

**Tennessee Department of Transportation
Division of Materials and Tests**

**Procedures for Field Sampling of Cementitious Material
(SOP 4-6)**

Purpose: The purpose of this document is to establish a formal process for the field sampling of cementitious materials, for use in Tennessee Department of Transportation (TDOT) concrete mixtures, from the source of use (i.e. ready mix, precast, and prestressed concrete plants).

Background: Cementitious materials must exhibit certain physical and chemical properties that reflect their ultimate quality for use in concrete mixtures. The TDOT Standard Specifications for Road and Bridge Construction dated January 1, 2015, specify the chemical and physical requirements the cementitious material must meet. When verifying the quality of the cementitious material at the source of use, it is paramount to obtain an uncontaminated sample to accurately assess the quality of the material.

1. Sampling Equipment

- 1.1 Collect samples using an appropriate sampling device such as a clean shovel, a clean scoop, or a sampling tube meeting the requirements of AASHTO T-127.
- 1.2 The sample container shall be a plastic-lined sample bag suitable for a 1 gallon sample.
- 1.3 Use proper safety equipment and devices needed for the selected sampling procedure (eye protection, respiratory protection, fall protection, etc.)

2. Sampling Procedure

- 2.1 Samples shall be taken by Regional Materials & Tests personnel or by a representative of the concrete producer and witnessed by Regional Materials & Tests personnel at the frequency stated in SOP 1-1.
- 2.2 The concrete producer is responsible for providing one of the following methods of obtaining a sample without contamination. Appropriate safety measures shall be used and followed at all times when obtaining the sample.

2.2.1 Sampling from the Top of a Transport Truck

Take a sample from the top of the truck prior to unloading. Brush back the top foot of material and obtain a sample using a sampling tube.

2.2.2 Sampling from the Discharge Line of Transport Truck

If the discharge line is equipped with a sampling valve, obtain the sample at the approximate halfway point of unloading to ensure the line is purged of old material.

2.2.3 Sampling from the Silo

If the storage silo has a sampling port, obtain a sample using a sampling tube.

2.2.4 Sampling from the Weigh Hopper

When sampling from the weigh hopper, first drop a load of material into a clean loader bucket and then waste the material in the loader bucket. Then drop a second load of material in the loader bucket and obtain the sample from that load.

- 2.3 Place the sample in the plastic-lined sample bag and tie the bag tight to prevent contamination. Do not tie the plastic separate from the bag. Examples of properly and improperly tied sample bags are shown in Appendix A.
- 2.4 The concrete producer shall give a copy of the latest mill test report (MTR) for the material being sampled at the time of obtaining a sample. An example of an MTR is shown in Appendix B.
- 2.5 Deliver the sample with the MTR to Headquarters Materials & Tests (HQMT) and take precaution to minimize aeration, contamination, and moisture absorption.

Appendix A: Examples of Properly and Improperly Tied Sample Bags

Properly Tied



Figure 1: Sample bag tied with string



Figure 2: Sample bag tied with multiple wraps on electrical tape

Improperly Tied

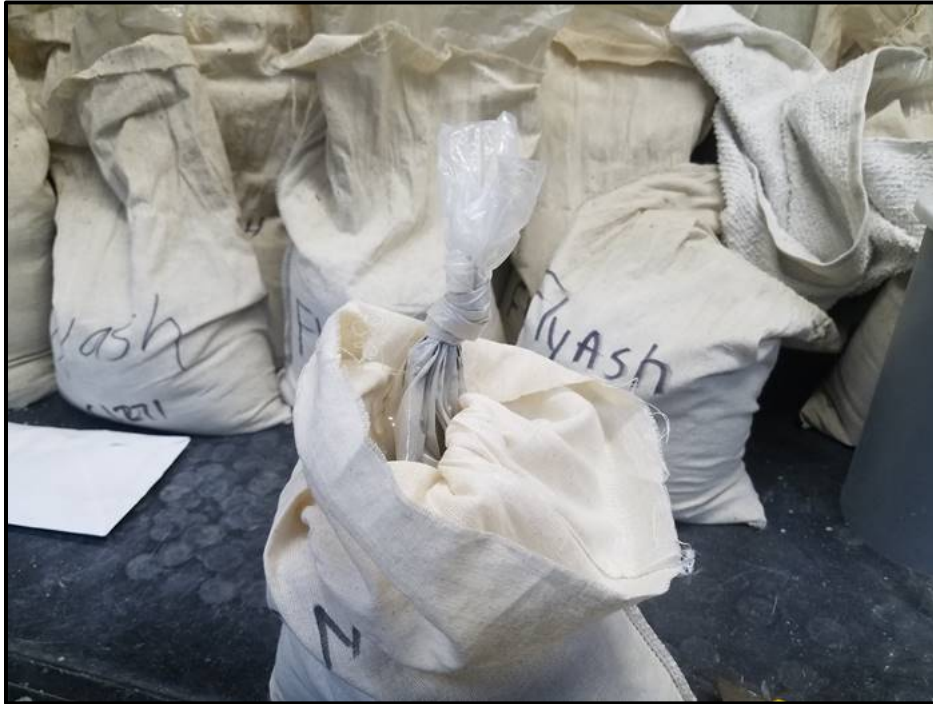


Figure 3: Sample with plastic liner tied separately from the bag



Figure 4: Sample bag with plastic liner tied separately with duct tape

Appendix B: Example of Mill Test Report

ABC Portland Cement Company
Nashville, TN

Plant: Example

Cement Type: II(MH)

Date: June 9, 2019

Production Period: June 2, 2019–June 8, 2019

STANDARD REQUIREMENTS M 85

CHEMICAL			PHYSICAL		
Item	Spec. Limit	Test Result	Item	Spec. Limit	Test Result
SiO ₂ (%)	^a	21.2	Air content of mortar (volume %)	12 max	7
Al ₂ O ₃ (%)	6.0 max	3.9	Fineness (m ² /kg) (Air permeability)	260 min 430 max	367
Fe ₂ O ₃ (%)	6.0 max	3.8	Autoclave expansion (%)	0.80 max	0.06
CaO (%)	^a	61.3	Compressive strength (MPa)	Min:	
MgO (%)	6.0 max	2.4	1 day	^a	
SO ₃ (%)	3.0 max	2.8	3 days	7.0	23.6
Loss on ignition (%)	3.5 max	2.3	7 days	12.0	29.9
Na ₂ O (%)	^a	0.19	28 days	^a	
K ₂ O (%)	^a	0.50	Time of setting (minutes) (Vicat)		
Equivalent alkalis, Na ₂ O _{eq} (%)	^a	0.52	Initial	Not less than 45 Not more than 375	131
Insoluble residue (%)	1.5 max	0.29	Heat of hydration (kJ/kg)		
CO ₂ (%)	^a	1.1	ASTM C1702		
Limestone (%)	5.0 max	3.9	3 days	^c	248
CaCO ₃ in limestone (%)	70 min	76	ASTM C1038 mortar bar expansion (%)	^d	0.011 ^e
Inorganic processing addition (ground, granulated blast-furnace slag)	5.0 max	3.3			
Potential phase compositions (%) ^b					
C ₃ S	^a	58			
C ₂ S	^a	11			
C ₃ A	8 max	6			
C ₄ AF	^a	9			
C ₄ AF + 2(C ₃ A)	^a	21			
C ₂ S + 4.75 C ₃ A, (%)	100 max	87			

^a Not applicable.

^b Adjusted per Annex A1.6.

^c Test result represents most recent value and is provided for information only.

^d Required only if percent SO₃ exceeds the limit in Table 1, in which case expansion shall not exceed 0.020 percent at 14 days.

^e Test result for this production period not available. Most recent test result provided.

OPTIONAL REQUIREMENTS M 85

CHEMICAL			PHYSICAL		
Item	Spec. Limit	Test Result	Item	Spec. Limit	Test Result
Chloride (%)	^f	0.018	False set (%)	50 min	84
			Compressive strength (MPa)		
			28 days	28.0 min	39.9 ^e

^f Limit not specified by purchaser. Test result provided for information only.

We certify that the above-described cement, at the time of shipment, meets the chemical and physical requirements of
M 85-xx or (other) _____ specification.

Signature: _____

Title: _____