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RAILTRACK PLC

MODEL CLAUSES FOR SPECIFYING CIVIL ENGINEERING WORKS

SECTION 90 Steelwork (BS 5400)

ISSUE NO. 1 REVISION B

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Amendments

Amendments and additions since the previous issue are marked by a vertical line in the right hand margin.

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SECTION 90

STEELWORK (BS 5400)

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SECTIONS 90

STEELWORK (BS 5400)

NOTES TO SPECIFIER:

These notes do not form part of the Specification.

Test certificates **90.1** *The requirement for provision of test certificates is to ensure traceability of steel or steel products, and should be expected from a supplier with an accredited quality system.*

Test certificates for bridge steelwork should always be provided. A certificate of product conformity is not an equivalent document, and should not be accepted as a substitute for a test certificate.

Material options **90.2** *The options in the various standards requiring a maximum carbon equivalent value to apply should always be invoked when welding is involved for:*

- (i) grade S275 steels over 50 mm thick,*
- (ii) grade S355 steels over 30 mm thick,*
- (iii) all thicknesses of steels grade S420 and S460.*

The options for steel to be provided with proven through thickness ductility quality should only be invoked when necessary for those parts of the structure such as cruciform, T and corner joints when the total weld throat thickness exceeds 30 mm.

Various standards include requirements for specific inspection and testing. Where this requirement is optional (BS EN 10 025, BS EN 10 155 and BS EN 10 210: Part 1), the applicable option should be invoked.

The various options relating to inspection should not need to be invoked when steel is provided by a supplier with an accredited quality system. However, the Contractor should be permitted to invoke the option should he consider it necessary for his own purposes.

SECTION 90

STEELWORK (BS 5400)

Application of standards and codes of practice

90.001

Steelwork including handrailing, walkways and bearings forming part of the bridge steelwork fabrication shall comply with BS 5400: Part 6 as qualified or amended by this and the following Clauses.

!C!

Steel bearings made by specialist manufacturers shall comply with Section 100: Bearings. **!CHECK!**

All numbers within the heading margin are the relevant clause numbers within BS 5400: Part 6.

(90.001)

Structural steels generally 3.1

90.002

Steel, bolts, nuts, washers, load indicating washers, rivets, swaged collar grooved rivets and shear connectors shall be supplied by manufacturers and/or suppliers who have quality systems approved to BS EN ISO 9002 or BS EN ISO 9003 by a body accredited by the United Kingdom Accreditation Service (UKAS) or manufacturers and/or suppliers who have quality systems that can be demonstrated to the Employer's Representative to be equivalent.

NOTE TO SPECIFIER

The Contractor should be asked to indicate in his Tender which manufacturers and/or stockists he intends to use for the supply of steel. Suppliers who do not have systems which are certified to BS EN ISO 9002 or 9003 should be inspected and accepted by Railtrack before the Contract is placed.

A record of the source of, and test certificates for steel, bolts, nuts, washers, load indicating washers, rivets, swaged collar grooved rivets, and shear connectors shall be maintained by the Contractor.

3.1.1

Delete BS 5400: Part 6, clause 3.1.1 and the following shall apply.

Structural steels shall comply with the requirements of BS EN 10 025, BS EN 10 113: Parts 1, 2 and 3, BS EN 10 155, BS EN 10 210: Part 1 or BS 7668 as applicable and shall be to the grades specified in such British Standards and as shown on the Contract Drawings. **!CHECK!**

!C!

Steel supplied shall, after all heat treatment associated with the fabrication (including welding, hot forming and correction of distortion) maintain the minimum mechanical properties specified in the above British Standards.

NOTE TO SPECIFIER

Notch toughness 3.1.3. The grades shown on the Contract Drawings should include the notch toughness requirements of BS 5400: Part 3, clause 6.5.

The ladle analysis for each grade of steel shall be supplied.

**Options
BS EN 10 025**

For structural steel supplied in accordance with BS EN 10 025, the following options shall apply.

Option 5 Maximum carbon equivalent value to be as stated in table 4.

NOTE TO SPECIFIER

If Option 5 is not invoked, Option 6 should be so that the carbon equivalent value (CEV) can be calculated.

Option 6 Additional chemical elements to be recorded for steel grade S355.

Option 10 Steel to comply with the improved properties perpendicular to the surface in BS EN 10 164, where shown by the letters TTP to designate through thickness properties on the Contract Drawings.**!CHECK!**

!C!

NOTE TO SPECIFIER

Locations where through thickness properties are to be tested should be shown on the Contract Drawings by the letters TTP, with the appropriate grade from BS EN 10 164. If not required, delete Option 10 above.

Option 11 Steel to be suitable for hot dip galvanizing where shown on the Contract Drawings.**!CHECK!** as galvanized.

!C!

Option 12 Steel to be submitted to specific inspection and testing as specified in Clause 90.005.**!CHECK!**

!C!

Option 13 This option may be invoked at the discretion of the Contractor.

Option 16 This option may be invoked at the discretion of the Contractor.

**BS EN 10 113
Parts 1, 2 and 3**

For structural steel supplied in accordance with BS EN 10 113: Parts 1, 2 and 3, the following options shall apply.

Option 2 Maximum carbon equivalent value to be as stated in BS EN 10 113: Part 2, table 2, or BS EN 10 113: Part 3, table 2 as appropriate.

NOTE TO SPECIFIER

If Option 2 is not invoked, Option 3 should be invoked so that the CEV can be calculated.

Option 6 Steel to comply with the improved properties perpendicular to the surface in BS EN 10 164, where shown by the letters TTP to designate through thickness properties on the Contract Drawings.**!CHECK!**

!C!

NOTE TO SPECIFIER

Locations where through thickness properties are to be tested should be shown on the Contract Drawings by the letters TTP, with the appropriate grade from BS EN 10 164. If not required, delete option 6 above.

- !C!** Option 7 Steel to be suitable for hot dip galvanizing where shown on the Contract Drawings. **!CHECK!** as galvanized.
- Option 9 This option may be invoked at the discretion of the Contractor.
- !C!** Option 10 If steel is stamped, low stress stamps as specified in Clause 90.004. **!CHECK!** shall be used.

BS EN 10 155

For structural steel supplied in accordance with BS EN 10 155, the following options shall apply.

- Option 4 A maximum carbon equivalent value of 0.52% for grade S355 and 0.44% for grade S275 is required.

NOTE TO SPECIFIER

If Option 4 is not invoked, Option 3 should be invoked so that the CEV can be calculated.

- !C!** Option 6 If steel grade S355WP is specified, **!CHECK!** the impact values shall be verified.
- !C!** Option 7 Steel to be submitted to inspection and testing which shall be as specified in Clause 90.005. **!CHECK!**
- Option 8 This option may be invoked at the discretion of the Contractor.
- Option 9 This option may be invoked at the discretion of the Contractor.

NOTE TO SPECIFIER

Where the thickness of the steel required by the design and shown accordingly on the Contract Drawings exceeds the nominal thickness limits in BS 10 155, table 2, option 1 should also be specified.

**BS EN 10 210:
Part 1**

For structural steel hollow sections supplied in accordance with BS EN 10 210: Part 1, the following options shall apply.

- Option 1.1 A product analysis shall be carried out.
- Option 1.2 Maximum carbon equivalent value to be as stated in table A2 for non alloy grades.
- !C!** Option 1.3 Ladle analysis to be reported in the inspection certificate in accordance with Clause 90.005. **!CHECK!**
- Option 1.4 Maximum carbon equivalent value to be as stated in table B2 for grades S275 and S355.

NOTE TO SPECIFIER

If Options 1.2 and 1.4 are not invoked, Option 1.1 should be invoked so that the CEV can be calculated.

Option 1.5 Ladle analysis limits for steel grade S460 are required.

!C!

Option 1.7 Steel to be suitable for hot dip galvanizing where shown on the Contract Drawings!**CHECK!** as galvanized.

Option 1.8 Weld repair to the body of structural steel hollow sections not to be permitted.

!C!

Option 1.9 Steel to be submitted to specific inspection and testing as specified in Clause 90.005!**CHECK!**

BS 7668

For structural steel hollow sections supplied in accordance with BS 7668, the following options shall apply.

Option B4 Maximum carbon equivalent value as stated in table B1.

Option B7 No repair by welding shall be carried out.

Option B8 Marking using a continuous white paint line is required.

Option B12 This option may be invoked at the discretion of the Contractor.

Surface conditions

Surface conditions of plates and wide flats shall comply with Class B Subclass 3 of BS EN 10 163: Part 2. The surface conditions of sections shall comply with Class D Subclass 3 of BS EN 10 163: Part 3.

!C!

When verification of the surface condition is carried out by the manufacturer, the surface condition shall be recorded on the manufacturer's certificate in accordance with Clause 90.005!**CHECK!**

!C!

When verification of the surface condition is carried out by the Contractor, the programme and method of verification shall be submitted to the Employer's Representative, a minimum twenty one days!**CHECK!** prior to verification being carried out.

The surface of the steel material before surface preparation and application of protective treatment shall comply with rust grades A or B in accordance with BS 7079: Part A1. Material which is pitted (grades C and D) shall not be used.

NOTE TO SPECIFIER

Grades C and D should be avoided since it is almost impossible to remove corrosion products from the deepest pits, and such residue will lead to premature breakdown of the applied protective treatment.

Steelwork orders

All orders for steelwork shall include the following words:

"Bridge Structure- No Repair Welding To Be Carried Out."

NOTE TO SPECIFIER

This restriction need not apply to footbridge structures, or steel such as piles not subject to cyclic loading and if not required for such structures, the list of options needs to be reviewed to delete the relevant option.

3.1.2

Delete BS 5400: Part 6, clause 3.1.2.

Appendix A

Delete BS 5400: Part 5, Appendix A, clause A.1.1, and the following shall apply.

Rivets shall be manufactured from round bar material grade S275 or grade S355JO as applicable in accordance with BS EN 10 025, and the additional requirements in BS 5400: Part 6, appendix A, clauses A.1.2, A.1.3, A.2 and A.3, subject to the following amendments.

In BS 5400: Part 6, Appendix A, clause A.1.3.1, delete grade 43A and insert grade S275 .

In BS 5400: Part 6, Appendix A, clause A.1.3.2, delete grade 50C and insert grade S355JO .

(90.002)

Internal imperfections 3.1.4

90.003

Reference to 'laminations' in BS 5400: Part 6, clause 3.1.4 shall be replaced by internal imperfections .

Where BS 5400: Part 6, clause 3.1.4.1 refers to DD21, the following methods and quality grades of BS 5996 shall be used:

DD21

BS 5996 equivalent

C
E

B4
E

In addition to BS 5400: Part 6, clause 3.1.4.1, end plates, a band of flange or web plate 25 times the plate thickness either side of an intermediate stiffener, bearing stiffener or intermediate diaphragm and a band of deck plate 25 times the plate thickness either side of a stiffening member where connected by welding shall not have internal imperfections exceeding B4 of Table I of BS 5996.

In BS 5400: Part 6, clause 3.1.4.2, delete DD21 and insert BS 5996 .

When testing for internal imperfections is carried out by the manufacturer, the results shall be shown on the manufacturer's certificate in accordance with Clause 90.005. **!CHECK!**

!C!

When testing for internal imperfections is carried out by the Contractor, the programme and method of testing to demonstrate compliance with the above 'quality' grades shall be submitted to the Employer's Representative, a minimum twenty one days **!CHECK!** prior to testing being carried out.

(90.003)

**Marking
3.1.5**

90.004 Delete BS 5400: Part 6, clause 3.1.5 and the following shall apply.

!C! Steel shall be marked in accordance with the relevant British Standard listed in Clause 90.002. **!CHECK!**

A method of marking which identifies individual components shall be agreed with the Employer's Representative before cutting plates or sections. The method shall ensure that all components can be traced back to their unique certification.

Steel shall not be hard-die stamped. Low stress stamps with a maximum indentation depth of 0.25 mm and a minimum radius of 0.25 mm are acceptable.

The Employer's Representative shall be provided with a sketch or sketches which relate these components to their certification and their final place in the structure.

(90.004)

**Steel test and
inspection
certification
3.1.6**

90.005 Delete BS 5400: Part 6, clause 3.1.6 and the following shall apply.

!C! Test and inspection certificates for all steel, high strength friction grip bolts, nuts, washers, load indicating washers, rivets, swaged collar grooved rivets and shear connectors shall be submitted to the Employer's Representative. Certificates for steel plates, sections and flats shall be traceable to the original cast. Test certificates shall be submitted at least seven days **!CHECK!** before acceptance is required.

Test and inspection certificates shall include:

- (i) materials specification including options,
- (ii) steel identification including cast numbers, test identification numbers etc,
- (iii) results of mechanical tests,
- (iv) results of ladle analysis, including carbon equivalent value,
- (v) results of tests for internal imperfections,
- (vi) surface condition.