

Specification for

Acceptance levels for internal imperfections in steel plate, strip and wide flats, based on ultrasonic testing

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The preparation of this British Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) to Technical Committee ISM/73, upon which the following bodies were represented:

- Associated Offices Technical Committee
- BEAMA Ltd.
- British Forging Industry Association
- British Gas plc
- British Steel Industry
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Lloyd's Register of Shipping
- Power Generation Contractors' Association (BEAMA Ltd.)
- Process Plant Association
- Seamless Steel Tube Association
- Welding Institute
- Coopted members

The following body was also represented in the drafting of the standard, through subcommittees and panels:

- National Association of Steel Stockholders

This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 August 1993

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Acceptance levels	1
Annex A (normative) Method for ultrasonic testing of steel plate, strip and wide flats	5
Annex B (normative) Technique for establishing a distance amplitude correction (DAC) curve	7
Annex C (normative) Determination of the size of internal imperfections by manual ultrasonic scanning	8
Figure 1 — Schematic representation of terms	4
Table 1 — Acceptance criteria for material body examination	2
Table 2 — Acceptance criteria for material edge examination	3
Table A.1 — Types of ultrasonic transducer for manual and assisted manual testing	5
Table A.2 — Band width for material edge testing	6
List of references	Inside back cover

Foreword

This British Standard has been prepared under the direction of the Iron and Steel Standards Policy Committee. It supersedes BS 5996:1980 which is withdrawn.

Improvements in steelmaking technology resulting in cleaner steels, and the improvements in ultrasonic test techniques since the publication of BS 5996:1980 have resulted in technical changes being introduced in this edition. These include broadening the scope to permit the testing of material up to 200 mm thickness, the testing of austenitic stainless steels and the use of automatic ultrasonic testing. To reflect the increase in cleanliness of steels additional stringent acceptance levels have been introduced, particularly for edge testing.

This standard differs from BS 5996:1980 in that for any acceptance level only one test procedure is specified, the terms “discontinuity”, “lamination” and “inclusion cluster” have been replaced by “internal imperfections”, and the criteria for rejection have been simplified.

Assessed capability. Users of this British Standard are advised to consider the desirability of quality system assessment and registration against the appropriate Part of BS 5750 by a third party certification body.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies acceptance levels for internal imperfections in ferritic and austenitic steel plate, strip and wide flat material based on ultrasonic testing. Six acceptance levels (B1 to B6) are specified for the body of the material, and three acceptance levels (E1 to E3) are specified for the material edges. Two further acceptance levels, one for the body of the material (B7) and the other for the material edges (E4), are specified for austenitic steel plate.

This British Standard covers the inspection of material with a thickness in the range of 5 mm to 200 mm, using manual, assisted manual, semi-automatic or automatic testing methods.

This British Standard may be used to specify the requirements for the ultrasonic testing of steel plate/strip used in the manufacture of welded tubes, for the detection of internal imperfections, to acceptance levels B1 to B4 and E1 to E3.

NOTE 1 Two further special acceptance levels, one for the body of the material and the other for the material edges (BX and EX respectively) may be specified by the purchaser when the material is intended for critical applications, and also for certain grades of austenitic steels. When these acceptance levels are specified, the test sensitivity and the reference standard to be adopted, together with acceptance criteria for imperfection size and population density, should be agreed between the purchaser and the manufacturer.

NOTE 2 The supply of material in accordance with this British Standard can be to any acceptance level for the material body or for the material edges or for any acceptance level combination for both material body and edges, e.g. B3, E2, B3E3, B3E2.

NOTE 3 For thicknesses less than 5 mm and greater than 200 mm (or less in the case of austenitic plate dependent on chemical composition), difficulties can be experienced in achieving an adequate ultrasonic test for the detection of internal imperfections. In such instances agreement between purchaser and manufacturer is required to determine any deviation from the requirements of this British Standard.

2 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by amendment or revision.

3 Definitions

For the purposes of this British Standard, the definitions given in BS 3683-4:1985 apply, together with the following.

3.1

internal imperfection

any imperfection lying within the thickness of the material, e.g. planar or laminar imperfections, single-plane or multi-plane inclusion bands or clusters

3.2

defects

unacceptable internal imperfections, i.e. exceeding the specified maximum size or population density limits

3.3

population density

the number of individual internal imperfections of a size greater than a specified minimum size and less than a specified maximum size per specified area of body or length of edge zone

3.4

manual and assisted manual testing

testing by an operator applying an ultrasonic transducer, or transducers, to the material surface, manually executing the appropriate scanning pattern on the material surface and visually assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or by built-in signal amplitude alarm devices

3.5

automatic and semi-automatic testing

testing using a mechanized means of applying the ultrasonic transducer or transducers to, and executing the appropriate scanning pattern on, the material surface, together with ultrasonic signal indication evaluation by electronic means. Such testing can be either fully automatic with no operator involvement, or semi-automatic when the operator performs basic equipment operation functions

4 Acceptance levels

4.1 Criteria for material body acceptance levels B1 to B7 shall be as given in Table 1 (see also Figure 1). When tested in accordance with annex A, material shall be deemed to conform to a particular acceptance level if it meets the following requirements.

- The material shall contain no internal imperfections larger than the maximum individual imperfection size $B_{\max}$ given in Table 1.
- The population density of imperfections smaller than the maximum imperfection size but larger than the minimum imperfection size shall be not greater than that specified in Table 1.