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IRISH STANDARD

I.S. EN 12274-4:2003

ICS 93.080.20

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SLURRY SURFACING - TEST METHODS - PART 4: DETERMINATION OF COHESION OF THE MIX

This Irish Standard was published under the authority of the National Standards Authority of Ireland and comes into effect on:

April 11, 2003

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12274-4

February 2003

ICS 93.080.20

English version

Slurry surfacing - Test methods - Part 4: Determination of cohesion of the mix

Matériaux bitumineux coulés à froid - Méthode d'essai - Partie 4: Détermination de la cohésion du mélange

Dünne Asphaltschicht in Kaltbauweise - Prüfverfahren - Teil 4: Bestimmung der Kohäsion der Mischung

This European Standard was approved by CEN on 21 November 2002.

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Foreword

This document (EN 12274-4:2003) has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2003, and conflicting national standards shall be withdrawn at the latest by December 2005.

This European Standard is one of a series of standards as listed below:

EN 12274-1, *Slurry surfacing – Test methods – Part 1: Sampling for binder extraction.*

EN 12274-2, *Slurry surfacing – Test methods – Part 2: Determination of residual binder content.*

EN 12274-3, *Slurry surfacing – Test methods – Part 3: Consistency.*

EN 12274-4, *Slurry surfacing – Test methods – Part 4: Determination of cohesion of the mix.*

EN 12274-5, *Slurry surfacing – Test methods – Part 5: Determination of wearing.*

EN 12274-6, *Slurry surfacing – Test methods – Part 6: Rate of application.*

EN 12274-7[1], *Slurry surfacing – Test methods – Part 7: Shaking abrasion test in suitability of mineral aggregates to slurry mixes.*

EN 12274-8[1], *Slurry surfacing – Test methods – Part 8: Visual assessment.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a test method for determining the minimum cohesion of a slurry surfacing mix which enables the set time and trafficability time to be determined.

This European Standard applies to slurry surfacing to be used in surface layers.

NOTE For some course mixtures the precision is poor due to loss of aggregates comes up, a comment will be made in the report.

[1] In preparation.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12274-3, *Slurry surfacing — Test methods — Part 3: Consistency.*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (Hardness between 10 IRHD and 100 IRHD).*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
set
end of the non-reversible process in a slurry surfacing when the emulsion coalescence takes place

NOTE 1 The coalescence of an emulsion is the non-reversible phase starting from the beginning of the breaking of the emulsion to the total setting when the bitumen emulsion reverts to bitumen in presence of a mineral.

NOTE 2 After the set of a slurry surfacing

– it is not possible to stir the mixture;

– free emulsion during washing with water cannot be observed;

– an absorbent paper is not stained when pressed slightly onto the surface of the slurry.

3.2
set time
time elapsed between placing a slurry surfacing and its setting

3.3
trafficability time
period of time after laying, when the slurry surfacing can accept traffic

3.4
quick setting slurry
slurry with a set time less than or equal to 30 min

3.5
slow setting slurry
slurry with a set time more than 30 min

4 Principle

Torque measurements are taken on five samples of the same slurry mix at suitable intervals after casting.

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5 Materials

5.1 Coarse aggregates and sand

A sufficient amount of the separated aggregates to be used in the slurry shall be dried in an oven at (110 ± 5) °C to reach constant mass.

NOTE Constant mass is deemed to be achieved when the difference between successive weighings at 30 min intervals does not exceed 0,1 % of the mass.

5.2 Reactive filler

The filler, e.g. cement or hydrated lime, shall be dried in an oven at (110 ± 5) °C to reach a constant mass.

NOTE Constant mass is deemed to be achieved when the difference between successive weighings at 30 min intervals does not exceed 0,1 % of the mass.

5.3 Emulsion

The emulsion shall be manually homogenized using a glass rod.

6 Apparatus

6.1 Apparatus used for preparation of samples

6.1.1 Oven, with a minimum capacity of 80 l capable of maintaining a temperature of (110 ± 5) °C.

6.1.2 Balance, accurate to 0,1 g.

6.1.3 Timing device, accurate to 1 s.

6.1.4 Metal square-shaped moulds, having four trunco-conical holes (see Figure 1) of the dimensions given in Table 1.

Table 1 — Dimensions of moulds

Moulds	Dimensions							
	Width (W) mm	Length (L) mm	Height (H) mm	Hole diameter mm		Tolerances mm		
				upper D	lower D'	(W),(L)	(H)	(D,D')
Type A	140	140	6,3	60	60,3	±1 %	±1 %	±1 %
Type B	140	140	10,0	60	60,4			
Type C	200	200	13,0	90	90,6			
Type D	250	250	19,0	115	115,8			

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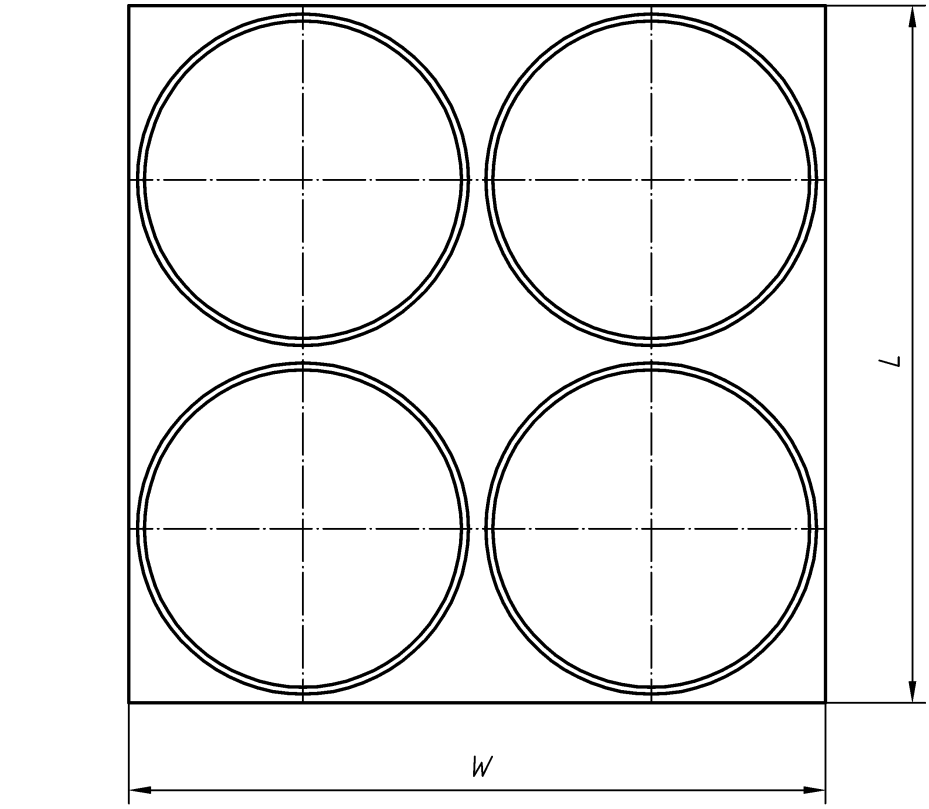

Figure 1 — Metal square-shaped moulds, upper view, side view

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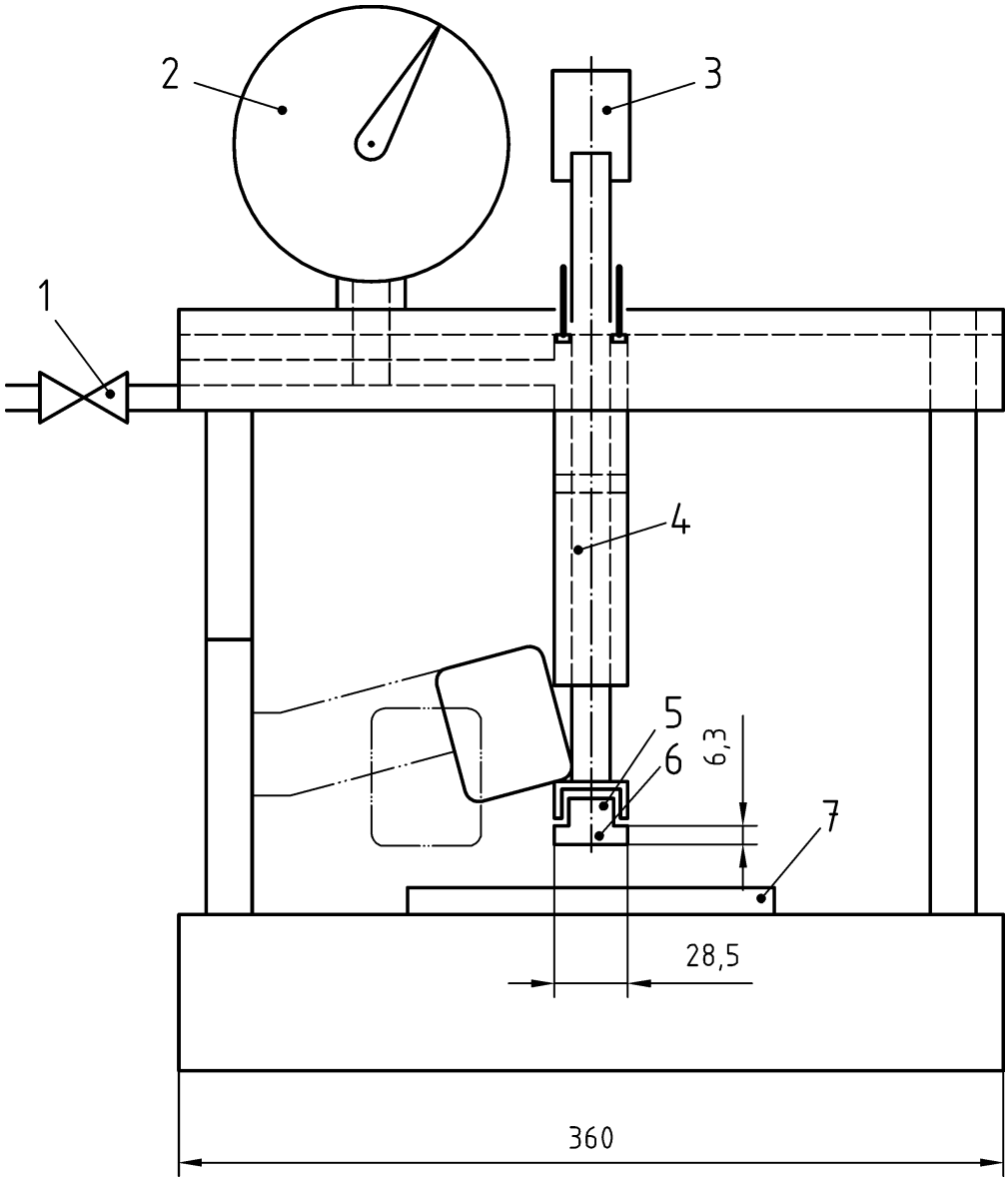
Dimensions in millimetres



Key
1 Control valve
2 Air pressure gauge
3 Drive socket for straighthandle of torquemeter
4 Double acting double endrod pneumatic cylinder
5 Rubber foot
6 Autotire plug
7 Sample

Figure 2 — Metal square-shape moulds, front view

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6.1.5 End-rounded spatula, or metal rod.

6.1.6 **Ladles or beakers**, of 1 l and 2 l capacity.

6.1.7 **Roofing felt**, for sample holder of the same dimensions as the moulds of (700 ± 70) g/m².

6.2 Apparatus used for testing

6.2.1 Cohesion tester

6.2.1.1 General

A cohesion tester, as shown in Figures 2 to 4, shall consist of the elements described in 6.2.1.2 to 6.2.1.7:

6.2.1.2 Double rod end air cylinder, 28,5 mm in diameter, with 8 mm diameter rods and 76 mm stroke.

6.2.1.3 Neoprene rubber foot, (60 ± 2) degrees durometer in accordance with ISO 48, 6,3 mm height and 28,5 mm in diameter.

6.2.1.4 Air pressure regulator, with a variable down stream bleed valve so that constant pressure is maintained.

6.2.1.5 Four-way directional control valve, with exhaust port regulating valves.

6.2.1.6 Air pressure gauge, with a 0 kPa to 700 kPa pressure gauge.

6.2.1.7 Torque meter, capable of measuring and recording at least 3,5 Nm (35 kg/cm) torque.

6.2.2 **Air supply**, of 700 kPa.

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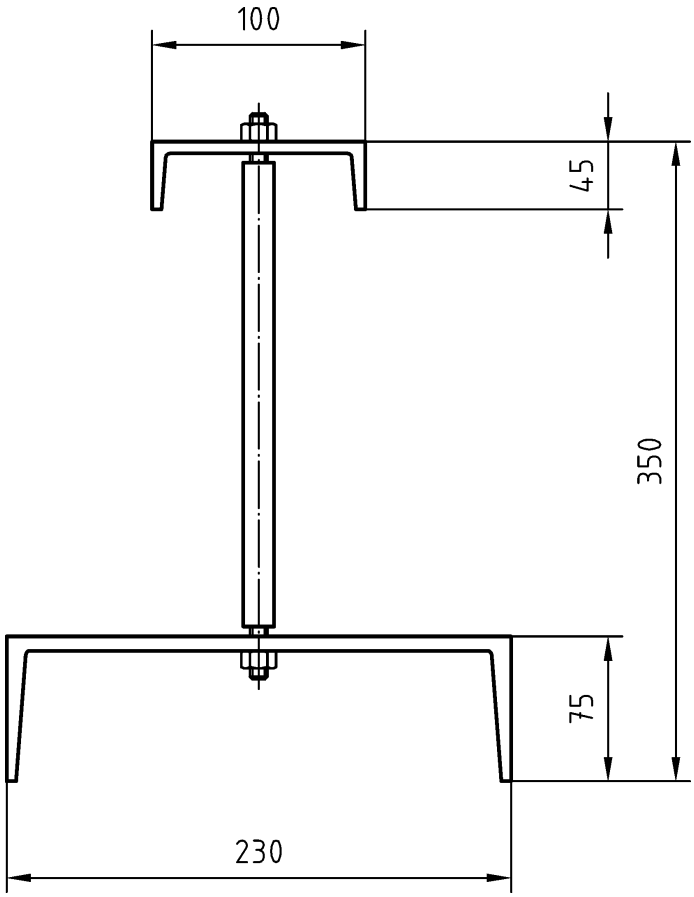
Dimensions in millimetres



NOTE Tolerance for the dimensions: 1 %

Figure 3 — Cohesion tester, side view

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NOTE Tolerance for the dimensions: 1 %

Figure 4 — Cohesion tester, side view

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7 Calibration of test apparatus

7.1 Materials

7.1.1 Calibrated sand, with a grading curve in accordance with Table 2.

Table 2 — Grading curve of calibrated sand

Sieve mm	Passing %
1	85 to 100
0,5	0 to 5

7.1.2 P220 grit silicon carbide sand paper.

7.1.3 P100 grit silicon carbide sand paper.

NOTE P220 and P100 according to FEPA system (see Bibliography).

7.2 Procedure

Place the 220 grit sand paper in the cohesion tester and make up to 10 measurements in accordance with clause 9 (with the exception of the time intervals) in order to polish the rubber foot. Continue tests until a constant reading is achieved.

Once the rubber foot is polished, place the calibrated sand in the 10 mm high mould and take a series of measurements with the torque meter in accordance with clause 9 (with the exception of the time intervals) until a constant reading is achieved.

Place the 100 grit sand paper in the cohesion tester and make a series of measurements in accordance with clause 9 (with the exception of the time intervals) until a constant reading is achieved.

The cohesion tester shall then be deemed to be calibrated.

The calibration shall be carried out at least once per year.

8 Preparation of sample

8.1 Temperature

All materials that are going to be used in sample preparation shall remain at temperature of (23 ± 2) °C for at least 2 h before testing.

8.2 Water

The proportion of water shall be previously determined according to EN 12274-3.

NOTE In quick setting slurries, this test is sometimes difficult to carry out. In such cases the amount of water should be determined by observation to ensure complete homogeneity.

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8.3 Aggregates and filler

Weigh aggregates and filler in the same proportions as the design mix and place into a ladle or beaker of a size conforming to Table 3 and mix with a spatula until a homogeneous mixture is obtained (approximately 1 min).

Table 3 — Sample size

Maximum aggregate size mm	Amount of aggregates and filler g	Ladle or beaker size l
4	400	1
5,6		
6,3		
8		
10	900	2
11,2		
16		

8.4 Water and additive

Add water and additive, (if necessary) and stir the mixture until all the aggregates and filler are completely wetted.

The calcium carbonate content of the water shall be less than 250 ppm.

8.5 Preparation of the mix

Add the corresponding amount of emulsion to that required in the design and stir using a spatula or metal rod until a visual homogeneous mixture is obtained. The mixing time for quick setting slurries shall be (45 ± 1) s and for slow setting slurries shall be between (60 ± 1) s and (180 ± 1) s.

8.6 Sample size

Prepare the sample in metal square-shape moulds corresponding to the maximum size of the aggregate in accordance with Table 4.

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Table 4 — Mould size

Maximum aggregate size mm	Mould size
4,0	A
5,6	
6,3	B
8,0	
10,0	C
11,2	
16,0	D

Centre the mould over the supports and pour the slurry into it. Spread the sample and level it until a level, uniform and smooth surface is obtained. During this operation the handling of the slurry shall be minimized to avoid segregation.

8.7 Curing

Remove the moulds after the setting of the mix and keep the samples at a test temperature of (23 ± 2) °C.

9 Test procedure

Torque measurements shall be made at intervals of 15 min, 30 min, 60 min, 90 min and 120 min after casting.

NOTE 1 These intervals are provisional and should be confirmed by Round Robin Tests.

The test shall be performed at (23 ± 2) °C.

NOTE 2 For particular purposes, the torque test may be performed at other fixed temperatures.

Centre the specimen under the neoprene foot, with the instrument air pressure set at (200 ± 4) kPa, and lower the foot against the specimen at a rate of 80 mm/s to 100 mm/s.

Placing the foot, zero the torque meter and place it on the top cylinder rod-end and twist it in a smooth, firm, horizontal motion through a 90° to 120° arc within 0,5 s to 0,7 s.

Record the torque reading and the time.

10 Expression of results

Results shall be recorded at the time intervals mentioned in clause 9 until a definite trend is established and plotted onto graph paper.

NOTE When plotted onto graph paper to a suitable scale, the characteristics curve showing the development of cohesive strength of the particular mix tested will be indicated. The graph should show the calibration values.

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11 Test report

The test report shall state that the test has been performed in accordance with this European Standard and shall contain the following information:

a) type and size of aggregates used;

b) type and amount of filler used;

c) type and amount of emulsion used;

d) type and amount of additives used;

e) date of test;

f) location of test;

g) name of the person responsible for the test;

h) results as calculated in clause 10;

i) remarks;

j) signature of the person responsible for the test.

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ISSA n° 139-90, *Test method to classify emulsified asphalt-aggregate mixture systems by modified cohesion tester measurement of set and cure characteristics.*

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