



LOW-CARBON CEMENT

ASTM INTERNATIONAL STANDARD GUIDELINES

1.0 ASTM International Standards

To ensure that a Low-Carbon Cement Protocol (LCCP) project displaces portland cement (PC), the project material (supplementary or alternative cementitious material (SCM/ACM)) must meet industry standards. ASTM International is an international standard setting organization that has a series of standards for various types of cements and concretes.

Section 3.6 in the LCCP outlines that a project SCM/ACM must meet applicable ASTM standards to be eligible. This supporting document summarizes the currently available and applicable ASTM standards for the LCCP and will be updated over time as new products and standards are developed. Verification bodies will require a copy of relevant ASTM standard reports during verification prior to project registration and credit issuance.

If project developers have multiple types of SCMs/ACMs, each product must meet its applicable ASTM standard. Projects must demonstrate the standards were met for materials produced during the relevant reporting period. If the material was produced in batches and each batch has a separate report, the project developer must demonstrate to the verification body that each batch has an ASTM report and must provide a selection or specific report upon request based on the project specifics.

If the LCCP project includes a material that does not yet have an ASTM standard, the project developer will need to provide alternative documentation to give the verification body reasonable assurance that the product can or has displaced PC in the market. The Reserve has provided a few examples of alternative documentation in Section 3.0 of this guidance document.

Table 1.0 Applicable ASTM Standards for SCM/ACM categories

Eligible SCM/ACM	ASTM Standard Specifications
Beneficiated coal ash	C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
Natural pozzolans	C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
Ground glass pozzolans	C1866/C1866M – 22: Standard Specification for Ground-Glass Pozzolan for Use in Concrete
Calcined clays/shale and/or metakaolin	C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
CO ₂	C1905-23: Standard Specification for Cements that Require Carbonation Curing
Blended Cements including an eligible SCM/ACM (such as Limestone calcined clay cements (LC3))	<p>C595/C595M – 23: Standard Specification for Blended Hydraulic Cements (or C1157/C1157M-23: Standard Performance Specification for Hydraulic Cement)</p> <p>C1697-21: Specification for Blended Supplementary Cementitious Materials</p>
Manufactured ACMs	No specific standard. Some products may meet the specifications within ASTM Standard C989: Standard Specification for Slag Cement for Use in Concrete and Mortars.
Biochar	These products do not currently have a specific ASTM standard. The protocol will be revised to include future ASTM standards for other SCM products which are currently under development.

Other artificial pozzolans or treated calcined materials (including rice husk ash)	These products do not currently have a specific ASTM standard. The protocol will be revised to include future ASTM standards for other SCM products which are currently under development.
Other waste by-products (including Bauxite residue (Red Mud), lime kiln dust, or cement kiln dust)	These products do not currently have a specific ASTM standard. The protocol will be revised to include future ASTM standards for other SCM products which are currently under development.
Hydroxide products (including portlandite (Ca(OH) ₂) and brucite (Mg(OH) ₂))	These products do not currently have a specific ASTM standard. The protocol will be revised to include future ASTM standards for other SCM products which are currently under development.
Other novel SCM/ACMs (biogenic limestone, etc)	These products do not currently have a specific ASTM standard. The protocol will be revised to include future ASTM standards for other SCM products which are currently under development.

2.0 Beneficiated Coal Ash

The Reserve expects that most beneficiated ash products will be processed to meet the specifications within ASTM standard C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete (see chemical and physical requirements for C618-23ε1 in Table 3.2 and 3.3 below). However, project developers can demonstrate eligibility by providing test results before and after processing to meet another relative ASTM standard such as ASTM Standard C989: Standard Specification for Slag Cement for Use in Concrete and Mortars. The verification body will review these documents to assess product eligibility).

Table 3.2 Chemical Requirements under ASTM Standard C618-23ε1

Chemical Requirement	Before Processing	After Processing
Silicon dioxide (SiO ₂) plus aluminum oxide (Al ₂ O ₃) plus iron oxide (Fe ₂ O ₃)	< 50.0%	≥ 50.0%
Sulfur trioxide (SO ₃)	> 5.0%	≤ 5.0%
Moisture content	> 3.0%	≤ 3.0%
Loss on ignition	> 6.0%	≤ 6.0%

Table 3.3 Physical Requirements under ASTM Standard C618-23ε1

Physical Requirement	Before Processing	After Processing
Fineness (wet-sieved, retained on 45-µm (No. 325) sieve)	> 34%	≤ 34%
Fineness (retained on 150-µm (No. 100) sieve) ¹	> 10%	≤10%
Strength activity index	< 75% of control at both 7 and 28 days	≥ 75% at either 7 or 28 days
Water requirement, max, percent of control	> 105%	≤ 105%
Uniformity Requirements <ul style="list-style-type: none"> - Density, max variation from average - Percent retained on 45-µm (No. 325) 	> 5% (either property)	≤ 5% (both properties)

3.0 Alternative Documentation Suggestions

If a product has an applicable ASTM standard, that project must provide evidence that the material meets the specific requirements of that standard and must provide their ASTM standard report as evidence during verification. If a material does not yet have an ASTM standard at the time of the project (i.e. biochar in this version of the guidance materials), the project developer can provide alternative documentation that gives the verification body reasonable assurance the product has or will displace PC. Some example documentation is listed below. Generally, projects should provide two documents: one displaying the chemical and physical qualities of the product and the other confirming these qualities meet the customer’s requirements to displace PC.

- Signed letters from the SCM/ACM purchaser or infrastructure manufacturer that the product has been used and/or confirming the product quality is sufficient to be used in a project instead of PC
- Specific language on sales receipts or bills of lading stating that the customer agrees the product meets quality requirements and will displace PC
- Lab analysis from an unbiased lab with verifiable accreditation
- Third-party, unbiased review and validation of internal lab analysis
- Report from another standard setting organization with verifiable accreditation
- Proof the product has already been used instead of PC

¹ Only applies to harvested coal ash or coal ash containing bottom ash.