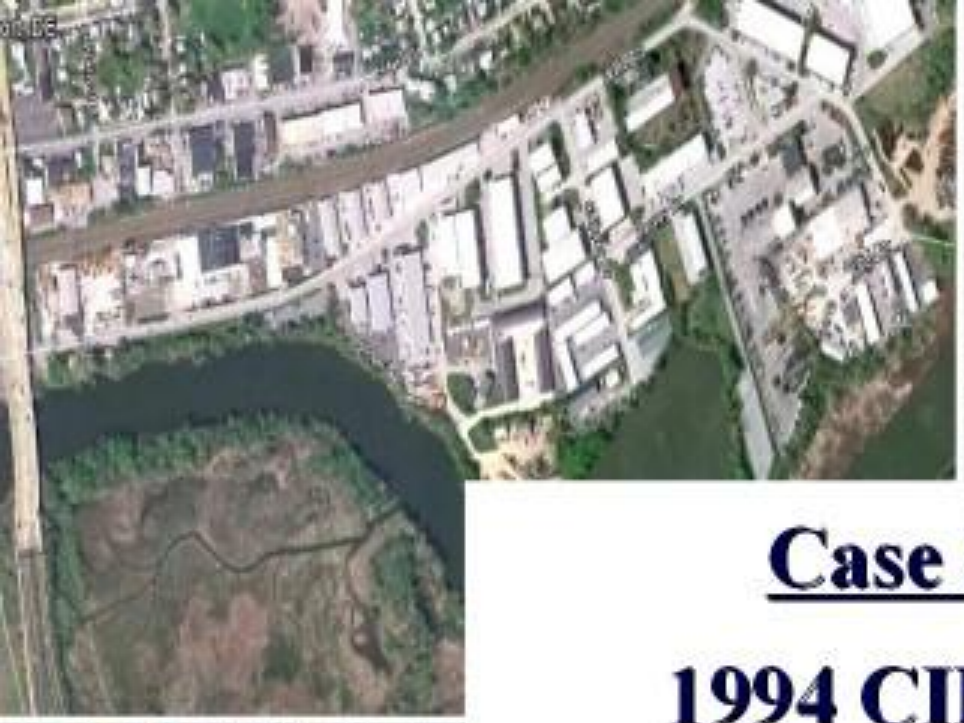


Case Study

1994 CIR Project

Newport, Delaware

Topics to be Covered

- Project Introduction
- Why was CIR selected?
- Project Evaluation
- 15 Years Later
- Comparison with Mill/Patch/Overlay Project
- Ensuring Quality

Project Location

- An industrial Park in Newport, DE
- Serves more than 40 Businesses including
  - Trash Transfer Station
    - 300+ trash Trucks/per day/6 days a week
    - 30+ Trucks to the landfill
  - Concrete Plant
  - Warehouses
  - Manufacturing Plants
  - Crane Rental

Aerial Map


OP SOIL

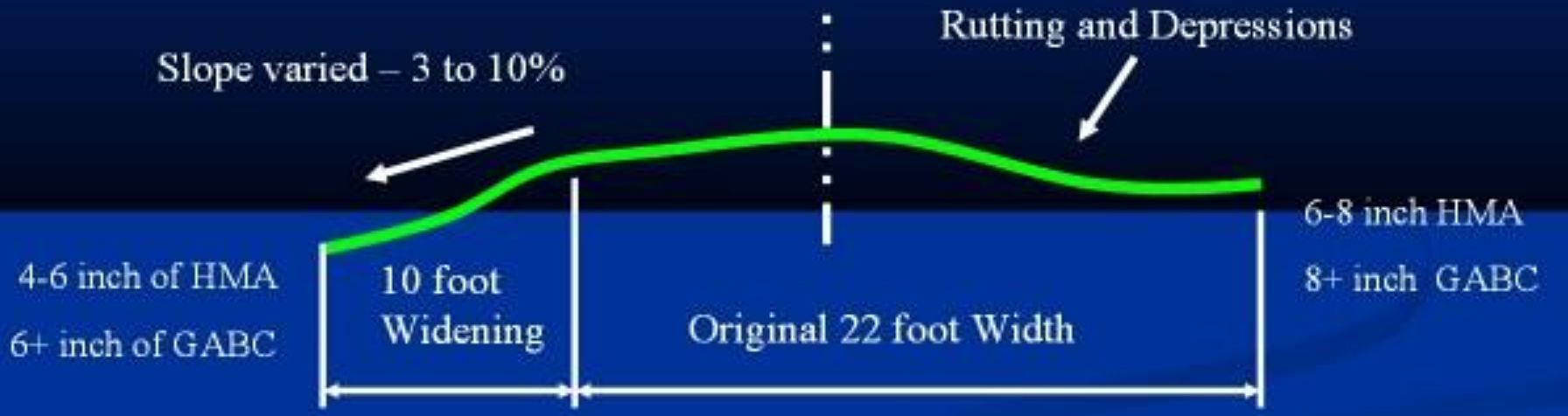
Project Background

- In Spring 1994, the municipality rehabilitated one of the side streets
  - 4-inch Mill, Patch and Fill
  - Extensive base patching
  - Expensive
- In Summer 1994, the municipality was planning to do the same type of project to the main road into the industrial park in the Fall.

Project Background

- Pavement Distresses
  - Extensive Fatigue Cracking (HS - HE)
  - Significant Transverse Cracking (HS – ME)
  - Significant Raveling (MS/HS)
- Poor Cross-Slope
- Poor Drainage
- Curb repairs

Existing X-Section



Original Cross-Section

Project Background

- Concerned about the long-term performance of a "Patch/Mill/Fill" approach
  - There had been many repairs on the entrance road over the years
- However, a consultant was in the process of designing a patch/mill/fill project (June 1994)

Project Background

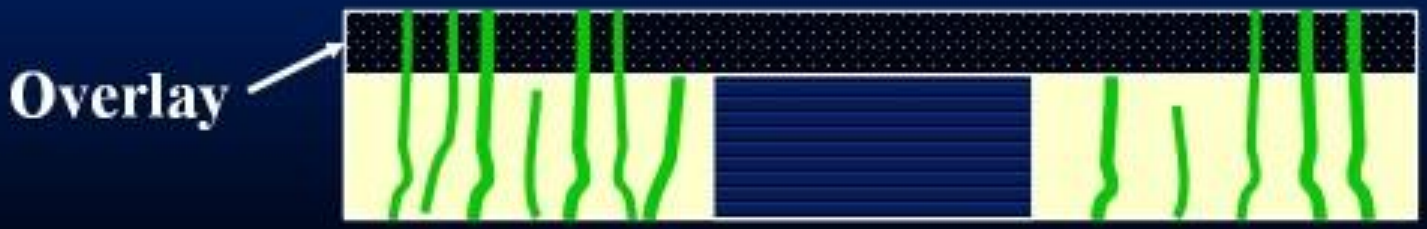
- Late Summer 1994 (August 1994), the Town Manager read an LTAP (T2 Center) Newsletter article about CIR and then attended CIR/FDR training course
- Meeting to discuss the possibility of CIR
- Steps to determine if it is a good candidate
  - Test Pits
  - Utilities/Drainage/Curbs/Driveway Entrances
  - Geometry (Cross-slope and profile) issues
  - Construction Time – Concerned about interference with traffic
  - Costs

Prior to Overlay

Section View

Plan View

After Overlay



Section View

Plan View

More on this later

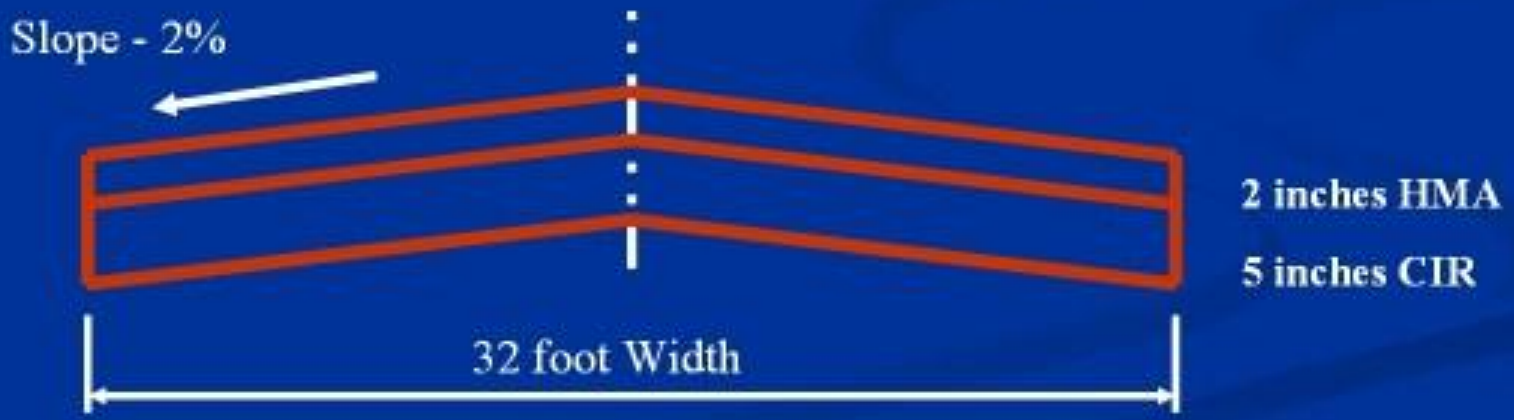
Results of Investigation

- Test Pits
  - Confirmed that adequate material existed for CIR
- Other Identified Benefits
  - Reshape the roadway easily with the CIR process
    - Time/Cost savings
  - Greatly reduce the amount of patching
  - Quick in-out – minimal disruption to businesses
  - Utilize existing in-place materials

Pavement Coring

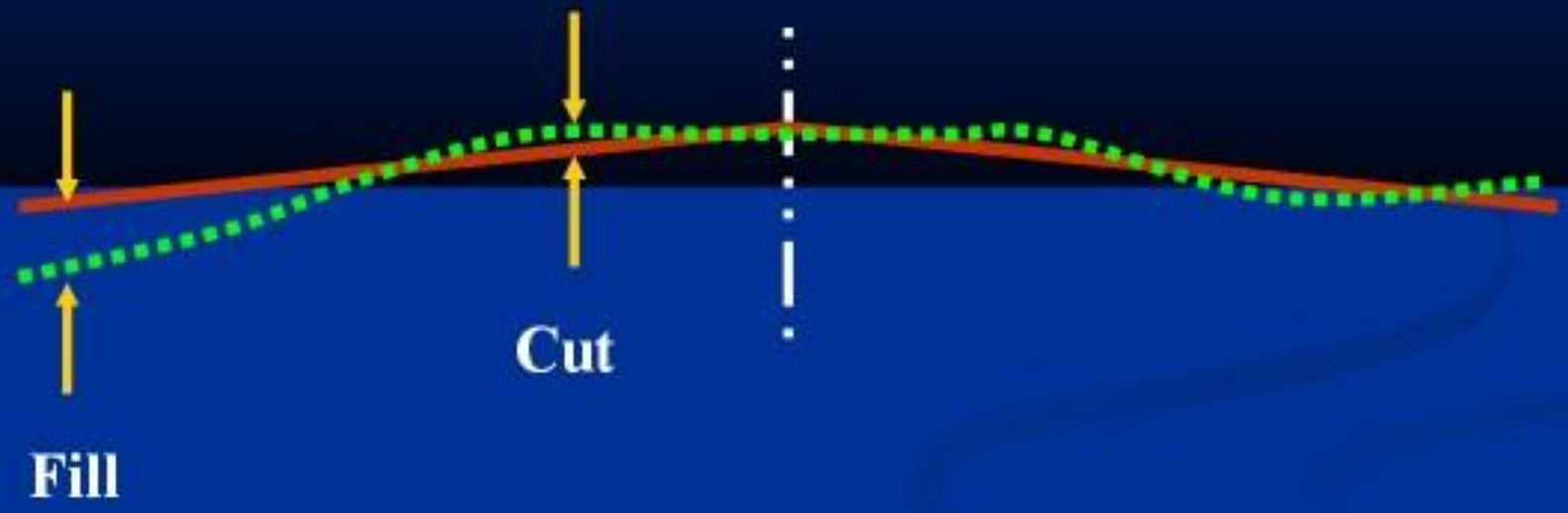
Existing and Proposed X-Section

Original Cross-Section



Original Cross-Section

Existing and Proposed X-Section



Existing Cross-Section

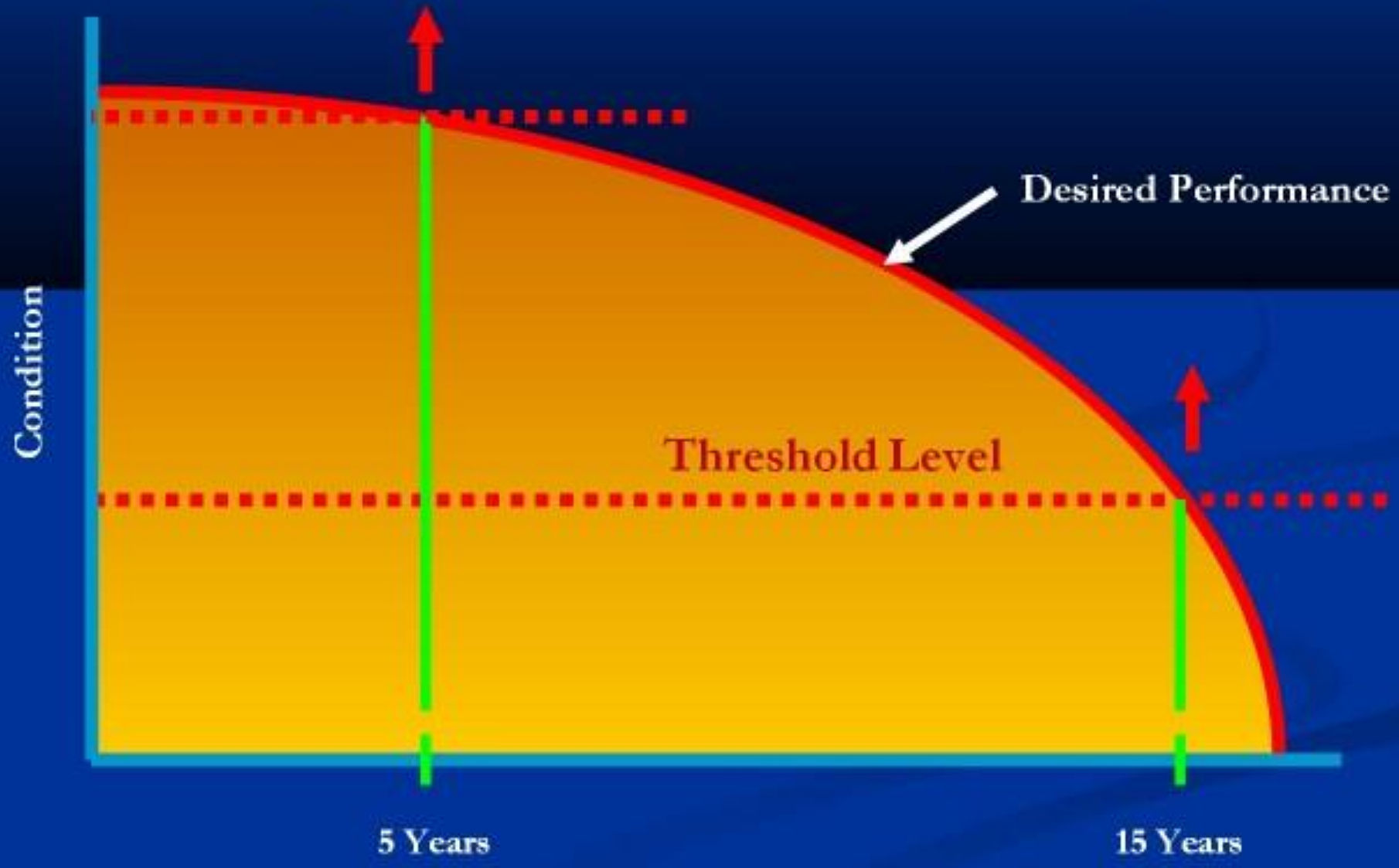
Proposed Cross-Section

During Recycling Process

Performance Specification

- Warranty Clause
  - 5 years "free of defects"
    - Minimal amount of low severity distresses allowed
  - Repairable Defects were defined
  - Required Repairs were defined
- Problems not covered by the warranty
  - Weak Subbase/Mositure/Overlay Issues

Why not 15 Year Warranty



Cost Comparison

Bid Prices (1994):

- Traditional Thick Overlay: $375,000
  - Deep Patching, Milling & 4 inch Overlay
  - Minimal Slope/Grade Correction
- CIR/2" Overlay: $230,000
  - 5 inch CIR Base & 2 inch Overlay
  - Significant Correction of Slope/Grade

Note: Does not include the cost of drainage and curb work

Current Condition

16 Years Later

The Good!!!

For a 16-year old Road – Pretty darn Good

It's Not all Perfect

A Few Spots with Distress

One Significant Issue

Serious Rutting Occurred Early On in Two Locations

A Subgrade Moisture Problem

Comparison

1994 Patch and Overlay

Side Street

Patch and Overlay Street

- Side Road in the Industrial Park
- Receives approximately 1/3 the traffic loading as the Main Road
- Pavement Structure
  - Slightly less asphalt
  - Similar aggregate base
  - Similar subgrade

Comparison

1994 Patch, Mill & Fill

1994 Cold In-place Recycling

Quality Control

Quality Product

- To attain Quality/Long-Term Performance
  - Field Testing
  - Geometric/Drainage Design
  - Pavement Design
  - Mix Design
  - In-depth Contract Documents
  - Thorough Inspection
    - Verifying Application Rates, Gradation, Depth, Density, Moisture, Weather, etc.

Specifications

- In-depth Specifications are Imperative
- Required for:
  - Competitive Bidding
    - Level playing field
  - Inspection
    - Enforcement
  - Conflict resolution
    - Legal document

Specifications

Different Approaches:

- **Recipe/Method Specifications**
- **Performance Specifications**
- **Combination Specifications**

Must be enforced !!!!!!

Remaining Streets in the Ind. Park

- The remaining streets did not have adequate HMA thickness for CIR
- Significant Aggregate Base
  - Granular material with minimal fines
  - Asphalt Emulsion Binder
- Rehabilitated in 2001 using FDR

After Construction

Last Week

9 Years Later

Thank You

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