Contactor's Perspective on Successful Construction of CIR and FDR

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What are the Keys to Successful CIR and FDR Projects?

- Proper Site Selection – Right Method Right Road
- Good Communication and Education

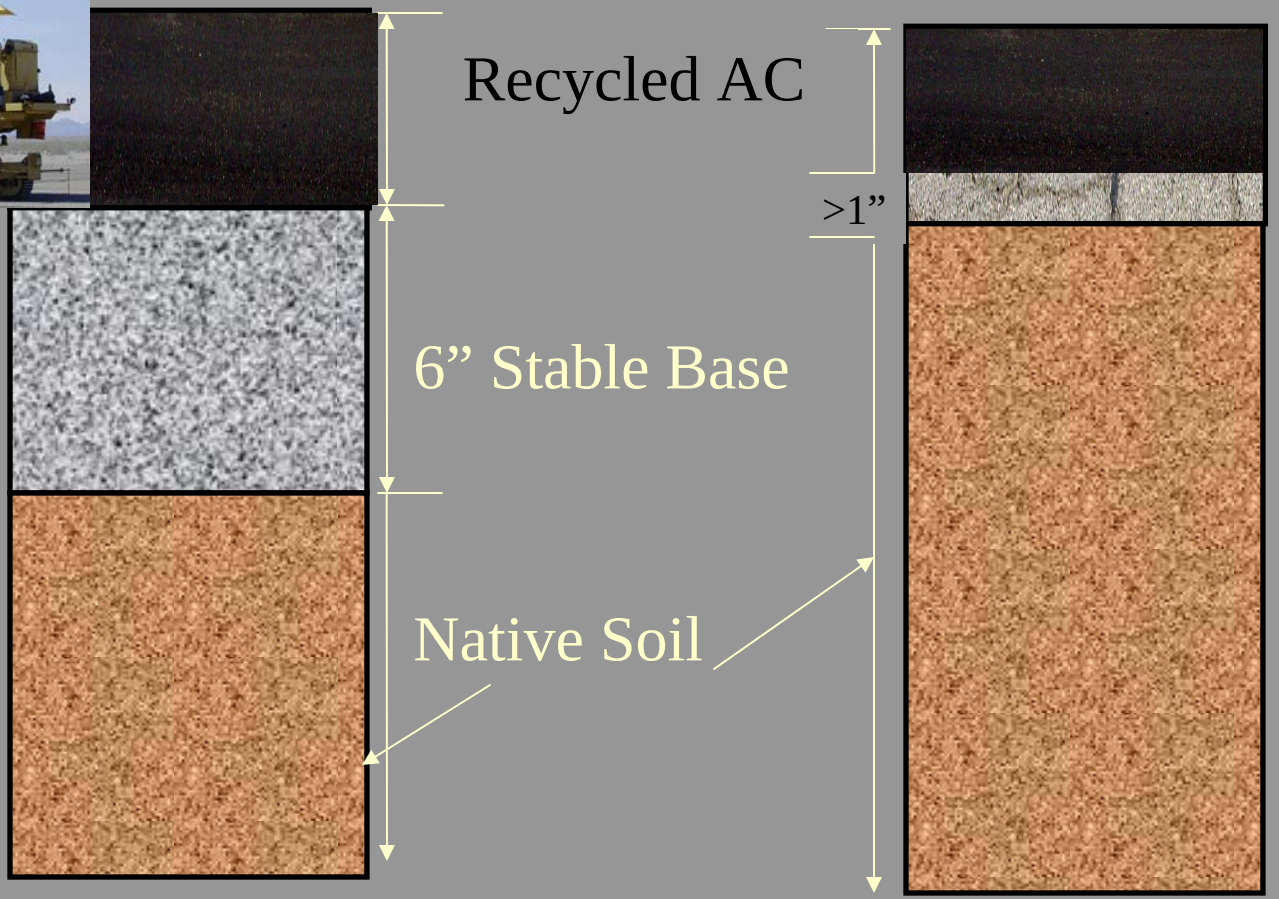
Proper Site Selection
Right Method Right Road

- Cold In-Place Recycling (Preservation) Versus FDR (Rehabilitation) – Structural Needs
  - Thickness of AC
  - Future Traffic Considerations
- Logistics
  - Geometry
  - Environmental Conditions
  - Utilities

Cold In-place Recycling (CIR) – Preservation/Minor Rehab.

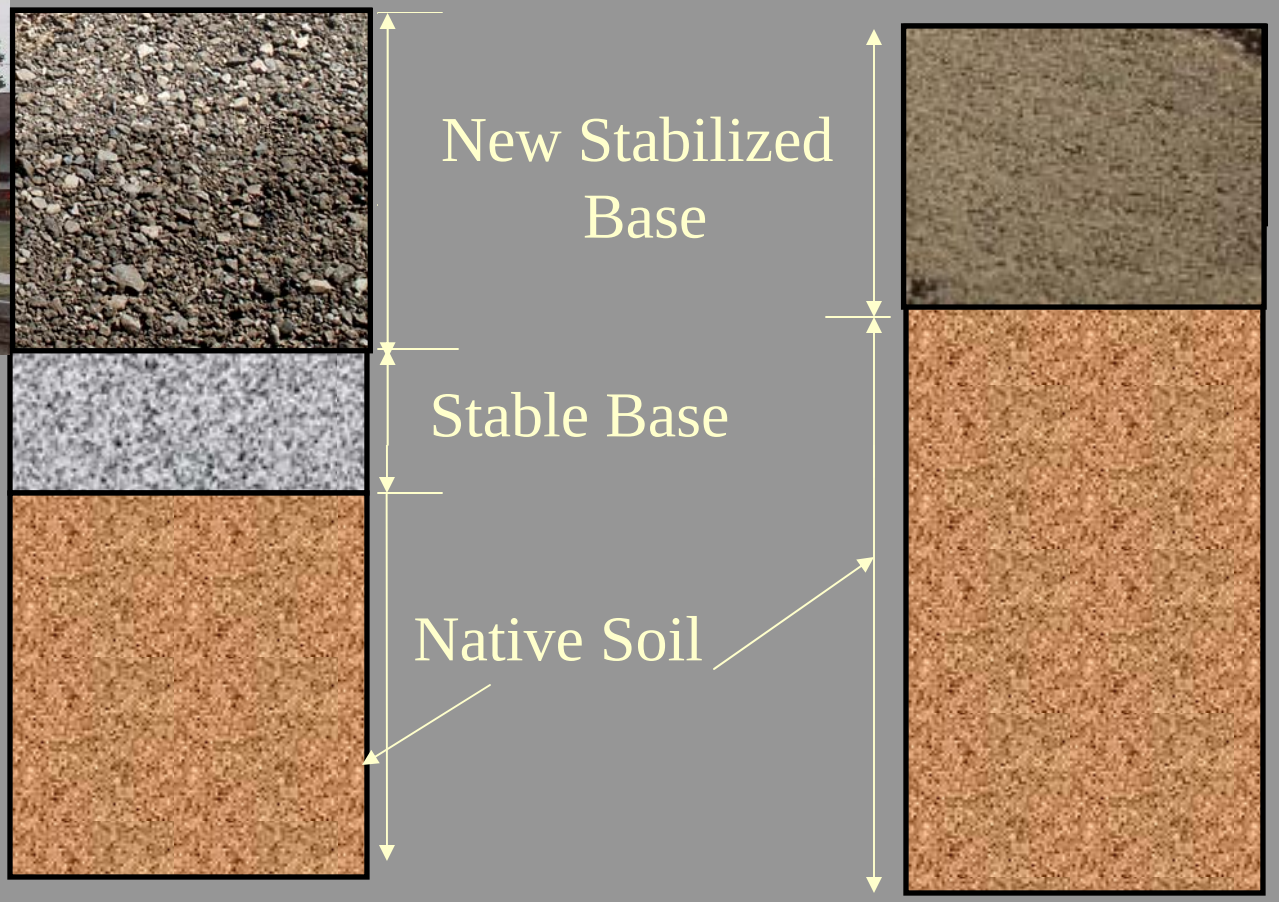
Recycle AC to:

- Stable Base
- Within 1” of less Supportive Material



Full Depth Reclamation (FDR) - Rehabilitation

Improves existing materials in-place to provide greater structural support and reduction of imported material.



Where to Use Cold In-place Recycling

- Anywhere mill and fill is considered
- Adequate existing pavement thickness
  - 2 to 5 inches in thickness
  - Thick enough to take to stable base
  - Leave 1” of existing pavement on native
  - Don’t contaminate the CIR
- Will handle all cracking distress provided not base related

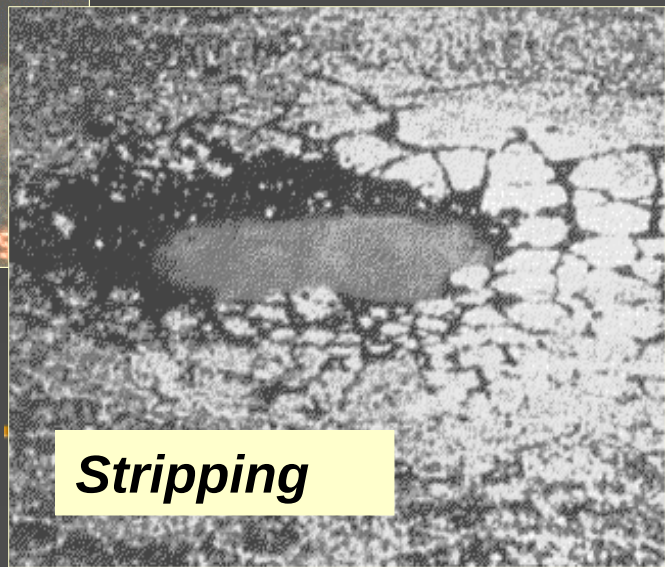
Pavements with Difficulty to CIR

Paving fabric makes it messy!

~~Asphalt Rubber~~

Thin AC and getting into the subgrade.

Avoid base problems!



Cracking Pattern Disrupted Does Not Need to Go Full Depth

Poor Subgrade Will Not be Fixed by CIR

Pavement Conditions that Can be Addressed by Cold In-Place Recycling

Ruts	**< 3/4 in**	**√**
	> 3/4	**?[1]**
Crack	**Fatigue**	**?[1]**
	Longitudinal	**√**
	Transverse	**√**
	Block	**√**
Surface	**Dry**	**√**
	Flushing	**√**
	Bleeding	**√**
	Variable	**√**
Raveling		**√**
Potholes		**√**
Texture - Rough		**√**

Ride - Poor	**√**
Poor Drainage	**no**
Snow Plow Use	**√**
Low Skid Resistance	**√**
Asphalt Crumb Rubber	**no**
Stripping Pavement	**?[2]**
Paving Fabrics	**?[3]**
Structural Deficiency	**no**
Base Failure	**no**

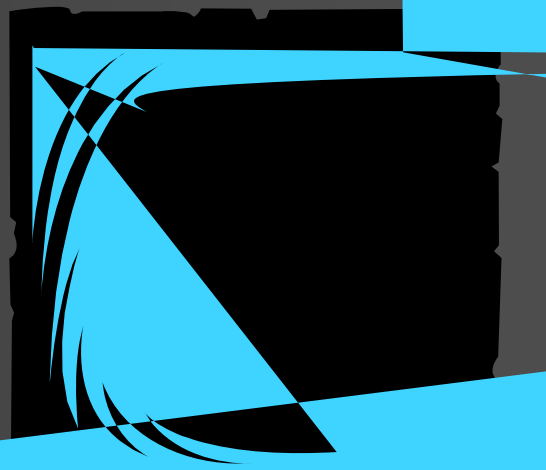
Questions?

1. **Provided not base, subgrade or unstable mix related.**
2. **Depends on severity. May be able to add antistrip additive.**
3. **No problem if properly installed. If not, logistical issue with additional costs for disposal.**

CIR Logistics

- Main mill is 12.5-feet wide. Allows for full lane width and overlap per specifications. Shoulders up to 5-feet wide can be accomplished with a supplemental mill that works in parallel.
- Wider shoulder passes are accomplished by a pass with the main mill and large overlaps. Some inefficiency.
- Curbs and gutters are header cut to allow for the overlay.
- Equipment is mostly 14' tall. Watch for low power lines and trees.
- Utilities should be double adjusted. Avoid stopping and starting the train.

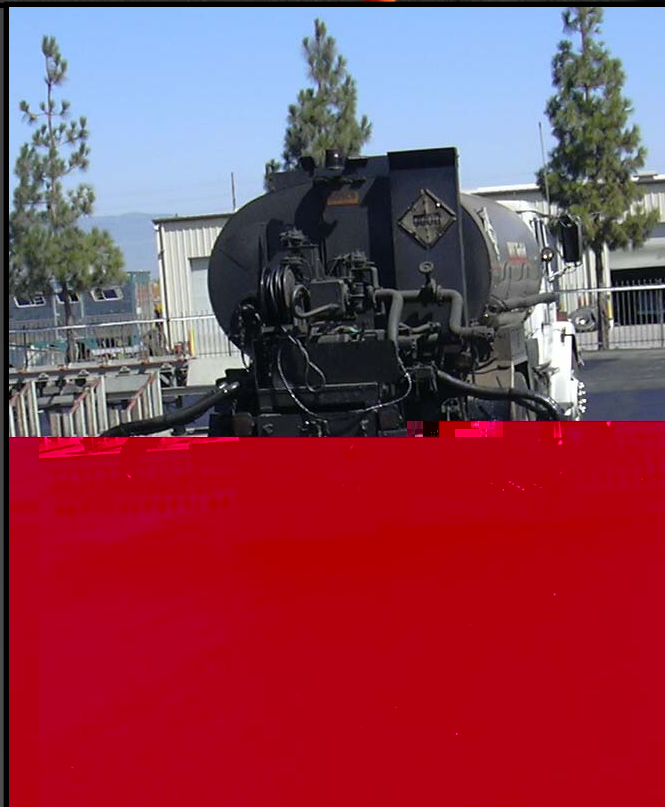
Environmental Conditions



- Make sure construction occurs at right tim
- Not perf

Traffic - CIR

- The main method of failure is excessive raveling during initial traffic.
- Minor raveling/shedding is expected and mitigated by a fog seal. In urban environments sand blotter prevents pickup.
- Secondary compaction from traffic can be caused by insufficient rolling.
- Good design can mitigate most issues.



Equipment Width Should be Considered

Issues Affecting CIR Performance

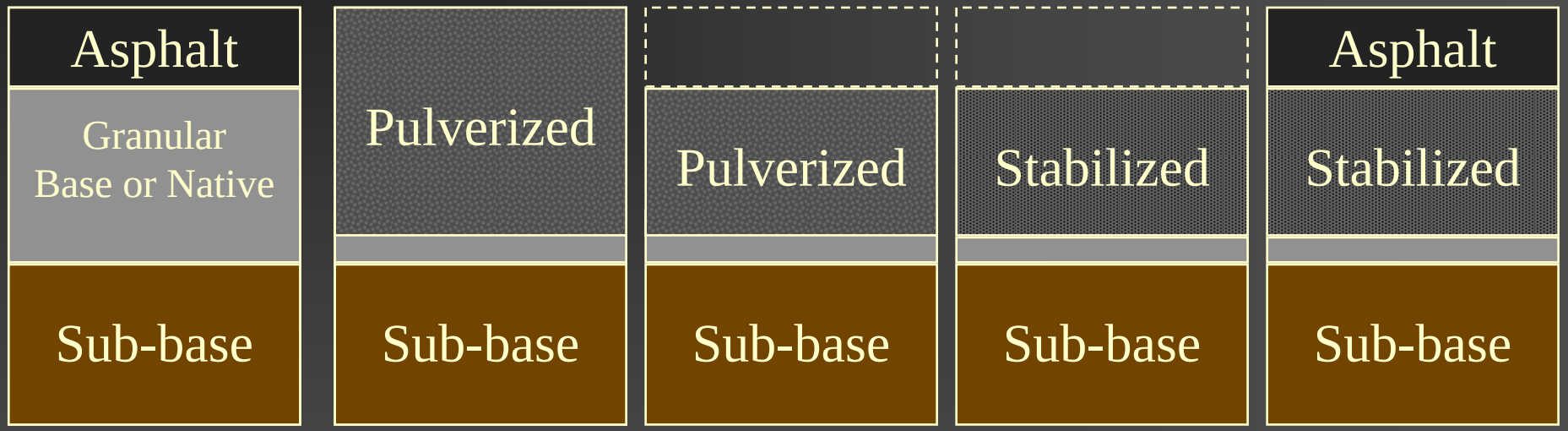
- Decreased service life if treatment is applied at the wrong time of year or in poor environmental conditions. Adequate cohesive strength is not achieved if curing is incomplete. Make sure the construction occurs in right season.

- Failure to recognize structural inadequacies. Too thin of pavement. CIR will restore existing pavement but will not restore structurally deficient roads.

Where to Use Full Depth Reclamation

- Anywhere complete reconstruction is considered.
- Replacement for AC over aggregate base section.
- Much less pavement limitations than CIR.
- Handles all cracking distress.
- Can improve poor subgrade.

Pulverization, Add Any Additives, Mix In-place, Shape, Compact and Seal



Existing road

Pulverization to desired depth

Removal of excess material (if necessary) and shaping.

Addition of additives, mixing, reshaping and compaction.

Final surface treatment.

Right Additive for Right Soil Condition

Table 1

FDR Logistics and Environment

- FDR Less sensitive to temperature. However, should not be performed during freezing or wet conditions.
- Work hour windows can be shorter.
- Smaller more maneuverable equipment. Tighter work areas.
- When excess removal is required consider removing the AC via milling and recycle the AC prior to reclaiming.
- May expose the soft subgrade. May have to allow time for stabilized subgrade to gain strength.

FDR Logistics and Environment

- Soil around structures such as manholes, utility risers, and cross gutters is pulled out into area accessible to reclaimer.

- Edges adjacent to curb and gutter are pulled out into areas accessible to reclaimer.

- Have to temporary ramp at intersections and driveways.

FDR Difficulties to Overcome

- Unmarked and shallow utilities the biggest issue.
- Too of thick of pavement. Reclaimer may not get through.
- Cobbles and rocks directly under the areas to be reclaimed.
- Deep sections over 14” but still specified to get to 95% relative compaction.

Traffic - FDR

- The roadway can be traveled in a pulverized state.
- Depending on the stabilizing agent, such as cement, a curing/strength gain period may be necessary. Some specify 7 days.
- May have to schedule around trash pickup and limit truck access to minimize heavy loading during curing.
- Less traffic concerns with bituminous additives I.e asphalt foam or emulsion.

Key to Successful CIR and FDR Good Communication and Education

- Resident Engineer and Agency Inspectors Unfamiliar with the Processes
  - Ask a Recycling Contractor to Review the Project and Specifications Before the Bid. Use Their Expertise and Experience.
  - Just In Time Meeting/Training can Provide Reasonable Expectations Amongst Unfamiliar Parties.

- Need to Better Educate Outside Consultant Inspectors
  - Until They are Converted They Tend to Be More Resistant to the Alternative Methods Such as Recycling.
  - Tend to Try Test Using Hot Mix Asphalt Methods.
    - Need to be Educated as to the Breakover Point of CIR Compaction.
    - Want to Take the Material to the Laboratory for Performance Testing.

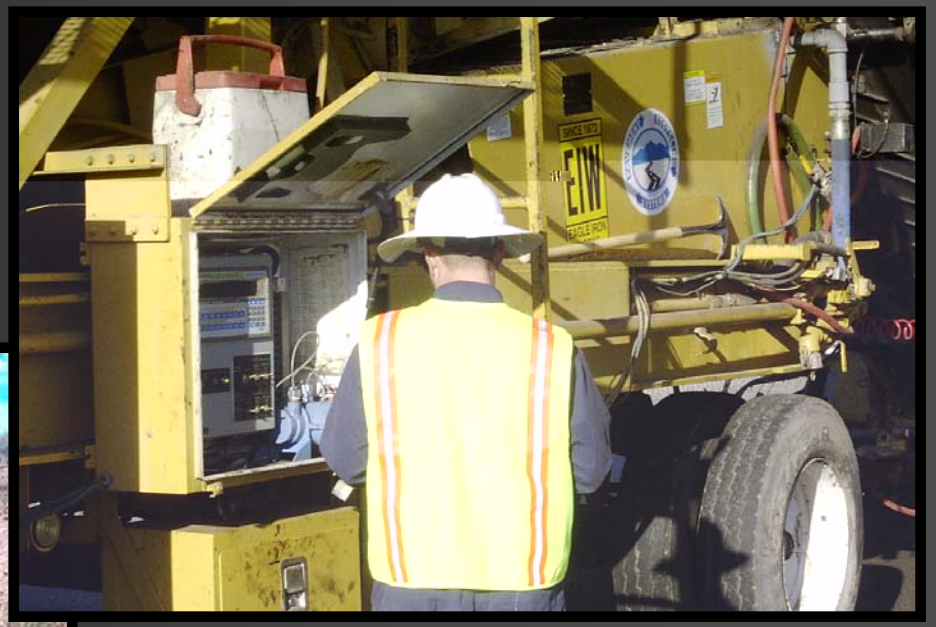
Recycling Subcontractors Interaction with General Contractors

- Typical Issues in Recycling and Reclamation:
  - Insufficient rollers or rollers without working water.
  - Inadequate paving and pickup equipment in CIR.
  - General wants to pave prior to proper cure time.
  - Heating the paving screed with CIR.
  - Personnel just not familiar with the material and how to pave the CIR or make grade in FDR.
- Recycling Contractor can Provide a Scope of Work Letter to General Prior to Bid.
  - Include support equipment necessary.
  - Outline separation of responsibilities.
- Subcontractor Cannot Make the General Construct the Project Correctly. The Agency Must Make The General Adhere to the Specifications.

Tips for Successful CIR and FDR

- Analyze Existing Structure & Conditions
- Even if Agency is Requiring the Contractor to Perform the Mix Design. Prior to Bidding the Project Agency Should Core.
  - Check existing pavement for adequate thickness.
  - Look for fabric and pavement type.
- Understand Causes for Distress
- Analyze Profile of Road
- Consider any Drainage or Base Problems
- Select Best Materials & Methods

Follow the Specs.
On Site QC/QA



In Summary
Let's Get It Right!

- More Agency Successes Lead to More Successful Contractors
- Good Recycling Contractors Want Stringent Quality Control and Specifications
- Avoid Surprises

Questions?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