

Granular Materials and Chemical Stabilization

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Background

- Changing demands on transportation infrastructure:
 - agricultural industry
 - commercial growth
 - energy industry
- Variety of highway performance characteristics in response to changing demand:
 - Some performing well
 - Others experiencing failure
- **Why do some roads perform while others do not?**

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Subgrade Stabilization

Subgrade stabilization is the process of improving the strength and stability of a soil's subgrade to support the construction of roadways.

Subgrade stabilization can reduce construction costs and carbon emissions by up to 50%. It can also increase the bearing capacity of a subgrade layer, which can support heavier loads.

Subgrade Stability is important for prevention of excessive rutting and shoving during construction, and for limiting permanent deformation in the subgrade.

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Types of Stabilization

- Cement stabilization.
- Mechanical stabilization.
- Lime stabilization.
- Chemical stabilization
- Bituminous stabilization
- Fly ash stabilization
- Geotextile and fabric stabilization

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Types of Chemical Subgrade Improvements Commonly Used

Here are some common chemical subgrade stabilization methods:

- Lime:** A common choice for stabilizing soil with high clay content. Lime can be in the form of hydrated lime, which is a fine powder, or quicklime, which is more granular. Hydrated lime is safer to work with than quicklime.
- Cement:** A common choice for stabilizing sandy or silty soils.
- Fly ash:** An additive that can be used to chemically modify the soil

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Base Stabilization

- Base stabilization is a process that improves the properties of the ground and soil where a road is built. It's used to create a strong, stable, and durable layer between the pavement and the subgrade soil. The goal is to prevent water from damaging the road's layers, which can lead to erosion and other issues.

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Base Material and Effects on End Product

- What are we designing for?
- What will be our final product?
- Will it be maintainable over time?
- Stabilizers
- Fabrics
- Geo Grids
- Deep base layers
- Treated sub-grades

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Types of Chemical Base Stabilizers

Categories of chemical stabilizers are as follows:

- Water with surfactant
- Water-absorbing
- Organic non-petroleum
- Organic petroleum
- Synthetic polymer emulsion
- Concentrated liquid stabilizer and clay additive

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Stabilization Methods

- Full Depth Stabilization
- Partial Depth Stabilization
- Spread and Mix
- Water and Mix
- Incorporation at Source

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Base Stabilization



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Incorporating Liquid Stabilization



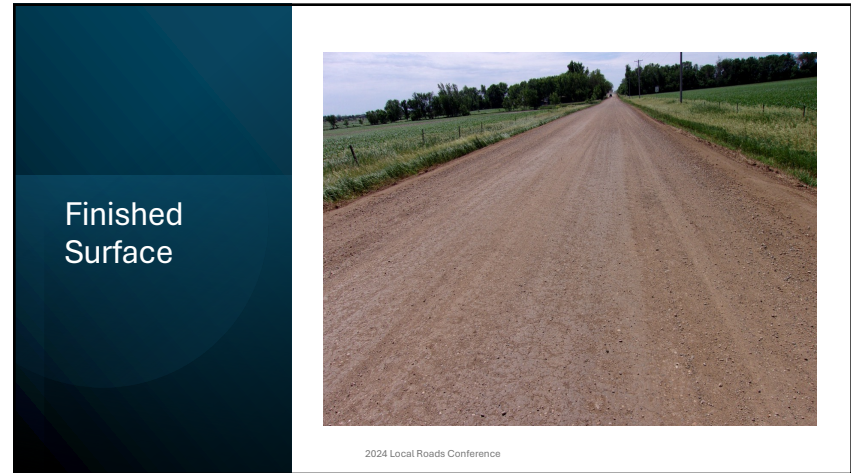
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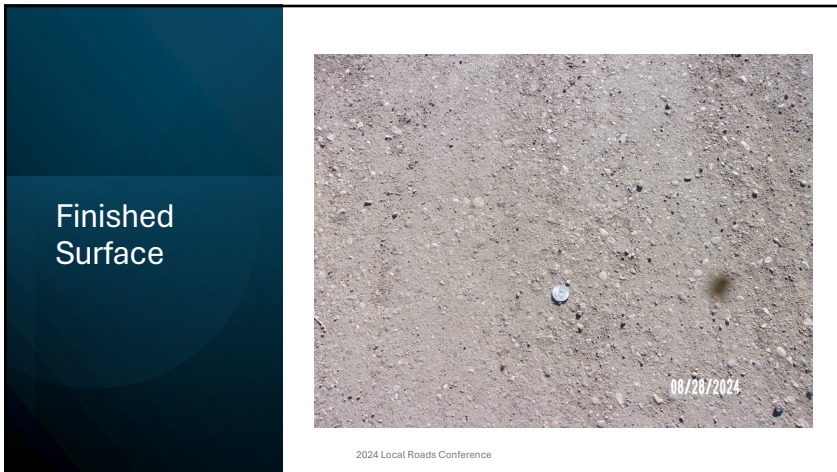
Compaction Methods

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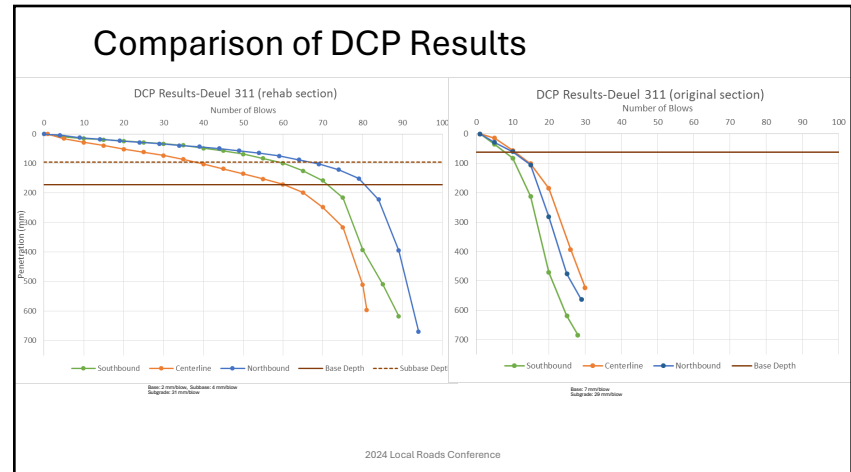
Finished Surface

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Finished Surface

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We Define this as Base Stabilization

Is base stabilization meant to be a final surface?

Long term maintenance goals

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Surface Stabilization Advantages

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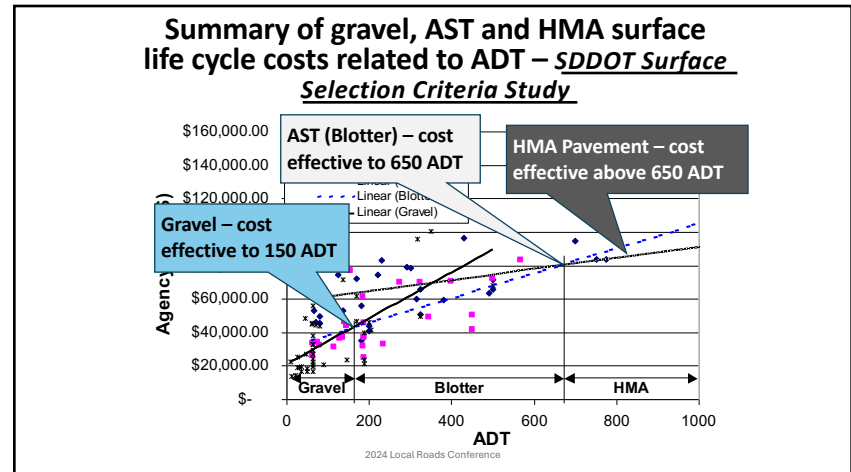
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Types of Surface Stabilizers

- Calcium Chloride
- Magnesium Chloride
- Soy Based Products
- Liquid Wood Resins (Lignin Sulfonate)
- Water
- Many Other Chemicals are Marketed as Dust Control

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Disadvantages of Surface Treatments

- Increase in Speeds
- Annual Cost of Treatment
- Improper Preparation Leading to Failure
- Material Issues
- Application Issues
- Complaints From Others Who Don't Recieve It

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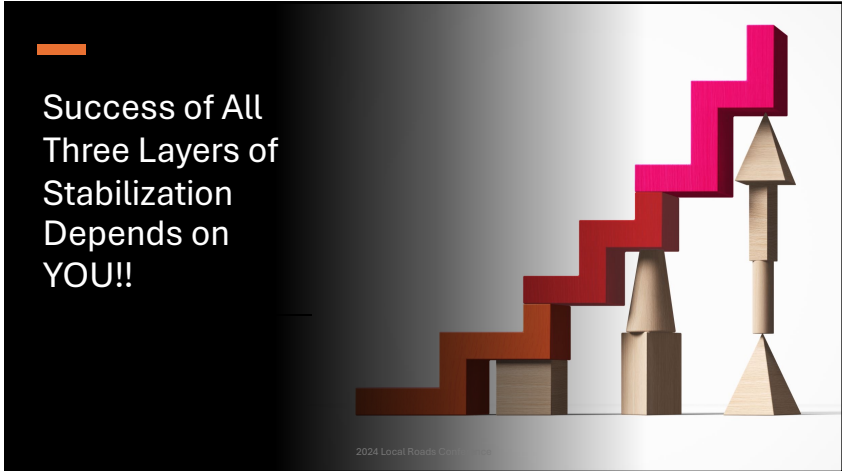
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Tasks That Must Be Completed Prior and During Stabilization

- Sample all material to be treated (Sub-Base-Surface)
- Choose the right treatment for each application
- Material Specs must be used for determining proper product
- Work with a consultant for testing and design when needed
- Proper construction practices
- Take ownership in the project

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