Soil Cement Roads
Richland County MT

2017 Rapid City Roads Conference

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Google “soil cement montana”
Richland Co Rural Road Problems-2010

• Road Damage → Heavy Oil Field Trucks
• Clay subgrade soils, soft spots
• Limited Resources
  – Costly Gravel
  – 10 M$ road budget, 100M$ problem
• Hot Mix Paving Issues
  – Not enough road width for thick gravel base layer
  – Too costly per mile
  – Construction process too slow
Answer ➔ Subgrade Soil Stabilization

- No subgrade widening, lower cost, ½ mile/day
- Lab mix designs with subgrade soils
  - Lime, Fly Ash, Portland Cement
- 2010 Test Sections
  - 4 miles with Portland Cement – 8, 10 & 12 inch thickness
  - Wearing Surface
    - Double Chip with & without geotextile
    - Otta Seal with High Float Emulsion
    - 4” layer of gravel treated with Calcium Chloride and Bentonite Clay
2011-2013 Soil Cement Construction

• 55 Miles Built – less than ½ cost of hot mix paving

• 2011 – 10” Soil Cement  2012 & 13 – 12” Soil Cement

• Worst Designs – Double Chip on Soil Cement – no gravel base

• Best Designs
  – Subgrade Soft Spot Treatment – 18” depth with 3% Cement
  – Structural Layer – 12” depth with 6% to 7.5% (depending on clay soil)
  – Wearing Surface
    • Double Chip with 3 inches gravel base
    • 3 inches hot mix with 3 inches gravel base
Strength Testing of Soil Cement

- Falling Weight Deflectometer on 39 miles
  - Spring & Fall for 8 years (2010-2017)

- Long Term Results after 8 years
  - Typical: 3 to 5 times as strong as gravel base
  - Worst Case: 2 times as strong as gravel base
  - Long Term Costs: much less than ½ cost of hot mix option

- Best Designs
  - Clay Soil Stabilization:
  - Wearing Surface for Heavy Truck Traffic
    - Double chip on 3 inches gravel base
    - 3 inches hot mix on 3 inches gravel base
County Road Crew Use of Portland Cement, 2015-2017

• 2015 - Permanent stabilization of gravel road soft spots with 3% cement (CBR 1 → 12)
• 2016 - Rebuilt 2011 soil cement problem areas – one mile in 39 miles
• 2017 - Stabilized 1 mi. of failed BST road

Double Chip

Structural Layer

Fabric

Gravel Base – 8” Thick (2009)

Rutted/Failed Structure (2017)

12” Cemented stabilized gravel & subgrade

Subgrade

Avg. FWD = 12 mils

Avg. FWD = 68 mils
Recommendations

• Consider cost savings with soil cement for upgrading high traffic routes
• Select the right stabilizer for you soils
• Consider Portland cement for permanent repair of subgrade soft spots