International Standard 881

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Asbestos-cement pipes, joints and fittings for sewerage and drainage

Tuyaux, joints et accessoires en amiante-ciment pour canalisations d'assainissement

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 881 was developed by Technical Committee ISO/TC 77, *Products in fibre reinforced cement*, and was circulated to the member bodies in March 1979.

It has been approved by the member bodies of the following countries :

Australia	Israel	Romania
Austria	Italy	South Africa, Rep. of
Brazil	Korea, Rep. of	Spain
Colombia	Libyan Arab Jamahiriya	Switzerland
Czechoslovakia	Mexico	Thailand
Egypt, Arab Rep. of	Morocco	Turkey
France	Netherlands	United Kingdom
Greece	New Zealand	USSR
India	Poland	Yugoslavia
Ireland	Portugal	

The member body of the following country expressed disapproval of the document on technical grounds :

Belgium

This International Standard cancels and replaces ISO Recommendation R 881-1968, of which it constitutes a technical revision.

Contents

Page blanche

Asbestos-cement pipes, joints and fittings for sewerage and drainage

1 Scope and field of application

This International Standard gives specifications relating to asbestos-cement pipes, joints and fittings suitable for use with gravity flow at atmospheric pressure[1], intended for sewerage and drainage applications; it defines certain conditions of manufacture, classification, characteristics and acceptance tests applicable to these products.

NOTE — Asbestos-cement pressure pipes and joints are covered by ISO 160[2]. Building and sanitary pipes in asbestos-cement are covered by ISO 391[2]. Asbestos-cement pipe fittings for building and sanitary purposes are covered by ISO 392[2].

2 References

ISO 390, *Asbestos-cement products — Sampling and inspection.*

ISO 2785, *Guide to the selection of asbestos-cement pipes subject to external loads with or without internal pressure.*

ISO 4482, *Asbestos-cement pipelines — Guide for laying.*

3 Pipes

3.1 Composition

The pipes shall be made from a close and homogeneous mixture essentially consisting of a suitable inorganic hydraulic binder[3], asbestos fibre and water, excluding any materials liable to cause ultimate deterioration in the quality of the pipes.[4]

3.2 Classification

The pipes are classified according to their crushing strength. The ultimate loads (see table 4) of the four[5] following series are based on a load per unit area[6] of

— 40 kN/m^2 for series 1

— 60 kN/m^2 for series 2

— 90 kN/m^2 for series 3

— 120 kN/m^2 for series 4

provided that no crushing load at rupture (see 3.6.1) is less than 15 kN/m.

The choice of the class of the pipes is determined by the purchaser's engineer, who is qualified to judge the conditions of laying and using the pipes. However, it is recommended that a class be selected such that, taking into account all the loads and the method of laying adopted, the pipes used give a safety factor against crushing of at least 1,3 for diameters up to 1 000 and of 1,5 for diameters above 1 000 (see also ISO 2785).

3.3 Types

The pipes may be either of the type with both ends plain or of the type with socket at one end.

3.4 General appearance and finish

The internal surface shall be regular and smooth. If necessary, the pipes may be coated internally and/or externally, but their internal surface shall remain regular and smooth (see 6.4).

1) Accidental overpressures are admitted provided that a safety factor of 2,0 be maintained in relation to the hydraulic test pressure provided for in 3.6.2.

2) At present at the stage of draft. (Revisions of ISO/R 160, ISO/R 391 and ISO/R 392.)

3) National standards may specify the binder to be used.

4) This International Standard applies both to water-cured pipes and to autoclaved pipes in which the binder is partially replaced by ground silica.

5) National standards may include different series than the four mentioned above, but not lower than series 1.

6) The load per unit area is the crushing load per metre length of pipe divided by the nominal diameter of the pipe in metres.

3.5 Characteristics

3.5.1 Geometrical characteristics

3.5.1.1 Nominal diameter

The nominal diameter of the pipe corresponds to the internal diameter expressed in millimetres, tolerances excluded.

The series of nominal diameters is given in table 1. Nominal diameters not shown within parentheses are preferable.

Table 1 — Nominal diameters

100	(1 100)
125	1 200
150	(1 300)
200	1 400
250	1 500
300	1 600
350	(1 700)
400	1 800
450	(1 900)
500	2 000
600	(2 100)
700	2 200
800	(2 300)
900	2 400
1 000	2 500

NOTE — National standards may continue to provide for nominal diameters from the following range of approximately corresponding metric/inch sizes : 100/4 in, 125/5 in, 150/6 in, 175/7 in, 200/8 in, 225/9 in, 250/10 in, 300/12 in, 350/14 in, 375/15 in, 400/16 in, 450/18 in, 500/20 in, 525/21 in, 600/24 in, 675/27 in, 700/28 in, 750/30 in, 800/32 in, 825/33 in, 900/36 in, 975/39 in, 1 000/40 in, 1 050/42 in.

3.5.1.2 Thickness of wall

The nominal thickness of the pipes is the thickness of the barrel of the pipe, excluding the machined ends.

The nominal thickness and the method of measurement shall be specified by the manufacturer, taking into consideration all the requirements provided in this International Standard.

3.5.1.3 Length

The nominal length of the pipes refers to the length measured between the extremities for pipes with plain ends and to the effective length for socketed pipes. It should preferably be not less than

— 3 m for pipes with a nominal diameter equal to or less than 200,

— 4 m for pipes with a nominal diameter exceeding 200.

In special cases shorter pipes may be specified. The nominal length should preferably be a multiple of 0,5 m (see also 6.3).

3.5.1.4 Tolerances

a) External diameter of finished ends

The tolerances on the external diameter of the pipe ends where jointing rings are located (plain ends), as well as a suitable method of measuring, shall be established by the manufacturer according to the type of joint used and taking into account the tolerances acceptable in respect of jointing rings.

b) Regularity of the internal diameter (Roundness — Optional test)

If required, the regularity of the internal diameter of pipes of nominal diameter up to 500 may be checked by means of a sphere or a disk, of a material unaffected by water, passing freely in the pipe.

The disk shall be kept perpendicular to the axis of the pipe. The diameter of the sphere or the disk shall be less than the nominal diameter of the pipe by the following value, expressed in millimetres (rounded to the nearest millimetre) :

$2{,}5 + 0{,}01\,d$

d being the nominal diameter, expressed in millimetres.

If required, the regularity of the internal diameter of pipes of nominal diameter exceeding 500 shall be checked by measuring at each end of the pipe three diameters at an angle of about 60° between them, with an accuracy of ± 1 mm. None of the six measured diameters shall be smaller than that allowed by application of the above formula.

c) Nominal thickness of the wall (excluding machined ends)

The lower deviations of the tolerances are as follows for the nominal thicknesses shown :

— up to 10 mm :	− 1,5 mm
— over 10 mm up to 20 mm :	− 2,0 mm
over 20 mm up to 30 mm :	2,5 mm
— over 30 mm up to 60 mm :	− 3,0 mm
— over 60 mm up to 90 mm :	− 3,5 mm
— over 90 mm :	− 4,0 mm

NOTE — Upper deviations are free.

d) Nominal length

For all lengths : $^{+\ 5}_{-\ 20}$ mm

e) Straightness (Optional test)

The straightness may be checked by either of the following two methods :

— by rolling the pipe on two parallel runners placed at a distance apart equal to two-thirds of the nominal length l of the pipe [see figure 1a)], or

— by rolling the pipe on an even, flat floor until one or both ends of the pipe reach the maximum elevation from the floor [see figure 1b)].

The maximum deviations, f, according to the method in figure 1a) and measured on the external surface at mid-span, or j, according to the method in figure 1b) and measured from the floor to the outer surface at the ends of the pipe, shall not exceed the values in table 2.

Table 2 — Maximum deviations from straightness

Nominal diameter	f mm	j mm
from 100 to 150	5,5 l	6,5 l
from 200 to 400	4,5 l	5,5 l
from 450 to 2 500	3,0 l	4,0 l

l being the length of the pipe, in metres.

3.5.2 Physical characteristics

Tested as prescribed in 3.6.2 (optional test), the pipes shall show no fissure, leakage or sweating.

3.5.3 Mechanical characteristics

3.5.3.1 Crushing

Tested as prescribed in 3.6.1 (compulsory test), the pipes shall indicate

— a minimum total transverse crushing load at rupture at least equal to that defining the series to which they belong [see 3.6.1 a)];

— a minimum transverse crushing strength of 33 N/mm²*.

3.5.3.2 Bending

Tested as prescribed in 3.6.3 (optional test), pipes with nominal diameters of 100, 125 or 150, irrespective of their series, shall indicate minimum total bending loads at rupture of 2,8, 4,2 and 6,0 kN respectively.

3.5.4 Chemical characteristics

Tested as prescribed in 3.6.4 (optional test), the pipes shall not show a neutralization of acetic acid exceeding 0,100 g per square centimetre.

3.6 Tests

The acceptance tests shall be carried out at the manufacturer's works on pipes, coated or otherwise, sufficiently matured. The number of tests shall be as specified in ISO 390.

a) Compulsory test (see 3.5.3.1)

Transverse crushing test (method as specified in 3.6.1).

b) Optional tests at purchaser's request

1) Hydraulic pressure test (method as specified in 3.6.2).

2) Longitudinal bending test (method as specified in 3.6.3) (see 3.5.3.2).

3) Chemical resistance test (method as specified in 3.6.4) (see 3.5.4).

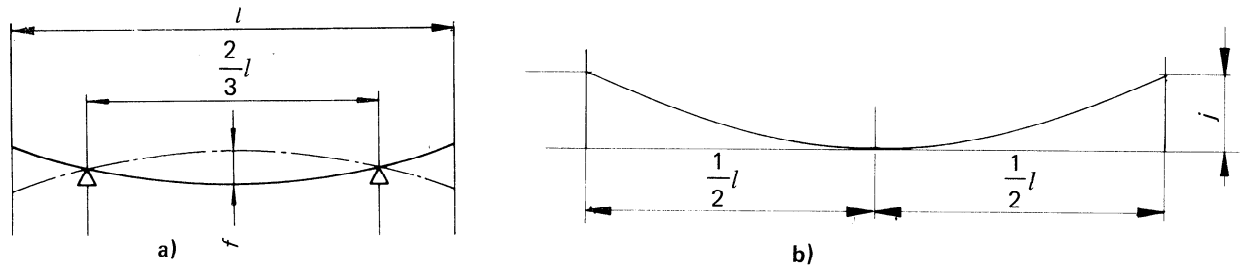

Figure 1 — Measurement of straightness

* When dry specimens are tested, the minimum transverse crushing strength shall be 36 N/mm².

3.6.1 Transverse crushing test

The test shall be carried out on a piece of pipe, taken from a part not accommodating the joint, of a length cut to

— 200 mm for pipes of nominal diameters up to and including 300,

— 300 mm for pipes of nominal diameters from 350 to 2 500,

after immersion for 48 h in water (see footnote to 3.5.3.1).

The load shall be applied through press-blocks as shown in figure 2, at a constant rate regulated so that the rupture occurs after at least 15 s and not more than 30 s, according to the diameter.

The lower press-block consists of a V-shaped support having an included angle of 150°, made of metal or hard wood; the flat upper press-block, made of the same material, has a width b varying with the nominal diameter of the pipe. The values of b are given in table 3.

The load may be applied either horizontally or vertically.

Strips of rubber of suitable width and length shall be interposed between the press-blocks and the test piece. The rubber strips shall be 15 mm thick and of a hardness of 60 ± 5 Shore A degrees.

Table 3 — Width of upper press-block

Nominal diameter	Width b mm
up to 250	25
300 to 350	35
400 to 450	50
500 to 600	60
700 to 800	85
900 to 1 000	105
1 100 to 1 200	130
1 300 to 1 400	150
1 500 to 1 600	175
1 700 to 1 800	195
1 900 to 2 000	220
2 100 to 2 200	240
2 300 to 2 400	265
2 500	290

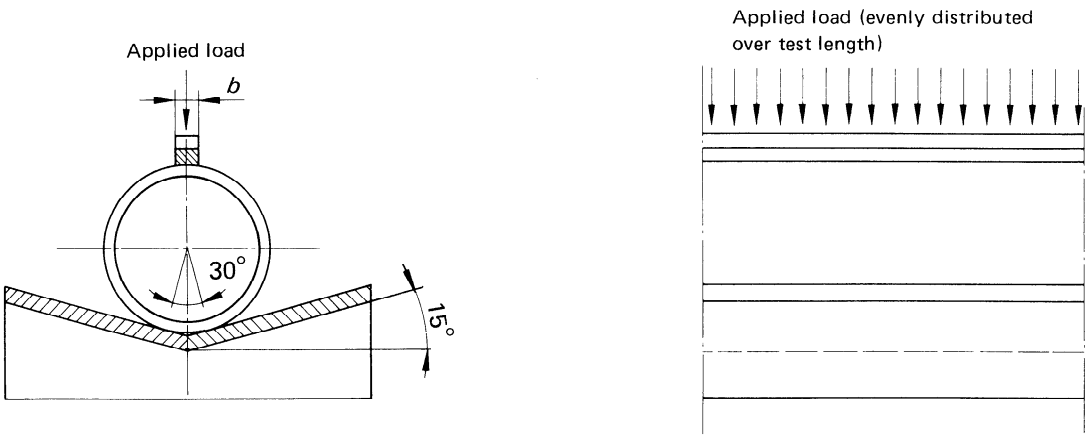

Figure 2 — Loading in transverse crushing test

a) Total transverse crushing loads on test length

The total transverse crushing loads at rupture, expressed in kilonewtons, shall be not less than the values given in table 4.

Table 4 — Transverse crushing loads

Nominal diameter	Length of test piece mm	Crushing load, kN			
		Series 1	Series 2	Series 3	Series 4
100	200	–	–	–	3,0
125	200	–	–	–	3,0
150	200	–	–	3,0	3,5
200	200	–	3,0	3,5	5,0
250	200	–	3,0	4,5	6,0
300	200	3,0	3,5	5,5	7,0
350	300	4,5	6,5	9,5	12,5
400	300	5,0	7,0	11,0	14,5
450	300	5,5	8,0	12,0	16,0
500	300	6,0	9,0	13,5	18,0
600	300	7,0	11,0	16,0	21,5
700	300	8,5	12,5	19,0	25,0
800	300	9,5	14,5	21,5	29,0
900	300	11,0	16,0	24,5	32,5
1 000	300	12,0	18,0	27,0	36,0
1 100	300	13,5	20,0	29,5	39,5
1 200	300	14,5	21,5	32,5	43,0
1 300	300	15,5	23,5	35,0	47,0
1 400	300	17,0	25,0	38,0	50,5
1 500	300	18,0	27,0	40,5	54,0
1 600	300	19,0	29,0	43,0	57,5
1 700	300	20,5	30,5	46,0	61,0
1 800	300	21,5	32,5	48,5	65,0
1 900	300	23,0	34,0	51,5	68,5
2 000	300	24,0	36,0	54,0	72,0
2 100	300	25,0	38,0	56,5	75,5
2 200	300	26,5	39,5	59,5	79,0
2 300	300	27,5	41,5	62,0	83,0
2 400	300	29,0	43,0	65,0	86,5
2 500	300	30,0	45,0	67,5	90,0

NOTE — For the diameters shown in the note to 3.5.1.1, the width of the upper press-block and the total transverse crushing load at rupture shall be specified in accordance with 3.2 and with table 3.