



Transport
Roads & Maritime
Services

Test method T221

Dusting or falling unsoundness in
metallurgical slag (Petrographic method)

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Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D.Dash	May 1999
		Date on Test Method Revised to Agree with Date on Revision Summary	D.Dash	Feb 2001
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T221 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T221

Dusting or falling unsoundness in metallurgical slag (Petrographic method)

1. Scope

This test method sets out the procedure for the petrographic examination of metallurgical slag in order to determine whether the material is liable to disintegrate due to "dusting" or "falling" unsoundness.

This test method conforms to the method set out in Australian Standard 1141.

2. Definition

Term	Definition
Dusting/ Falling	Unsoundness may be found in metallurgical slags containing dicalcium silicate, $2\text{CaO}\cdot\text{SiO}_2$. A "falling" slag is one which, although solid when hot, disintegrates to a powder as it cools, or under certain circumstances disintegration may occur some time after cooling or not at all.

3. Apparatus

- Crushing equipment to reduce material to pass a 19.0 mm sieve
- Laboratory glassware including watchglasses or other items as required.
- A metallurgical microscope
- 19.0 mm and 13.2 mm AS sieves
- Cutting, Grinding, and Polishing Apparatus as described in Test Method T226
- A thermostatically controlled oven with good air circulation, capable of maintaining a temperature within the range of 105°C to 110°C
- Magnesium Sulphate (MgSO_4 anhydrous). A 10% solution with water

4. Test Portion

- From the test sample, take at random a test portion of not less than six pieces of aggregate.
- Take a duplicate test portion and reserve for retest.

5. Preparation of Test Portions

- Aggregate exceeding 20 mm nominal size: Lightly crush each piece of aggregate to pass through a 19.0 mm sieve. Retain the portion of the sample collected on a 13.2 mm sieve. Select a piece from each lump or aggregate crushed, and mount for examination as described below.
- Aggregate less than 20 mm nominal size: Cut each piece of aggregate through its largest diameter to expose a fresh face.

6. Procedure

- Mounting

Grind flat the largest freshly exposed surface of each piece obtained as in Clause 5, using 240 grade silicon carbide grinding medium and water. Dry the pieces for one hour at 105°-110°C. Place each piece, ground surface down, in a 25 mm diameter by 13 mm high rubber mould. Cover with an air-setting epoxy resin mounting medium and cure in accordance with the manufacturer's directions. Grind the specimens either by hand or on a mechanical lap using 240, 320, 400 and 600 grades silicon carbide and water lubricant. If a mechanical lap is used apply a very light pressure. Complete

the preparation by polishing with alpha alumina (0.3 μm grade) and water on a rotating high speed lap covered with a suitable cloth.

(b) Examination of a Polished Specimen

Examine the specimen under a metallurgical microscope by reflected light at successive magnifications of about 100 and 400 to determine that it is free from scratches. If the specimen is satisfactory in this respect proceed to etch it.

(c) Etching the Polished Specimen

To etch the specimen, place it face downwards in a small watchglass (about 75 mm in diameter) containing a 10% solution of MgSO_4 (anhyd) at a temperature of approximately 50°C . During the etching operation, gently rock the dish and contents. Continue the etching for 1 min, after which period remove the specimen, wash the surface with water and dry by gently dabbing it on lens tissue.

(d) Examination of the Polished, Etched Specimens

- (i) Examine the polished, etched specimen under a metallurgical microscope by reflected light at successive magnifications of about 100 and 400.
- (ii) If one or more of the specimens in the test portion contains β -dicalcium silicate repeat procedures 6 (a) to 6 (c) on the duplicate test portion and report the total number of specimens for both portions containing β -dicalcium silicate.

7. Reporting

- (a) If there is no β -dicalcium silicate present report the slag as free from "dusting" or "falling" unsoundness
- (b) If β -dicalcium silicate is present report the total number of specimens containing β -dicalcium silicate

8. Techniques

Metallurgical furnace slags which are liable to "dusting" or "falling" unsoundness, exhibit irregular-shaped etched crystals having parallel or cross-hatched striations on surface, against the polished background. These are crystals of β -dicalcium silicate. In most specimens of iron blast-furnace slag, white highly-reflective crystals often assembled in patterns may be observed. These are crystals of calcium sulphide and should be disregarded when examining for "dusting" or "falling" unsoundness.