SOIL – STABILIZATION AND MODIFICATION
What is Soil Stabilization

- Soil stabilization is the permanent physical and chemical alteration of soils to enhance their physical properties. Stabilization can increase the shear strength of a soil thereby controlling the shrink-swell properties of a soil and, improving the load bearing capacity of a sub-grade.

- Stabilization can be used to treat a wide range of sub-grade materials from expansive clays to granular materials.
What stabilization does

- Bonds soil particles together (increases strength & stiffness).
- Reduces permeability (fills voids, forms membrane).
- Improves compaction (lubrication, particle restructuring.)
Features & Benefits

- Higher resistance (R) values
- Reduction in plasticity
- Lower permeability
- Reduction of pavement thickness
- Elimination of excavation, material hauling and handling, and base importation
- Aids compaction
- Provides “all-weather” access onto and within project sites.
EQUIPMENT

- Reclaimer
- Dry material applicator
- Wet material applicator
- Dry material storage tanker
- Graders
- Compaction equipment
- Water truck
Most commonly used stabilizers or additives

- Lime. (Calcium hydroxide)
- Portland Cement
- Calcium Chloride
- Emulsified Asphalt
- Expanded asphalt or Foamed Asphalt
- Fly Ash Type “C”
Reclaimer with water truck
Dry additive applicator: truck
Water Truck
Motor Grader
Pad Foot Roller
Storage Tankers for Water
Off loading dry product from bulk tanker
Off loading dry product from stationary storage tanker
Lime and Fly Ash Stabilization

Pennsylvania Department of Transportation
I-81
District 8.0
Lime/Fly Ash Engineering

- **Lime.** (Calcium Hydroxide). Reduces plasticity and improves compaction.
- **Fly Ash.** Bonds particles together through pozzolanic action, when clay is present.
I-81 PROJECT LIMITS

INTER CHANGE I-78 & I-81
NORTH TO
SCHUYLKILL/LEBANON COUNTY BORDER
Commercial, commuter & vacation traffic move safely through I-81 construction zone
Rubblized concrete pavement
Fly ash was placed before the lime additive
The lime/fly ash combination will bond particles through pozzolanic action.
Mixing lime/fly ash combination
Lime & fly ash are pulverized into the old wet sub-base of I-81.
Moisture control is essential in lime stabilization.
A water truck was needed to add moisture when necessary.
The additives are mixed, while rough grade is established.
Checking rough grade
Final grading of lime/fly ash treated soil
I-81 Compaction Effort

Both Pad Foot & Flat Steel Drum Rollers
Lime stabilized base cures in the summer sun
Final Stabilization Grade

After one day of curing, stabilized base material was solid.
Transformation
From soft & yielding to stabilized
Encapsulation of Environmentally Unsafe Materials. Reading Sewer Facility
D8 dozers rip and move materials to reclaiming area
Track hoes and dozers tear down the old structures
Truck mounted cement spreader applying 8% Portland cement.
Reclaimer pulverizes the cement and contaminated soils together.
Cement spreading and mixing
Mixing the contaminated soils
Testing, density and moisture for laboratory analysis
Pennsylvania Department of Transportation

State Route 100 Relocation
Lehigh County
District 5
Unseasonable Wet Spring and Summer
Lime is introduced into the base to facilitate the drying.
Lime is metered out of the material distributor
After the pulverization the base is left to cure
Moisture in the material is monitored on regular basis.
The reclaimer pushes a water tanker
After compaction fine grading can take place.
Reclaiming on the new Route 100 by-pass
The new dry stabilized base of Route 100
The hardness of the base material is evident
The unusable new roadway wet mud between catch basins
Lime is spread on top of the wet material
Lime is mixed with the wet soils
Mixing wet soil and lime
The precise amount of lime is added
Moisture is monitored in the soil
Soil conditions change during soil stabilization.
Drying the soil is essential for the developer and builders.
THANK YOU

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