SLOVENSKI STANDARD
SIST-TP CEN/TR 15481:2007

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Varjenje betonskega jekla – Varivost spenjalnih varkov – Preskusne metode in zahteve za izvedbo

Welding of reinforcing steel - Tack weldability - Test methods and performance requirements

Schweißen von Betonstahl - Heftschweißeignung - Prüfverfahren und Anforderungen bei der Durchführung der Prüfung

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Soudage des aciers pour armature - Soudabilité au pointage - Méthodes d'essai et exigences de performances

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25.160.10 Varilni postopki in varjenje Welding processes

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TECHNICAL REPORT

RAPPORT TECHNIQUE

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CEN/TR 15481

December 2006

ICS 25.160.01

English Version

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This Technical Report was approved by CEN on 27 July 2006. It has been drawn up by the Technical Committee CEN/TC 121.

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Foreword

This document (CEN/TR 15481:2006) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN.

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1 Scope

This Technical Report presents a method to verify the tack weldability of reinforcing steel. The purpose is to ensure that sufficient strength and ductility will remain in the welded material when short welding times are applied. This Technical Report does not cover the welded joint itself.

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.

EN ISO 4063, *Welding and allied processes - Nomenclature of processes and reference numbers (ISO 4063:1998)*

EN ISO 15630-1, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 1: Reinforcing bars, wire rod and wire (ISO 15630-1:2002)*

3 Chemical composition

The restrictions to the chemical composition should be in accordance with the relevant standard for the weldable reinforcing steel concerned.

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4 Welding processes

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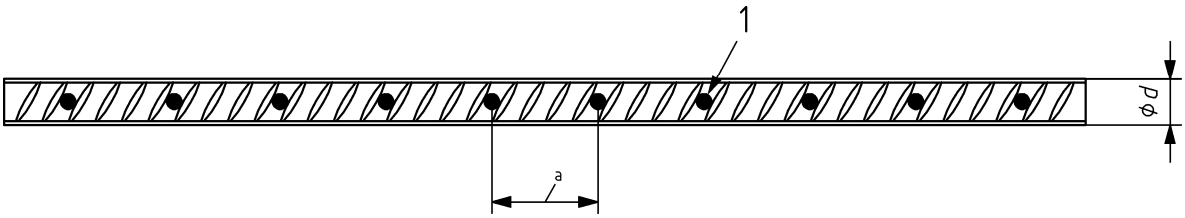
The tack weldability test is carried out by welding process 135 (see EN ISO 4063). Tack weldability is also considered verified for the welding processes 111, 114, 136, 21 and 23 down to 0 °C.

5 Test piece

The test piece is made by welding a straight row of tacks in accordance with Table 1 and Figure 1 on straight pieces of the reinforcing steel bar with a length suitable for tensile and bending testing according to EN ISO 15630-1. The reinforcing steel used for the test piece should be in the condition required by the relevant product specification.



Key
1 welded tack
a 2*d* to 3*d*

Figure 1— Test piece

The number of tacks should be at least 10. The location of the tacks should be between transverse ribs but away from the longitudinal ribs, so that the tacks connect as little as possible to the longitudinal and transverse ribs. The distance between the tacks should be uniform and two to three times the nominal diameter of the reinforcing steel bar.

The voltage setting on the welding machine should be adjusted as close as possible to the value given in Table 1. The wire feed should be adjusted so that the welding current is within the range indicated in Table 1 when welding continuous welds on the same type of material.

The welding should be done indoors at room temperature and the welds should cool in calm air. The welding wire should be EN 440 - G3Si1 and the shielding gas should be EN 439 - M21. Before testing, the welded test specimens should be artificially aged at 100 °C for 1 h.

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Table 1 — Diameters of welding wire and welded tacks

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Diameter range for reinforcing steel bar	Diameter of welding wire	max. Diameter of welded tack	Welding current	Voltage setting
mm	mm	mm	A	V
6 < d ≤ 8	0,8	5	120 to 150	25
8 < d ≤ 12	0,8	6	120 to 150	25
12 < d ≤ 20	0,8	8	120 to 150	25
20 < d ≤ 32	1,0	10	150 to 180	25
d > 32	1,0	12	150 to 180	25

6 Testing and performance requirements

6.1 General

Testing should be performed by a testing laboratory at room temperature with test specimens that have cooled to room temperature.

6.2 Tensile test

Tensile testing is done in accordance with EN ISO 15630-1. The welded part of the test specimen should be within the gauge length.

At least an equal amount of unwelded samples from adjacent bars should be tested for comparison.

The performance requirements regarding yield strength, tensile strength and elongation are in accordance with the requirements in the product specification for the reinforcing steel bar.

NOTE The requirements for the results of the tensile test may vary between countries because of national regulations.

6.3 Bend test

The bend test should be carried out in accordance with EN ISO 15630-1. The row of welded tacks should be in the outer perimeter of the bending zone.

The bending angle should be at least 90° and the mandrel diameters in accordance with Table 2 for bend test.

Table 2 — Mandrel diameters for bend test of welded bar

Diameter range for reinforcing steel bar mm	Diameter of mandrel in bend test	Diameter of mandrel in no break test
$6 < d \leq 8$	5 d	3 d
$8 < d \leq 12$	6 d	4 d
$12 < d \leq 20$	8 d	5 d
$20 < d \leq 32$	10 d	6 d
$d > 32$	12 d	8 d

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The bent sample should be visually inspected. There should be no cracks visible to the bare eye in the surface of the bar. Partial detachment of the welded tack may occur along the surface of the bar if the bar material remains ductile. If the situation is unclear, the bar is bent further at least 90° around the smaller mandrel given in Table 2 for the no break test. In this case the performance requirement is that the bar should not break.

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The test may be replaced in case the starting point for the crack is within the surface of the tack.

7 Extent of testing

7.1 General

At least two batches of each steel grade, delivery condition and nominal size of steel should be tested.

7.2 Number of tests

From each batch at least three tensile tests and three bend tests should be done with welded test specimens. In addition at least three tensile tests should be done with unwelded adjacent test specimens from the same bar.

7.3 Validity

The tack weldability test is valid as long as:

— steel grade is the same;

— production route is the same;

— carbon equivalent value does not increase;

— diameters of steel bars in production are in accordance with the test.

8 Evaluation of test results

8.1 General

The test results are examined separately for each steel grade, manufacturing route and nominal size of reinforcing steel. The number of test results will generally not be sufficient for proper statistical analysis.

8.2 Tensile test

The test is passed if all individual values for yield strength, tensile strength and elongation are above the nominal value specified in the relevant specification for the steel. If these mechanical properties are characteristic values, the mean value should be at least 1,05 times the nominal value, unless the average reduction of property is less than 1 % in comparison with the unwelded samples.

The average drop in yield strength (R_e) should in any case not exceed 5 % compared to the unwelded samples.

NOTE National regulations may allow other requirements.

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8.3 Bend test

In case there is one failure within a test unit a new test of the same unit may be done with double the number of test pieces. If there are no failures the test is passed.

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9 Identification

Steels that meet the requirements of this document should be identified as such.