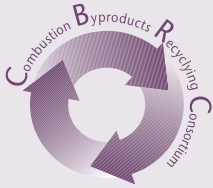


# Project Facts



*Promoting and supporting the commercially viable and environmentally sound recycling of coal combustion byproducts for productive uses through scientific research, development, and field testing.*



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## *Engineering and Environmental Specifications of State Agencies for Utilization and Disposal of Coal Combustion Products*

### **Project Objectives**

- Present a state-by-state comparison of Department of Transportation (DOT) specifications governing the use of coal combustion byproducts (CCBs)
- Establish a comparison of state environmental laws and regulations as they pertain to utilization and/or disposal of CCBs

### **Background**

Most transportation and materials engineers lack the resources to properly research all the current coal ash utilization technologies. In addition, engineering practices are typically slow to change. To facilitate the wider use of CCBs, a systematic approach must be taken to help familiarize engineers and officials with coal ash applications.

### **Description**

A comparison of state transportation specifications governing the use of CCBs will allow transportation and materials engineers to become familiar with other department practices and to identify areas where specifications need to be developed within their own transportation offices.

Because CCB utilization and disposal are regulated at the state level, laws and regulations vary widely among states. Therefore, comparing state environmental laws and regulations related to utilization and/or disposal of CCBs will help engineers and state officials facilitate the use of coal ash applications and help the coal ash industry to develop a plan to expand coal ash markets.

### **Preliminary Results and Status**

Beginning in 2004, the study team obtained specifications on the use of CCBs from all state DOT offices. The team also performed a similar survey with state health agencies to determine state regulations pertaining to CCBs. All data on current specifications and regulations has been collected.

Results show that all states have specifications pertaining to CCBs and their applications. The single most noted application is the partial replacement of cement in concrete. For this reason, the most commonly referenced specifications were ASTM C618 or AASHTO M295. Both of these specifications were designed as methods of verifying whether an ash can be used as a partial cement replacement in concrete. Transportation departments changed their specification from the indicated ASTM C618 and AASHTO M295 to reflect regional practices.

The most significant changes in DOT specifications since 1992 are the additions of specifications for controlled low-strength materials (CLSM), ground granulated blast furnace (GGBF) slag, and blended cements. During the earlier comparison study most states were aware of CLSM applications, but few had specifications for its uses. The specified use of blended cements is an indication of the increased use of fly ash within the cement industry, as is also the case for GGBF slag. Some states have already adopted, or are currently adopting, updated specifications for utilizing CCBs. Differences between DOT specifications still vary greatly among states, even neighboring ones. A transition in material specifications to performance specifications will gradually blur the lines between state specifications.

A number of states have adopted laws and regulations or issued policies and/or guidance pertaining

to CCB use. These uses vary widely with some states authorizing liberal use of CCBs while others authorize CCB use only in limited applications. In addition, the level of regulatory control and oversight varies significantly among states. CCB uses presenting the greatest concern to state regulators are those that involve land application, such as use of CCBs in agricultural applications, structural fills, mine applications, and embankments. Some states consider these applications to be waste disposal and not reuse or recycling.

Finally, other states have adopted "industrial solid waste beneficial use" rules to authorize use of a variety of material, such as coal ash, paper mill sludge, and foundry sand. These reuse rules with application to multiple materials may represent a growing trend.

**ASTM C618-03 Chemical and Physical Specifications**

Chemical Requirements	Mineral Admixture Class		
	N	F	C
Silicon Dioxide, Aluminum Oxide, Iron Oxide (SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub> ), min, %	70.0	70.0	50.0
Sulfur Trioxide (SO <sub>3</sub> ), max, %	4.0	5.0	5.0
Moisture Content, max, %	3.0	3.0	3.0
Loss on Ignition, max, %	10.0	6.0 <sup>A</sup>	6.0

<sup>A</sup> The use of Class F pozzolan containing up to 12.0% loss on ignition may be approved by the user if either acceptable performance records or laboratory test results are made available.

Physical Requirements	N	F	C
Fineness: Amount retained when wet-sieved on 45µm (No. 325) sieve, max, % <sup>A</sup>	34	34	34
Strength Activity Index: <sup>B</sup> with Portland Cement at 7-day, min % of control 28-day min % of control	75 <sup>C</sup> 75 <sup>C</sup>	75 <sup>C</sup> 75 <sup>C</sup>	75 <sup>C</sup> 75 <sup>C</sup>
Soundness water requirement, max, percent of control	115	105	105
Autoclave expansion or contraction, max, %	0.8	0.8	0.8

<sup>A</sup> Care should be taken to avoid the retaining of agglomeration of extremely fine material.

<sup>B</sup> The strength activity index with Portland cement is not to be considered a measure of the compressive strength of concrete containing the fly ash or natural pozzolan. The mass of fly ash or natural pozzolan specified for the test to determine the strength activity index with Portland cement is not considered to be the proportion recommended for the concrete to be used in the work. Strength activity index with Portland cement is a measure of reactivity with a given cement and may vary as to the source of both the fly ash or natural pozzolan and the cement.

<sup>C</sup> Meeting the 7-day or 28-day strength activity index will indicate specification compliance.