TEST REPORT

On Behalf of

Prepared For :	
Trade Mark :	**N/A**
Product Name :	**Container House**
Model(s) :	TPC001
Prepared By:	
Test Date:	**Mar.23,2023-Mar.30, 2023**
Date of Report:	**Mar.30, 2023**
Report No. :	**CDT-2023032935PR**

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent

TEST REPORT

EN 1090-1:2009+A1:2011

Execution of steel structures and aluminium structures Part 1: Requirements for conformity assessment of structural components.

EN 1090-2 : 2018

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

Reference No.....: CDT-2023032935PR

Contents.....: 46 pages

Date of issue .....: Mar.20,2023

Testing laboratory

Name.....: Shenzhen CDT Testing Technology Co., Ltd.

Address……..……...: Room 301, building B, Xinyi Industrial Park, Yuquan Road, Yulv community, Yutang street, Guangming New District, Shenzhen, Guangdong, China

Testing location.....: Same as above

Test specification

Standard.....: EN 1090-1:2009+A1:2011+EN 1090-2 : 2018

Test procedure .....: Test report

Non-standard test method.....: Steel structure

Test item

Model and/or type reference .....: TPC001

Manufacturer.....: DONGGUAN TOPPRE MODULAR HOUSE CO.，LTD

Address……..: Room 1801,Building 6,Yongya Shanzhuang,No.204,HuangjiangHuancheng Road,Huangjiang Town,Dongguan City, Guangdong Province

Testing procedure and testing location

Laboratory name……	:	Shenzhen CDT Testing Technology Co., Ltd.
Testing location/address:	:	Room 301, building B, Xinyi Industrial Park, Yuquan Road, Yulv community, Yutang street, Guangming New District, Shenzhen，Guangdong, China
Testing Iprocedure	:	TL ☒ RMT ☐ SMT ☐ WMT ☐ TMP ☐
Tested By (Test Engineer)	:	JayLiu
Reviewed By (Supervisor)	:	NancyZhang
Approved By (Chief Engineer)	:	JackeyWang

EC DECLARATION OF CONFORMITY

ccording to Annex III of the Regulation

We,
NAME:

ADDRESS:

Manufacturer:
NAME:
ADDRESS:

THE TECHNICAL DOCUMENTAATION WAS COMPILED BY

NAME: Container House

MODEL: TPC001

COMPLIEDS WITH THE PROVISIONS OF THE FOLLOWING DIRECTIVE

Construction Product Regulation 305/2011/EU

AND COMPLIES WITH THE PROVISONS OF THE FOLLOWING STANDARDS:
EN 1090-1:2009+A1:2011
EN1090-2:2018

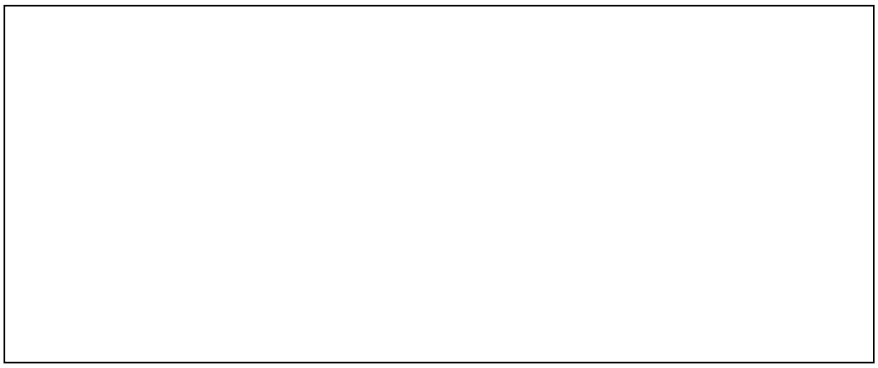
Mar.30.2023

ISSUE PLACE AND DATE

COMPANY STAMP AND SIGNATURE OF AUTHORIZED PERSONNEL

Summary of compliance with National Differences: N/A

Copy of marking plate:



Possible test case verdicts: - test case does not apply to the test object ..... : N/A - test object does meet the requirement..... : P (Pass) - test object does not meet the requirement..... : F (Fail)
Testing..... : Date of receipt of test item..... : Mar.23, 2023 Date (s) of performance of tests..... : Mar.23, 2023 to Mar.30, 2023
General remarks: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(See appended table)" refers to a table appended to the report. Throughout this report a comma (point) is used as the decimal separator.
General product information: Maximum operation temperature of the product is 40All models are similar except rating power and appearance and all tests are conduct on model ZH1090BSS/01

Test Result

Test Standards	Conclusion
EN 1090-1:2009+A1:2011 Execution of steel structures and aluminium structures Part 1: Requirements for conformity assessment of structural components.	Pass
EN 1090-2 : 2018 Execution of steel structures and aluminium structures-part 2 : Technical requirements for steel structures	Pass

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict

1.	Scope		----
	This European Standard specifies requirements for conformity assessment of performance characteristics for structural steel and aluminium components as well as for kits placed on the market as construction products . The conformity assessment covers the manufacturing characteristics , and where appropriate the structural design characteristics	This product is a steel structure product	P
	This European Standard covers also the conformity assessment of steel components used in composite steel and concrete structures	Not applicable	N/A
	The components can be used directly or in construction works or as structural components in the form of kits . This European Standard applies to series and non-series structural components including kits		P
	The components can be made of hot rolled or cold formed constituent products or constituent products produced with other technologies . They may be produced of sections / profiles with various shapes , flat products (plates sheet , strip) , bars , castings , forgings made of steel and aluminium materials , unprotected or protected against corrosion by coating or other surface treatment , e.g. anodising of aluminium		P
	This European Standard covers structural cold formed members and sheeting as defined in EN 1993-1-3 and EN1999-1-4		P
	This European Standard does not cover conformity assessment of components for suspended ceilings , rails or sleepers for use in railway systems .		P
2.	Normative references		---
3.	Terms , definitions and abbreviations		---
3.1	Terms and definitions		---
3.1.1	Component specification		---
3.1.2	Constituent products		---
3.1.3	Design brief		---
3.1.4	European technical specifications		---
3.1.5	Evaluation method		---
3.1.6	Load bearing capacity		---

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict

3.1.7	Manufacturing		----
3.1.8	Structural characteristics		---
3.1.9	Structural components		-–
3.1.10	Structural kit		---
3.1.11	weldability		---
3.2	Abbreviations		---
4.	Requirements		---
4.1.	Constituent products		---
4.1.1	General		-–
	Structural components of steel and aluminium shall be made of constituent products as given in 4.1.2 and 4.1.3 ,respectively .	These requirements have been complied	P
4.1.2	Constituent products for steel components		-–
	Constituent products for steel components shall be in accordance with the European Standards referred to in the relevant Clauses of EN 1090-2	EN 1090-2	P
4.1.3	Constituent products for aluminium components		---
	Constituent products for aluminium components shall be in accordance with the European Standards referred to in the relevant Clauses of EN 1090-3		P
4.2	Tolerances on dimensions and shape		---
	The geometrical tolerances specified in EN 1090-2 and EN1090-3 for the essential tolerances shall apply to all components . If any special tolerances apply these shall be stated in the component specification		P
4.3	Weldability		---
	If steel and aluminium structural components are to be declared as weldable they shall be made of weldable constituent products according to EN 1090-2 or EN 1999-1-1 as appropriate . If relevant to the performance of a steel product the through-thickness properties shall be declared		P
4.4	Fracture toughness		---
	Steel components shall be manufactured from constituent products that meet the fracture toughness properties required . The constituent products specified in the component specification shall be used		P
	Fracture toughness is not tested or specified for aluminium materials		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict

4.5	Structural characteristics		----
4.5.1	General		---
	Structural characteristics of a component covered in this European Standard refer to its ! load bearing capacity ,deformation at serviceability limit state , fatigue strength and resistance to fire	These requirements have been complied with	P
	The required structural characteristics shall be achieved by :		P
	–an adequate structural design , if and as required for thecomponent , and		P
	- -manufacturing the component according to the component specification developed in accordance with EN 1090-2 or EN1090-3		P
4.5.2	Load bearing capacity		---
	Declaration of the load bearing capacity may refer to the resistance of the cross sections of the component , expressed as a characteristic value or as a design value . Alternative the load bearing capacity may be expressed in terms of the loads the component can carry according to the applied design provisions , expressed as a characteristic value or as a design value		P
4.5.3	Fatigue strength		-–
	Declaration of the fatigue strength of a structural component shall be specific to fatigue actions against which the fatigue strength has been assessed		P
	Fatigue strength in this standard refers to situations for which the loads are such that the influence of repetitive loads needs to be considered to assess the structural characteristics of the component		P
4.5.4	Resistance to fire		---
	Declaration of the fire resistance of a structural member may refer to the fire exposure represented by the stand ardtem Cperature-time relationship to be used for assessment of the performance characteristics R , E , I and M in the classification according to EN 13501-2		---
	Constituent products for aluminium components shall be in accordance with the European Standards referred to in the relevant Clauses of EN 1090-3		P
4.4	Fracture toughness		---
	Steel components shall be manufactured from constituent products that meet the fracture toughness properties required . The constituent products specified in the component specification shall be used		P
	Fracture toughness is not tested or specified for aluminium		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	The classification periods against any of the characteristics shall be declared in minutes, using one of the periods: 15, 20, 30, 45, 60, 90, 120, 180, 240 or 360.		P
	Alternatively a declaration of fire resistance under a given set of actions on the component during a fire exposure may be referenced to other specified fire exposures than the standard temperature-time relationship such as the parametric temperature-time curves according to Annex A of EN 1991-1-2.		P
	The requirements to resistance to fire of a component is under the responsibility of each Member State and is generally dependent on the type of structure/building it will be in, where in the structure/building and finally its function in the structural system. This shall appear from the design brief.		P
4.5.5	Deformation at serviceability limit state		--
	The deformations at serviceability limit state determined by using the appropriate combination of actions shall be within the required limits for vertical and horizontal deformations specified in the design assumptions and/or European Standards (e.g. National Determined Parameters, NDP, of the National Annex of EN 1990, EN 1993, EN 1994 and/or EN 1999)."		P
4.6	Reaction to fire		--
	Declaration of the reaction to fire shall be in accordance with the classes and test requirements given in EN 13501-1.	These requirements have been complied with.	P
4.7	Dangerous substances		--
	Dangerous substances in this standard refer to the material properties with regard to emission of radioactivity or release of cadmium. Only constituent products shall be used for which any emission of radioactivity and any release of cadmium is non-existent or limited to be within an accepted limit in the territory of intended destination. Materials used in coatings shall not release or emit any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material, or permitted in national provisions of the member state of destination.	These requirements have been complied with.	P
4.8	Impact resistance		--
	Impact resistance is a material characteristic which expresses the same properties of steel as fracture toughness. There are no additional requirements.	These requirements have been complied with.	P
4.9	Durability		--

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	The component specification shall specify any requirements for corrosion protection. See EN 1090-2 for carbon steel, EN 1993-1-4 for stainless steel and EN 1999-1-1 for aluminium.	These requirements have been complied with.	P
5	Evaluation methods		---
5.1	General		---
	The term 'evaluation method' is used for all kinds of methods used to demonstrate compliance with the requirements, e.g. physical testing, measurements of geometry and structural calculations whether assisted or not by physical testing.	These requirements have been complied with.	P
5.2	Constituent products		---
	The constituent products shall be evaluated by checking that the inspection documents for the products used comply with the requirements of the component specification.	These requirements have been complied with.	P
	The evaluation of constituent products shall also include a check that the geometry of the products is correct, using methods and instruments in accordance with 5.3.		P
5.3	Tolerances on dimensions and shape		---
	Geometrical tolerances shall be measured using methods and instruments selected from those listed in ISO 7976-1 and ISO 7976-2 and in accordance with provisions given in EN 1090-2 and EN 1090-3. Accuracy of measurements shall be assessed in accordance with ISO 17123-1.	These requirements have been complied with.	P
5.4	Weldability		---
	For weldability, reliance may be placed on properties associated with constituent materials and components provided these are given by reference to a European Technical Specification and inspection documents.	These requirements have been complied with.	P
	If through-thickness properties are specified for steel products, they shall be assessed according to the quality classes given in EN 10164.		P
5.5	Fracture toughness		---
	For fracture toughness of the constituent products, reliance may be placed on properties for impact strength associated with materials and components used as constituent products provided these are given by reference to a European Technical Specification and inspection documents.	These requirements have been complied with.	P
	If data for the constituent products are not available, fracture toughness may be assessed using Charpy impact tests carried out in accordance with EN 10045-1. For steel components provisions for evaluation of the test results are given in EN 1993-1-10.		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	Testing the fracture toughness of aluminium constituent products is not required.		P
5.6	Structural characteristics		---
5.6.1	General		---
	Assessment of structural characteristics shall be based on:	These requirements have been complied with.	P
	a) the structural design, and		P
	b) the manufacturing characteristics of the component.		P
5.6.2	Structural design		---
	An adequate structural design may be demonstrated by:		P
	a) structural calculations, or		P
	b) structural testing supported by structural calculations for the component.		P
5.6.2.1	Structural calculations		---
	Structural calculations may be used to determine the structural design characteristics of the component and that the requirements given in the design brief are met.		P
	The structural design calculations shall be in accordance the relevant Eurocodes. In a general case this requires the use of:		P
	a) EN 1990, Eurocode: Basis of structural design;		P
	b) EN 1991, Eurocode 1: Actions on structures (all relevant parts);		P
	c) EN 1993, Eurocode 3: Design of steel structures (all relevant parts)		P
	d) EN 1994, Eurocode 4: Design of composite steel and concrete structures (all relevant parts for the steel parts in composite structures);		P
	e) EN 1998, Eurocode 8: Design of structures for earthquake resistance (all relevant parts);		P
	f) EN 1999, Eurocode 9: Design of aluminium structures (all relevant parts).		P
	To determine the structural characteristics of a component, provisions given in the National Annexes to the Eurocodes for the country where the component shall be used apply.		P
5.6.2.2	Structural testing		---

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	Structural testing shall be based on European Standards, and be accompanied by structural calculations.		P
5.6.3	Manufacturing characteristics		---
	The manufacturing characteristics shall be assessed in relation to the requirements in the component specification.		P
	The manufacturing of components shall be inspected and evaluated in accordance with the requirements for inspection to the specified execution class and tolerance requirements in compliance with the provisions in EN 1090-2 for steel structures or EN 1090-3 for aluminium structures.		P
5.7	Resistance to fire		---
	The component specification shall specify all necessary information on the evaluation methods to be used; either they are performed by calculation or by testing.	These requirements have been complied with.	P
	Performance characteristic R: A component's resistance to fire may be evaluated according to test results and the classification standard EN 13501-2, or by using a calculation method from the Eurocodes listed in 5.6.2 and a fire exposure according to the standard temperature-time relationship referred to in EN 13501-2.		P
	Performance characteristic I: A component's integrity as a separating element may be evaluated according to test results and the classification standard EN 13501-2, or by using a calculation method according to EN 1994-1-2, and a fire exposure according to the standard temperature-time relationship referred to in EN 13501-2.		P
	Alternatively, if the evaluation of fire resistance or integrity is based on calculation according to another specified fire exposure than the standard temperature-time relationship, the characteristic should not be designated R or I as these are designations for class of resistance according to EN 13501-2.		P
	Performance characteristics E and M: These performance characteristics may only be evaluated based on testing in accordance with the classification standard EN 13501-2.		P
5.8	Reaction to fire		---
	Constituent products of steel and aluminium fall within Class A1 of the European classification with respect to reaction to fire, and no further documentation is required. Galvanized steels and anodized aluminium components are also Class A1.	These requirements have been complied with.	P
	In the case of coated components it shall be demonstrated		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	that the component has a fire classification that complies with the requirements according to its use and function. Classification shall be performed in accordance with EN 13501-1.		
5.9	Dangerous substances		--
	The requirement in 4.7 is fulfilled if the constituent products comply with the European Standards referenced in EN 1090-2 for steel or EN 1090-3 for aluminium. No further testing is required unless protective coatings are used for which a possible emission cannot be assessed indirectly by control of the raw coating material.	These requirements have been complied with.	P
5.10	Impact resistance		--
	Impact resistance of steel products is assessed by evaluation of the fracture toughness of the product.	These requirements have been complied with.	P
5.11	Durability		--
	There is no direct method for testing durability. Durability is indirectly evaluated by checking the exposure of the component and by evaluating any requirements for surface protection given in the component specification.	These requirements have been complied with.	P
6	Evaluation of conformity		--
6.1	General		--
	The conformity of a component or kit with the requirements of this European Standard and with the stated values (including classes) shall be demonstrated by:	These requirements have been complied with.	P
	a) initial type testing, see 6.2; and		P
	b) factory production control by the manufacturer, including inspection and testing of products sampled from production in accordance with a prescribed plan by the manufacturer, see 6.3.		P
	For the purposes of testing, components or kits may be grouped into families if the selected property/properties is/are common to all components within that family.		P
	A family of welded steel components may be characterized by the parent material and the welding process used. Materials of lower strength and materials which are more weldable may be included in the same family.		P
	A family of welded aluminium components may be characterized by the material group and the welding process applied whereby 7xxx alloys cover all other alloys, 6xxx alloys cover 5xxx alloys and 3xxx alloys, 5xxx alloys and 3xxx alloys		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	may be regarded as one group.		
	Non-welded components in the same execution class may be treated as a family.		P
6.2	Initial type testing		---
6.2.1	General		---
	Initial type testing is the complete set of tests or other procedures, determining the performance of samples of products representative of the product type. The intention is to demonstrate and assess that the manufacturer has the capabilities to provide structural components and kits according to this European Standard. The assessment is related to two possible tasks performed by the manufacturer:	These requirements have been complied with.	P
	a) Initial type calculation (ITC) to assess the structural design capabilities, where the manufacturer shall declare structural characteristics governed by design of the component;		P
	b) Initial type testing (ITT) to assess the manufacturing capabilities. Initial type testing shall be performed:		P
	1) at the commencement of the production of a new component or the use of new constituent products (unless a component of the same family);		P
	2) at the commencement of a new or modified method of production if this would affect a characteristic subject to evaluation;		P
	3) if production is changed to a higher execution class.		P
	In case of type testing of components or kits for which initial type evaluation in accordance with this standard has already been performed, type evaluation may be reduced:		P
	--if it has been established that the performance characteristics compared with the already evaluated components or kits have not been affected; or		P
	--in accordance with the rules for grouping into families or direct extended application of test results.		P
	If components are used whose characteristics have already been determined by the component manufacturer on the basis of conformity with other product standards (e.g. manufacturing using constituent products declared as conforming to a European Technical Specification), these characteristics need not be re-evaluated, provided the characteristics of constituent products and components used in the manufacturing process maintain their declared characteristics. Constituent products and components CE marked in accordance with appropriate harmonised European		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	specifications may be presumed to have the performances stated with the CE marking.		
6.2.2	Characteristics		--
	All characteristics for which the manufacturer provides a declaration shall be determined using initial type testing, with the following exceptions:		P
	a) reaction to fire of a component which may be assessed indirectly by controlling the component's constituent products;		P
	b) release of dangerous substances which may be assessed indirectly by controlling the content of the component's constituent products;		P
	c) durability of all characteristics, which is ensured by correct specification to avoid corrosion or to limit its effect by a prescriptive requirement for corrosion protection of the components.		P
6.2.3	Use of historical data		--
	Evaluations previously performed in accordance with the provisions of this European Standard (same component type, same characteristic(s), same test method, same sampling procedure, same system of attestation of conformity etc.) may be taken into account.		P
6.2.4	Use of structural calculations for conformity assessment		--
	If structural calculations are used to determine characteristic or design values to be declared, the conformity evaluation of these characteristics (ITC) shall be based on the manufacturer's personnel resources (employed directly or by a sub-contractor), equipment and procedures used to perform structural calculations for the range of components to be manufactured.		P
	Procedures for the structural design process shall be documented and shall encompass handling of design assumptions, design methods, design calculations including any use of computer programs and results of the calculations with demonstration of procedures for corrective actions to be taken in case of non conformity.		P
	In cases where the manufacturer produces components in accordance with calculations and component specifications provided by the purchaser, the conformity evaluation shall check that the components or kits comply with the component specification.		P
6.2.5	Initial type calculation		--

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	An initial type calculation carried out for a component can be used for documentation of subsequent manufactured components with the same performance characteristics. A new or revised type calculation shall be carried out if there is a change in one or more of the structural performance characteristics that are affected by a change in the design brief of the component.		P
6.2.6	Sampling, evaluation and conformity criteria		---
	The number of samples to be evaluated representing a component or family of components shall be in accordance with Table 1.		P
6.2.7	Declaration of performance characteristics		---
	All performance characteristics given in Table 1 shall be declared by the manufacturer of the component. NPD may be declared if this complies with the method for declaration, or if there are no requirements for the performance characteristic where the component shall be used.		P
6.2.8	Recording of results from evaluations		---
	The results from all Initial Type Evaluations shall be recorded and held by the manufacturer for at least five years.		P
6.2.9	Corrective actions		---
	If corrective actions are needed to satisfy the requirements of this European Standard, the corrective actions shall be carried out as given in EN 1090-2 for steel components and EN 1090-3 for aluminium components.		P
6.3	Factory production control		---
6.3.1	General		---
	The manufacturer shall establish, document and maintain a factory production control (FPC) system to ensure that products placed on the market conform to the declared performance characteristics.	These requirements have been complied with.	P
	The FPC system shall consist of written procedures, regular inspections and tests and/or assessments and the use of results to control the component's constituent products, equipment, the production process and the manufactured component.		P
	A FPC system conforming to the requirements of EN ISO 9001 and made specific to the requirements of this European standard shall be considered to satisfy the above requirements.		P
	The results of inspections, tests and assessments stated in		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	the manufacturer`s FPC system shall be recorded. The action to be taken if control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.		
	The assessment of FPC shall be as Annex B.		P
6.3.2	Personnel		---
	The responsibility, authority and the relationship between personnel that manage, perform or verify work affecting product conformity, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-conformity from occurring, actions in case of non-conformities and to identify and register any conformity problems.		P
	The FPC system shall describe measures to ensure that personnel involved in activities influencing the conformity of the components have adequate qualifications and training for the range of components and execution classes to be exercised by the manufacturer.		P
6.3.3	Equipment		---
	Weighing, measuring and testing equipment influencing the conformity of the components shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.		P
	Equipment used in the manufacturing process shall be regularly inspected and maintained to ensure that use, wear and failure does not cause significant inconsistency in the manufacturing process.		P
	Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures. The records shall be retained for the period defined in the manufacturer's FPC procedures.		P
6.3.4	Structural design process		---
	In the case of structural design carried out by the manufacturer, the FPC system shall ensure compliance with the design brief, identify the procedures for checking the calculations and those individuals responsible for the design.		P
	The records shall be sufficiently detailed and accurate to demonstrate that the manufacturer's design responsibilities have been carried out satisfactorily. A record of the documents shall be retained for a period defined in the manufacturers FPC procedure.		P
6.3.5	Constituent products used in manufacture		---

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
	The manufacturer shall implement a written inspection procedure for checking and recording that constituent products conform to the specification, and for tracing that they are correctly used in component manufacture. The requirements for traceability of constituent products given in EN 1090-2 and EN 1090-3 shall be complied with.		P
	The specification for the constituent products used in manufacture shall be retained according to the manufacturer`s FPC procedures.		P
6.3.6	Component specification		--
	The manufacture of components shall be controlled using a component specification giving all the necessary information of the component in sufficient detail to enable it to be manufactured and for its conformity to be evaluated.		P
	The execution class to be applied shall be given in the component specification, see EN 1090-2 and EN 1090-3.		P
	The manufacturer shall implement a written inspection and test plan for checking and recording that manufactured components conform to their component specification.		P
	The component specification shall be prepared from design information. To the extent that the manufacturer undertakes the preparation of the component specification from design information Clause 6.3.4 applies.		P
	Annex A gives guidance on preparation of the component specification.		P
6.3.7	Product evaluation		--
	The manufacturer shall establish procedures to ensure that the declared values and classes of all of the characteristics are maintained. The means of production control of characteristics and the sampling methods for a component or family to be evaluated shall be in accordance with Table 2.		P
	If the component specification includes a prescribed inspection and test plan for component properties then those requirements shall be followed in addition to the requirements given in Table 2.		P
6.3.8	Non-conforming products		--
	The manufacturer shall have written procedures that specify how to deal with non-conforming products. Such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures. The procedures shall conform with EN 1090-2 or EN 1090-3 as appropriate.		P

EN 1090-1:2009+A1:2011			
Clause	Requirement – Test	Result - Remark	Verdict
7	Classification and designation		--
	The component shall be classified in accordance with the execution classes given in EN 1090-2 for steel components and EN 1090-3 for aluminium components.		P
8	Marking		--
	The component shall be delivered with a mark that clearly identifies it, with reference to the component specification.		P
	Hard stamping may only be used if and where positions have been agreed with the purchaser. For requirements and restrictions on marking, see EN 1090-2 and EN 1090-3.		P

EN 1090-2:2018			
Clause	Requirement – Test	Result - Remark	Verdict
1	Scope		--
	This European Standard specifies requirements for execution of structural steelwork as structures or as manufactured components, produced from:	This product is a steel structure product	P
	— hot rolled, structural steel products up to and including grade S700;		P
	— cold formed components and sheeting up to and including grade S700 (unless coming within the scope of EN 1090-4);		N/A
	— hot finished or cold formed austenitic, austenitic-ferritic and ferritic stainless steel products;		N/A
	— hot finished or cold formed structural hollow sections, including standard range and custom-made rolled products and hollow sections manufactured by welding.		N/A
	For components produced from cold formed components, and cold formed structural hollow sections that are within the scope of EN 1090-4, the requirements of EN 1090-4 take precedence over corresponding requirements in this European Standard.		N/A
	This European Standard can 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.		N/A
	This European Standard specifies requirements, which are mostly 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. Certain requirements are differentiated in terms of execution classes.		P
	This European Standard applies to structures designed according to the relevant part of the EN 1993 series. Sheet piling, displacement piles and micropiles designed to EN 1993-5 are intended to be executed in accordance with respectively EN 12063, EN 12699 and EN 14199. This European Standard only applies to the execution of waling, bracing, and connections.		P
	This European Standard applies to steel components in composite steel and concrete structures designed according to the relevant part of the EN 1994 series.		N/A
	This European Standard can 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.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	This European Standard includes the requirements for the welding of reinforcing steels to structural steels. This European Standard does not include requirements for the use of reinforcing steels for reinforced concrete applications.		P
4	Specifications and documentation		---
4.1	Execution Specification		---
4.1.2	Execution classes		---
	Four execution classes 1 to 4, denoted EXC1 to EXC4, are given, for which requirement strictness increases from EXC1 to EXC3 with EXC4 being based on EXC3 with further project specific requirements (e.g. see 7.6.1, 12.4.2.3 and 12.4.2.4).	EXC1	P
	The list of requirements related to execution classes is given in A.3.		P
4.1.3	Requirements for surface preparation for corrosion protection		---
	With respect to the preparation of welds, edges and other areas with surface imperfections for the application of paint and related products, three preparation grades, denoted P1 to P3 according to EN ISO 8501-3, are given, for which requirement strictness increases from P1 to P3.		N/A
4.1.4	Geometrical tolerances		---
4.2	Constructor's documentation		---
4.2.1	Quality documentation		---
4.2.2	Quality plan		---
	It shall be specified if a quality plan for execution of the works is required.		P
4.2.3	Safety of the erection works		---
	Method statements giving detailed work instructions shall comply with the technical requirements relating to the safety of the erection works as given in 9.2 and 9.3.		P
4.2.4	Execution documentation		---
	Sufficient documentation shall be prepared during execution and as a record of the as-built structure to demonstrate that the works have been carried out according to the execution specification.		P
5	Constituent products		---
5.2	Identification, inspection documents and traceability		---
	The properties of supplied constituent products shall be documented in a way that enables them to be compared to		P

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Clause	Requirement – Test	Result - Remark	Verdict
	the specified properties. Their conformity with the relevant product standard shall be checked in accordance with 12.2.		
	For metallic products, the inspection documents according to EN 10204 shall be as listed in Table 1.		P
	Type 3.2 inspection documents are also suitable if Type 3.1 documents are listed in Table 1.		P
	For structural bolting assemblies and other fasteners, inspection documents according to the EN ISO 16228 series may be used instead of documents according to EN 10204.		N/A
5.3	Structural steel products		---
5.3.2	Thickness tolerances		---
	Unless otherwise specified, the thickness tolerances for structural steel plates shall be class A in accordance with EN 10029 for hot rolled steel plates and EN ISO 18286 for hot-rolled stainless steel plates.		P
5.3.3	Surface conditions		---
5.3.4	Additional properties		---
	Unless otherwise specified, internal discontinuity quality class S1 of EN 10160 shall be used for welded cruciform joints transmitting primary tensile stresses through the plate thickness on a band of width four times the thickness of the plate each side of the proposed attachment.		P
	It shall be specified whether areas close to bearing diaphragms or stiffeners should be checked for the existence of internal discontinuities. In this case quality class S1 of EN 10160 shall apply to a band of flange or web plate of width 25 times the plate thickness each side of a bearing diaphragm or stiffener if attached by welding.		P
5.4	Steel castings		---
	Steel castings shall conform to the requirements in EN 10340. The technical delivery conditions (grades, qualities and, if appropriate, surface conditions) shall be specified together with any required options permitted by the product standard including necessary information and options as required in EN 1559-1 and EN 1559-2. Unless otherwise specified the properties of delivered castings shall be evaluated by testing.		P
5.5	Welding consumables		---
	All welding consumables shall conform to the requirements of the appropriate product standard as listed in Table 5.		P

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Clause	Requirement – Test	Result - Remark	Verdict
5.6	Mechanical fasteners		---
5.6.2	Terminology		---
5.6.3	Structural bolting assemblies for non-preloaded applications		---
	Carbon steel, alloy steel and stainless steel structural bolting assemblies for non-preloaded applications shall conform to the requirements of the EN 15048 series.	This product does not reflect the components required by the standard.	N/A
	Assemblies according to EN 14399 may also be used for non-preloaded applications.		N/A
	Property classes of bolts and nuts and, if appropriate, surface finishes shall be specified together with any required options permitted by the product standard.		N/A
5.6.4	Structural bolting assemblies for preloading		---
	High strength structural bolting assemblies for preloading include system HR, system HV and HRC bolting assemblies. They shall conform to the testing requirements in EN 14399-2 and in the appropriate European Standard as listed in Table 7.		N/A
	Property classes of bolts and nuts and, if appropriate, surface finishes shall be specified together with any required options permitted by the product standard.		N/A
5.6.5	Direct tension indicators		---
	Direct tension indicators and associated HN/HB nut face and bolt face washers shall be in accordance with EN 14399-9.		N/A
	Direct tension indicators shall not be used with weather resistant steels or stainless steels.		N/A
5.6.6	Weather resistant assemblies		---
	Weather resistant assemblies shall be made of improved atmospheric corrosion resistance material the chemical composition of which shall be specified.		N/A
5.6.7	Foundation bolts		---
	The mechanical properties of foundation bolts shall be in accordance with EN ISO 898-1 or fabricated from hot-rolled steel conforming to EN 10025-2 to EN 10025-4.		N/A
	Unless otherwise specified, reinforcing steels shall not be used. If their use is specified, the steel shall conform to EN 10080 and the grade shall be specified.		N/A
5.6.8	Locking devices		---

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Clause	Requirement – Test	Result - Remark	Verdict
	If required, devices which effectively prevent loosening or loss of preload of the assembly if subjected to impact, significant vibration or cyclic loading, shall be specified.		N/A
	For the prevention of loosening, prevailing torque nuts from EN ISO 7040, EN ISO 7042, EN ISO 7719 and EN ISO 10511 and the performance requirements given in EN ISO 2320 may be used unless otherwise specified.		N/A
5.6.9	Washers		--
5.6.9.1	Plain washers		--
	Washers supplied as part of a fastener assembly shall comply with the relevant product standard for that assembly.		N/A
	Washers supplied separately may be used in non-preloaded applications and shall be in accordance with EN ISO 7089, EN ISO 7090, EN ISO 7091, EN ISO 7092, EN ISO 7093-1 or EN ISO 7094 for carbon steel, EN ISO 7089, EN ISO 7090, EN ISO 7092 or EN ISO 7093-1 for stainless steels.		N/A
5.6.9.2	Taper washers		--
	Taper washers shall meet the hardness and other requirements specified for plain washers as specified in 5.6.9.1 with the exception of dimensions applicable to shape, which shall be specified.		N/A
5.6.9.3	Plate washers		--
	Plate washers shall be dimensioned with nominal clearances according to Table 11 and with dimensions that ensure that the washer overlaps the connected component by at least as much as a standard plain washer would when used with normal round holes.		N/A
5.6.10	Solid rivets for hot riveting		--
	Solid rivets for hot riveting shall comply with the relevant product standard, which shall be specified.		N/A
5.6.11	Special fasteners		--
	Special fasteners are fasteners that are not covered by European or International Standards. They shall be specified, as well as any tests necessary.		N/A
5.6.12	Delivery and identification		--
	Fasteners according to 5.6.3 to 5.6.5 shall be delivered and identified in accordance with the requirements of the relevant product standard.		N/A
5.7	Studs and shear connectors		--

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Clause	Requirement – Test	Result - Remark	Verdict
	Studs for arc stud welding shall comply with the requirements of EN ISO 13918.	This product does not reflect the components required by the standard.	N/A
	Studs or shear connectors other than the stud types in EN ISO 13918 shall be classified as special fasteners and comply with 5.6.11.		N/A
5.8	Reinforcing steel welded to structural steel		--
	Reinforcing steels to be welded to structural steel shall be suitable for welding according to EN 10080.		P
5.9	Grouting materials		--
	The grouting materials to be used shall be specified. It shall be cement based grout, special grout or fine concrete.	This product does not reflect the components required by the standard.	N/A
5.10	Expansion joints for bridges		--
	Requirements for type and characteristics of expansion joints shall be specified.	This product does not reflect the components required by the standard.	N/A
5.11	High strength cables, rods and terminations		--
	Wires for high strength cables shall be cold drawn or cold rolled steel wires and conform to the requirements of EN 10264-3 or EN 10264-4. The tensile strength grade and, if appropriate, coating class according to EN 10244-2 shall be specified.	This product does not reflect the components required by the standard.	N/A
	Strands for high strength cables shall conform to the requirements of prEN 10138-3. The designation and class of the strand shall be specified.		N/A
	Steel wire ropes shall conform to the requirements of EN 12385- 1 and EN 12385-10. The minimum breaking load and diameter of the steel wire rope and, if appropriate, requirements related to corrosion protection shall be specified.		N/A
	The filling material for the sockets shall conform to the requirements of EN 13411-4. It shall be selected taking into account service temperature and actions such that continued creeping of the loaded strand through the socket is prevented.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
5.12	Structural bearings		--
	Structural bearings shall comply with the requirements of EN 1337-2, EN 1337-3, EN 1337-4, EN 1337-5, EN 1337-6, EN 1337-7 or EN 1337-8 as relevant.		P
6	Preparation and assembly		--
6.2	Identification		--
	At all stages of manufacturing each piece or package of similar pieces of steel components shall be identifiable by a suitable system.		P
	Identification may be achieved as appropriate by batching or by the shape and the size of the component or by the use of durable and distinguishing marks applied in a way not producing damage. Chiselled notches are not permitted.		P
6.3	Handling and storage		--
	Constituent products shall be handled and stored in conditions that are in accordance with product manufacturer's recommendations.		P
	A constituent product shall not be used beyond a shelf life specified by its manufacturer. Products that have been handled or stored in a way or for a length of time that could have led to significant deterioration shall be checked before use to ensure that they still comply with the relevant product standard.		P
	Structural steel components shall be packed, handled and transported in a safe manner, so that permanent deformation does not occur and surface damage is minimized. Handling and storage preventive measures specified in Table 8 shall be applied as appropriate.		P
6.4	Cutting		--
6.4.2	Shearing and nibbling		--
	The free edge surfaces shall be checked and smoothed as necessary in order to remove significant defects. If grinding or machining is used after shearing or nibbling, the minimum depth of grinding or machining shall be 0,5 mm.		P
6.4.3	Thermal cutting		--
	The capability of automated thermal cutting processes shall be checked annually as set out below.		P
6.4.4	Hardness of free edge surfaces		--
	Processes that are likely to produce local hardness shall have		P

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Clause	Requirement – Test	Result - Remark	Verdict
	their capability checked.		
	For carbon steels ≥ S460 the hardness of free edge surfaces shall be no more than 450 (HV10).		P
	The execution specification may specify other requirements for the hardness of free edge surfaces.		P
6.5	Shaping		---
6.5.2	Hot forming		---
	Shaping by hot forming shall conform to the requirements relating to hot forming in the relevant product standard and to the recommendations of the steel manufacturer. Unless otherwise specified, hot forming of stainless steels is not permitted.		P
	For steels according to EN 10025-4 and in the delivery condition +M according to EN 10025-2 hot forming is not permitted.		P
	For quenched and tempered steels, hot forming is not permitted unless the requirements of EN 10025-6 are fulfilled.		P
	Shaping by hot forming (T > 580 °C) of components is not permitted if the nominal yield strength is achieved by cold forming.		P
	For steel grades up to and including S355, the hot forming process shall take place in the red hot (600 °C to 650 °C) state and the temperature, timing and cooling rate shall be appropriate to the particular type of steel. Bending and forming in the blue heat range (250 °C to 380 °C) is not permitted.		P
	For steel grades S450+N (or +AR) according to EN 10025-2, and S420 and S460 according to EN 10025-3, the hot forming process shall take place in the temperature range 960 °C to 750 °C with subsequent cooling at air temperature. The cooling rate should be such as to prevent hardening as well as excessive grain coarsening. If this is not practicable, a subsequent normalizing treatment shall be carried out.		P
	Hot forming is not allowed for S450 according to EN 10025-2 if no delivery condition is indicated.		P
6.5.3	Flame straightening		---
6.5.3.2	Additional requirements for stainless steels		---
6.5.4	Cold forming		---
	Shaping by cold forming, produced either by roll forming, pressing or folding shall conform to the requirements for cold formability given in the relevant product standard. Hammering		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	shall not be used.		
6.6	Holing		---
6.6.1	Dimensions of holes		---
	This clause applies to the making of holes for connections with mechanical fasteners and pins.		P
	The definition of the nominal hole diameter combined with the nominal diameter of the bolt to be used in the hole determines whether the hole is “normal” or “oversize”. The terms “short” and “long” applied to slotted holes refer to two types of holes used for the structural design of preloaded bolting assemblies.		P
	These terms may be used also to designate clearances for non-preloaded bolting assemblies.		P
6.6.2	Tolerances on hole diameter for bolts and pins		---
6.6.3	Execution of holing		---
6.7	Cut outs		---
	Over-cutting of re-entrant corners shall not be permitted. Re-entrant corners are those where the open angle between the faces is less than 180°.		P
	Unless otherwise specified, re-entrant corners and notches shall be rounded off with a minimum radius of 5mm.		P
	Unless otherwise specified, punched cut outs are permitted. At punched cut outs in plates over 16 mm in thickness, the deformed materials shall be removed by grinding.		P
6.8	Full contact bearing surfaces		---
	If full contact bearing surfaces are specified, the cutting length, squareness of ends and flatness of bearing surfaces shall comply with the tolerances specified in Clause 11.		P
6.9	Assembly		---
	Assembly of components shall be carried out so as to fulfil the specified tolerances.		P
	Precautions shall be taken so as to prevent galvanic corrosion produced by contact between different metallic materials.		P
	Contamination of stainless steel by contact with structural steel shall be avoided.		P
6.10	Assembly check		---
	The fit between manufactured components that are inter-		P

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Clause	Requirement – Test	Result - Remark	Verdict
	connected at multiple connection interfaces shall be checked using dimensional templates, accurate three-dimensional measurements or by trial assembly. Requirements for whether, and to what extent, trial assembly is to be used shall be specified.		
	Trial assembly means putting together sufficient components of a whole structure to check that they fit.		P
	It should be considered to prove fit-up between components if this is not provable by using templates or measurement.		P
7	Welding		---
7.2	Welding plan		---
7.2.1	Requirements for a welding plan		---
	A welding plan shall be provided as part of the production planning required by the relevant part of the EN ISO 3834 series.		P
7.2.2	Content of a welding plan		---
7.3	Welding processes		---
	Welding processes that may be used, and their associated reference numbers, are defined in EN ISO 4063.		P
7.4	Qualification of welding procedures and welding personnel		---
7.4.1	Qualification of welding procedures		---
7.4.1.2	Qualification of welding procedures for processes 111, 114, 12, 13 and 14		---
	The qualification of the welding procedure for processes 111, 114, 12, 13 and 14 depends on the execution class, the parent metal and the degree of mechanization in accordance with Table 12.		P
7.4.1.3	Qualification of welding procedures for other welding processes		---
	The qualification of welding procedures of welding processes not covered in 7.4.1.2 shall be performed according to Table 13.		P
7.4.1.4	Validity of a welding procedure qualification		---
	The validity of a welding procedure depends on the requirements of the standard used for the qualification. If specified, welding production tests shall be carried out in accordance with the relevant standard of qualification, e.g. EN ISO 14555, EN ISO 11970, EN ISO 17660-1, EN ISO 17660-2, EN ISO 17652-2.		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.4.2	Welders and welding operators		---
7.4.2.2	Branch connections		---
7.4.3	Welding coordination		---
	For EXC1, a sufficient supervision during the execution of welding works shall be provided as specified in EN ISO 3834-4.	EXC1	P
	For EXC2, EXC3 and EXC4, welding coordination shall be maintained during the execution of welding processes by welding coordination personnel suitably qualified for, and experienced in the welding operations they supervise as specified in EN ISO 14731.		N/A
	With respect to the welding operations being supervised, welding coordination personnel shall have a technical knowledge according to Tables 14 and 15 in which B, S and C are respectively basic, specific and comprehensive knowledge as specified in EN ISO 14731.		P
7.5	Preparation and execution of welding		---
7.5.1	Joint preparation		---
7.5.1.2	Hollow sections		---
	Circular hollow sections being used as branch components in fillet-welded joints may be cut in straight segments to prepare them for interconnection at saddle joints provided that the fit-up of the joint geometry suits the requirements of the WPS.		P
	For joints between hollow sections welded from one side, the joint preparations given EN ISO 9692-1 and EN ISO 9692-2 shall be used, as appropriate. Annex E illustrates the application given in EN ISO 9692-1 and EN ISO 9692-2 to branch joints between hollow sections.		P
7.5.2	Storage and handling of welding consumables		---
	The welding consumables shall be stored, handled and used in accordance with the manufacturer's recommendations.		P
	If electrodes and fluxes need to be dried and stored, appropriate temperature levels and times shall be fulfilled in accordance with the manufacturer's recommendations.		P
	Welding consumables showing signs of damage shall be rejected.		P
7.5.3	Weather protection		---
	Both the welder and the working area shall be adequately protected against the effects of wind, rain and snow.		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.5.4	Assembly for welding		--
	Components to be welded shall be brought into alignment and held in position by tack welds or external devices and maintained during initial welding. Assembly shall be carried out such that the fit-up of joints and the final dimensions of the components are all within the specified tolerances. Suitable allowances shall be made for distortion and shrinkage.		P
	The components to be welded shall be assembled and held in position such that the joints to be welded are readily accessible and easily visible to the welder.		P
	Assembly of hollow section components to be welded should be in accordance with the guidance given in Annex E, unless otherwise specified.		P
	Additional welds shall not be introduced, and the locations of specified welds shall not be changed without ensuring compliance with the specification. Methods of locally strengthening a welded joint in a hollow section lattice structure should facilitate the testing of the integrity of the as-welded joint. The alternative of thickening the component should also be considered.		P
7.5.5	Preheating		--
	Preheating, when required, shall be carried out in accordance with EN ISO 13916, EN 1011-2 and/or EN 1011-3.		P
	If required, preheat shall be undertaken according to the applicable WPS and be applied during welding, including tack welding and the welding of temporary attachments.		P
7.5.6	Temporary attachments		--
	If the assembly or erection procedure requires the use of components temporarily attached by welds, they shall be positioned such that they can easily be removed without damage to the permanent steelwork. All welds for temporary attachments shall be made in accordance with the WPS. Any areas where welding of temporary attachments is not permitted shall be specified.		P
	Possible restrictions on the use of temporary attachments for EXC3 and EXC4 shall be specified in the execution specification.	EXC1	N/A
	The removal of temporary welded attachments by cutting, gouging or chipping shall be carried out in such a way that the parent metal is not damaged and shall subsequently be carefully ground smooth. The removal locations shall be visually inspected and for steel grades ≥ S355 shall be		P

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Clause	Requirement – Test	Result - Remark	Verdict
	subjected to NDT.		
	Chipping and gouging are not permitted on steel grades ≥ S460 or on components subject to fatigue, unless otherwise specified.		P
	After removal, inspection shall be carried out to ensure that the constituent product is not cracked on the surface at the temporary weld location.		P
7.5.7	Tack welds		--
	For EXC2, EXC3 and EXC4, tack welds shall be made using a welding procedure specification based on a suitable qualified welding procedure. The minimum length of the tack shall be the lesser of four times the thickness of the thicker part or 50 mm, unless a shorter length can be demonstrated as satisfactory by test.	EXC1	N/A
	All tack welds not incorporated into the final welds shall be removed. Tack welds that are to be incorporated into the final weld shall have a suitable shape and be carried out by qualified welders. Tack welds shall be free from deposition faults and shall be cleaned thoroughly before final welding. Tack welds with impermissible defects, such as cracks, shall be removed.		N/A
7.5.8	Fillet welds		--
7.5.8.2	Fillet welds on member connections		--
	Fillet welds terminating at the ends or sides of components shall be returned continuously around the corners for a distance of not less than twice the leg length of the weld unless access or configuration renders this impracticable or unless otherwise specified.		P
	The minimum length of a run of fillet weld, excluding end returns, shall be at least four times the leg length of the weld.		P
	Intermittent fillet welds shall not be used where capillary action could lead to the formation of rust pockets. End runs of fillet welds shall extend to the end of the part connected.		P
	For lap joints, the minimum lap shall be not less than four times the thickness of the thinner connected part. Single fillet welds shall not be used if the parts are not restrained to prevent opening of the joint.		P
	If the end of a component is connected only by longitudinal fillet welds, the length of each weld (L we) shall not be less than 75 % of the transverse spacing between them (b) (see Figure 2).		P
7.5.9	Butt welds		--

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Clause	Requirement – Test	Result - Remark	Verdict
7.5.9.2	Single sided welds		--
	Full penetration welds welded from one side may be produced with or without metallic or non-metallic backing material.		P
	Unless otherwise specified, permanent steel backing material may be used. The requirements for its use shall be included in the WPS.		P
	If steel backing is used, it shall have a carbon equivalent value (CEV) not exceeding 0,43 %, or be the same material as the most weldable of the parent metal to be joined by the weld.		P
	Backing materials shall be fitted tightly to the parent metal and should preferably be continuous for the full length of the joint. For EXC3 and EXC4, permanent backing metal shall be made continuous by means of full penetration butt welds. Tack welds shall be included in the butt welds.	EXC1	N/A
	Flush grinding of single-sided butt welds in joints between hollow sections executed without backing is not permitted, unless otherwise specified; if those welds are fully backed they may be ground off flush with the general surface profile of the parent metal.		P
7.5.9.3	Back gouging		--
	Back gouging shall be carried out to a sufficient depth to eliminate unacceptable imperfections in the weld metal.		P
	Back gouging shall produce a contour of a single U-shaped groove with its fusion faces readily accessible for welding.		P
7.5.10	Welds on steels with improved atmospheric corrosion resistance		--
	Welds on steels with improved atmospheric resistance shall be carried out using appropriate welding consumables (see Table 6). As a further option, C-Mn consumables may be used for the body of a multi-run fillet or butt weld, provided the capping runs and/or surface layer are made using suitable consumables.		P
7.5.11	Branch connections		--
	Branch connections in hollow section lattice structures, which use combined welded joints (fillet weld and single-sided butt weld), may be welded without backing.		P
7.5.12	Stud welding		--
	Stud welding shall be carried out in accordance with EN ISO 14555.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Procedure testing undertaken in accordance with EN ISO 14555 shall be consistent with the application.		P
7.5.13	Slot and plug welds		--
	Holes for slot and plug welds shall be proportioned so that adequate access can be provided for welding.		P
	Dimensions shall be specified.		P
7.5.14	Other weld types		--
	The requirements for other weld types, e.g. seal welds, shall be specified and shall be subject to the same welding requirements as specified in this European Standard.		P
7.5.15	Post-weld heat treatment		--
	If heat treatment of welded components is necessary, it shall be demonstrated that the procedures used are appropriate.		P
7.5.16	Execution of welding		--
	Precautions shall be taken to avoid stray arcing, and if stray arcs do occur outside the weld fusion face, the surface of the steel shall be lightly ground and checked. Visual checking for steel grades ≥ S460 and other grades if specified, should be supplemented by penetrant or magnetic particle testing.		P
	Precautions shall be taken to minimize weld spatter. Unless otherwise specified, for steel grades ≥ S460 it shall be removed.		P
	Visible imperfections such as cracks, cavities and other not permitted imperfections shall be removed from each run before deposition of further runs.		P
	All slag shall be removed from the surface of each run before each subsequent run is added and from the surface of the finished weld. Particular attention shall be paid to the junctions between the weld and the parent metal.		P
	Any requirements for grinding and dressing of the surface of completed welds shall be specified.		P
7.5.17	Welding of orthotropic bridge decks		--
	Production tests shall be carried out according to 12.4.4 c). Production tests are not required for stiffener-deck plate connection outside the roadway (kerbs) which is without loading by vehicles.		P
	For stiffener-deck plate connections and local welds, e.g. at stiffener-stiffener connections with splice plates the starts and stops shall be removed.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	For stiffener-crossbeam connections with stiffeners passing through the crossbeam with or without cope holes at first the stiffeners should be welded to the deck plate and the crossbeams subsequently assembled and welded.		P
7.6	Acceptance criteria		--
7.6.1	Routine requirements		--
	Welded components shall comply with the requirements specified in Clauses 10 and 11.		P
7.6.2	Fatigue requirements		--
	Unless otherwise specified, for welds subject to fatigue designed according to EN 1993-1-9, the execution specification shall specify the relevant acceptance criteria in terms of the detail category (DC) for the welded joint location.		P
7.6.3	Orthotropic bridge decks		--
	If specified in the execution specification, welds in orthotropic bridge decks, as shown in EN 1993-1-9:2005, Table 8.8, shall meet the requirements of 7.6.1 together with the requirements of EN 1993-2:2006.		P
7.7	Welding of stainless steels		--
	The requirements for welding different stainless steel types to each other or to other steels, such as carbon steels, shall be specified.		P
	The welding coordinator shall take into account the appropriate welding techniques, welding processes and welding consumables. The issues associated with contamination of the stainless steel and galvanic corrosion should be considered carefully.		P
8	Mechanical fastening		--
8.2	Use of bolting assemblies		--
8.2.2	Bolts		--
	The nominal fastener diameter used for structural bolting shall be at least M12, unless otherwise specified together with the associated requirements.	This product does not reflect the components required by the standard.	N/A
	The bolt length shall be chosen such that after tightening the following requirements are met for bolt end protrusion beyond the nut face and the thread length.		N/A
	The length of protrusion shall be at least the length of one thread pitch measured from the outer face of the nut or		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	additional locking devices to the end of the bolt for preloaded and non-preloaded assemblies.		
	If it is intended that a connection utilizes the shear capacity of the unthreaded shank of bolts, then the dimensions of the bolts shall be specified to allow for the tolerances on the length of the unthreaded portion.		N/A
	For non-preloaded bolts, at least one full thread (in addition to the thread run out) shall remain clear between the bearing surface of the nut and the unthreaded part of the shank.		N/A
	For preloaded bolting assemblies in accordance with the EN 14399 series clamp lengths and grip lengths shall be chosen in accordance with the relevant product standards.		N/A
	The tabulated nominal clamp lengths and grip lengths in the EN 14399 series take into account that between the bearing surface of the nut and the unthreaded part of the shank in assemblies according to EN 14399–4 and EN 14399–8 nominally at least two full threads and in assemblies according to EN 14399–3, EN 14399–7 and EN 14399–10 nominally at least four full threads shall remain clear.		N/A
8.2.4	Washers		--
	Washers are not required for use with non-preloaded bolting assemblies in normal round holes, unless otherwise specified. If required, it shall be specified whether washers are to be placed under the nut or the bolt head, whichever is rotated, or both. For single lap connections with only one bolt row, washers are necessary under both bolt head and the nut, unless otherwise specified.	This product does not reflect the components required by the standard.	N/A
8.3	Tightening of non-preloaded bolting assemblies		--
	The connected components shall be drawn together such that they achieve firm contact.	This product does not reflect the components required by the standard.	N/A
	Shims may be used to adjust the fit. For constituent products with $t \geq 4$ mm for plates and sheeting and $t \geq 8$ mm for sections, unless full contact bearing is specified, residual gaps of up to 4 mm may be left at the edges on condition that contact bearing is achieved at the central part of a connection.		N/A
	Each bolting assembly shall be brought at least to a snug-tight condition, with special care being given to avoid over-tightening especially short bolts and M12. The tightening process shall be carried out from bolt to bolt of the group, starting from the most rigid part of the connection and moving		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	progressively towards the least rigid part. To achieve a uniform snug-tight condition, more than one cycle of tightening may be necessary.		
8.4	Preparation of contact surfaces in slip resistant connections		--
	This clause is not applicable to stainless steels for which any requirement related to contact surfaces shall be specified. This clause does not deal with corrosion protection for which requirements are specified in Clause 10 and Annex F.	This product does not reflect the components required by the standard.	N/A
	The area of contact surfaces in preloaded slip-resistant connections shall be specified.		N/A
8.5	Tightening of preloaded bolting assemblies		--
8.5.2	Torque reference values		--
8.5.3	Torque method		--
	The bolting assemblies shall be tightened using a torque wrench offering a suitable operating range. Hand or power operated wrenches may be used. Impact wrenches may be used for the first step of tightening for each bolt.	This product does not reflect the components required by the standard.	N/A
	The tightening torque shall be applied continuously and smoothly.		N/A
8.5.4	Combined method		--
8.5.5	HRC method		--
	The HRC bolts shall be tightened using a specific shear wrench equipped with two co-axial sockets, which react by, torque one against the other. The outer socket, which engages the nut, rotates clockwise. The inner socket, which engages the spline end of the bolt, rotates anticlockwise.	This product does not reflect the components required by the standard.	N/A
8.5.6	Direct tension indicator method		--
	This subclause applies to direct tension indicators in accordance with EN 14399-9, which indicate at least the required minimum preload has been achieved, by monitoring the force in the bolt. It does not cover indicators that rely on torsion. It does not apply to direct measurement of bolt preload by use of hydraulic instruments.	This product does not reflect the components required by the standard.	N/A
	The direct tension indicators and their associated washers shall be assembled as specified in EN 14399-9.		N/A
	The first step of tightening to reach a uniform “snug-tight” condition of a fastener assembly shall be when initial deformation of the DTI protrusions begins. This first step shall be completed for all bolting assemblies in one connection		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	prior to commencement of the second step.		
	The second step of tightening shall be as EN 14399-9. The gaps measured on the indicating washer may be averaged to establish the acceptability of the bolting assembly.		N/A
8.6	Fit bolts		--
	8.1 to 8.5 apply as appropriate in addition to the requirements below.	This product does not reflect the components required by the standard.	N/A
	The length of the threaded portion of the shank of the fit bolt (including thread run out) included in the bearing length shall not exceed 1/3 of the thickness of the plate (t), unless otherwise specified (see Figure 4).		N/A
8.7	Hot riveting		--
8.7.1	Rivets		--
	Every rivet shall be of sufficient length to provide a head of uniform dimensions, a complete filling of the hole and to avoid surface indentation by the riveting machine on the outer faces of the plies.	This product does not reflect the components required by the standard.	N/A
8.7.2	Installation of rivets		--
	The connected components shall be drawn together such that they achieve firm contact and held together during riveting.	This product does not reflect the components required by the standard.	N/A
	Eccentricity between common holes for the same rivet shall be no more than 1 mm. To meet this requirement, reaming is permitted. Following reaming it may be necessary to install a larger diameter of rivet.		N/A
	For multiple riveted connections, a temporary bolt shall be tightened in at least every fourth hole prior to driving which shall start at the middle of the rivet group. Special measures shall be taken to hold components of single riveted connections together (e.g. clamping).		N/A
	If practicable, riveting shall be carried out using machines of the steady pressure type. After the upsetting is complete, the driving pressure shall be maintained on the rivets for a short time sufficient for the head to be black when the machine is disengaged.		N/A
	Every rivet shall be heated uniformly throughout its length,		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	without burning or excessive scaling. It shall be at a consistent bright red heat from the head to point when inserted and shall be upset in its entire length when hot, so as to fill the hole completely. Special care shall be taken in heating and driving long rivets.		
	Every rivet shall be freed from scale by striking the hot rivet on a hard surface after being heated and before being inserted into the hole.		N/A
	A burned rivet shall not be used. A heated rivet not used immediately shall not be re-heated for use.		N/A
	If a flush surface of countersunk rivets is specified protruding rivet metal shall be chipped or ground off.		N/A
8.7.3	Acceptance criteria		--
	The rivet heads shall be centred. The head eccentricity relative to the shank axis shall not exceed 0,15 d 0 where d 0 is the hole diameter.	This product does not reflect the components required by the standard.	N/A
	The rivet heads shall be well formed and shall not show cracks or pits.		N/A
	The rivets shall be in satisfactory contact with the assembled parts both at the outer surface of the plies and in the hole. No movement or vibration shall be detected when the rivet head is lightly tapped with a hammer.		N/A
	A small well-formed and centred lip may be accepted if only a small number of rivets in the group are concerned.		N/A
	The execution specification may specify that the outerfaces of plies shall be free of indentation by the riveting.		N/A
	If countersunk rivets are specified, the heads shall fill the countersink completely after riveting. If the countersinking is not completely filled, the rivet shall be replaced.		N/A
	Any rivet not meeting the acceptance criteria shall be removed and replaced by a new one.		N/A
8.8	Use of special fasteners and fastening methods		--
	Special fasteners shall be used and special fastening methods shall be performed in accordance with the product manufacturer's recommendations, and the appropriate sections of 8.1 to 8.7. This also applies to bolts connecting steelwork to other construction materials including chemically anchored foundation bolts.	This product does not reflect the components required by the standard.	N/A
8.9	Galling and seizure of stainless steels		--

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Clause	Requirement – Test	Result - Remark	Verdict
	Galling may result from local adhesion and rupture of surfaces under load and in relative motion during fastening. In some cases, weld bonding and seizure may result.	This product does not reflect the components required by the standard.	N/A
9	Erection		---
9.2	Site conditions		---
9.3	Erection method		---
9.3.1	Design basis for the erection method		---
9.3.2	Constructor's erection method		---
	A method statement describing the constructor's erection method shall be prepared and it shall be checked in accordance with design rules, notably against resistance of the partly erected structure to erection loads and other loading.		P
	The erection method statement may deviate from the design basis method of erection, provided that it is a safe alternative.		P
	Amendments to the erection method statement, including those necessitated by site conditions, shall be checked and reviewed in accordance with the above requirement.		P
	The erection method statement shall describe procedures to be used to safely erect the steelwork and shall take into account the technical requirements regarding the safety of the works.		P
	The procedures should link to specific work instructions.		P
9.4	Survey		---
9.4.1	Reference system		---
	Unless otherwise specified, site measurements for the works shall be related to the system established for the setting out and measurement of the construction works in accordance with ISO 4463-1.		P
	A documented survey of a secondary net shall be provided and used as the reference system for setting out the steelwork and establishing the deviations of supports. The coordinates of the secondary net given in this survey shall be accepted as true provided that they comply with the acceptance criteria specified in ISO 4463-1.		P
	The reference temperature for setting out and measuring the steelwork shall be specified.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.4.2	Position points		--
	The position points, which mark the intended position for the erection of individual components, shall be in accordance with ISO 4463-1.		P
9.5	Supports, anchors and bearings		--
9.5.1	Inspection of supports		--
	The condition and location of the supports shall be checked using appropriate visual and measurement means before the commencement of erection.		N/A
	If supports are unsuited to erection, they shall be corrected prior to the commencement of erection.		N/A
	Nonconformities shall be documented.		N/A
9.5.2	Setting out and suitability of supports		--
	All foundations, foundation bolts and other supports for the steelwork shall be suitably prepared to receive the steel structure. Installation of structural bearings shall comply with the requirements of EN 1337-11.		N/A
	Erection shall not commence until the location and levels of the supports, anchors or bearings comply with the acceptance criteria in 11.2, or an appropriate amendment to the specified requirements has been issued.		N/A
	The compliance survey used to check the positions of the supports shall be documented.		N/A
	If foundation bolts anchored to a grillage are to be pre-stressed, arrangements shall be made that the bolt has no adhesion to the concrete over its full length.		N/A
	Foundation bolts intended to move in sleeves should be provided with sleeves three times the diameter of the bolt with a minimum of 75 mm.		N/A
9.5.3	Maintaining suitability of supports		--
	Whilst erection is proceeding, the supports for the steelwork shall be maintained in an equivalent condition to their condition at the commencement of erection.		P
	Areas of supports that require protection against rust staining should be identified and appropriate protection provided.		P
	Compensation for settlement of supports is acceptable, unless otherwise specified. This shall be done by grouting or packing between steelwork and support.		P
9.5.4	Temporary supports		--

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Clause	Requirement – Test	Result - Remark	Verdict
	Shims and other supporting devices used as temporary supports under base plates shall present a flat surface to the steel and be of adequate size, strength and rigidity to avoid local crushing of the substructure concrete or masonry.		N/A
	If packings are subsequently to be grouted, they shall be placed so that the grout totally encloses them with a minimum cover of 25 mm, unless otherwise specified.		N/A
	For bridges, packings shall not be left in position, unless otherwise specified.		N/A
	If packings are left in position after grouting, they shall be made from materials with the same durability as the structure.		N/A
	If adjustment to the position of the base is achieved using levelling nuts on the foundation bolts under the base plate these may be left in position, unless otherwise specified. The nuts shall be selected to ensure that they are suitable to maintain the stability of the part-erected structure but not to jeopardize the performance of the foundation bolt in service.		N/A
9.5.5	Grouting and sealing		--
9.5.6	Anchoring		--
	Anchoring devices in concrete parts of the structure or adjacent structures shall be set in accordance with their specification.		N/A
	Suitable measures shall be taken to avoid damage to concrete in order to achieve the necessary anchoring resistance.		N/A
9.6	Erection and work at site		--
9.6.1	Erection drawings		--
	Erection drawings or equivalent instructions shall be provided and form a part of the erection method statement.		P
	Drawings shall be prepared showing plans and elevations and at such a scale that the erection marks for all components can be shown on them.		P
	Drawings shall show grid locations, bearing positions and assembly of components together with requirements for tolerances.		P
	Foundation plans shall show the base location and orientation of the steelwork, any other components in direct contact with the foundations, their base location and level, the intended bearing level and the datum level. Foundations shall include column base support and other structural supports.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Elevations shall show required levels for floors and/or structure.		P
	Drawings shall show necessary details for fixing of steel or bolts to the foundations, the method of adjustment by packing and wedging and grout requirements as well as fixing of steelwork and bearings to their supports.		N/A
	Drawings shall show details and arrangements of any steelwork or other temporary works necessary for erection purposes to ensure the stability of the construction or the safety of personnel.		P
	Drawings shall state the weight of all components or assemblies over 5 tonnes and the centre of gravity of all large irregular pieces.		N/A
9.6.2	Marking		--
	Components that are individually assembled or erected at the site shall be allocated an erection mark.		P
	A component shall be marked with its erected orientation if this is not clear from its shape.		P
	Marking methods shall comply with 6.2.		P
9.6.3	Handling and storage on site		--
	Handling and storage on site shall comply with the requirements of 6.3 and those given below.		P
	Components shall be handled and stacked in such a way that the likelihood of damage is minimized.		P
	Particular attention shall be paid to slinging methods to avoid damage to the steelwork and protective treatment.		P
	Steelwork damaged during off-loading, transportation, storage or erection shall be restored to conformity.		P
	The procedure for restoration shall be defined before undertaking the repair. For EXC2, EXC3 and EXC4 the procedure shall also be documented.	EXC1	N/A
	Fasteners stored on site shall be kept in dry conditions prior to use and shall be suitably packed and identifiable. The fasteners shall be handled and used in accordance with the manufacturer's recommendations.		P
	All small plates and other fittings shall be suitably packed and identified.		P
9.6.4	Trial erection		--
9.6.5	Erection works		--

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Clause	Requirement – Test	Result - Remark	Verdict
9.6.5.2	Temporary works		--
	All temporary bracing and temporary restraints shall be left in position until erection is sufficiently advanced to allow its safe removal.		P
	If it is required that bracings in tall buildings are to be de-stressed as erection progresses, to release the forces induced in them by vertical loads, this shall be carried out progressively one panel at a time. During such de-stressing sufficient alternative bracing shall be in place to ensure stability. If necessary, additional bracing shall be added temporarily for this purpose.		P
	All connections for temporary components provided for erection purposes shall be made in accordance with the requirements of this European Standard and in such a way that they do not weaken the permanent structure or impair its serviceability.		P
	If backing bars and draw cleats are used to support the structure during welding, it shall be ensured that they are suitable for the erection load conditions.		P
	If the erection procedure involves rolling or otherwise moving the structure, or part of the structure, into its final position after assembly, provision shall be made for controlled braking of the moving mass.		P
	Provision for reversing the direction of movement may need to be considered.		P
	All temporary anchoring devices shall be made secure against unintentional release.		N/A
	Only jacks that can be locked in any position under load shall be used unless other safety provisions are made.		P
9.6.5.3	Fit-up and alignment		--
	Care shall be taken that no part of the structure is permanently distorted or over-stressed by stacking of steelwork components or by erection loads during the erection process.		P
	Each part of the structure shall be aligned as soon as practicable after it has been erected and final assembly completed as soon as possible thereafter.		P
	Permanent connections shall not be made between components until sufficient of the structure has been aligned, levelled, plumbed and temporarily connected to ensure that components will not be displaced during subsequent erection or alignment of the remainder of the structure.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Alignment of the structure and lack of fit in connections may be adjusted by the use of shims. Shims shall be secured where they are in danger of coming loose.		N/A
	Shims shall be made of flat steel, unless otherwise specified. Shims shall have similar durability to that of the structure. For stainless steel structures, they shall be made of stainless steel.		N/A
	If shims are used to align structures composed of coated material, the shims shall be protected in a similar manner to provide the specified durability unless the shims are required to meet a specified friction classification.		N/A
	Gaps in non-preloaded bolted connections shall conform to 8.3. Prior to preloading, gaps in preloaded bolted connections shall conform to 8.5.1.		N/A
	If lack-of-fit between erected components cannot be corrected by the use of shims, components of the structure shall be locally modified in accordance with the methods specified in this European Standard.		N/A
	The modifications shall not compromise the performance of the structure in the temporary or permanent state. This work may be executed on site. Care shall be taken with structures built of welded latticed components and space structures to ensure that they are not subjected to excessive forces in an attempt to force a fit against their inherent rigidity.		P
	Unless otherwise specified, drifts may be used to align connections. Elongation of holes for bolts used for transmission of loads shall not be more than the values given in 6.9.		N/A
	In case of misalignment of holes for bolts, the method of correction shall be checked for consistency with the requirements of Clause 12.		N/A
	Realigned holes may be proven to comply with the oversize or slotted hole requirements specified in 6.6 provided the load path has been checked.		P
	Correction of misalignment by reaming or using a hollow milling cutter is preferred, but if the use of other cutting methods is unavoidable, the internal finish of all holes formed by these other methods shall be specifically checked for consistency with the requirements of Clause 6.		P
	Completed site connections shall be checked in accordance with 12.5.		P
10	Surface treatment		--

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Clause	Requirement – Test	Result - Remark	Verdict
10.2	Preparation of steel substrates for paints and related products		--
	These requirements do not apply to products subject to hot dip galvanizing or metal spraying or to stainless steels, except for any requirements relating to the surface cleanness of stainless steels, which shall be specified.		N/A
	Substrates (i.e. surfaces, welds and edges of steel components) to which paints and related products are to be applied shall be prepared using the methods described in the EN ISO 8504 series.		N/A
	In terms of cleanliness, roughness and preparation grade, substrates shall be prepared to meet the criteria appropriate to the products that are to be applied. If the expected life of the corrosion protection and corrosivity category are specified, the preparation grade according to EN ISO 8501-3 shall be in accordance with Table 22. If the expected life of the corrosion protection and corrosivity category are not specified, P1 shall apply, unless otherwise specified.		N/A
10.3	Weather resistant steels		--
	If it is necessary to ensure that the surface of uncoated weather resistant steels is acceptable visually after weathering, the execution specification shall specify applicable procedures including, as appropriate, those necessary to prevent contamination (e.g. from oil, grease, paint, concrete or asphalt).		P
10.4	Galvanic coupling		--
	Unintended contact between different metallic constituent products, e.g. stainless steels to aluminium, or structural steel shall be avoided. If stainless steel is to be welded to structural steel, corrosion protection for the steel structure shall continue from the weld on to the stainless steel by 20 mm as a minimum (see also 6.3, 6.9 and 7.7).		P
10.5	Hot dip galvanizing		--
10.6	Sealing of spaces		--
	If enclosed spaces are to be sealed by welding or provided with internal protective treatment, the internal treatment system shall be specified.		P
	If spaces are to be fully enclosed by welds, it shall be specified if weld imperfections permitted under the execution specification require sealing by application of suitable filler material to prevent the ingress of moisture. If welds are for sealing purposes only, those welds shall be visually inspected. If required, further inspection shall be specified.		P

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Clause	Requirement – Test	Result - Remark	Verdict
10.7	Surfaces in contact with concrete		---
	Surfaces that are to be in contact with concrete including the undersides of baseplates shall be coated with the protective treatment applied to the steelwork, excluding any aesthetic finishing coat, for a minimum of the first 50 mm of the embedded length, unless otherwise specified, and the remaining surfaces need not be coated unless specified. If uncoated, such surfaces shall be blast cleaned or hand/power tool cleaning to remove loose mill scale and cleaned to remove dust, oil and grease.		N/A
	Immediately before concreting, any loose rust, dust and other loose debris shall be removed by cleaning.		N/A
10.8	Inaccessible surfaces		---
	Areas and surfaces that are difficult to access after assembly should be treated before assembly.		P
	In slip resistant connections, faying surfaces shall meet the requirements necessary to develop the friction for the specified surface treatment (see 8.4). Other preloaded connections shall not be made with excess paint on the faying surfaces. As a maximum, faying surfaces and surfaces beneath washers shall be treated with a primer and midcoat, unless otherwise specified (see F.4).		P
	Unless otherwise specified, bolted connections including the perimeter around such connections shall be treated with the full corrosion protection system specified for the remainder of the steelwork.		N/A
10.9	Repairs after cutting or welding		---
	It shall be specified if repair, or additional protective treatment, is required to cut edges and adjacent surfaces after cutting or after welding.		P
	If precoated constituent products are to be welded, the methods and extent of repair necessary to the coating shall be specified.		N/A
	If hot dip galvanizing to surfaces has been removed or damaged by welding, the surfaces shall be cleaned, prepared and treated with a zinc rich primer and paint system offering a similar level of corrosion protection as the hot dip galvanizing for the given corrosivity category (see EN ISO 1461 for additional guidance).		N/A
10.10	Cleaning of stainless steel components		---
	Cleaning procedures shall be appropriate for the grade of constituent product, surface finish, function of the component		P

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Clause	Requirement – Test	Result - Remark	Verdict
	and corrosion risk. The method, level and extent of cleaning shall be specified.		
11	Geometrical tolerances		---
11.1	Tolerance types		---
11.2	Essential tolerances		---
11.2.2	Manufacturing tolerances		---
11.2.2.1	Rolled sections		---
	Hot rolled, hot finished or cold formed structural products shall conform to the tolerances specified by the relevant product standard. These tolerances continue to apply to components manufactured from such products, unless superseded by more stringent criteria specified in Annex B.		N/A
11.2.2.2	Welded sections		---
	Welded components manufactured from plates shall conform to the permitted deviations in Table B.1 and Tables B.3 to B.6.		N/A
	As an example, cross-sectional tolerances for welded sections manufactured from split rolled sections would be in accordance with the relevant product standard except for overall depth and web geometry which should be in accordance with Table B.1.		N/A
11.2.2.3	Cold formed sections		---
	Components cold formed by pressing shall conform to the permitted deviations in Table B.2. For components fabricated from rolled cold formed sections, see 11.2.2.1.		N/A
	As an example, cross sectional tolerances from EN 10162 apply to cold rolled sections whereas Table B.2 applies to sections formed by pressing.		N/A
11.2.2.4	Stiffened plating		---
	Stiffened plating shall conform to the permitted deviations in Table B.7.		N/A
11.2.2.5	Shells		---
	Shell structures shall conform to the permitted deviations in Table B.11, in which the choice of the appropriate class shall be based on EN 1993-1-6.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
11.2.3	Erection tolerances		---
11.2.3.1	Reference system		---
	Deviations of erected components shall be measured relative to their position points (see the ISO 4463 series). If a position point is not established, deviations shall be measured relative to the secondary system.		N/A
11.2.3.2	Foundation bolts and other supports		---
	The position of the centre points of a group of foundation bolts or other support shall not deviate by more than ±6 mm from its specified position relative to the secondary system.		N/A
	A best-fit position should be chosen to assess a group of adjustable foundation bolts.		N/A
	The execution specification shall specify special tolerances, if these are required, for continuously supported shells (such as flatness or local slope of foundations or other structural supports).		N/A
11.2.3.3	Column bases		---
	Holes in baseplates and other plates used for fixing to supports should be dimensioned to allow clearances to match the permitted deviations for the supports to those for the steelwork. This may require the use of large washers between the nuts on the holding down bolts and the top of the baseplate.		N/A
11.2.3.4	Columns		---
	The deviations of erected columns shall conform to the permitted deviations in Tables B.15, B.17 and B.18.		N/A
11.2.3.5	Full contact bearing		---
	Where full contact bearing is specified, the fit-up between surfaces of erected components shall be in accordance with Table B.19 after alignment.		N/A
	For bolted splices, shims may be used where the gap exceeds the specified limits after initial bolting-up, to reduce the gaps to within the permitted deviation, unless otherwise specified in the execution specification. The shims may be made of flats according to EN 10025-2 with a maximum thickness of 3 mm. No more than three shims shall be used at any point. If necessary, the shims may be held in place by		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	means of either fillet welds or a partial penetration butt weld extending over the shims, as shown in Figure 5.		
11.3	Functional tolerances		---
11.3.2	Tabulated values		---
	Tabulated values for functional tolerances are given in Annex B. Generally, values for two classes are shown.		N/A
	Tolerance class 1 shall apply unless the execution specification specifies otherwise. In that case, the execution specification shall specify the tolerance class applicable to individual components or selected parts of an erected structure.		N/A
11.3.3	Alternative criteria		---
12	Inspection, testing and correction		---
12.2	Constituent products and components		---
12.2.1	Constituent products		---
	Documents supplied with constituent products in accordance with the requirements of Clause 5 shall be checked to verify that the information on the products supplied matches those in the component specification.		P
12.2.2	Components		---
	Documents supplied with components shall be checked to verify that the information on the components supplied matches those ordered.		P
12.2.3	Non-conforming products		---
	If the documentation supplied does not include a declaration from the supplier that the products conform to the specifications, they shall be treated as non-conforming products until it can be demonstrated that they meet the requirements of the inspection and test plan.		P
	If products are first designated as nonconforming and are subsequently proved to be in conformity by test or retest, the test results shall be recorded.		P
12.3	Manufacturing: geometrical dimensions of manufactured components		---
	The inspection and test plan shall consider the requirements and the checks necessary on prepared constituent steel products and manufactured components.		P
	Dimensional measurements of components shall always be taken.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Methods and instruments used may be selected, as appropriate, from those listed in ISO 7976-1 and ISO 7976-2. Accuracy may be assessed in accordance with the relevant part of ISO 17123.		P
	The location and frequency of measurements shall be specified in the inspection and test plan.		P
	The acceptance criteria shall be in accordance with 11.2. The deviations shall be measured with respect to any specified camber or preset.		P
12.4	Welding		---
12.4.2	Inspection after welding		---
12.4.2.1	Timing		---
	The supplementary NDT of a weld shall generally not be completed until after the minimum hold time after welding shown in Table 23. The hold times in Table 23 should also be observed if it is specified that the parent metal adjacent to a weld zone shall be inspected for laminations after welding.		P
12.4.2.2	Type testing		---
12.4.2.3	Routine inspection and testing		---
	All welds shall be visually inspected throughout their entire length. If surface breaking defects are detected, surface testing by penetrant testing or magnetic particle inspection shall be carried out on the inspected weld.		P
	For EXC1, EXC2 and EXC3 welds, the extent of supplementary NDT is as specified in Table 24.	EXC1	P
	For EXC4 welds, the scope of supplementary NDT shall be specified with respect to each identified weld.	EXC1	N/A
	The extent of NDT covers both testing of surface or internal imperfections if applicable.		P
	The methods to be used for supplementary NDT shall be selected by the appropriate welding coordination personnel from those given in 12.4.2.6.		P
	Once it has been established that production welding according to a WPS meets the quality requirements according to 12.4.2.2, the required extent of supplementary NDT shall be in accordance with Table 24 with further joints welded according to the same WPS treated as a single continuing inspection lot. The percentages apply to the extent		P

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Clause	Requirement – Test	Result - Remark	Verdict
	of supplementary NDT treated as the cumulative amount within each inspection lot.		
12.4.2.4	Project specific inspection and testing		---
	For EXC1, EXC2 and EXC3, the execution specification may identify requirements for production testing and specific joints for inspection together with the extent of testing.	EXC1	P
	For EXC4 execution specification shall identify specific joints for inspection together with the extent of testing, which shall be that specified for EXC3 as a minimum.	EXC1	N/A
	If specified, weld inspection classes (WICs) may be used to classify specific welds for inspection, and in this respect to define the scope and percentage extent of supplementary testing and the test methods to be used according to the criticality of the weld (see Annex L for guidance). If weld inspection classes (WICs) are used, the execution specification shall be used to identify the weld inspection class (WIC) for each relevant weld.		P
12.4.2.5	Visual inspection of welds		---
	The visual inspection shall be performed after completion of welding in an area and before any other NDT inspection is carried out.		P
12.4.2.6	Supplementary NDT methods		---
12.4.2.7	Correction of welds		---
	For EXC2, EXC3 and EXC4, repairs by welding shall be carried out in accordance with the procedures required for production welding.	EXC1	N/A
	Corrected welds shall be checked and shall meet the requirements of the original welds.		P
12.4.3	Inspection and testing of welded shear studs for composite steel and concrete structures Inspection and testing of welded shear studs for composite steel and concrete structures shall be carried out according to EN ISO 14555.		N/A
12.4.4	Production tests on welding		---
12.4.5	Inspection and testing of welding of reinforcing steel		---
	Inspection and testing of welding of reinforcing steel for composite steel and concrete structures shall be carried out according to EN ISO 17660-1 or EN ISO 17660-2.		P

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Clause	Requirement – Test	Result - Remark	Verdict
12.5	Mechanical fastening		---
12.5.1	Inspection of non-preloaded bolted connections		---
	All connections with non-preloaded mechanical fasteners shall be visually checked after they are bolted up with the structure aligned locally.		N/A
	Connections identified during snagging that do not have a full complement of bolting assemblies shall be checked for fit up after the missing bolting assemblies have been installed.		N/A
	Acceptance criteria and action to correct nonconformity shall be in accordance with 8.3 and 9.6.5.3.		N/A
	If the nonconformity is due to differing ply thickness that exceeds the criteria specified in 8.1, the connection shall be remade. Otherwise, nonconformity may be corrected, if possible, by adjusting the local alignment of the component.		N/A
	Corrected connections shall be checked again on re-completion.		N/A
	If an insulation system is required at junctions between stainless steel and other metals, the requirements for checking the installation shall also be specified.		N/A
12.5.2	Inspection and testing of preloaded bolted connections		---
12.5.2.2	Inspection of friction surfaces		---
	For slip-resistant connections, the faying surfaces shall be visually checked immediately before assembly.		N/A
	Acceptance criteria shall be in accordance with 8.4. Nonconformities shall be corrected in accordance with 8.4.		N/A
12.5.2.3	Inspection before tightening		---
	All connections with preloaded mechanical fasteners shall be visually checked after they are initially bolted up with the structure aligned locally and before the commencement of preloading. Acceptance criteria shall be in accordance with 8.5.1.		N/A
	If the nonconformity is due to differing ply thickness that exceeds the criteria specified in 8.1, the connection shall be remade. Otherwise, nonconformity may be corrected, if possible, by adjusting the local alignment of component.		N/A
	If chamfered washers are installed then they shall be visually checked to ensure that assembly is in accordance with 8.2.4.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	Corrected connections shall be checked on re-completion.		N/A
	For EXC2, EXC3 and EXC4, the tightening procedure shall be checked. If tightening is carried out by the torque method or the combined method, the torque wrench calibration certificates shall be checked to verify the accuracy to 8.5.1.		N/A
12.5.2.4	Inspection during and after tightening		N/A
	In addition to the following general requirements for inspection, which apply to all tightening methods except for the HRC method, particular requirements are given in 12.5.2.4 to 12.5.2.7.		N/A
12.5.2.6	Combined method		---
	For EXC3 and EXC4 the first step shall be checked before marking using the same torque conditions as used to reach the 75 % condition. A nut, which turns by more than 15°by the application of the inspecting torque, shall be retightened.		N/A
	If the connections are not fully packed according to 8.3 and 8.5.1, the calibrations of the torque wrenches in combination with the applied loads shall be controlled by supplementary tests to achieve the correct initial pretightening load. If necessary, the first step has to be repeated with the corrected torque values.		N/A
	If still unpacked, the thickness and out of plane of the assembled connections shall be inspected and adjusted, if necessary by repacking the connection according to 8.5.1 and re-tightening.		N/A
	Before the second step starts, the markings of all the nuts relative to the bolt threads shall be visually inspected. Any mark missing shall be corrected.		N/A
12.5.2.7	HRC method		---
	For EXC2, EXC3 and EXC4 the first tightening step shall be checked by visual inspection of connections to ensure they are fully packed.		N/A
	The inspection shall be carried out on 100 % of the bolting assemblies by visual inspection. Fully tightened bolting assemblies are identified as those with the spline end sheared off. A bolting assembly for which the spline end remains is considered to be under-tightened.		N/A
	If tightening of HRC bolting assemblies is completed using the torque method according to 8.5.3 or by the DTI method to		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	8.5.6, they shall be inspected according to 12.5.2.4 or 12.5.2.7 as appropriate.		
12.5.2.8	Direct tension indicator method		---
	After the first step, connections shall be inspected to ensure that they are properly packed in accordance with 8.3. The local alignment of non-conforming connections shall be corrected before final tightening commences.		N/A
	After final tightening, assemblies selected for inspection in accordance with 12.5.2.3 shall be checked to establish that the final indicator settings are in accordance with the requirements in EN 14399-9. The visual inspection shall include a check to identify any indicators that exhibit full compression of the indicator.		N/A
	If the fasteners are not installed in accordance with EN 14399-9 or if the final indicator setting is not within the specified limits, the removal and reinstallation of the non-conforming assembly shall be supervised, and the whole bolt group shall then be inspected. If the direct tension indicator has not been tightened to the specified limit, the assembly can be further tightened until this limit is achieved.		N/A
12.5.3	Inspection and repairs of solid rivets for hot riveting		---
12.5.3.1	Inspection		---
	The number of rivets inspected overall in a structure shall be at least 5 %, with a minimum of 5.		N/A
	Heads of driven rivets shall be visually inspected and shall satisfy the acceptance criteria of 8.7.3.		N/A
	Inspection of satisfactory contact shall be done by lightly ringing the rivet head with a hammer of 0,5 kg.		N/A
12.5.2.4	Inspection during and after tightening		---
	In addition to the following general requirements for inspection, which apply to all tightening methods except for the HRC method, particular requirements are given in 12.5.2.4 to 12.5.2.7.		N/A
12.5.2.5	Torque method		---
12.5.2.6	Combined method		---
	For EXC3 and EXC4 the first step shall be checked before		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	marking using the same torque conditions as used to reach the 75 % condition. A nut, which turns by more than 15°by the application of the inspecting torque, shall be retightened.		
	If the connections are not fully packed according to 8.3 and 8.5.1, the calibrations of the torque wrenches in combination with the applied loads shall be controlled by supplementary tests to achieve the correct initial pretightening load. If necessary, the first step has to be repeated with the corrected torque values.		N/A
	If still unpacked, the thickness and out of plane of the assembled connections shall be inspected and adjusted, if necessary by repacking the connection according to 8.5.1 and re-tightening.		N/A
	Before the second step starts, the markings of all the nuts relative to the bolt threads shall be visually inspected. Any mark missing shall be corrected.		N/A
12.5.2.7	HRC method		---
	For EXC2, EXC3 and EXC4 the first tightening step shall be checked by visual inspection of connections to ensure they are fully packed.		N/A
	The inspection shall be carried out on 100 % of the bolting assemblies by visual inspection. Fully tightened bolting assemblies are identified as those with the spline end sheared off. A bolting assembly for which the spline end remains is considered to be under-tightened.		N/A
	If tightening of HRC bolting assemblies is completed using the torque method according to 8.5.3 or by the DTI method to 8.5.6, they shall be inspected according to 12.5.2.4 or 12.5.2.7 as appropriate.		N/A
12.5.2.8	Direct tension indicator method		---
	After the first step, connections shall be inspected to ensure that they are properly packed in accordance with 8.3. The local alignment of non-conforming connections shall be corrected before final tightening commences.		N/A
	After final tightening, assemblies selected for inspection in accordance with 12.5.2.3 shall be checked to establish that the final indicator settings are in accordance with the requirements in EN 14399-9. The visual inspection shall include a check to identify any indicators that exhibit full compression of the indicator.		N/A
	If the fasteners are not installed in accordance with EN		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	14399-9 or if the final indicator setting is not within the specified limits, the removal and reinstallation of the non-conforming assembly shall be supervised, and the whole bolt group shall then be inspected. If the direct tension indicator has not been tightened to the specified limit, the assembly can be further tightened until this limit is achieved.		
12.5.3	Inspection and repairs of solid rivets for hot riveting		--
12.5.3.1	Inspection		--
	The number of rivets inspected overall in a structure shall be at least 5 %, with a minimum of 5.		N/A
	Heads of driven rivets shall be visually inspected and shall satisfy the acceptance criteria of 8.7.3.		N/A
	Inspection of satisfactory contact shall be done by lightly ringing the rivet head with a hammer of 0,5 kg.		N/A
12.5.3.2	Repairs		--
	If it is necessary to replace a defective rivet, it shall be done before the structure is loaded. Cutting out shall be done by means of a chisel or by cutting.		N/A
	After removing a rivet, sides of the rivet hole shall be inspected carefully. In case of cracks, pits, or hole distortion, the hole shall be reamed. If necessary, the replacement rivet shall be of a larger diameter than that removed.		N/A
12.5.4	Special fasteners and fastening methods		--
12.5.4.2	Other mechanical fasteners		--
	Inspection of connections with other mechanical fasteners (such as, e.g. hook-bolts, special fasteners) shall be applied according to national product standards/recommendations or manufacturers guidelines or specified methods.		N/A
12.6	Surface treatment and corrosion protection		--
	If the structure is to be protected against corrosion, inspection of the structure prior to corrosion protection shall be carried out against the requirements of Clause 10.		P
	All substrates (i.e. surfaces, welds and edges of steel components) shall be visually inspected.		P
12.7	Erection		--
12.7.1	Inspection of trial erection		--

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Clause	Requirement – Test	Result - Remark	Verdict
	Requirements for inspection of any trial erection to 9.6.4 shall be specified.		P
12.7.2	Inspection of the erected structure		---
	The condition of the erected structure shall be inspected for any indication that components have been distorted or overstressed, and to ensure that any temporary attachments have either been removed satisfactorily or are in accordance with the specified requirements.		P
12.7.3	Survey of geometrical position of connection nodes		---
12.7.3.1	Survey methods and accuracy		---
	A survey of the completed structure shall be made. This survey shall be related to the secondary net. For EXC3 and EXC4 this survey shall be recorded. At acceptance of the structure, detailed specific dimensional checks do not need recording unless otherwise specified.		N/A
	The method selected shall take into account the capability of the survey process in terms of accuracy relative to the acceptance criteria. Cloud point survey methods may be used.		P
	Methods and instruments used may be selected from those listed in ISO 7976-1 and ISO 7976-2.		P
	If appropriate, the survey shall be corrected for the effects of temperature and the accuracy of the measurements relative to that in 9.4.1.		P
	Corrections may be estimated according to the relevant parts of ISO 17123.		P
12.7.3.2	System of measurement		---
	The system of permitted deviations is built up from position points at base level, an envelope for column verticality and a series of intermediate and roof levels referred to as-built floor levels.		P
12.7.3.3	Reference points and levels		---
12.7.3.4	Location and frequency		---
	Measurements will only be taken of the position of components adjacent to site interconnection nodes as set out below, unless otherwise specified. The location and frequency of measurements shall be specified in the		P

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Clause	Requirement – Test	Result - Remark	Verdict
	inspection and test plan.		
	Critical dimensional checks of the as-built structure necessary in relation to special tolerances should be identified and these should be incorporated into the inspection and test plan.		P
	The positional accuracy of the erected steelwork should be measured under self-weight of steelwork only, unless otherwise specified. The conditions under which the measurements shall take place shall then be specified as well as the deviations and movements due to imposed loads, other than those due to self-weight of steelwork, if these can affect dimensional checks.		P
12.7.3.5	Acceptance criteria		---
	The acceptance criteria are given in 11.2 and 11.3.		P
12.7.3.6	Definition of nonconformity		---
	Assessment of whether a non-conformity exists shall take into account the inevitable variability in methods of measurement calculated in accordance with 12.7.3.1.		P
12.7.3.7	Action on nonconformity		---
	Action on nonconformity shall be in accordance with 12.3. Corrections shall be carried out using methods that are in accordance with this European Standard.		P
	If a steel structure is handed over with uncorrected nonconformities awaiting action these shall be listed.		P
12.7.4	Other acceptance tests		---
	If components of a structure are to be erected to a specific load rather than position, detailed requirements, including tolerance range on the load shall be specified.		P

Photo documentation

Picture 1

Picture 2

Picture 3

Picture 4

-- end of the report- -