
International Standard



4179

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Ductile iron pipes for pressure pipelines — Centrifugal cement mortar lining — General requirements

Tuyaux en fonte ductile pour canalisations avec pression — Revêtement interne au mortier de ciment centrifugé — Prescriptions générales

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Foreword

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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 4179 was developed by Technical Committee ISO/TC 5, *Metal pipes and fittings*, and was circulated to the member bodies in October 1978.

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

Austria	Germany, F. R.	Netherlands
Belgium	India	Norway
Brazil	Israel	Poland
Canada	Italy	Romania
Czechoslovakia	Japan	Spain
Egypt, Arab Rep. of	Korea, Dem. P. Rep. of	Switzerland
Finland	Korea, Rep. of	United Kingdom
France	Mexico	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds:

Australia
USA

Ductile iron pipes for pressure pipelines — Centrifugal cement mortar lining — General requirements

1 Scope and field of application

This International Standard specifies the nature, the method of application, the surface condition as well as the minimum thickness of the internal lining of centrifuged cement mortar for ductile iron pipes intended for transporting water under pressure, as defined in ISO 2531.

2 References

ISO 2531, *Ductile iron pipes, fittings and accessories for pressure pipelines*.

ISO 6600, *Ductile iron pipes for pressure pipelines — Centrifugal cement mortar lining — Composition controls of freshly applied mortar*.¹⁾

3 Materials

3.1 Cement

The cement used for the lining shall conform with the standards on cement used by the producing country.

The type of cement to be used is left to the discretion of the pipe manufacturer who shall, however, inform the customer.

3.2 Sand

The sand used shall have a controlled granulometric distribution from fine to coarser elements and shall be composed of inert, hard, strong and stable granular particles.

Sampling shall be carried out in accordance with the national standards for the testing of construction materials.

The granulometric curve for sand shall be drawn up by using a sieve standardized in the producing country and shall meet the following requirements :

- The fine fraction comprising particles passing through a sieve having a mesh opening of 0,125 mm, shall not be more than 10 % in mass.
- The fraction comprising grains up to a maximum diameter equal to a third of the normal thickness of the mortar coating, shall not be less than 50 % in mass.
- The coarsest fraction comprising particles which do not pass through a sieve having a mesh opening nearest to half the normal thickness of the coating, shall not exceed 5 % in mass.

Sand cleanliness is considered from the point of view of organic impurities and clay-bearing substances according to the methods given below.

The testing for organic impurities shall be carried out by the colorimetric method in accordance with the standards in force in the producing country. (Using this method, the sand shall not produce any coloration darker than that of the reference solution.)

A determination of the percentage in the sand of clay-bearing substances and other fine particles (having dimensions less than 60 to 80 μm depending on the country) shall be carried out in accordance with the standards in force in the country producing the cement mortar coating.

This percentage shall not exceed 2 % in mass.

1) At present at the stage of draft.

3.3 Water

The water used for the preparation of the mortar shall neither be deleterious to the mortar nor to the water it is eventually intended to transport in the pipe. The presence of solid mineral particles is however admissible provided that these conditions are still fulfilled.

3.4 Mortar

The mortar of the lining shall be composed of cement, sand and water.

Any additives must be indicated and may be used as long as they do not prejudice the quality of the coating and that of the transported water nor the conformance of the lining with all the specifications of this International Standard.

The mortar shall be thoroughly mixed and have a consistency which results in a dense and homogeneous lining.

The cement mortar shall contain at least one part of cement to 3,5 parts of sand (or $S/C \leq 3,5$ in mass in the mortar)¹⁾.

4 Condition of the interior surface of the pipe before lining application

All foreign bodies, loose scale or any other material which could be detrimental to good contact between the metal and the lining shall be removed from the surface to which the lining is to be applied.

The inner surface of the pipe shall also be free of any metal projections likely to protrude beyond the thickness of the lining.

5 Application of the lining

The cement mortar of the lining is cast centrifugally inside the pipe²⁾.

Apart from the inner surface of the joint, the parts of the pipe coming into contact with the transported water shall be entirely covered with mortar.

The mortar shall be free of any cavities or visible air bubbles, and care shall be taken to ensure maximum density at all points. The consistency of the mortar, the time required and the speed of centrifuging the pipe shall be controlled so that segregation of the sand in the lining is reduced to a minimum.

Once centrifuging is finished, the lining shall be aged at temperatures greater than 0 °C. Any loss of water from the mortar by evaporation shall be sufficiently slow not to impede the hardening.

Repairs to damaged or defective areas are allowable. The damaged mortar shall first be removed from these areas. Then the defective part is repaired by using, for example, a trowel with fresh mortar so that a continuous lining having a constant thickness is again obtained.

For the repair operation, the mortar must have a suitable consistency. Additives may be included to obtain good adhesion against the side of the existing undamaged mortar.

6 Thickness of the lining

The normal thickness of the lining and the minimum permissible values (mean and local values) are given in the table.

At the pipe ends, the lining may be reduced to values below the minimum thickness. The length of the chamfer shall be as small as possible but less than 50 mm.

7 Determination of lining thickness

The thickness of the lining is checked on the freshly centrifuged mortar by the insertion of a steel pin, or on the hardened mortar by means of a non-destructive measurement process.

The thickness of the lining shall be measured at both ends of the pipe in at least one section perpendicular to the pipe axis.

In each section, which shall be at least 200 mm from the pipe end, measurements shall be taken at four points spaced at 90° intervals.

The values for the thickness of the lining are to be given to the nearest 0,1 mm.

The lining thickness measured at any one point in the pipe shall not be smaller than the minimum value given in the table.

The arithmetical mean of the four measurements in each section shall not be less than the minimum mean value specified in the table.

8 Surface condition of the hardened lining

The surface of the cement mortar lining shall be uniformly smooth. Only isolated grains of sand are allowed to appear on the surface of the lining.

The lining shall not have any flaky area. It shall not be crumbly nor have any waves or grooves.

On contraction of the lining, the formation of superficial cracks cannot be avoided. As for other single, superficial cracks which may result from manufacture or perhaps develop during transportation, cracks caused by shrinkage are acceptable up to a width of 0,8 mm.

1) As far as the methods for determining this ratio of sand to cement, S/C, refer to ISO 6600.

2) Similarly, this International Standard is also valid for methods in which the cement mortar lining is applied by a centrifugal projection head.