



Model Specification for the Purchase of Structural Bolting Assemblies and Holding Down Bolts

1.0 Introduction

This specification is for the purchase of structural bolting assemblies and holding down bolts for constructional steelwork and should be used in conjunction with the *National Structural Steelwork Specification for Buildings* (5th edition, CE Marking) and the *Steel Bridge Group: Model Project Specification for the Execution of Steelwork in Bridge Structures*.

Acceptance of structural fasteners from a supplier is conditional on the supplier complying with the full requirements of this model specification.

Note: The earlier version of the '*Model Specification for the Purchase of Structural Bolting Assemblies and Holding Down Bolts*' may be used for non-CE Marked bolting assemblies.

2.0 General

All fasteners shall be supplied with a colour coded system. The colour coding system shall identify the diameter of the fastener and the type of protective treatment used. Example colour coding systems for the fastener diameter shown on the bag or drum and protective treatment shown on a label are given below. Manufacturers/suppliers may use alternative colour coding systems provided the system is agreed with the purchaser in advance.

Fastener diameter

M12	=	RED
M16	=	BLUE
M20	=	YELLOW
M24	=	GREEN
M30	=	BLACK

Type of protective treatment

Electroplating	=	BLUE
Galvanized	=	ORANGE
Sherardized	=	PINK

If a technical non-conformity is discovered after delivery, the supplier shall replace the product or rectify the problem immediately and make available to the purchaser the results of the corrective action taken.

3.0 Technical Specification

Fasteners shall be supplied in accordance with the following tables or in the case of proprietary fasteners in accordance with clauses 4 and 5.

Note: Fasteners supplied in accordance with Tables 3 and 4 cannot be CE Marked.

Table 1: MATCHING ORDINARY ASSEMBLIES			
Property Class	Incorporating fully threaded length bolts		
	Bolt	Nut ⁽¹⁾	Washer
4.6	BS EN ISO 4018	BS EN ISO 4034 (Class 4) ⁽³⁾⁽⁴⁾	BS EN ISO 7091 (100HV)
8.8	BS EN ISO 4017 ⁽²⁾	BS EN ISO 4032 ⁽²⁾ (Class 8) ⁽⁴⁾	BS EN ISO 7091 (100HV)
10.9	BS EN ISO 4017 ⁽²⁾	BS EN ISO 4032 ⁽²⁾ (Class 10) ⁽⁴⁾	BS EN ISO 7091 (100HV)
Incorporating part threaded length bolts			
4.6	BS EN ISO 4016	BS EN ISO 4034 (Class 4) ⁽³⁾⁽⁴⁾	BS EN ISO 7091 (100HV)
8.8	BS EN ISO 4014 ₍₂₎	BS EN ISO 4032 ⁽²⁾ (Class 8) ⁽⁴⁾	BS EN ISO 7091 (100HV)
10.9	BS EN ISO 4014 ₍₂₎	BS EN ISO 4032 ⁽²⁾ (Class 10) ⁽⁴⁾	BS EN ISO 7091 (100HV)
<p>(1) Nuts of a higher property class may also be used</p> <p>(2) Bolts to the property classes 8.8 and 10.9 of BS EN ISO 4014 or BS EN ISO 4017 (dimensions and tolerances of BS EN ISO 4016 or BS EN ISO 4018) may also be used, with matching nuts to the property classes of BS EN ISO 4032 (dimensions and tolerances of BS EN ISO 4034).</p> <p>(3) Property Class 5 nuts for size M16 and smaller.</p> <p>(4) Nuts for galvanized or sherardized bolts must be tapped over-size to accommodate the thickness of galvanizing/sherardizing. This over-tapping reduces the strength of the nut and therefore a nut that has a proof load higher than the minimum ultimate tensile load of the assembly must be used. Nuts for galvanized or sherardized 4.6 bolts shall be property class 8; nuts for galvanized or sherardized 8.8 bolts shall be property class 10 and nuts for galvanized and sherardized 10.9 bolts shall be property class 12 to BS EN ISO 4033.</p>			

Table 2 MATCHING PRELOADED ASSEMBLIES⁽¹⁾⁽²⁾			
	System HR		System HRC
	Hexagon bolt	Countersunk bolt	HRC bolt⁽³⁾
Bolt/nut assembly	BS EN 14399-3	BS EN 14399-7	BS EN 14399-10
Bolt marking	HR	HR	HRC
Nut marking	HR	HR	HR or HRD
Property class	8.8/8;8.8/10 or 10.9/10	8.8/8; 8.8/10 or 10.9/10	10.9/10
Washers	BS EN 14399-5 or BS EN 14399-6		
Washer marking	H		
DTI ⁽⁴⁾ , nut and bolt face washers	BS EN 14399-9		At user's discretion
DTI marking ⁽⁴⁾	H8 or H10		
Nut face washer marking	HN		
Bolt face washer marking	HB	Not applicable	
<p>(1) In terms of suitability for preloading, fasteners shall meet the test requirements of BS EN 14399-2 and any additional testing specified in the product standard.</p> <p>(2) Bolt lengths shall be selected to ensure that a minimum number of four full threads (in addition to the thread run-out) remain clear between the bearing surface of the nut and the unthreaded part of the shank.</p> <p>(3) Commonly known as a "tension control bolt". BS EN 14399-10 system HRC assemblies with calibrated preload depend on accurate control of the torque-tension characteristics to achieve the specified axial tensile loads as with other torque methods.</p> <p>(4) DTI – direct tension indicator</p>			

Table 3: HOLDING DOWN ASSEMBLIES			
Property class	Bolt	Nut⁽¹⁾	Washer⁽⁴⁾
4.6	BS 7419	BS EN ISO 4032 ⁽²⁾ (Class 4) ⁽³⁾	BS EN ISO 7091 (100HV)
8.8	BS 7419	BS EN ISO 4032 ⁽²⁾ (Class 8) ⁽³⁾	BS EN ISO 7091 (100HV)
<p>(1) Nuts of a higher property class may also be used.</p> <p>(2) Nuts to the property class of BS EN ISO 4032 with dimensions and tolerances to BS EN ISO 4034 may also be used.</p> <p>(3) Nuts for galvanized or sherardized bolts must be tapped over-size to accommodate the thickness of galvanizing/sherardizing. This over-tapping reduces the strength of the nut and therefore a nut that has a proof load higher than the minimum ultimate tensile load of the assembly must be used. Nuts for galvanized or sherardized 4.6 bolts shall be property class 8 and nuts for galvanized or sherardized 8.8 bolts shall be property class 10.</p> <p>(4) As an alternative BS 4320 form G may be used</p>			

Table 4: CUP BOLTS and COUNTERSUNK BOLTS IN NON-PRELOADED ASSEMBLIES

Property class	Bolt	Nut ⁽¹⁾	Washer
4.6	BS 4933	BS EN ISO 4032 ⁽²⁾ (Class 4) ⁽³⁾	BS EN ISO 7091 (100HV)
8.8	BS 4933	BS EN ISO 4032 ⁽²⁾ (Class 8) ⁽³⁾	BS EN ISO 7091 (100HV)

- (1) Nuts of a higher property class may also be used.
 (2) Nuts to the property classes of BS EN ISO 4032 with dimensions and tolerances to BS EN ISO 4034 may also be used
 (3) Nuts for galvanized or sherardized bolts must be tapped over-size to accommodate the thickness of galvanizing/sherardizing. This over-tapping reduces the strength of the nut and therefore a nut that has a proof load higher than the minimum ultimate tensile load of the assembly must be used. Nuts for galvanized or sherardized 4.6 bolts shall be property class 8 and nuts for galvanized or sherardized 8.8 bolts shall be property class 10.

Table 5: PROTECTIVE COATINGS

Galvanizing	BS EN ISO 10684
Zinc Electroplating	BS EN ISO 4042
Sherardizing	BS 7371-8

4.0 Proprietary Products

All proprietary items shall be used in accordance with the manufacturer's recommendations and instructions if relevant.

5.0 CE Marking

All fastener assemblies manufactured to harmonised BS EN standards shall be supplied complete with CE marking as follows:

- Ordinary (non-preloaded) assemblies to BS EN 15048-1
- Preloaded assemblies to BS EN 14399-1

Fasteners supplied as proprietary items shall either be CE marked as being in accordance with a European Technical Approval or be treated as special fasteners to BS EN 1090-2. Special fasteners shall only be used if the manufacturer publishes suitable product information in the form of a component specification and provides a declaration of conformity that the fasteners have been supplied in accordance with the component specification.

6.0 Inspection certificates

All goods shall be supplied with a Type 3.1 Inspection certificate from the manufacturer/supplier to BS EN 10204: 2004 verifying compliance with this specification. If the fastener is surface coated this shall be included.

The manufacturer's Inspection certificate and the supplier's Inspection certificate which is traceable to the manufacturer's Inspection certificate must be retained by the supplier for a period of not less than 10 years and made available on request.

When agreed with the purchaser, the supplier may provide a certificate of conformance created by the supplier that references the original manufacturer's conformance documents. The original manufacturer's conformance documents shall be retained by the supplier and the supplier's certificate of conformance shall be traceable to the manufacturer's original conformance documents.

7.0 Service temperature

If bolts are intended for use at a service temperature below -20°C, the purchase order shall specify the temperature at or below which the bolts have a minimum impact strength of 27J according to BS EN ISO 898-1.

8.0 Quality Management

8.1 National Highways Sector Scheme 3

Suppliers and distributors of structural fasteners shall also comply with National Highways Sector Scheme 3 (NHSS3) when it comes into force ⁽¹⁾. This applies to all structures not just highway structures.

Compliance with National Highways Sector Scheme 3 may not be required for structural fasteners supplied to countries outside the UK.

⁽¹⁾ The National Highways Sector Scheme 3 comes into force in August 2011.

8.2 Bolts supplied direct from a Manufacturer

The manufacturer shall have a quality management system with a suitable scope that complies with the requirements of BS EN ISO 9001: 2008 and is certified by a certification body accredited by UKAS or an equivalent approved body. Verification of BS EN ISO 9001 compliance will be provided prior to order. Verification of the raw material quality control and verification of heat treatment control is also required.

The manufacturer shall have a system of receipt and despatch in place to ensure continued traceability from manufacture to despatch of the goods to the client.

Note: The definition of a manufacturer is that given in the Construction Products Regulations.

'Manufacturer means any natural or legal person who manufactures a construction product or who has such a product designed or manufactured, and markets that product under his name or trademark.'

8.3 Bolts provided by a Supplier who is not a manufacturer

Both the supplier and his manufacturer shall have a quality management system with a suitable scope that complies with the requirements of BS EN ISO 9001: 2008 and is certified by a certification body accredited by UKAS or an equivalent approved body. Verification of this compliance will be supplied prior to order. Verification of raw material quality control as well as verification of heat treatment control is required.

The supplier shall have a system of receipt and despatch in place to ensure continued traceability from the manufacturer to despatch of the goods to the client.

Verification of continued quality assurance/quality control by the manufacturer shall be provided by the supplier.

Inspection and sample testing of the product to BS EN ISO 3269: 2001 and mechanical testing to Table 6 is required at the point of entry in to the EU market place and shall be organised by the supplier/importer to supplement the manufacturer's data as agreed at time of order.

Table 6: Values to be used with BS EN ISO 3269: 2001	
AQL to be used for non-destructive tests	0.65
AQL to be used for destructive tests	1.5
Ac Level	0

9.0 References

The following dated standards and specifications are referenced in this specification. For dated references only the edition cited applies.

BS 4933: 2010, ISO metric black cup and countersunk head bolts and screws with hexagon nuts, 2010.

BS 7371-8: 1998, Coatings on metal fasteners – Part 8. Specification for sherardized coatings, 1998.

BS 7419: 1991, Specification for holding down bolts, 1991.

BS EN 1090-2: 2008, Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures, 2008.

BS EN ISO 9001: 2008, Quality management systems – Requirements, 2008.

BS EN 10204: 2004, Metallic materials, Types of inspection documents, 2004.

BS EN 14399-1: 2005, High-strength structural bolting assemblies for preloading – Part 1: General requirements, 2005.

BS EN 14399-2: 2005, High-strength structural bolting assemblies for preloading – Part 2: Suitability test for preloading, 2005.

BS EN 14399-3: 2005, High-strength structural bolting assemblies for preloading – System HR – Hexagon bolt and nut assemblies, 2005.

BS EN 14399-5: 2005, High-strength structural bolting assemblies for preloading – Part 5: Plain washers, 2005.

BS EN 14399-6: 2005, High-strength structural bolting assemblies for preloading – Part 6: Plain and chamfered washers, 2005.

BS EN 14399-7: 2007, High-strength structural bolting assemblies for preloading – Part 7: System HR – Countersunk head bolts and nut assemblies, 2007.

BS EN 14399-9: 2009, High-strength structural bolting assemblies for preloading – Part 9: System HR or HV – Bolt and nut assemblies with direct tension indicators, 2009.

BS EN 14399-10: 2009, High-strength structural bolting assemblies for preloading – Part 10: System HRC – Bolt and nut assemblies with calibrated preload, 2009.

BS EN 15048-1: 2007, Non preloaded structural bolting assemblies – Part 1: General requirements, 2007.

BS EN ISO 898-1: 2009, Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs, 2009.

BS EN ISO 3269: 2001, Fasteners. Acceptance inspection, 2001.

BS EN ISO 4014: 2001, Hexagon head bolts. Product grades A and B, 2001

BS EN ISO 4016: 2001, Hexagon head screws. Product grades C, 2001

BS EN ISO 4017: 2001, Hexagon head screws. Product grades A and B, 2001

BS EN ISO 4018: 2001, Hexagon head screws. Product grade C, 2001.

BS EN ISO 4032: 2001, Hexagon nuts, style 1. Product grades A and B, 2001.

BS EN ISO 4033: 2001, Hexagon nuts, style 2. Product grades A and B, 2001.

BS EN ISO 4034: 2001, Hexagon nuts. Product grade C, 2001.

BS EN ISO 4042: 1999, Fasteners, Electroplated coatings, 1999.

BS EN ISO 7091: 2000, Plain washers – Normal series – Product grade C, 2000.

BS EN ISO 10684: 2004, Fasteners – Hot dip galvanized coatings, 2004.

National Highways Sector Schemes for Quality Management in Highway Works 3, Stocking and Distribution Activities for Mechanical Fasteners, Published by Sector Scheme Advisory Committee for Mechanical Fasteners (SSACMF), UKAS, 2010.

National Structural Steelwork Specification for Buildings CE Marking version (5th edition), British Constructional Steelwork Association and the Steel Construction Institute, 2010.

Steel Bridge Group: Model Project Specification for the Execution of Steelwork in Bridge Structures, Steel Construction Institute, SCI Publication P382, 2009.

10.0 Undertaking

I/we the undersigned agree to supply products in accordance with this specification and any variation from this agreement will be sought in writing.

Signed: _____

Print: _____

Date: _____