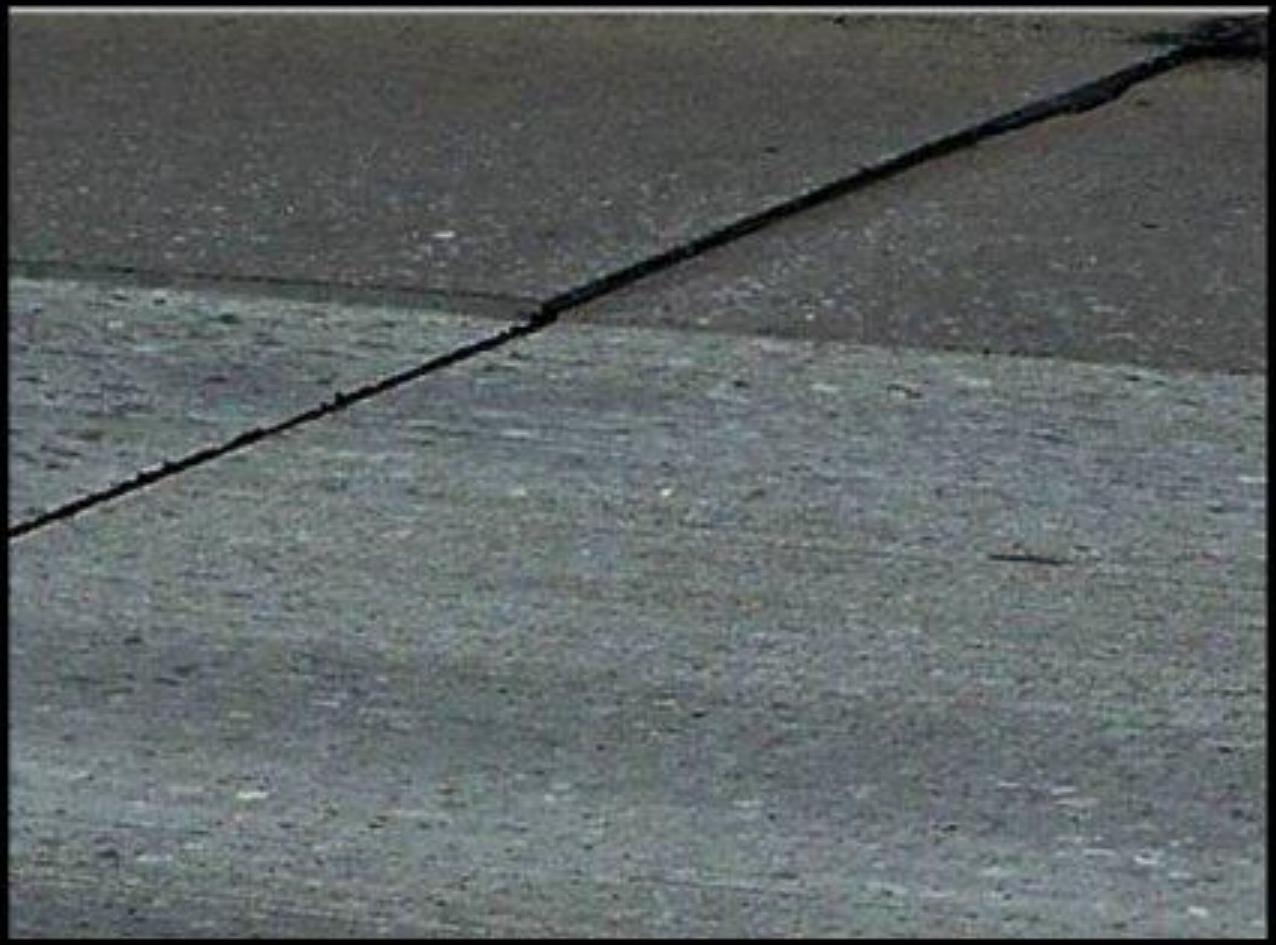
Grinding Machine

Diamond Grinding

Grinding Process

Diamond Grinding

Finished Product



Advantages of Diamond Grinding

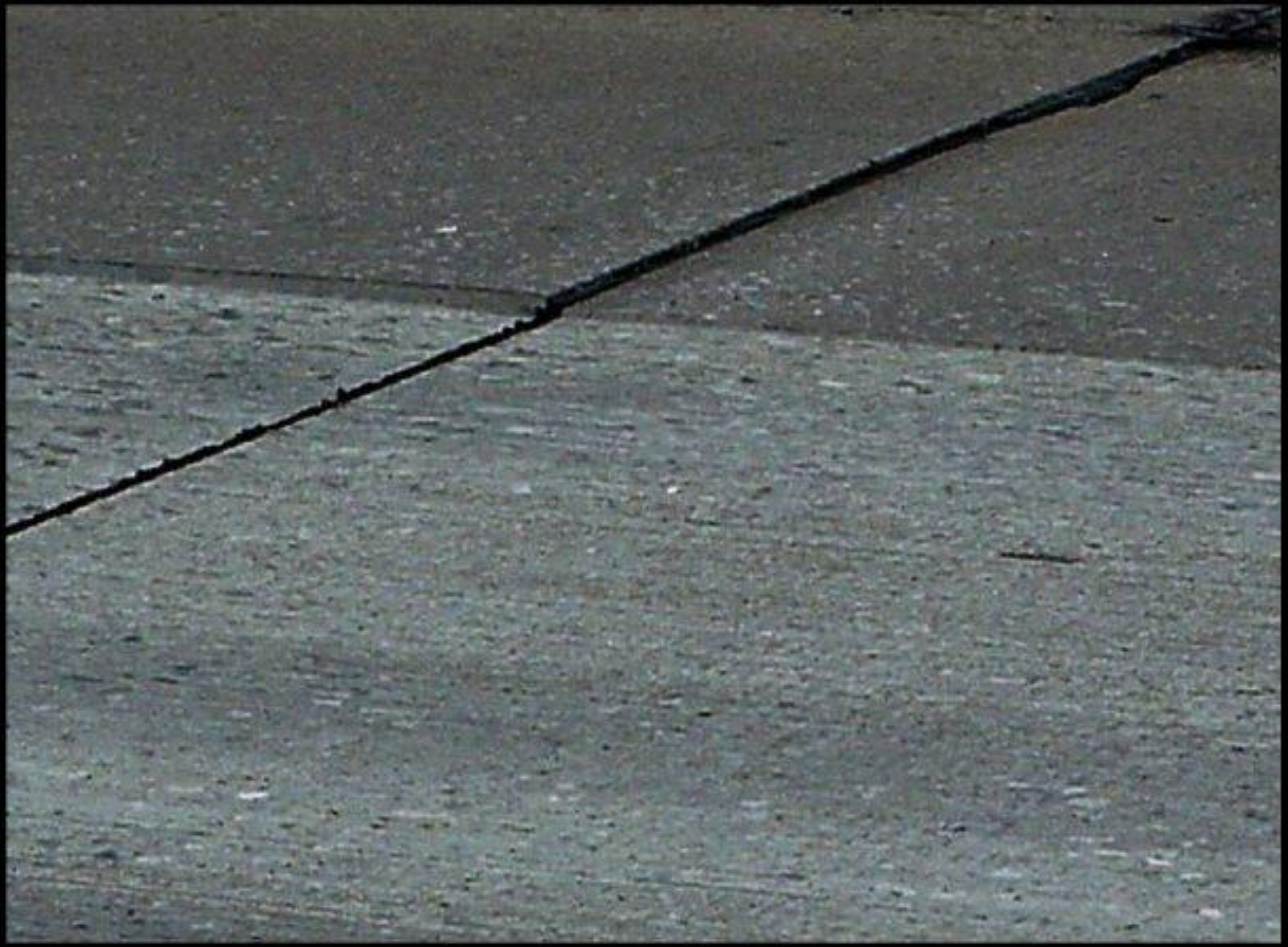
- Cost competitive;
- Enhances surface friction and safety;
- Can be accomplished during off-peak hours with short lane closures and without encroaching into adjacent lanes;
- Grinding of one lane does not require grinding of the adjacent lane;
- Does not affect overhead clearances underneath bridges;
- Blends patching and other surface irregularities into a consistent, identical surface;
- Provides a low noise surface texture!

Diamond grinding should provide a 60 % to 70% improvement over the pre-grind profile!

Pavement Problems Addressed

- Faulting at joints and cracks
- Built-in or construction roughness
- Polished concrete surface
- Wheelpath rutting
- Unacceptable noise level
- Permanent upward slab warping
- Inadequate transverse slope

Faulted Joints



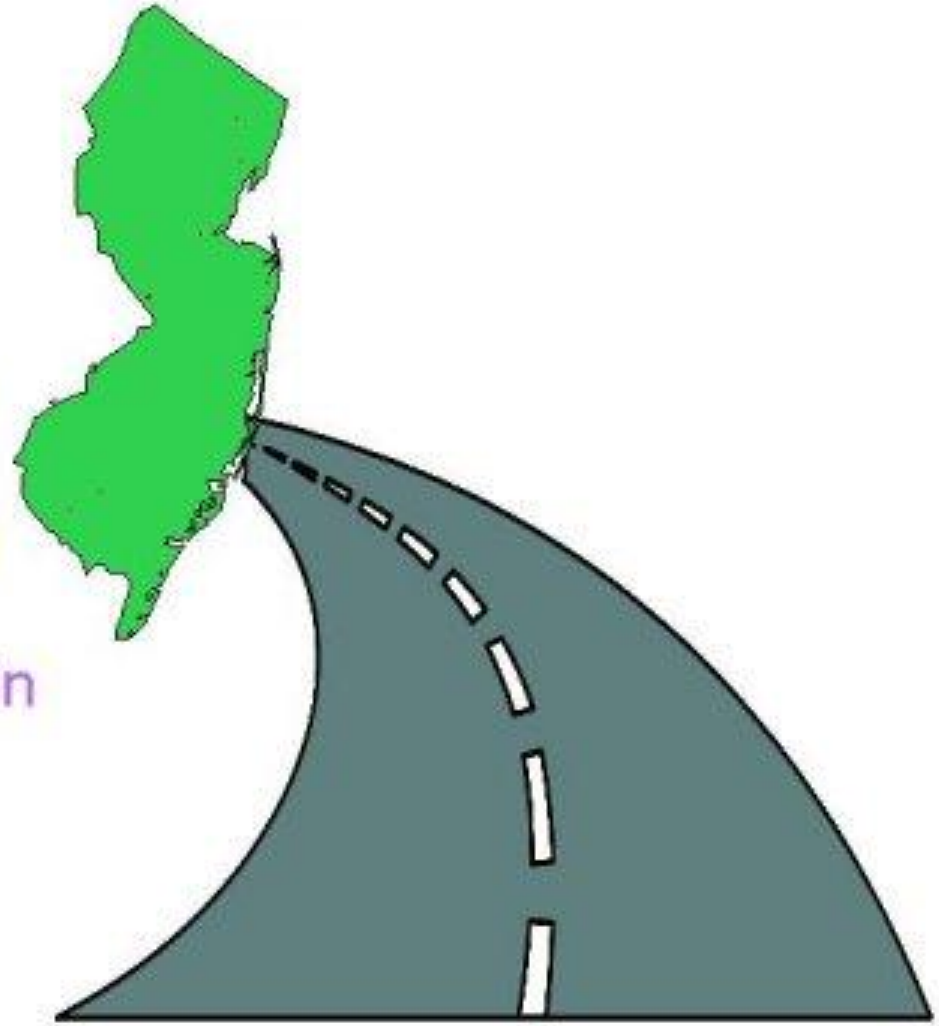
Why Diamond Grinding for City Streets?

- Diamond grinding does not reduce the reservoir capacity of the gutter
- Curb reveal is not reduced
- Man-hole covers and drainage inlets do not require adjustment
- Guide-rails and overhead fixtures do not require adjustment
- Residential driveways do not require expensive tie-in operations

New Jersey Route 21

Project Location

- Newark New Jersey
- Route 21 Essex & Passaic Counties
- MP 5.0 to 6.5 constructed in 1931
- MP 6.5 to 10 constructed in 1958



New Jersey Hwy 21

New Jersey Route 21 Road History

- Six mile long project
- First 1.5 miles built in 1931
- Last 4.5 miles built from 1959-1961
- AADT 70,000
- 9″ concrete with 78′ panel lengths
- Three 12′ lanes in each direction
- 1959-61 concrete used stainless steel clad dowels

New Jersey Route 21 Road History

- Rt. 21 had received two thin lift asphalt surfacing treatments
- Old concrete was originally overlaid due to high wet weather accident rates
- The first micro surfacing placed in 1993 failed due to delamination
- The second treatment was Nova Chip placed in 2001
- Nova Chip also experienced delamination problems

New Jersey DOT

- Due to low skid numbers and Nova Chip Delamination problems NJDOT initiates rehab
- Project plan will mill off asphalt overlay (approx. 2") and repair underlying concrete
- CPR treatments used include slab stabilization, full depth repair, precast repair panels, partial depth repair and joint resealing
- Diamond Grinding utilized for final riding surface
- All Work done at night 8:00 pm – 6:00 am only

New Jersey Route 21

- Old Section close to Buildings
- Diamond Grinding equipment needs 24" of clearance
- This section went to an asphalt overlay

NJDOT's Route 21 Scope

- Precast Panel replacement
  - Bid price of $472.89 /SY for 4,900 SY or $2,317,161
- Slab stabilization - polyurethane grout
  - Bid Price $4.32 /pound for 150,000 pounds or $648,000
- Synthetic resin partial depth repairs
  - Bid Price of $1,113.95 for 490 SY or $545,835.50
- Diamond Grinding final surface
  - Bid Price of $7.63 SY for 266,750 SY or $1,963,280

Removals

Failed Catch Basins

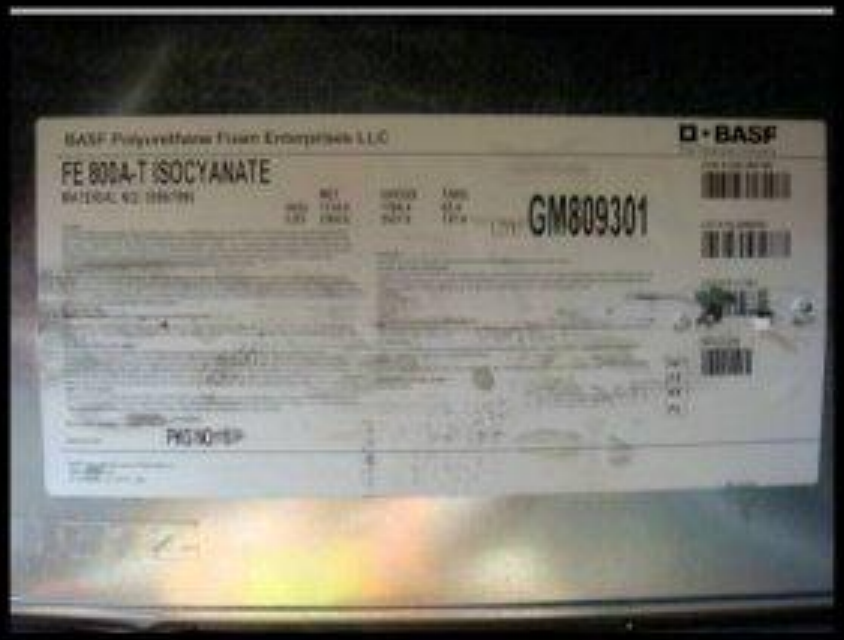
Pre-cast Panel Replacement

Why Precast PCCP?

- NJ fast track mix requires 6.5 hr cure, temperature sensitive
- Fast Track long term durability issues
- Cast in place requires flexural beam tests that require staff and equipment at night
- Many concrete plants don't want to open at night for a few loads of concrete
- Some towns prohibit concrete plants from operating at night

Slab Stabilization

Slab Stabilization



BASF Polyurethane Foam

Slab Stabilization

Partial Depth Repair

Crafco Product TechCrete

Repair area after removal and sandblasting

Pre-cast Panel Installed Ready for Diamond Grinding

Conventional Diamond Grinding

- Used as a final surface texture
- Met NJDOT smoothness requirements
- Provides low noise surface
- Met NJDOT friction requirements
- Provides long lasting, light reflective surface

Diamond Grinding

- Diamond Grinding Contractor Interstate Improvement Co.
- Asked that asphalt milling not dig too deep into old concrete
- Some asphalt left in low spots

Diamond Grinding Machine

Final Surface

New Jersey Route 21

Washington SR 522

- Located near North end of Lake Washington
- Constructed in 1917 on the site of an old logging road
- Constructed as a 8 " jointed plain concrete pavement (JPCP)

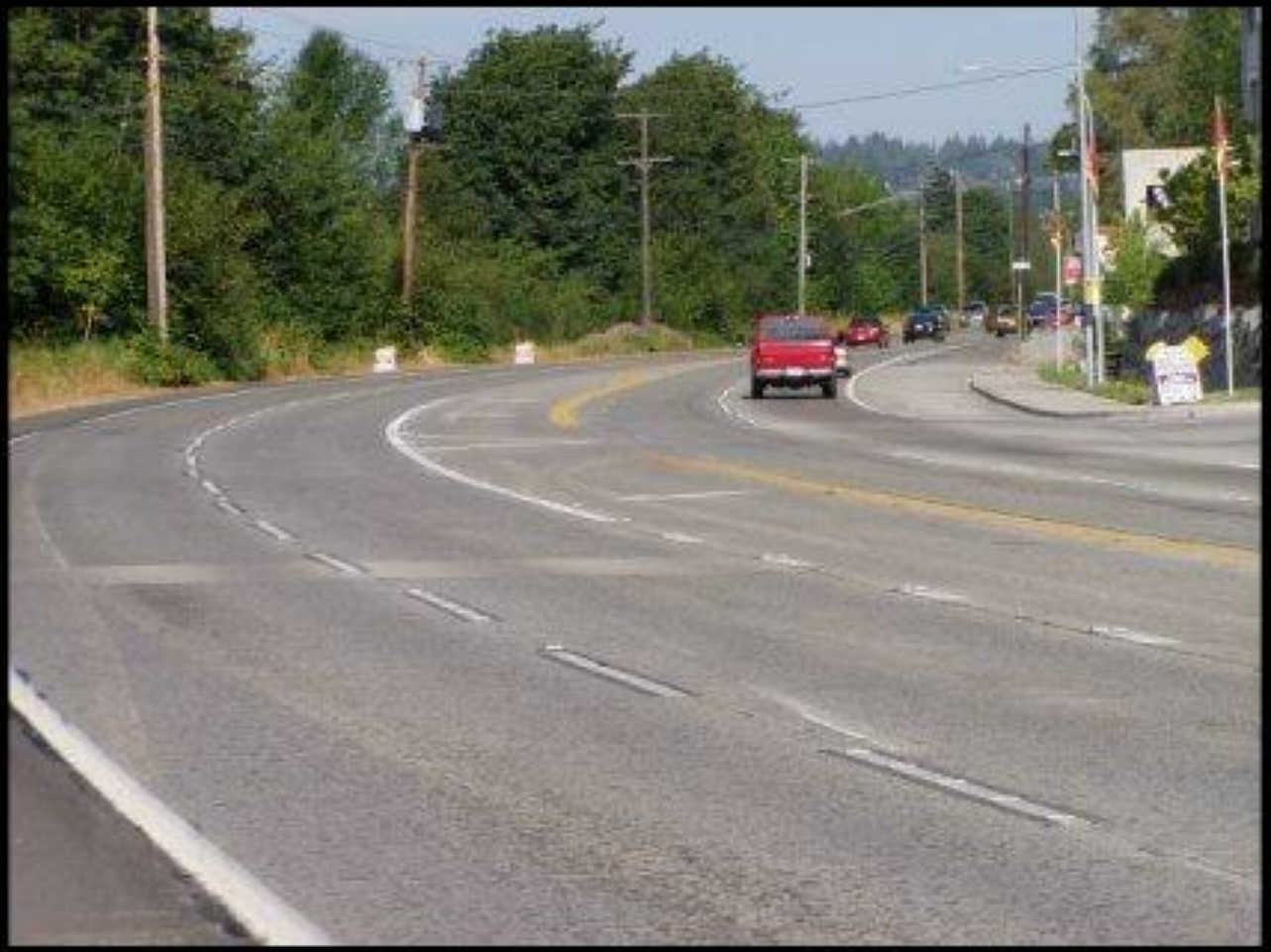
Washington SR 522

- Over time receives multiple asphalt maintenance patches and partial asphalt overlays
- Widened with full depth asphalt lane additions to address capacity issues
- Ride quality and appearance suffered due to multiple patches, overlays and aging asphalt lane additions

Washington SR 522

- In 2002, WASHDOT decides to rehabilitate pavement
- Old overlays and asphalt patches removed
- Full depth PCC patches used to repair damaged concrete
- Widened asphalt lanes replaced with full depth concrete lanes
- Entire surface diamond ground as final surface texture
- Pavement still performing well today

Washington SR 522



Washington SR 522

Washington SR 522

It's a Fact!

- **Diamond grinding can provide the safest, smoothest, most quiet PCC pavement texture available when properly designed and constructed with durable aggregates!**

Summary

- This is a challenging time for the transportation industry
- Innovative cost effective solutions are needed to survive the storm
- Many old PCCPs were overlaid in the past due to functional, not structural reasons (noise, friction, ride)
- The RAP removed from overlaid PCCP has value and can help reduce project costs

Summary

- Performance and cost vary with given conditions
- CPR provides long term lasting solutions for all structurally sound PCCP
- Diamond grinding provides a long lasting, smooth, safe and quiet surface at competitive pricing
- Take advantage of local contractor experience
- IGGA is ready to assist

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