Full Depth Reclamation - FDR

JONATHAN PEASE – PRESIDENT, ROCK SOLID STABILIZATION & RECLAMATION, INC.
Jonathan Pease History

• Started in the heavy civil construction industry in 1986 at 12 yrs. of age
• Performed various tasks throughout my career in the heavy civil road building industry
• Purchased the family road construction business in 2002
• Formed Rock Solid Stabilization in 2007
• Joined the Board of Directors of ARRA in 2015
• Been involved in 40million+ SY of soil stabilization & FDR projects
Per ARRA Full Depth Reclamation is a technique in which the full flexible pavement section and a predetermined portion of the underlying materials are uniformly crushed, pulverized, or blended, resulting in a stabilized base course; further stabilization may be obtained through the use of available additives. By addressing the entire pavement section, full depth reclamation is able to correct delinquent cross sections, increase the load-bearing strength of the base, and utilize 100% of the existing materials. (ARRA)
Industry Overview
Chose the Right Process @ the Right Time, on the Right Road, For the Right Price

- Visual site investigation
- Subsurface investigation (includes subgrade)
- Mix Design and/or recommendations from experienced person for all present varying conditions, choose the “right team”
- Cost comparison of available options
- Fix subgrade drainage issues if needed
- Utilizing a competent “team” of civil engineer, geotechnical engineer and contractor
- Realize and inform customer that there can be field changes due to unforeseen circumstances at times
- Infield QC/QA when possible
Pulverization
Cold Recycling Mill vs. Reclaimer

- Collects millings into central windrow
- Utilizes to remove surface asphalt if your project is sensitive to grade/ elevation
- Keeps pulverized material in same path
- Creates homogenous blend
- Adds volume/ raises grade
- > 6” \(\rightarrow\) compact before grading
FDR Candidates

- Deteriorated Asphalt and/or Aggregate Base (Reconstruction)
- Parking Lots
- Industrial Storage Lots
- Secondary Roads
- City Streets
- Interstate Highways
- Airport Runways
When to Utilize FDR

- Spec’d or Value Engineered on Asphalt Pavements in Need of Replacement
- Frequent Deep Cracking
- Reflective Cracking
- Heavy Pothole Patching
- Severe Rutting/ Shoveling
- Frost Heaves (may require drainage corrections)
- Insufficient Base Strength
FDR Cross Sections

Mill & Fill

Overlay

Full Depth Reclamation

Mill & Fill

Overlay

Surface Course

HMA

Base/Sub-base

Subgrade

HMA

Base/Sub-base

6-10” FDR

Subgrade

Subgrade

Subgrade
FDR Methods

- Mechanical
- Chemical
- Bituminous
Mechanical stabilization

• Pulverizing deteriorated asphalt and/or aggregate surface
• May incorporate the addition of supplemental aggregate
• No stabilizer or binder are incorporated into the blend
Chemical stabilization

- Includes the addition of chemical stabilizers such as:
  - Portland Cement
    - Dry or Slurry
  - Quicklime or Hydrated Lime
    - Dry or Slurry
  - Lime Kiln Dust
  - Cement Kiln Dust
  - Class “C” Fly Ash
    - Or blends of the above
  - Other Polymers or Enzymes
Bituminous stabilization

• Includes the addition of bituminous binders
  • Emulsified Asphalt
  • Expanded Foam
Pre-pulverization
Shape & Compact

Pre-pulverization

FDR
The process
Transportation

FDR
The process

Pre-pulverization
Shape & Compact
FDR

The process

Mixing Powder

Pre-pulverization

Shape & Compact

Transportation

Spreading
The process

Mixing

Emulsion/Foam

Pre-pulverization

Shape & Compact

Transportation

Spreading

Mixing
FDR

The process

Compacting

Pre-pulverization

Spreading

Shape & Compact

Mixing

Transportation
The process

Grading

Pre-pulverization

Spreading

Mixing

Shape & Compact

Compacting

Transportation
The process

Finish Static Roll

Pre-pulverization

Shape & Compact

Compacting

Transportation

Grading

Mixing

Spreading

FDR
# Structural Equivalent FDR vs. R&R

## Proposed FDR Section

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Sn/ Inch</th>
<th>DEPTH (INCHES)</th>
<th>IBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Depth Reclamation</td>
<td>0.25</td>
<td>10.00</td>
<td>2.50</td>
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</table>

**Total Structural Number:** 2.50

## Replacement Section with Aggregate (structural equivalent)

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Sn/ Inch</th>
<th>DEPTH (INCHES)</th>
<th>IBR</th>
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</thead>
<tbody>
<tr>
<td>Aggregate Base</td>
<td>0.14</td>
<td>18.00</td>
<td>2.52</td>
</tr>
<tr>
<td>Bituminous BAM</td>
<td>0.30</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bituminous Binder</td>
<td>0.30</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bituminous Surface</td>
<td>0.33</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4000 PSI (Un-Reinforced) PCC Pavement</td>
<td>0.50</td>
<td>0.00</td>
<td>0.00</td>
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</table>

**Total Structural Number:** 2.52

**Mill and Remove 18" of Existing and Replace with 18" of CA-6**

## Replacement Section with BAM (structural equivalent)

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Sn/ Inch</th>
<th>DEPTH (INCHES)</th>
<th>IBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Base</td>
<td>0.14</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bituminous BAM</td>
<td>0.30</td>
<td>8.50</td>
<td>2.55</td>
</tr>
<tr>
<td>Bituminous Binder</td>
<td>0.30</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bituminous Surface</td>
<td>0.33</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4000 PSI (Un-Reinforced) PCC Pavement</td>
<td>0.50</td>
<td>0.00</td>
<td>0.00</td>
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</tbody>
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**Total Structural Number:** 2.55

**Mill and Remove 8.5" of Existing and Replace with 8.5" of BAM**
### STRUCTURAL EQUIVALENT FDR VS. R&R

#### 108th Comparison

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Unit $</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Bit. Materials (GAL)</td>
<td>74,231.00</td>
<td>2.55</td>
<td>189,289.05</td>
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<tr>
<td>FDR Base Course 10&quot; (SY)</td>
<td>27,415.00</td>
<td>7.15</td>
<td>196,017.25</td>
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<td><strong>Total FDR:</strong></td>
<td></td>
<td></td>
<td>$ 385,306.30</td>
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<tr>
<td>Mill &amp; Remove 18&quot; Existing HMA, AGG BASE, CLAY (SY)</td>
<td>27,415.00</td>
<td>11.52</td>
<td>315,820.80</td>
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<td>18&quot; CA-6 Agg Base (SY)</td>
<td>27,415.00</td>
<td>13.86</td>
<td>379,971.90</td>
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<td><strong>Total R&amp;R Agg Base:</strong></td>
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<td>$ 695,792.70</td>
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<tr>
<td>Mill &amp; Remove 8.5&quot; Existing HMA, AGG BASE, CLAY (SY)</td>
<td>27,415.00</td>
<td>5.44</td>
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<td>8.5&quot; CA-6 BAM (SY)</td>
<td>27,415.00</td>
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<td>664,265.45</td>
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<tr>
<td><strong>Total R&amp;R Agg Base:</strong></td>
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<td>$ 813,403.05</td>
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</tbody>
</table>
Thanks for your Participation

Please complete the evaluation to provide your feedback on this session and suggest topics for future events.

Remember to mark these upcoming events on your calendar!

March 7-11, 2017
www.conexpoconagg.com
www.ifpe.com