

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1052

STEELS FOR GENERAL ENGINEERING PURPOSES

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1052, *Steels for general engineering purposes*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led, in 1967, to the adoption of a Draft ISO Recommendation.

In December 1967, this Draft ISO Recommendation (No. 1357) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Hungary	South Africa, Rep. of
Austria	India	Spain
Belgium	Israel	Sweden
Canada	Italy	Switzerland
Chile	Japan	Turkey
Colombia	Korea, Rep. of	U.A.R.
Czechoslovakia	Netherlands	United Kingdom
Denmark	New Zealand	U.S.A.
Finland	Norway	U.S.S.R.
France	Poland	
Germany	Romania	

One Member Body opposed the approval of the Draft :

Brazil

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in April 1969, to accept it as an ISO RECOMMENDATION.

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STEELS FOR GENERAL ENGINEERING PURPOSES

1. SCOPE

- 1.1 This ISO Recommendation covers a group of non-rimming steels forming a supplement to those specified by ISO Recommendation R 630, *Structural steels*, and not intended to replace them.
- 1.2 Steels specially intended for forging, for welded constructions, for heat treatment, and for the construction of boilers and pressure vessels are not dealt with in this ISO Recommendation; they are dealt with in special ISO Recommendations.

TABLE 1 Grades and qualities

Grades	Qualities	
	1	2
Fe 50	X	X
Fe 60	X	X
Fe 70		X

TABLE 2 Chemical composition and mechanical properties

Grades	Qualities	Chemical composition		Tensile properties		
		Ladle	Product*	R_e	R_m	$A\%$
Fe 50	1	X	X	X	X	X
	2	X	X	X	X	X
Fe 60	1	X	X	X	X	X
	2	X	X	X	X	X
Fe 70	2	X	X	X	X	X

* Verifications of the chemical composition on the product are not carried out unless specified on the order.

2. CHARACTERISTICS OF GRADES AND QUALITIES

2.1 Chemical composition

2.1.1 *Ladle analysis.* The composition limits for analysis carried out on the ladle sample are given in Table 3 and are maximum values.

2.1.2 *Product analysis.* This analysis can be requested by the purchaser, in which case it should be specified on the order. The composition limits are given in Table 3 and are maximum values.

The chemical analysis should be carried out on chips taken in such a manner as to represent the whole section of the product.

TABLE 3 – Chemical composition

Grades	Qualities	P max. %		S max. %	
		Ladle	Product	Ladle	Product
Fe 50	1	0.08	0.090	0.06	0.065
	2	0.05	0.055	0.05	0.055
Fe 60	1	0.08	0.090	0.06	0.065
	2	0.05	0.055	0.05	0.055
Fe 70	2	0.05	0.055	0.05	0.055

2.2 Mechanical properties

The mechanical properties should be as stated in Table 4 when they are determined on test pieces obtained according to the requirements of clause 4.4.

TABLE 4 – Mechanical properties

Grades	Qualities	R_e kgf/mm ² min.			R_m kgf/mm ²	A % min.* ($L_0 = 5.65 \sqrt{S_0}$)	
		$e \leq 16$	$16 < e \leq 40$	$40 < e \leq 63$		$e \leq 40$	$40 < e \leq 63$
Fe 50	1	30	29	28	50 to 62	20	19
	2	30	29	28	50 to 62	21	20
Fe 60	1	34	33	32	60 to 72	15	14
	2	34	33	32	60 to 72	16	15
Fe 70	2	37	36	35	70 to 85	11	10

* For transverse test pieces, for plates and for flats wider than 400 mm, these values may be reduced by two points.

NOTE. – The properties required for products thicker than 63 mm should be stated on the order.

3. MANUFACTURE

3.1 Process of manufacture

The process of manufacture may be specified on the order after agreement between the purchaser and the supplier.

When the process of manufacture is not stated on the order, it is left to the choice of the producer; it should, however, be stated on his advice note to the purchaser (see Annex and ISO Recommendation R 404, *General technical delivery requirements for steel*).

3.2 Defects

Internal or surface defects not prejudicial to the uses or proper application of the product should not be ground for rejection or claim.

Less important defects can be removed by the producer by grinding, provided that the thickness is not reduced locally by more than 4 % (with a maximum of 3 mm) in relation to its nominal value. For reductions greater than 4 %, but not exceeding 7 %, the agreement of the purchaser or his representative is necessary.

4. INSPECTION REQUIREMENTS

Rolled products covered by this ISO Recommendation should be the subject of a technical inspection which will involve only the chemical composition and mechanical properties defined in Tables 3 and 4. The verifications of chemical composition on the product are only carried out if required by the order.

4.1 Inspection unit

If inspection is required by the order, the inspection unit is drawn from the following :

- (a) the batch*;
- (b) the cast.

The method of batching should be stated on the order.

The inspection unit is

- (a) 20 t or fraction thereof for inspection by batches;
- (b) 40 t or fraction thereof for inspection by cast.

4.2 Number and nature of tests

For each inspection unit or thickness range as shown in Table 4, a series of tests is carried out comprising

- 1 tensile test (or 2, in conformity with clause 4.3 (b)),
- and, if specified on the order,
- 1 product analysis.

* A batch is defined as the product of one or several casts of similar quality and grade rolled into one class of product and submitted for inspection at the same time.

4.3 Selection of test samples for tensile testing

The purchaser or his representative may choose the products from which are selected the test samples for the verification of the properties.

In the absence of any indication by the purchaser, the following procedure should be adopted :

If the thickness of the products comprising the inspection unit

- (a) differs by not more than 10 mm, the series of test samples should be taken from the thickest product;
- (b) differs by more than 10 mm, one series of test samples should be taken from the thinnest product and another from the thickest product.

4.4 Position and orientation of test samples for test pieces (see diagrams in section A.2 of Annex)

4.4.1 *Plates and flats wider than 600 mm.* The test samples are so taken that the axis of the test piece is midway between the axis in the direction of rolling and the edge of the rolled product and longitudinal or transverse to the direction of rolling.

4.4.2 *Sections, joists and flats having a width of 400 mm or less.* The longitudinal axis is parallel to the direction of rolling.

The test samples are so taken that the axis of the test piece is 1/3 from the outer edge of the half flange (for joists) or of the flange (for sections), or, in the case of small sections, as near as possible to this position. It is permissible, in the case of sections having tapered flanges, to take the test samples at a position 1/4 of the height of the web.

4.4.3 *Rounds, squares, flats, hexagons and other similar products.* The longitudinal axis of the tensile test piece is parallel to the direction of rolling.

For small sizes, the test piece consists of a length of the product.

In other cases, the test samples are so taken that the axis of the test piece lies as near as possible

- for a non-cylindrical test piece, at 1/3 of the half width;
- for a cylindrical test piece, at 1/3 from the outside of the half-diagonal or of the half-diameter.

4.4.4 *Circular, square and rectangular hollow sections.* The longitudinal axis of the test piece is parallel to the direction of rolling.

For small sizes, the test piece consists of a length of the product, the ends of the length being plugged for grips, if necessary.

Test pieces of strips cut from round hollow sections are tested in the curved condition, but the ends may be flattened cold for grips.

For square and rectangular hollow sections, the test pieces are cut from any side midway between and excluding the corners.

5. TEST METHODS

5.1 Types of tensile test piece (see ISO Recommendation R 82, *Tensile testing of steel*)

The test piece used is the proportional non-cylindrical or cylindrical test piece having an original gauge length given by the formula $L_0 = 5.65 \sqrt{S_0}$, where S_0 is the cross-sectional area of the gauge length portion of the test piece.

The non-cylindrical test piece of rectangular cross-section has a maximum width on the gauge length portion of 40 mm, its thickness being that of the product. However, if the thickness of the product exceeds 30 mm, the test piece can be reduced to 30 mm by planing or milling on one face only.

The cylindrical test piece has a diameter of 10 to 30 mm, the original gauge length being determined by the above formula.

The non-proportional test piece with a fixed original gauge length (200 mm) can be used in conjunction with a conversion table. However, in the case of dispute, only the results obtained on a proportional test piece will be valid.

NOTE. – The yield stress, as covered by this ISO Recommendation, corresponds to the stress at which there is for the first time a hesitation, a stop, or a recoil of the measuring apparatus. The speed of the testing machine is defined in ISO Recommendation R 82.

5.2 Cancellation of tests

When, owing to any fault in carrying out the test, the test does not give the results specified, it is cancelled. By fault is understood defective machining, incorrect mounting in the testing machine, malfunctioning of the machine, or any other similar faults independent of the metal itself.

5.3 Additional tests*

If, during the course of inspection, a test does not give the required result, additional tests, unless otherwise agreed, can be made as follows :

5.3.1 *Defective test piece – unsatisfactory results.* From the same product a test piece is taken for an additional test of the same type. If the result of this test does not meet the requirements, the product is rejected, but a further test of the same type is carried out on test samples taken from two other products of the same batch of the same thickness. If one of these two tests does not give satisfactory results, the batch is rejected (see section 6); if, however, both the further tests are satisfactory, the batch is accepted.

5.3.2 *Sound test piece – unsatisfactory results.* The corresponding product is rejected and two further tests are carried out under the same conditions and with the same provisos as above (see clause 5.3.1).

When a test piece having a defect gives the required results, the batch is accepted, but the corresponding product can be submitted to an examination for soundness.

5.4 Delivery certificates

The provisions of ISO Recommendation R 404 apply.

6. RE-SUBMISSION (see clause 6.5 of ISO Recommendation R 404)

6.1 The producer may re-submit for inspection the products that have been rejected during earlier inspection because of unsatisfactory properties, after he has subjected them to a suitable treatment (selection, heat treatment) which, on request, will be indicated to the purchaser. In this case, the tests are carried out as if they applied to a new batch.

6.2 The producer has the right to present the products discarded at the first examination to a new examination for compliance with the requirements for another quality.

* See also the Annex of ISO Recommendation R 404, *General technical delivery requirements for steel*.