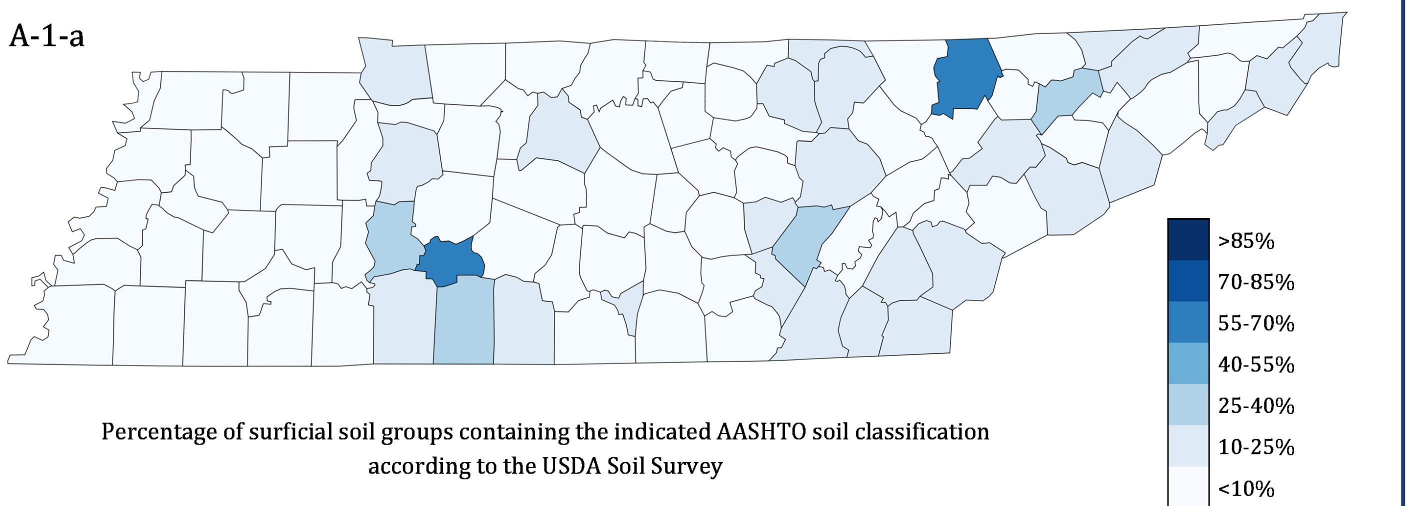
Appendix D Stabilization Fact Sheets and AASHTO Classification Maps by County

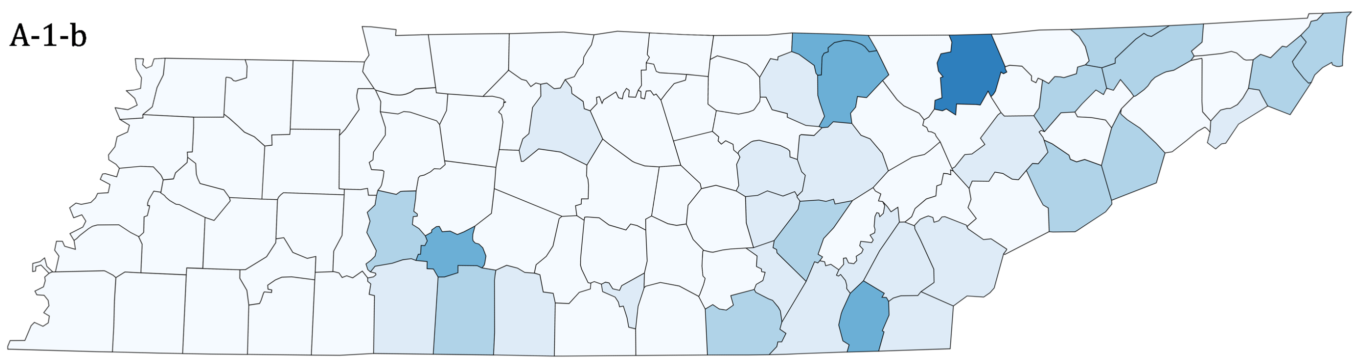
Surficial Soil Type Distribution in TN by AASHTO Classification

A-1-a



Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

A-1-b



Images created with mapchart.net

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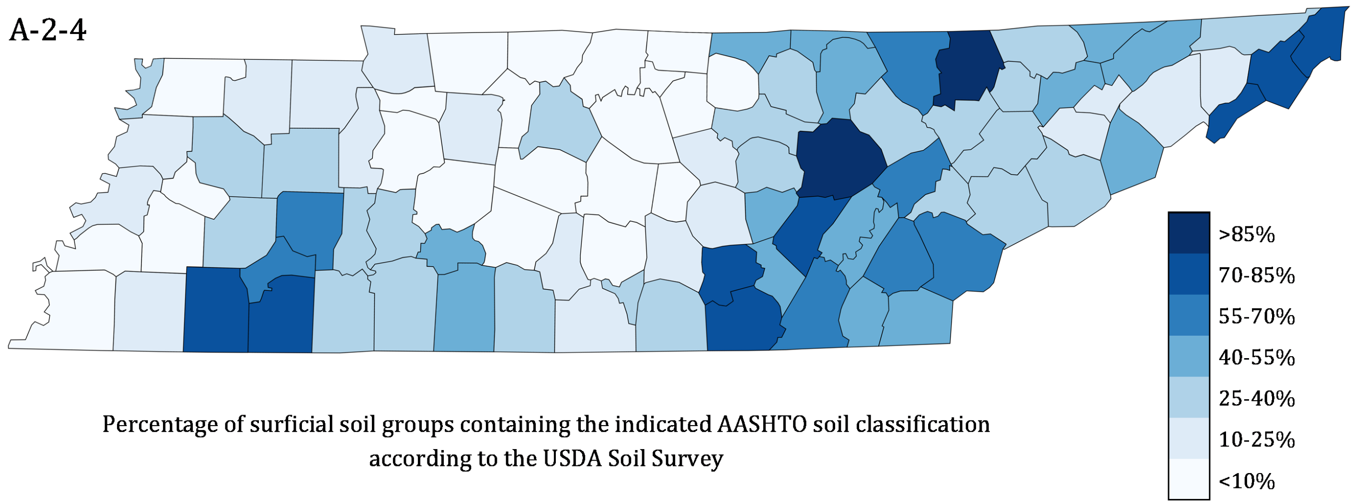
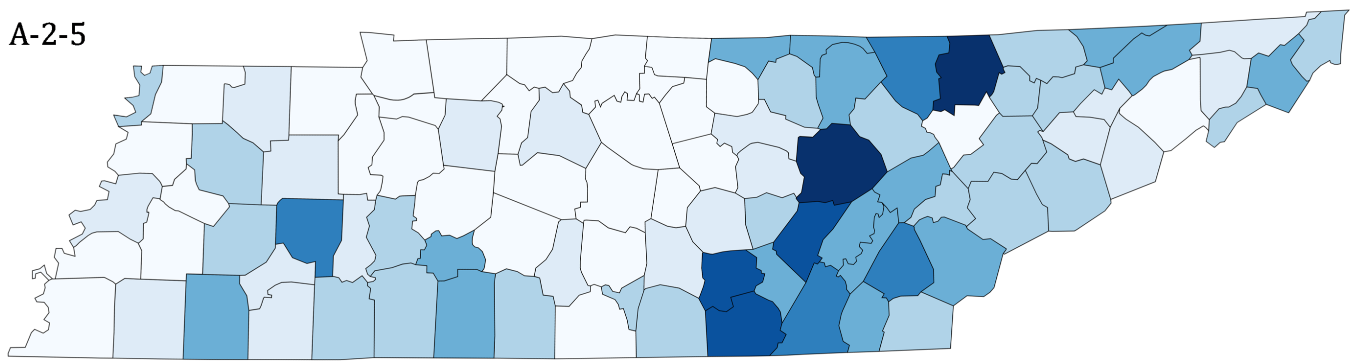
Surficial Soil Type Distribution in TN by AASHTO Classification

A-2-4



Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

A-2-5



Images created with mapchart.net

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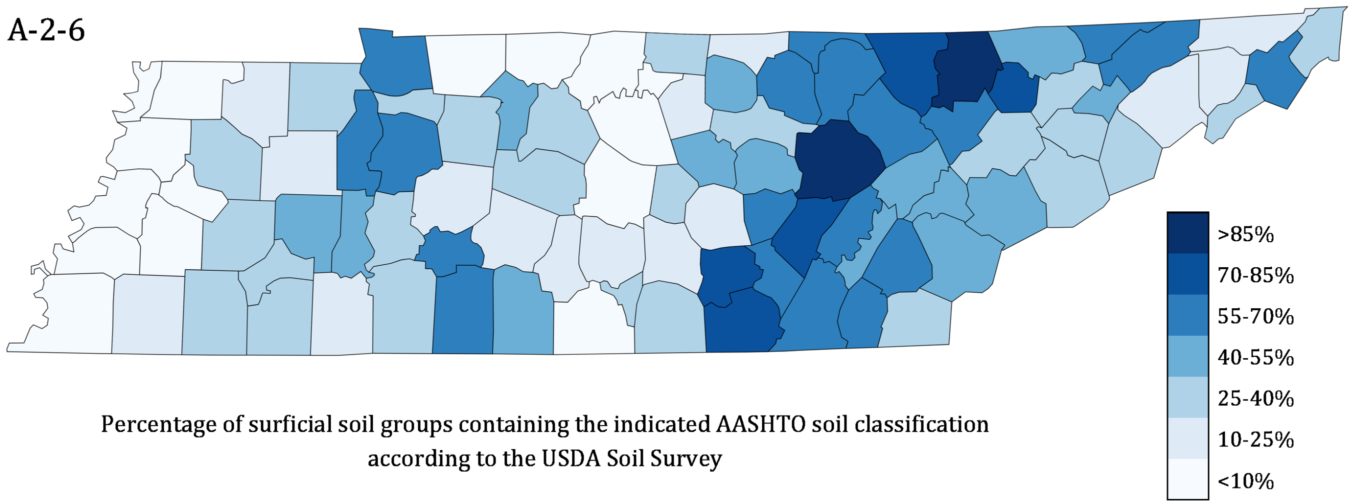
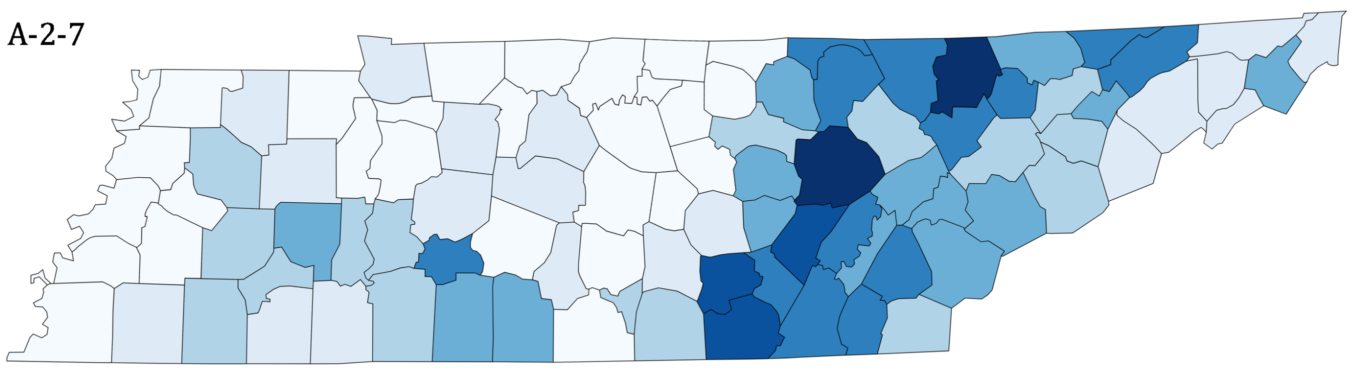
Surficial Soil Type Distribution in TN by AASHTO Classification

A-2-6



Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

A-2-7



Images created with mapchart.net

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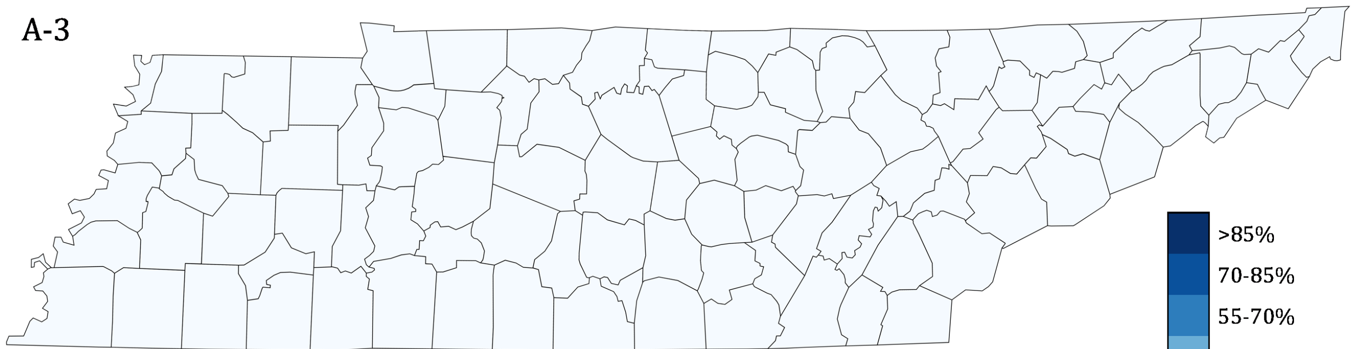
Surficial Soil Type Distribution in TN by AASHTO Classification

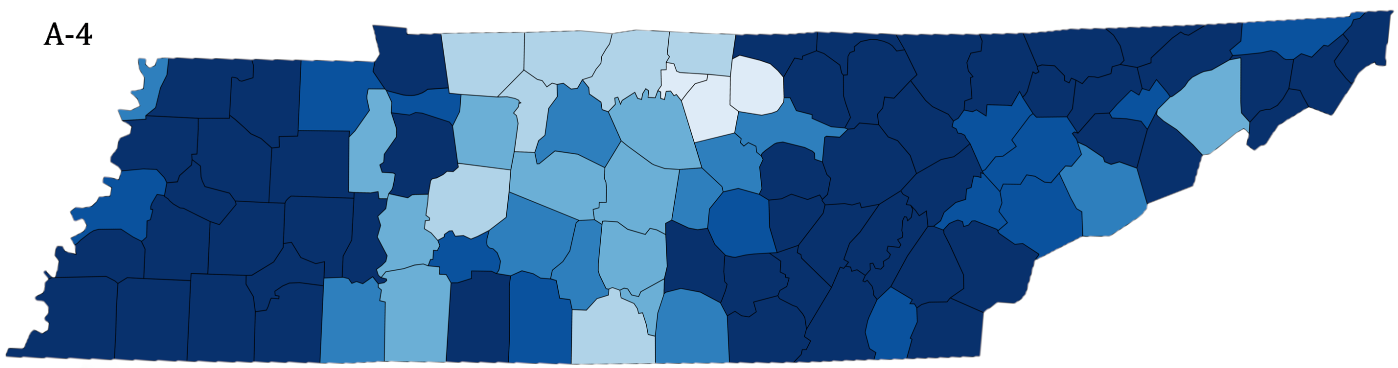
A-3



Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

>85%
70-85%
55-70%
40-55%
25-40%
10-25%
<10%

A-4



Images created with mapchart.net

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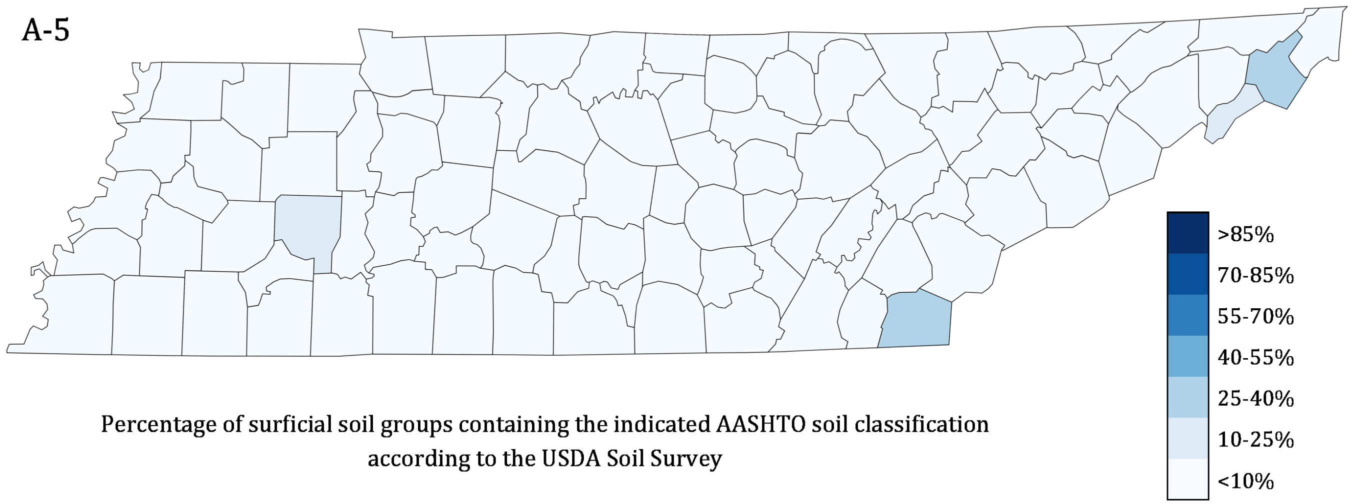
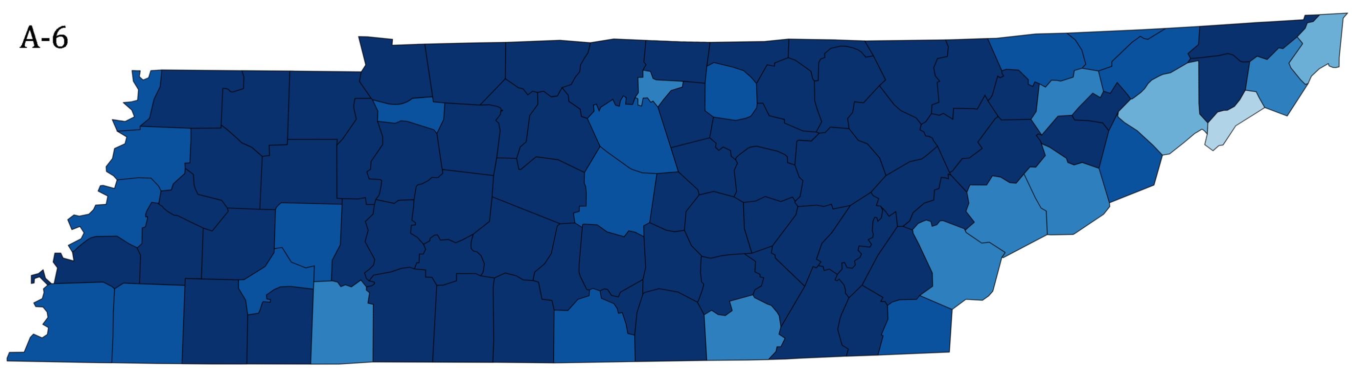
Surficial Soil Type Distribution in TN by AASHTO Classification

A-5



Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

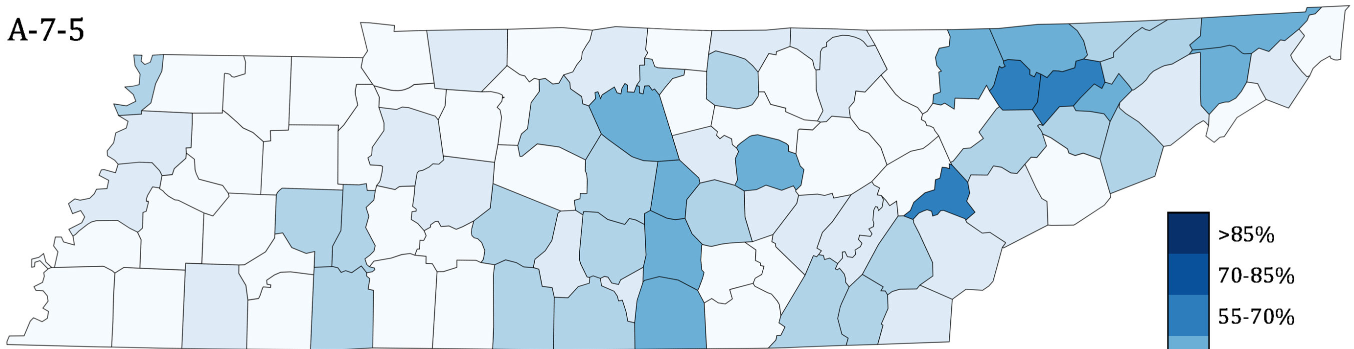
A-6

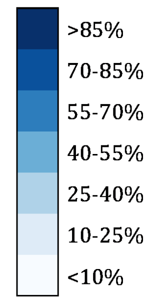


Images created with mapchart.net

Surficial Soil Type Distribution in TN by AASHTO Classification

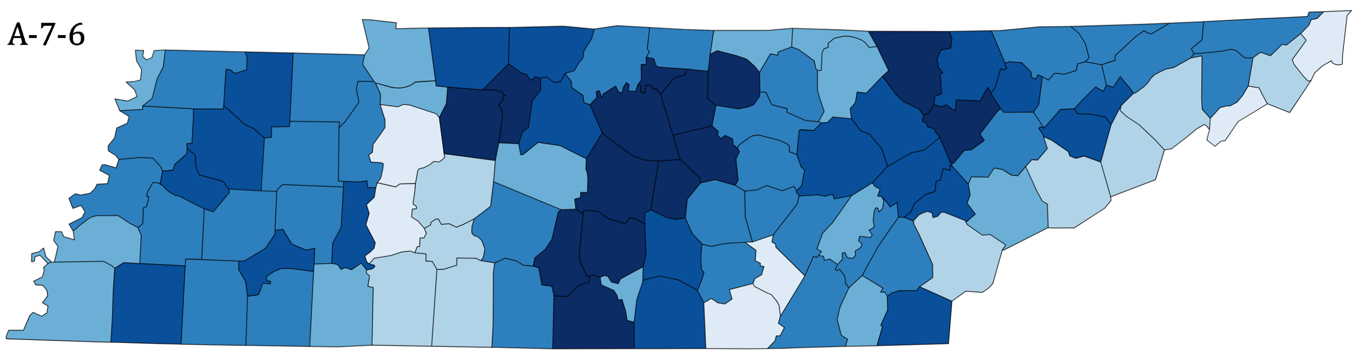
A-7-5





Percentage of surficial soil groups containing the indicated AASHTO soil classification according to the USDA Soil Survey

A-7-6



Images created with mapchart.net

Chemical Stabilization of A-2-4 & A-2-5 Soils (USCS: SM, GM, SC, & GC)

Untreated Soil Properties

A-2-4 and A-2-5 soils typically have between 6 and 35% fines and PI ≤ 10. They are mostly silty sands and gravels but include some clayey soils.

As a compacted pavement subgrade, A-2-4 and A-2-5 soils will have the following properties:

- Poor to no drainage
- Reasonable stability when well-compacted
- Good to fair pavement support

A-2-4 and A-2-5 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength, UCS ≈ 20 psi
  Std. Dev ≈ 7.5 psi
- California bearing ratio,
  CBR = 5 to 40 (sands)
  CBR = 20 to 60 (gravels)

Typical Chemical Admixtures

A-2-4 and A-2-5 are sandy soils with low plasticity indices that are characteristic of silt, silty clay, and low plasticity lean clay. The changes in Atterberg limits from stabilization tend to be small.

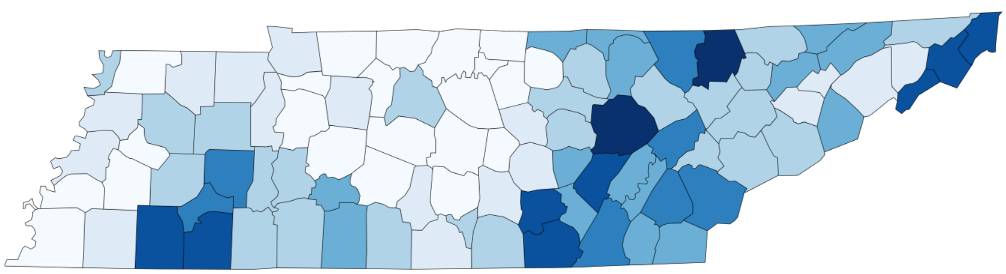
A-2-4 and A-2-5 soils typically contain a low percentage of clay minerals. For this reason, lime has limited ability to increase the strength of these soils but can provide drying that enables better compaction and fill stability.

Portland cement is more effective at increasing the strength of sandy soils as illustrated by the high shear strengths reported. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing.

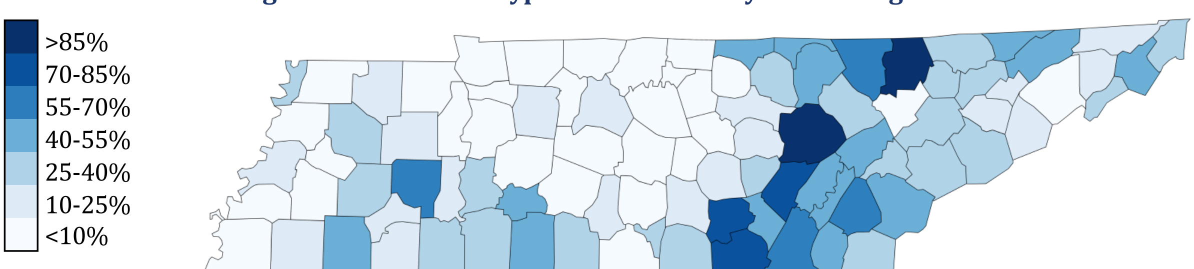
The typical ranges of admixture required to stabilize A-2-4 and A-2-5 soils are summarized below. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	Up to 10%	80 (average), 35 to 180
Portland cement	3 to 10%	300 to 700

Percentage of Surficial Soil Types in Each County Containing A-2-4 Soil

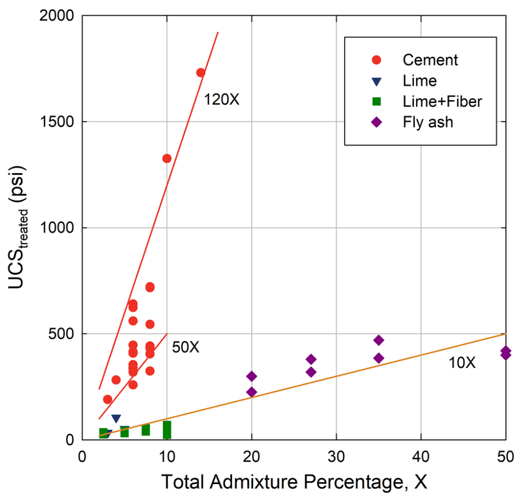


Percentage of Surficial Soil Types in Each County Containing A-2-5 Soil



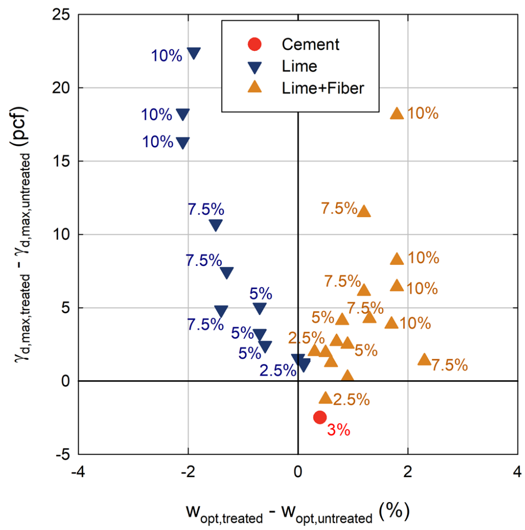
Images created with mapchart.net

Representative Chemical Stabilization Behavior for A-2-4 and A-2-5 Soils



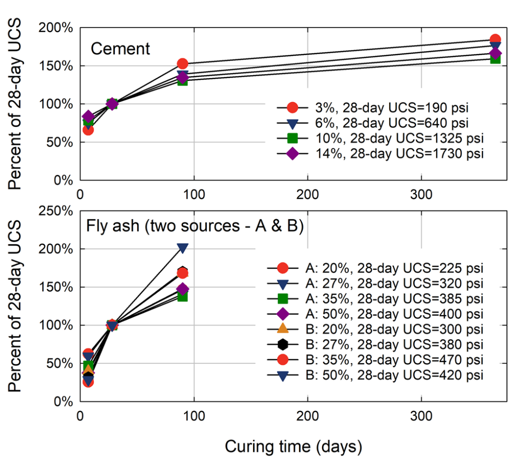
Unconfined Compressive Strength

Much of the data for stabilized A-2-4 and A-2-5 soils does not include UCS for the natural condition, likely due to the low UCS of these materials. The treated UCS (in psi) for cement tends fall between 50 and 120 times the admixture percentage. Fly ash, lime, and lime blends tend to produce much lower UCS of about 10 times the admixture percentage.



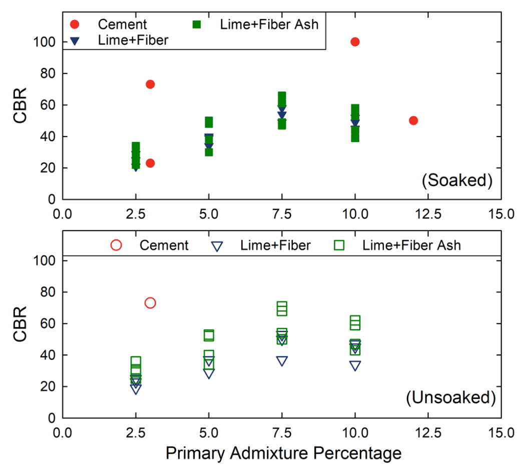
Compaction Characteristics

Stabilization with lime and fiber-based additives tends to increase $\gamma_{d,max}$ of A-2-4 and A-2-5 soils. The change in w_{opt} depends on the secondary additive. Cement causes a small increase in w_{opt} and a slight decrease in $\gamma_{d,max}$.



Curing Effects

Curing data for cement and fly ash mixed with A-2-4 and A-2-5 soils indicate a 50% increase at 90 days and a 150% to 200% increase at one year.



Subgrade Stability Characteristics

The CBR of stabilized A-2-4 and A-2-5 soils is generally in the range of 20 to 60, which is about 3 to 5 times higher than the CBR of the natural soil. The CBR tends to increase with admixture percentage. The effects of soaking were small compared with the effects of stabilization.

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.

Chemical Stabilization of A-2-6 & A-2-7 Soils (USCS: SC, GC, SM, & GM)

Untreated Soil Properties

A-2-6 and A-2-7 soils typically have a fines content between 6 and 35% and PI ≥ 11. They are described as clayey, or sometimes silty, sands and gravels.

As a compacted pavement subgrade, A-2-6 and A-2-7 soils will have the following properties:

- Poor to no drainage
- Reasonable stability
- Good to fair pavement support

A-2-6 and A-2-7 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength, UCS ≈ 20 psi
  Std. Dev ≈ 7.5 psi
- California bearing ratio, CBR = 5 to 20 (sands) & CBR = 20 to 40 (gravels)

Typical Chemical Admixtures

A-2-6 and A-2-7 are sandy soils with a substantial amount of fines with plasticity indices greater than 11. The fines will be clay and occasionally silt. Chemical stabilization tends to decrease the PI with some substantial changes in soils with higher plasticity fines.

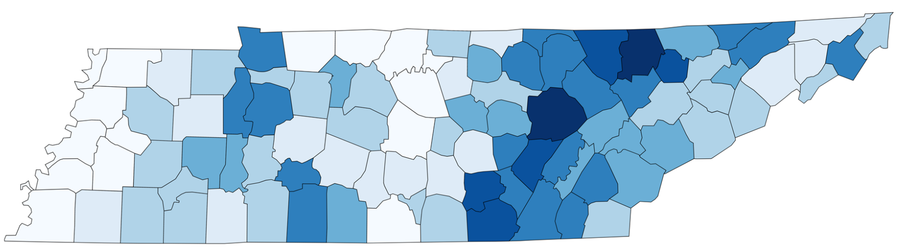
A-2-6 and A-2-7 soils typically contain a moderate percentage of clay minerals, which react with lime. For this reason, lime may be effective to reduce plasticity and dry these soils to allow better compaction. Past studies indicate low strength gains from lime.

Portland cement is more effective at increasing the strength of sandy soils as illustrated by the high shear strengths reported. Cement hydration occurs quickly, and final compaction should typically be completed within 2 hours after mixing.

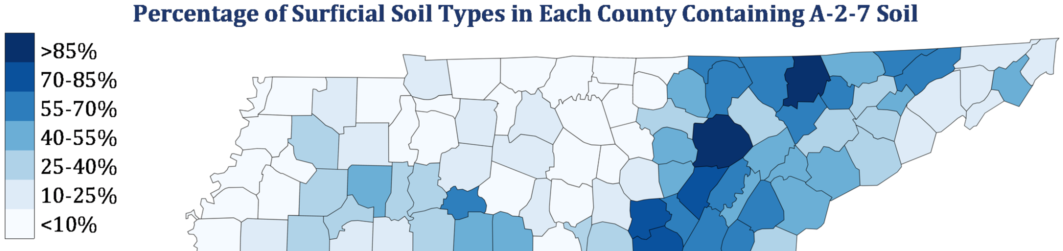
The typical ranges of admixture required to stabilize A-2-6 and A-2-7 soils are summarized below. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	Up to 10%	80 (average), 50 to 150
Portland cement	3 to 10%	300 to 700

Percentage of Surficial Soil Types in Each County Containing A-2-6 Soil

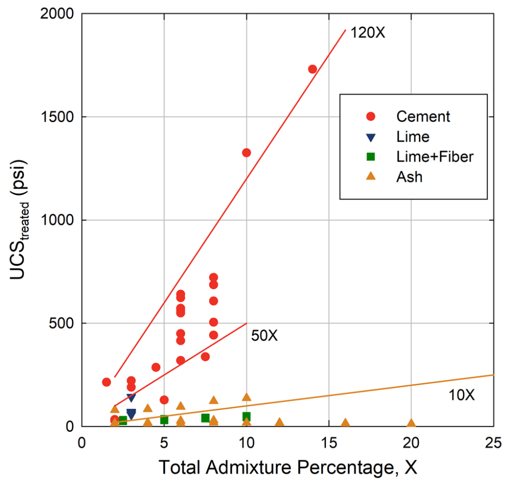


Percentage of Surficial Soil Types in Each County Containing A-2-7 Soil



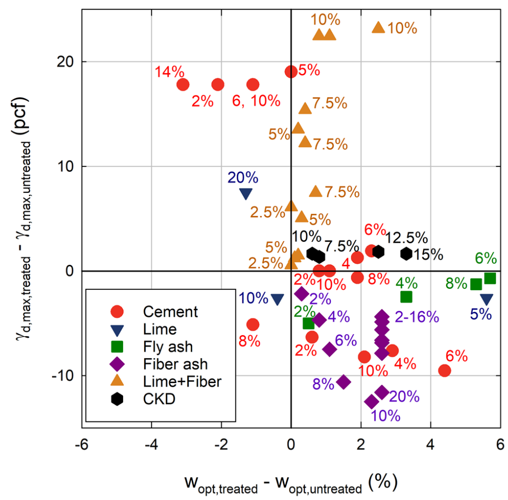
Images created with mapchart.net

Representative Chemical Stabilization Behavior for A-2-6 and A-2-7 Soils



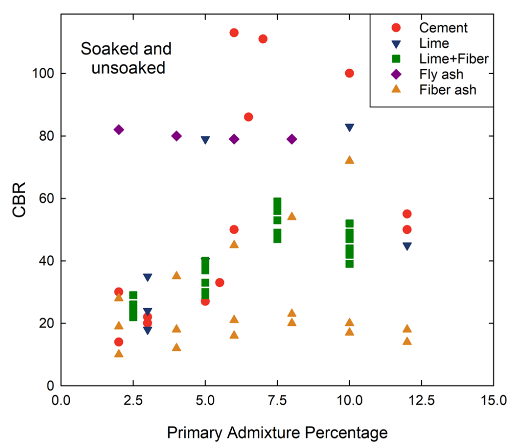
Unconfined Compressive Strength

Much of the data for stabilized A-2-6 and A-2-7 soils does not include UCS for the natural condition, likely due to the low UCS of these materials. The treated UCS (in psi) for cement tends fall between 50 and 120 times the admixture percentage. Fly ash, lime, and lime blends tend to produce much lower UCS of about 10 times the admixture percentage.



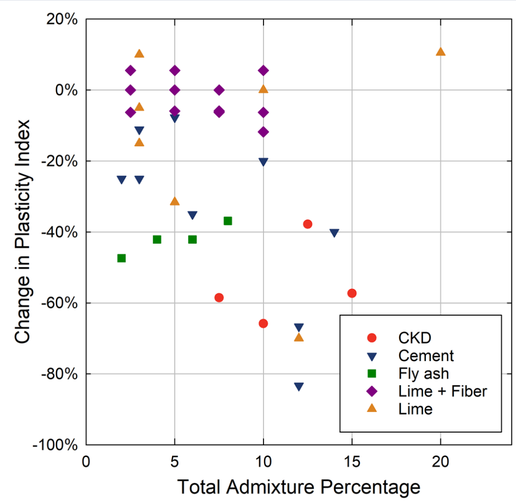
Compaction Characteristics

Stabilization with lime and fiber-based additives tends to increase $\gamma_{d,max}$ of A-2-6 and A-2-7 soils. Effects of cement varied depending on the soil. Fiber ash and fly ash caused increases in w_{opt} and decrease in $\gamma_{d,max}$.



Subgrade Stability Characteristics

The CBR of stabilized A-2-6 and A-2-7 soils is generally in the range of 20 to 60, or higher for cement and fly ash. These values are about 3 to 5 times higher than the CBR of the natural soil. The CBR tends to increase with admixture percentage. The effects of soaking were small compared with the effects of stabilization.



Effect on Plasticity

Cement, fly ash, and CKD all produce a decrease in the plasticity index. Lime reduced the PI for some, but not all, A-2-6 and A-2-7 soils. Lime plus fiber ash did not substantially change the PI.

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.

Chemical Stabilization of A-4 Soils
(USCS Classification: ML, CL-ML, and CL)

TN TDOT Department of Transportation

Untreated Soil Properties

A-4 soils are mostly low plasticity silts and silty clays. Some lean clays also fall in this category. The liquid limits of these soils are less than 40 and plasticity index less than or equal to 10. They exhibit low tendency to shrink and swell from changes in water content but easily become unstable when wet.

As a compacted pavement subgrade, A-4 soil will have the following properties:

- Poor to no drainage
- Fair stability
- Fair to poor pavement support

A-4 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength, UCS ≈ 25 psi, Std. Dev. ≈ 40 psi
- California bearing ratio, CBR = 3 to 25

Typical Chemical Admixtures

A-4 soils have low plasticity indices that are characteristic of silt, silty clay, and low plasticity lean clay. Admixtures should not be expected to produce substantial changes in the Atterberg limits.

A-4 soils typically contain a low percentage of clay minerals. For this reason, the effectiveness of lime to increase the strength of A-4 soils is somewhat limited. However, lime can effectively reduce the water content of A-4 soils to allow compaction and creation of a stable subgrade. Lime-soil reactions require a mellowing period of 1 to 7 days to occur. Pozzolanic strength gain with lime-soil depends on the soil mineralogy. The minimum lime percentage (MLP) required to reach pH of 12.4 is found by the Eades-Grim test.

Portland cement is more effective at increasing the strength of A-4 soils because of the lower PI and low clay mineral content. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing.

Fly ash is sometimes used to stabilize A-4 soils; however, Class F fly ash requires activation using lime or portland cement. Both Class C and F fly ash are more effective when combined with other admixtures. Fly ash stabilization typically produces slower reactions and compaction occurs within about 6 hours after mixing.

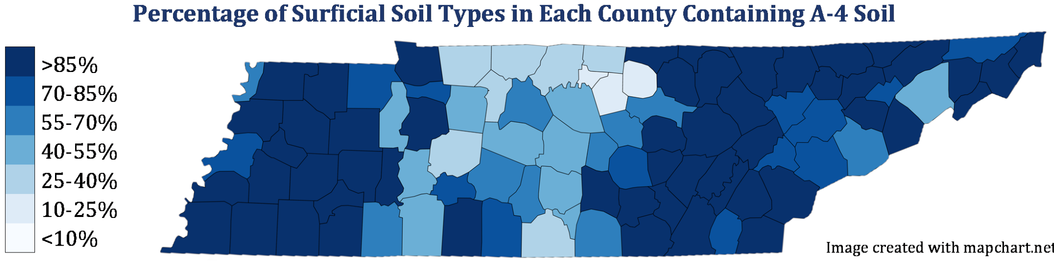
Other materials are sometimes used for the stabilization of A-4 soils, including cement kiln-dust. Less common options include zeolite, proprietary enzymes, and volcanic ash.

Common Admixture Percentages and Strengths

The typical ranges of admixture required to stabilize A-4 soils are summarized to the right. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	MLP up to MLP + 4%	80 (average), 35 to 180
Portland cement	7 to 12%	200 to 500
Fly ash	Up to 40%	50 to 300 (only fly ash)

Percentage of Surficial Soil Types in Each County Containing A-4 Soil



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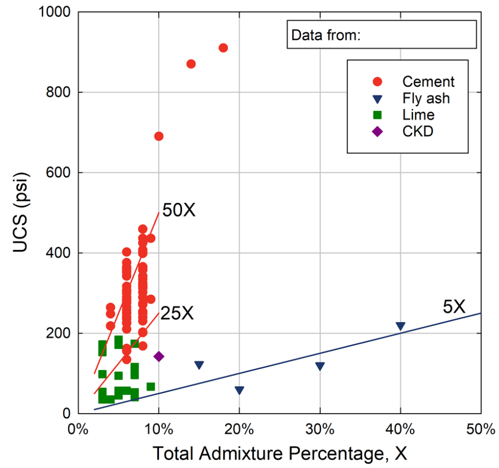
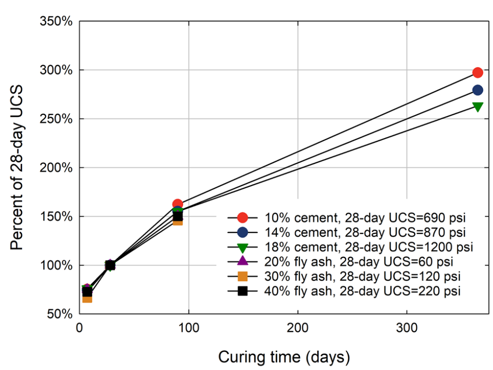
Representative Chemical Stabilization Behavior for A-4 Soils



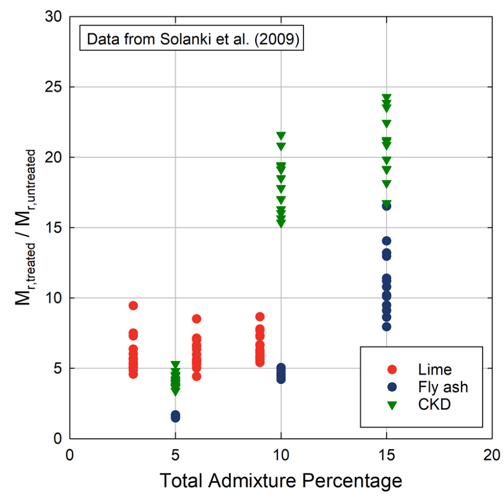
Unconfined Compressive Strength

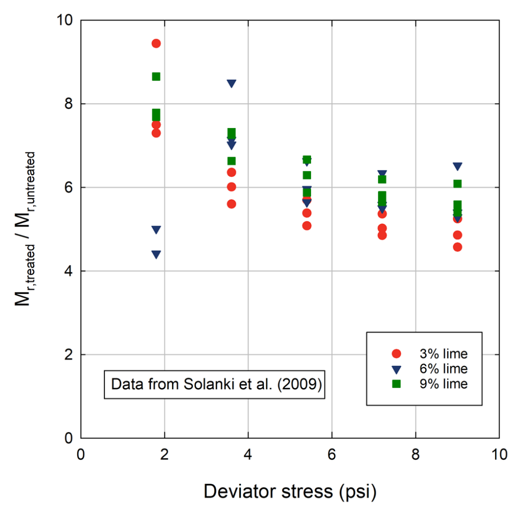
Much of the data for stabilized A-4 soils does not include UCS for the natural condition, likely due to the low UCS of these materials. The treated UCS (in psi) for cement tends to be between 25 and 50 times the admixture percentage. Fly ash tends to produce much lower UCS of about 5 times the admixture percentage. The addition of up to 10% lime produces UCS between 35 and 180 psi but exhibits little trend with percentage. Limited data on CKD indicates UCS between those from cement stabilization and the UCS produced by lime or fly ash.



Curing Effects

Curing data for cement and fly ash mixed with A-4 soils indicate a 50% increase at 90 days and a 150% to 200% increase after 365 days.





Subgrade Stability Characteristics

Subgrade stability measurements were found for A-4 soils in terms of resilient modulus, M_r, which can be correlated to CBR. M_r increases by 4 to 9 times when stabilized with 3 to 9% lime. The amount of lime had less effect on the increase in M_r. The increase in M_r increased with fly ash (CFA) content as well as cement kiln dust (CKD). Higher increases in M_r tend to occur at lower deviator stress and lower confining pressure. A-4 soil stabilized with CFA showed less sensitivity to confining stress or deviator stress.

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.

Chemical Stabilization of A-5 Soils
(USCS Classification: MH and some ML)

Untreated Soil Properties

A-5 soils are silts with low plasticity index (≤ 10) and liquid limits greater than 40. They will exhibit low to moderate tendency to shrink and swell from changes in water content. A-5 soils easily become unstable from excess moisture.

As a compacted pavement subgrade, A-5 soil will have the following properties:

- Poor to no drainage
- Fair to poor fill stability
- Poor pavement support

A-5 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength, UCS ≈ 25 psi (assumed to be similar to A-4)
- California bearing ratio, CBR = 3 to 10

Typical Chemical Admixtures

A-5 soils have a low PI indicating a low percentage of clay minerals. These soils are not particularly common in Tennessee as shown in the figure below. In general, data for stabilization of A-5 soils is sparse. For this reason, representative data has not been included on the reverse side of this fact sheet.

A-5 soils typically contain a low percentage of clay minerals. For this reason, the effectiveness of lime to increase the strength of A-5 soils is somewhat limited. However, lime can effectively reduce the water content of A-5 soils to allow compaction and creation of a stable subgrade. Lime-soil reactions require a mellowing period to occur, typically 1 to 7 days. Pozzolanic strength gain with lime-soil depends on the soil mineralogy. The minimum lime percentage (MLP) required to reach pH of 12.4 is found by the Eades-Grim test.

Portland cement would likely be more effective at increasing the strength of A-5 soils because of the lower PI and low clay mineral content. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing.

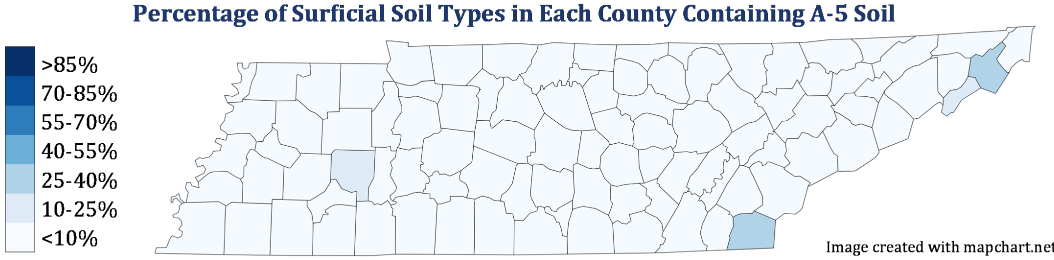
Fly ash is sometimes used to stabilize clayey soils; however, Class F fly ash requires activation using lime or portland cement. Fly ash stabilization typically produces slower reactions and compaction occurs within about 6 hours after mixing.

Common Admixture Percentages and Strengths

The typical ranges of admixture required to stabilize A-5 soils are summarized to the right. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Portland cement	8 to 13%	200 to 500

Percentage of Surficial Soil Types in Each County Containing A-5 Soil



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Chemical Stabilization of A-6 Soils

(USCS Classification: CL and some ML)

Untreated Soil Properties

A-6 soils are mostly lean clays. They have plasticity indices greater than 10 and liquid limits less than 40. They exhibit moderate tendency to shrink and swell from changes in water content.

As a compacted pavement subgrade, A-6 soil will have the following properties:

- Poor to no drainage
- Good fill stability
- Fair to poor pavement support

A-6 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength, UCS = 60 psi ± 25 psi
- California bearing ratio: CBR = 3 to 15

Typical Chemical Admixtures

A-6 soils have plasticity indices up to about 30. As the PI increases, the soil becomes more clayey and more suitable for stabilization with lime. The higher PI indicates that clay minerals are present, which can react with lime, exchanging cations. This reaction will reduce the plasticity index and improve workability. Lime-soil reactions require a mellowing period to occur, typically 1 to 7 days. Pozzolanic strength gain with lime-soil depends on the soil mineralogy. The minimum lime percentage (MLP) required to reach pH of 12.4 is found by the Eades-Grim test.

Portland cement can be used to stabilize A-6 soils with PI closer to 10. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing. Cement hydration produces lime, which produces additional benefit. Adequate mixing for cement stabilization may be difficult in some A-6 soils with higher liquid limits or plasticity indices.

Fly ash is sometimes used to stabilize clayey soils; however, Class F fly ash requires activation using lime or portland cement. Fly ash stabilization typically produces slower reactions and compaction occurs within about 6 hours after mixing.

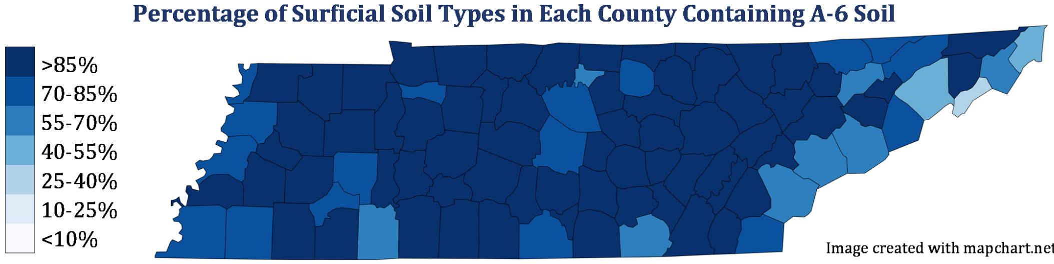
Other materials are sometimes used for the stabilization of A-6 soils, including lime kiln dust and cement kiln-dust. Less common options include sewage sludge ash and nano-aluminum oxide.

Common Admixture Percentages and Strengths

The typical ranges of admixture required to stabilize A-6 soils are summarized to the right. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	MLP up to MLP + 4%	140 (average), 35 to 350
Portland cement	6 to 15%	100 to 660
Fly ash	Up to 15%	100 (only fly ash)

Percentage of Surficial Soil Types in Each County Containing A-6 Soil



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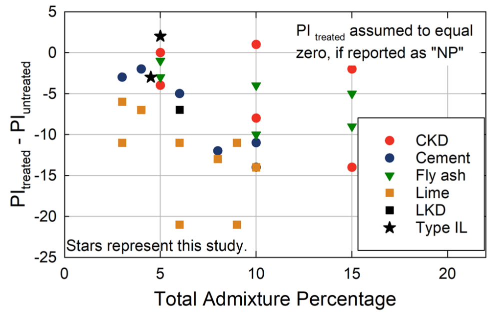
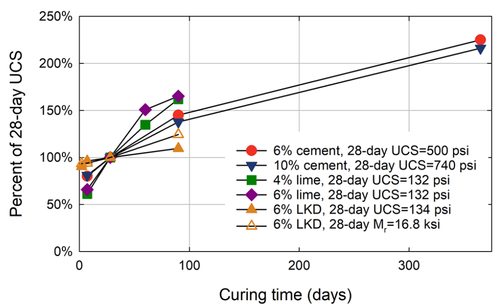
Representative Chemical Stabilization Behavior for A-6 Soils



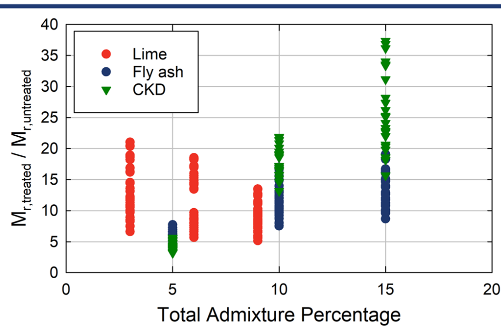
Plasticity Reduction

Chemical stabilization tends to reduce the plasticity index (PI) of A-6 soils. The effects are most pronounced for lime and cement and are lower for fly ash and CKD.



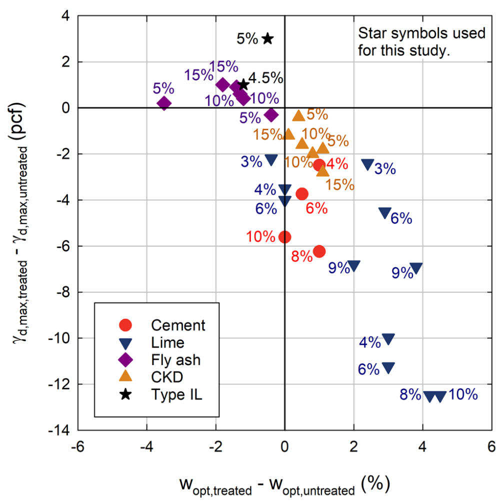
Curing Effects

For A-6 soils, lime and cement produce a 50% increase in strength from 28 to 90 days. Additional strength gain occurs with time. LKD produced higher 7 day strengths but less strength gain with time.



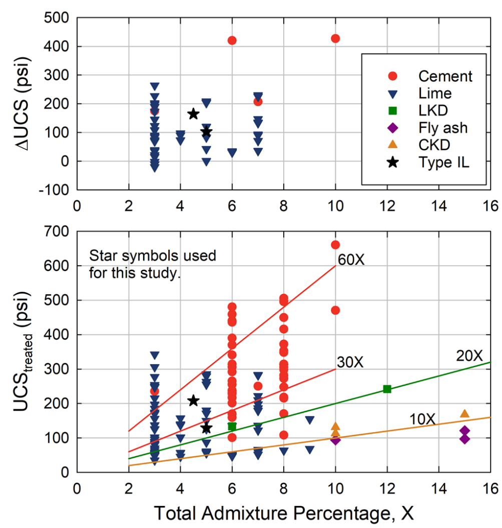
Subgrade Stiffness

Lime caused an increase in resilient modulus (M_r) of 5 to 20 times in two A-6 soils. Higher increases in stiffness occurred at higher percentages of fly ash and CKD.



Compaction Characteristics

Stabilization with cement, lime, and CKD tends to increase w_{opt} and decrease $\gamma_{d,max}$ of A-6 soils. Fly ash and Type IL cement causes a decrease in w_{opt} and a slight increase in $\gamma_{d,max}$.



Unconfined Compressive Strength

Chemical stabilization increases UCS of A-6 soil up to about 200 psi for lime and higher for cement. The UCS (in psi) is

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.

Chemical Stabilization of A-7-5 Soils

(USCS Classification: mostly MH, some ML and CH)

Untreated Soil Properties

A-7-5 soils are silty and clayey soils with moderate plasticity. The liquid limits of these soils are greater than 40. They exhibit some shrink and swell tendency from changes in water content.

As a compacted pavement subgrade, A-7-5 soil will have the following properties:

- Poor drainage
- Fair to poor fill stability
- Poor pavement support

A-7-5 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength: UCS = 30 psi ± 20 psi
- California bearing ratio: CBR = 3 to 10

Typical Chemical Admixtures

A-7-5 soils have moderate PI that is traditionally associated with silt. However, many of these soils have high percentages of clay minerals with low activity, such as kaolinite. As shown below, A-7-5 soils are not particularly common in Tennessee.

A-7-5 soils with higher PI will act more like clay and can often be stabilized using lime. The clay minerals react with the lime, exchanging cations. The plasticity index reduces, which results in improved workability. Lime-soil reactions require a mellowing period to occur, typically 1 to 7 days. Pozzolanic strength gain with lime-soil depends on the soil mineralogy. The minimum lime percentage (MLP) required to reach pH of 12.4 is found by the Eades-Grim test.

Portland cement can be used to stabilize A-7-5 soils with PI closer to 10. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing. Cement hydration produces lime, which produces additional benefit. Adequate mixing for cement stabilization may be difficult in some A-7-5 soils.

Fly ash is sometimes used to stabilize clayey soils; however, Class F fly ash requires activation using lime or portland cement. Fly ash stabilization typically produces slower reactions and compaction occurs within about 6 hours after mixing.

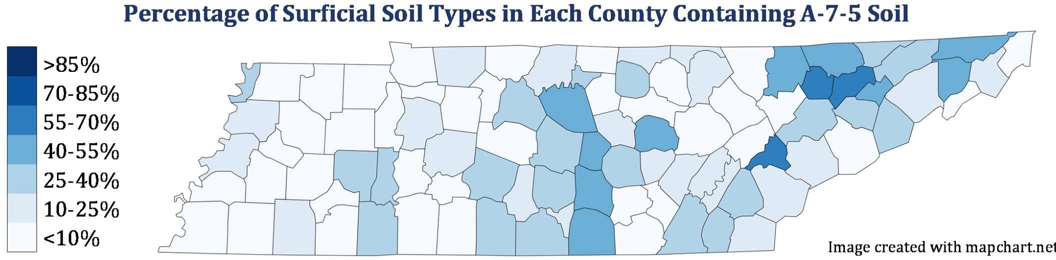
Other materials are sometimes used for the stabilization of A-7-5 soils, including lime kiln dust and cement kiln-dust. Less common options include phosphogypsum (PG), natural pozzolans, electrolytes, and synthetic compounds.

Common Admixture Percentages and Strengths

The typical ranges of admixture required to stabilize A-7-5 soils are summarized to the right. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	MLP up to MLP + 4%	155 (average), 20 to 800
Portland cement	9 to 15%	90 to 600
Fly ash	Up to 30% [2]	75 to 100 (only fly ash)

Percentage of Surficial Soil Types in Each County Containing A-7-5 Soil



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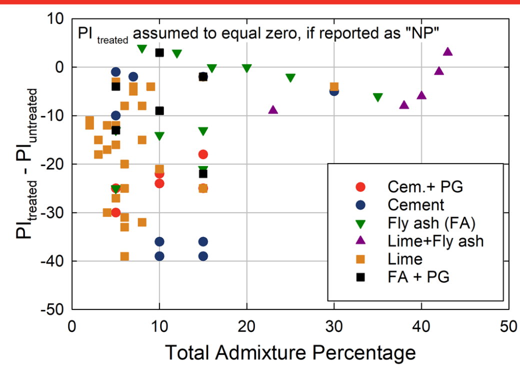
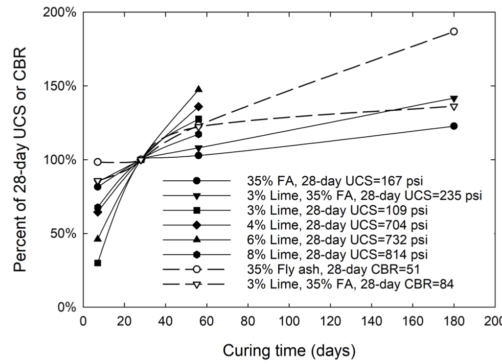
Representative Chemical Stabilization Behavior for A-7-5 Soils



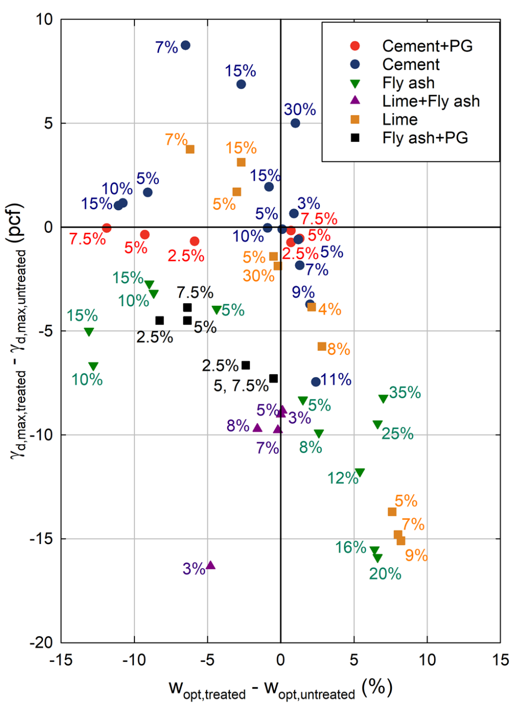
Plasticity Reduction

Chemical stabilization tends to reduce the plasticity index (PI) of A-7-5 soils as shown above. The effects vary for lime and cement and are least evident for fly ash.



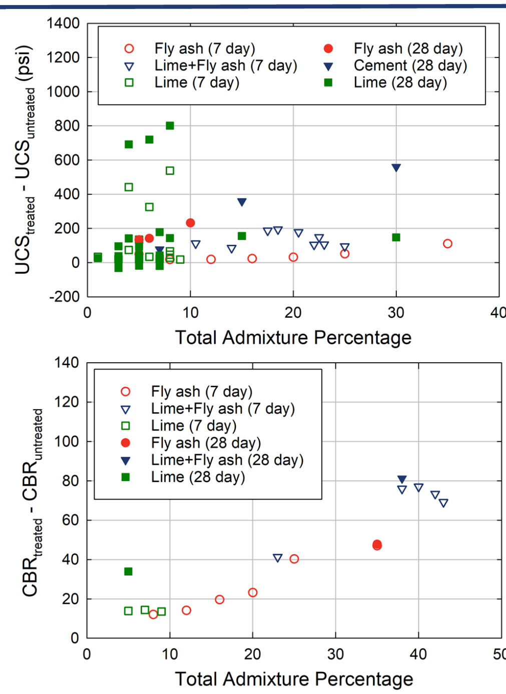
Curing Effects

The curing data found in the literature for A-7-5 soils was limited to lime and fly ash. Up to 50% increase in strength or stability occurs from 28 to 56 days.



Compaction Characteristics

Stabilization can either increase or decrease w_{opt} and $\gamma_{d,max}$ of A-7-5 soils. The average change across all admixtures shown above is a 1.6% drop in w_{opt} and a 3.3 pcf decrease in $\gamma_{d,max}$.



Strength and Stability Characteristics

Chemical stabilization with lime tends to increase UCS up to about 200 psi and CBR by 20 to 40. However, some soils are not reactive with lime. The addition of fly ash leads to further increase in UCS and CBR.

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.

Chemical Stabilization of A-7-6 Soils

(USCS Classification: CL and CH with LL > 40)

Untreated Soil Properties

A-7-6 soils are clayey soils with high plasticity. The liquid limits of these soils are greater than 40. They shrink and swell substantially because of changes in water content.

As a compacted pavement subgrade, A-7-6 soil will have the following properties:

- Poor drainage
- Fair fill stability
- Subject to softening, cracking, expansion, etc.
- Poor to very poor support

A-7-6 soils compacted to about 100% of Standard Proctor maximum dry unit weight typically have the following strength properties:

- Unconfined compressive strength: UCS = 55 psi ± 30 psi
- California bearing ratio: CBR = 3 to 10

Typical Chemical Admixtures

Clay soils are most often stabilized using lime. The clay minerals react with the lime, exchanging cations. The clay particles flocculate into larger aggregates. The grain size distribution becomes coarser and the plasticity index reduces, both of which result in improved workability. These lime-soil reactions require a mellowing period of 1 to 7 days to occur. The pozzolanic strength gain with lime-soil depends on the soil mineralogy. Lime reactions occur when the pH exceeds about 12.4. The minimum lime percentage (MLP) required to reach this pH is found by the Eades and Grim test.

Portland cement can be used to stabilize some A-7-6 soils, especially those with relatively low liquid limits and plasticity indices. However, it may be less economical in many cases. Cement hydration occurs quickly, and final compaction is often completed within 2 hours after mixing. Cement hydration produces lime, which produces additional benefit through lime-soil reaction. Adequate mixing for cement stabilization may be difficult in A-7-6 soils.

Fly ash is sometimes used to stabilize clayey soils; however, Class F fly ash requires activation using lime or portland cement. Fly ash stabilization typically produces slower reactions and compaction occurs within about 6 hours after mixing.

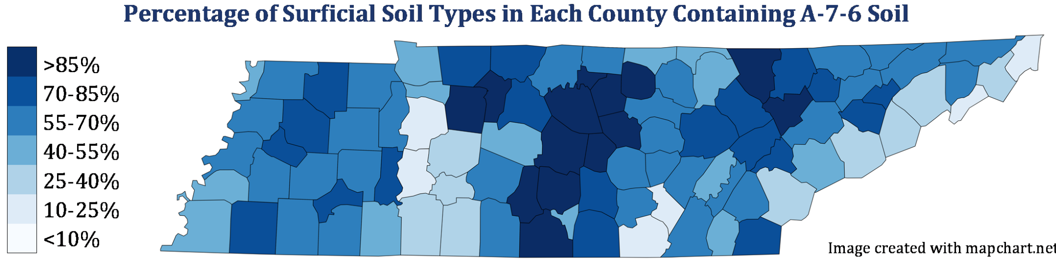
Other materials that have been explored for the stabilization of A-7-6 soils include by-product materials such as cement kiln dust (CKD), lime kiln dust (LKD), and waste lime. Less common options include volcanic ash, xantham gum, and copper slag.

Common Admixture Percentages and Strengths

The typical ranges of admixture required to stabilize A-7-6 soils are summarized to the right. A mix design should be used to select the particular requirements for a specific soil.

Admixture	Percentage (by weight)	Typical 28-day UCS (psi)
Lime	MLP up to MLP + 4%	140 (average), 30 to 230
Portland cement	10 to 16%	250 to 600
Fly ash	8 to 16% [2]	50 to 150 (only fly ash)

Percentage of Surficial Soil Types in Each County Containing A-7-6 Soil



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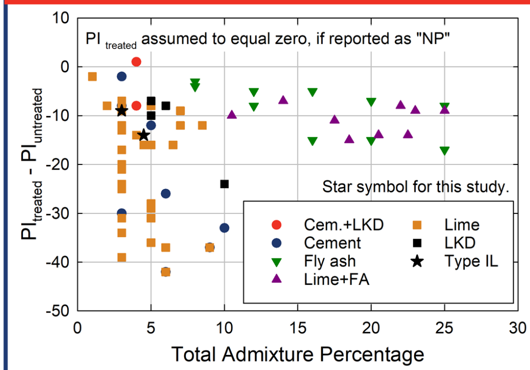
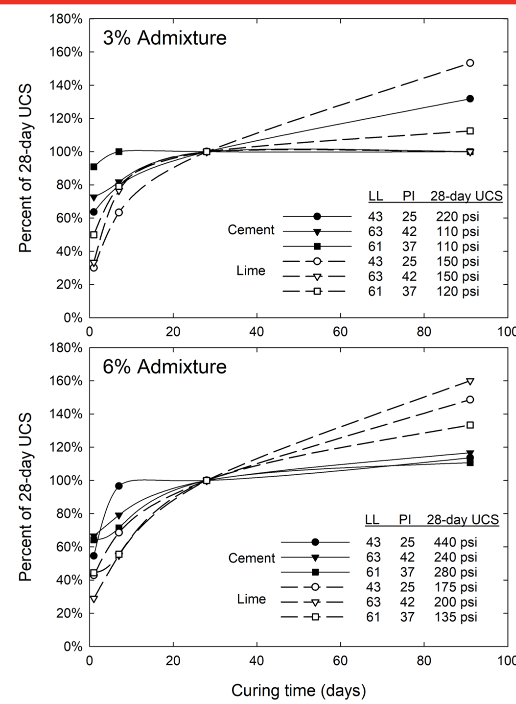
Representative Chemical Stabilization Behavior for A-7-6 Soils



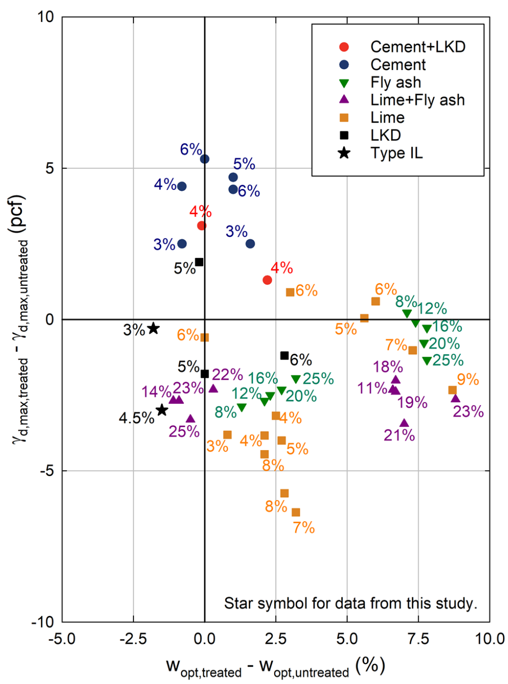
Plasticity Reduction

Chemical stabilization tends to reduce the plasticity index (PI) as shown above. The effects are most pronounced for lime.



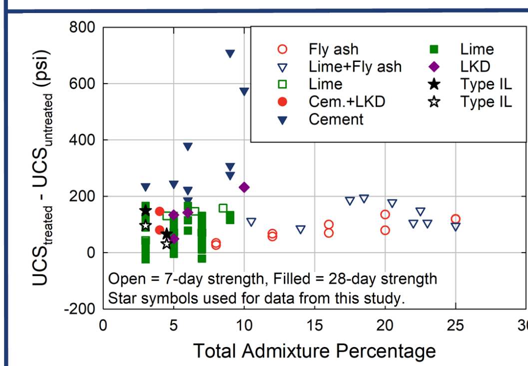
Curing Effects

The example data indicate higher overall strengths for portland cement compared to lime. However, the strength gain behavior with time in A-7-6 soil appears to be better for lime, especially for higher percentages.



Compaction Characteristics

Lime and fly ash stabilization causes large increases in w_{opt} and moderate to large decreases in $\gamma_{d,max}$. Cementitious stabilization has less effect on w_{opt} and tends to increase $\gamma_{d,max}$ slightly.



Strength Characteristics

Chemical stabilization with cementitious materials tends to result in UCS gains of 100 psi or more. Lime results in UCS gains up to about 200 psi, but some soils are not re-active with lime and produce little to no strength gain.

Data sources are summarized in the Final Report for TDOT Research Project RES2023-13.