Method of Test for

DETERMINING ALKALI CONTENT OF FLY ASH BY X-RAY FLUORESCENCE SPECTROMETER

DOTD Designation 531

I. Scope

Use this method to determine total sodium oxide (Na_2O) and potassium oxide (K_2O) content of fly ash for calculation of equivalent percentage of sodium oxide by weight.

II. Apparatus

A. Fly Ash Worksheet (Figure 1)
B. Analytical Balance – 120 g capacity accurate to +/-0.0001 g (Figure 2)
C. Bead Fusion Instrument (Figure 3)
D. X-Ray Fluorescence (Figure 4)

III. Reagents

A. Fusion flux
B. Release agent

IV. Health Precautions

Proper precautions are to be taken whenever hot materials or equipment must be handled. Use container holder or thermal gloves while handling hot containers. Wear eye protection while stirring and weighing materials. Perform the preparation of sample under vent hood to prevent exposure to fumes.

V. Sample

Obtain sample according to DOTD S102 sampling procedure as stated in Material sampling Manual.

VI. Procedure

A. Weigh 0.6 g of fly ash and transfer to bead fusion instrument crucible.
B. Weigh 1.0 g of fusion flux and transfer to bead fusion instrument crucible.
C. Initiate the fusion procedure in accordance with the instrument's operating instructions.
D. Upon completion of the fusion cycle, remove the bead from the instrument's mold.
E. Determine Na_2O and K_2O content utilizing x-ray fluorescence spectrometer in accordance with the instrument manufacturer's operating procedure.

VII. Calculation

A. Calculate the results as percent by weight of the original fly ash sample.
B. The equivalent percentage of sodium oxide (Na_2O), calculated as follows:

$$Equivalent\ Na2O,\% = Na2O,\% + (0.658\ x\ K2O,\%)$$

Example:

Na_2O = 1.42%

K_2O = 0.17%

Equivalent Na_2O % = 1.42 + (0.658 x 0.17)

Equivalent Na_2O % = 1.42 + 0.11

Equivalent Na_2O % = 1.53

Equivalent Na_2O % = 1.5

VIII. Report

The data shall be reported to the nearest tenth of a percent (0.1%) on the Fly Ash worksheet (Figure 1).

Example: 1.53 is reported as 1.5

FLY ASH, CLASS F, MATERIAL CODES 297 AND 589

CHEMICAL PROPERTIES

TOTAL OXIDES (ASTM C311)			84.2	P
SILICON DIOXIDE		57.3		
Al_2O_3	19.9			
FeO_2	7.0			
AMMONIUM HYDROXIDE GROUP		26.9		
SULFUR TRIOXIDE (ASTM C311)		0.3		P
MAGNESIUM OXIDE (ASTM C311)		2.0		
CALCIUM OXIDE (ASTM C311)		2.0		
LOSS ON IGNITION, % (ASTM C311)			__.__	_____
TOTAL ALKALI EQUIVALENT, % (DOTD TR 531)			2.57	
Na_2O	1.07			
K_2O	2.28			
MOISTURE CONTENT, % (ASTM C311)			__.__	_____

PASS/FAIL BASED ON AASHTO M295, TABLE 1

TESTED BY: _____ DATE: 9/28/2017

CHECKED BY: _____ DATE: _____

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Figure 1. Fly Ash Worksheet

Figure 2. Analytical Balance

Figure 3. Bead Fusion Instrument

Figure 4. X-Ray Fluorescence