

Minnesota Concrete Council:
We Have to Build it Where? Solutions for Building on Challenging Construction Sites
Cement Soil Stabilization

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Minnesota Concrete Council
October 13th, 2021 / MCC Webinar / Cement Soil Stabilization

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Overview – Soil Stabilization

- ▶ Right Tool, Right Time, Right Place
- ▶ Construction Process
- ▶ Planning
- ▶ Market and Pricing



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Right Tool, Right Place, Right Time

- Save Money
- Save Time
- Reset Pavement Design Process
- Extend the Life of Pavement
- Reduce Maintenance Costs
- Reduce Carbon Emissions
- Recycle and Re-Use



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Soil Stabilization with Cement

Use proven engineering practices and modern equipment to design and blend in-place materials (clay, silt, clay) with Portland cement powder to create an engineered soil cement layer.



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Vane Spreader

- ▶ **Modern Cement Vane Spreader**
- ▶ Material application rate controlled by onboard computer that is constantly collecting GPS and ground radar data to apply the proper amount of Portland cement regardless of conditions or the ground speed of the spreader



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How a Reclaimer Works

Direction of Travel

Spray Bar with Nozzles

Drum Rotation



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Construction Keys



- ▶ Uniform Distribution of Cement
- ▶ Thorough Blending and Moisture
- ▶ Compaction Best Practices
- ▶ Proper Quality Control with Onsite Technician

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Cure of the Stabilized Layer

- ▶ Portland Cement
 - ▶ Keep surface moist to prevent shrinkage cracks at the top of the stabilized layer
 - ▶ Cure time is dependent on weather conditions, 24 to 48 hours
 - ▶ Utilize a DCP when available
 - ▶ Work your way out on a freshly stabilized surface, push the gravel out onto the layer to distribute the load
 - ▶ When wet, clay fines will make the surface slippery, be careful



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Quality Control - TRUST but VERIFY

Material Properties <ul style="list-style-type: none"> • Gradation • Depth Checks • Moisture • Density <ul style="list-style-type: none"> ✓ Compaction is KEY • DCPs <ul style="list-style-type: none"> ✓ Simple but effective! 	Additives <ul style="list-style-type: none"> • Calibration Checks <ul style="list-style-type: none"> ✓ Monitor Yields • Summarize Load Tickets Daily
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Planning Tools for an Engineered Solution

- ▶ Geotechnical Report
 - ▶ Proctor
 - ▶ Identify Insitu Soil Types
 - ▶ DCP's
- ▶ Mix Design
 - ▶ Understand relationship between moisture content, insitu soil, and amount of cement needed for stabilization and long-term durability
- ▶ Pavement Design

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Soil Stabilization with Cement

12 inches of Engineered Soil Cement = 18 inches of Compacted Gravel

12 inches of engineered cement soil stabilization equals the structural capacity of 18 inches of compacted gravel

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Productions / Bidding / Cost

- ▶ By the Day
 - ▶ 400 TN Additive
 - ▶ 15,000 SY
- ▶ Bidding
 - ▶ SY to be stabilized
 - ▶ TN of additive
- ▶ Variables
 - ▶ Depth of Stabilized Layer
 - ▶ Unit Weight of Material to be Stabilized
 - ▶ Area to be Stabilized
 - ▶ Market Price of Additive
 - ▶ Distance from Terminal to Project

▶ \$4.50 to \$7.50 per SY (12-inch depth)

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Soil Stabilization with Cement

- ▶ Benefits
 - ▶ Proven Freeze/Thaw Durability
 - ▶ Performs well in both dry **AND** soaked conditions
 - ▶ Won't weaken or experience performance issues through the spring thaw
 - ▶ Engineered Solution
 - ▶ Save money by importing less gravel
 - ▶ Accelerate Construction Schedules
 - ▶ Significant cost savings when the technique is used on the right road, at the right time, with the right pavement condition.

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