Tech Letter

Fly Ash Treatment for Aggregate Bases and Subgrade Soils

The modification of aggregate bases and/or subgrade soils will typically involve attempts to reduce the plasticity index, increase strength and cohesion, eliminate movement in the sub-pavement layers and increase wet/dry durability. This process is often referred to as base and subgrade stabilization.

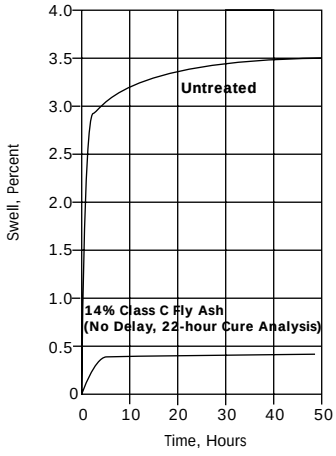
Successful stabilization of base and subgrade materials can be achieved with the proper installation and mixing of either ASTM C 618 Class C Fly Ash or ASTM C 618 Class F Fly Ash. Prior testing of the untreated base and subgrade material is essential for developing the overall targeted results and the dosage rates of Fly Ash as a mineral admixture. Since project costs are typically a major consideration, your Boral Material Technologies representative can offer consultation as to which mineral admixtures may offer the best stabilization results for the lowest overall costs. Hydrated lime, quicklime or Portland cement may be used in conjunction with Fly Ash to achieve desired results. Fly Ash, however, can be used successfully without added lime or cement under certain conditions.

Fly Ash is a pozzolan. A pozzolan is a finely divided siliceous or alumino-siliceous mineral that, in the presence of moisture and certain alkali, possesses the abiltity to create additional cementitious bonds. When Fly Ash is used in the presence of lime or cement, it may extend the reactivity of the lime or cement and improve testing results and the overall impact of any added mineral admixtures. The combination of Fly Ash with lime or cement may therefore allow for a much smaller addition of lime or cement which may significantly reduce the overall costs.

Stabilization with Class C Fly Ash

ASTM C 618 Class C Fly Ash contains a significant lime (CaO) content and can be used successfully in many stabilization applications as the single mineral admixture. Class C Fly Ash

Swell Test - Dark Gray Clay with Class C Fly Ash



Subgrade Stabilization with Class C Fly Ash

Subgrade Material	Material Condition	MOISTURE-DENSITY RELATIONSHIPS: Maximum Dry Density (pcf)	MOISTURE-DENSITY RELATIONSHIPS: Optimum Moisture Content (percent)	MOISTURE-STRENGTH RELATIONSHIPS: Maximum Compressive Strength (psi)	MOISTURE-STRENGTH RELATIONSHIPS: Optimum Moisture Content (percent)	Atterberg Limits: LL*	Atterberg Limits: PL*	Atterberg Limits: PI*
Dark Gray Clay	Untreated	86.8	30.1	54	22	64	23	41
	14% Class C Fly Ash	92.0	24.4	78	25.6	50	31	19
Tan Silty Clay	Untreated	112.1	15.8	50	12.0	37	16	21
	14% Class C Fly Ash	113.4	14.5	216	11.8	33	21	12

**LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index*

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has the proven capacity to virtually eliminate the swell potential in a wide variety of soils and to reduce the plasticity indexes by 50% or more through a means of ionic exchange. With Class C Fly Ash as the stabilizing mineral admixture,
unconfined compressive strengths of soils and aggregate bases may be elevated many times beyond the strength values of untreated materials.

Stabilization with Class F Fly Ash

ASTM C 618 Class F Fly Ash has a lower lime content than Class C and therefor is typically used in conjuction with an such as lime or cement. Class F Fly Ash is excellent for enhancing the effects of lime or cement treatments and reducing the amount of needed lime or cement to achieve desired results. Class F Fly Ash in combination with lime or cement is much more resistant to sulfate attack than Class C Fly Ash or lime or cement used independently.

The occurance of lime-induced heave, not uncommon to sulfate laden soils treated with lime, may be avoided when the proper dosage of Class F Fly Ash is used in conjunction with a lower dosage of lime. Plasticity and swell reduction, increases in bearing capacity, improvements in wet-dry durability and unconfined compressive strength are examples of the many benefits offered through the proper use of Boral Class F Fly Ash in subgrade soil and aggregate base stabilization.

Subgrade Stabilization with Class F Fly Ash

Sample Material	Moisture-Density Relationship ASTM D 698	Atterberg Limits ASTM D 4318	Days Cured	Dry Density, pcf	UC, psi
Untreated Subgrade Soil-sandy silt with clay and gravel	135.0 pcf Max. Dry Density 6.5% opt. moisture	Liquid Limit: 40 Plastic Limit: 14 Plasticity Index: 26	7	128.2	50
			7	127.8	50
			28	128.4	60
			28	127.9	60
Subgrade Soil with 18% Class F Fly Ash	134.5 pcf Max. Dry Density 6.9% opt. moisture	Plasticity Index: 2	7	127.4	95
			7	127.8	90
			28	127.9	165
			28	127.7	160
Subgrade Soil with 2.5% Lime and 7.5%	131.5 pcf Max. Dry Density @ 8.3% opt. moisture	(NP) Non-Plastic	7	126.0	180
			7	125.2	175
			28	125.0	250
			28	124.8	240
Subgrade Soil with 5% Lime	130.0 pcf Max Dry Density @ 8.3% opt. moisture	(NP) Non-Plastic	7	123.9	55
			7	124.2	60
			28	124.1	115
			28	123.8	105

Contact your local Boral Material Technologies representative for consultation on source locations, proper testing techniques, recommended installation procedures and additional technical information.

Boral Material Technologies is a major processor and marketer of coal combustion products in the United States. With over 40 years of marketing experience, Boral is committed to supplying quality products broadly supported with skilled technical sales professionals. To meet both our customer's present and future needs with coal combustion products Boral continues its commitment to customer based research and development and broad based marketing programs.

For more information on our complete line of products, contact your local Boral representative, corporate office or visit us online at www.boralmti.com.

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