TEXAS DEPARTMENT OF TRANSPORTATION

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Fly Ash: Here Today? (Maybe), Gone Tomorrow? (Maybe)

Where Has the Fly Ash Gone?

Pending EPA regulations and an unseasonably mild winter in Texas have dramatically impacted the availability of fly ash during the first few months of 2012.

The Cross State Air Pollution Rule (CSAPR), scheduled to become effective on January 1, 2012, would have eliminated two Class F fly ash sources. The Monticello facility would have idled two units and would have begun to burn Powder River Basin (PRB) coal in unit 3. The Big Brown facility would also have begun to burn PRB coal, which results in the production of Class C fly ash. The idling of two units, coupled with the fact that burning PRB coal produces much less fly ash than Texas lignite coal, would have resulted in an overall reduction in the quantity of ash available in the market. The utility industry and the Texas Attorney General took legal action against EPA, and in early January 2012, the CSAPR was stayed until April 2012, when the U.S. District Circuit Court is scheduled to hear the case.

The unseasonably mild Texas winter of 2011–2012 has also played a factor in the availability of fly ash. Due to low power demand, several utility companies have switched to the cheaper natural gas to keep generators running; fly ash is only produced when coal is burned. Compounding the shortage, these periods of low power demand are often the time utility companies schedule routine shutdowns for repair and maintenance to gear up for peak summertime demands. The schedule of these shutdowns is typically not released to the public and, due to regulatory laws, is not information that is suitable for publication. Fly ash marketers generally plan for these spring shutdowns to mitigate their impact on availability. Numerous plants have shut down units for maintenance, but additional, unforeseen plant shutdowns have temporarily affected the supply of fly ash. Once these planned and unplanned maintenance procedures are completed, the availability of fly ash should return to normal.

Even though the current short-term fly ash shortages are an inconvenience, the more concerning issue is the long-term uncertainty of fly ash availability. EPA is still in the process of deciding whether to classify fly ash as a "special waste" material with allowance for "beneficial use." Even though "beneficial use" would be allowed, the "special waste" classification would have a negative stigma, likely eliminating "beneficial use" of fly ash due to the potential liability to the utility companies and fly ash marketers. Also, with natural gas being a cheap and cleaner alternative to coal, there is a small possibility that some plants completely convert to natural gas, further reducing the available fly ash. Even though fly ash is here today, it may be gone tomorrow.

With the potential for the state's fly ash resources to dwindle, TxDOT must take a hard look at how fly ash, particularly Class F fly ash, is being specified and used in projects. For instance, specifying Class F fly ash in concrete pavements during summer months has become common in several large urban districts. This specification is important to the long-term performance of concrete pavements, but it consumes a large quantity of Class F fly ash, and the same performance can be achieved through other means. Class F fly ash should be

diverted to concrete structures (bridge decks, columns and precast bridge beams) where TxDOT has historically encountered alkali-silica reaction (ASR).

Options for When Your Fly Ash Source is Abruptly No Longer Available

One of the primary reasons fly ash is used in concrete is to mitigate ASR. The concrete mix design options listed in Item 421 were developed to be a prescriptive measure to prevent ASR from occurring in new concrete structures. Deviation from these prescriptive options elevates the risk of ASR to occur, so allowable deviations are generally going to be more conservative than the prescriptive options listed in Item 421.

Switching to a Class F ash from either another Class F or a Class C ash is the less concerning switch. Generally, Texas Class F ashes are very similar in their ability to mitigate ASR when used at minimum prescribed dosages. This switch may only require trial batch testing to substantiate other job requirements.

Because Texas Class C ashes are much more variable in chemistry and less efficient at mitigating ASR than Class F ashes, performing ASTM C 1567 testing is required up front when switching to Class C ash from a Class F or switching to a different Class C ash source to determine the minimum dosage of Class C ash needed. Without this test data, the only option is to require high dosages of only certain Class C ashes (CaO contents ≤ 26%). When taking this route, ASTM C 1567 testing is still recommend to determine if reduced dosages are acceptable or if other local Class C ashes can be used.

A second option is to design non-structural classes of concrete mixes that contain < 520 lb./cu. yd. of cementitious material. The low cement content drastically reduces the potential for ASR; therefore, any Class C ash can be used without additional testing. This only applies to classes of concrete other than structural classes (A, B, D, E, P, HES).

The third option is to use Class C ash as part of a ternary mixture (Item 421, Option 5) or to completely remove the ash from the mix designs and limit the alkali loading to ≤ 3.5 lb./cu. yd. (Item 421, Option 7).

The following flow chart can help concrete suppliers determine the acceptable options when switching ash sources due to supply shortages.

Contact Information

If you have questions regarding the use of fly ash in your mix designs, please contact:

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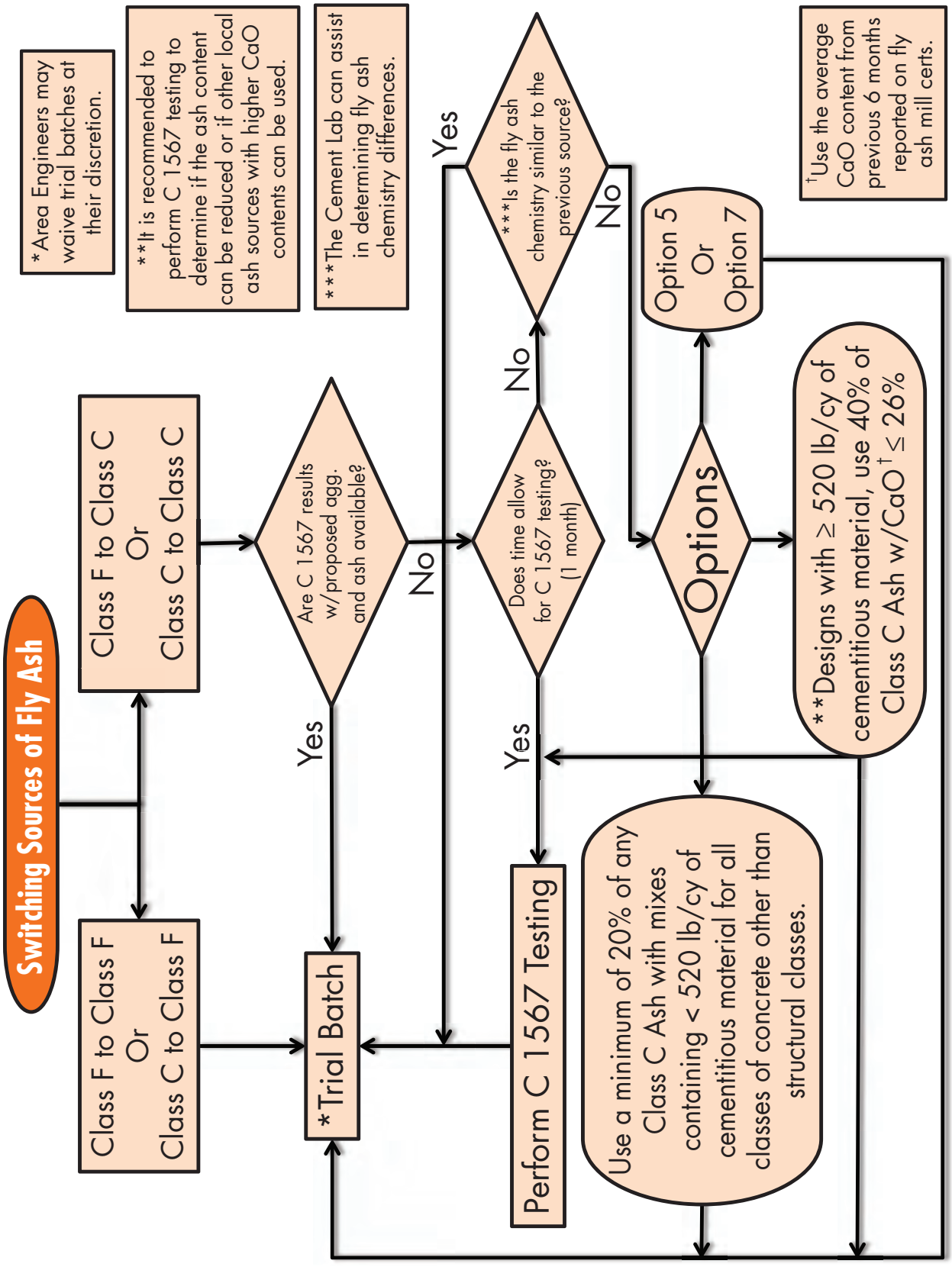
Switching Sources of Fly Ash
Class F to Class F Or Class C to Class F
Class F to Class C Or Class C to Class C
*Trial Batch
Are C 1567 results w/proposed agg. and ash available?
Yes
No
Perform C 1567 Testing
Does time allow for C 1567 testing? (1 month)
Yes
No
***Is the fly ash chemistry similar to the previous source?
Yes
No
Options
Option 5 Or Option 7
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.
**Designs with ≥ 520 lb/cy of cementitious material, use 40% of Class C Ash w/CaO† ≤ 26%
*Area Engineers may waive trial batches at their discretion.
**It is recommended to perform C 1567 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.
†Use the average CaO content from previous 6 months reported on fly ash mill certs.