FLY ASH SUPPLY

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What is Fly Ash?

Coal Fired Electricity Generating Plant

Fly Ash Particles
Why Do We Use Fly Ash?

- Prior to 1999, Fly Ash was used to reduce the cost of concrete primarily in concrete pavements.
- During the Late 80’s and mid 90’s, TxDOT was discovering major Alkali-Silica Reaction (ASR) in both Cast-in-Place and Precast structures.
ASTM C 1260 for Fine Aggregates

- Consider ALL Aggregates Reactive
  - Level playing field for all aggregate suppliers
  - No premium for “non-reactive aggregate
  - Requires all concrete mixtures to incorporate a mitigation option
  - No aggregate reactivity testing – eliminates the discussion of whether ASTM C 1260 or ASTM C 1293 is the proper test to conduct.

90% of sands tested thus far exceed 0.1% expansion
79% of sands tested thus far exceed 0.2% expansion
Why Do We Use Fly Ash?

- In 1999 TxDOT issued its first ASR mitigation specification, and using fly ash was one of the options.

- Class F fly ash is great at mitigating ASR at relatively low dosages.
- Class C fly ash is not as efficient at mitigating ASR.
Why Do We Use Fly Ash?

- Premature Deterioration: ASR, DEF, SRC
  - TxDOT relies heavily on fly ash for mitigation of these types of distresses
- High Performance Concrete: Typically required in coastal and North Texas
  - Concrete Mix Options 1-4: All rely on SCM’s to meet requirements
    - Fly ash only locally available option
    - Small amount of Silica Fume used in Panhandle
  - Permeability: Use of brine solutions as anti-icing/de-icing material
- Mass Concrete Placements
  - High volume fly ash mixes used to reduce peak temperatures during curing of large concrete elements
TxDOT consumes approximately 150,000 to 200,000 tons of fly ash annually.
What Affects Fly Ash Supply?

- **Plant Outages/Seasonal Outages**
  - Seasonal outages typically occur in early spring when power demands are low. These can last for a few weeks at a time.
  - Unusually long outages can delay project schedules.

- **Seasonal Temperatures**
  - Mild winters and springs: Low power demand - no need to run coal furnace for power generation, thus no fly ash.

- **Alternate fuels**
  - Low natural gas prices – during times of low power demand.

- **Long-term Storage Limitations**
  - Most fly ash marketers only have small storage silos, so no way to stock-up prior to outage.
What’s the Future of Fly Ash Availability?

- Difficult question to answer.
  - In the short-term, no indication of fly ash going away
  - Coal still the primary way to produce power
  - In the long-term, depends on EPA regulations
EPA Classification of Fly Ash as Hazardous Waste

5.4 million CY of Ponded Fly Ash
After 2008 Kingston Ash Pond failure, EPA proposed to classify fly ash as “hazardous” waste while still allowing for beneficial use.

The industry was worried that the stigma of the “Hazardous” classification would open the door for frivolous lawsuits and liability, and many were considering not allowing the fly ash to be distributed for beneficial use.

Good News!

Years of committee meetings, lobbying, lawsuits, and EPA administration changes has resulted in keeping the same classification and allowing state to regulate fly ash disposal.
Cross-State Air Pollution Rule

- Reduce $\text{SO}_x$ and $\text{NO}_x$ from Eastern States
- Could force power plants to switch from Texas Coal sources to Powder River Basin Coal – Reduction in Class F fly ash.
What are my options when fly ash is not available?

- **ASR Mitigation**
  - Other mitigation options: Limit Alkali loading, Lithium Admixtures, Other SCM’s

- **Sulfate Resistance Concrete**
  - 2014 specification no longer requires fly ash when SRC is specified
    - Only need to use a moderate sulfate resistant cement (Type II and Type I/II)

- **Mass Placements**
  - Use of fly ash is not require if temperature and other requirements are met.

- **High Performance Concrete**
  - Sticking to our guns on this in most regions (North Texas and Costal)
  - Will consider non-HPC mixes in substructure not over bridge joint on case by case basis

- Requirement to use Class F Fly Ash from April to October in Concrete Pavement.
What do I do if I need to Switch Fly Ash Sources?

Switching Sources of Fly Ash

Class F to Class F
Or
Class C to Class F

*Trial Batch

Class F to Class C
Or
Class C to Class C

Are C1567 results w/proposed agg. and ash available?

Does time allow for C1567 testing? (1 month)

Options

Perform C1567 Testing

Use a minimum of 20% of any Class C Ash with mixes containing < 520 lb/cy of cementitious material for all classes of concrete other than structural classes.

*Area Engineers may waive trial batches at their discretion.

**It is recommended to perform C1567 testing to determine if the ash content can be reduced or if other local ash sources with higher CaO contents can be used.

***The Cement Lab can assist in determining fly ash chemistry differences.

**Designs with ≥ 520 lb/cy of cementitious material, use 40% of Class C Ash w/CaO ≤ 26%.

Option 5 or Option 7

1Use the average CaO content from previous 6 months reported on fly ash mill certs.
QUESTIONS?

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