

**SINGAPORE STANDARD**

# **Execution of steel structures and aluminium structures**

**– Part 2 : Technical requirements for steel structures**

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– Part 2 : Technical requirements for steel structures

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*Surbana Jurong Consultants Pte Ltd*

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*TYH Consulting Engineers*

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## **National Foreword**

This Singapore Standard was prepared by the Working Group appointed by the Technical Committee on Building Structures and Sub-structures under the direction of the Building and Construction Standards Committee.

This SS EN is the modified implementation of EN 1090-2:2008+A1:2011 and is adopted with the permission of the CEN, Avenue Marnix 17, 1000 Brussels.

The modification made to the standard is as follows:

- The acceptance on the use of alternative structural steel materials that are listed in the publication 'BC1:2012 Design Guide on Use of Alternative Structural Steel to BS 5950 and Eurocode 3' that is issued by the Building and Construction Authority of Singapore.

BC1:2012 serves as Singapore's national code of practice for the use of alternative steel materials in design to the Singapore Standards SS EN 1993 as well as the Singapore National Annexes to SS EN 1993. Alternative steel materials in BC1:2012 refers to steel material that are manufactured to various national standards listed therein, apart from those that are under the British Standard or the European Standard approved by CEN. In this way, BC1:2012 serves as a guide to ensure that only adequate (in terms of material performance) and reliable (in terms of quality assurance) steel materials, regardless of standards to which the materials are manufactured to, are used in the design of permanent and temporary structural steelwork to ensure quality and public safety. BC1:2012 shall be used in conjunction with SS EN 1993 as well as the Singapore National Annexes to SS EN 1993.

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English Version

## Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures

Exécution des structures en acier et des structures en  
aluminium - Partie 2: Exigences techniques pour les  
structures en acier

Ausführung von Stahltragwerken und Aluminiumtragwerken  
- Teil 2: Technische Regeln für die Ausführung von  
Stahltragwerken

This European Standard was approved by CEN on 11 April 2008 and includes Amendment 1 approved by CEN on 25 June 2011.

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COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This document (EN 1090-2:2008+A1:2011) has been prepared by Technical Committee CEN/TC 135 "Execution of steel structures and aluminium structures", the secretariat of which is held by SN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

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

This document includes Amendment 1, approved by CEN on 2011-06-25.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** and **A1**.

This document supersedes **A1** EN 1090-2:2008 **A1**.

EN 1090, *Execution of steel structures and aluminium structures* consists of the following parts:

*Part 1: Requirements for conformity assessment of structural components*

*Part 2: Technical requirements for steel structures*

*Part 3: Technical requirements for aluminium structures*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



## **Introduction**

This European Standard specifies requirements for execution of steel structures, in order to ensure adequate levels of mechanical resistance and stability, serviceability and durability.

This European Standard specifies requirements for execution of steel structures in particular those that are designed according to all parts of EN 1993 and the steel parts of composite steel and concrete structures designed according to all parts of EN 1994.

This European Standard presupposes that the work is carried out with the necessary skill and adequate equipment and resources to perform the work in accordance with the execution specification and the requirements of this European Standard.

## 1 Scope

This European Standard specifies requirements for execution of structural steelwork as structures or as manufactured components, produced from:

- hot rolled, structural steel products up to and including grade S690;
- cold formed components and sheeting up to and including grades S700 <sup>[A1]</sup> *deleted text* <sup>[A1]</sup>;
- hot finished and cold formed austenitic, austenitic-ferritic and ferritic stainless steel products;
- hot finished and cold formed structural hollow sections, including standard range and custom-made rolled products and hollow sections manufactured by welding.

This European Standard may also be used for structural steel grades up to and including S960, provided that conditions for execution are verified against reliability criteria and any necessary additional requirements are specified.

This European Standard specifies requirements independent of the type and shape of the steel structure (e.g. buildings, bridges, plated or latticed components) including structures subjected to fatigue or seismic actions. The requirements are expressed in terms of execution classes

This European Standard applies to structures designed according to the relevant part of EN 1993.

This European Standard applies to structural components and sheeting as defined in EN 1993-1-3.

This European Standard applies to steel components in composite steel and concrete structures designed according to the relevant part of EN 1994.

This European Standard may be used for structures designed according to other design rules provided that conditions for execution comply with them and any necessary additional requirements are specified.

This European Standard does not cover requirements for watertightness or air permeability resistance of sheeting.

## 2 Normative references

### 2.1 General

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.

### 2.2 Constituent products

#### 2.2.1 Steels

EN 10017, *Steel rod for drawing and/or cold rolling — Dimensions and tolerances*

EN 10021, *General technical delivery conditions for steel products*

EN 10024, *Hot rolled taper flange I sections — Tolerances on shape and dimensions*

EN 10025-1:2004, *Hot rolled products of structural steels — Part 1: General technical delivery conditions*

EN 10025-2, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10025-3, *Hot rolled products of structural steels — Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

EN 10025-4, *Hot rolled products of structural steels — Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

EN 10025-5, *Hot rolled products of structural steels — Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

EN 10025-6, *Hot rolled products of structural steels — Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition*

EN 10029, *Hot rolled steel plates 3 mm thick or above —  $\text{A}_1$  Tolerances on dimensions and shape  $\text{A}_1$*

EN 10034, *Structural steel I and H sections — Tolerances on shape and dimensions*

EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

EN 10051,  $\text{A}_1$  *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels  $\text{A}_1$  — Tolerances on dimensions and shape*

EN 10055, *Hot rolled steel equal flange tees with radiused root and toes — Dimensions and tolerances on shape and dimensions*

EN 10056-1, *Structural steel equal and unequal leg angles — Part 1: Dimensions*

EN 10056-2, *Structural steel equal and unequal leg angles — Part 2: Tolerances on shape and dimensions*

EN 10058, *Hot rolled flat steel bars for general purpose — Dimensions and tolerances on shape and dimensions*

EN 10059, *Hot rolled square steel bars for general purposes — Dimensions and tolerances on shape and dimensions*

- EN 10060, *Hot rolled round steel bars for general purposes — Dimensions and tolerances on shape and dimensions*
- EN 10061, *Hot rolled hexagon steel bars for general purposes — Dimensions and tolerances on shape and dimensions*
- EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel — General*
- EN 10088-1, *Stainless steels — Part 1: List of stainless steels*
- EN 10088-2:2005, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*
- EN 10088-3:2005, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*
- EN 10131, *Cold rolled uncoated and zinc or zinc-nickel electrolytically coated low carbon and high yield strength steel flat products for cold forming — Tolerances on dimensions and shape*
- EN 10139, *Cold rolled uncoated mild steel narrow strip for cold forming — Technical delivery conditions*
- EN 10140, *Cold rolled narrow steel strip — Tolerances on dimensions and shape*
- EN 10143, *Continuously hot-dip coated steel sheet and strip — Tolerances on dimensions and shape*
- EN 10149-1, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 1: General delivery conditions*
- EN 10149-2, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 2: Delivery conditions for thermomechanically rolled steels*
- EN 10149-3, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 3: Delivery conditions for normalized or normalized rolled steels*
- EN 10160, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*
- EN 10163-2, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 2: Plate and wide flats*
- EN 10163-3, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 3: Sections*
- EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*
- EN 10169, *Continuously organic coated (coil coated) steel flat products — Technical delivery conditions*
- EN 10204, *Metallic products — Types of inspection documents*
- EN 10210-1, *Hot finished structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*
- EN 10210-2, *Hot finished structural hollow sections of non-alloy and fine grain steels — Part 2: Tolerances, dimension and sectional properties*
- EN 10219-1, *Cold formed welded structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*

EN 10219-2, *Cold formed welded structural hollow sections of non-alloy and fine grain steels — Part 2: Tolerances, dimensions and sectional properties*

EN 10268, *Cold rolled steel flat products with high yield strength for cold forming — Technical delivery conditions*

EN 10279, *Hot rolled steel channels — Tolerances on shape, dimensions and mass*

**A1** deleted text **A1**

EN 10296-2:2005, *Welded circular steel tubes for mechanical and general engineering purposes — Technical delivery conditions — Part 2: Stainless steel*

EN 10297-2:2005, *Seamless circular steel tubes for mechanical and general engineering purposes — Technical delivery conditions — Part 2: Stainless steel*

**A1** EN 10346, *Continuously hot-dip coated steel flat products — Technical delivery conditions* **A1**

EN ISO 1127, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length (ISO 1127:1992)*

**A1** EN ISO 9445-1, *Continuously cold-rolled stainless steel — Tolerances on dimensions and form — Part 1: Narrow strip and cut lengths (ISO 9445-1:2009)*

EN ISO 9445-2, *Continuously cold-rolled stainless steel — Tolerances on dimensions and form — Part 2: Wide strip and plate/sheet (ISO 9445-2:2009)* **A1**

ISO 4997, *Cold-reduced carbon steel sheet of structural quality*

## **2.2.2 Steel castings**

EN 10340:2007, *Steel castings for structural uses*

**A1** EN 1559-1, *Founding — Technical conditions of delivery — Part 1: General*

EN 1559-2, *Founding — Technical conditions of delivery — Part 2: Additional requirements for steel castings* **A1**

## **2.2.3 Welding consumables**

EN 756, *Welding consumables — Solid wires, solid wire-flux and tubular cored electrode-flux combinations for submerged arc welding of non alloy and fine grain steels — Classification*

EN 757, *Welding consumables — Covered electrodes for manual metal arc welding of high strength steels — Classification*

EN 760, *Welding consumables — Fluxes for submerged arc welding — Classification*

EN 1600, *Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat resisting steels — Classification*

EN 13479, *Welding consumables — General product standard for filler metals and fluxes for fusion welding of metallic materials*

EN 14295, *Welding consumables — Wire and tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels — Classification*

EN ISO 636, *Welding consumables — Rods, wires and deposits for tungsten inert gas welding of non alloy and fine grain steels — Classification (ISO 636:2004)*

EN ISO 2560, *Welding consumables — Covered electrodes for manual metal arc welding of non-alloy and fine grain steels — Classification  $\square_{A1}$  (ISO 2560:2009)  $\square_{A1}$*

EN ISO 13918, *Welding — Studs and ceramic ferrules for arc stud welding (ISO 13918:2008)*

EN ISO 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes (ISO 14175:2008)*

EN ISO 14341, *Welding consumables — Wire electrodes and deposits for gas shielded metal arc welding of non alloy and fine grain steels — Classification (ISO 14341:2002)*

EN ISO 14343, *Welding consumables — Wires electrodes, strip electrodes, wires and rods for  $\square_{A1}$  arc  $\square_{A1}$  welding of stainless and heat resisting steels — Classification  $\square_{A1}$  (ISO 14343:2009)  $\square_{A1}$*

EN ISO 16834, *Welding consumables — Wire electrodes, wires, rods and deposits for gas-shielded arc welding of high strength steels — Classification (ISO 16834:2006)*

EN ISO 17632, *Welding consumables — Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non alloy and fine grain steels — Classification (ISO 17632:2004)*

EN ISO 17633, *Welding consumables — Tubular cored electrodes and rods for gas shielded and non-gas shielded metal arc welding of stainless and heat-resisting steels — Classification  $\square_{A1}$  (ISO 17633:2010)  $\square_{A1}$*

EN ISO 18276, *Welding consumables — Tubular cored electrodes for gas-shielded and non-gas-shielded metal arc welding of high-strength steels — Classification (ISO 18276:2005)*

## 2.2.4 Mechanical fasteners

EN 14399-1, *High-strength structural bolting assemblies for preloading — Part 1: General requirements*

EN 14399-2, *High-strength structural bolting assemblies for preloading — Part 2: Suitability test for preloading*

EN 14399-3, *High-strength structural bolting assemblies for preloading — Part 3: System HR — Hexagon bolt and nut assemblies*

EN 14399-4:2005, *High-strength structural bolting assemblies for preloading — Part 4: System HV — Hexagon bolt and nut assemblies*

EN 14399-5, *High-strength structural bolting assemblies for preloading — Part 5: Plain washers*

EN 14399-6, *High-strength structural bolting assemblies for preloading — Part 6: Plain chamfered washers*

EN 14399-7, *High-strength structural bolting assemblies for preloading — Part 7: System HR — Countersunk head bolts and nut assemblies*

EN 14399-8, *High-strength structural bolting assemblies for preloading — Part 8: System HV — Hexagon fit bolt and nut assemblies*

$\square_{A1}$  EN 14399-9  $\square_{A1}$ , *High-strength structural bolting assemblies for preloading — Part 9: System HR or HV — Bolt and nut assemblies with direct tension indicators*

$\square_{A1}$  EN 14399-10  $\square_{A1}$ , *High-strength structural bolting assemblies for preloading — Part 10: System HRC — Bolt and nut assemblies with calibrated preload*

EN 15048-1, *Non preloaded structural bolting assemblies — Part 1: General requirements*

EN 20898-2, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread (ISO 898-2:1992)*

EN ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: <sup>A1</sup> Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2009) <sup>A1</sup>*

EN ISO 1479, *Hexagon head tapping screws (ISO 1479:1983)*

EN ISO 1481, *Slotted pan head tapping screws (ISO 1481:1983)*

EN ISO 3506-1, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 1: Bolts, screws and studs <sup>A1</sup> (ISO 3506-1:2009) <sup>A1</sup>*

EN ISO 3506-2, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 2: Nuts <sup>A1</sup> (ISO 3506-2:2009) <sup>A1</sup>*

<sup>A1</sup> EN ISO 4042, *Fasteners — Electroplated coatings (ISO 4042:1999) <sup>A1</sup>*

EN ISO 6789, *Assembly tools for screws and nuts — Hand torque tools — Requirements and test methods for design performance testing, quality performance testing and recalibration procedure (ISO 6789:2003)*

EN ISO 7049, *Cross recessed pan head tapping screws (ISO 7049:1983)*

<sup>A1</sup> EN ISO 7089, *Plain washers — Normal series — Product grade A (ISO 7089:2000)*

EN ISO 7090, *Plain washers, chamfered — Normal series — Product grade A (ISO 7090:2000)*

EN ISO 7091, *Plain washers — Normal series — Product grade C (ISO 7091:2000)*

EN ISO 7092, *Plain washers — Small series — Product grade A (ISO 7092:2000)*

EN ISO 7093-1, *Plain washers — Large series — Part 1: Product grade A (ISO 7093-1:2000)*

EN ISO 7093-2, *Plain washers — Large series — Part 2: Product grade C (ISO 7093-2:2000)*

EN ISO 7094, *Plain washers — Extra large series — Product grade C (ISO 7094:2000) (Corrigendum AC:2002 incorporated) <sup>A1</sup>*

EN ISO 10684, *Fasteners — Hot dip galvanized coatings (ISO 10684:2004)*

EN ISO 15480, *Hexagon washer head drilling screws with tapping screw thread (ISO 15480:1999)*

EN ISO 15976, *Closed end blind rivets with break pull mandrel and protruding head — St/St (ISO 15976:2002)*

EN ISO 15979, *Open end blind rivets with break pull mandrel and protruding head — St/St (ISO 15979:2002)*

EN ISO 15980, *Open end blind rivets with break pull mandrel and countersunk head — St/St (ISO 15980:2002)*

EN ISO 15983, *Open end blind rivets with break pull mandrel and protruding head — A 2/A2 (ISO 15983:2002)*

EN ISO 15 984, *Open ended blind rivets with break pull mandrel and countersunk head — A 2/A2 (ISO 15984:2002)*

ISO 10509, *Hexagon flange head tapping screws*

### 2.2.5 High strength cables

prEN 10138-3, *Prestressing steels — Part 3: Strand*

EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings*

EN 10264-3, *Steel wire and wire products — Steel wire for ropes — Part 3: Round and shaped non alloyed steel wire for high duty applications*

EN 10264-4, *Steel wire and wire products — Steel wire for ropes — Part 4: Stainless steel wire*

EN 12385-1, *Steel wire ropes — Safety — Part 1: General requirements*

EN 12385-10, *Steel wire ropes — Safety — Part 10: Spiral ropes for general structural applications*

EN 13411-4, *Terminations for steel wire ropes — Safety — Part 4: Metal and resin socketing*

### 2.2.6 Structural bearings

EN 1337-2, *Structural bearings — Part 2: Sliding elements*

EN 1337-3, *Structural bearings — Part 3: Elastomeric bearings*

EN 1337-4, *Structural bearings — Part 4: Roller bearings*

EN 1337-5, *Structural bearings — Part 5: Pot bearings*

EN 1337-6, *Structural bearings — Part 6: Rocker bearings*

EN 1337-7, *Structural bearings — Part 7: Spherical and cylindrical PTFE bearings*

EN 1337-8, *Structural bearings — Part 8: Guide bearings and restraint bearings*

## 2.3 Preparation

EN ISO 9013, *Thermal cutting — Classification of thermal cuts — Geometrical product specification and quality tolerances (ISO 9013:2002)*

ISO 286-2, <sup>[A1]</sup> *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts <sup>[A1]</sup>*

CEN/TR 10347, *Guidance for forming of structural steels in processing*

## 2.4 Welding

EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 1011-1:1998, *Welding — Recommendations for welding of metallic materials — Part 1: General guidance for arc welding*



EN 1011-2:2001, *Welding — Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels*

EN 1011-3, *Welding — Recommendations for welding of metallic materials — Part 3: Arc welding of stainless steels*

EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

EN ISO 3834 (all parts), *Quality requirements for fusion welding of metallic materials (ISO 3834:2005)*

EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers* <sup>Ⓐ</sup> (ISO 4063: 2009, Corrected version 2010-03-01) <sup>Ⓐ</sup>

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006)*

EN ISO 9692-1, *Welding and allied processes — Recommendations for joint preparation — Part 1: Manual metal-arc welding, gas-shielded metal-arc welding, gas welding, TIG welding and beam welding of steels (ISO 9692-1:2003)*

EN ISO 9692-2, *Welding and allied processes — Joint preparation — Part 2: Submerged arc welding of steels (ISO 9692-2:1998)*

EN ISO 13916, *Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature (ISO 13916:1996)*

EN ISO 14373, *Resistance welding — Procedure for spot welding of uncoated and coated low carbon steels (ISO 14373:2006)*

EN ISO 14544 (all parts), *Quality requirements for welding — Resistance welding of metallic materials (ISO 14544-1:2000)*

EN ISO 14555, *Welding — Arc stud welding of metallic materials (ISO 14555:2006)*

EN ISO 14731, *Welding coordination — Tasks and responsibilities (ISO 14731:2006)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15609-4, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 4: Laser beam welding* <sup>Ⓐ</sup> (ISO 15609-4:2009) <sup>Ⓐ</sup>

EN ISO 15609-5, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 5: Resistance welding (ISO 15609-5:2004)*

EN ISO 15610, *Specification and qualification of welding procedures for metallic materials — Qualification based on tested welding consumables (ISO 15610:2003)*

EN ISO 15611, *Specification and qualification of welding procedures for metallic materials — Qualification based on previous welding experience (ISO 15611:2003)*

EN ISO 15612, *Specification and qualification of welding procedures for metallic materials — Qualification by adoption of a standard welding procedure (ISO 15612:2004)*

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials — Qualification based on pre-production welding test (ISO 15613:2004)*

EN 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 15614-1:2004)*

EN ISO 15614-11, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 11: Electron and laser beam welding (ISO 15614-11:2002)*

EN ISO 15614-13, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 13: Resistance butt and flash welding (ISO 15614-13:2005)*

EN ISO 15620, *Welding — Friction welding of metallic materials (ISO 15620:2000)*

EN ISO 16432, *Resistance welding — Procedure for projection welding of uncoated and coated low carbon steels using embossed projection(s) (ISO 16432:2006)*

EN ISO 16433, *Resistance welding — Procedure for seam welding of uncoated and coated low carbon steels (ISO 16433:2006)*

## 2.5 Testing

EN 473, *Non destructive testing — Qualification and certification of NDT personnel — General principles*

EN 571-1, *Non destructive testing — Penetrant testing — Part 1: General principles*

EN 970, *Non-destructive examination of fusion welds — Visual examination*

EN 1290, *Non-destructive examination of welds — Magnetic particle examination of welds*

EN 1435, *Non-destructive testing of welds — Radiographic testing of welded joints*

EN 1713, *Non-destructive testing of welds — Ultrasonic testing — Characterization of indications in welds*

EN 1714, *Non-destructive testing of welds — Ultrasonic testing of welded joints*

EN 10160, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 12062:1997, *Non-destructive examination of welds — General rules for metallic materials*

EN ISO 6507 (all parts), *Metallic materials — Vickers hardness test (ISO 6507:2005)*

EN ISO 9018, *Destructive tests on welds in metallic materials — Tensile test on cruciform and lapped joints (ISO 9018:2003)*

EN ISO 10447, *Resistance welding - Peel and chisel testing of resistance spot and projection welds (ISO 10447:2006)*

## 2.6 Erection

EN 1337-11, *Structural bearings — Part 11: Transport, storage and installation*

ISO 4463-1, *Measurement methods for building — Setting-out and measurement — Part 1: Planning and organization, measuring procedures, acceptance criteria*

ISO 7976-1, *Tolerances for building — Methods of measurement of buildings and building products — Part 1: Methods and instruments*

ISO 7976-2, *Tolerances for building — Methods of measurement of buildings and building products — Part 2: Position of measuring points*

ISO 17123 (all parts), *Optics and optical instruments — Field procedures for testing geodetic and surveying instruments*

## **2.7 Corrosion protection**

EN 14616, *Thermal spraying — Recommendations for thermal spraying*

EN 15311, *Thermal spraying — Components with thermally sprayed coatings — Technical supply conditions*

EN ISO 1461:1999, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods (ISO 1461:1999)*

EN ISO 2063, *Thermal spraying — Metallic and other inorganic coatings — Zinc, aluminium and their alloys (ISO 2063:2005)*

EN ISO 2808, *Paints and varnishes — Determination of film thickness (ISO 2808:2007)*

EN ISO 8501 (all parts), *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness*

EN ISO 8503-1, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces (ISO 8503-1:1988)*

EN ISO 8503-2, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure (ISO 8503-2:1988)*

EN ISO 12944 (all parts), *Paints and varnishes — Corrosion protection of steel structures by protective paint systems (ISO 12944:1998)*

**[A1]** EN ISO 14713-1, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 1: General principles of design and corrosion resistance (ISO 14713-1:2009)*

EN ISO 14713-2, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 2: Hot dip galvanizing (ISO 14713-2:2009)* **[A1]**

ISO 19840, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces*

## **2.8 Tolerances**

EN ISO 13920, *Welding — General tolerances for welded constructions — Dimensions for lengths and angles — Shape and position (ISO 13920:1996)*

## **2.9 Miscellaneous**

EN 508-1, *Roofing products from metal sheet — Specification for self-supporting products of steel, aluminium or stainless steel sheet — Part 1: Steel*

EN 508-3, *Roofing products from metal sheet — Specification for self-supporting products of steel, aluminium or stainless steel sheet — Part 3: Stainless steel*

EN 1993-1-6, *Eurocode 3: Design of steel structures — Part 1-6: Strength and Stability of Shell Structures*

EN 1993-1-8, *Eurocode 3: Design of steel structures — Part 1-8: Design of joints*

EN 13670, *Execution of concrete structures*

ISO 2859-5, *Sampling procedures for inspection by attributes — Part 5: System of sequential sampling plans indexed by acceptance quality limit (ALQ) for lot-by-lot inspection*

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