
**Welding — Welding of reinforcing steel —
Part 2:
Non load-bearing welded joints**

*Soudage — Soudage des aciers d'armatures —
Partie 2: Assemblages non transmettants*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17660-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding*, in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 17660 consists of the following parts, under the general title *Welding — Welding of reinforcing steel*:

- *Part 1: Load-bearing welded joints* [ISO 17660-2:2006](https://standards.iteh.ai/catalog/standards/sist/4c36ac15-b521-4ad5-be77-8301e4bb4592/iso-17660-2-2006)
- *Part 2: Non load-bearing welded joints* [8301e4bb4592/iso-17660-2-2006](https://standards.iteh.ai/catalog/standards/sist/4c36ac15-b521-4ad5-be77-8301e4bb4592/iso-17660-2-2006)

Requests for official interpretations of any aspect of this part of ISO 17660 should be directed to the Secretariat of ISO/TC 44/SC 10 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Introduction

Reinforcing steel bars are produced by a number of process routes and usually have a ribbed profile. Taking these issues into account, it is apparent that both the welder and the welding coordinator require a specific level of skill and job knowledge and that special procedures for quality assurance need to be adopted.

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Welding — Welding of reinforcing steel —

Part 2: Non load-bearing welded joints

1 Scope

This part of ISO 17660 is applicable to the welding of weldable reinforcing steel and stainless reinforcing steel of non load-bearing welded joints, in workshops or on site. It specifies requirements for materials, design and execution of welded joints, welding personnel, quality requirements, examination and testing.

Load-bearing welded joints are covered by ISO 17660-1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3834-4, *Quality requirements for fusion welding of metallic materials — Part 4: Elementary quality requirements*

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ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 14731:—¹⁾, *Welding coordination — Tasks and responsibilities*

ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-5, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 5: Resistance welding*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ISO 15614-12, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 12: Spot, seam and projection welding*

ISO 15630-1, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 1: Reinforcing bars, wire rod and wire*

ISO 16020, *Steel for the reinforcement and prestressing of concrete — Vocabulary*

EN 10079, *Definition of steel products*

EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel — General*

1) To be published (revision of ISO 14731:1997, EN 719:1994).

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10079, EN 10080 and ISO 16020 and the following apply.

3.1 load-bearing welded joint
welded joint used for transmission of specified loads between reinforcing steel bars, or between reinforcing steel bars and other steel products

3.2 non load-bearing welded joint
welded joint whose strength is not taken into account in the design of the reinforced concrete structure

3.3 manufacturer
enterprise carrying out the welding works within workshops or on site

4 Symbols and abbreviated terms

a	throat thickness
A_{gt}	percentage total elongation at maximum force
A_n	nominal cross-sectional area of the bar
d	nominal diameter of the welded bar
d_{max}	maximum nominal diameter of the welded bar
d_{min}	minimum nominal diameter of the welded bar
F_{max}	maximum tensile force
l	length of the weld (cross joint)
L_{min}	minimum length of the test specimen
r	radius of bent reinforcing steel bar
R_e	specified characteristic yield strength of the reinforcing steel bar
R_m	nominal tensile strength of the reinforcing steel bar
t	thickness of the web of a section or of a plate to be welded
CEV	carbon equivalent value
WPQR	welding procedure qualification record
WPS	welding procedure specification

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5 Welding processes

The following welding processes in accordance with ISO 4063 may be used (see Table 1).

Table 1 — List of welding processes and reference numbers in accordance with ISO 4063

Welding process	English term	American term
111	manual metal arc welding (metal arc welding with covered electrode)	shielded metal arc welding
114	self-shielded tubular cored arc welding	
135	metal active gas welding (MAG-welding)	gas metal arc welding
136	tubular cored metal arc welding with active gas shield	flux cored arc welding
21	resistance spot welding	
23	projection welding	

The principles of this part of ISO 17660 may be applied to other welding processes.

6 Non load-bearing welded joints

6.1 General

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A summary of recommended diameters for non load-bearing welded joints, depending on the welding process, is given in Table 2.

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Table 2 — Recommended range of bar diameters for non load-bearing welded joints

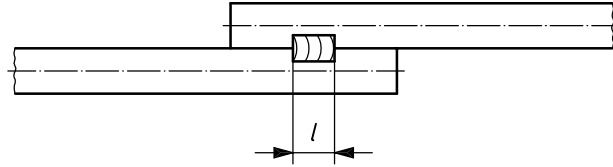
Welding processes	Type of welded joint	Range of bar diameter for non load-bearing welded joints mm
21 23	lap joint	4 to 32
	cross joint ^a	6 to 50
111 114 135 136	lap joint	6 to 32
	cross joint ^a	6 to 50
^a d_{\min}/d_{\max} should be $\geq 0,4$.		

The welds shall not influence significantly the full load-bearing capacity and ductility of the bars, and the welding procedure may not cause embrittlement of the material.

NOTE The purpose of a non load-bearing welded joint is normally only to keep the reinforcing components in their correct places during fabrication, transport and concreting. These welds are often referred to as tack welds. The tack weldability of reinforcing steels can be demonstrated by special tack weldability tests (see CEN/TR 15481).

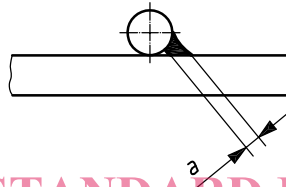
6.2 Type of joints

An example of a lap joint is given in Figure 1. Examples of a cross joint are given in Figures 2 and 3. The length of the weld l and throat thickness a depend on the application, and shall be in accordance with the WPS.



Key
 l length of the weld

Figure 1 — Lap joint



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Key
 a throat thickness

Figure 2 — Cross joint
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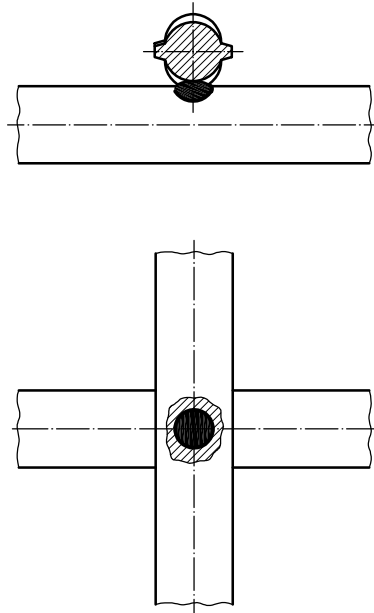


Figure 3 — Cross joint welded by welding processes 21 and 23

7 Materials

7.1 Parent materials

7.1.1 Reinforcing steels

Weldable reinforcing steel and stainless reinforcing steel, in accordance with the relevant standards or technical specification, may be used. For refurbishment and extensions of buildings, the weldability of the existing reinforcing steel shall be verified.

7.1.2 Inspection documents

An inspection certificate is required, unless the manufacturer of the reinforcing steel is certified to the relevant product standard for the market.

The carbon equivalent value (CEV), the manufacturing route and the delivery conditions shall be determined before welding.

This requirement for the CEV does not apply if:

- a) the weldability is proven by a welding procedure test with a maximum CEV allowed in accordance with the relevant product standard, or
- b) it can be proven that the steel delivered has an equal or lower CEV than the steel used in the welding procedure test.

For reinforcing and structural steels, the CEV shall be in accordance with the product standard, and shall be calculated in accordance with the following equation:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \quad (1)$$

7.2 Welding consumables

Welding consumables to be used shall be qualified in accordance with the relevant standard.

8 Quality requirements

Manufacturers which perform shop- or site-welding of non load-bearing welded joints with reinforcing steel shall fulfil the quality requirements specified in ISO 3834-4, as applicable, as well as the requirements of this part of ISO 17660.

9 Welding personnel

9.1 Welding coordination

The manufacturer of welded reinforcing steel joints shall have at its disposal at least one welding coordinator conforming to the requirements of ISO 14731, with specific technical knowledge in the welding of reinforcing steel (see Annex A).

The welding coordination personnel shall be responsible for the quality of welded reinforcing steel joints in the workshop as well as on the site. The welding coordination personnel shall ensure that all welding is carried out in accordance with qualified welding procedure specifications and that it complies with ISO 15609-1 or