Manual of Contract Documents for Highway Works

Highway Structures & Bridges
Contract preparation

CP 483 Instructions for specifiers for CC 483 Structural steelwork

(formerly)

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Latest release notes

Document Code	Version number	Date of publication of relevant change	Changes made to	Type of change
CP 483	LIVE_2025-01-24	Not available	Core document	Change to policy, major revision, new document development
This document replaces Series NG 1800 Structural Steelwork				

Previous versions

Document Code	Version number	Date of publication of relevant change	Changes made to	Type of change

Foreword

This document provides specifier instructions for the production of the works specific requirements for CC 483 Structural steelwork.

This document does not form part of the works specification.

The works specification is made up of both the Specification for Highway Works and the works specific requirements completed by the Specifier.

This document is applicable for contracts throughout the UK, complemented by the additional specification requirements and contractual changes of each Overseeing Organisation.

Users are responsible for applying all appropriate documents applicable to their contract.

Users are responsible for archiving contract documentation in accordance with the user's quality management system.

1. Structural steelwork

General requirements for structural steelwork

1.1 The requirements of this document shall apply to the execution of all permanent and temporary structural steelwork.

Application of BS EN 1090-2 for structural steelwork

1.2 The requirements in this document shall be read in conjunction with the part of BS EN 1090-2 [Ref 13.N] referenced in the heading or sub-heading.

1.3 The requirements specified in BS EN 1090-2 [Ref 13.N] shall apply unless amended, supplemented, or qualified by this document.

1.4 Where a requirement in BS EN 1090-2 [Ref 13.N]is qualified in that standard by the words or intention 'unless otherwise specified', the requirement shall not be amended unless it is described otherwise in this document.

1.5 Where requirements are described in this document, the requirements in the related sub-clause in BS EN 1090-2 [Ref 13.N] shall also apply unless otherwise described in this document.

BS EN 1090-2 options and additional requirements for structural steelwork

1.6 Where there is a choice between two or more different requirements in a sub-clause in BS EN 1090-2 [Ref 13.N], the selected requirement(s) shall be as described in this document.

1.7 Where there is a choice between two or more different requirements in a sub-clause in BS EN 1090-2 [Ref 13.N], all other requirements in that sub-clause shall apply unless otherwise described in this document.

Basis of execution of structural steelwork

1.8 Structural steelwork shall be as specified in CC 483/WSR/001.

Structural steelwork					
Structure reference	**Component reference**	**Component description**	**Drawing or model reference (s)**	**Document reference (s)**	**Relevant Quantified Service Category(s) (QSC)**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to identify the unique reference of the structure that contains the component referenced in this schedule.

b) Enter a unique reference, to define the detail, component, structure (or part thereof) to which the details of the structural steelwork apply, and provide a unique reference that can be used for cross-referencing throughout this document.

c) Enter text, to describe the detail, component, structure (or part thereof) to which the details of the structural steelwork apply.

d) Enter text, to identify the drawing(s) or model(s) in which details of the structural steelwork are shown.

e) Enter text, to identify the document(s) in which details of the structural steelwork are described.

f) Enter one or more values, from options N/A, F36, F56, F71, F90, F112, F140, to define the QSC(s) applicable to details within the component (detail, component, structure, or part thereof), in accordance with PD 6705-2 [Ref 42.N].

Structural steelwork (continued)		
Structure reference	**QSC Details**	**Execution Class**
(a)	(g)	(h)

g) Enter text, to provide details of QSCs or a reference to the drawing(s) or document(s) that show the details of QSCs.

h) Enter a value, from options EXC1, EXC2, EXC3, EXC4, to define the execution class of the component (detail, component or structure, or part thereof).

1.9 The execution of structural steelwork shall be compliant with BS EN 1090-1 [Ref 12.N].

1.10 The Structural steelwork shall meet the performance characteristics as stated in table 1.10.

Table 1.10 Performance characteristics of structural steelwork to BS EN 1090-1	
Performance characteristic	Required value
Tolerances on dimensions and shape	BS EN 1090-2 [Ref 13.N] as amended by this document
Weldability	Refer to drawings and documents listed in WSR 483/001 for specific requirements

Fracture toughness	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Impact resistance	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Reaction to fire	Class A1
Release of cadmium and its compounds	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Emission of radioactivity	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Durability	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Execution class	Refer to WSR 483/001
Structural characteristics - load bearing capacity	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Structural characteristics - deformation at serviceability limit state	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Structural characteristics - fatigue resistance	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Structural characteristics - resistance to fire	Refer to drawings and documents listed in WSR 483/001 for specific requirements
Structural characteristics - design	Reference to the design calculations for conformity assessment methods 2 and 3b
Structural Characteristics - manufacturing	Entry to be: 'According to component specification "X", which specifies the relevant BS EN 1090-2 [Ref 13.N] requirements and execution class(es).' Where "X" is defined in WSR 483/001.

1.11 The requirements of "Designated standards" in Section 10 of GC 101 [Ref 16.N] shall apply to structural steelwork.

1.12 The component specification "X" in Table 1.10 shall be as specified in CC 483/WSR/001.

The component specification "X" in Table 1.10		
Structure reference	**Component reference**	**Component specification "X"**
(a)	(b)	(c)

a) Enter text, to identify the unique reference of the structure that contains the component referenced in this schedule.

b) Enter a unique reference, to define the detail, component, structure (or part thereof) to which the component specification reference applies and provide a unique reference that can be used for cross-referencing throughout this document.

c) Enter text, to define the code "X" for component specification, where the component specification comprises this document with the associated WSR. The reference number shall be designated CS483-mmm-yyyy:*ref*-*issue*, where mmm-yyyy is the month and year of issue of this document, *ref* is the contract reference number (not less than 3 characters) and *issue* is the issue number of the component specification.

1.13 Where there is a requirement in BS EN 1090-2 [Ref 13.N] to comply with a designated standard, documentation shall be provided in accordance with Designated standards in Section 10 of GC 101 [Ref 16.N].

1.14 Where the execution of structural steelwork comprises multiple stages, all processes, components and sub-components shall be covered by the documentation required in Designated Standards in Section 10 of GC 101 [Ref 16.N].

1.15 Where the execution of structural steelwork includes activities that are undertaken on site, the documentation in accordance with Designated Standards in Section 10 of GC 101 [Ref 16.N] shall be submitted prior to completion of Construction Compliance Certificates in accordance with CG 300 [Ref 54.N].

Quality management and control for structural steelwork

Quality management scheme for structural steelwork

1.16 Structural steelwork in transportation infrastructure assets shall be executed by organisations registered to and operating in compliance with a quality management scheme in accordance with "Quality management schemes" in Section 7 of GC 101 [Ref 16.N].

1.17 Mechanical fasteners shall be stocked and distributed by organisations registered to and operating in compliance with a quality management scheme in accordance with "Quality management schemes" in Section 7 of GC 101 [Ref 16.N].

1.18 Structural steel products for structural steelwork shall be stocked and distributed by organisations registered to and operating in compliance with a quality management scheme in accordance with "Quality management schemes" in Section 7 of GC 101 [Ref 16.N].

Technical capability and competence scheme for structural steelwork

1.19 Execution of structural steelwork shall be undertaken by organisations registered to, operating in compliance with, and assessed against, a technical capability and competence scheme.

1.20 The technical capability and competence scheme shall have the following features:.

1. the scheme has publicly available, documented requirements including assessment criteria and certification guidelines;

2. the scheme administrator maintains a publicly available, documented list of companies that hold current certification to the scheme;

3. the scheme administrator and the assessors have a detailed technical knowledge of current construction and fabrication practice and processes for structural steelwork;

4. the scheme is managed by a technical supervisory panel with over-sight of the operation of the scheme;

5. the technical supervisory panel is made up of representatives of steelwork industry experts and highways clients;

6. the technical supervisory panel has documented governance processes and structure of the panel;

7. the technical supervisory panel reviews the technical capability and competence scheme bi-annually or more frequently;

8. the scheme administrator carries out a visit to the organisation's steelwork fabrication facilities or live sites at least every three years and carries out a desktop assessment in the intervening years;

9. the scheme administrator undertakes a technical assessment of the capability of the organisation to execute structural steelwork for a given category of contract value and technical complexity;

10. the scheme includes verification that the organisation has the financial and management resources to execute steelwork of the value and technical complexity for the category to which they are certified;

11. the scheme includes verification that the organisation has completed three steelwork contracts within the last three years of similar value and technical complexity to the category to which they are certified;

12. the scheme includes verification that the three referenced contracts required steelwork materials and workmanship to recognised bridgework standards;

13. the scheme includes verification that at least one of the three referenced contracts required thick plate welding of steelwork;

14. the scheme includes verification that the organisation has manufactured in-house at least 75% of the steelwork for each of the three referenced contracts; and

15. the scheme verifies that the organisation has a steelwork fabrication facility within the UK or European Union.

1.21 The technical capability and competence certification shall demonstrate the organisation's capability and competence for the execution of structural steelwork for the value and technical complexity of the works.

1.22 The following Documentation shall be submitted for the organisations responsible for the execution of structural steelwork prior to the commencement of the execution of steelwork: documentation demonstrating the organisation’s current certification to the technical capability and competence scheme, including the assessment criteria and certification guidelines.

Project Technical Capability and Competence Review for structural steelwork

1.23 An internal Project Technical Capability and Competence Review shall be undertaken to verify that the organisations responsible for the execution of the works have the required technical capability and competence for the execution of the works described in WSR 483/001.

1.24 The Project Technical Capability and Competence Review of organisations responsible for the execution of the works shall include confirmation of:.

1. the organisation's compliance with the requirements for certification in this document;

2. the organisation's capability and competence for the execution of works through review of the following:

    1. type and scale of works;

    2. value of contract;

    3. product forms and thicknesses of steelwork specified in the works;

    4. material grades and qualities of steelwork specified in the works;

5. types of facilities and process equipment required to execute the works;

6. execution quality requirements; and

7. quantified service category (QSC) requirements.

3. qualification of personnel.

1.25 The following Documentation shall be submitted for the Project Technical Capability and Competence Review prior to the commencement of execution of the works: record of the Project Technical Capability and Competence Review and associated evidence of capability and competence.

1.26 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to the Product Technical Capability and Competence Review.

Summary of amendments to BS EN 1090-2 for structural steelwork

1.27 Clauses in BS EN 1090-2 with works specific amendments shall be as listed in CC 483/WSR/001.

Clauses in BS EN 1090-2 with works specific amendments		
Structure reference	**Component reference**	**BS EN 1090-2 Amended clauses**
(a)	(b)	(c)

a) Enter a unique reference, to identify the structure to which the amended clauses apply.

b) Enter a unique reference, to identify the components to which the amended clauses apply.

c) Enter text, to identify which clauses in BS EN 1090-2 [Ref 13.N] are amended through WSR.

2. Specifications and documentation (BS EN 1090-2 Section 4)

Execution specification (BS EN 1090-2, 4.1)

General (BS EN 1090-2, 4.1.1)

2.1 The execution specification for structural steelwork shall comprise this document and the drawings and documents listed in CC 483/WSR/001.

Execution classes (BS EN 1090-2, 4.1.2)

2.2 For the technical requirements in BS EN 1090-2 [Ref 13.N]that are differentiated on the basis of execution class, the execution class given in each corresponding requirement of this document shall define the execution classes to which the requirement applies.

2.3 Where a requirement is common to more than one execution class, the requirement shall apply to all execution classes listed, for example EXC2/3/4 applies to EXC2, EXC3, and EXC4.

Requirements for surface preparation for corrosion protection (BS EN 1090-2, 4.1.3)

2.4 Preparation grades for structural steelworks shall comply with "Surface treatment (BS EN 1090-2 Section 10)" in Section 8 of this document.

Documentation (BS EN 1090-2, 4.2)

Quality documentation (BS EN 1090-2, 4.2.1)

2.5 Quality documentation for structural steelwork shall conform to the requirements for EXC2/3/4.

2.6 The hold-points or requirements to facilitate witnessing of inspections or tests for structural steelwork, and any consequent access requirements, shall be as specified in CC 483/WSR/002.

The hold-points or requirements to facilitate witnessing of inspections or tests for structural steelwork, and any consequent access requirements,				
Structure reference	**Component reference**	**Description of the hold-points or requirements to facilitate witnessing of inspections or tests, and any**	**Drawing / Model numbers**	**Additional documents**

		consequent access requirements		
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the hold-points or requirements to facilitate witnessing of inspections or tests, and any consequent access requirements, apply.

b) Enter text, to identify the components to which the hold-points or requirements to facilitate witnessing of inspections or tests, and any consequent access requirements, apply.

c) Enter text, to describe the hold-points or requirements to facilitate witnessing of inspections or tests, and any consequent access requirements.

d) Enter text, to list the drawings or models which show the structure or component to which the hold-points or requirements to facilitate witnessing of inspections or tests, and any consequent access requirements, apply.

e) Enter text, to list the documents that provide information about the hold-points or requirements to facilitate witnessing of inspections or tests, and any consequent access requirements.

Quality plan (BS EN 1090-2, 4.2.2)

2.7 The following Documentation shall be submitted for structural steelworks prior to the commencement of execution: quality plan, construction drawings, and execution records as described in this document and BS EN 1090-2 [Ref 13.N] 4.2.2.

2.8 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to the quality plan, construction drawings, and execution records.

2.9 The quality plan for the execution of the works shall include the items recommended in BS EN 1090-2 [Ref 13.N] Annex C and the reference temperature for setting and measuring the steelwork specified in Erection (BS EN 1090-2 Section 9) in Section 7 of this document.

2.10 The execution records shall include the construction drawings, including electronic files, for the execution of all components in accordance with CG 302 [Ref 1.N].

2.11 Construction drawings, including electronic files, shall include the Quantified Service Category (QSC) and unique component mark information.

2.12 Construction drawings in this document shall be treated as working and fabrication drawings.

Execution documentation (BS EN 1090-2, 4.2.4)

2.13 The following Documentation for structural steelwork execution shall be submitted as continuous records: execution documentation as described in BS EN 1090-2 [Ref 13.N], 4.2.4.

2.14 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to structural steelwork execution documentation as described in BS EN 1090-2 [Ref 13.N], 4.2.4.

3. Constituent products (BS EN 1090-2 Section 5)

General (BS EN 1090-2, 5.1)

3.1 The properties of constituent products not covered by the European Standards listed in BS EN 1090-2 Section 5 shall be as specified in CC 483/WSR/003.

The properties of constituent products not covered by the European Standards listed in BS EN 1090-2 Section 5					
Structure reference	**Component reference**	**Description of the constituent product not covered by the standards listed in BS EN 1090-2 [Ref 13.N]Section 5**	**Product standard for the constituent product**	**Required properties of the constituent product**	**Drawing / model numbers**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to define the structures containing constituent products which are not covered by the standards listed in BS EN 1090-2 [Ref 13.N]Section 5.

b) Enter text, to define the components containing constituent products which are not covered by the standards listed in BS EN 1090-2 [Ref 13.N]Section 5.

c) Enter text, to describe the constituent products not covered by the standards listed in BS EN 1090-2 [Ref 13.N]Section 5.

d) Enter text, to define the product standard (if any), not listed in Section 5 of BS EN 1090-2 [Ref 13.N]to which the constituent product shall comply.

e) Enter text, to specify the required properties of the constituent product in accordance with BS EN 1090-2 [Ref 13.N]Section 5.1.

f) Enter text, to list the drawings or models which show the constituent product (and any relevant properties) that is not covered by the standards listed in BS EN 1090-2 [Ref 13.N]Section 5.

The properties of constituent products not covered by the

European Standards listed in BS EN 1090-2 Section 5 (continued)	
Structure reference	**Additional documents**
(a)	(g)

g) Enter text, to list the documents that provide information on the constituent products not covered by the standard listed in BS EN 1090-2 [Ref 13.N]Section 5.

Identification, inspection documents and traceability (BS EN 1090-2, 5.2)

3.2 Stages of traceability of constituent products shall conform to the requirements of EXC3/4.

3.3 Specialist proprietary or bespoke constituent products shall be individually traceable.

3.4 Small identical bespoke products such as special fasteners shall be traceable to their individual manufacturing lot.

3.5 The identification of different grades and qualities of structural steel for each individual constituent product shall conform to the requirements for EXC2/3/4.

Structural steel products (BS EN 1090-2, 5.3)

General (BS EN 1090-2, 5.3.1)

3.6 Weather resistant steel hot finished hollow sections shall be compliant with BS EN 10210-3 [Ref 18.N], unless otherwise stated in CC 483/WSR/003.

3.7 Weather resistant steel cold formed hollow sections shall be compliant with BS EN 10219-3 [Ref 4.N], unless otherwise stated in CC 483/WSR/003.

3.8 Grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products shall be as specified in CC 483/WSR/003.

Grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products				
Structure reference	**Component reference**	**Description of the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products are applicable.

b) Enter text, to define the components for which the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products are applicable.

c) Enter text, to describe the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products.

d) Enter text, to list the drawings or models which show the components for which the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products are applicable.

e) Enter text, to list the documents that provide the requirements for the grades, qualities, coating weights and finishes, and required options permitted by product standards for structural steel products.

3.9 The following options for impact property verification shall apply:.

1. option 3 in BS EN 10025-1 [Ref 21.N], 7.3.2.2; and

2. option 3 in BS EN 10025-5 [Ref 24.N], 7.3.2.1 and 8.3.2.

3.10 The following options for steel that is to be hot dip galvanized shall apply:.

1. option 5 in BS EN 10025-1 [Ref 21.N], 7.4.3;

2. option 1.4 in BS EN 10210-1 [Ref 20.N], 6.7.2; and

3. option 1.4 in BS EN 10219-1 [Ref 6.N], 6.8.2.

3.11 The following options for weld repair of hollow sections in zones of QSCs F112 and F140 shall apply:.

1. option 1.5 in BS EN 10210-1 [Ref 20.N], 6.8.4;

2. option 1.5 in BS EN 10219-1 [Ref 6.N], 6.9.4;

3. option 3.9 in BS EN 10219-3 [Ref 4.N] 7.44; and

4. option 3.9 in BS EN 10210-3 [Ref 18.N] 7.44.

3.12 Requirements for structural hollow sections in weather resistant steel shall be as specified in CC 483/WSR/003.

Requirements for structural hollow sections in weather resistant steel				
Structure reference	**Component reference**	**Description of the requirements for structural hollow sections in weather resistant steel**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which there are requirements for structural hollow sections in weather resistant steel.

b) Enter text, to define the components for which there are requirements for structural hollow sections in weather resistant steel.

c) Enter text, to describe the requirements for structural hollow sections in weather resistant steel.

d) Enter a number, to list the drawings or models which show the components with requirements for structural hollow sections in weather resistant steel.

e) Enter text, to the documents that provide the requirements for structural hollow sections in weather resistant steel.

Thickness tolerances (BS EN 1090-2, 5.3.2)

3.13 For structural steel plates, thickness tolerance Class A shall be used.

Surface conditions (BS EN 1090-2, 5.3.3)

3.14 For plates and wide flats, the limits on surface discontinuities and ground areas shall be in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B, unless otherwise stated in CC 483/WSR/003.

3.15 The limits on surface discontinuities and ground areas for plates and wide flats, where not in conformance with BS EN 10163-2 Class A or Class B shall be as specified in CC 483/WSR/003.

The limits on surface discontinuities and ground areas for plates and wide flats, where not in conformance with BS EN 10163-2 Class A or Class B				
Structure reference	**Component reference**	**Description of the limits on surface discontinuities and ground areas of the plates or wide flats, where not in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures with plates and wide flats for which the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-2 [Ref 7.N]Class A or Class B.

b) Enter text, to define the components with plates and wide flats for which the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B.

c) Enter text, to describe the limits on surface discontinuities and ground areas of the plates or wide flats, where not in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B.

d) Enter text, to list the drawings or models which show the plates or wide flats where the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B.

e) Enter text, to list the additional documents which describe the limits on surface discontinuities and ground areas of the plates or wide flats, where not in conformance with BS EN 10163-2 [Ref 7.N] Class A or Class B.

3.16 For sections, excluding hot finished and cold formed welded hollow sections, the limits on surface discontinuities and ground areas shall conform with BS EN 10163-3 [Ref 8.N] Class C or Class D, unless otherwise stated in CC 483/WSR/003.

3.17 Limits on surface discontinuities and ground areas for sections, excluding hot finished and cold formed welded hollow sections, where not in conformance with BS EN 10163-3 Class C or Class D shall be as specified in CC 483/WSR/003.

Limits on surface discontinuities and ground areas for sections, excluding hot finished and cold formed welded hollow sections, where not in conformance with BS EN 10163-3 Class C or Class D				
Structure reference	**Component reference**	**Description of the limits on surface discontinuities and ground areas for sections, excluding hot finished and cold formed welded hollow sections, where not in conformance with BS EN 10163-3 [Ref 8.N] Class C or Class D**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures with sections, excluding hot finished and cold formed welded hollow sections, for which the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-3 [Ref 8.N] Class C or Class D.

b) Enter text, to define the components with sections, excluding hot finished and cold formed welded hollow sections, for which the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-3 [Ref 8.N] Class C or Class D.

c) Enter text, to describe the limits on surface discontinuities and ground areas for sections, excluding hot finished and cold formed welded hollow sections, where not in conformance with BS EN 10163-3 [Ref 8.N] Class C or Class D.

d) Enter text, to list the drawings or models which show the sections, excluding hot finished and cold formed welded hollow sections, where the limits on surface discontinuities and ground areas are not in conformance with BS EN 10163-3 [Ref 8.N]Class C or Class D.

e) Enter text, to list the documents which describe the limits on surface discontinuities and ground areas for sections, excluding hot finished and cold formed welded hollow sections, where not in conformance with BS EN 10163-3 [Ref 8.N] Class C or Class D.

3.18 For plates, wide flats, and sections, excluding hot finished and cold formed welded hollow sections, repair by welding shall not be carried out for steels conforming to BS EN 10025-6 [Ref 22.N] or where QSC F112 or F140 applies.

3.19 For plates, wide flats, and sections, excluding hot finished and cold formed welded hollow sections, where repairs by welding are required, they shall conform to subclass 2 in accordance with BS EN 10163-2 [Ref 7.N].

3.20 For sections, excluding hot finished and cold formed welded hollow sections, imperfections such as cracks, shells, and seams shall be repaired in accordance with BS EN 10163-3 [Ref 8.N].

3.21 For hot finished and cold formed welded hollow sections, surface defects in the body of the section shall be repaired in accordance with BS EN 10210-1 [Ref 20.N] and BS EN 10219-1 [Ref 6.N] respectively, subject to the restrictions in this Section.

3.22 Verification shall be undertaken for the quality of repairs by welding on plates, wide flats, and sections through inspection by ultrasound testing (UT) in accordance with BS EN ISO 17640 [Ref 33.N] and magnetic particle testing (MT) in accordance with BS EN 17638 [Ref 28.N].

3.23 The frequency of UT and MT inspections on repairs by welding shall be as follows:.

1. at least once per weld; and

2. for components with a QSC of F71 or F90, at least twice per weld - once upon completion of the repair by welding has been made and once on delivery.

3.24 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to UT and MT inspections on repairs by welding.

3.25 The following Documentation for repairs by welding on plates, wide flats and sections shall be submitted as continuous records: test reports for repairs by welding.

3.26 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to test reports for repairs by welding.

3.27 Steel with pitted surfaces, rust grades C and D according to BS EN ISO 8501-1 [Ref 37.N], shall not be used.

3.28 Additional requirements related to special restrictions on either surface imperfections or repair of surface defects by grinding in accordance with BS EN 10163-1, BS EN 10163-2, and BS EN 10163-3, or with BS EN 10088-4 and BS EN 10088-5 for stainless steel shall be as specified in CC 483/WSR/003.

Additional requirements related to special restrictions on either surface imperfections or repair of surface defects by grinding in accordance with BS EN 10163-1, BS EN 10163-2, and BS EN 10163-3, or with BS EN 10088-4 and BS EN 10088-5 for stainless steel				
Structure reference	**Component reference**	**Description of the special restrictions on either surface imperfections or repair of surface defects by grinding**	**Drawings / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the special restrictions on either surface imperfections or repair of surface defects by grinding apply.

b) Enter text, to define the components to which the special restrictions on either surface imperfections or repair of surface defects by grinding apply.

c) Enter text, to describe the special restrictions on either surface imperfections or repair of surface defects by grinding.

d) Enter text, to list the drawings or models which show the components to which the special restriction on either surface imperfections or repair of surface defects by grinding.

e) Enter text, to list the documents that provide the special restrictions on either surface imperfections or repair of surface defects by grinding.

3.29 The surface finish requirements for other constituent products shall be as specified in CC 483/WSR/003.

The surface finish requirements for other constituent products				
Structure reference	**Component reference**	**Description of the surface finish requirements for the other constituent products**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structure to which the surface finish requirements for other constituent products apply.

b) Enter text, to define the components to which the surface finish requirements for other constituent products apply.

c) Enter text, to describe the surface finish requirements for other constituent products.

d) Enter text, to list the drawings or models which show the components to which the surface finish requirements for other constituent products apply.

e) Enter text, to list the documents that provide the surface finish requirements for other constituent products.

Additional properties (BS EN 1090-2, 5.3.4)

3.30 Additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels, or processing conditions shall be as specified in CC 483/WSR/003.

Additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels, or processing conditions				
Structure reference	**Component reference**	**Description of the additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions apply.

b) Enter text, to define the components to which the additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions apply.

c) Enter text, to describe the additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions.

d) Enter text, to list the drawings or models which show the components to which the additional requirements for testing on

constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions apply.

e) Enter text, to list the documents which provide the additional requirements for testing on constituent products, improved deformation properties perpendicular to the surface, delivery conditions of stainless steels or processing conditions.

3.31 For cross plates in welded cruciform and welded tee joints transmitting primary stresses through the plate thickness on a band of width four times the thickness of the plate each side of the proposed attachment, for QSC F56, BS EN 10160 [Ref 56.N] internal discontinuity quality class S_1 shall apply.

3.32 For cross plates in welded cruciform and welded tee joints transmitting primary stresses through the plate thickness on a band of width four times the thickness of the plate each side of the proposed attachment, for QSC F71 and above, BS EN 10160 [Ref 56.N] internal discontinuity quality class S_2 shall apply.

3.33 Flange or web plates close to bearing diaphragms and/or single sided bearing stiffeners, where attached by welding, shall conform to BS EN 10160 [Ref 56.N] internal discontinuity quality class S_1 in the areas defined in BS EN 1090-2 [Ref 13.N] 5.3.4.

3.34 Precautions to avoid lamellar tearing in tee, cruciform and corner joints shall be determined and implemented, whether or not improved deformation properties to BS EN 10164 [Ref 48.N] have been specified for the through plates.

3.35 The guidance on precautions to avoid lamellar tearing in tee, cruciform and corner joints given in BS EN 1011-2 [Ref 60.N] and PD 6695-1-10 [Ref 41.N] shall be followed.

Steel castings (BS EN 1090-2, 5.4)

3.36 Grades, qualities, surface conditions, and options for steel castings shall be as specified in CC 483/WSR/003.

Grades, qualities, surface conditions, and options for steel castings				
Structure reference	**Component reference**	**Description of the grades, grade suffixes, finishes, and options for steel castings**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the grades, grade suffixes, finishes and options for steel castings apply.

b) Enter text, to define the components to which the grades, grade suffixes, finishes and options for steel castings apply.

c) Enter text, to describe the grades, grade suffixes, finishes and options for steel castings.

d) Enter text, to list the drawings or models which show the components to which the grades, grade suffixes, finishes and options for steel castings apply.

e) Enter text, to list the documents which provide the grades, grade suffixes, finishes and options for steel castings.

3.37 Verification shall be undertaken for steel castings through testing in accordance with the specific requirements and acceptance levels given in Table 3.37.

3.38 The frequency of testing shall be as given in Table 3.37.

3.39 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to testing of steel castings in accordance with Table 3.37.

Table 3.39 Specific testing requirements and acceptance levels for steel castings.

BS EN 1090-2 5.4 Item	Testing Requirement	QSC				
		F56	F71	F90	F112	F140
a) Visual inspection	% of lot	100				
b) Destructive tests	Test piece type	Product Sample				
c) Non-destructive tests	6) MT % of lot	20	100	100	100	100
	7) UT % of lot	20	50	100	100	100
	7) RT % of lot	20	20	50	100	100
Acceptance Criteria	MT severity level SM	2	2	1	No indications permitted	No indications permitted
	MT severity level LM/AM	3	2	1	No indications permitted	No indications permitted

	UT severity level	2	1	1	No indications permitted	No indications permitted
	RT severity level in accordance with BS EN 12681-1 [Ref 15.N]	3	2	1	No indications permitted	No indications permitted

Welding consumables (BS EN 1090-2, 5.5)

3.40 Where structural steel supplied to BS EN 10025-5 [Ref 24.N]is to be welded, one of the following options for welding consumables shall be used: one of the options 1, 2, or 3 of BS EN 1090-2 [Ref 13.N]Table 6 or C-Mn consumables.

3.41 C-Mn consumables shall only be used for single run fillet welds not exceeding 8 mm leg length using processes 135 and 121, butt welds using one run only per side, or the body of multi-pass fillet or butt welds except for the outer 3 mm thick surface zones of the cap, root, and ends (excluding any overfill).

3.42 Where C-Mn consumables are used for the body of multi-pass fillet or butt welds, the surfaces zones shall be deposited using consumables conforming to options 1, 2, or 3 of BS EN 1090-2 [Ref 13.N]Table 6.

Mechanical fasteners (BS EN 1090-2, 5.6)

Structural bolting assemblies for non-preloaded applications (BS EN 1090-2, 5.6.3)

3.43 The surface finishes for carbon steel, alloy steel and stainless steel structural bolting assemblies for non-preloaded applications shall be as given in "Protective systems for bridges, parapets, and other highway structures except bearings and minor structures for protection of steelwork against corrosion" in Section 5 of CC 486 [Ref 38.N].

3.44 The property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications shall be as specified in CC 483/WSR/003.

The property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications				
Structure reference	**Component reference**	**Description of the property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications are applicable.

b) Enter text, to define the components to which property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications are applicable.

c) Enter text, to describe the property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications.

d) Enter text, to list the drawings or models which show the components to which the property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications apply.

e) Enter text, to list the documents which provide the property classes of bolts and nuts, and any required options permitted by product standards for structural bolting assemblies for non-preloaded applications.

3.45 The technical delivery conditions for structural bolting assemblies for non-preloaded applications listed in BS EN 1090-2 5.6.3 a), b) and c) shall be as specified in CC 483/WSR/003.

The technical delivery conditions for structural bolting assemblies for non-preloaded applications listed in BS EN 1090-2 5.6.3 a), b) and c)				
Structure reference	**Component reference**	**Description of the technical delivery conditions for structural bolting assemblies for non-preloaded applications**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the technical delivery conditions for structural bolting assemblies for non-preloaded applications apply.

b) Enter text, to define the components to which the technical delivery conditions for structural bolting assemblies for non-preloaded applications apply.

c) Enter text, to describe the technical delivery conditions for structural bolting assemblies for non-preloaded applications.

d) Enter text, to list the drawings or models which show the components to which the technical delivery conditions for structural bolting assemblies for non-preloaded applications apply.

e) Enter text, to list the documents which provide the technical delivery conditions for structural bolting assemblies for non-preloaded applications.

3.46 The full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications shall be as specified in CC 483/WSR/003.

The full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications				
Structure reference	**Component reference**	**Description of the use of insulation kits for structural bolting assemblies for non-preloaded applications**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications apply.

b) Enter text, to define the components to which the full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications apply.

c) Enter text, to describe the use of insulation kits for structural bolting assemblies for non-preloaded applications.

d) Enter text, to list the drawings or models which show the components to which the full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications apply.

e) Enter text, to list the documents which give the full details for the use of insulation kits for structural bolting assemblies for non-preloaded applications.

Structural bolting assemblies for preloading (BS EN 1090-2, 5.6.4)

3.47 Bolt assemblies conforming to BS EN 14399-3 [Ref 17.N], HR type, shall be used for preloaded bolt assemblies using all tightening methods except the High Resistance Calibrated (HRC) method.

3.48 Nuts fully lubricated by the manufacturer after the nuts have been tapped and after any coating passivation process has been completed, shall be used for preloaded bolted assemblies using all tightening methods except the HRC method.

3.49 Lubricant coatings which are permanently liquid and risk contamination of faying surfaces shall not be used for preloaded bolted assemblies.

3.50 The surface finishes for structural bolting assemblies for preloading shall be as given in "Protective systems for bridges, parapets, and other highway structures except bearings and minor structures for protection of steelwork against corrosion" in Section 5 of CC 486 [Ref 38.N].

3.51 Electroplated property class 10.9 bolting assemblies shall not be used.

3.52 Cleaning of property class 10.9 bolting assemblies prior to hot dip galvanising shall be by a mechanical process such as blast cleaning and not by pickling.

3.53 Nuts of property class 10 shall be used with bolts of property class 8.8.

3.54 Bolts of property class 10.9 shall not be used for assemblies tightened by the part turn method.

3.55 The property classes of bolts and nuts, and requirements for options permitted by product standards for structural bolting assemblies for preloading shall be as specified in CC 483/WSR/003.

The property classes of bolts and nuts, and requirements for options permitted by product standards for structural bolting assemblies for preloading				
Structure reference	**Component reference**	**Description of the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading apply.

b) Enter text, to define the components to which the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading apply.

c) Enter text, to describe the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading.

d) Enter text, to list the drawings or models which show the components to which the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading apply.

e) Enter text, to list the documents which give the property classes of bolts and nuts and requirements for options permitted by product standards for structural bolting assemblies for preloading.

3.56 The locations where stainless steel bolts are used in preloaded applications shall be as specified in CC 483/WSR/003.

The locations where stainless steel bolts are used in preloaded applications				
Structure reference	**Component reference**	**Description of the locations where stainless steel bolts are used in preloaded applications**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where stainless steel bolts are used in preloaded applications.

b) Enter text, to define the components where stainless steel bolts are used in preloaded applications.

c) Enter text, to describe the locations where stainless steel bolts are used in preloaded applications.

d) Enter text, to list the drawings or models which show the components where stainless steel bolts are used in preloaded applications.

e) Enter text, to list the documents which give the locations where stainless steel bolts are used in preloaded applications.

3.57 Where stainless steel bolting assemblies are specified in CC 483/WSR/003, they shall be treated as special fasteners in accordance with BS EN 1090-2 [Ref 13.N] 5.6.11, 8.8, and 12.5.4.1 and the corresponding clauses in this document.

Weather resistant assemblies (BS EN 1090-2, 5.6.6)

3.58 The chemical composition of weather resistant assemblies shall comply with the requirements for Type 3 Grade A fasteners to ASTM standard ASTM F3125 / F3125M [Ref 46.N].

Foundation bolts (BS EN 1090-2, 5.6.7)

3.59 Reinforcing steels shall not be used for foundation bolts, unless otherwise stated in CC 483/WSR/003.

3.60 The locations where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade shall be as specified in CC 483/WSR/003.

The locations where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade				
Structure reference	**Component reference**	**Description of the locations where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where reinforcing steels are permitted to be used for foundation bolts.

b) Enter text, to define the components where reinforcing steels are permitted to be used for foundation bolts.

c) Enter text, to describe the locations where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade.

d) Enter text, to list the drawings or models which show the components where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade.

e) Enter text, to list the documents which give the locations where reinforcing steels are permitted to be used for foundation bolts, together with the steel grade.

Locking devices (BS EN 1090-2, 5.6.8)

3.61 The locations where locking devices are required shall be as specified in CC 483/WSR/003.

The locations where locking devices are required				
Structure reference	**Component reference**	**Description of the locations where locking devices are required**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where locking devices are required.

b) Enter text, to define the components where locking devices are required.

c) Enter text, to describe the locations where locking devices are required.

d) Enter text, to list the drawings or models which show the components where locking devices are required.

e) Enter text, to list the additional documents which describe the locations where locking devices are required.

3.62 The locking device products to be used, other than those in the standards referred to inBS EN 1090-2 5.6.8 shall be as specified in CC 483/WSR/003.

The locking device products to be used, other than those in the standards referred to inBS EN 1090-2 5.6.8					
Structure reference	**Component reference**	**Description of the locking device products to be used and their locations**	**Product standard for locking device**	**Locking device performance requirements**	**Drawing / model numbers**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to define the structures for which the locking device products, other than those in the standards referred to in BS EN 1090-2 [Ref 13.N]5.6.8, are to be used.

b) Enter text, to define the components for which the locking device products, other than those in the standards referred to in BS EN 1090-2 [Ref 13.N]5.6.8, are to be used.

c) Enter text, to describe the locking device products to be used, other than those in the standards referred to in BS EN 1090-2 [Ref 13.N]5.6.8, and their locations.

d) Enter text, to define the product standard that the locking device shall comply with.

e) Enter text, to define the performance characteristics for the locking device.

f) Enter text, to list the drawings or models showing the components for which the locking device products, other than those in the standards referred to in BS EN 1090-2 [Ref 13.N]5.6.8, are to be used.

The locking device products to be used, other than those in the standards referred to inBS EN 1090-2 5.6.8 (continued)	
Structure reference	**Additional documents**
(a)	(g)

g) Enter text, to list the documents stating the locking device products to be used, other than those in the standards referred to in BS EN 1090-2 [Ref 13.N]5.6.8.

Washers: Taper washers (BS EN 1090-2, 5.6.9.2)

3.63 The dimensions applicable to the shape of taper washers shall be as specified in CC 483/WSR/003.

The dimensions applicable to the shape of taper washers				
Structure reference	**Component reference**	**Description of the dimensions applicable to the shape of taper washers**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the dimensions applicable to the shape of taper washers apply.

b) Enter text, to define the components to which the dimensions applicable to the shape of taper washers apply.

c) Enter text, to describe the dimensions applicable to the shape of taper washers.

d) Enter text, to list the drawings or models which show the components to which the dimensions applicable to the shape of taper washers apply.

e) Enter text, to list the documents which give the dimensions applicable to the shape of taper washers.

Solid rivets for hot riveting (BS EN 1090-2, 5.6.10)

3.64 Solid rivets for hot riveting shall conform to ASTM A502 [Ref 47.N].

Special fasteners (BS EN 1090-2, 5.6.11)

3.65 The requirements for special fasteners not standardised in CEN or ISO standards, and testing, shall be as specified in CC 483/WSR/003.

The requirements for special fasteners not standardised in CEN or ISO standards, and testing,				
Structure reference	**Component reference**	**Description of the requirements for special fasteners not standardised in CEN or ISO standards, and testing**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the requirements for special fasteners not standardised in CEN or ISO standards, and testing, are applicable.

b) Enter text, to define the components for which the requirements for special fasteners not standardised in CEN or ISO standards, and testing, are applicable.

c) Enter text, to describe the requirements for special fasteners not standardised in CEN or ISO standards, and testing.

d) Enter text, to list the drawings or models which show the components for which the requirements for special fasteners not standardised in CEN or ISO standards, and testing, are applicable.

e) Enter text, to list the documents which give the requirements for special fasteners not standardised in CEN or ISO standards, and testing.

Studs and shear connectors (BS EN 1090-2, 5.7)

3.66 Headed stud connectors shall be Type SD1 in accordance with BS EN ISO 13918 [Ref 61.N].

Grouting materials (BS EN 1090-2, 5.9)

3.67 Bedding mortars, including those to be used between steel bases or bearing plates and concrete foundations, shall conform to the requirements of "Bedding Mortar" in Section 1 of CC 495 [Ref 27.N].

3.68 Grouting materials to be used shall be as specified in CC 483/WSR/003.

Grouting materials to be used				
Structure reference	**Component reference**	**Description of the grouting materials to be used**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures to which the grouting materials are applicable.

b) Enter text, to define the components to which the grouting materials are applicable.

c) Enter text, to describe the grouting materials to be used.

d) Enter text, to list the drawings or models which show the components to which the grouting materials are applicable.

e) Enter text, to list the documents which give the requirements for grouting materials to be used.

Expansion joints for bridges (BS EN 1090-2, 5.10)

3.69 Expansion joints shall conform to the requirements of CC 490 [Ref 3.N].

High strength cables, rods, and terminations (BS EN 1090-2, 5.11)

3.70 The tensile strength grade and coating class according to BS EN 10244-2 of wires for high strength cables shall be as specified in CC 483/WSR/003.

The tensile strength grade and coating class according to BS EN 10244-2 of wires for high strength cables				
Structure reference	**Component reference**	**Description of the tensile strength grade and coating class of wires for high strength cables**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures in which the wires for high strength cables, rods, and terminations are used.

b) Enter text, to define the components in which the wires for high strength cables are used.

c) Enter text, to describe the tensile strength and coating class according to BS EN 10244-2 [Ref 49.N]of wires for high strength cables.

d) Enter text, to list the drawings which show the components in which the wires for high strength cables are used.

e) Enter text, to list the documents which give the requirements for the tensile strength grade and coating class of wires for high strength cables, rods, and terminations.

3.71 The designation and class of strands for high strength cables shall be as specified in CC 483/WSR/003.

The designation and class of strands for high strength cables				
Structure reference	**Component reference**	**Description of the designation and class of strands for high strength cables**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures in which the strands for high strength cables are used.

b) Enter text, to define the components in which the strands for high strength cables are used.

c) Enter text, to describe the designation and class of strands for high strength cables.

d) Enter text, to list the drawings or models which show the components in which the strands for high strength cables are used.

e) Enter text, to list the documents which give the requirements for designation and class of strands for high strength cables.

3.72 The minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection shall be as specified in CC 483/WSR/003.

The minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection				
Structure reference	**Component reference**	**Description of the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection are applicable.

b) Enter text, to define the components for which the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection are applicable.

c) Enter text, to describe the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection.

d) Enter text, to list the drawings or models which show the components for which the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection are applicable.

e) Enter text, to list the documents which give the minimum breaking load and diameter of steel wire rope and requirements related to corrosion protection.

Structural bearings (BS EN 1090-2, 5.12)

3.73 The requirements for bridge bearings shall be as stated in "General requirements for bridge bearings" in Section 1 of CC 489 [Ref 2.N].

3.74 The requirements for structural bearings, other than bridge bearings, shall be as stated in CC 483/WSR/003.

3.75 The schedule of design requirements and acceptance tests for structural bearings, other than bridge bearings, shall be as specified in CC 483/WSR/003.

The schedule of design requirements and acceptance tests for structural bearings, other than bridge bearings,				
Structure reference	**Component reference**	**Description of the design requirements and acceptance tests for structural bearings**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the schedule of design requirements and acceptance tests for structural bearings is applicable.

b) Enter text, to define the components for which the schedule of design requirements and acceptance tests for structural bearings is applicable.

c) Enter text, to describe the design requirements and acceptance tests for structural bearings.

d) Enter text, to list the drawings or models which show the components for which the schedule of design requirements and acceptance tests for structural bearings is applicable.

e) Enter text, to list the documents which give the schedule of design requirements and acceptance tests for structural bearings.

3.76 Execution of structural bearings shall be in accordance with PD 6703 [Ref 50.N], BS EN 1337-1 [Ref 51.N], BS EN 1337-11 [Ref 52.N] and the manufacturer's instructions.

4. Preparation and assembly (BS EN 1090-2 Section 6)

Identification (BS EN 1090-2, 6.2)

4.1 An identification system shall match each finished steel component to the documentation supplied for its constituent product(s).

4.2 Hard stamps, punched, or drilled marks for identification of steel components shall only be used for zones with QSC of F56 or lower.

4.3 Soft or low stress stamps for identification of steel components shall only be used for zones with a QSC of F90 or lower.

4.4 For stainless steels, the zones in which soft or low stress stamps for identification of steel components are not to be used shall be as specified in CC 483/WSR/004.

For stainless steels, the zones in which soft or low stress stamps for identification of steel components are not to be used				
Structure reference	**Component reference**	**Description of the zones, for stainless steel, in which soft or low stress stamps are not to be used for identification of steel components**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structure with zones where soft or low stress stamps for identification of steel components shall not be used for stainless steel.

b) Enter text, to identify the components with zones where soft or low stress stamps for identification of steel components shall not be used for stainless steel.

c) Enter text, to describe the zones in which soft or low stress stamps for identification of steel components shall not be used for stainless steel.

d) Enter text, to list the drawings or models that show the zones in which soft or low stress stamps for identification of steel components shall not be used for stainless steel.

e) Enter text, to list the documents that state the zones in which soft or low stress stamps for identification of steel components shall not be used for stainless steel.

4.5 No type of marking process for identification of steel components involving deformation, or removal, of metal from the surface shall be used for zones with a QSC of F112 and above.

4.6 Markings shall be visible when structural steelwork is assembled and erected, unless otherwise stated in CC 483/WSR/004.

4.7 The zones where identification marks on components of steelwork are not permitted shall be as specified in CC 483/WSR/004.

The zones where identification marks on components of steelwork are not permitted				
Structure reference	**Component reference**	**Description of the zones where identification marks on components of steelwork are not permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with zones where identification marks on components of steelwork are not permitted.

b) Enter text, to identify the components with zones where identification marks on components of steelwork are not permitted.

c) Enter text, to describe the zones where identification marks on components of steelwork are not permitted.

d) Enter text, to list the drawings or models that show the zones where identification marks on components of steelwork are not permitted.

e) Enter text, to list the documents that state the zones where identification marks on components of steelwork are not permitted.

4.8 The zones where identification marks on components of steelwork are not to be visible after completion shall be as specified in CC 483/WSR/004.

The zones where identification marks on components of steelwork are not to be visible after completion				
Structure reference	**Component reference**	**Description of the zones where identification marks are not to be visible after completion**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with zones where identification marks are not to be visible after completion.

b) Enter text, to identify the components with zones where identification marks are not to be visible after completion.

c) Enter text, to describe the zones where identification marks are not to be visible after completion.

d) Enter text, to list the drawings or models that show the zones where identification marks are not to be visible after completion.

e) Enter text, to list the documents that state the zones where identification marks are not to be visible after completion.

Cutting (BS EN 1090-2, 6.4)

Shearing and nibbling (BS EN 1090-2, 6.4.2)

4.9 All sheared edges of structural steelwork shall be ground or filed normal to the thickness direction of the plate to remove all visible signs of drag lines and glass-like surfaces.

Thermal cutting (BS EN 1090-2, 6.4.3)

4.10 The quality of thermally cut surfaces of structural steelwork shall conform to the requirements for EXC3/4.

4.11 Isolated imperfections on thermally cut surfaces of structural steelwork such as gouges, melting beads, and oxide remainders, as described in BS EN ISO 9013 [Ref 55.N] Section 7, shall be removed by grinding, linishing, or machining.

Hardness of free edge surfaces (BS EN 1090-2, 6.4.4)

4.12 Free edge surfaces of structural steelwork with hardnesses exceeding 380 (HV10) values shall be ground, linished, or machined until sufficient material has been removed such that the 380 (HV10) limit is not exceeded, subject to the exceptions in this section.

4.13 The hardness limit of 380 (HV10) stated in this section shall not apply to straight machine plasma cut plain edge surfaces of structural steelwork away from stress raising zones, as defined in PD 6705-2 [Ref 42.N] Annex C.8, providing all the following conditions are met.

1. the steel grade does not exceed S420;

2. the plain edge surfaces are not subject to a QSC above F71;

3. the plain edge surfaces are not subject to subsequent cold forming, unless fully fused over the full length and width by subsequent welding; and

4. the procedure trials have been carried out to verify that the proposed method of surface preparation of the plasma cut edge can readily achieve the cleanliness and profile stated in CC 486 [Ref 38.N], where corrosion protection of the edges is required.

4.14 The edge surfaces where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted shall be as specified in CC 483/WSR/004.

The edge surfaces where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted				
Structure reference	**Component reference**	**Description of the edge surfaces where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with edge surfaces for which the relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted.

b) Enter text, to identify the components with edge surfaces for which the relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted.

c) Enter text, to describe the edge surfaces where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted.

d) Enter text, to list the drawings or models that show where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted.

e) Enter text, to list the documents that provide information about where relaxation of the hardness limit for machine plasma cutting of structural steelwork is not permitted.

Shaping (BS EN 1090-2, 6.5)

Flame straightening: general (BS EN 1090-2, 6.5.3.1)

4.15 Flame straightening procedures shall be specific to the steel grade and one of the following typical modes of distortion:.

1. an out-of-plane bow of a flat element;

2. an in-plane bow of a flat element or a bow about the minor axis of an open section; and

3. a bow about either axis of a hollow section or about the major axis of an open section.

4.16 The following Documentation shall be submitted for procedures for the correction of distortion using flame straightening prior to the commencement of execution: flame straightening procedure.

4.17 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to flame straightening procedures.

4.18 The fuel gas mixture, nozzle size and arrangement, heat zones, and sequence of heating for flame straightening shall be stated in the flame straightening procedure.

4.19 The method of heating for flame straightening shall be by oxy-acetylene fuel gas using equipment with nozzles made for the purpose of heating.

4.20 For flame straightening, the surface temperature of the heated zones shall be measured and controlled using a contact pyrometer or temperature sensitive crayons.

4.21 For structural steels conforming to BS EN 10025-2 [Ref 26.N], BS EN 10025-3 [Ref 23.N], BS EN 10025-5 [Ref 24.N], BS EN 10210-1 [Ref 20.N], BS EN 10210-2 [Ref 19.N], and BS EN 10210-3 [Ref 18.N], but excluding those supplied in the "M+" delivery condition, the maximum surface temperature shall not be greater than 625 ^{o}C, irrespective of the temperatures reached during any flame straightening procedure trials.

4.22 For structural steels conforming to BS EN 10025-4 [Ref 25.N], BS EN 10025-6 [Ref 22.N], and BS EN 10219-2 [Ref 5.N], including any other steels supplied in the "M+" delivery condition, the maximum surface temperature shall not be greater than 550 ^{o}C, irrespective of the temperatures reached during any flame straightening procedure trials.

4.23 For flame straightening, the cooling phase down to 350 ^{o}C shall be unassisted.

4.24 For the flame straightening cooling phase below 350 ^{o}C, assistance by an air blast shall be permitted.

4.25 For the flame straightening cooling phase, quenchingby water shall not be used except where permitted for stainless steels, see BS EN 1090-2 [Ref 13.N], 6.5.3.2 c).

4.26 For flame straightening, the use of passive restraints during the heating cycle shall be permitted.

4.27 For flame straightening, active application of force during the heating cycle, for example by jacking, shall not be used.

4.28 For steel grades greater than S355, flame straightening procedures shall be qualified by applying the method to a test piece of representative form and known rolling direction, thickness and material grade.

4.29 Material for the longitudinal tensile, impact, and hardness tests required for flame straightening procedure qualification by BS EN 1090-2 [Ref 13.N] 6.5.3.1, tested in accordance with BS EN 10025-1 [Ref 21.N] to demonstrate that the specified mechanical properties of the product have been maintained, shall be taken from 2 mm below the material surface of the heated zone where the maximum specified temperature had been sustained for the longest period.

4.30 A conforming procedure qualification test shall qualify flame straightening procedures within the following limits:.

1. all material grades and subgrades up to and including those tested; and

2. the number of full thermal cycles per heat zone up to and including the number applied in the test.

4.31 Verification shall be undertaken for flame straightening personnel by assessment and approval by the welding coordinator, to ensure competence for implementing the documented instruction for correction.

4.32 The frequency of assessment and approval of flame straightening personnel by the welding coordinator shall be at least once per flame straightening personnel.

4.33 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to the assessment and approval of flame straightening personnel by the welding coordinator.

Flame straightening: additional requirements for stainless steels (BS EN 1090-2, 6.5.3.2)

4.34 Flame straightening of stainless steels shall not be undertaken on duplex, low nickel austenitic, and martensitic grades.

4.35 Flame straightening of stainless steel grades other than duplex, low nickel austenitic, and martensitic shall not be undertaken, unless otherwise stated in CC 483/WSR/004.

SI.4.35 Flame straightening of stainless steel grades other than duplex, low nickel austenitic, and martensitic is permissible in the following situations: [enter free text].

Cold forming (BS EN 1090-2, 6.5.4)

4.36 For cold forming, the minimum inside bend radii, r, for stainless steels to referred grades shall be as specified in CC 483/WSR/004.

For cold forming, the minimum inside bend radii, r, for stainless steels to referred grades				
Structure reference	**Component reference**	**Description of the minimum inside bend radii, r, for shaping of stainless steels by cold forming, and the referred grades**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the specified minimum inside bend radii, r, for shaping of stainless steels to referred grades by cold forming apply.

b) Enter text, to identify the components for which the specified minimum inside bend radii, r, for shaping of stainless steels to referred grades by cold forming apply.

c) Enter text, to describe the minimum inside bend radii, r, for shaping of stainless steels by cold forming, and the referred grades.

d) Enter text, to list the drawings or models that show the locations where the specified minimum inside bend radii, r, for shaping of stainless steels to referred grades by cold forming apply.

e) Enter text, to list the documents that provide the specified minimum inside bend radii, r, for shaping of stainless steels by cold forming, and the referred grades.

4.37 For circular tubes, the conditions for bending by cold forming in addition to those stated in BS EN 1090-2 6.5.4 shall be as specified in CC 483/WSR/004.

For circular tubes, the conditions for bending by cold forming in addition to those stated in BS EN 1090-2 6.5.4				
Structure reference	**Component reference**	**Description of the conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 6.5.4**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 [Ref 13.N] 6.5.4, apply.

b) Enter text, to identify the components for which the conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 [Ref 13.N] 6.5.4, apply.

c) Enter text, to describe the conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 [Ref 13.N] 6.5.4.

d) Enter text, to list the drawings or models that show the locations where the conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 [Ref 13.N] 6.5.4, apply.

e) Enter text, to list the documents that provide the specified other conditions for circular tube bending by cold forming, in addition to those stated in BS EN 1090-2 [Ref 13.N] 6.5.4.

Holing (BS EN 1090-2, 6.6)

Dimensions of holes (BS EN 1090-2, 6.6.1)

4.38 The special dimensions for holes for movement joints shall be as specified in CC 483/WSR/004.

The special dimensions for holes for movement joints				
Structure reference	**Component reference**	**Description of the special dimensions for holes for movement joints**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the special dimensions for holes for movement joints apply.

b) Enter text, to identify the components for which the special dimensions for holes for movement joints apply.

c) Enter text, to describe the special dimensions for holes for movement joints.

d) Enter text, to list the drawings or models that show where the special dimensions for holes for movement joints apply.

e) Enter text, to list the documents that provide the special dimensions for holes for movement joints.

4.39 The nominal diameters of holes for solid rivets for hot riveting shall be as specified in CC 483/WSR/004.

The nominal diameters of holes for solid rivets for hot riveting				
Structure reference	**Component reference**	**Description of the nominal diameters of holes for solid rivets for hot riveting**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the nominal diameter of holes for solid rivets for hot riveting apply.

b) Enter text, to identify the components for which the nominal diameter of holes for solid rivets for hot riveting apply.

c) Enter text, to describe the nominal diameters of holes for solid rivets for hot riveting.

d) Enter text, to list the drawings or models that show where nominal diameter of holes for solid rivets for hot riveting apply.

e) Enter text, to list the documents that provide the nominal diameter of holes for solid rivets for hot riveting.

4.40 The dimensions of the countersinking for countersunk bolts shall be as specified in CC 483/WSR/004.

The dimensions of the countersinking for countersunk bolts				
Structure reference	**Component reference**	**Description of the dimensions of the countersinking for countersunk bolts**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the dimensions of the countersinking for countersunk bolts apply.

b) Enter text, to identify the components for which the dimensions of the countersinking for countersunk bolts apply.

c) Enter text, to describe the dimensions of the countersinking for countersunk bolts.

d) Enter text, to list the drawings or models that show where the dimensions of the countersinking for countersunk bolts apply.

e) Enter text, to list the documents that provide the dimensions of the countersinking for countersunk bolts.

Execution of holing (BS EN 1090-2, 6.6.3)

4.41 Round or slotted holes in structural steelwork for fasteners or pins shall be drilled, or punched at least 2 mm undersize in diameter and reamed after punching to the final diameter, where any of the following conditions apply:.

1. the material thickness is greater than 3 mm;

2. the QSC is F71 or higher; or

3. the joint is made using preloaded bolting assemblies

4.42 Slotted holes in structural steelwork formed by drilling or punching shall be completed by machining, e.g. reaming, milling, to ensure smooth holes free from cracks.

4.43 Hand thermal cutting of slotted holes in structural steelwork shall not be permitted in any material thickness.

4.44 For holes in structural steelwork formed by thermal cutting, isolated faults such as gouges, melting beads, and oxide remainders, as described in BS EN ISO 9013 [Ref 55.N] 7.2.1 shall be removed by grinding, linishing, or machining.

Cut outs (BS EN 1090-2, 6.7)

4.45 For cut-outs in structural steelwork, the minimum radius values for rounded off re-entrant corners and notches shall be 5 mm for QSC F56 and 10 mm for QSC F71 and above, unless otherwise stated in CC 483/WSR/004.

4.46 For cut-outs in structural steelwork, the other minimum radius values for rounded off re-entrant corners and notches shall be as specified in CC 483/WSR/004.

For cut-outs in structural steelwork, the other minimum radius values for rounded off re-entrant corners and notches				
Structure reference	**Component reference**	**Description of the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork apply.

b) Enter text, to identify the components for which the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork apply.

c) Enter text, to describe the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork.

d) Enter text, to list the drawings or models that show where the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork apply.

e) Enter text, to list the documents that provide the other minimum radius values for rounded off re-entrant corners and notches for cut-outs in structural steelwork.

4.47 Cut outs in structural steelwork shall not be formed by punching.

Full contact bearing surfaces (BS EN 1090-2, 6.8)

4.48 The locations where full contact bearing surfaces are required shall be as specified in CC 483/WSR/004.

The locations where full contact bearing surfaces are required				
Structure reference	**Component reference**	**Description of the**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which full contact bearing surfaces are required.

b) Enter text, to identify the components for which full contact bearing surfaces are required.

c) Enter text, to describe the locations where full contact bearing surfaces are required.

d) Enter text, to list the drawings or models that show where full contact bearing surfaces are required.

e) Enter text, to list the documents that provide the locations where full contact bearing surfaces are required.

Assembly (BS EN 1090-2, 6.9)

4.49 Holes for which elongation for assembly is not permitted shall be as specified in CC 483/WSR/004.

Holes for which elongation for assembly is not permitted				
Structure reference	**Component reference**	**Description of the holes for which elongation for assembly is not permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures on which elongation of holes for assembly is not permitted.

b) Enter text, to identify the components on which elongation of holes for assembly is not permitted.

c) Enter text, to describe the holes for which elongation for assembly is not permitted.

d) Enter text, to list the drawings or models that show where elongation of holes for assembly is not permitted.

e) Enter text, to list the documents that provide information about the holes for which elongation for assembly is not permitted.

4.50 All connections for temporary components shall be executed in accordance with the requirements of this document, according to the QSC at each connection location.

4.51 Special requirements applying to connections for temporary components, including those related to fatigue, shall be as specified in CC 483/WSR/004.

Special requirements applying to connections for temporary components, including those related to fatigue,				
Structure reference	**Component reference**	**Description of the special requirements applying to connections for temporary components, including those related to fatigue**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the special requirements applying to connections for temporary components, including those related to fatigue, apply.

b) Enter text, to identify the components for which the special requirements applying to connections for temporary components, including those related to fatigue, apply.

c) Enter text, to describe the special requirements applying to connections for temporary components, including those related to fatigue.

d) Enter text, to list the drawings or models that show where the special requirements applying to connections for temporary components, including those related to fatigue, apply.

e) Enter text, to list the documents that provide information about the special requirements applying to connections for temporary components, including those related to fatigue.

4.52 Connections for temporary components shall not result in the removal or addition of permanent material or introduction of permanent stress concentrating details, unless otherwise stated in CC 483/WSR/004.

4.53 The locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted shall be as specified in CC 483/WSR/004.

The locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted				
Structure reference	**Component reference**	**Description of the locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted.

b) Enter text, to identify the components with locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted.

c) Enter text, to describe the locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted.

d) Enter text, to list the drawings or models that show the locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted.

e) Enter text, to list the documents that provide information on the locations where the removal or addition of permanent material or the introduction of permanent stress concentrating details is permitted.

4.54 Where the design permits temporary holes in structural steelwork, any filling of temporary holes by welding shall be subject to qualification of the procedure(s) and the welder(s) using the preparation(s) and material thickness(es) to be used in production, and to specific testing.

4.55 The following Documentation for any connections for temporary components shall be submitted as continuous records: A record of the details of any connections for temporary components.

4.56 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to any connections for temporary components.

Assembly check (BS EN 1090-2, 6.10)

4.57 The requirements for whether, and to what extent, trial assembly of structural steelwork is to be undertaken shall be as specified in CC 483/WSR/004.

The requirements for whether, and to what extent, trial assembly of structural steelwork is to be undertaken				
Structure reference	**Component reference**	**Description of the requirements and extent of the trial assembly of structural steelwork**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which trial assembly of structural steelwork is required to be undertaken.

b) Enter text, to identify the components for which trial assembly of structural steelwork is required to be undertaken.

c) Enter text, to describe the requirements and extent of the trial assembly of structural steelwork.

d) Enter text, to list the drawings or models that show requirements and extent of the trial assembly of structural steelwork.

e) Enter text, to list the documents that provide information on the requirements and extent of the trial assembly of structural steelwork.

4.58 Where a full or staged trial assembly of structural steelwork is undertaken, the correction of hole alignment by reaming of bolted splices, selection of pack thicknesses, correction of weld preparation fit-up and correct positioning of temporary alignment cleats shall be carried out during the trial assembly.

4.59 For assembly checks for structural steelwork, support of the assembly parts shall minimise self-weight stresses, where the unstressed camber profile is being checked.

4.60 For assembly checks for structural steelwork, alignment of assembly parts shall be re-established in staged trial assembly including relative levels of bearings.

4.61 For assembly checks for structural steelwork, differential temperature distributions throughout the steelwork shall be controlled or allowed for if exposed to direct sunlight when surveys are made.

4.62 For assembly checks for structural steelwork, unique marking for identification and orientation of individual components shall be used.

4.63 For assembly checks for structural steelwork, all shop welding and bolting shall be complete.

4.64 For assembly checks for structural steelwork, every bolt hole shall be proved with a bolt of identical size to those to be used at the site.

4.65 For assembly checks for structural steelwork, lack of fit between components shall not be corrected by bolt tensioning.

4.66 For assembly checks for structural steelwork, the position and level of all bearings and primary control points shall be surveyed at the trial erection.

5. Welding (BS EN 1090-2 Section 7)

General (BS EN 1090-2, 7.1)

5.1 The quality requirements for fusion welding of metallic materials shall conform to the requirements for BS EN ISO 3834-2 [Ref 39.N], unless otherwise stated in CC 483/WSR/005.

5.2 The steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 apply shall be as specified in CC 483/WSR/005.

The steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 apply				
Structure reference	**Component reference**	**Description of the steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N] apply**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with the steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N] apply.

b) Enter text, to identify the steel components to which the the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N] apply.

c) Enter text, to describe the steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N] apply.

d) Enter text, to list the drawings or models that show the steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N] apply.

e) Enter text, to list the documents that provide information about the steel components to which the quality requirements for fusion welding of metallic materials conforming to BS EN ISO 3834-3 [Ref 40.N]apply.

5.3 Welding conforming to the requirements of EXC2 shall be undertaken by organisations holding valid BS EN ISO 3834-3 [Ref 40.N] certification issued by a certification body accredited by UKAS.

5.4 For welds conforming to the requirements of EXC2, the certified welding quality management system shall be in accordance with BS EN ISO 3834-3 [Ref 40.N].

5.5 Welding conforming to the requirements of EXC3/4 shall be undertaken by organisations holding valid BS EN ISO 3834-2 [Ref 39.N] certification issued by a certification body accredited by UKAS.

5.6 For welds conforming to the requirements of EXC3/4, the certified welding quality management system shall be in accordance with BS EN ISO 3834-2 [Ref 39.N].

5.7 Permanent welds not specified in the design shall not be permitted.

Welding plan (BS EN 1090-2, 7.2)

Content of a welding plan (BS EN 1090-2, 7.2.2)

5.8 When applying the conditions for welding cold formed zones according to Section 4 of BS EN 1993-1-8 [Ref 10.N], the ‘predominantly static loading’ condition shall be deemed to apply to a QSC of F56 and the ‘fatigue predominates’ condition to QSCs of F71 and above.

Welding processes (BS EN 1090-2, 7.3)

5.9 A welding process which is not covered by BS EN 1090-2 [Ref 13.N] Table 12 or Table 13 shall be classified as an Exceptional Welding Process (EWP).

5.10 An EWP shall conform to all requirements stated in this section.

5.11 The welding procedure specifications (WPSs) for EWPs shall include all variables.

5.12 The WPS for EWPs shall include fit up tolerances and details of jigging, other fixtures, and measurement devices..

5.13 The WPSs for EWPs shall include details of any thermal processes, including tack welding, pre- and post-heating, other welding processes (including repair welds), and thermal cutting, to be used in conjunction with the EWP.

5.14 Each preliminary WPS (pWPS) for EWPs shall be qualified by pre-production welding tests in accordance with BS EN ISO 15613 [Ref 43.N] followed by non-destructive and destructive testing in accordance with the applicable requirements for the weld type in BS EN ISO 15614-1 [Ref 44.N].

5.15 Verification shall be undertaken for the pre-production welding tests for the qualification of the pWPS of EWPs through non-destructive and destructive testing in accordance with BS EN ISO 15614-1 [Ref 44.N].

5.16 The frequency of non-destructive and destructive testing of the pre-production welding tests for the qualification of the pWPS of EWPs shall be in accordance with BS EN ISO 15614-1 [Ref 44.N].

5.17 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to non-destructive and destructive testing of the pre-production welding tests for the qualification of the pWPS of EWPs.

5.18 The range of qualification of the pWPS for EWPs shall be in accordance with BS EN ISO 15614-1 [Ref 44.N] for the type of weld tested.

5.19 The welding personnel shall be qualified by performing the pre-production welding tests for qualification of the pWPSs for EWPs, as described in this section.

5.20 The NDT procedures for welds made by an EWP shall be approved by an operator qualified to Level 3 of BS EN ISO 9712 [Ref 36.N] for the technique(s) used.

5.21 Verification shall be undertaken for production EWP welds through testing in accordance with Table 10.140, except tensile and Charpy testing of in-line transverse butt welds in tension.

5.22 The frequency of testing of production EWP welds, except tensile and Charpy testing of in-line transverse butt welds in tension, shall be as stated in Table 10.140.

5.23 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to testing of production EWP welds, except tensile and Charpy testing of in-line transverse butt welds in tension.

5.24 Verification shall be undertaken for production EWP welds through tensile and Charpy testing of production EWP in-line transverse butt welds in tension in accordance with Table 10.140.

5.25 The frequency of tensile and Charpy testing of production EWP in-line transverse butt welds in tension shall be every fifth weld for all material grades.

5.26 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to tensile and Charpy testing of production EWP in-line transverse butt welds in tension.

5.27 The following Documentation shall be submitted for the EWP prior to the commencement of the works: ..

1. WPSs;

2. pWPSs;

3. evidence demonstrating the welding personnel have the specified qualifications; and

4. evidence demonstrating the welding coordination personnel have in-depth knowledge and experience of the EWP.

5.28 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to the documentation for EWPs.

Qualification of welding procedures and welding personnel (BS EN 1090-2, 7.4)

Qualification of welding procedures: general (BS EN 1090-2, 7.4.1.1)

5.29 For tack welds, the WPS shall include the special deposition conditions.

5.30 For tack welds, the WPS shall include macroscopic examination and hardness testing within the tack weld length.

5.31 The tolerances on cross section and length of the tack weld and any subsequent profiling requirements, such as feathering of ends, shall be specified in the WPS.

5.32 To qualify the procedure for a tack weld where it is to be incorporated in the joint, the maximum permitted cross section of tack weld shall be used in the qualification test.

5.33 To qualify the procedure for a tack weld where it is to be incorporated in the joint, the positions of the ends of the tack weld shall be marked on the test piece.

5.34 Macroscopic examination and hardness testing shall be carried out within the tack weld length.

5.35 Macroscopic examination and hardness testing within the tack weld length shall not be required if the original test for qualifying the complete weld includes the tack weld tested.

5.36 For joints in hollow section lattice structures, the start and stop zones and the method to be used in order to cope with locations where the welds change from a fillet weld to butt around a joint shall be as specified in CC 483/WSR/005.

For joints in hollow section lattice structures, the start and stop zones and the method to be used in order to cope with locations where the welds change from a fillet weld to butt around a joint				
Structure reference	**Component reference**	**Description of the start and stop zones for joints in hollow section lattice structures, and the method to be used in order to cope with locations where the welds change from a fillet weld to butt around a joint**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where joints in hollow section lattice structures are present.

b) Enter text, to define the components where joints in hollow section lattice structures are present.

c) Enter text, to describe the start and stop zones for joints in hollow section lattice structures, and the method to be used in order to cope with locations where the welds change from a fillet weld to butt around a join.

d) Enter text, to list the drawings or models that show the joints in hollow section lattice structures.

e) Enter text, to list the documents that provide the requirements for the start and stop zones for joints in hollow section lattice structures, and the method to be used in order to cope with locations where the welds change from a fillet weld to butt around a joint.

Qualification of welding procedures: qualification of welding procedures for processes 111, 114, 12, 13, and 14 (BS EN 1090-2, 7.4.1.2)

5.37 Methods of qualification of welding procedures for processes 111, 114, 12, 13, and 14 shall be in accordance with those permitted for EXC3/4 in BS EN 1090-2 [Ref 13.N], Table 12.

5.38 Qualification of welding procedures for processes 111, 114, 12, 13, and 14 by means of a standard welding procedure shall not be permitted.

5.39 Where the limits given in BS EN ISO 15614-1 [Ref 44.N] are less restrictive than the Fitness for Purpose (FFP) acceptance criteria for visual inspection of welds and supplementary NDT, the relevant WPS and associated welding procedure qualification record (WPQR) shall be

reviewed and any additional controls added to the WPS to ensure that the acceptance criteria is met in production.

5.40 Where the acceptance criteria for visual inspection of welds and supplementary NDT specified in Table 10.115, Table 10.125, Table 10.128 and Table 10.129 are not met, a pre-production test of the joint concerned shall be carried out..

5.41 Verification shall be undertaken for pre-production tests of joints through NDT and destructive examination to demonstrate that the acceptance criteria for visual inspection of welds and supplementary NDT specified in Table 10.115, Table 10.125, Table 10.128 and Table 10.128 has been met.

5.42 The frequency of NDT and destructive examination of pre-production test joints shall be at least once for each pre-production test.

5.43 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to NDT and destructive examination of pre-production test joints.

5.44 Alternatives to the cruciform tensile test to BS EN ISO 9018 [Ref 9.N] for fillet welds on steel grades S460 and above shall not be permitted.

5.45 Slot and plug welds shall be subject to procedure testing in accordance with BS EN ISO 15613 [Ref 43.N].

Qualification of welding procedures: qualification of welding procedures for other welding processes (BS EN 1090-2, 7.4.1.3)

5.46 Welding procedure qualification for welding process numbers 783, 784, and 786 shall be carried out by a welding procedure test in accordance with BS EN ISO 14555 [Ref 58.N] ,10.2.

5.47 For welding process 783, the examination and testing of test pieces shall be carried out in accordance with BS EN ISO 14555 [Ref 58.N] for comprehensive quality requirements according to BS EN ISO 3834-2 [Ref 39.N].

5.48 Fillet, partial penetration and full penetration tee joint welds shall be qualified by a supplementary inline butt weld procedure qualification record to demonstrate mechanical properties in accordance with BS EN ISO 15614-1 [Ref 44.N].

5.49 Verification shall be undertaken for qualification of welded joints involving reinforcing steel, irrespective of whether a joint is nominally classified as 'load' or 'non-load' bearing, through qualification testing in accordance with BS EN ISO 17660-1 [Ref 62.N].

5.50 The frequency of qualification testing of welded joints involving reinforcing steel shall be in accordance with BS EN ISO 17660-1 [Ref 62.N].

5.51 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to qualification testing of welded joints involving reinforcing steel.

Qualification of welding procedures: validity of a welding procedure qualification (BS EN 1090-2, 7.4.1.4)

5.52 Welding production tests for welding procedure qualification shall be carried out in accordance with the qualification standard for the process concerned.

Welders and welding operators: general (BS EN 1090-2, 7.4.2.1)

5.53 Welders shall be qualified by specific test for welding of joints with restricted access.

5.54 Welders of joints involving reinforcing steel shall be qualified in accordance with BS EN ISO 17660-1 [Ref 62.N].

Welding coordination (BS EN 1090-2, 7.4.3)

5.55 Welding coordination shall conform to the requirements for EXC2/3/4.

Preparation and execution of welding (BS EN 1090-2, 7.5)

Joint preparation: general (BS EN 1090-2, 7.5.1.1)

5.56 Where prefabrication primers are to be left on fusion faces or heat affected zones, the weld procedures for EXC1 shall be tested in accordance with the requirements for EXC2/3/4.

Joint preparation: hollow sections (BS EN 1090-2, 7.5.1.2)

5.57 The guidance on joint preparation for joints between hollow sections given in BS EN 1090-2 [Ref 13.N], Annex E shall be applied.

Assembly for welding (BS EN 1090-2, 7.5.4)

5.58 The guidance on the assembly of hollow section components given in BS EN 1090-2 [Ref 13.N], Annex E shall be applied.

5.59 Verification shall be undertaken for demonstrating that the required penetration can be achieved for the assembly of hollow section components where access to the joint for welding is restricted, by conducting a pre-production welding test conforming to BS EN ISO 15613

[Ref 43.N] using the tolerances on preparation and fit-up that give the most restricted access.

5.60 The frequency of pre-production weld testing demonstrating that the required penetration can be achieved for the assembly of hollow section components where access to the joint for welding is restricted shall be in accordance with BS EN ISO 15613 [Ref 43.N].

5.61 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to pre-production weld testing for the assembly of hollow section components where access to the joint for welding is restricted.

Temporary attachments (BS EN 1090-2, 7.5.6)

5.62 Areas where welding of temporary attachments to permanent steel members is not permitted shall be as described in CC 483/WSR/005.

Areas where welding of temporary attachments to permanent steel members is not permitted				
Structure reference	**Component reference**	**Description of the areas where welding of temporary attachments to permanent steel members is not permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where welding of temporary attachments to permanent steel members is not permitted.

b) Enter text, to define the components where welding of temporary attachments to permanent steel members is not permitted.

c) Enter text, to describe the areas where welding of temporary attachments to permanent steel members is not permitted.

d) Enter text, to list the drawings or models to show the areas where the welding of temporary attachments to permanent steel members is not permitted.

e) Enter text, to list the documents that provide the requirements for areas where the welding of temporary attachments to permanent steel members is not permitted.

5.63 Restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4 shall be as specified in CC 483/WSR/005.

Restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4				
Structure reference	**Component reference**	**Description of the restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4 are required.

b) Enter text, to define the components for which restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4 are required.

c) Enter text, to describe the restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4.

d) Enter text, to list the drawings or models that show the restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4.

e) Enter text, to list the documents that provide the restrictions on the use of temporary welded attachments to permanent steel members for EXC3/4.

5.64 Temporary welded attachments to permanent steel members shall not be permitted in zones of QSC F112 and above.

5.65 Temporary welded attachments to permanent steel members shall not be permitted within 25 mm of an edge.

5.66 Except where excluded elsewhere in this section, removal of temporary welded attachments by thermal cutting, gouging, or chipping shall be permitted provided that the finished cut surface of the remainder of the attachment is at least 3 mm from the permanent steel member surface prior to grinding smooth.

5.67 Remnants of temporary material, from temporary welded attachments, proud of the permanent steel member surface shall be removed by grinding parallel to the permanent steel member axis.

5.68 Verification shall be undertaken for the absence of cracking on the surfaces of the permanent steel members, following removal of temporary welded attachments, through magnetic particle testing.

5.69 The frequency of magnetic particle testing of the surfaces of the permanent steel members, following removal of temporary welded attachments, shall be once for all surfaces after grinding.

5.70 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to magnetic particle testing of the surfaces of the permanent steel members, following removal of temporary welded attachments.

5.71 Gouging and chipping shall not be used for the removal of temporary welded attachments on steel grades S460 and above.

5.72 Gouging and chipping shall not be used for the removal of temporary welded attachments where a QSC of F71 or above applies.

Tack welds (BS EN 1090-2, 7.5.7)

5.73 Tack welds shall conform to the requirements for EXC2/3/4.

Fillet welds: general (BS EN 1090-2, 7.5.8.1)

5.74 For fillet welded joints with root gaps, compensation shall be made for loss of throat and effective leg length by increasing the deposit size as follows:.

1. minimum required throat size a + 0.7h; and

2. minimum required leg length z + h, on affected leg only.

Butt welds: general (BS EN 1090-2, 7.5.9.1)

5.75 Run-on and run-off pieces shall be used on all butt welds.

5.76 Run-on and run-off pieces for butt welds shall conform to the requirements for EXC2/3/4.

5.77 Where a weld surface is required to be ground or machined flush, this shall be executed prior to non-destructive testing.

5.78 The location of butt welds used as splices to accommodate available lengths of constituent products shall be as specified in CC 483/WSR/005.

The location of butt welds used as splices to accommodate available lengths of constituent products				
Structure reference	**Component reference**	**Description of the location of butt welds used as splices to accommodate available lengths of constituent products**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures on which butt welds used as splices to accommodate available lengths of constituent products are present.

b) Enter text, to define the components on which butt welds used as splices to accommodate available lengths of constituent products are present.

c) Enter text, to describe the locations of butt welds used as splices to accommodate available lengths of constituent products.

d) Enter text, to list the drawings or models that show the locations of butt welds used as splices to accommodate available lengths of constituent products.

e) Enter text, to list the documents that provide information on the locations of butt welds used as splices to accommodate available lengths of constituent products.

5.79 Flush surfaces required for butt welds shall be as specified in CC 483/WSR/005.

Flush surfaces required for butt welds				
Structure reference	**Component reference**	**Description of the requirements for flush surfaces for butt welds**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which a flush surface is required for butt welds.

b) Enter text, to define the components for which a flush surface is required for butt welds.

c) Enter text, to describe the requirements for flush surfaces for butt welds.

d) Enter text, to list the drawings or models that show butt welds for which a flush surface is required.

e) Enter text, to list the documents that provide the requirements for flush surfaces for butt welds.

Butt welds: single sided welds (BS EN 1090-2, 7.5.9.2)

5.80 Single sided welds where the use of permanent steel backing is permitted shall be as specified in CC 483/WSR/005.

Single sided welds where the use of permanent steel backing is permitted				
Structure reference	**Component reference**	**Description of the requirements for the use of permanent steel backing for single sided welds**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the use of permanent steel backing for single sided welds is permitted.

b) Enter text, to define the component for which the use of permanent steel backing for single sided welds is permitted.

c) Enter text, to describe the requirements for the use of permanent steel backing for single sided welds.

d) Enter text, to list the drawings or models that show single sided welds where the use of permanent steel backing is permitted.

e) Enter text, to list the documents that provide the requirements for the use of permanent steel backing for single sided welds.

5.81 The continuity of permanent steel backing for single sided welds shall conform to the requirements for EXC3/4.

5.82 The execution of the continuity weld shall depend upon the QSC related to stresses parallel to the axis of the steel backing component, as follows:.

1. F36: no additional requirements;

2. F56 to F90: make continuous by full penetration butt weld at any stage, followed by surface crack detection; and

3. F112 to F140: make continuous by full penetration butt weld, followed by flush grinding and surface crack detection before assembly.

Welds on steels with improved atmospheric corrosion resistance (BS EN 1090-2, 7.5.10)

5.83 The requirements for the welding consumables to be used for welds on steels with improved atmospheric corrosion resistance shall be as those stated in "Constituent products (BS EN 1090-2 Section 5)" in Section 3 of this document.

Branch connections (BS EN 1090-2, 7.5.11)

5.84 The guidance on the execution of branch connections in hollow sections given in BS EN 1090-2 [Ref 13.N], Annex E shall be applied to all branch connections.

Stud welding (BS EN 1090-2, 7.5.12)

5.85 The comprehensive quality requirements in accordance with BS EN ISO 3834-2 [Ref 39.N] shall be adopted for stud welding.

Slot and plug welds (BS EN 1090-2, 7.5.13)

5.86 The dimensions of holes for slot and plug welds shall be as specified in CC 483/WSR/005.

The dimensions of holes for slot and plug welds				
Structure reference	**Component reference**	**Description of the dimensions of holes for slot and plug welds**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to describe the structures in which slot and plug welds are required.

b) Enter text, to describe the components in which slot and plug welds are required.

c) Enter text, to describe the dimensions of holes for slot and plug welds.

d) Enter text, to list the drawings or models which show the dimensions of holes for slot and plug welds.

e) Enter text, to list the documents that provide the requirements for the dimensions of holes for slot and plug welds.

5.87 The depth-to-minimum width ratio of the slot or plug hole shall not exceed that used for the weld procedure qualification test.

Other weld types (BS EN 1090-2, 7.5.14)

5.88 The requirements for other weld types shall be as specified in CC 483/WSR/005.

The requirements for other weld types					
Structure reference	**Component reference**	**Description of other weld types**	**Description of the requirements for other weld types**	**Drawings / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to define the structures with other weld types.

b) Enter text, to define the components with other weld types.

c) Enter text, to describe the other weld types.

d) Enter text, to describe the requirements for the other weld types.

e) Enter text, to list the drawings or models which show the other weld types.

f) Enter text, to list the documents that provide the requirements for the other weld types.

Execution of welding (BS EN 1090-2, 7.5.16)

5.89 Grinding and dressing of the surface of completed welds shall be as specified in CC 483/WSR/005.

Grinding and dressing of the surface of completed welds				
Structure reference	**Component reference**	**Description of the requirements for grinding and dressing of the surface of completed welds**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which the grinding and dressing requirements for the surfaces of completed welds apply.

b) Enter text, to define the components for which the grinding and dressing requirements for the surfaces of completed welds apply.

c) Enter text, to describe the requirements for grinding and dressing of the surface of completed welds.

d) Enter text, to list the drawings or models which show the welds to which the grinding and dressing of the surface is required.

e) Enter text, to list the documents which give the requirements for grinding and dressing of the surface of completed welds.

5.90 Stray arc sites shall be free from cracking.

5.91 Verification shall be undertaken for the absence of cracking at stray arc sites through PT or MT testing on all steel grades for QSC F90 and above.

5.92 The frequency of PT or MT testing of stray arc sites shall be at least once for every stray arc site for all steel grades for QSC F90 and above.

5.93 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to PT or MT testing of stray arc sites.

5.94 Deposits of weld spatter shall be removed from steel surfaces which are to receive corrosion protection, except as allowed in "Surface treatment (BS EN 1090-2 Section 10)" in Section 8 of this document.

5.95 Deposits of weld spatter shall be removed from surfaces of uncoated steel conforming to BS EN 10025-5 [Ref 24.N] and BS EN 10088-1 [Ref 45.N].

5.96 The direction of grinding of the surfaces of completed welds shall be parallel to the stress direction for welds with a QSC of F90 and above.

Acceptance criteria (BS EN 1090-2, 7.6)

Routine requirements (BS EN 1090-2, 7.6.1)

5.97 Acceptance criteria used for FPC during the work shall not be to a lower standard than that required for specific inspection of the work as stated in Table 10.115, Table 10.125, Table 10.128, and Table 10.129, taking into account the method of testing and QSCs required for the work; see "Inspection, testing and correction (BS EN 1090-2 Section 12)" in Section 10 of this document.

Fatigue requirements (BS EN 1090-2, 7.6.2)

5.98 The method of specification and the acceptance criteria given in BS EN 1090-2 [Ref 13.N], 7.6.2 shall not be used in place of those given in Table 10.115, Table 10.125, Table 10.128, and Table 10.129 for specific inspection of production welds; see "Inspection, testing and correction (BS EN 1090-2 Section 12)" in Section 10 of this document.

Orthotropic bridge decks (BS EN 1090-2, 7.6.3)

5.99 The requirements for specific inspection and testing of welds in orthotropic bridge decks shall be as given in Table 10.115, Table 10.125, Table 10.128, and Table 10.129.

Welding of stainless steels (BS EN 1090-2, 7.7)

5.100 Requirements for welding different stainless steel types to each other or to other steels, such as carbon steels, shall be as specified in CC 483/WSR/005.

Requirements for welding different stainless steel types to each other or to other steels, such as carbon steels,				
Structure reference	**Component reference**	**Description of the requirements for welding different stainless steel types to each other or to other steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which different stainless steel types are to be welded to each other or to other steels, such as carbon steels.

b) Enter text, to components for which different stainless steels are to be welded to each other or to other steels, such as carbon steels.

c) Enter text, to describe the requirements for welding different stainless steel types to each other or to other steels, such as carbon steels.

d) Enter text, to list the drawings or models that show the welding of different stainless steel types to each other or to other steels, such as carbon steels.

e) Enter text, to list the documents that provide the requirements for welding different stainless steel types to each other or to other steels, such as carbon steels.

6. Mechanical fastening (BS EN 1090-2 Section 8)

Use of bolting assemblies (BS EN 1090-2, 8.2)

General (BS EN 1090-2, 8.2.1)

6.1 Bolting assemblies that require additional measures or means to secure the nuts, in addition to tightening shall be as specified in CC 483/WSR/006.

Bolting assemblies that require additional measures or means to secure the nuts, in addition to tightening				
Structure reference	**Component reference**	**Description of the additional measures or means to secure the nuts of bolting assemblies, in addition to tightening**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where additional measures or means to secure the nuts of bolting assemblies, in addition to tightening, are required.

b) Enter text, to define the components where additional measures or means to secure the nuts of bolting assemblies, in addition to tightening, are required.

c) Enter text, to describe the additional measures or means to secure the nuts of bolting assemblies, in addition to tightening, where required.

d) Enter text, to list the drawings or models that show the additional measures or means to secure the nuts of bolting assemblies, in addition to tightening, where required.

e) Enter text, to list the documents that provide the requirements for the additional measures or means to secure the nuts of bolting assemblies, in addition to tightening, where required.

6.2 Locations where welding of property class 4.6 nuts, bolts, or washers is permitted shall be as stated in CC 483/WSR/006.

Locations where welding of property class 4.6 nuts, bolts, or washers is permitted

Structure reference	Component reference	Description of the the locations where welding of property class 4.6 nuts, bolts, or washers is permitted	Drawing / model numbers	Additional documents
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where welding of property class 4.6 nuts, bolts, or washers is permitted.

b) Enter text, to define the components where welding of property class 4.6 nuts, bolts or washers is permitted.

c) Enter text, to describe the locations where welding of property class 4.6 nuts, bolts, or washers is permitted.

d) Enter text, to list the drawings or models that show where welding of property class 4.6 nuts, bolts, or washers is permitted.

e) Enter text, to list the documents that provide the requirements for welding of property class 4.6 nuts, bolts, or washers.

6.3 Where permitted, welding of property class 4.6 nuts, bolts, or washers shall comply with "Welding (BS EN 1090-2 Section 7)" in Section 5 of this document.

6.4 Where permitted, welding of property class 4.6 nuts, bolts, or washers shall comply with "Inspection, testing and correction (BS EN 1090-2 Section 12)" in Section 10 of this document.

6.5 Where permitted, welding of property class 4.6 nuts, bolts, or washers shall comply with BS EN 1090-2 [Ref 13.N] Section 7.

6.6 Where welding of class 4.6 nuts, bolts, or washers is permitted, the weld procedures shall be in accordance with BS EN ISO 15613 [Ref 43.N].

6.7 The restrictions on orientation of bolting assemblies shall be as stated in CC 483/WSR/006.

The restrictions on orientation of bolting assemblies				
Structure reference	**Component reference**	**Description of the restrictions on orientation of bolting assemblies**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where the orientation of bolting assemblies is restricted.

b) Enter text, to define the components where the orientation of bolting assemblies is restricted.

c) Enter text, to describe the restrictions on orientation of bolting assemblies.

d) Enter text, to list the drawings or models that show where the orientation of bolting assemblies is restricted.

e) Enter text, to list the documents that provide the restrictions on the orientation of bolting assemblies.

Bolts (BS EN 1090-2, 8.2.2)

6.8 The use of fasteners with nominal diameters less than M12 for structural bolting shall be as specified in CC 483/WSR/006.

The use of fasteners with nominal diameters less than M12 for structural bolting					
Structure reference	**Component reference**	**Description of where fasteners with nominal diameter less than M12 are permitted**	**Requirements for the use of fasteners with nominal diameters less than M12 for structural bolting**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to define the structures where fasteners with nominal diameter less than M12 are permitted by the design for structural bolting.

b) Enter text, to define the components where fasteners with nominal diameter less than M12 are permitted by the design for structural bolting.

c) Enter text, to describe where fasteners with nominal diameter less than M12 are permitted by the design for structural bolting.

d) Enter text, to describe the associated requirements for the use of fasteners with nominal diameters less than M12 for structural bolting.

e) Enter text, to list the drawings or models that show where fasteners with nominal diameters less than M12 are permitted by the design for structural bolting and any associated requirements.

f) Enter text, to list the documents that provide the associated requirements for the use of fasteners with nominal diameters less than M12 for structural bolting.

6.9 The dimensions of bolts in connections utilising the shear capacity of the unthreaded shank of bolts shall be as specified in CC 483/WSR/006.

The dimensions of bolts in connections utilising the shear capacity of the unthreaded shank of bolts				
Structure reference	**Component reference**	**Description of the dimensions of bolts in connections utilising the shear capacity of the unthreaded shank of bolts**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures with connections where the shear capacity of the unthreaded shank of bolts is utilised.

b) Enter text, to define the components with connections where the shear capacity of the unthreaded shank of bolts is utilised.

c) Enter text, to describe the dimensions of bolts in connections utilising the shear capacity of the unthreaded shank of bolts.

d) Enter text, to list the drawings or models that show the bolts in connections utilising the shear capacity of the unthreaded shank of bolts.

e) Enter text, to list the documents that provide the dimensions of bolts in connections utilising the shear capacity of the unthreaded shank of bolts.

Washers (BS EN 1090-2, 8.2.4)

6.10 Washers shall be placed under the nut or head of the bolt in non-preloaded assemblies, whichever is rotated.

6.11 Washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 Clause 5.6.9.3, shall be as specified in CC 483/WSR/006.

Washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 Clause 5.6.9.3,				
Structure reference	**Component reference**	**Description of the washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where washers are to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3.

b) Enter text, to define the components where washers are to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3.

c) Enter text, to describe the washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3.

d) Enter text, to list the drawings or models that show the washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3.

e) Enter text, to list the documents that provide details of the washers to be used for connections with slotted and oversized holes, which are not plate washers in accordance with BS EN 1090-2 [Ref 13.N] Clause 5.6.9.3.

6.12 The dimensions and steel grades of plate washers shall be as specified in CC 483/WSR/006.

The dimensions and steel grades of plate washers				
Structure reference	**Component reference**	**Description of the dimensions and steel grade of plate washers**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where the dimensions and steel grades of plate washers apply.

b) Enter text, to define the components where the dimensions and steel grades of plate washers apply.

c) Enter text, to describe the dimensions and steel grade of plate washers.

d) Enter text, to list the drawings or models that show the dimensions and steel grades of plate washers.

e) Enter text, to list the documents that provide details of the dimensions and steel grades of plate washers.

Tightening of non-preloaded bolting assemblies (BS EN 1090-2, 8.3)

6.13 The locations where full contact bearing of non-preloaded bolting assemblies is required shall be as specified in CC 483/WSR/006.

The locations where full contact bearing of non-preloaded bolting assemblies is required				
Structure reference	**Component reference**	**Description of the locations where full contact bearing of non-preloaded bolting assemblies is required**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where full contact bearing of non-preloaded bolting assemblies is required.

b) Enter text, to define the components where full contact bearing of non-preloaded bolting assemblies is required.

c) Enter text, to describe where full contact bearing of non-preloaded bolting assemblies is required.

d) Enter text, to list the drawings or models that show where full contact bearing of non-preloaded bolting assemblies is required.

e) Enter text, to list the documents that provide further information about where full contact bearing of non-preloaded bolting assemblies is required.

Preparation of contact surfaces in slip resistant connections (BS EN 1090-2, 8.4)

6.14 For slip resistant connections, all surfaces which overlap each other in the final assembled connection excluding any painted edge strip around the perimeter of the connection shall be deemed to be 'contact surfaces'.

6.15 For slip resistant connections, the surface treatment applied to the friction surfaces shall be maintained until the surfaces are brought together and the connection assembled.

6.16 The requirements for the preparation of contact surfaces in slip resistant connections for stainless steels shall be as specified in CC 483/WSR/006.

The requirements for the preparation of contact surfaces in slip resistant connections for stainless steels				
Structure reference	**Component reference**	**Description of the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures where the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels apply.

b) Enter text, to define the components where the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels apply.

c) Enter text, to describe the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels.

d) Enter text, to list the drawings or models that show where the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels apply.

e) Enter text, to list the documents that provide the requirements for the preparation of contact surfaces in slip resistant connections for stainless steels.

6.17 For preloaded joints, the required class of contact surfaces and design life, where other than 50 years, shall be as specified in CC 483/WSR/006.

For preloaded joints, the required class of contact surfaces and design life, where other than 50 years,					
Structure reference	**Component reference**	**Description of the required class of contact surfaces in preloaded joints**	**Design life, where other than 50 years**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to define the structures for which the required class of contact surfaces in preloaded joints is defined.

b) Enter text, to define the components for which the required class of contact surfaces in preloaded joints defined.

c) Enter text, to describe the required class of contact surfaces in preloaded joints.

d) Enter text, to define the design life, where other than 50 years.

e) Enter text, to list the drawings or models that show where the required class of contact surfaces in preloaded joints is required.

f) Enter text, to list the documents that provide further information about the requirements for the class of contact surfaces in preloaded joints, and design life where other than 50 years.

Tightening of preloaded bolting assemblies (BS EN 1090-2, 8.5)

General (BS EN 1090-2, 8.5.1)

6.18 During tightening of preloaded bolting assemblies, at the snug tight stage, the exposed surfaces of the components being connected shall be aligned within 1 mm where they emerge from beneath the cover plate(s) at the joint plane.

6.19 During tightening of preloaded bolting assemblies, where the 1 mm tolerance on the exposed surfaces of the components being connected during the snug tight phase is exceeded, the cover plate(s) shall be removed and corrective steel packing plates installed.

6.20 Any coating passivation process shall only be undertaken following verification once tightening of the affected preloaded bolts has been completed.

6.21 The locations where the use of Annex H in BS EN 1090-2 [Ref 13.N] for the torque method is permitted shall be as specified in CC 483/WSR/006.

The locations where the use of Annex H in BS EN 1090-2 [Ref 13.N] for the torque method is permitted				
Structure reference	**Component reference**	**Description of locations where the use of Annex H in BS EN 1090-2 [Ref 13.N] for the torque method is permitted**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures with locations where the use of Annex H in BS EN 1090-2 [Ref 13.N] for the torque method is permitted.

b) Enter text, to define the components with locations where the use of Annex H in BS EN 1090-2 [Ref 13.N]for the torque method is permitted.

c) Enter text, to describe the locations where the use of Annex H in BS EN 1090-2 [Ref 13.N]for the torque method is permitted.

d) Enter text, to list the drawings or models that show the locations where the use of Annex H in BS EN 1090-2 [Ref 13.N]for the torque method is permitted.

e) Enter text, to list the documents that provide further information about the locations use of Annex H in BS EN 1090-2 [Ref 13.N]for the torque method is permitted.

6.22 In the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces, measures to limit the out-of-plane bending stiffness of cover plates shall be as specified in CC 483/WSR/006.

In the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces, measures to limit the out-of-plane bending stiffness of cover plates				
Structure reference	**Component reference**	**Description of the measures to limit the out-of-plane bending stiffness of cover plates in the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures for which measures to limit the out-of-plane bending stiffness of cover plates are specified for preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

b) Enter text, to define the components for which measures to limit the out-of-plane bending stiffness of cover plates are specified for preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

c) Enter text, to describe the measures to limit the out-of-plane bending stiffness of cover plates in the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

d) Enter text, to list the drawings or models that show where the measures to limit the out-of-plane bending stiffness of cover plates are specified for preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

e) Enter text, to list the documents that provide further information about the measures to limit the out-of-plane bending stiffness of cover plates in the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

6.23 Preloaded lap joints subject to axial load acting in the plane of the friction surfaces shall be as specified in CC 483/WSR/006.

Preloaded lap joints subject to axial load acting in the plane of the friction surfaces				
Structure reference	**Component reference**	**Description of preloaded lap joints subject to axial load acting in the plane of the friction surfaces**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures which include preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

b) Enter text, to define the components which include preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

c) Enter text, to describe the preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

d) Enter text, to list the drawings or models that show the preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

e) Enter text, to list the documents that provide further information about the preloaded lap joints subject to axial load acting in the plane of the friction surfaces.

6.24 In the case of preloaded lap joints subject to axial load acting in the plane of the friction surfaces, as listed in WSR 483/006, any contact surfaces in addition to cover plates shall be treated as contact surfaces in slip resistant connections.

6.25 Connections designed to transfer applied tensile forces through a flanged and bolted end plate shall be as specified in CC 483/WSR/006.

Connections designed to transfer applied tensile forces through a flanged and bolted end plate				
Structure reference	**Component reference**	**Description of the connections designed to transfer applied tensile forces through a flanged and bolted end plate**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to define the structures which include connections designed to transfer applied tensile forces through a flanged and bolted end plate.

b) Enter text, to define the components which include connections designed to transfer applied tensile forces through a flanged and bolted end plate.

c) Enter text, to describe the connections designed to transfer applied tensile forces through a flanged and bolted end plate.

d) Enter text, to list the drawings or models that show the connections designed to transfer applied tensile forces through a flanged and bolted end plate.

e) Enter text, to list the documents that provide further information about the connections designed to transfer applied tensile forces through a flanged and bolted end plate.

6.26 For connections designed to transfer applied tensile forces through a flanged and bolted end plate, as listed in CC 483/WSR/006, the area of the mating surfaces in direct line with the tension member cross section shall be in contact when all bolts are snug tight.

6.27 For connections designed to transfer applied tensile forces through a flanged and bolted end plate, as listed in CC 483/WSR/006, any gaps remaining in the area of the mating surfaces not in direct line with the tension member cross section shall be filled by steel shims prior to the application of the remaining preload.

6.28 For connections designed to transfer applied tensile forces through a flanged and bolted end plate, as listed in CC 483/WSR/006, partially slackening bolts to enable steel shims to be inserted shall be permitted.

6.29 For connections designed to transfer applied tensile forces through a flanged and bolted end plate, as listed in CC 483/WSR/006, steel shims used to fill the remaining gaps shall not be loose in the final snug tight stage.

6.30 For connections designed to transfer applied tensile forces through a flanged and bolted end plate, as listed in CC 483/WSR/006, where the remaining gaps to be filled are tapering gaps, one of the following methods of filling the gaps with steel shims shall be used:.

1. purpose machined tapered steel shims; or

2. flat (parallel) steel shims of not less than 0.1 mm and of not more than 0.2 mm thick, inserted to refusal, in steps until the gap in the contact zone is filled, followed by re-tightening to the snug tight stage

6.31 Use of the part turn method shall be permitted for tightening preloaded bolts if all the following conditions apply:.

1. the bolts are property class 8.8 and assemblies conform to the requirements in this document;

2. the required nominal minimum preloading force is not in excess of the values specified in BS EN 1090-2 [Ref 13.N], Table 18; and

3. the joint fit-up conforms to the requirements in this document.

6.32 The part turn method shall be carried out as for the combined method in BS EN 1090-2 [Ref 13.N] 8.5.4, with the exceptions given in this section.

6.33 The 'part-turn' method of tightening preloaded fasteners shall be restricted to Grade 8.8 assemblies of all class: K2, K1, and K0.

6.34 When using the part turn method, in the first tightening step the nut shall be tightened to the specified torque, as given in Table 6.34.

Table 6.34 Torque values for the part turn method – step one										
Bolt diameter d, mm	12	14	16	18	20	22	24	27	30	36
Torque value M, Nm	40	60	80	110	160	210	270	340	460	810

6.35 When using the part turn method, in the second tightening step the nut shall be tightened to the specified turn as given in Table 6.35.

Table 6.35 Torque values for the part turn method – step two		
Bolt diameters, mm	Grip length, equal to nominal thickness, t, in BS EN 1090-2 [Ref 13.N] Table 21, mm	Rotation, °
12 to 22	t ≤ 115 115 < t ≤ 275	180 (½ turn) 270 (¾ turn)
24 to 36	t ≤ 160 160 < t ≤ 350	180 (½ turn) 270 (¾ turn)

Torque method (BS EN 1090-2, 8.5.3)

6.36 The torque method shall not be used for the tightening of preloaded bolts, unless otherwise stated in CC 483/WSR/006.

6.37 The preloaded bolts that are permitted to be tightened using the torque method shall be as specified in CC 483/WSR/006.

The preloaded bolts that are permitted to be tightened using the torque method					
Structure reference	**Component reference**	**Description of the preloaded bolts that are permitted to be tightened using the torque method**	**Drawing / model numbers**	**Additional documents**	**Use of BS EN 1090-2 [Ref 13.N] Annex H permitted**
(a)	(b)	(c)	(d)	(e)	(f)

a) Enter a unique reference, to identify the structures where the torque method is permitted for the tightening of preloaded bolts.

b) Enter text, to identify the components where the torque method is permitted for the tightening of preloaded bolts.

c) Enter text, to describe the preloaded bolts that are permitted to be tightened using the torque method.

d) Enter text, to list the drawings or models that show where preloaded bolts are permitted to be tightened using the torque method.

e) Enter text, to list the documents that provide further information about the preloaded bolts permitted to be tightened using the torque method.

f) Enter a value, from options Yes, No, to define whether use of BS EN 1090-2 [Ref 13.N] Annex H for the torque method is permitted.

6.38 Verification shall be undertaken for the k value for tightening of preloaded bolting assemblies using the torque method through checking with torque wrenches in accordance with BS EN 1090-2 [Ref 13.N], Annex H.

6.39 The frequency of checking the k value for tightening of preloaded bolting assemblies using the torque method shall be at least once per day.

6.40 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to checking the k value for tightening of preloaded bolting assemblies using the torque method.

6.41 Following verification of the k value for tightening of preloaded bolting assemblies using the torque method, the torque for both tightening steps shall be adjusted accordingly.

6.42 Any test assemblies of preloaded bolts tightened using the torque method that fail the verification in this sub-section shall be discarded.

Combined method (BS EN 1090-2, 8.5.4)

6.43 For property classes 8.8 and 10.9 bolting assemblies to BS EN 14399-3 [Ref 17.N], the further rotation values in BS EN 1090-2 [Ref 13.N], Table 21 shall be amended as follows for the same thickness ranges: replace 60° by 90° (1/4 turn); replace 90° by 120° (1/3 turn); replace 120° by 180° (1/2 turn).

6.44 Verification shall be undertaken for the k value for tightening of preloaded bolting assemblies using the combined method through checking with torque wrenches in accordance with BS EN 1090-2 [Ref 13.N], Annex H.

6.45 The frequency of checking the k value for tightening of preloaded bolting assemblies using the combined method shall be at least once per day.

6.46 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to checking the k value for tightening of preloaded bolting assemblies using the combined method.

6.47 Following verification of the k value for tightening of preloaded bolting assemblies using the combined method, the torque for the first tightening steps shall be adjusted accordingly.

6.48 Any sample assemblies of preloaded bolts tightened using the combined method that fail the verification in this sub-section shall be discarded.

6.49 In the first tightening step of tightening of preloaded bolting assemblies by the combined method, the simplified value of $0.75M_{r,1} = 0.094dF_{p,C}$ given in BS EN 1090-2 [Ref 13.N] 8.5.4 shall not be used.

HRC method (BS EN 1090-2, 8.5.5)

6.50 When HRC bolts are used, surfaces shall be brought into contact using temporary service bolts with the same grade and diameter as the permanent bolts.

6.51 Verification shall be undertaken for the preload for preloaded bolting assemblies tightened using the HRC method through checking of a sample assembly in accordance with BS EN 1090-2 [Ref 13.N], Annex H.

6.52 The frequency of checking the preload for preloaded bolting assemblies tightened using the HRC method shall be at least once per assembly lot within 28 days prior to use.

6.53 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to checking the preload for preloaded bolting assemblies tightened using the HRC method.

6.54 Any sample assemblies of preloaded bolts tightened using the HRC method that fail the verification in this sub-section shall be discarded.

6.55 For all fasteners in assemblies that have had samples tested in accordance with this sub-section, the as-tested lubrication condition shall be maintained through to installation in the works.

6.56 Where the as tested lubrication condition of fasteners in assemblies that have had samples tested in accordance with this sub-section is not maintained through to installation in the works, as determined by the Bolting Coordinator, the fasteners shall either not be used in the works or be retested in accordance with this sub-section.

6.57 Fasteners from assemblies that have not been installed within 28 days of the preload test described in this section shall be retested in accordance with this sub-section.

6.58 The first-tightening step shall be repeated until the shear wrench outer socket has stopped turning on all assemblies in a connection.

Direct tension indicator method (BS EN 1090-2, 8.5.6)

6.59 When direct tension indicators are used, surfaces shall be brought into contact using temporary service bolts with the same grade and diameter as the permanent bolts.

Hot riveting (BS EN 1090-2, 8.7)

Installation of rivets (BS EN 1090-2, 8.7.2)

6.60 Countersunk rivets that require a flush surface shall be as specified in CC 483/WSR/006.

Countersunk rivets that require a flush surface				
Structure reference	**Component reference**	**Description of the countersunk rivets that require a flush surface**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with countersunk rivets that require a flush surface.

b) Enter text, to identify the components with countersunk rivets that require a flush surface.

c) Enter text, to describe the countersunk rivets that require a flush surface.

d) Enter text, to list the drawings or models that show where countersunk rivets require a flush surface.

e) Enter text, to list the documents that provide further information about the countersunk rivets that require a flush surface.

Acceptance criteria (BS EN 1090-2, 8.7.3)

6.61 The locations where outer faces of plies are to be free of indentation by the riveting machine, and the acceptance criteria, shall be as specified in CC 483/WSR/006.

The locations where outer faces of plies are to be free of indentation by the riveting machine, and the acceptance criteria,				
Structure reference	**Component reference**	**Description of the locations where outer faces of plies are to be free of indentation by the riveting machine and the acceptance criteria**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the outer faces of plies are to be free of indentation by the riveting machine.

b) Enter text, to identify the components for which the outer faces of plies are to be free of indentation by the riveting machine.

c) Enter text, to describe the locations where outer faces of plies are to be free of indentation by the riveting machine, and the acceptance criteria.

d) Enter text, to list the drawings or models that show where outer faces of plies are to be free of indentation by the riveting machine.

e) Enter text, to list the documents that provide further information about the locations where outer faces of plies are to be free of indentation by the riveting machine, and the acceptance criteria.

Use of special fasteners and fastening methods (BS EN 1090-2, 8.8)

6.62 The requirements for use of special fasteners and fastening methods, including for any procedure tests, shall be as specified in CC 483/WSR/006.

The requirements for use of special fasteners and fastening methods, including for any procedure tests,				
Structure reference	**Component reference**	**Description of the requirements for use of special fasteners and fastening methods including any procedure tests**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for the use of special fasteners and fastening methods apply.

b) Enter a unique reference, to identify the components to which the requirements for the use of special fasteners and fastening methods apply.

c) Enter text, to describe the requirements for use of special fasteners and fastening methods, including for any procedure tests.

d) Enter text, to list the drawings or models that show where the requirements for the use of special fasteners and fastening methods apply.

e) Enter text, to list the documents that provide further information about the requirements for use of special fasteners and fastening methods.

Use of special fasteners and fastening methods (BS EN 1090-2, 8.8)

6.63 The requirements for use of resin injection bolts shall be as specified in CC 483/WSR/006.

The requirements for use of resin injection bolts				
Structure reference	**Component reference**	**Description of the requirements for use of resin injection bolts**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for the use of resin injection bolts apply.

b) Enter text, to identify the components to which the requirements for the use of resin injection bolts apply.

c) Enter text, to describe the requirements for use of resin injection bolts.

d) Enter text, to list the drawings or models that show where the requirements for the use of resin injection bolts apply.

e) Enter text, to list the documents that provide the requirements for use of resin injection bolts.

7. Erection (BS EN 1090-2 Section 9)

Erection method (BS EN 1090-2, 9.3)

Design basis for the erection method (BS EN 1090-2, 9.3.1)

7.1 The camber and presets required in relation to those provided at manufacturing stage shall be as specified in CC 483/WSR/007.

The camber and presets required in relation to those provided at manufacturing stage				
Structure reference	**Component reference**	**Description of the camber and presets required in relation to those provided at manufacturing stage**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the specified camber and presets required in relation to those provided at manufacturing stage apply.

b) Enter text, to identify the components to which the specified camber and presets required in relation to those provided at manufacturing stage apply.

c) Enter text, to describe the camber and presets required in relation to those provided at manufacturing stage.

d) Enter text, to list the drawings or models that show the specified camber and presets required in relation to those provided at manufacturing stage.

e) Enter text, to list the documents that provide information about the camber and presets required in relation to those provided at manufacturing stage.

Constructor's erection method (BS EN 1090-2, 9.3.2)

7.2 The method of securing and sealing permanent formwork shall be as given in CC 482 [Ref 53.N].

Survey (BS EN 1090-2, 9.4)

Reference system (BS EN 1090-2, 9.4.1)

7.3 The reference temperature for setting out and measuring the steelwork shall be 15 °C, unless otherwise stated in CC 483/WSR/007.

7.4 Where not 15 °C, the reference temperature for setting out and measuring the steelwork shall be as specified in CC 483/WSR/007.

Where not 15 oC, the reference temperature for setting out and measuring the steelwork				
Structure reference	**Component reference**	**Description of the reference temperature for setting out and measuring the steelwork, where not 15 °C**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the reference temperature for setting out and measuring the steelwork applies, where not 15 °C.

b) Enter text, to identify the components to which the reference temperature for setting out and measuring the steelwork applies, where not 15 °C.

c) Enter text, to describe the required reference temperature for setting out and measuring the steelwork, where not 15 °C.

d) Enter text, to list the drawings or models that show where the specified reference temperature for setting out and measuring the steelwork applies, where not 15 °C.

e) Enter text, to list the documents that provide information about the reference specified temperature for setting out and measuring the steelwork, where not 15 °C.

Supports, anchors, and bearings (BS EN 1090-2, 9.5)

Maintaining suitability of supports (BS EN 1090-2, 9.5.3)

7.5 Locations where compensation for settlement of supports is limited shall be as specified in CC 483/WSR/007.

Locations where compensation for settlement of supports is limited				
Structure reference	**Component reference**	**Description of limits on permissible compensation for settlement of supports, and locations where these apply**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the compensation for settlement of supports is limited.

b) Enter text, to identify the components for which the compensation for settlement of supports is limited.

c) Enter text, to describe the locations where compensation for settlement of supports is limited, and the limitations on settlement.

d) Enter text, to list the drawings or models that show where compensation for settlement of supports is limited.

e) Enter text, to list the documents that provide information about the locations where compensation for settlement of supports is limited, and the limitations on settlement.

Temporary supports (BS EN 1090-2, 9.5.4)

7.6 Where the design requires a post-tensioning force, levelling nuts or other devices providing temporary support shall be slackened off before final tensioning of foundation bolts to allow the post-tensioning force to be transferred to the foundations.

7.7 In the case of exposed steelwork and irrespective of bedding material, the minimum finished cover to steel packings or other temporary support devices left in position shall be 50 mm..

7.8 Packings for bridges that are permitted to be left in position shall be as specified in CC 483/WSR/007.

Packings for bridges that are permitted to be left in position				
Structure reference	**Component reference**	**Description of the requirements for packings for bridges that are permitted to be left in position**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures where packings for bridges are permitted to be left in position.

b) Enter text, to identify the components where packings for bridges are permitted to be left in position.

c) Enter text, to describe the requirements for packings for bridges that are permitted to be left in position.

d) Enter text, to list the drawings or models that show where packings for bridges are permitted to be left in position.

e) Enter text, to list the documents that provide information about whether packings for bridges are permitted to be left in position.

7.9 The requirements for removing levelling nuts on the foundation bolts under the base plate shall be as specified in CC 483/WSR/007.

The requirements for removing levelling nuts on the foundation bolts under the base plate				
Structure reference	**Component reference**	**Description of the requirements for removing levelling nuts on the foundation bolts under the base plate**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the requirements for removing levelling nuts on the foundation bolts under the base plate apply.

b) Enter text, to identify the components for which the requirements for removing levelling nuts on the foundation bolts under the base plate apply.

c) Enter text, to describe the requirements for removing levelling nuts on the foundation bolts under the base plate.

d) Enter text, to list the drawings or models that show where the requirements for removing levelling nuts on the foundation bolts under the base plate apply.

e) Enter text, to list the documents that provide the requirements for removing levelling nuts on the foundation bolts under the base plate.

Grouting and sealing (BS EN 1090-2, 9.5.5)

7.10 Unless specified otherwise in CC 483/WSR/007, surfaces of steelwork and bearings that are to be in contact with grout or bedding mortar shall be treated in accordance with Surfaces in contact with concrete (BS EN 1090-2, 10.7) in "Surface treatment (BS EN 1090-2 Section 10)" in Section 8 of this document.

7.11 Requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting shall be as specified in CC 483/WSR/007.

Requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting				
Structure reference	**Component reference**	**Description of the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structure for which the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting apply.

b) Enter text, to identify the components for which the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting apply.

c) Enter text, to describe the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting.

d) Enter text, to list the drawings or models that show where the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting apply.

e) Enter text, to list the documents that provide the requirements for the treatment of steelwork, bearings, and concrete surfaces before grouting.

7.12 The method of sealing the edges of the base plates where no grouting is needed shall be as stated in CC 483/WSR/007.

The method of sealing the edges of the base plates where no grouting is needed				
Structure reference	**Component reference**	**Description of the method of sealing the edges of the base plates where no grouting is needed**	**Drawing / model numbers**	**Additional documentsAdditional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures for which the method of sealing the edges of the base plates, where no grouting is needed, applies.

b) Enter text, to identify the components for which the method of sealing the edges of the base plates, where no grouting is needed, applies.

c) Enter text, to describe the method of sealing the edges of the base plates where no grouting is needed.

d) Enter text, to list the drawings or models that show where the method of sealing the edges of the base plates where no grouting is needed applies.

e) Enter text, to list the documents that provide information about the method of sealing the edges of the base plates where no grouting is needed.

Erection and work at site (BS EN 1090-2, 9.6)

Handling and storage on site (BS EN 1090-2, 9.6.3)

7.13 The following Documentation shall be submitted for the restoration of damage to any part of structural steelwork prior to the commencement of erection and work at site: Procedures for restoration of damage to steelwork, in accordance with the requirements of EXC2/3/4.

7.14 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to procedures for restoration of damage to steelwork.

Erection works: fit-up and alignment (BS EN 1090-2, 9.6.5.3)

7.15 The use of shims shall be avoided where correct alignment of the structure and fit in connections can be achieved by controls on preparation, assembly and weld distortion and by machining.

7.16 Welding used to secure shims shall be in accordance with BS EN 1090-2 [Ref 13.N], Welding (BS EN 1090-2 Section 7) in Section 5 of this document, and Inspection, testing, and correction (BS EN 1090-2 Section 12) in Section 10 of this document.

7.17 Shims used to correct the fit between members, including in preloaded tension joints where gaps are variable across the interface, shall be either: purpose machined tapered shims or flat (parallel) shims.

7.18 Where flat, parallel, shims are used to correct the fit between members, including in preloaded tension joints where gaps are variable across the interface, the gap shall be filled by insertion of shims of not less than 0.1 mm and not more than 0.2 mm thick from the widest gap position until refusal.

7.19 Where the fit between members is corrected through filling by insertion of shims, the excess material shall be cut off on completion.

8. Surface treatment (BS EN 1090-2 Section 10)

General (BS EN 1090-2, 10.1)

8.1 Treatment of surfaces of steelwork to receive corrosion protection shall be in accordance with CC 486 [Ref 38.N].

8.2 The requirements for the execution of corrosion protection of steelwork in BS EN 1090-2 [Ref 13.N] Appendix F shall be supplemented by those in CC 486 [Ref 38.N].

8.3 The performance specification for corrosion protection of steelwork required by BS EN 1090-2 [Ref 13.N]F.1.2 shall be as stated in CC 486 [Ref 38.N].

8.4 The prescriptive requirements for corrosion protection of steelwork required by BS EN 1090-2 [Ref 13.N]F.1.3 shall be as given in CC 486 [Ref 38.N].

8.5 For surfaces in slip resistant connections, the requirements for friction surfaces and class of treatment or tests shall be as specified in CC 483/WSR/008.

For surfaces in slip resistant connections, the requirements for friction surfaces and class of treatment or tests				
Structure reference	**Component reference**	**Description of the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections apply.

b) Enter text, to identify the components to which the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections apply.

c) Enter text, to describe the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections.

d) Enter text, to list the drawings or models that show where the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections apply.

e) Enter text, to list the documents that provide the requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections.

8.6 Where corrosion protection of steelwork is specified at preloaded connections, the requirements for corrosion protection and extent of surfaces to be painted shall be in accordance with CC 486 [Ref 38.N].

8.7 The extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant shall be as specified in CC 483/WSR/008.

The extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant				
Structure reference	**Component reference**	**Description of the extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with preloaded bolts in connections that are not required to be slip resistant.

b) Enter text, to identify the components with preloaded bolts in connections that are not required to be slip resistant.

c) Enter text, to describe the extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant.

d) Enter text, to list the drawings or models that show where the specified extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant apply.

e) Enter text, to list the documents that provide information on the extent of surfaces affected by preloaded bolts in connections that are not required to be slip resistant.

8.8 The requirements for the protection of the lower embedded part of foundation bolts shall be as stated in BS EN 1090-2 [Ref 13.N] F.5, unless otherwise stated in CC 483/WSR/008.

8.9 Where not as stated in BS EN 1090-2 F.5, the requirements for the protection of the lower embedded part of foundation bolts shall be as specified in CC 483/WSR/008.

Where not as stated in BS EN 1090-2 F.5, the requirements for the protection of the lower embedded part of foundation bolts				
Structure reference	**Component reference**	**Description of the requirements for the protection of the lower embedded part of foundation bolts, where not as stated in BS EN 1090-2 [Ref 13.N] F.5**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for the protection of the lower embedded part of foundation bolts apply, where not as stated in BS EN 1090-2 [Ref 13.N] F.5.

b) Enter text, to identify the components to which the requirements for the protection of the lower embedded part of foundation bolts apply, where not as stated in BS EN 1090-2 [Ref 13.N] F.5.

c) Enter text, to describe the requirements for the protection of the lower embedded part of foundation bolts, where not as stated in BS EN 1090-2 [Ref 13.N] F.5.

d) Enter text, to list the drawings or models that show where the requirements for the protection of the lower embedded part of foundation bolts apply, where not as stated in BS EN 1090-2 [Ref 13.N] F.5.

e) Enter text, to list the documents that provide the requirements for the protection of the lower embedded part of foundation bolts, where not as stated in BS EN 1090-2 [Ref 13.N] F.5.

8.10 For cold formed steel components that are to be galvanised after manufacture, the requirements for procedure qualification of the dipping process shall be as specified in CC 483/WSR/008.

For cold formed steel components that are to be galvanised after manufacture, the requirements for procedure qualification of the dipping process				
Structure reference	**Component reference**	**Description of requirements for procedure qualification of the dipping process for cold formed steel components that are to be galvanised after manufacture**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with cold formed steel components that are to be galvanised after manufacture.

b) Enter text, to identify the structures with cold formed steel components that are to be galvanised after manufacture.

c) Enter text, to describe the requirements for procedure qualification of the dipping process for cold formed steel components that are to be galvanised after manufacture.

d) Enter text, to list the drawings or models that show where the requirements for procedure qualification of the dipping process for cold formed steel components that are to be galvanised after manufacture apply.

e) Enter text, to list the documents that provide the requirements for procedure qualification of the dipping process for cold formed steel components that are to be galvanised after manufacture.

8.11 The requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating of galvanised components shall be as specified in CC 483/WSR/008.

The requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating of galvanised components				
Structure reference	**Component reference**	**Description of the requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating of galvanised components**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with galvanised components with requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating.

b) Enter text, to identify the galvanised components with requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating.

c) Enter text, to describe the requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating of galvanised components.

d) Enter text, to list the drawings or models that show the galvanised components where the requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating apply.

e) Enter text, to list the documents that provide the requirements for the inspection, checking, and qualification of the preparation to be carried out before subsequent over-coating of galvanised components.

8.12 Reference areas used in procedure trials shall be as required by "Procedure trials for protection of steelwork against corrosion" in Section 16 of CC 486 [Ref 38.N].

8.13 Verification shall be undertaken for hot dip galvanised components through post-galvanising inspection in accordance with BS EN 1090-2 [Ref 13.N] F.7.4.

8.14 The frequency of post-galvanising inspection shall be at least once per hot dip galvanised component.

8.15 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to the post-galvanising inspection of hot dip galvanised components.

8.16 Steel components or specific locations of steelwork that require additional NDT, and the scope and method of NDT shall be as specified in CC 483/WSR/008.

Steel components or specific locations of steelwork that require additional NDT, and the scope and method of NDT				
Structure reference	**Component reference**	**Description of the steel components or specific locations of steelwork that require additional NDT, and the scope and method of NDT**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with steel components or specific locations of steelwork require additional NDT.

b) Enter text, to identify the components on which steel components or specific locations of steelwork require additional NDT.

c) Enter text, to describe the steel components or specific locations of steelwork that require additional NDT, and the scope and method of NDT.

d) Enter text, to list the drawings or models that show the steel components or specific locations of steelwork that require additional NDT.

e) Enter text, to list the documents that provide the details of the steel components or specific locations of steelwork that require additional NDT, and the scope and method of NDT.

Preparation of steel substrates for paints and related products (BS EN 1090-2, 10.2)

8.17 All steelwork surfaces to be painted shall be prepared in accordance with "Surface preparation for protection of steelwork against corrosion " in Section 2 of CC 486 [Ref 38.N].

8.18 The requirements for the surface cleanliness of stainless steels shall be as specified in CC 483/WSR/008.

The requirements for the surface cleanliness of stainless steels				
Structure reference	**Component reference**	**Description of the requirements for the surface cleanliness of stainless steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for the surface cleanliness of stainless steels apply.

b) Enter text, to identify the components to which the requirements for the surface cleanliness of stainless steels apply.

c) Enter text, to describe the requirements for the surface cleanliness of stainless steels.

d) Enter text, to list the drawings or models that show where the requirements for the surface cleanliness of stainless steels apply.

e) Enter text, to list the documents that provide the requirements for the surface cleanliness of stainless steels.

Weather resistant steels (BS EN 1090-2, 10.3)

8.19 Exposed surfaces of uncoated weather resistant steel shall be blast cleaned to grade Sa2 to BS EN ISO 8501-1 [Ref 37.N] to achieve a uniform surface.

8.20 Any surfaces of uncoated weather resistant steel that are marked or contaminated subsequent to blast cleaning shall be cleaned to grade Sa2 to BS EN ISO 8501-1 [Ref 37.N].

8.21 Uncoated weather resistant steel shall be kept free of contamination such as oil, grease, paint, concrete, and asphalt.

8.22 Wax or grease markers shall not be used to mark surfaces of weather resistant steels.

8.23 The requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels shall be as specified in CC 483/WSR/008.

The requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels				
Structure reference	**Component reference**	**Description of the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels apply.

b) Enter text, to identify the components to which the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels apply.

c) Enter text, to describe the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels.

d) Enter text, to list the drawings or models that show where the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels apply.

e) Enter text, to list the documents that provide the requirements for treatment of surfaces of non-weather resistant steels in contact with uncoated weather resistant steels.

Hot dip galvanizing (BS EN 1090-2, 10.5)

8.24 The preparation of surfaces prior to hot dip galvanizing shall be as given in CC 486 [Ref 38.N].

8.25 The requirements for sealing enclosed spaces after hot dip galvanizing, including the requirements for the sealant, shall be as specified in CC 483/WSR/008.

The requirements for sealing enclosed spaces after hot dip galvanizing, including the requirements for the sealant,				
Structure reference	**Component reference**	**Description of the requirements for sealing enclosed spaces after galvanizing, including the requirements for the sealant**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for sealing enclosed spaces after hot dip galvanizing apply.

b) Enter text, to identify the components to which the requirements for sealing enclosed spaces after hot dip galvanizing apply.

c) Enter text, to describe the requirements for sealing enclosed spaces after hot dip galvanizing, including the requirements for the sealant.

d) Enter text, to list the drawings or models that show where the requirements for sealing enclosed spaces after hot dip galvanizing apply.

e) Enter text, to list the documents that provide the requirements for sealing enclosed spaces after hot dip galvanizing, including the requirements for the sealant.

Sealing of spaces (BS EN 1090-2, 10.6)

8.26 For enclosed spaces that are to be sealed by welding or provided with internal protective treatment, the internal treatment system shall be as stated in CC 486 [Ref 38.N].

8.27 The internal spaces that are to be hermetically sealed shall be as specified in CC 483/WSR/008.

The internal spaces that are to be hermetically sealed				
Structure reference	**Component reference**	**Description of the internal spaces that are to be hermetically sealed**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures with internal spaces that are to be hermetically sealed.

b) Enter text, to identify the components with internal spaces that are to be hermetically sealed.

c) Enter text, to describe the internal spaces that are to be hermetically sealed.

d) Enter text, to list the drawings or models that show the internal spaces that are to be hermetically sealed.

e) Enter text, to list the documents that provide information on the internal spaces that are to be hermetically sealed.

8.28 Verification shall be undertaken for all joints, whether welded, mechanically fastened, or bonded, in internal spaces which have been identified in CC 483/WSR/008 as being hermetically sealed through leak testing using the bubble emission technique in accordance with BS EN 1593 [Ref 35.N].

8.29 The frequency of leak testing of hermetically sealed joints shall be at least once for all joints.

8.30 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to leak testing of hermetically sealed joints.

8.31 Where spaces are to be fully enclosed by sealing welds to prevent the ingress of moisture, weld imperfections involving surface breaking voids otherwise permitted by the execution specification shall be sealed by weld repair.

8.32 The method to be used for sealing the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners shall be as specified in CC 483/WSR/008.

The method to be used for sealing the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners				
Structure reference	**Component reference**	**Description of the method to be used for sealing the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures in which the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners is to be sealed.

b) Enter text, to identify the components in which the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners is to be sealed.

c) Enter text, to describe the method to be used for sealing the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners.

d) Enter text, to list the drawings or models that show where the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners is to be sealed.

e) Enter text, to list the documents that provide information on the method to be used for sealing the interface of the wall of sealed enclosed spaces penetrated by mechanical fasteners.

Surfaces in contact with concrete (BS EN 1090-2, 10.7)

8.33 For steel surfaces in contact with concrete, the embedded length of the steelwork within the concrete shall be defined from the face of the concrete formed when the formwork has been removed.

8.34 The specific requirements for coating steel surfaces in contact with concrete shall be as specified in CC 483/WSR/008.

The specific requirements for coating steel surfaces in contact with concrete				
Structure reference	**Component reference**	**Description of the specific requirements for coating surfaces in contact with concrete**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the specific requirements for coating steel surfaces in contact with concrete apply.

b) Enter text, to identify the components to which the specific requirements for coating steel surfaces in contact with concrete apply.

c) Enter text, to describe the specific requirements for coating steel surfaces in contact with concretes.

d) Enter text, to list the drawings or models that show where the specific requirements for coating steel surfaces in contact with concrete apply.

e) Enter text, to list the documents that provide the specific requirements for coating steel surfaces in contact with concrete.

Inaccessible surfaces (BS EN 1090-2, 10.8)

8.35 Faying surfaces and surfaces beneath washers in connections other than slip resistant connections that are to be painted shall be treated in accordance with CC 486 [Ref 38.N].

8.36 In uncoated weather resistant steels, faying surfaces and surfaces beneath washers in connections other than slip resistant connections shall have a cleanliness of grade St2 to BS EN ISO 8501-1 [Ref 37.N] at the time of the connection being made.

Repairs after cutting or welding (BS EN 1090-2, 10.9)

8.37 Protective treatment on edges and adjacent surfaces which have been damaged by cutting or after welding shall be restored in accordance with CC 486 [Ref 38.N].

8.38 The method and extent of repairs for restoring the coatings on precoated constituent products after cutting or welding shall be as specified in CC 483/WSR/008.

The method and extent of repairs for restoring the coatings on precoated constituent products after cutting or welding				
Structure reference	**Component reference**	**Description of the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding apply.

b) Enter text, to identify the components to which the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding apply.

c) Enter text, to describe the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding.

d) Enter text, to list the drawings or models that show where the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding apply.

e) Enter text, to list the documents that provide information on the method and extent of repairs for restoring the coatings on precoated constituent products that have been damaged by cutting or welding.

Cleaning of stainless steel components (BS EN 1090-2, 10.10)

8.39 The method, level, and extent of cleaning of stainless steels shall be as specified in CC 483/WSR/008.

The method, level, and extent of cleaning of stainless steels				
Structure reference	**Component reference**	**Description of the method, level, and extent of cleaning of stainless steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the method, level, and extent of cleaning of stainless steels apply.

b) Enter text, to identify the components to which the method, level, and extent of cleaning of stainless steels apply.

c) Enter text, to describe the method, level, and extent of cleaning of stainless steels.

d) Enter text, to list the drawings or models that show where the method, level, and extent of cleaning of stainless steels apply.

e) Enter text, to list the documents that provide information on the method, level, and extent of cleaning of stainless steels.

9. Geometrical tolerances (BS EN 1090-2 Section 11)

Tolerance types (BS EN 1090-2, 11.1)

9.1 Where full contact end bearing is specified in CC 4836/WSR/004, the maximum gap between two surfaces, as defined in BS EN 1090-2 [Ref 13.N]Table B.19, shall be limited to 0.5 mm.

9.2 In the case of fitted web stiffeners where full contact end bearing is specified in CC 483/WSR/004, the maximum gap between two surfaces, as defined in BS EN 1090-2 [Ref 13.N]Table B.19, shall be limited to a maximum of 0.25 mm over 60 % of the fitted area.

9.3 Where special tolerances in accordance with BS EN 1090-2 Section 11.1 are required, these shall be as specified in CC 483/WSR/009.

Where special tolerances in accordance with BS EN 1090-2 Section 11.1 are required, these				
Structure reference	**Component reference**	**Description of the special tolerances in accordance with BS EN 1090-2 [Ref 13.N] Section 11.1**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which special tolerances in accordance with BS EN 1090-2 [Ref 13.N] Section 11.1 apply.

b) Enter text, to identify the components to which special tolerances in accordance with BS EN 1090-2 [Ref 13.N] Section 11.1 apply.

c) Enter text, to specify the special tolerances in accordance with BS EN 1090-2 [Ref 13.N]Section 11.1.

d) Enter text, to list the drawings or models that show where special tolerances in accordance with BS EN 1090-2 [Ref 13.N] Section 11.1 apply.

e) Enter text, to list the documents that specify the special tolerances in accordance with BS EN 1090-2 [Ref 13.N] Section 11.1.

Essential tolerances (BS EN 1090-2, 11.2)

Manufacturing tolerances: shells (BS EN 1090-2, 11.2.2.5)

9.4 The scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 Table B.11, shall be as specified in CC 483/WSR/009.

The scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 Table B.11,				
Structure reference	**Component reference**	**Description of the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11 apply.

b) Enter text, to identify the components to which the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11 apply.

c) Enter text, to describe the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11.

d) Enter text, to list the drawings or models that show where the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11 apply.

e) Enter text, to list the documents that specify the scope of dimensional checking for dimple measurements of shells, as defined in BS EN 1090-2 [Ref 13.N] Table B.11.

Erection tolerances: foundation bolts and other supports (BS EN 1090-2, 11.2.3.2)

9.5 The special tolerances for continuously supported shells shall be as specified in CC 483/WSR/009.

The special tolerances for continuously supported shells				
Structure reference	**Component reference**	**Description of the special tolerances for continuously supported shells**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the special tolerances for continuously supported shells apply.

b) Enter text, to identify the components to which the special tolerances for continuously supported shells apply.

c) Enter text, to describe the special tolerances for continuously supported shells.

d) Enter text, to list the drawings or models that show where the special tolerances for continuously supported shells apply.

e) Enter text, to list the documents that specify the special tolerances for continuously supported shells.

Functional tolerances (BS EN 1090-2, 11.3)

Tabulated values (BS EN 1090-2, 11.3.2)

9.6 Functional tolerance class 1 shall be adopted, except in the following cases from BS EN 1090-2 [Ref 13.N]: Table B.1 No 1 to No 6 at bearing and bearing stiffener locations; and Table B.6, No 3 and No 4.

9.7 Functional tolerance class 2 shall be adopted in the following cases from BS EN 1090-2 [Ref 13.N]: Table B.1 No 1 to No 6 at bearing and bearing stiffener locations; and Table B.6, No 3 and No 4.

Alternative criteria (BS EN 1090-2, 11.3.3)

9.8 The locations where the alternative criteria for functional tolerances specified in BS EN 1090-2 11.3.3 are to be applied shall be as specified in CC 483/WSR/009.

The locations where the alternative criteria for functional tolerances specified in BS EN 1090-2 11.3.3 are to be applied				
Structure reference	**Component reference**	**Description of the locations where the alternative criteria for functional tolerances specified in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures where the alternative criteria for functional tolerances specified in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied.

b) Enter text, to identify the components where the alternative criteria for functional tolerances specified in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied.

c) Enter text, to describe the locations where the alternative criteria for functional tolerances specified in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied.

d) Enter text, to list the drawings or models that show where the alternative criteria for functional tolerances in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied.

e) Enter text, to list the documents that describe the locations where the alternative criteria for functional tolerances in BS EN 1090-2 [Ref 13.N] 11.3.3 are to be applied.

10. Inspection, testing and correction (BS EN 1090-2 Section 12)

10.1 Verification shall be undertaken for structural steelwork in accordance with BS EN 1090-2 [Ref 13.N].

10.2 Verification of structural steelwork shall include all inspection and testing detailed in BS EN 1090-2 [Ref 13.N].

10.3 The frequency of verification inspection and testing of structural steelwork shall be as stated in BS EN 1090-2 [Ref 13.N] unless otherwise stated in this Section.

10.4 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to all verification activities including inspection and testing of structural steelwork.

Constituent products and components (BS EN 1090-2, 12.2)

Constituent products (BS EN 1090-2, 12.2.1)

10.5 The specific testing requirements for constituent products shall be as specified in CC 483/WSR/010.

The specific testing requirements for constituent products				
Structure reference	**Component reference**	**Description of the specific testing requirements for constituent products**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the specific testing requirements for constituent products apply.

b) Enter text, to identify the components to which the specific testing requirements for constituent products apply.

c) Enter text, to describe the specific testing requirements for constituent products.

d) Enter text, to list the drawings or models that show where the specific testing requirements for constituent products apply.

e) Enter text, to list the documents that provide the specific testing requirements for constituent products.

10.6 The testing required for products not covered by the European or International standards referenced in BS EN 1090-2 shall be as specified in CC 483/WSR/010.

The testing required for products not covered by the European or International standards referenced in BS EN 1090-2				
Component reference	**Component reference**	**Description of the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N]**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N]apply.

b) Enter text, to identify the components to which the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N]apply.

c) Enter text, to describe the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N].

d) Enter text, to list the drawings or models that show where the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N]apply.

e) Enter text, to list the documents that provide information about the testing required for products not covered by the European or International standards referenced in BS EN 1090-2 [Ref 13.N].

10.7 Verification shall be undertaken for mechanical fasteners through inspection and sample testing in accordance with BS EN ISO 3269 [Ref 14.N] to confirm that the dimensional characteristics and mechanical, physical, and functional properties comply with the product standard to which the mechanical fasteners have been manufactured.

10.8 The frequency of inspection and sample testing of mechanical fasteners shall be in accordance with BS EN ISO 3269 [Ref 14.N].

10.9 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to the inspection and sample testing of mechanical fasteners.

10.10 The following Documentation shall be submitted for mechanical fasteners prior to the commencement of installation: mechanical fastener verification report including the evidence of certification of the quality of the mechanical fasteners, such as manufacturer's certificates, test reports from manufacturers / suppliers, and the results of the inspection and sample testing to BS EN ISO 3269 [Ref 14.N].

10.11 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to mechanical fastener verification reports.

10.12 The mechanical fastener verification reports for mechanical fasteners shall be treated as execution records and form part of the execution documentation.

10.13 Verification shall be undertaken for mechanical fastener suitability through contract compliance testing in accordance with the suitability test(s) related to the product standard to which the mechanical fastener has been manufactured.

10.14 The frequency of contract compliance testing of mechanical fasteners shall be three fasteners, selected at random, from each inspection lot.

10.15 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to contract compliance testing of mechanical fasteners.

10.16 Mechanical fasteners supplied for use in the works and used for contract compliance testing shall be discarded following testing.

10.17 In the event of a mechanical fastener supplied for use in the works not meeting the requirements of the contract compliance testing, all mechanical fasteners in the associated inspection lot shall be discarded.

10.18 The following Documentation shall be submitted for contract compliance tests on mechanical fasteners supplied for use in the works prior to the commencement of installation: contract compliance test reports for mechanical fasteners.

10.19 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to contract compliance test reports for mechanical fasteners.

10.20 The contract compliance test reports submitted as documentation for contract compliance tests on mechanical fasteners supplied for use in the works shall be treated as execution records and form part of the execution documentation.

10.21 The following Documentation shall be submitted for structural steel products prior to the commencement of installation: structural steel

products verification report including the evidence of certification of the quality of the structural steel products, such as manufacturer's certificates, test reports from manufacturers / suppliers, and the results of the inspection and sample testing.

10.22 The requirements for "Documentation" in Section 2 of GC 101 [Ref 16.N] shall apply to structural steel products verification report for structural steel products.

10.23 The structural steel products verification report for structural steel products shall be treated as execution records and form part of the execution documentation.

Non-conforming products (BS EN 1090-2, 12.2.3)

10.24 The following Documentation for testing undertaken to prove product conformity shall be submitted as continuous records: Records of testing undertaken to prove product conformity.

10.25 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to records of testing undertaken to prove product conformity.

Manufacturing: geometrical dimensions of manufactured components (BS EN 1090-2, 12.3)

10.26 All dimensions of manufactured components which are at risk of non-conformity shall be identified in the inspection plan.

10.27 Verification shall be undertaken for dimensions identified in the inspection plan as being at risk of non-conformity through dimensional checks during execution.

10.28 The frequency of checks of each dimension identified in the inspection plan as being at risk of non-conformity shall be at least once before delivery to site and at least once after connections are complete.

10.29 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to checks of dimensions identified in the inspection plan as being at risk of non-conformity.

10.30 Repair of local dents in the surface of hollow sections by means of welded cover plates shall not be undertaken, unless otherwise stated in CC 483/WSR/010.

SI.10.30 Repair of local dents in the surface of hollow sections by means of welded cover plates shall be allowed as follows: [enter free text].

Welding (BS EN 1090-2, 12.4)

Inspection after welding: routine inspection and testing (BS EN 1090-2, 12.4.2.3)

10.31 The extent of routine FPC inspection in BS EN 1090-2 [Ref 13.N] Table 24 shall not be less than that required for EXC3 or the project specific inspections as detailed in this section, whichever is the greater.

10.32 FPC inspections undertaken on a specific structure which conform to Table 10.101 shall be permitted to be included and documented as part of the project specific inspection and testing in BS EN 1090-2 [Ref 13.N] 12.4.2.4 and this section, providing that they fully meet the acceptance criteria for visual inspection of welds in BS EN 1090-2 [Ref 13.N] 12.4.2.5 , BS EN 1090-2 [Ref 13.N] 12.4.2.6, and this section.

Inspection after welding: project specific inspection and testing (BS EN 1090-2, 12.4.2.4)

10.33 Verification shall be undertaken for welded joints, as permitted for EXC1/2/3 through 100 % visual inspection of all joints.

10.34 The frequency of visual inspection of welded joints shall be at least once per welded joint.

10.35 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to visual inspection of welded joints.

10.36 Verification shall be undertaken for welded joints, as permitted for EXC1/2/3 through supplementary non-destructive testing (NDT) in accordance with the extent and methods given in Table 10.101, Table 10.105, and Table 10.106, according to the required QSC, and in accordance with the requirements in this sub-section.

10.37 The frequency of supplementary non-destructive testing of welded joints shall be as given in Table 10.101, Table 10.105, and Table 10.106, according to the required QSC.

10.38 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to supplementary non-destructive testing of welded joints.

10.39 The minimum proportions of welded joints subjected to specific supplementary NDT for shop welds in steel grades up to and including S355 and QSC F56, which represent the most common conditions, shall be as given in Table 10.101.

10.40 The percentages in Table 10.101 shall be applied to the number of joints tested up to weld lengths of one metre in any joint.

10.41 For joints with weld lengths exceeding one metre, the percentage in Table 10.101 shall be applied to the proportion of weld in every joint.

10.42 Where adjustments are made according to more than one condition in Table 10.105, the net level change shall be used, after adding and/or subtracting the number of levels given for each condition.

10.43 For QSC F71 and above, shop welds in steel grades up to and including S355 shall be subjected to supplementary NDT at the minimum proportions of welded joints specified in Table 10.106.

10.44 For conditions other than QSC F71 and above, the proportion tested in Table 10.106 shall be adjusted in accordance with Table 10.105 as described in this section for Table 10.101.

Inspection after welding: visual inspection of welds (BS EN 1090-2, 12.4.2.5)

10.45 The criteria for final acceptance without the need for remedial action shall be in accordance with Table 10.115 and Table 10.125, according to the required QSC.

10.46 The criteria for final acceptance without the need for remedial action shall apply irrespective of those used for FPC.

Inspection after welding: supplementary NDT methods (BS EN 1090-2, 12.4.2.6)

10.47 The criteria for final acceptance without the need for remedial action shall be in accordance with Table 10.129 for magnetic particle and penetrant testing, according to the required QSC.

10.48 The criteria for final acceptance without the need for remedial action shall be in accordance with Table 10.129 for ultrasonic and radiographic testing, according to the required QSC.

10.49 The criteria for final acceptance without the need for remedial action shall apply irrespective of those used for FPC.

Inspection after welding: correction of welds (BS EN 1090-2, 12.4.2.7)

10.50 Repairs by welding shall be carried out as required for EXC2/3/4.

Inspection and testing of welded shear studs for composite steel and concrete structures (BS EN 1090-2, 12.4.3)

10.51 For the visual examination specified in BS EN ISO 14555 [Ref 58.N] Section 11, the acceptance criteria for the length and angle of the stud after welding shall be:.

1. length of each shear stud after welding (LAW): within + 1.5 mm and - 2 mm of the manufacturer's specified nominal LAW; and

2. angle: aligned to within 4º from the normal to the plate to which the studs are welded.

10.52 Verification shall be undertaken for the quality of welded shear studs using production tests carried out in accordance with BS EN ISO 14555 [Ref 58.N].

10.53 The frequency of production tests shall be at least once for each combination of stud diameter, parent material, and type of equipment used before the beginning of welding operations and repeated after every 5000 welds.

10.54 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to production tests for welded shear studs.

10.55 Verification shall be undertaken for the quality of welded shear studs using the simplified production tests as required for product surveillance in accordance with BS EN ISO 14555 [Ref 58.N].

10.56 The frequency of simplified production tests shall be at least one test comprising three studs after every 100 welds on each piece of steelwork, with at least one test comprising three studs per piece.

10.57 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to simplified production tests for welded shear studs.

10.58 The direction of the bend test, when part of the verification for welded shear studs using the simplified production tests as required by BS EN ISO 14555 [Ref 58.N], shall be such that the bent stud does not interfere with other elements of the works.

10.59 Verification shall be undertaken for the quality of welded shear studs by hammer tap testing, striking the side of the head of the stud with a 2 kg hammer, where welds are acceptable if there is a clear ring tone due to the striking.

10.60 The frequency of hammer tap testing of welded shear studs shall be once per stud on a production piece of steelwork.

10.61 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to hammer tap testing of welded shear studs.

10.62 Any welded shear stud deemed unacceptable as a result of the hammer tap testing shall be tested as part of the verification required for welded shear studs using the simplified production tests as required for product surveillance in accordance with BS EN ISO 14555 [Ref 58.N].

10.63 The following Documentation for the verification of welded shear studs shall be submitted as continuous records: production surveillance records in accordance with BS EN ISO 14555 [Ref 58.N].

10.64 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to production surveillance records in accordance with BS EN ISO 14555 [Ref 58.N].

Production tests on welding (BS EN 1090-2, 12.4.4)

10.65 Production tests on welding conforming to the requirements for EXC3/4 shall be carried out.

10.66 Verification shall be undertaken for weld quality through specific production tests, on run-off coupon plates, in accordance with Table 10.140, according to the required QSC.

10.67 The frequency of the specific production tests shall be in accordance with Table 10.140 for all parts of the structure.

10.68 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to specific production tests on welds.

10.69 Where run-off coupons cannot be used for production tests due to geometric constraints, such as in the case of circumferential butt welds in tubular members, the production tests shall be conducted at the same time, on separate coupon plates using the same welding equipment and welder/welding operator.

10.70 Coupon material for production tests shall be from the same batch with the same weld preparation and orientation relative to the rolling direction(s) as in the production joint.

Inspection and testing of welding of reinforcing steel (BS EN 1090-2, 12.4.5)

10.71 Inspection and testing of welded joints involving reinforcing steel shall be carried out in accordance with BS EN ISO 17660-1 [Ref 62.N], irrespective of whether a joint is nominally classified as ‘load’ or ‘non-load’ bearing.

Mechanical fastening (BS EN 1090-2, 12.5)

Inspection of non-preloaded bolted connections (BS EN 1090-2, 12.5.1)

10.72 The requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections shall be as specified in CC 483/WSR/010.

The requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections				
Structure reference	**Component reference**	**Description of the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections apply.

b) Enter text, to identify the components to which the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections apply.

c) Enter text, to describe the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections.

d) Enter text, to list the drawings or models that show where the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections apply.

e) Enter text, to list the documents that provide the requirements for checking the installation of an insulation system at junctions between stainless steel and other materials at non-preloaded bolted connections.

Inspection and testing of preloaded bolted connections: general (BS EN 1090-2, 12.5.2.1)

10.73 The requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections shall be as specified in CC 483/WSR/010.

The requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections				
Structure reference	**Component reference**	**Description of the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections apply.

b) Enter text, to identify the components to which the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections apply.

c) Enter text, to describe the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections.

d) Enter text, to list the drawings or models that show where the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections apply.

e) Enter text, to list the documents that provide the requirements for inspection and testing of preloaded bolting assemblies used for stainless steel connections.

Inspection and testing of preloaded bolted connections: inspection before tightening (BS EN 1090-2, 12.5.2.3)

10.74 The tightening procedure for preloaded bolted connections shall be checked as required for EXC2/3/4.

Inspection and testing of preloaded bolted connections: inspection during and after tightening (BS EN 1090-2, 12.5.2.4)

10.75 Inspection during and after tightening of preloaded bolted connections shall be as required for EXC2/3/4.

10.76 In BS EN 1090-2 [Ref 13.N], 12.5.2.4 c), the number of preloaded boltassemblies inspected overall in a structure shall conform to the requirements for EXC3/4.

10.77 The number of preloaded bolting assemblies inspected overall in a structure for the part turn method shall conform to the requirements of BS EN 1090-2 [Ref 13.N], 12.5.2.4 c) 2) i).

10.78 In BS EN 1090-2 [Ref 13.N], 12.5.2.4 d) the sampling plan for inspection of preloaded bolting assemblies shall conform to the requirements for EXC2/3.

10.79 Verification shall be undertaken for the tightness of preloaded bolting assemblies through checking for overtightening, in addition to checking for under-tightening in accordance with BS EN 1090-2 [Ref 13.N], 12.5.2.4 g).

10.80 The frequency of checking for overtightening shall be at least once for every bolting assembly.

10.81 The requirements for "Verification" in Section 14 of GC 101 [Ref 16.N] shall apply to checking bolting assemblies for overtightening.

10.82 For the part turn method, the inspection and testing requirements of BS EN 1090-2 [Ref 13.N]12.5.2.6 shall apply except as follows.

1. the first step has to be checked as required for EXC3/4 but using the same torque conditions as given in Table 6.34; and

2. for inspection after the second step, rotation angle values given for the combined method is to be replaced with:

    1. 0° (in lieu of 15°); and

    2. 60° (in lieu of 30°).

Inspection and testing of preloaded bolted connections: torque method (BS EN 1090-2, 12.5.2.5)

10.83 Inspection of tightening of preloaded bolted connections by the torque method shall conform to the requirements for EXC3/4 in BS EN 1090-2 [Ref 13.N], Table 25.

Inspection and testing of preloaded bolted connections: combined method (BS EN 1090-2, 12.5.2.6)

10.84 For the combined method of tightening preloaded bolted connections, checking of the first step shall conform to the requirements for EXC3/4.

Inspection and testing of preloaded bolted connections: HRC method (BS EN 1090-2, 12.5.2.7)

10.85 For the HRC method of tightening preloaded bolted connections, checking of the first tightening step shall conform to the requirements for EXC2/3/4.

Inspection and testing of preloaded bolted connections: direct tension indicator method (BS EN 1090-2, 12.5.2.8)

10.86 For tightening of preloaded bolted connections using the direct tension indicator method, nomore than 10 % of indicators in a connection fastener group shall exhibit full compression of the indicator.

Inspection and repairs of solid rivets for hot riveting: inspection (BS EN 1090-2, 12.5.3.1)

10.87 The sequential sampling plan for inspection of solid rivets for hot riveting shall conform to the requirements for EXC2/3.

Special fasteners and fastening methods: general (BS EN 1090-2, 12.5.4.1)

10.88 The requirements for the inspection of connections using special fasteners or special fastening methods shall be as specified in CC 483/WSR/010.

The requirements for the inspection of connections using special fasteners or special fastening methods				
Structure reference	**Component reference**	**Description of the requirements for the inspection of connections using special fasteners or special fastening methods**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for the inspection of connections using special fasteners or special fastening methods apply.

b) Enter text, to identify the components to which the requirements for the inspection of connections using special fasteners or special fastening methods apply.

c) Enter text, to describe the requirements for the inspection of connections using special fasteners or special fastening methods.

d) Enter text, to list the drawings or models that show where the requirements for the inspection of connections using special fasteners or special fastening methods apply.

e) Enter text, to list the documents that provide the requirements for the inspection of connections using special fasteners or special fastening methods.

Erection (BS EN 1090-2, 12.7)

Inspection of trial erection (BS EN 1090-2, 12.7.1)

10.89 The following shall be checked during trial erection of structural steelwork:.

1. dimensions critical to assembly of other parts of the structure;
2. overall horizontal and vertical alignment and twist;
3. re-establishment of alignment of units in staged trial erection;
4. temperature differentials in box girders;
5. fit-up of bolted joints and site welding preparations;
6. alignment of bolt holes; and
7. identification marks of members and their orientation, including packer plates.

10.90 In addition to the checks specified in this section, the requirements for inspection of a trial erection shall be as specified in CC 483/WSR/010.

In addition to the checks specified in this section, the requirements for inspection of a trial erection				
Structure reference	**Component reference**	**Description of the requirements for inspection of a trial erection of structural steelwork**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements for inspection of a trial erection of structural steelwork apply.

b) Enter text, to identify the components to which the requirements for inspection of a trial erection of structural steelwork apply.

c) Enter text, to describe the requirements for inspection of a trial erection of structural steelwork.

d) Enter text, to list the drawings or models that show where the requirements for inspection of a trial erection of structural steelwork apply of structural steelwork apply.

e) Enter text, to list the documents that provide the requirements for inspection of a trial erection of structural steelwork.

Survey of geometrical position of connection nodes: survey methods and accuracy (BS EN 1090-2, 12.7.3.1)

10.91 The survey of the completed structure shall conform to the requirements for EXC3/4.

10.92 The survey of the completed structure shall include recording of dimensional checks at acceptance of the structure.

10.93 The following Documentation for the survey of the completed structure shall be submitted as continuous records: records of the survey of the completed structure, including records of dimensional checks.

10.94 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to the records of the survey of the completed structure, including records of dimensional checks.

10.95 The monitoring locations and requirements for initial measurements of material thickness of weather resistant steels shall be as specified in CC 483/WSR/010.

The monitoring locations and requirements for initial measurements of material thickness of weather resistant steels				
Structure reference	**Component reference**	**Description of the monitoring locations and requirements for initial measurements of material thickness of weather resistant steels**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the monitoring locations and requirements for initial measurements of material thickness of weather resistant steels apply.

b) Enter text, to identify the components to which the monitoring locations and requirements for initial measurements of material thickness of weather resistant steels apply.

c) Enter text, to describe the requirements for residual material thickness monitoring of weather resistant steels.

d) Enter text, to list the drawings or models that show the monitoring locations for initial measurements of material thickness of weather resistant steels.

e) Enter text, to list the documents that provide information about the monitoring locations and requirements for initial measurements of material thickness of weather resistant steels.

10.96 The following Documentation for the material thickness measurements of weather resistant steels as stated in this section shall be submitted as continuous records: details of the monitoring locations and the initial material thickness measurements.

10.97 The requirements of "Records" in Section 3 of GC 101 [Ref 16.N] shall apply to details of the monitoring locations and the initial material thickness measurements.

Survey of geometrical position of connection nodes: location and frequency (BS EN 1090-2, 12.7.3.4)

10.98 The extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes, shall be as specified in CC 483/WSR/010.

The extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes,				
Structure reference	**Component reference**	**Description of the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes, apply.

b) Enter text, to identify the components to which the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes, apply.

c) Enter text, to describe the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes.

d) Enter text, to list the drawings or models that show where the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes, apply.

e) Enter text, to list the documents that provide information about the extent of measurements for the survey of geometrical position of connection nodes, other than adjacent to site interconnection nodes.

10.99 Measurements of the positional accuracy of the steelwork shall be adjusted for the effects of temporary equipment supported by, or supporting, the erected structure.

10.100 Measurements of the positional accuracy of the steelwork shall be adjusted for the effects of any non-steelwork dead weight which is in place at the time of measurement.

10.101 The conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured shall be as specified in CC 483/WSR/010.

The conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured				
Structure reference	**Component reference**	**Description of the conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured**	**Drawing / model numbers**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured apply.

b) Enter text, to identify the components to which the conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured apply.

c) Enter text, to describe the conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured.

d) Enter text, to list the drawings or models that show where the conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured apply.

e) Enter text, to list the documents that provide information about conditions of measurement, other than under the self weight of steelwork, under which positional accuracy of erected steelwork is to be measured.

Survey of geometrical position of connection nodes: definition of nonconformity (BS EN 1090-2, 12.7.3.6).

10.102 For measurement of the positional accuracy of the erected steelwork, the envelope of permissible positions shall be as specified in CC 483/WSR/010.

For measurement of the positional accuracy of the erected steelwork, the envelope of permissible positions				
Structure reference	**Component reference**	**Description of the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork**	**Drawing / model number**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork applies.

b) Enter text, to identify the component to which the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork applies.

c) Enter text, to describe the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork.

d) Enter text, to list the drawings or models that show where the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork applies.

e) Enter text, to list the documents that provide information about the envelope of permissible positions for measurement of the positional accuracy of the erected steelwork.

Other acceptance tests (BS EN 1090-2, 12.7.4)

10.103 The specific requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load, shall be as specified in CC 483/WSR/010.

The specific requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load,				
Structure reference	**Component reference**	**Description of requirements including specific load and tolerance range on the load, where components of a structure are to be erected to a specific load**	**Drawing / model number**	**Additional documents**
(a)	(b)	(c)	(d)	(e)

a) Enter a unique reference, to identify the structures to which the requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load, apply.

b) Enter text, to identify the components to which the requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load, apply.

c) Enter text, to describe the requirements including specific load and tolerance range on the load, where components of a structure are to be erected to a specific load.

d) Enter text, to list the drawings or models that show where the requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load, apply.

e) Enter text, to list the documents that provide the requirements including load and tolerance range on the load, where components of a structure are to be erected to a specific load.

Supplementary NDT of welds in structural steelwork

10.104 With reference to Table 10.101, Table 10.106, Table 10.115, Table 10.125, Table 10.128, and Table 10.129, the transverse orientation shall be deemed to apply to all welds orientated within 60° of the longitudinal axis of members, except for connection zones where all orientations are deemed to be transverse, where connection zones are all locations within 200 mm of a main structural connection, loading point, or support position.

Minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSC F56

10.105 The minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSC F56 shall be in accordance with Table 10.101.

Table 10.105 Minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSC F56.

Weld type	Orientation	Nominal maximum parent metal thickness in the joint (t) or nominal fillet weld throat dimension (including any specified penetration) (a) mm	Proportion of joints tested %	
			Magnetic particle (MT) or penetrant testing (PT)	Ultrasonic testing (UT)
Butt	Transverse	t < 8	100	Not applicable
		8 ≤ t ≤ 20	20	50 (100% for single sided where there is no access to root side).
		t > 20	50	100
	Longitudinal	t < 8	50	Not applicable
		8 ≤ t ≤ 20	5	0
		t > 20	10	10
Fillet	Transverse	t ≤ 20	5	No requirement
		t > 20, a ≤ 10	10	0
		t > 20, 10 < a ≤ 15	20	5
		t > 20, a > 15	20	10
	Longitudinal	t ≤ 20	0	No requirement
		t > 20, a ≤ 10	2	0
		t > 20, 10 < a ≤ 15	5	0
		t > 20, a > 15	5	2

10.106 For supplementary NDT of shop welds in steel grades up to and including S355 and QSC F56, testing conditions to BS EN ISO 17640 [Ref 33.N] shall be Level B, evaluation level DAC -14 dB.

10.107 Where conditions other than those assumed in Table 10.101 apply, the minimum proportions of welded joints to be subjected to specific supplementary NDT shall be adjusted by one or more levels in accordance with Table 10.105.

Adjustments in proportions of supplementary NDT for conditions other than those covered by Table 10.100 and Table 10.106

10.108 For the conditions in Table 10.105, the change in minimum proportions of welded joints to be subjected to specific supplementary NDT shall be in accordance with Table 10.104.

Table 10.108 Adjustments in proportion of supplementary NDT.		
Change in Level	Original proportion of joints tested %	Adjusted proportion of joints tested %
- 1	0	0
	2	0
	5	2
	10	5
	20	10
	50	20
	100	50
+ 1	0	2
	2	5
	5	10
	10	20
	20	50
	50	100
	100	100
+ 2	0	5
	2	10
	5	20
	10	50
	20	100
	50	100
	100	100

10.109 Adjustments in the minimum proportions of welded joints to be subjected to specific supplementary NDT for conditions other than those covered by Table 10.101 and Table 10.106 shall be in accordance with Table 10.105.

Table 10.109 Adjustments in proportions of supplementary NDT for conditions other than those covered by Table 10.100 and Table 10.106.	
Condition	Change in level, as defined in Table 10.104
Site welded joints	+1
Automatic and robotic welded joints, excluding transverse butt welds of F90 or above.	-1
Standard proprietary products manufactured on a mass production basis, excluding transverse butt	-1

welds of F90 and above.	
Steel grades above S355 and below S500	+1
Steel grades S500 and above	+2
QSC F36 (relative to F56)	-1
After a non-conformance with acceptance criteria in Table 10.128 or Table 10.129, applicable to all joints of similar type tested in the same production batch; to be maintained until the cause has been identified and rectified and defects eliminated.	+2 (minimum, depending on degree of severity of non-conformance)
Exceptional Welding Process	+2

Minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSCs F71 to F140

10.110 The minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSCs F71 to F140 shall be in accordance with Table 10.106.

Table 10.110 Minimum extent of supplementary NDT of shop welds in steel grades up to and including S355 and QSCs F71 to F140.

Weld type	Orientation	Nominal maximum parent metal thickness in the joint (t) or nominal fillet weld throat dimension (including any specified penetration) (a) mm	Proportion of joints tested according to QSC								
			Magnetic particle (MT) or penetrant testing (PT)			Ultrasonic testing (UT)			Radiographic testing (RT) for in-line butt welds only		
			F71	F90	F112 and F140	F71	F90	F112 and F140	F90	F112	F140
Butt	Transverse	t < 8	100	100	100	Not applicable	20	100	20	100	100
		8 ≤ t ≤ 20	50	100	100	100	100	100	0	20	100
		t > 20	100	100	100	100	100	100	0	50	100
	Longitudinal	t < 8	100	100	100	Not applicable	20	100	10	50	100
		8 ≤ t ≤ 20	20	50	100	10	20	100	0	10	100
		t > 20	20	50	100	10	20	100	0	10	100
Fille	Transvers	t ≤ 20	20	10	100	No	No	No	No		

t	e			0		requirement	requirement	requirement	requirement
		t > 20, a ≤ 10	50	100	100	10	20	20	
		t > 20, 10 < a ≤ 15	100	100	100	20	50	50	
		t > 20, a > 15	100	100	100	50	100	100	
	Longitudinal	As per longitudinal butt weld							

10.111 For supplementary NDT of shop welds in steel grades up to and including S355 and QSCs F71 to F140, testing conditions to BS EN ISO 17640 [Ref 33.N] shall be as follows:.

1. for QSCs F71 and F90: testing level B, evaluation level DAC -14 dB;

2. for QSC F112: testing level C, evaluation level DAC -17 dB; and

3. for QSC F140: testing level C, evaluation level DAC -20 dB.

10.112 For longitudinal welds, in accordance with testing conditions to BS EN ISO 17640 [Ref 33.N], transverse indication scans shall be required.

10.113 Where phased array technique for ultrasonic testing of welds is to be used, the principles of BS EN ISO 13588 [Ref 34.N] shall be applied.

10.114 BS EN ISO 17640 [Ref 33.N] testing level D shall apply where the weld test procedures, the equipment, and the operator's competency are subject to independent validation for suitability for assessment of Table 10.129 requirements.

10.115 For radiographic testing of welds, test class B of BS EN ISO 17636-1 [Ref 32.N] or BS EN ISO 17636-2 [Ref 31.N] shall be used.

10.116 Radiographic testing shall not be used on in-line butt welds if the phased array technique is used for ultrasonic testing.

10.117 Radiographic testing shall not be undertaken for QSC F140 transverse butt welds conforming to Table 8.3 of BS EN 1993-1-9 [Ref 11.N].

10.118 Where radiographic testing is not undertaken for QSCs F112 and F140 butt welds, or QSC F90 transverse welds (butt or longitudinal) with t <8, phased array ultrasonic testing shall be used.

Acceptance criteria for welds in structural steelwork

Weld acceptance criteria for visual inspection

10.119 The weld acceptance criteria for visual inspection shall be in accordance with Table 10.115.

Table 10.119 Weld acceptance criteria for visual inspection (all dimensions in mm).

Main criterion	Imperfection type, where the three digit BS EN ISO 6520-1 [Ref 57.N]designation is deemed to include all four digit sub-categories		Dimensional parameter, where symbols are defined by BS EN ISO 5817 [Ref 59.N] or BS EN ISO 6520-1 [Ref 57.N]		Joint type	Weld type	Acceptance limits according to QSC, where symbols are defined by BS EN ISO 5817 [Ref 59.N] or BS EN ISO 6520-1 [Ref 57.N] [ ] applies to longitudinal welds and joints in any orientation to F36 only		Remedial action in event of non-conformance
	Description	BS EN ISO 6520-1 ref no.	Symbol	BS EN ISO 5817 ref no.			F56 and F36	F71 to F140	
Overall joint geometry	Weld location error	-	The dimension (or weld type) specified on the drawings (Dr)	-	All	Fillet	Dr ± 10 [±10]	As per F56	Refer to welding coordinator for remedial action
	Incorrect weld type	-	The dimension (or weld type) specified on the drawings (Dr)	-	All	All	Not permitted [Not permitted]	As per F56	Refer to welding coordinator for remedial action
	Inadequate weld length	-	The dimension (or	-	All	All	Dr -0 [-5]	As per F56	Add extra weld length

			weld type) specified on the drawings (Dr)						
	Linear misalignment	5071, 5072	h	3.1	In line butt	Butt	h ≤ 0.2t [0.3t] h ≤ 4 [5]	See Table 10.127	Remove existing weld, realign joint, remake preparations and check with MT or PT, reweld to approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document, check with UT
		507	h	-	Cruciform	All	h ≤ 0.4t [0.4t] h ≤ 6 [6]	See Table 10.127	
	Angular misalignment	508	β	-	In line butt	Butt	β ≤ 2° [3°]	See Table 10.127	Correct using approved procedure, check with MT or PT
	Root gap	617	h	3.2	Lap, tee, cruciform	Fillet	h ≤ 2 [3]	See Table 10.127	Refer to welding coordinator for remedial action
	Excess weld dimensions	502, 503, 504, 512, 5214	h	1.9, 1.10, 1.11, 1.16,	All	All	No limits specified	As per F56	Correct by grinding if any functional limits are required

				1.21					
Surface notches	Crack	100 to 106	-	1.1, 1.2	All	All	Not permitted [Not permitted]	As per F56	Remove imperfections by grinding to approved excavation shape, check with PT, reweld to approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document, refer to welding coordinator to determine cause
	Lack of fusion	401, 506	h	1.5, 1.13	All	All	Not permitted [Not permitted]	As per F56	
	Lack of penetration (unspecified)	402	-	1.6	All	Single sided butt	Not permitted [h ≤ 0.1t]	As per F56 [NP]	
	Large cavities	2015, 2016, 202, 510	-	2.6, 2.7, 1.15	All	Butt	Not permitted [Not permitted]	As per F56	
	Undercut under fill etc.	501, 509, 511, 515, 517	h	1.7, 1.8, 1.14, 1.17, 1.19	All	All	h ≤ 0.5 [1]	See Table 10.127	Remove by grinding, repair to approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document.
	Pore	2017	d	1.3	All	All	d ≤ 2 [2]	See Table 10.127	Remove to depth of 3 mm, repair to approved

									welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document.
	Toe angle	5051	α	1.12	All	All	α ≥ 90° [90°]	See Table 10.127	Correct with high speed rotary burr or reweld to approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document.
	Damage	601, 603 to 606	-	1.22	All	All	Not permitted [Not permitted]	As per F56	Grind out to smooth profile, repair by approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document, if h > 1
Loss of cross-	Insufficient weld throat,	5213	h	1.20	Tee, lap, crucifor	Fillet	Not permitted	As per	Increase size using

section	a				m		[h ≤ 0.1a] [h ≤ 1]	F56	approved welding procedure specification for repair, qualified in accordance with the requirements in Section 5 of this document.
	Insufficient leg length, z	521	h	-	Tee, lap, cruciform	Fillet	Not permitted [h ≤ 0.1z] [h ≤ 2]	As per F56	
	Multiple con-forming surface imperfections	201, 202, 501, 509, 511, 515, 521 3	h, l, d, l_p	4.2, 4.1	All	All	Requirements for summation and assessment of permitted imperfections resulting in loss of cross-section as given in this Section.	As per F56	Increase cross sectional area using methods above, depending on imperfection type
Surface condition	Deposits	602, 613, 614, 615	-	1.23	All	All	Not permitted if surface is to receive corrosion protection except as allowed by Section 8 of this document, or on uncoated steels conforming to BS EN 10025-5 [Ref 24.N]and BS EN 10088-1 [Ref 45.N].	See Table 10.127	Remove by grinding or blast cleaning

10.120 With reference to Table 10.115 and Table 10.125, where a root gap h has been observed in a tee, cruciform or corner joint, the nominal required fillet weld dimensions, as measured with a weld gauge, shall be increased as follows, unless compensating penetration beyond the root has been proven: minimum required throat size a + 0.7h; minimum required leg length z + h (on affected leg only).

10.121 With reference to Table 10.115 and Table 10.129, all permitted imperfections in welds resulting in loss of cross-section shall be summed and assessed as follows: $\Sigma hl + \Sigma 0.5dt \leq 4.5t$ or [$\leq 9t$].

10.122 With reference to Table 10.115, and Table 10.129, for the summation and assessment of all permitted imperfections in welds resulting in loss of cross-section, Σhl shall include subsurface imperfections assuming h = 3.

10.123 With reference to Table 10.115, and Table 10.129, for the summation and assessment of all permitted imperfections in welds resulting in loss of cross-section, the measurement length l_p shall be 100 mm.

10.124 With reference to Table 10.115, and Table 10.129, for the summation and assessment of all permitted imperfections resulting in loss of cross-section for fillet welds, 'a' shall be substituted for 't'.

10.125 With reference to Table 10.115, for imperfection types 'insufficient weld throat, a', and 'insufficient leg length, z', a and z shall be related as described in Table 10.121.

Table 10.125 Relationship between a, z and angle between fusion faces for weld acceptance criteria for visual inspection.

Angle between fusion faces	120°	110°	100°	90°	80°	70°	60°
z/a	2.0	1.74	1.56	1.41	1.31	1.22	1.15

10.126 With reference to Table 10.115, for imperfection types 'insufficient weld throat, a', and 'insufficient leg length, z', both a and z measurements shall be checked, irrespective of which has been specified on the drawings.

10.127 Where the imperfections of types 'excess weld dimensions', to BS EN ISO 6520-1 [Ref 57.N] reference numbers 502, 503, 504, 512 or 5214 are identified, functional limits shall apply to QSC F56 welds where specified for a particular application.

10.128 Where more than one limit is given for an imperfection for a given QSC and weld orientation, all limits shall apply.

Weld acceptance criteria for visual inspection for QSCs F71 to F140 where limits differ from those for F56 in Table 10.115 (all dimensions in mm)

10.129 The weld acceptance criteria for visual inspection for QSCs F71 to F140 where limits differ from those for QSC F56 in Table 10.115 shall be in accordance with Table 10.125.

Table 10.129 Weld acceptance criteria for visual inspection for QSCs F71 t where limits differ from those for QSC F56 in Table 10.115 (all dimensions									
Imperfection type, where the three digit BS EN ISO 6520-1 [Ref 57.N] designation is deemed to include all four digit sub-categories		Acceptance limits according to QSC, where symbols are defined by BS EN ISO 5817 [Ref 59.N] or BS EN ISO 6520-1 [Ref 57.N] [ ] applies to longitudinal welds only							
		F71		F90		F112		F140	
Linear misalignment	In-line butt	h ≤ 0.15t h ≤ 4	[0.2t] [5]	h ≤ 0.1t h ≤ 3	[0.2t] [4]	h ≤ 0.05t h ≤ 3	[0.2t] [4]	h ≤ 0.05t h ≤ 3	[0.2t] [4]
	cruciform	h ≤ 0.3t h ≤ 5	[0.4t] [6]	h ≤ 0.2t h ≤ 4	[0.4t] [6]	h ≤ 0.1t h ≤ 3	[0.3t] [5]	h ≤ 0.1t h ≤ 3	[0.2t] [3]
Angular misalignment		β ≤ 2°	[3°]	β ≤ 1.5°	[2°]	β ≤ 1°	[2°]	β ≤ 0.5°	[2°]
Root gap		h ≤ 2	[2]	h ≤ 2	[2]	h ≤ 1	[1]	h ≤ 0.5	[0.5]
Undercut, underfill		h ≤ 0.3	[h ≤ 1]	Not permitted	[h ≤ 1]	Not permitted	[h ≤ 0.5]	Not permitted	[h ≤ 0.5]
Porosity		d ≤ 1.5	[1.5]	d ≤ 1	[1]	Not permitted	[Not permitted]	Not permitted	[Not permitted]
Toe angle		α ≥ 110°	[90°]	α ≥ 150°	[90°]	α ≥ 165°	[110°]	α ≥ 175°	[110°]
Deposits		Not permitted if surface is to receive corrosion		Not permitted	[Not permitted]	Not permitted	[Not permitted]	Not permitted	[Not permitted]

	protection except as allowed by Section 8 of this document, or on uncoated steels conforming to BS EN 10025-5 [Ref 24.N] and BS EN 10088-1 [Ref 45.N].								
The maximum variation in cap or root longitudinal profile measured along weld axis over any length of 3 mm	Δh ≤ 3	[Δh ≤ 3]	Δh ≤ 2	[Δh ≤ 2]	Δh ≤ 1	[Δh ≤ 1]	Δh ≤ 0.5	[Δh ≤ 0.5]	

10.130 Where more than one limit is given for an imperfection for a given QSC and weld orientation, all limits shall apply.

10.131 Transverse welds outside connection zones shall be exempt from the restrictions on the maximum variation in cap or root longitudinal profile measured along weld axis over any length of 3 mm shown in Table 10.125.

Weld acceptance criteria for magnetic particle and penetrant testing

10.132 The weld acceptance criteria for magnetic particle and penetrant testing shall be in accordance with Table 10.128.

Table 10.132 Weld acceptance criteria for magnetic particle and penetrant

Imperfection type	Acceptance standards	Indication pattern	Acceptance limits according to QSC [ ] applies to longitudinal welds with longitudinal linear indications and joints in any orientation to F36 only					
			F56 and F36		F71		F90 to F140	
Surface notches identified in Table 10.122 and Table 10.127	BS EN ISO 23278 [Ref 29.N] and BS EN ISO 23277 [Ref 30.N]	Isolated	Level 2	[Level 3]	Level 1	[Level 2]	Not permitted	[Not permitted]
		Any indications separated by less than 2.5 mm ('grouped').	Not permitted	[Not permitted]	Not permitted	[Not permitted]	Not permitted	[Not permitted]

Weld acceptance criteria for ultrasonic testing with limited optional radiographic testing (all dimensions in mm)

10.133 The weld acceptance criteria for ultrasonic testing with limited optional radiographic testing shall be in accordance with Table 10.129.

Table 10.133 Weld acceptance criteria for ultasonic testing with limited o			
Imperfection	Dimensional	Locatio	Acceptance limits according to QSC, where

type, where the three digit BS EN ISO 6520-1 [Ref 57.N] designation is deemed to include all four digit sub-categories		parameter, where symbols are as defined by BS EN ISO 5817 [Ref 59.N]		n in cross section or throat	59.N] [ ] applies to longitudinal welds and joints i				
Description	BS EN ISO 6520-1, ref no.	Symbol	BS EN ISO 5817 [Ref 59.N]BS EN ISO 5817 ref no.		F56 and F36		F71		F90
Cracks	100 to 106	-	2.1, 2.2	Full depth	Not permitted	[Not permitted]	Not permitted	[Not permitted]	Not permitted
Pores, inclusion, cavities, lack of fusion, lack of penetration	2011, 2014, 2015, 2016, 202, 203 301 to 304, 401, 402	h, l	2.3, 2.5, to 2.13	Within 6 mm of any surface	h ≤ 3	[3]	h ≤ 3	[3]	Not permitted
					l ≤ 10	[20]	l ≤ 5	[10]	Not permitted
				Deeper than 6 mm from any surface	h ≤ 3	[3]	h ≤ 3	[3]	h ≤ 3
					l ≤ 1.5t	[3t]	l ≤ 10	[1.5t]	l ≤ 5
		h, l, l_p, clear gap between adjacent imperfections measured in through thickness direction (H), gap between ends of adjacent	4.2	Full depth	Σl ≤ 1.5t K)	[3t]	Σl ≤ 1.5t	[3t]	Σl ≤ 1.5t
					l_p = 100	[100]	l_p = 100	[100]	l_p = 10
					H ≥ 6	[6]	H ≥ 6	[6]	H ≥ 6
					L ≥ 10	[10]	L ≥ 10	[10]	L ≥ 10

		imperfections measured							
Uniformly distributed or clustered porosity	2012, 2013	-	2.3, 2.4,	Full depth	Not permitted if obstructs detection or eval above				

10.134 Where more than one limit is given for an imperfection for a given QSC and weld orientation, all limits shall apply.

10.135 Where surface breaking imperfections in welds are detected by UT, the criteria given in Table 10.115, Table 10.125, and Table 10.128 shall apply.

10.136 For pores, inclusions and cavities, the use of radiographic testing of welds shall be permitted to assist in the interpretation of these imperfections.

10.137 The rejection level for cracks in QSCs F36, F56, F71 and F90 welds shall be DAC -14 dB.

10.138 The rejection level for pores, inclusions, cavities, lack of fusion and lack of penetration for QSC F90 welds where the imperfection is within 6 mm of any surface, and for QSC F112 welds where the imperfection is deeper than 6 mm from any surface shall be DAC -14 dB.

10.139 The rejection level for cracks for QSC F112 welds shall be DAC -17dB.

10.140 The rejection level for pores, inclusions, cavities, lack of fusion and lack of penetration for QSC F112 welds where the imperfection is within 6 mm of any surface, and for QSC F140 welds where the imperfection is deeper than 6mm from any surface shall be DAC -17 dB.

10.141 The rejection level for cracks in QSC F140 welds shall be -20 dB.

10.142 The rejection level for pores, inclusions, cavities, lack of fusion and lack of penetration for QSC F140 welds within 6 mm of any surface shall be -20 dB.

10.143 The rejection level for full depth pores, inclusions, cavities, lack of fusion and lack of penetration for longitudinal QSC F56 welds and all QSC F36 welds shall be -20dB.

Specific production tests on run-off coupon plates

10.144 Production tests on run-off coupon plates shall be in accordance with Table 10.140.

Table 10.144 Specific production tests on run-off coupon plates.

Weld type	QSC	Material grades	Test type	Testing rate
In-line transverse butt weld in tension	F56 and above	S355 to S460 ML, NL	Charpys	1 in 10
		S460 to S690 Q	Tensile	1 in 5
		S420 to S690 QL, QL1	Tensile and Charpys	1 in 5
	F90 and above	All	In addition to the tests required for QSC F56 and above, UT+3 macros	1 in 5
Longitudinal butt or fillet	F90	All	UT+3 macros	1 in 20
	F112 and above	All	UT+3 macros	1 in 5

10.145 For longitudinal butt or fillet welds, a tack weld shall be included in the coupon plate if used in production.

10.146 For tack welds in longitudinal butt or fillet welds, at least one macro shall be taken at each end of the tack weld.

11. Normative references

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

Ref.	Document
Ref 1.N	National Highways. CG 302, 'As-built, operational and maintenance records for highway structures'
Ref 2.N	National Highways. CC 489 'Bridge bearings [Series 2100]'
Ref 3.N	National Highways. CC 490, 'Bridge expansion joints and sealing of gaps'
Ref 4.N	BSI. BS EN 10219-3, 'Cold formed welded steel structural hollow sections. Technical delivery conditions for high strength and weather resistant steels'
Ref 5.N	BSI. BS EN 10219-2, 'Cold formed welded steel structural hollow sections. Tolerances, dimensions and sectional properties '
Ref 6.N	BSI. BS EN 10219-1, 'Cold formed welded structural hollow sections of non-alloy and fine grain steels. Technical delivery requirements (Designated Standard - CPR)'
Ref 7.N	BSI. BS EN 10163-2, 'Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections. Plate and wide flats'
Ref 8.N	BSI. BS EN 10163-3, 'Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections. Sections '
Ref 9.N	BSI. BS EN ISO 9018, 'Destructive tests on welds in metallic materials. Tensile test on cruciform and lapped joints'
Ref 10.N	BSI. BS EN 1993-1-8, 'Eurocode 3 Design of steel structures. Design of Joints.'
Ref 11.N	BSI. BS EN 1993-1-9, 'Eurocode 3. Design of steel structures. Fatigue.'
Ref 12.N	BSI. BS EN 1090-1, 'Execution of steel structures and aluminium structures. Requirements for conformity assessment of structural components (Designated Standard - CPR)'
Ref 13.N	BSI. BS EN 1090-2, 'Execution of steel structures and aluminium structures. Technical requirements for steel

	structures.'
Ref 14.N	BSI. BS EN ISO 3269, 'Fasteners. Acceptance inspection'
Ref 15.N	BSI. BS EN 12681-1, 'Founding - Radiographic testing - Film techniques'
Ref 16.N	National Highways. GC 101, 'General requirements for the Specification for Highway Works'
Ref 17.N	BSI. BS EN 14399-3, 'High-strength structural bolting assemblies for preloading. System HR. Hexagon bolt and nut assemblies'
Ref 18.N	BSI. BS EN 10210-3, 'Hot finished steel structural hollow sections. Technical delivery conditions for high strength and weather resistant steels'
Ref 19.N	BSI. BS EN 10210-2, 'Hot finished steel structural hollow sections. Tolerances, dimensions and sectional properties'
Ref 20.N	BSI. BS EN 10210-1, 'Hot finished structural hollow sections of non-alloy and fine grain steels. Technical delivery requirements (Designated Standard - CPR)'
Ref 21.N	BSI. BS EN 10025-1, 'Hot rolled products of structural steels. General technical delivery conditions (Designated Standard - CPR)'
Ref 22.N	BSI. BS EN 10025-6, 'Hot rolled products of structural steels. Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition '
Ref 23.N	BSI. BS EN 10025-3, 'Hot rolled products of structural steels. Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels '
Ref 24.N	BSI. BS EN 10025-5, 'Hot rolled products of structural steels. Technical delivery conditions for structural steels with improved atmospheric corrosion resistance.'
Ref 25.N	BSI. BS EN 10025-4, 'Hot rolled products of structural steels. Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels'
Ref 26.N	BSI. BS EN 10025-2, 'Hot rolled products structural steels. Technical delivery conditions for non-alloy structural steels'
Ref 27.N	National Highways. CC 495 'Miscellaneous [Series 2600]'
Ref 28.N	BSI. BS EN 17638, 'Non-destructive testing of welds.

	Magnetic particle testing'
Ref 29.N	BSI. BS EN ISO 23278, 'Non-destructive testing of welds. Magnetic particle testing. Acceptance levels'
Ref 30.N	BSI. BS EN ISO 23277, 'Non-destructive testing of welds. Penetrant testing. Acceptance levels'
Ref 31.N	BSI. BS EN ISO 17636-2, 'Non-destructive testing of welds. Radiographic testing. X- and gamma-ray techniques with digital detectors'
Ref 32.N	BSI. BS EN ISO 17636-1, 'Non-destructive testing of welds. Radiographic testing. X- and gamma-ray techniques with film'
Ref 33.N	BSI. BS EN ISO 17640, 'Non-destructive testing of welds. Ultrasonic testing. Techniques, testing levels, and assessment'
Ref 34.N	BSI. BS EN ISO 13588, 'Non-destructive testing of welds. Ultrasonic testing. Use of automated phased array technology'
Ref 35.N	BSI. BS EN 1593, 'Non-destructive testing. Leak testing. Bubble emission techniques '
Ref 36.N	BSI. BS EN ISO 9712, 'Non-destructive testing. Qualification and certification of NDT personnel'
Ref 37.N	BSI. BS EN ISO 8501-1, 'Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Rust grades and preparation grades of uncoated steel substrates and of steel substrates after removal of previous coatings'
Ref 38.N	National Highways. CC 486, 'Protection of steelwork against corrosion'
Ref 39.N	BSI. BS EN ISO 3834-2, 'Quality requirements for fusion welding of metallic materials. Comprehensive quality requirements'
Ref 40.N	BSI. BS EN ISO 3834-3, 'Quality requirements for fusion welding of metallic materials. Standard quality requirements'
Ref 41.N	BSI. PD 6695-1-10, 'Recommendations for the design of structures to BS EN 1993-1-10'
Ref 42.N	BSI. PD 6705-2, 'Recommendations for the execution of steel bridges to BS EN 1090-2'
Ref 43.N	BSI. BS EN ISO 15613, 'Specification and qualification of

	welding procedures for metallic materials. Qualification based on pre-production welding test'
Ref 44.N	BSI. BS EN ISO 15614-1, 'Specification and qualification of welding procedures for metallic materials. Welding procedure test. Arc and gas welding of steels and arc welding of nickel and nickel alloys'
Ref 45.N	BSI. BS EN 10088-1, 'Stainless steels. List of stainless steels'
Ref 46.N	American Society for Testing and Materials. ASTM F3125 / F3125M, 'Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength'
Ref 47.N	American Society for Testing and Materials. ASTM A502, 'Standard Specification for Rivets, Steel, Structural'
Ref 48.N	BSI. BS EN 10164, 'Steel products with improved deformation properties perpendicular to the surface of the product. Technical delivery conditions '
Ref 49.N	BSI. BS EN 10244-2, 'Steel wire and wire products. Non-ferrous metallic coatings on steel wire. Zinc or zinc alloy coatings'
Ref 50.N	BSI. PD 6703 , 'Structural bearings – Guidance on the use of structural bearings'
Ref 51.N	BSI. BS EN 1337-1, 'Structural bearings. General design rules'
Ref 52.N	BSI. BS EN 1337-11, 'Structural bearings. Transport, storage and installation'
Ref 53.N	National Highways. CC 482, 'Structural concrete'
Ref 54.N	National Highways. CG 300, 'Technical approval of highway structures'
Ref 55.N	BSI. BS EN ISO 9013, 'Thermal cutting. Classification of thermal cuts. Geometrical product specification and quality tolerances'
Ref 56.N	BSI. BS EN 10160, 'Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method) '
Ref 57.N	BSI. BS EN ISO 6520-1, 'Welding and allied processes. Classification of geometric imperfections in metallic materials. Fusion welding'

Ref 58.N	BSI. BS EN ISO 14555, 'Welding. Arc stud welding of metallic materials'
Ref 59.N	BSI. BS EN ISO 5817, 'Welding. Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded). Quality levels for imperfections'
Ref 60.N	BSI. BS EN 1011-2, 'Welding. Recommendations for welding of metallic materials. Arc welding of ferritic steels'
Ref 61.N	BSI. BS EN ISO 13918, 'Welding. Studs and ceramic ferrules for arc stud welding'
Ref 62.N	BSI. BS EN ISO 17660-1, 'Welding. Welding of reinforcing steel. Load-bearing welded joints'