INTERNATIONAL STANDARD

ISO 9691

First edition
1992-11-15

Rubber — Recommendations for the workmanship of pipe joint rings — Description and classification of imperfections

Caoutchouc — Recommandations concernant l'exécution des garnitures d'étanchéité pour joint de canalisation — Description et classification des imperfections

Reference number
ISO 9691:1992(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9691 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Sub-Committee SC 4, *Miscellaneous products*.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Introduction

International Standards such as ISO 4633[1], ISO 6447[2] and ISO 6448[3] (see bibliography) for rubber joint rings for pipelines include some general requirements for the finished rings, particularly for workmanship, in statements such as: "The rings shall be free from porosity and shall not have surface defects or irregularities which could affect their functions".

In order to assist manufacturers wishing to comply with such requirements, this International Standard describes manufacturing imperfections which could arise during the production of pipe joint rings, and lists criteria by which the quality of workmanship can be assessed. It should be stressed, however, that this International Standard is not a specification. Whether an imperfection is to be considered as a defect will ultimately have to be agreed upon between the interested parties (see clause 4).

Rubber — Recommendations for the workmanship of pipe joint rings — Description and classification of imperfections

1 Scope

This International Standard describes and classifies imperfections in rubber joint rings for pipelines.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2781:1988, *Rubber, vulcanized — Determination of density.*

ISO 7743:1989, *Rubber, vulcanized or thermoplastic — Determination of compression stress-strain properties.*

3 Classification of imperfections

3.1 Surface imperfections

There are three types of surface imperfection:

a) imperfections not involving excess or shortage of material (see 3.1.1);

b) excess material (see 3.1.2);

c) shortage of material (see 3.1.3).

NOTE 1 Some surface imperfections, e.g. offset and shortage of material, can appear in combination.

3.1.1 Imperfections not involving excess or shortage of material

3.1.1.1 Bloom: A liquid or solid material which has migrated to the surface of a rubber.

3.1.1.2 Surface inclusion (foreign material): Any extraneous matter embedded in the surface.

3.1.1.3 Cut: A fine incision similar to that made by a scalpel. The cut is not open. It is usually necessary to stretch the rubber for the edges of the cut to become clearly visible.

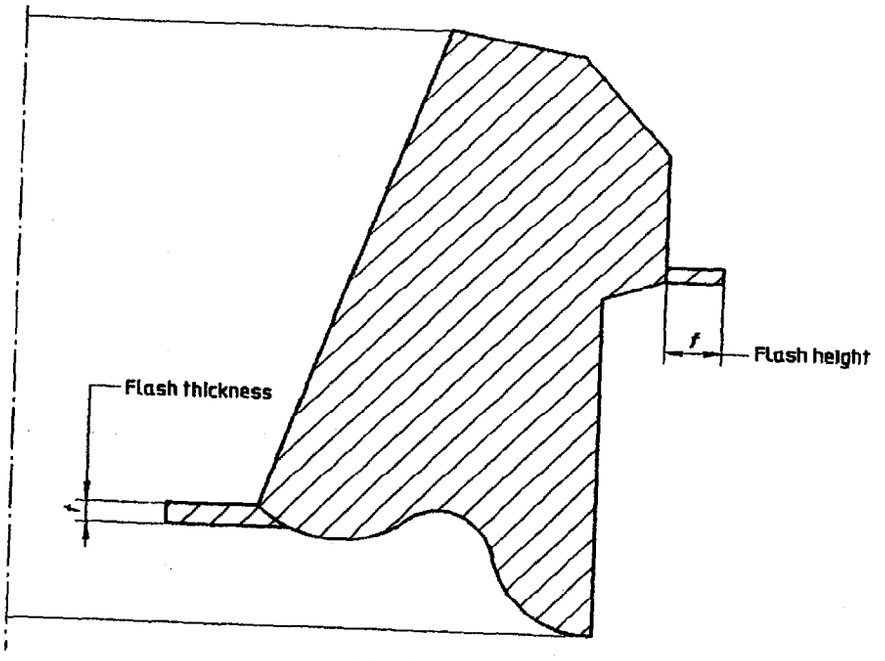
3.1.1.4 Cracking: A network of fine cracks or crazing which is not visible unless the rubber is folded. It may be caused, for example, by ageing or incorrect storage.

3.1.2 Excess material

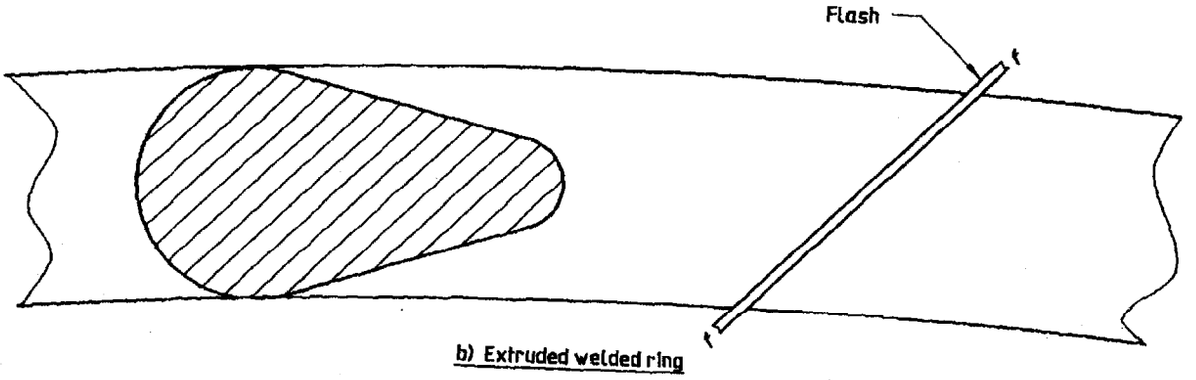
3.1.2.1 Flash (see figure 1): Excess material which escapes from the moulding cavity during moulding of a moulded ring, or is produced at the weld line of an extruded welded ring, and solidifies to form a film-like appendage. It is caused by mould separation and is present owing to inadequate trimming.

3.1.2.2 Offset: Joint ring halves that are off-register or mismatched.

3.1.2.2.1 Off-register (see figure 2): Misalignment of joint ring halves caused by lateral shift of one mould cavity plate or one end of the extrusion relative to the other.

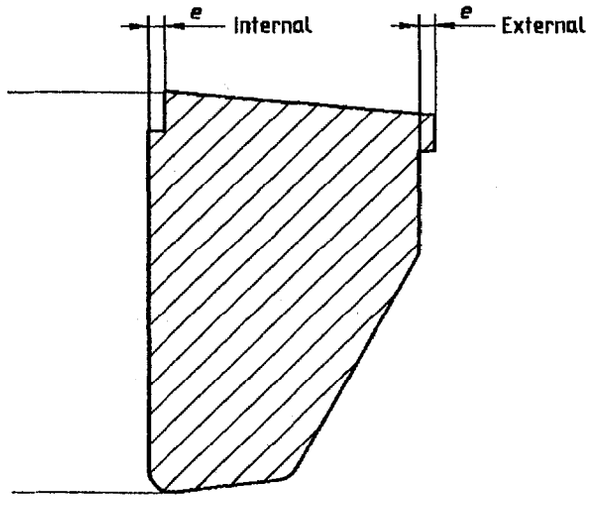


a) Moulded ring

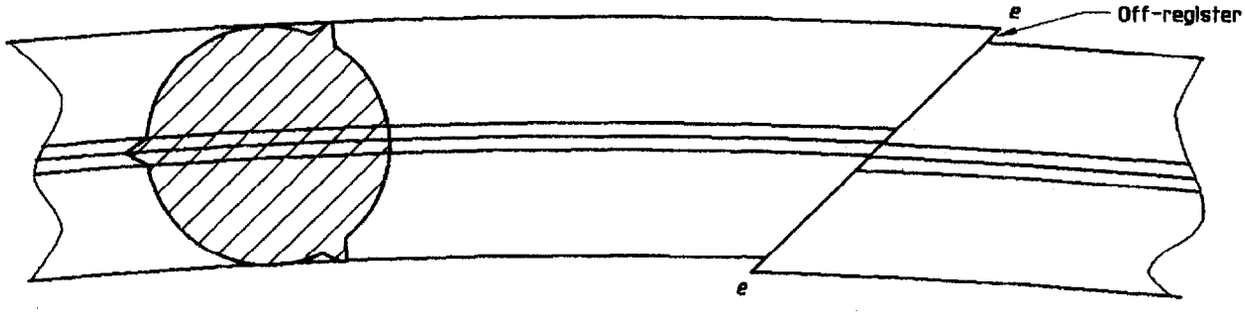


b) Extruded welded ring

Figure 1 — Flash



a) Moulded ring



b) Extruded welded ring

Figure 2 — Off-register

3.1.2.2.2 Mismatch (see figure 3): Abrupt change in cross-section of a joint ring, caused when the cross-sectional dimensions of one mould cavity plate are not equal to those of the other plate or, in the case of extruded welded rings, the cross-sectional dimensions of the two ends are unequal.

3.1.3 Shortage of material

3.1.3.1 Backrind [see figure 4 a)]: A longitudinal imperfection in which the rubber adjacent to the flash line shrinks below the level of the moulding and has a U- or W-shaped cross-section, with the flash frequently being ragged or torn.

3.1.3.2 Parting-line indentation [see figure 4 b)]: A shallow saucer-like recess, sometimes triangular in shape, located along the parting line where the two ring ends have been welded together. It is caused by deformation of the mould edge at the parting line.

3.1.3.3 Excessive trimming (see figure 5): A flattened and often roughened area around the inside and/or outside of the joint ring. It is caused by trimming off too much flash.

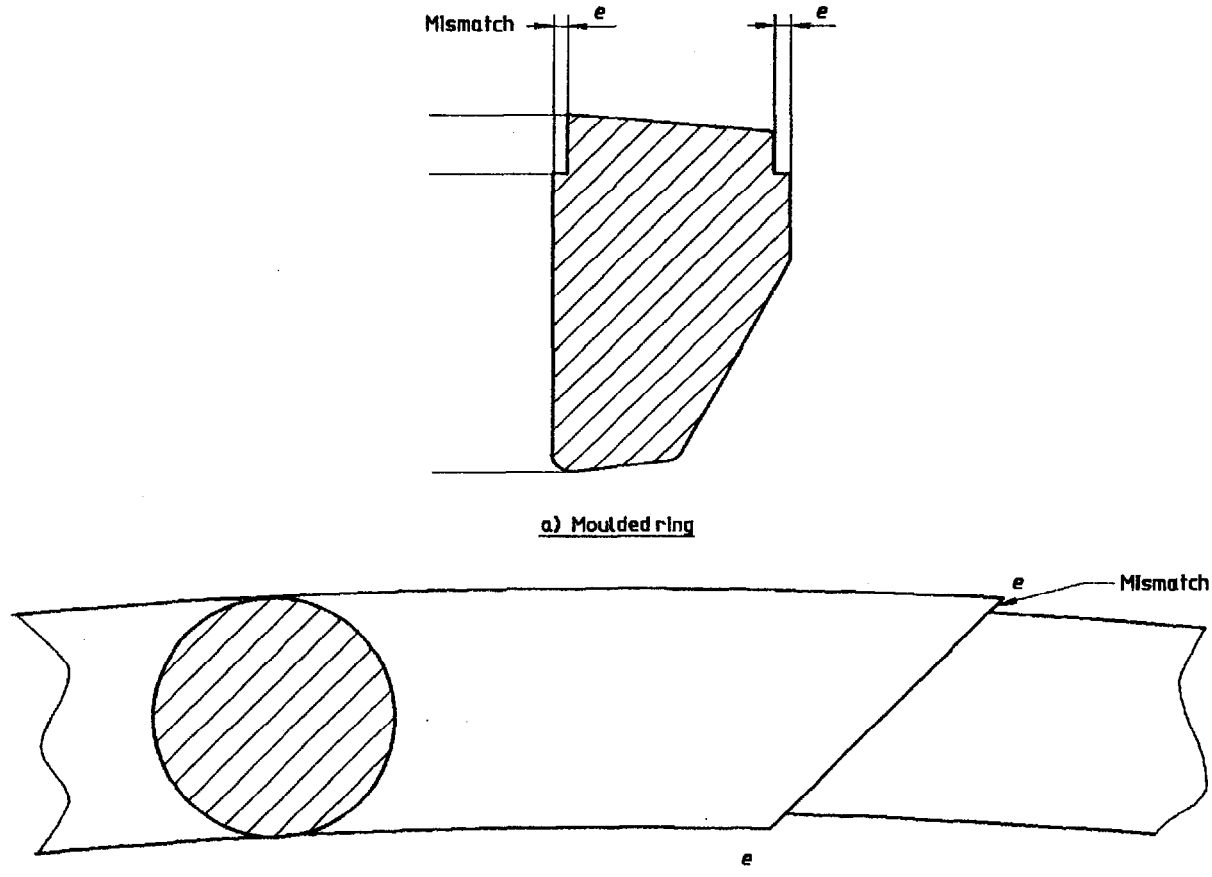
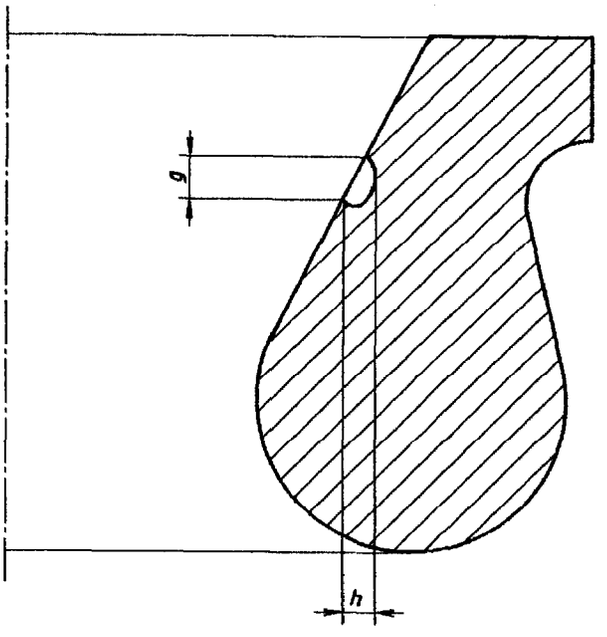
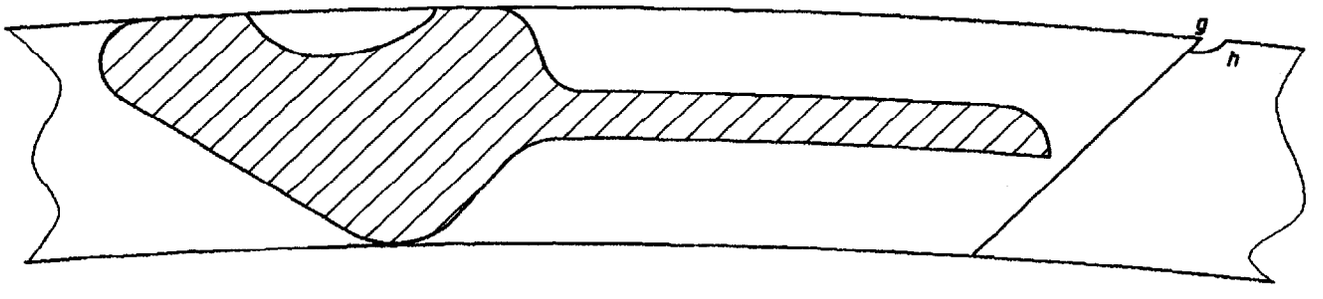


Figure 3 — Mismatch



a) Moulded ring



b) Extruded welded ring

Figure 4 — Backrind and parting-line indentation

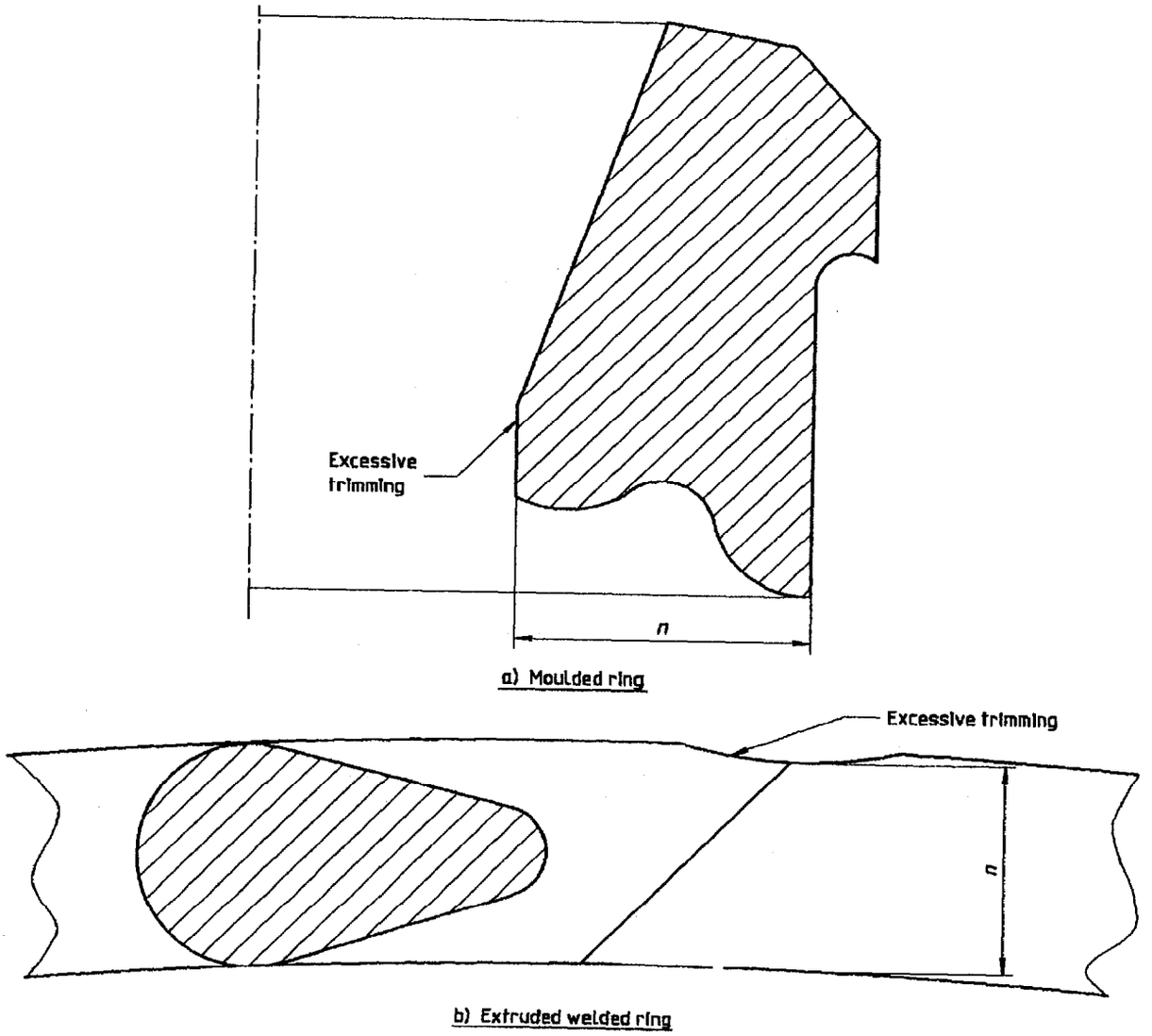


Figure 5 — Excessive trimming

3.1.3.4 Flow marks (see figure 6): Thread-like recesses, usually curved, of very slight depth in the unflexed state, with normal surface texture and rounded edges. Flow marks are caused by incomplete flow and knit in the material.

3.1.3.5 Surface depression (see figure 7): A recess in the surface, usually irregular in shape. It may be caused by:

- incomplete filling of the mould cavity and/or air trapped in the mould cavity (giving a randomly positioned indentation having a coarser surface texture than the normal product surface);
- the removal of foreign material from the surface;
- the build-up of a hardened deposit on the surface of the mould.

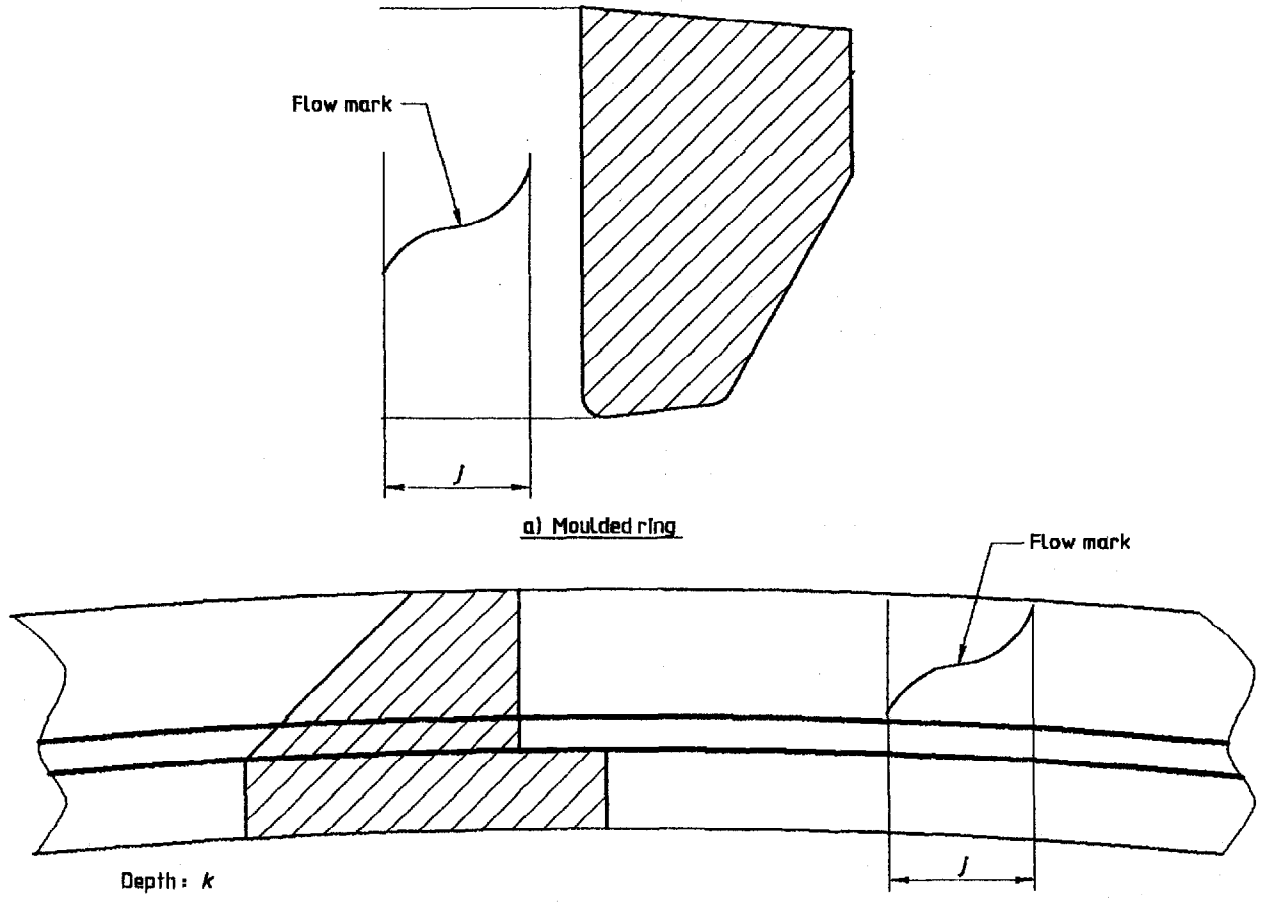


Figure 6 — Flow marks

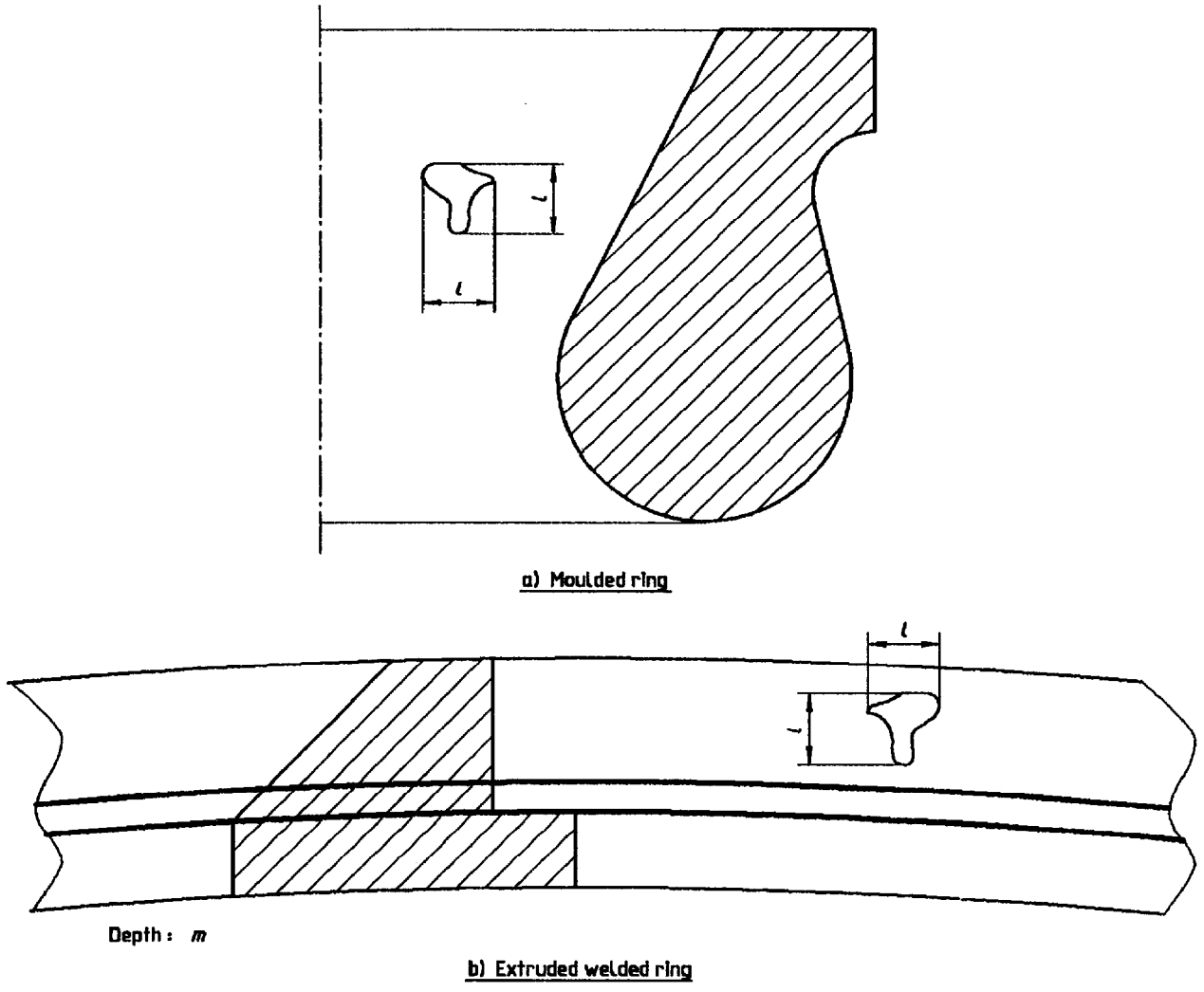


Figure 7 — Surface depression

3.1.4 Assessment

Surface imperfections are usually observed with a × 2 magnifying lens, slightly stretching or bending the joint ring in order to reveal surface imperfections which would not be visible without so doing.

Excessive stretching, which could damage the sealing ring, shall be avoided. A magnifying lens equipped with a length gauge should be sufficient.

3.2 Internal imperfections

3.2.1 Description

3.2.1.1 Foreign material (see also 3.1.1.2): Any extraneous matter embedded in the product.

3.2.1.2 Blisters/porosity: Air trapped in the product.

3.2.2 Assessment

Internal imperfections may be determined by comparing the compression stress-strain properties (see ISO 7743) or densities (see ISO 2781) of test pieces from a good finished product and test pieces taken from a finished product containing internal imperfections.

4 Maximum acceptable limits for imperfections

4.1 Surface imperfections

In most types of joint ring, a distinction can be made between the zones involved in the sealing function and other zones.

4.1.1 Surface imperfections in zones involved in the sealing function

All imperfections (except bloom) in zones involved in the sealing function are likely to result in unsafe conditions in the working of the joint. Therefore the sealing zone shall be free of all surface imperfections other than bloom. The mould design shall take account of this requirement for an imperfection-free sealing zone; in particular, the mould shall not produce a parting line.

4.1.2 Surface imperfections in zones not involved in the sealing function

4.1.2.1 Imperfections may be categorized into two classes as follows:

a) **Major imperfection**: Any imperfection which would seriously impair the use or efficiency of the joint ring, in particular an imperfection which would make it difficult to produce a satisfactory joint.

These imperfections are situated along the mould parting line as follows:

— off-register;

— flash.

b) **Minor imperfection**: Any imperfection not having an appreciable effect on the use or efficiency of the joint ring.

4.1.2.2 Table 1 gives a classification of major and minor imperfections, according to the size of the imperfection, in zones not involved in the sealing function.

NOTE 2 In order to facilitate the classification of an imperfection, observed imperfections can be compared to:

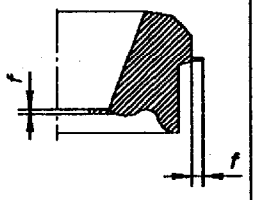
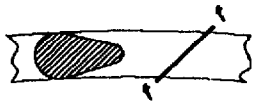
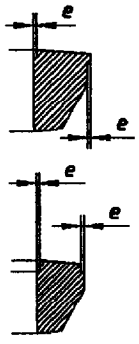
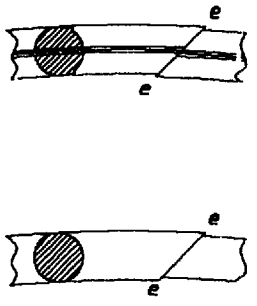
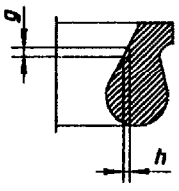
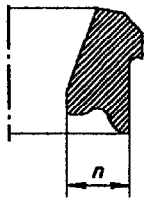
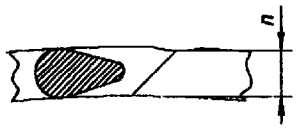
— a reference sample;

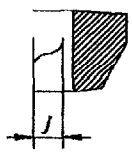
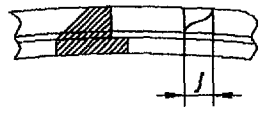
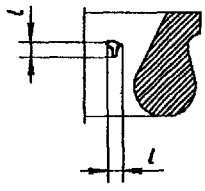
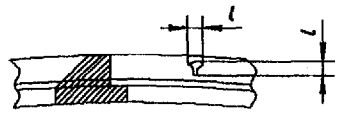
— photographs showing the type of imperfection.

4.2 Internal imperfections

The joint ring shall not contain foreign material, blisters or porosity which reduces the compressive force.

Table 1 — Classification of surface imperfections in zones not involved in the sealing function

Surface imperfection	Comments		Major imperfections	Minor imperfections	Sub-clause
Not involving excess or shortage of material					
Bloom				Minor imperfection	3.1.1.1
Surface inclusion			> 0,01 x internal diam. or > 10 mm	⩽ 0,01 x internal diam. with a max. of 10 mm	3.1.1.2
Cut	Defined by its length l and its depth h		l > 0,01 x internal diam. or l > 10 mm; h > 0,5 mm	l ⩽ 0,01 x internal diam. with a max. of 10 mm; h ⩽ 0,5 mm	3.1.1.3
Crazing			Major imperfection		3.1.1.4
Excess material	**Moulded ring**	**Extruded welded ring**			
Flash			f > 2 % of the dimension concerned[1] or f > 0,6 mm	f ⩽ 2% of the dimension concerned[1] with a max. of 0,6 mm	3.1.2.1
Offset			e > 2 % of the dimension concerned or e < 0,3 mm	e ⩽ 2 % of the dimension concerned with a max. of 0,3 mm	3.1.2.2
Shortage of material	**Moulded ring**	**Extruded welded ring**			
Backrind and parting-line indentation			g > 0,5 mm; h > 0,5 mm	g ⩽ 0,5 mm; h ⩽ 0,5 mm	3.1.3.1 and 3.1.3.2
Excessive trimming			n outside the thickness tolerance limits	n within the thickness tolerance limits	3.1.3.3

Surface imperfection	Comments		Major imperfections	Minor imperfections	Sub-clause
Shortage of material	**Moulded ring**	**Extruded welded ring**			
Flow marks			$j > 0{,}01$ x internal diam. or $j > 10$ mm; $k > 0{,}5$ mm	$j \leqslant 0{,}01$ x internal diam. with a max. of 10 mm; $k \leqslant 0{,}5$ mm	3.1.3.4
Surface depressions			$l > 0{,}01$ x internal diam. or $l > 10$ mm; $m > 0{,}5$ mm	$l \leqslant 0{,}01$ x internal diam. with a max. of 10 mm; $m \leqslant 0{,}5$ mm	3.1.3.5
1) Minimum cross-sectional dimension immediately adjacent to the flash or offset.					

Annex A
(informative)

Bibliography

[1] ISO 4633:1983, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials.*

[2] ISO 6447:1983, *Rubber seals — Joint rings used for gas supply pipes and fittings — Specification for material.*

[3] ISO 6448:1985, *Rubber seals — Joint rings used for petroleum product supply pipes and fittings — Specification for material.*

UDC 621.643.44-036.4

Descriptors: rubber, rubber products, sealing rings, pipelines, pipe joints, defects, classification, description.

Price based on 12 pages