National Light-Gauge

Steelwork Specification

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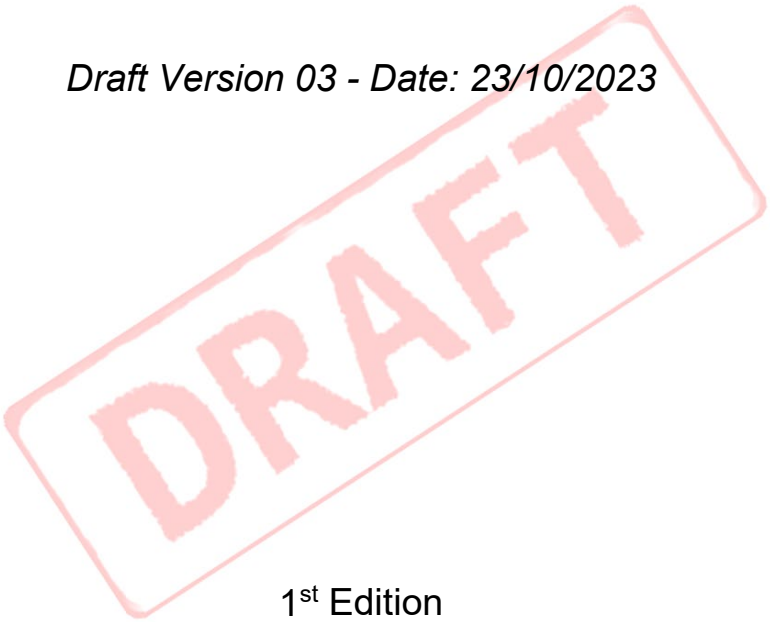

1st Edition

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About The British Constructional Steelwork Association Ltd
The BCSA is the national organisation for the steel construction industry: its member companies undertake the design, fabrication and erection of steelwork for all forms of construction in building and civil engineering. Industry members are those principal companies involved in the direct supply to all or some members of components, materials or products. Corporate members are clients, main contractors, professional offices, educational establishments etc., which support the development of national specifications, quality, fabrication and erection techniques, overall industry efficiency and good practice.

About The Steel Construction Institute
Info on SCI to be added as joint publication…

Foreword

The National Light-Gauge Steelwork Specification (NLSS) is presented here in its 1st Edition.

The objective of this Specification is to achieve greater uniformity in Project Specifications for light gauge steel framing and to be recognised as a document that can be incorporated readily into the contract documentation to specify acceptable standards for the manufacture and installation of light gauge steel frame buildings.

It is intended that this Specification should be invoked as part of the individual Project Specification and thus be part of the total building contract. It is essential that the Light Gauge Steelwork Designer, Manufacturer and Installer receive, on time, all information necessary for them to carry out the contract. Section 1 gives guidance on the items and information that should be included in the Project Specification. It is recognised that if the structure is unorthodox it may be appropriate to qualify and/or enlarge upon the provisions of this Specification.

It is considered that this Specification can be incorporated within the forms of contract normally employed in the steel construction industry.

Generally, the steel construction industry operates to the requirements of European Standards adopted as British Standards and these together with the British Standards that are used are referred to as British Standards. The British Constructional Steelwork Association Ltd. (BCSA) takes an active part in the preparation of these documents. Much of the information noted in this Specification is based upon that given in these standards, but it shall not be inferred that the full details of the standards are not relevant.

Account is taken of the fact that information is increasingly exchanged in electronic form and the adoption of standard forms of steelwork connections allows the review of structural details to be streamlined. Building Information Modelling (BIM) information required by and provided by the Light Gauge Steelwork Manufacturer is introduced in Sections 1 and 3, respectively.

References to British Standards (issued with BS, BS EN, BS EN ISO references) have been included throughout this Specification. For dated references, only the edition cited applies, e.g. Clause *x* of BS EN 1090-2:2018. For undated references, the latest edition of the referred standard, including any amendments, applies, e.g. BS EN 1090-2.

All parties are reminded that under the Construction (Design and Management) Regulations 2015 they have a duty to cooperate with others involved with construction to demonstrate compliance with Health and Safety legislation. Compliance with this Specification will make that task easier.

All parties are reminded of their obligations under the Building Safety Act 2022 including those related to competence.

Attention is drawn to Section 12 which requires that Light Gauge Steelwork Designers, Manufacturers and Installers should have all the necessary facilities, skills and effective quality management to ensure that their services and products conform to this Specification. It stipulates that the quality management system shall be open to assessment by the Employer or be certified by an approved certification body for compliance with BS EN ISO 9001. In addition, it stipulates that the manufacturer's factory production control system shall be certified by an Approved Body (UK) or a Notified Body (EU) for compliance with BS EN 1090-1.

It is intended to update this Specification at regular intervals. BCSA would appreciate any observations, particularly on inaccuracies and ambiguities, or proposals on the clauses as printed here or on any other matters which should be included in future editions.

This issue of the Specification has been prepared under the guidance of a Steering Committee composed of the individuals listed below:

Mr A Jackson	-	NHBC
Mr S Hall (Chair)	-	Hadley Group
Mr S Napper	-	MMCEngineer Ltd
Mr A Way (Author)	-	Steel Construction Institute
Dr A Girão Coelho (compiler)	-	British Constructional Steelwork Association
A N Others	-	XYZ
A N Others	-	XYZ
A N Others	-	XYZ

Care has been taken to obtain the views and comments of all sections of the industry including clients, government bodies, architects, surveyors, consulting structural engineers, warranty providers, general contractors, manufacturers, installers, and component suppliers. The BCSA acknowledges with thanks the helpful contributions made.

This 1st edition of the National Light-Gauge Steelwork Specification comes into force on the 00th Month Year.

Documents referred to in this Specification

Copies of documents referred to in this Specification may be obtained from:

British, European, American and ISO Standards
British Standards Institution
389 Chiswick High Road
London W4 4AL

The *Construction (Design and Management) Regulations* and *Guidance Notes to Environmental Protection Act* 1990 *[PG6/23]*
Her Majesty's Stationery Office (HMSO) or its approved agents

BCSA Publications
The British Constructional Steelwork Association
4 Whitehall Court
Westminster
London SWIA 2ES

SCI Publications
The Steel Construction Institute
Silwood Park
Ascot
Berkshire SL5 7QN

Contents

Scope

This Specification is compatible with the following structural steelwork design standards but may also be used with other standards, as required by the Project Specification:

BS EN 1993-1-1	Eurocode 3: Design of steel structures - Part 1.1: General rules and rules for buildings
BS EN 1993-1-3	Eurocode 3: Design of steel structures - Part 1.3: Supplementary rules for cold-formed members and sheeting
BS EN 1993-1-8	Eurocode 3: Design of steel structures - Part 1.8: Design of joints
BS 5950-1	Structural use of steelwork in buildings - Code of practice for design: Rolled and welded sections
BS 5950-5	Structural use of steelwork in buildings - Code of practice for design of cold formed thin gauge sections

This Specification deals with light gauge steel framing executed in accordance with:

BS EN 1090-1	Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components
BS EN 1090-2	Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures
BS EN 1090-4	Execution of steel structures and aluminium structures - Part 4: Technical requirements for cold-formed structural steel elements and cold-formed structures for roof, ceiling, floor and wall applications

This Specification can be used for all types of building construction in loadbearing light gauge steel framing, and designed for static loading including:

- Cold-formed steel structural members;
- Cold-formed steel component assemblies;
- Bracing systems.

This Specification does not include the following items although they may be included in loadbearing light gauge steel frame buildings within the scope of this Specification. The National Structural Steelwork Specification for Building Construction, 7th Edition, 1st revision (NSSS) should be used for the following items, unless otherwise stated in this Specification:

- Hot -rolled structural steel members;
- Hollow section structural steel members;
- Decking;
- Cladding;
- Sheeting;
- Purlins and rails;
- Stairs;
- Balconies;
- Handrails and balustrades.

Cold-formed portal frame structures are excluded from this Specification.

This Specification is based on execution of structural steelwork in Execution Class 2 according to BS EN 1993-1-1.

This Specification describes the information to be included in a Project Specification, and also covers materials, transfer of design information, manufacture, assembly, installation , and the requirements for protective treatment.

This Specification should be introduced into a light gauge steel framing contract by a Project Specification, the contents of which are described herein. The Project Specification should also include any additions or modifications that may be required to the National Light-Gauge Steelwork Specification (NLSS) by the Employer for a particular contract if the form of behaviour or other aspects of the structure are unorthodox.

Specific requirements are placed on the Light Gauge Steelwork Manufacturer and the Light Gauge Steelwork Installer and the Employer. Other requirements are allocated to the Light Gauge Steelwork Designer, who may not be directly a party to the light gauge steel framing contract, but may be engaged by the Employer or by the Light Gauge Steelwork Manufacturer. It should also be noted that in certain design-build contracts design responsibility is shared, and, in these instances, the role of Light Gauge Steelwork Designer will have to be redefined.

Light gauge steel frame buildings commonly incorporate hot-rolled steel sections or structural hollow sections. Therefore, the NSSS 7th Edition, 1st revision and this Specification (NLSS) may both be applicable to different parts of the same building. Where hot-rolled steel sections or structural hollow sections form a complete frame e.g. a podium structure the NSSS is applicable. Where hot-rolled steel sections or structural hollow sections form discrete beams, columns or sub-frames incorporated into the light gauge steel frame this Specification (NLSS) is applicable. Compatibility of construction must be achieved at interfaces and unless otherwise specified the most onerous specification is applicable.

Where parts of the NSSS are applicable to light gauge steel frames cross references to the NSSS have been provided without duplicating the guidance in each specification.

Definitions

Terms which are defined in this section are treated as proper nouns throughout the text of the Specification. The definitions given in the Construction (Design and Management) Regulations are given in Annex G of NSSS 7th Edition.

The following definitions apply for the purposes of this Specification:

Ancillary components	Plates, flats or bracketry which are fastened to structural members.
As erected (as built) information	Record drawings or electronic equivalent representing the final design in terms of nominal dimensions to which the building is within in terms of the permitted deviations. The permitted deviations do not include the actual deformations under self-weight or movements due to variable actions.
Assembly (an)	A set of light gauge steel components connected together to form a light gauge steel frame wall panel, floor cassette, lattice truss or other assembly of light gauge steel framing which will form part of the final works.
Assembly Drawings	Drawings or electronic equivalent prepared by the Light Gauge Steelwork Manufacturer showing all necessary information required to assemble the light gauge steelwork into an Assembly. Information provided on drawings is defined in BS EN 1090-4.
Building Information Modelling (BIM)	A process for controlling the sharing of electronic information at every step in the construction process from concept through design, construction, handover, operation, maintenance, and demolition or demounting.
Client	Organisation or individual for whom a construction project is carried out. Clients will make suitable arrangements for managing a project. This includes making sure that: - other duty holders are appointed, - sufficient time and resources are allocated. Clients shall also make sure that: - relevant information is prepared and provided to other duty holders, - the Principal Designer and Principal Contractor carry out their duties, - welfare facilities are provided.
Component Specification	Document or documents giving all necessary information and technical requirements for manufacturing the structural component.
Connection	For design purposes, it is the assembly of the basic components required to represent the behaviour during the transfer of the relevant internal forces and moments at the location at which two or more members meet.

Connection design	The design of bolts, screws, rivets, cleats, plates and fittings required to provide an adequate load path between the end of a member and the member it connects to.
Consequence Class	Consequence Classes are established by considering the consequences of failure or malfunction of the structure, for the purpose of reliability differentiation.
Construction Operation Building information exchange (COBie)	Structured facility information for the commissioning, operation and maintenance of a project often in a neutral spreadsheet format that will be used to supply data to the Employer or operator to populate decision-making tools, facilities management and asset management systems, as defined by BS EN ISO 19650-2.
Consulting Structural Engineer	The professional responsible for preparing the design calculations, drawings, specifications and schedules for the parts of the structure that are not within the Light Gauge Steelwork Designers scope of works. This may include the sub-structure and other groundworks, supporting or transfer structures and other elements or components pertinent to the design, e.g. masonry or claddings .
Corrosivity	Ability of an environment to cause corrosion of a metal in a given corrosion system.
Design calculations	Calculations prepared by the Light Gauge Steelwork Designer showing the design and analysis of the light gauge steel framing.
Design drawings	Fully dimensioned drawings or electronic equivalent prepared by the Light Gauge Steelwork Manufacturer showing all members with their size, material grades and coating, eccentricities (offsets or levels) and other information necessary for the completion of manufacture, assembly and installation drawings. The Light Gauge Steelwork Designer is responsible for approval of the design drawings.
Electronic data	Computer data and similar data transferred between parties providing essentially equivalent information to traditional drawings.
Employer	The individual, or company, placing the contract with the Light Gauge Steelwork Manufacturer. *Note: This will usually be the Principal Contractor and is not necessarily the Employer as defined in JCT contracts or CDM Regulations.*
Environmental Product Declaration (EPD)	An EPD communicates verifiable, accurate, non-misleading environmental information for products and their applications; EPD information is expressed in information modules, which allow easy organisation and expression of data packages throughout the life cycle of the product. *Adapted from BS EN* 15804:2012+*A*2:2019
Installation drawings	Drawings prepared by the Light Gauge Steelwork Manufacturer, showing details to amplify the information given

	in the Light Gauge Steelwork Manufacturer's installation method statement and showing details of any temporary steelwork.
Execution Class	Classified set of requirements specified for the execution of The Light Gauge Steel Works as a whole, of an individual component or of a detail of a component.
Foundation plan drawings or Load chase down drawings	Drawings, prepared by the Light Gauge Steelwork Designer, indicating location of wall panels for the ground floor or transfer structure, column bases at the ground floor or transfer structure and details of connections between the supporting structure and the light gauge steel frame, including bracing positions and subsequent positions of uplift forces.
General arrangement drawings	Drawings, prepared by the Light Gauge Steelwork Manufacturer, showing plans, cross-sections and elevations (where required), main dimensions and the erection marks of components.
If specified	Any additions or modifications made to the National Light-Gauge Steelwork Specification (NLSS) by the Employer.
Information	Representation of data in a formal manner suitable for communication, interpretation or processing by human beings or computer applications, as defined by BS EN ISO 19650-2.
Information Manager	The individual responsible for managing the delivery of the project using BIM procedures and methods. This usually forms part of a wider set of duties under an existing appointment and is likely to be performed either by the design lead or the project lead.
Information model / Model	BIM model comprising documentation, non-graphical information and graphical information, as defined by BS EN ISO 19650-2. *Note: The model is conveyed using PDF, COBie and native model files.*
Inspection Authority	A competent independent person or organisation which verifies compliance with this Specification and the Project Specification.
Joint	Zone where two or more members are interconnected.
Level of definition	Collective term used for and including 'level of model detail' and the 'level of information detail''. 'Level of model detail' is the description of graphical content in models at each of the stages defined, for example, in The Construction Industry Council (CIC) scope of services. The 'level of model information' is the description of non-graphical content in models at each of these stages.
Light Gauge Steelwork or Light Gauge Steel Frame	A light gauge steel framing system using galvanized cold-formed steel sections as the primary structural components, which can be assembled as prefabricated panels. The cold-formed steel sections used in the light gauge steel framing are generally C or Z shaped cross-sections. The light gauge steel

	is typically 1.2 to 4.0 mm in thickness.
Light Gauge Steelwork Designer	The professional responsible for preparing the design calculations, specifications and schedules and, in particular, for the structural adequacy and performance criteria of the Light Gauge Steel Frame and of the overall design of The Light Gauge Steel Works. The Light Gauge Steelwork Designer is responsible for approval of the design drawings. If required by the Project Specification, the Light Gauge Steelwork Designer will also be responsible for detailing of the Light Gauge Steel Frame and connections. *Note: The Light Gauge Steelwork Designer may be a different company to the Light Gauge Steelwork Manufacturer and the Light Gauge Steelwork Installer.*
Light Gauge Steelwork Installer	The company appointed to install the light gauge steel frame on-site. The Light Gauge Steelwork Installer undertakes the role of Constructor defined in BS EN 1090-2. *Note: The Light Gauge Steelwork Installer may be a different company to the Light Gauge Steelwork Manufacturer and the Light Gauge Steelwork Designer.*
Light Gauge Steelwork Manufacturer	The company appointed to manufacture the light gauge steel frame components and to assemble components off-site. The Light Gauge Steelwork Manufacturer will be responsible for production of the manufacturing data and Installation drawings. *Note: The Light Gauge Steelwork Manufacturer may be a different company to the Light Gauge Steelwork Designer and the Light Gauge Steelwork Installer.* *Note: The manufacture of light gauge steel components and the offsite assembly of the light gauge components may be executed by separate organisations, both are defined as The Light Gauge Steelwork Manufacturer for the purposes of this specification.*
Model file	Native, proprietary format, CAD file that can be a 2D or 3D model, as defined by BS EN ISO 19650-2.
Ordinary bolt assemblies	A bolt used in a non-preloaded bolt assembly which is designed to carry forces in shear and bearing, and/or tension.
Principal Contractor	The contractor appointed by the client to coordinate the construction phase of a project where it involves more than one contractor. Plan, manage, monitor and coordinate health and safety in the construction phase of a project. This includes: - liaising with the client and Principal Designer, - preparing the construction phase plan, - organising cooperation between contractors and coordinating their work. Ensuring that:

	- suitable site inductions are provided, - reasonable steps are taken to prevent unauthorised access, - workers are consulted and engaged in securing their health and safety, - welfare facilities are provided.
Principal Designer	Designer appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role. Plan, manage, monitor and coordinate health and safety in the pre-construction phase of a project. This includes: - identifying, eliminating or controlling foreseeable risks, - ensuring designers carry out their duties. Prepare and provide relevant information to other duty holders. Provide relevant information to the principal contractor to help them plan, manage, monitor and coordinate health and safety in the construction phase.
Production data	Electronic means of communication for automatic or semi-automatic methods of component manufacture.
Production drawings or Manufacturing drawings	Drawings or electronic equivalent prepared by the Light Gauge Steelwork Manufacturer, showing all necessary information required to manufacture the light gauge steelwork. *Note: These are often termed 'part drawings'.*
Programme	The programme of dates given in the Project Specification for (i) the release of all necessary information for the progress of The Light Gauge Steel Works, (ii) the preparation, submission and acceptance of production drawings, calculations and information, and (iii) the intended starting and completion for steelwork installation .
Project Specification	A specification prepared for a specific building project, see 'The Light Gauge Steel Works', which includes the latest version of the National Light-Gauge Steelwork Specification (NLSS) and qualifies it where necessary. The Project Specification includes the execution specifications defined in BS EN 1090-2 and BS EN 1090-4 and the individual Component Specifications defined in BS EN 1090-1.
Quality assurance	Activities concerned with the provision of systems, equipment and personnel necessary to achieve the required level of quality.
Responsible Sourcing	Management of sustainable development in the provision or procurement of a product *BS* 8902:2009
Site	The area defined in the Project Specification within which The Light Gauge Steel Works will be constructed.
Steel strip	Flat steel which is continuously hot-dip coated and used to

	manufacture profiled members and sheeting, usually in a coil.
The Light Gauge Steel Works	Those parts of the construction works described in the Project Specification as light gauge steel framing.
UK/CE Marking	Abbreviated text to refer to UKCA, UKNI CE or CE Marking.

Note: Terms and definitions given in BS EN 1090-1*, BS EN* 1090-2 *and BS EN* 1090-4 *also apply.*

1 Information required by the Light Gauge Steelwork Designer, Manufacturer and Installer

1.1 Allocation of design responsibilities

Accurate, timely and comprehensive information, especially design information, is essential to all parties involved in a construction project. To achieve this, everyone throughout the supply chain needs to understand exactly their roles and responsibilities, the level of detail required and the dates by which information is to be provided. The early identification of design requirements by the Principal Designer is the easiest way of avoiding delay due to variations.

The allocation of design responsibilities should be defined by the Employer coordinating the design to identify and agree the roles of each party in the project team.

1.2 Project specification for light gauge steelwork

1.2.1 Provision of information

It is the responsibility of the Employer to provide appropriate information for the intended works. The non-exhaustive checklists given in Tables 1.1 to 1.7 set out information that is to be provided in the Project Specification.

All parties shall follow the project BIM Execution Plan (BEP) and the provision of information which are contained with the BEP.

1.2.2 Reference to National Light-Gauge Steelwork Specification

The Project Specification shall state that the National Light-Gauge Steelwork Specification, 1st Edition (NLSS) is incorporated into the contract along with any additions or modifications required by the Employer.

1.2.3 Precedence if there is a conflict

If there is a conflict in specification requirements, the Project Specification takes precedence over other documents.

1.2.4 Information checklists

Table 1.1 Proposed works - Checklist

Information required by all parties involved in the construction project:

(i) A brief description of the structure;

(ii) The intended purpose of the structure;

(iii) Details of the Site within which The Light Gauge Steel Works will be constructed, including the location, geographical and orographical features of the site;

(iv) The Consequence Class in accordance with the appropriate guidance for England, Wales, Scotland, and Northern Ireland, e.g. Approved Document A - Structure for England;

(v) The corrosion category for any elements of The Light Gauge Steel Works which are located outside of the warm frame insulation layer or may be exposed to condensation and/or high levels of humidity.

(vi) Any areas of The Light Gauge Steel Works less than 150mm above external ground level (or waterproofing layer of a flat roof, balcony or terrace) and cavity fill.

Table 1.2 Design - Checklist

Information required by the Light Gauge Steelwork Designer:

(i) A statement describing the design requirements;

(ii) Conceptual drawings of the project or, if agreed, equivalent electronic data;

(iii) Particulars of any aesthetic, structural or clearance limits to be observed, or environmental conditions which may affect design and detailing or protective treatment;

(iv) The parameters to be considered in preparing the design layout;

(v) The loading data and design standards to be used;

(vi) A schedule of drawings, BIM models, calculations and other information which the Light Gauge Steelwork Designer shall submit for acceptance;

(vii) Specification of any other materials to be used in The Light Gauge Steel Works;

(viii) The deflection limits and serviceability criteria to be observed if the criteria are different from those given in the design standard.

Table 1.3 Manufacture - Checklist

Information required by the Light Gauge Steelwork Manufacturer:

(i) Drawings showing the position of light gauge steel framing or, if agreed, equivalent electronic data;

(ii) Particulars of any aesthetic, structural or clearance limits to be observed, or environmental conditions which may affect design and detailing or protective treatment;

(iii) Section sizes and material specifications for all elements in the Light Gauge Steel Frame;

(iv) Drawings, BIM models, calculations and other information;

(v) Specification of any other materials to be used in The Light Gauge Steel Works;

(vi) Areas on light gauge steel framing where hard stamping or other permanent forms of identification may not be used, see 4.1.3;

(vii) Any special requirements regarding production or installation of attachments, see 3.5.2;

(viii) Any non-standard or third party fittings or finishes to be included within the light gauge steel frame assembly.

Table 1.4 Installation - Checklist

Information required by the Light Gauge Steelwork Installer:

(i) A Site plan showing position of datum level and setting-out lines;

(ii) Width and level of the prepared working area, for access of Site traffic and cranes, and areas available for storage, see 8.2;

(iii) Availability of Site services and any prearranged procedures for cooperation with other contractors;

(iv) Any limitation on dimensions or weights of components to be delivered to the Site or ground capacity limits for heavy loads;

(v) Any design features which would affect the construction sequence, or which may create an unusual hazard during construction;

(vi) Details of any overhead cables or Site obstructions;

(vii) An outline of the method of installation envisaged by the Light Gauge Steelwork Designer and the Light Gauge Steel Manufacturer, giving the sequence for erecting the structure taking into account any phasing of The Light Gauge Steel Works, including positions on the structure where temporary bracing, metal decking or other restraints are needed to provide stability to individual members or the structure until walls, floors or non-steel structures are in position, in accordance with 8.4.1;

(viii) A description of any temporary works and any special requirements for temporary bracing required by the Light Gauge Steelwork Designer to comply with (vii) above; the stage when it is no longer necessary, or whether it is to be left in position after completion of the light gauge steel framing;

(ix) A description of who is responsible for coordination of temporary works.

(x)	A list of the responsibilities at the interfaces between the light gauge steel framing and other trades.

Table 1.5 Inspections and tests - Checklist

Information required by the Light Gauge Steelwork Manufacturer and Light Gauge Steelwork Installer:	
(i)	Inspections or tests to be carried out or witnessed by the Employer, Light Gauge Steelwork Designer or Inspection Authority;
(ii)	The period of advance notice required for these additional requirements.

2 Materials

2.1 Constituent products

Materials or products which are incorporated into completed structural components shall comply with the requirements of the Component Specification. Only products with a UK/CE Mark shall be used if a designated standard exists for that constituent product type.

Note: This only refers to standards harmonised [designated] under the Construction Products Regulation.

Systems may also be UK/CE Marked based upon an appropriate ETA or UKTA.

2.2 Responsible sourcing

All constituent products should be procured based on the principles of responsible sourcing as defined in BES 6001 - or equivalent -, and requires the supplier to have an Environmental Management System that follows the fundamentals of BS EN ISO 14001 - or equivalent.

2.3 Light gauge steel components

2.3.1 Steel grade

Materials for structural light gauge steel components shall be suitable for cold forming, and shall comply with the requirements in Table 2 to 6 and Tables 8 to 11 of BS EN 10346:2015.

Note: When specifying and ordering, the full steel designation should be given including the standard number, steel grade and qualities, e.g. BS EN 10346 S450GD+Z275, so that the correct yield strength, tensile strength, elongation and metallic coating are ensured. The Light Gauge Steelwork Manufacturer will typically specify any additional coating treatments or qualities such as spangle and passivation.

Note: DX steel grades are not permitted for primary loadbearing elements of structure.

An inspection certificate 3.1 according to BS EN 10204 (Type 3.1 Mill Test Certificate) shall be made available for materials used in accordance with BS EN 1090-4.

2.3.2 Type of coatings and coating mass

The products shall be supplied with coatings of zinc (Z), zinc-iron-alloy (ZF), zinc-aluminium-alloy (ZA), zinc-magnesium-alloy (ZM), aluminium-zinc-alloy (AZ) or aluminium-silicon-alloy (AS).

Note: See 10 for coating thickness.

2.3.3 Testing

All flat steel products for cold forming for use in The Light Gauge Steel Works shall have been specifically tested in accordance with BS EN 10346. The flat steel product manufacturer shall declare the results using an inspection certificate Type 3.1 to BS EN 10204, or a test report from a UKAS (or equivalent) accredited test house where an inspection certificate is not available.

The Light Gauge Steelwork Manufacturer shall have access to inspection documents to BS EN 10204 provided by manufacturers of all steel products used in The Light Gauge Steel Works. If requested, the Light Gauge Steelwork Manufacturer shall make these inspection documents available to the Principal Contractor or Inspection Authority.

Any supplementary tests carried out by the supplier to establish whether the mechanical properties of the steel products are appropriate for use shall be undertaken by a laboratory certified as competent to BS EN ISO/IEC 17025 by a UKAS (or equivalent) accredited certification body. The tests shall be carried out in accordance with the requirements for mechanical properties and coating mass given in BS EN 10346.

2.3.4 Dimensions and tolerances

Dimensions and tolerances of the steel sheet or strip shall comply with BS EN 10143.

The Project Specification shall specify (i) the tolerance limit value, or (ii) the tolerance type for the thickness.

Note: Tolerance types, "normal" tolerance (N) or "special" tolerance (S), are given for continuously hot-dip metal coated steel strip in BS EN 10143. Tolerances closer than special tolerances can also be specified.

The type of tolerance specified to BS EN 10143 shall be considered for determining the design thickness and structural resistance in accordance with BS EN 1993-1-3. Further guidance is available in SCI Advisory Desk Note AD 358: Design thickness of cold-formed members and sheeting.

2.3.5 Surface condition

At the time of order the Light Gauge Steelwork Manufacturer shall specify,

(i) Coating finish, see 2.3.2;

(ii) Surface quality - As coated surface (A), Improved surface (B), or Best quality surface (C); as defined in BS EN 10346.

2.4 Welding consumables

Not applicable.

Note: Welding consumables are not used for spot welding.

2.5 Mechanical fasteners

2.5.1 Conformity assessment marking

Mechanical fasteners manufactured to designated BS EN standards or EAD / UKTAG shall be supplied complete with UK/CE Marking in accordance with a British Standard, European Technical Assessment or UK Technical Assessment. The type of fastener with designation of the relevant British Standard, European Technical Assessment or UK Technical Assessment shall be specified.

Proprietary fasteners shall be treated as special fasteners to BS EN 1090-2. See 2.5.10.

For fasteners supplied complete with UK/CE marking, The Light Gauge Steelwork Manufacturer and/or The Light Gauge Steelwork Installer shall make certificates of conformity, provided by manufacturers of structural fasteners, available to the Principal Contractor or Inspection Authority, if requested.

Special fasteners and proprietary bolting assemblies not covered by European or International Standards do not require UK/CE marking. If provided, certificates supplied by the fastener manufacturer shall be made available to the Principal Contractor or Inspection Authority, if requested.

2.5.2 Procurement, supply and distribution

A quality management system shall be used for the procurement, supply and distribution of structural fasteners.

Bolts shall be supplied with an inspection certificate 3.1 according to BS EN 10204 (Type 3.1 Mill Test Certificate). Certificates shall be made available if requested.

2.5.3 Durability of fasteners

The fastener material shall be specified with due consideration of the corrosion environment, see Annex B of BS EN 1993-1-3:2006 and its UK National Annex.

Fasteners that are completely or partially exposed to weathering or similar moisture loading (partially exposed does not include short exposure to weathering during installation) shall be made from austenitic stainless steel or aluminium, if not otherwise specified, unless it can be proven by testing that the corrosion protection system of the exposed part of carbon steel fasteners corresponds to the corrosion protection of the parts to be connected. This does not apply to welded-on drill tips. With fasteners that are not made from stainless steel, the corrosion protection of the fasteners shall be adapted to the required corrosion protection of the parts to be connected by means of galvanizing and, if necessary, organic coating. The requirements in EN ISO 4042 shall be observed. In the case of electrolytic galvanizing, the coating thickness shall be at least 8 µm. Less thickness might be acceptable provided specific verification of the durability for the intended use of the fasteners is given.

2.5.4 Bolt and nut (and washer) assemblies

Bolt and nut (and washer if used) assemblies should comply with the requirements given in 2.4 of the NSSS. Unless otherwise specified, the requirement to comply with the National Highways Sector Scheme 3 (NHSS3) (or equivalent) quality management system does not apply.

Bolts M6, M8, and M10 are also accepted for non-preloaded bolt assemblies.

The risk of hydrogen embrittlement in bolts M6, M8, and M10 when using electroplated coating in joints between light gauge steel components should be controlled.

Note: The risk of hydrogen embrittlement in bolts M6, M8 and M10 with a maximum property class of 8.8 and used in environments of corrosion category of either C1 (very low) or C2 (low) is considered to be controlled.

2.5.5 Thread forming screws

Thread forming screws may be used for installation of the light gauge steel frame, with light gauge steel components with a thickness not greater than 4 mm.

Note: Thread forming screws can be grouped as follows, see also BS EN 1090-4:

- *Thread-forming self-tapping screws, which produce their female threads in pre-drilled holes in a chipless manner;*
- *Self-drilling self-tapping screws with a drill tip, with the drilling of a hole, the forming of the female thread and the tightening of the screw all taking place in a single operation;*
- *Self-piercing screws, with a piercing tip which forms the female thread without pre-drilling but by material displacement.*

2.5.6 Blind rivets

Blind rivets may be used for installation of the light gauge steel frame, with light gauge steel components with a thickness not greater than 4 mm.

Note: Blind rivets comprise a rivet sleeve and a rivet mandrel with a predetermined breaking point, see also BS EN 1090-4.

Note: For rivet nuts, see Special Fasteners (2.5.10).

2.5.7 Cartridge fired pins

Cartridge fired pins may be used for connecting light gauge steel frame components with a thickness not greater than 4 mm to hot-rolled steel sections.

Note: Cartridge fired pins are forced through the component being attached into the supporting member using a fastening tool, see also BS EN 1090-4. Details of the firing charge and driving forces are given by the relevant European or UK Technical Assessment.

2.5.8 Clinch connections

Clinching is a combination of drawing and forming that locks two or more layers of thin gauge steel together. Clinch connections must comply with the relevant European or UK Technical Assessment, see also BS EN 1090-4.

2.5.9 Foundation bolt assemblies

Holding down bolt assemblies should comply with the requirements given in 2.4 of the NSSSn.

Post installed anchors shall comply with British Standards or European or UK Technical Assessments.

The use of post-installed anchors should comply with the guidance given in BS 8539.

Note: See BS EN 1992-4 for design of fastenings for use in concrete.

2.5.10 Special fasteners

Special fasteners, such as proprietary bolting assemblies, are not covered by European or International Standards. Special fasteners shall be used, and special fastening methods shall be performed, in accordance with the product manufacturer's recommendations.

See BS EN 1090-2: 2018 clause 5.6.11 for use of special fasteners.

Bespoke fasteners such as blind fixings (e.g. expanding bolts, toggle bolts or rivet nuts) may be used for the installation of light gauge steel frame.

Fasteners manufactured according to UKTAG / EAD shall be supplied complete with UK/CE marking in accordance with an UKTA or ETA. The type of fastener with designation of the relevant ETA or UKTA shall be specified.

The type of fastener with designation of the relevant British Standard or UKTA or ETA shall be specified.

2.5.11 Corrosion protection for bolt assemblies

Corrosion protection for bolt assemblies should comply with the requirements given in 2.4 of the NSSS.

2.5.12 Corrosion protection for fasteners other than bolt assemblies

For connections made by fasteners other than bolt assemblies, the fastener specification shall be made with reference to Annex B of BS EN 1993-1-3:2006 and its UK National Annex for the relevant corrosivity category.

2.6 Protective treatment materials

Light Gauge Steel Frame structural members shall be formed from continuously hot-dip coated steel flat products in accordance with BS EN 10346, see also 2.3.2.

Secondary treatments may be added to provide enhanced protection in higher Corrosivity Categories. Secondary treatments may include polymeric paint systems, epoxy zinc phosphate-based paints, heavy duty bituminous paint, or similar.

Note: See 10 for coating thickness.

2.7 Proprietary items

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

Note: Proprietary items include brackets, bracing straps and shims.

2.8 Substitution of material or form of components

Material quality or form of components may be substituted, with the agreement of the Light Gauge Steelwork Designer, if it can be demonstrated that the structural properties are not less suitable than the designed component and that compatibility with the intention of the design is maintained.

Note: The availability of information on constituent products that have the required UK/CE Marking, see 2.1, permits the avoidance of unmonitored substitution with superficially similar products.

3 Information provided by the Light Gauge Steelwork Designer, Manufacturer and Installer

3.1 Information system

The information system used for manufacturing steelwork components may include drawings, BIM models and calculations.

The system shall have means of identifying that the latest information provided by the Light Gauge Steelwork Designer is being used and that superseded information has been withdrawn.

The system shall be open to audit.

3.2 Building Information Modelling

For projects using BIM, the process of creation, sharing and issuing of information shall be consistent so that information is managed and delivered in an efficient and timely manner. Ownership/responsibility of information shall remain with the originator and although it may be shared and reused, only the originator may change it.

The Light Gauge Steelwork Manufacturer shall provide the following information:

(i) Name and contact details of the Light Gauge Steelwork Manufacturer's 'BIM Coordinator' who is able to provide details for the responsible author of any element or component;

(ii) The details of the software applications used.

3.3 General arrangement of components or assemblies

3.3.1 Marking system

Every component or Assembly which is to be individually erected shall be allocated an erection mark.

Components or Assemblies which are identical in all respects may have the same erection mark.

Components or Assemblies shall be marked with their installation orientation if this is not clear from their shape.

3.3.2 General arrangement drawings / BIM models (marking plans)

Drawings shall be prepared by the Light Gauge Steelwork Manufacturer or the Light Gauge Steelwork Designer showing plans and elevations at a scale such that the erection marks for all components or Assemblies can be shown on them. Preferred scales are 1:100 or larger.

The drawings shall identify each component or Assembly with respect to its Component Specification, its location relative to other components or Assemblies and the grid.

Details at an enlarged scale should also be made if these are necessary to show the assembly of components.

If agreed, equivalent electronic data describing the general arrangement of the light gauge steel framing may be prepared and used for the purposes of coordination and acceptance. Equivalent electronic data may be in the form of a BIM model. The preferred scale for BIM models is 1:1.

3.4 Foundation interface information

Information showing holding down bolts and the interface of light gauge steel framing components to foundations shall include a foundation plan showing the light gauge steel frame wall panel locations, any other components in direct contact with the foundations, their base location and level, and the datum level.

Similar information shall also be provided for components connecting to other concrete surfaces.

Complete details of the connection of light gauge steel framing components to foundations or walls, including the method of adjustment and packing space, shall be provided.

If agreed, equivalent electronic data describing the foundation interfaces may be prepared and used for the purposes of coordination and acceptance. Equivalent electronic data may be in the form of a BIM model.

3.5 Production information for components

3.5.1 Production drawings and production data

Production drawings or production data used in the manufacturing system need only provide details and dimensions necessary for the manufacture of components. Such details shall be available to the Employer if specified in the Project Specification or on request.

The system shall include all necessary information and technical requirements for the manufacture of each component together with full details of the date when component information is released for manufacture. The Component Specification shall specify the dimensions and grade of constituent products and the surface treatment. A reference system to connection types may be utilised.

3.5.2 Attachments to facilitate installation

Details of holes and fittings in components necessary for safety or to provide lifting and installation aids shall be included.

Unless specified otherwise by the Project Specification, such holes and fittings may remain on the permanent structure.

3.5.3 Packs and clearances

The Light Gauge Steelwork Manufacturer shall make provision for:

(i) Packs which may be necessary for levelling of ground floor wall panels;

(ii) The need for clearances between the manufactured components so that the permitted deviations in manufacture and installation are not exceeded, see Sections 7 and 9.

3.5.4 Hole sizes

Holes in components shall be shown to the following sizes

(i) For ordinary bolts and countersunk bolts:

- not exceeding 14mm diameter - 1mm greater than the nominal bolt diameter;
- from 16mm to 24mm diameter - 2mm greater than the nominal bolt diameter;
- greater than 24mm diameter - 3mm greater than the nominal bolt diameter;

In accordance with BS EN 1090-2 and BS EN 1993-1-8, bolts with nominal diameter 12 mm and 14 mm, or countersunk bolts may also be used in 2 mm clearance holes if specified. If bolts with nominal diameter 12 mm and 14 mm are specified in 2 mm clearance holes, the design guidance given in BS EN 1993-1-8:2005, clause 3.6.1(5) must be applied which includes a 0.85 reduction factor on the shear resistance of the bolt. In addition, the ductility requirement must also be satisfied:

- For steel grades up to (but excluding) S460:

  The design value of shear resistance of any fastener, taking into account the number of shear planes, should be greater than 0,8 times the design value of the bearing resistance.

- For steel grades S460 and higher:

(ii) The design value of shear resistance of any fastener, taking into account the number of shear planes, should be greater than the design value of the bearing resistance. For holding down bolts:

6mm greater than the nominal bolt diameter, or with sufficient clearance to ensure that a bolt, whose adjustment may cause it to be out of perpendicular, can be accommodated through the base plate, see 9.2.4;

3.5.5 Holding down bolt details

Holding down bolt details shall include provision of cover plates or washers with hole diameter 3mm greater than the holding down bolts.

3.5.6 Connections to allow movement

If the connection is designed to allow movement, the bolt assembly used shall remain secure without impeding the movement.

3.6 Installation information

3.6.1 Installation drawings

The Light Gauge Steelwork Manufacturer is responsible for production of the installation drawings.

3.6.2 Temporary steelwork drawings

Details and arrangements of temporary steelwork necessary for installation purposes shall be shown with the installation information, see 8.4.1.

3.7 Drawing or information review

3.7.1 Submission to the Light Gauge Steelwork Designer

Drawings or equivalent electronic data described in 3.7.2 shall be submitted for review by the Light Gauge Steelwork Designer in accordance with the Programme.

3.7.2 Extent of submissions

Unless stated otherwise in the Project Specification the following drawings, BIM models and calculations shall be submitted, see Table 1.2 vi:

(i) General arrangement drawings / BIM models as defined in 3.3.2:

The Light Gauge Steelwork Manufacturer shall create references on the general arrangement drawings / BIM models such that a connection calculation or standard connection can be identified to a specific location on the structure;

(ii) Design calculations.

Calculations shall include sketches or drawings showing the arrangement of the light gauge steel frame connections and shall be referenced to a location on the structure. If necessary drawings showing complex geometry shall also be submitted.

Submission of any BIM model should include information on the model scale (1:1 recommended), the location of the origin for the BIM model and the unit of measurement for the BIM model. The level of definition for all elements of the structure should be clearly identifiable.

3.7.3 Acceptance of general arrangement drawings / BIM models and design calculations

The review and acceptance by the Principal Designer or Consulting Structural Engineer means:

(i) The principle levels, dimensions, materials and typical details shown on the general arrangement drawings are a correct interpretation of design requirements when general arrangement drawings are issued for acceptance;

(ii) The model geometry and materiality are a correct interpretation of design requirements when BIM models are issued for acceptance;

(iii) The principles adopted for the design calculations are compatible with the design.

Acceptance does not relieve the Light Gauge Steelwork Designer of the responsibility for accuracy of the calculations, detail dimensions on the drawings / BIM models, nor the Light Gauge Steelwork Manufacturer of the responsibility for accuracy of the general fit-up of parts to be assembled on site.

3.7.4 Acceptance classification

The following designations may be used by the Principal Designer or Consulting Structural Engineer when reviewing drawings or other information submitted in accordance with the Programme:

Classification		Meaning
A	'Accepted'	Information submitted may be released for construction
B	'Accepted subject to comments'	Information submitted shall be amended in line with the comments, but need not be re-submitted
C	'Not Accepted'	Information shall be amended in the way indicated and re-submitted for acceptance

3.7.5 Acceptance without comment

If the Light Gauge Steelwork Manufacturer submits information in accordance with the Programme but receives no comments, or other instruction concerning the submission, within the period given in the Project Specification, the information may be released for manufacturing after notifying the Principal Designer and Employer.

3.8 'As erected' structure

3.8.1 General

On completion of the contract, the Light Gauge Steelwork Manufacturer shall provide the Employer with either:

(i) Electronic information of 'As erected' structure comprising:

General arrangement drawings / BIM models;
Production and assembly drawings;
Design calculations;
Drawings / BIM models made after manufacture showing revisions;
The drawing / BIM model register; or

(ii) If it is agreed with the Employer, one set of paper prints equivalent to that shown in (i).

3.8.2 Delivery of BIM information

For BIM Level 2 projects which have been delivered in accordance with BS EN ISO 19650-2, the issue of information on completion shall be in accordance with 3.8.1(i) above and include:

(i) 'As erected' 3D model files;

(ii) COBie-UK-2012 data.

3.8.3 Construction to operations building information exchange (COBie-UK-2012)

COBie-UK-2012 data need only be provided for the light gauge steel framing as a system and not for each individual element within the system. COBie-UK-2012 data shall comprise:

Manufacturer Name/Company Details of the Light Gauge Steelwork Manufacturer (Contact)
Completion date (attributes of a system);
UK/CE Mark number (attributes of a system);
Declaration of Performance (documents of a system);
Execution Class (attributes of a system);
Corrosion Protection System (attributes of a system);
Fire Protection System (attributes of a system).

3.8.4 Operation and maintenance manual

If required by the Project Specification, the Light Gauge Steelwork Manufacturer may provide an operation and maintenance manual.

4 Workmanship - general

4.1 Identification

4.1.1 Traceability of steel products

All constituent steel products to be used in The Light Gauge Steel Works shall have a reference to a suitable material inspection certificate (test certificate) so that the properties are known and can be verified, see 2.3.3. Individual pieces do not need to be traceable to a particular inspection document, unless specified by either the Project Specification, or the Light Gauge Steelwork Designer.

If differing grades and/or coating specifications of constituent products are in circulation together, each item shall be designated with a mark that identifies its grade and its coating.

Partial traceability means nominally identical items do not need to be distinguished. Hence, backwards traceability is limited. This type of traceability can be achieved by carrying out a paper check of the order against the delivery note and a physical check of the light gauge steel components and other products against the order when the light gauge steel components and other products are delivered.

Traceability through the manufacturing facility can then be achieved through a combination of shape and location within the manufacturing facility, i.e. section profile code can be obtained from the shape of the sections and the grade and job reference can be obtained by storing different grades in different locations. Alternatively, a colour coding or marking system can be used to distinguish between different grades, coatings, sections and projects/jobs.

4.1.2 Material grade identification

The material grade and other relevant properties shall be identifiable within the manufacturing system.

4.1.3 Marking steelwork

Individual pieces shall be capable of positive identification at all stages of manufacture and assembly.

Completed components and Assemblies shall be marked with a durable and distinguishing erection mark in such a way as not to damage the material.

Hard stamped, punched or drilled marks are not permitted on light gauge steel frame products.

4.2 Handling

Steelwork shall be bundled, packed, handled and transported in a safe manner so that permanent distortion does not occur and surface damage is minimised. Particular care shall be taken to stiffen free ends.

Note: Table 8 *of BS EN* 1090-2:2018 *and Clause* 9.9 *of BS EN* 1090-4:2018 *include more detailed recommendations on handling and storage preventive measures.*

4.3 Cold forming

Structural members shall be manufactured by cold forming from steel strip/coil.

Shaping by cold forming, produced either by roll forming or press braking shall conform to the requirements for cold formability given in the relevant product standard and shall be manufactured considering the requirements in Section 10 and within the tolerances specified in Section 7.

Hammering shall not be used.

Shaped components with damaged surface coatings or lack of adhesion of the metallic coating shall be treated as non-conforming products. The minimum inside bend radii shall be specified to avoid damage.

There shall be no cracks at the bended areas visible by the naked eye.

4.4 Cutting

4.4.1 Cutting operations

Cutting shall be carried out in such a way that the requirements for geometrical tolerances are met.

If coated materials are to be cut, the method of cutting shall be selected to minimise the damage to the coating.

Note: Components cut to length as part of the overall roll forming process and shearing minimizes damage to the coating.

Cutting and shaping of steel may be carried out by thermal cutting, sawing, shearing, nibbling, or water jetting.

Note: Thermal cutting refers to plasma cutting, laser cutting or flame cutting.

Note: Specific requirements for quality of cut surfaces, hardness of free edge surfaces and tolerances on diameter, taper and burring of holes are given in BS EN 1090-4. *It is recommended that the checking of process equipment capability is undertaken in liaison with the equipment manufacturer or supplier.*

4.4.2 Thermal cutting

The capability of thermal cutting shall be proved including the effect on the corrosion protection.

Requirements of BS EN 1090-2:2008 clause 6.4.3 apply.

4.4.3 Shearing and nibbling

The free edge surfaces shall be checked as necessary in order to remove significant defects. If grinding or machining is used after shearing or nibbling, the minimum depth of grinding or machining shall be 0.5 mm. The corrosion protection then shall be renewed.

4.5 Dressing

4.5.1 Removal of burrs

Cut edges shall be dressed to remove dross, burrs, and irregularities. Holes shall be dressed as required to remove burrs and protruding edges.

Burrs that could cause injury or prevent the proper alignment or bedding of sections shall be removed.

4.5.2 Dressing of edges

Sharp edges shall be dressed, but a 90° rolled, cut, sheared or machined edge is acceptable without further treatment.

4.6 Punching

4.6.1 General

Holes and notches in light gauge steel components with a sheet thickness of not greater than 15mm may be punched.

The capability of the punching processes shall be checked annually in accordance with BS EN 1090-4.

4.6.2 Matching

All matching holes for fasteners shall align with each other so that fasteners can be inserted freely through the assembled components in a direction at right angles to the faces in contact. Drifts may be used but holes shall not be distorted.

4.6.3 Punching full size

Provided that the capability of the punching process used has been checked to satisfy the requirements of BS EN 1090-4, clause 6.5, full size punching of holes shall be permitted unless otherwise specified in the Project Specification.

The diameter of normal round punched holes shall be not less than the nominal thickness of the component being punched. For non-circular holes, the minimum hole dimension shall be not less than the nominal thickness of the component being punched.

Any areas on components where holes are not to be punched full size shall be indicated in the Project Specification.

4.6.4 Punching and reaming

In areas indicated in the Project Specification where holes are not to be punched full size punching is permitted provided that the holes are punched at least 2mm less in diameter than the required size, and the hole is reamed to the full diameter after punching.

4.7 Assembly

Connected components shall be drawn together such that they achieve firm contact consistent with the requirements for fit-up or direct bearing.

Drifting of holes to align the components shall be permitted, but shall not cause damage or distortion to the final assembly, see 6.1.6.

4.8 Inspection

Sufficient components shall be checked for dimensional accuracy and conformity to drawing, to prove that the manufacturing process is working satisfactorily.

4.9 Storage

4.9.1 General

Manufactured components and assemblies shall be stored according to BS EN 1090-4, clause 9.9.

4.9.2 Stacking

Manufactured components which are stored prior to being transported or erected shall be stacked in a safe manner clear of the ground. They shall be kept clean and supported in such a manner as to avoid permanent distortion.

4.9.3 Visible markings

Individual components shall be stacked and marked in such a way as to ensure that they can be identified.

4.10 Accuracy

Deviations in an entire building frame and the members used to connect other building elements to the frame can be a combination of mill (source), manufacturing and installation deviations.

The permitted deviations of source coil shall be in accordance with the appropriate product standards. Section 7 defines the permitted deviations during manufacture and Section 9 defines the permitted deviations during installation.

Permitted deviations are additive but with an overall requirement that the accumulated sum of the discrete deviations shall not be greater than the permitted deviations for the total structure defined in Section 9.

The procedure to calculate the accumulated sum of the discrete deviations (Δ_{sum}) arising from several independent sources of deviation is to calculate the 'Root-Sum-of-Squares' (RSS):

$$\Delta_{\mathrm{sum}} = \sqrt{{\Delta_{12}}^2 + {\Delta_{22}}^2 + {\Delta_{32}}^2 + etc.}$$

where Δ_{ii} are the permitted deviations.

5 Workmanship - welding

5.1 General

All welding documentation (welder qualifications, welding procedure qualification records, welding procedure qualifications and associated work instructions) shall be reviewed for applicability by the Light Gauge Steelwork Manufacturer's Responsible Welding Coordinator or delegated Welding Coordinator. If requested, the documentation shall be made available to the Inspection Authority.

The Light Gauge Steelwork Manufacturer shall ensure that constituent product materials to be welded are compatible with the welding procedure being used.

5.2 Spot welding

Spot welding of light gauge materials shall be in accordance with the requirements of BS EN ISO 14373 and BS EN 1090-2. Procedures and qualification shall be in accordance with BS EN ISO 15614-12.

5.3 Other types of welding

Other types of welding besides spot welding, see 5.2, are not commonly used with steel gauge steel products and are not included in this specification.

6 Workmanship - fastening

6.1 Bolt and nut (and washer) assemblies

6.1.1 Bolt length

The bolt length shall be chosen such that, after tightening, at least one thread plus the thread run-out will be clear between the nut and the unthreaded shank of the bolt. The length of bolt protrusion shall be at least the length of one thread pitch measured from the outer face of the nut to the end of the bolt.

Note: Due to the thread run-out permitted by the bolt product standards, this does not mean that a full thread form will necessarily be shown beyond the nut.

6.1.2 Washers

Generally, washers are not required for use with non-preloaded bolts in normal round holes. If required, it shall be specified whether washers are to be placed under the nut or the bolt head, whichever is rotated, or both.

For single lap connections with only one bolt row, washers are required under both bolt head and the nut.

To achieve the full bearing capacity when using an ordinary (non-preloaded) bolting assembly connecting two or more light gauge steel components of 4mm thickness, or less, washers shall be used under both the bolt head and the nut.

Note: This requirement does not apply when connecting light gauge steel components to another steel component that is not light gauge steel, nor where proprietary fasteners or connections are used.

If the components being connected have a finished surface protective treatment which may be damaged by the nut or bolt head being rotated, a washer shall be placed under the rotating part.

Plate washers shall be used under the head and nut if bolts are used to assemble components with oversize or slotted holes.

Plate washers shall be dimensioned such that the washer overlaps the connected components by at least as much as a standard plain washer would when used with nominal round holes in accordance with 3.5.4. Plate washers shall be at least 4mm thick and the steel grade should be specified.

For ordinary bolt assemblies, in addition to the minimum specified washer(s), up to (i) two additional washers, or (ii) one plate washer, or (iii) one washer and one plate washer may be used. The combined thickness of the additional washers shall not exceed 12mm.

6.1.3 Galvanised nuts

Nut blanks (unthreaded nuts) shall be tapped after being galvanised. Galvanising and re-tapping of nuts is not permitted.

6.1.4 Bolt tightening

Bolts may be assembled using power tools or shall be fully tightened by hand using appropriate spanners in accordance with BS 2583.

6.1.5 Fit-up

Connected parts shall be firmly drawn together. If there is an unacceptable residual gap it shall be taken apart and a pack of not less than 2mm thickness inserted. Residual gaps are unacceptable in general if they exceed 2mm, but in connecting parts thicker than 8mm, residual gaps of up to 4mm may be left at the edges, provided that contact bearing is achieved at the central part of the connection, unless otherwise specified in the Project Specification.

If plies of different nominal thickness are being joined, no more than three packing plates should be used. The maximum limit on the total thickness of packs should be limited to 1/3 of the bolt diameter. Where thicker packing is specified, consult the Light Gauge Steelwork Designer.

6.1.6 Reaming

If parts cannot be brought together by drifting without distorting the steelwork, rectification may be made by reaming, provided the design of the connection allows for the use of larger diameter holes and bolts.

6.2 Thread forming screws

The use of thread forming screws shall comply with BS EN 1090-4 clause 8, referred to as self-tapping and self-drilling screws.

The screw length shall be chosen such that, after tightening, at least three thread pitches protrude beyond the final ply being connected, or as specified by the fastener manufacturer .

The screw thread form shall be appropriate for the intended application as specified by the fastener manufacturer.

Components to be connected using self-tapping and self-drilling screws shall be held together tightly during installation of screws.

Fit-up of connected parts shall comply with 6.1.5

6.3 Blind rivets

The length of the blind rivet shall be appropriate for the total thickness to be fastened.

Note: The rivet length recommended by the blind rivet manufacturer generally takes account of drawing together of the plates to be fastened.

The tools and procedures used to install blind rivets shall be in accordance with the blind rivet manufacturer's recommendations.

6.4 Cartridge fired pins

The length of the pins shall be appropriate for the total thickness to be fastened.

The tools and procedures used to install cartridge fired pins shall be in accordance with the pin manufacturer's recommendations.

Cartridge fired pins should only be used for connecting light gauge steel frame components to hot-rolled steel sections, see 2.5.7.

6.5 Clinch connections

The tools and procedures used to form clinch connections shall be in accordance with the manufacturer's recommendations.

6.6 Special fasteners

The tools and procedures used to install special fasteners, such as proprietary fasteners and bespoke bolting assemblies, shall be in accordance with the fastener manufacturer's recommendations and as specified in relevant British Standards or European or UK Technical Assessments (ETA or UKTA).

7 Workmanship - accuracy of manufacture

7.1 General

Permitted deviations for manufacture of structural components are classified as *essential tolerances* or *functional tolerances*. Tolerances identified with an 'E' reflect the essential tolerances from BS EN 1090-4. Components are warranted by the Light Gauge Steelwork Manufacturer as conforming with the essential tolerance requirements when the component is UK/CE marked.

Functional tolerances are defined for two classes in BS EN 1090-4, of which the less onerous tolerance class 1 is the default specification for routine execution. Tolerance class 2 is likely to require special and more expensive measures in fabrication and installation. This Specification is based on tolerance class 1. Other tolerances, including the tighter class 2 tolerances may be specified in the Project Specification.

The permitted deviations, indicated by Δ, do not include elastic deformations induced by the self-weight of the components. The deviations shall be measured with respect to any specified camber or pre-set.

Methods and instruments used for dimensional measurement shall be selected, as appropriate, from those listed in ISO 7976-1 and ISO 7976-2 (BS 7307-1 and BS 7307-2). Accuracy shall be assessed in accordance with the relevant part of ISO 17123.

Note: ISO 17123 *is not issued as a BS but it supersedes ISO* 8322 *which was issued as BS* 7334.

Constituent products used in the manufacture of structural components shall conform to the relevant product standard. The permitted deviations of those product standards continue to apply to components manufactured from such products, unless superseded by more stringent criteria specified within this Specification.

Dimensional measurements of components shall always be taken. The location and frequency of measurements shall be specified in the plan for factory production control.

For press braked or folded cold formed members refer to Table D.2 of BS EN 1090-4:2018.

For members formed by cold rolling refer to BS EN 10162:2003.

7.2 Permitted deviations for light gauge steel frame components after manufacture (Δ)

7.2.1 Cross-section after manufacture

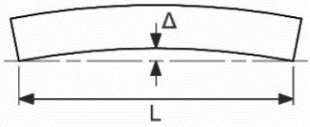
In accordance with the appropriate tolerances given in BS EN 10143 for flat products e.g. bracing straps, BS EN 1090-4 D.2 for profiled sheets and D.3.1 press braked products and BS EN 10162 and BS EN 1090-4 D.3.2 for roll formed members.

No image

7.2.2 Straightness for components to be used unrestrained (E)

$\Delta = \pm L/750$ for folded components

$\Delta = \pm L/500$ for roll-formed components



7.2.3 Length

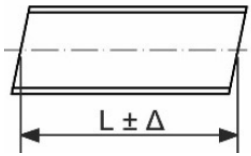
Length *L* after cutting, measured on the centreline of the section.

Exact length supply:

L ≤ 2000mm	Δ = 1mm
2000 < L ≤ 6000mm	Δ = 2mm
6000 < L ≤ 10000mm	Δ = 3mm
10000 < L ≤ 15000mm	Δ = 4mm
L > 15000mm	Δ = 6mm

Stock item supply:

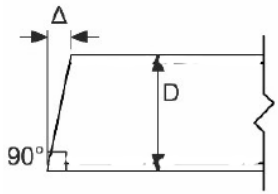
Δ = -0/+50mm



7.2.4 Squareness of ends

Plan or elevation of end.

$\Delta = \pm D/200$

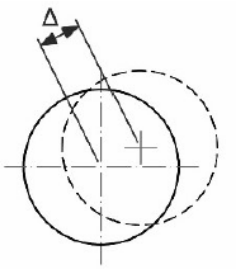


7.3 Permitted deviations for elements of manufactured components (Δ)

7.3.1 Position of service holes

Deviation from the intended position of an individual hole within a group of holes.

$\Delta = \pm$ 5mm



7.3.2 Punched holes

Height of the clean-cut surface.

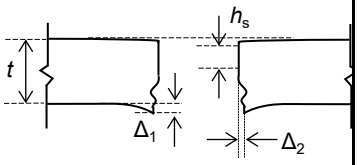
$h_s \geq t/5$

Hole clearance.

$\Delta_2 \leq t/10$

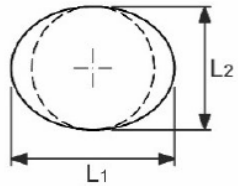
Burrs.

$\Delta_1 \leq$ min (t/10; 0.50mm)



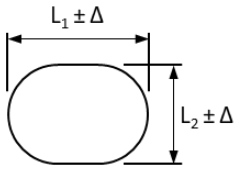
7.3.3 Ovalisation of holes for fasteners

$\Delta = L_1 - L_2 = \pm$ 1mm



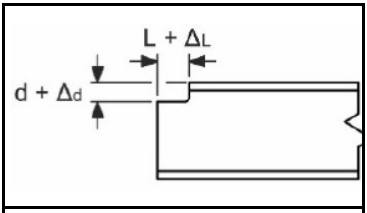
7.3.4 Size of service holes

$\Delta = \pm$ 2mm



7.3.5 Notches

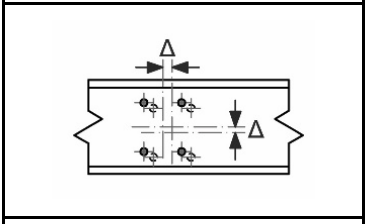
$\Delta = \pm 3$mm on depth d, Δ_d, or length L, Δ_L



7.3.6 Position of hole group (E)

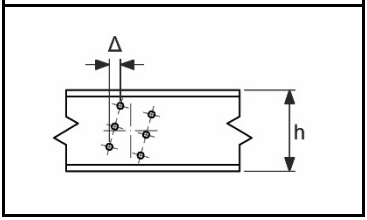
Deviation of a hole group from its intended position.

$\Delta = \pm 2$mm



7.3.7 Twist of a hole group

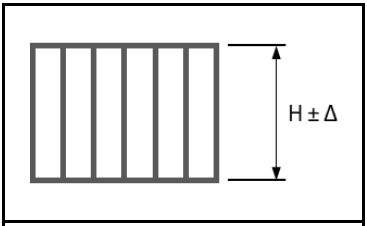
$\Delta = \pm 2$mm



7.4 Permitted deviations for assemblies of components (Δ)

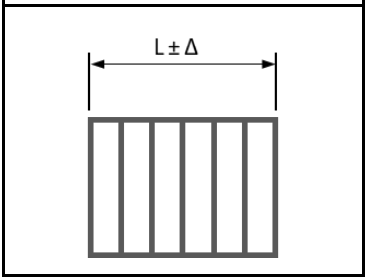
7.4.1 Height of assembly

H ≤ 3000mm	$\Delta = \pm 2$mm
3000 < H ≤ 6000mm	$\Delta = \pm 3$mm
H > 6000mm	$\Delta = \pm 4$mm



7.4.2 Length of assembly

L ≤ 3000mm	$\Delta = \pm 2$mm
3000 < L ≤ 6000mm	$\Delta = \pm 3$mm
L > 6000mm	$\Delta = \pm 4$mm

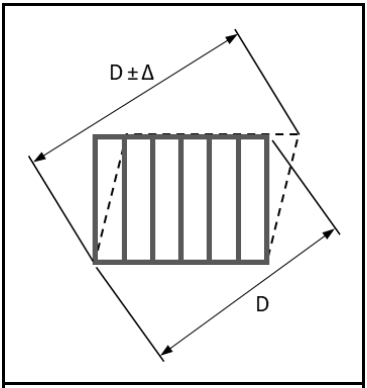


7.4.3 Squareness of assembly

D ≤ 5000mm $\Delta = \pm 2$mm

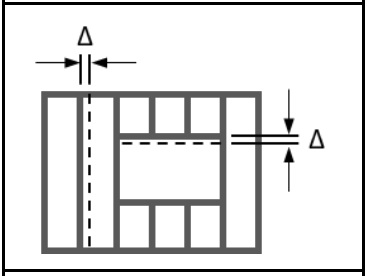
5000 < D ≤ 10000mm $\Delta = \pm 3$mm

D > 10000mm $\Delta = \pm 4$mm



7.4.4 Position of components within assembly

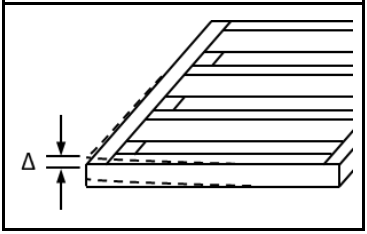
$\Delta = \pm 5$mm



7.4.5 Twist

Overall twist in a component of length *L*.

$\Delta = \pm L/700$ or 4mm whichever is greater, up to a maximum of 20mm

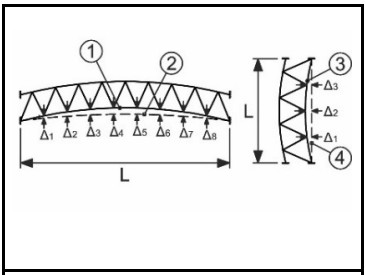


7.5 Permitted deviations for lattice components (Δ)

7.5.1 Straightness

Deviations Δ_i of the actual positions 1 or 3 at each panel point relative to a straight line 2 or 4 when measured after manufacture with the component lying flat on its side.

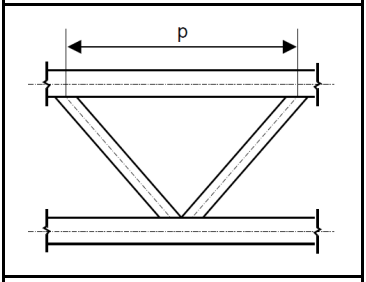
$\Delta = \pm$ L/500 or 10mm whichever is greater



7.5.2 Panel dimensions

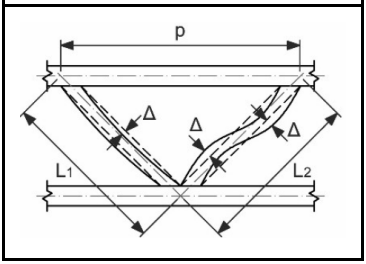
Deviation of individual distances p between intersections of centrelines of intersection points. Δ = ± 5mm

Cumulative deviation Σp of intersection point position. Δ = ± 10mm



7.5.3 Straightness of inclined components

Deviation Δ of individual inclined lengths L_i (L_1 or L_2) from straightness: $\Delta = \pm L_i/1000$ or 4mm whichever is greater



8 Workmanship - installation

8.1 General

8.1.1 Installation method statement

The Light Gauge Steelwork Installer shall prepare a written method statement in accordance with the Construction (Design and Management) Regulations 2015. It should take account of the information provided by the Employer on design, installation and Programme, see Tables 1.1 to 1.5.

The Light Gauge Steelwork Installer shall submit the method statement to the Light Gauge Steelwork Designer for acceptance at least two weeks before installation commences.

Installation shall not commence before the method statement has been accepted by the Light Gauge Steelwork Designer.

8.1.2 Meaning of acceptance

Acceptance by the Light Gauge Steelwork Designer of the installation statement means that the Light Gauge Steelwork Designer's design concept for safe installation has not been invalidated.

8.1.3 Provision of setting-out lines

The Light Gauge Steelwork Installer will be provided with a system for setting out the building in accordance with ISO 4463-1 (BS 5964-1). Deviations in the position of foundations for The Light Gauge Steel Works shall be measured relative to this system.

8.1.4 Handling and storage

Components and assemblies shall be handled and safely stacked in such a manner as to minimise the risk of surface abrasion and damage.

Fasteners and small fittings shall be stored under cover in dry conditions.

8.1.5 Damaged steelwork

Any light gauge steelwork damaged during off-loading, transportation, storage or installation shall be restored to conform to the standards of manufacture as given in this Specification. The procedure for repairing damaged steelwork shall be documented.

8.1.6 Column and panel bases and slabs

Steel packs (shims) shall be supplied to allow the structure to be properly lined and levelled, and shall be of sufficient size to avoid local crushing of the concrete.

Base tracks shall be placed so that they do not prevent subsequent grouting to completely fill all spaces directly under the base tracks.

Steel packs must be galvanized to a minimum of Z275 to BS EN 10346 or equivalent.

Steel packs may be left permanently in place.

Plastic packs shall not be used.

8.1.7 Grouting

Where the gap under the base track is 10 to 20mm, grouting is required under the whole length of the base track.

Where the gap under the base track is greater than 20mm, the Light Gauge Steelwork Manufacturer and Light Gauge Steelwork Designer must advise on the required action.

Grouting shall not be carried out under base tracks until a sufficient portion of the structure has been aligned, levelled, plumbed and adequately braced.

Where the floor structure above is a composite slab, grouting shall be carried out before the floor slab above is poured.

Immediately before grouting, the space under base tracks shall be clean and free of all extraneous matter.

Note: Further guidance on grouting and packs is provided in SCI publication P402.

8.2 Site conditions

8.2.1 Duty holders' responsibilities

Unless otherwise stated in the Project Specification, the Light Gauge Steelwork Installer is not responsible for the following:

(i) Maintenance of the working surfaces of the Site free from standing water and removal of water from foundations;

(ii) Provision of a firm, properly graded, working area and storage area; also maintenance of adequate access roads, into and through the Site, for the safe delivery of plant and materials on normal road vehicles, see Table 1.4(ii) and (iv);

(iii) Provision to the Light Gauge Steelwork Installer of the position of any underground services which may be considered liable to damage by the Light Gauge Steelwork Installer's plan, see Table 1.4(vi);

(iv) Removal of overhead obstructions;

(v) Provision of properly graded firm standing of appropriate strength and clear access for cranes and/or other lifting equipment.

8.3 Pre-construction information

8.3.1 Responsibilities - all parties

The planning, design, Site management and procedures adopted for safe installation of the structure shall be in accordance with The Construction (Design and Management) Regulations 2015.

Note: Everyone on Site has health and safety responsibilities. Checking that working conditions are safe before work begins, and ensuring that the proposed work is not going to put others at risk requires effective planning and organisation. This applies whatever the size, or nature, of the Site. This responsibility cannot be excluded.

8.3.2 Light Gauge Steelwork Installer's responsibility

The Light Gauge Steelwork Installer shall:

(i) Ensure that the operations comply with the Employer's rules for operating on Site;

(ii) Ensure that appropriate safe systems of work are provided, installed and properly maintained to discharge the duties under current safety legislation;

(iii) Ensure projects involving more than one contractor, coordinate their activities with information provided by the Principal Contractor.

8.4 Stability

8.4.1 Temporary restraints until permanent features are built

The Light Gauge Steelwork Designer shall advise the Light Gauge Steelwork installer of positions on the structure where temporary bracing, boarding or other restraints are needed to provide stability to individual components or the structure and at when they may be removed.

The Light Gauge Steelwork Designer shall provide sufficient information to enable the relevant Temporary Works Designs to be completed.

8.4.2 Other temporary restraints used by the Light Gauge Steelwork Installer

If the Light Gauge Steelwork Installer uses temporary restraints during installation which do not substitute for permanent features, they may be removed after the structure has been lined, levelled and plumbed provided that sufficient light gauge steelwork and/or permanent bracing has been erected to ensure the stability of the structure under the worst expected conditions of permanent and variable (including wind) loading.

8.5 Installation loads

The Light Gauge Steelwork Installer shall ensure that no part of the light gauge steelwork is permanently distorted by stacking of materials or temporary installation loads during the installation process.

No other contractor shall place loads on the partly erected structure without the permission of the Light Gauge Steelwork Installer.

8.6 Lining and levelling

8.6.1 Alignment of part of the structure

Each part of the structure shall be aligned as soon as practicable after it has been erected. Permanent connections shall not be made between components until a sufficient part of the structure has been aligned, levelled, plumbed and temporarily connected to ensure that components will not be displaced during subsequent installation or alignment of the remainder of the structure.

Alignment of the light gauge steelwork structure at ground level (or the lowest level of light gauge steel framing) may be adjusted by the use of shims under the base track. Shims shall be secured if they are in danger of coming loose.

8.6.2 Temperature effects

Due account shall be taken of the effects of temperature on the structure and on tapes and instruments when measurements are made for setting out, during installation, and for subsequent dimensional checks. The reference temperature shall be 20°C.

8.7 Site fastening

Fastening shall be carried out in accordance with Section 6.

All fixings shall be visually inspected after they are installed and the light gauge steel frame has been aligned locally. Connections identified during snagging that do not have the full complement of fasteners shall be checked for fit up after the missing or noncompliant fasteners have been installed or replaced.

8.8 Certification of completion

When the light gauge steelwork, or portion of the light gauge steelwork, has been completed, the Light Gauge Steelwork Installer shall present a certificate or handover notice for the Employer and the Light Gauge Steelwork Installer to sign.

9 Workmanship - accuracy of erected steelwork

9.1 General

Permitted deviations are additive but with an overall requirement that the accumulated sum of the discrete deviations shall not be greater than the permitted deviations for the total structure.

The procedure to calculate the accumulated sum of the discrete deviations is given in 4.10.

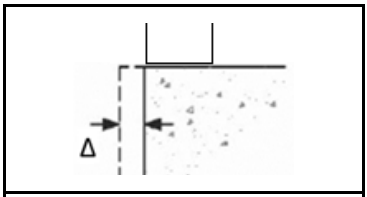
9.2 Permitted deviations for foundations and foundation bolts (Δ)

Note: The permitted deviations in 9.2.3 to 9.2.7 are in accordance with the National Structural Concrete Specification.

9.2.1 Foundation edge position

Deviations Δ from specified position.

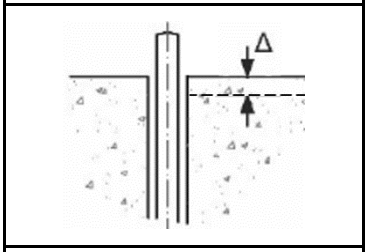
Δ = +15mm / -0mm



9.2.2 Foundation level

Deviations Δ from specified level.

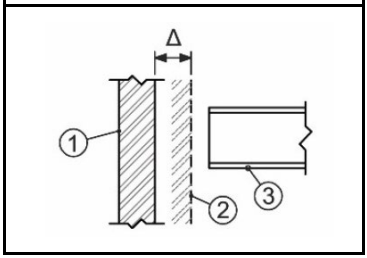
Δ = -6mm below / +0mm above



9.2.3 Vertical wall

Deviation Δ of actual position (1) from specified position (2) at steelwork (3) support point.

Δ = +/- 25mm



9.2.4 Pre-set foundation bolt or bolt groups if prepared for adjustment

Deviation Δ_p of bolt protrusion relative to intended position.

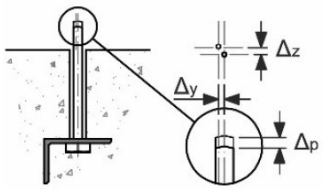
Δ_p = -5mm (low) / +25mm (high)

Deviation Δ_y or Δ_z from specified position at top of concrete.

Δ_y or Δ_z = +/-10mm

A minimum clearance of 25mm around the bolt is required for adjustment.

Note: The permitted deviation for the location of the centre of the foundation bolt group is +/-6mm.



9.2.5 Pre-set foundation bolt or bolt groups if not prepared for adjustment

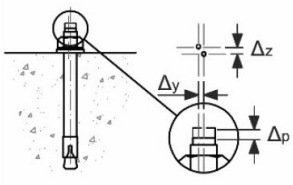
Deviation Δ_p of bolt protrusion relative to intended position.

Δ_p = -5mm (low) / +45mm (high)

Deviation Δ_y or Δ_z from specified position at top of concrete.

Δ_y or Δ_z = -3mm

Note: The permitted deviation for the location of the centre of the foundation bolt group is also +/-3mm.



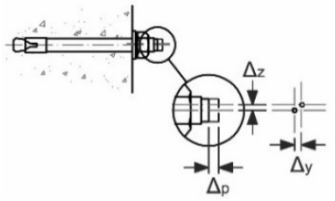
9.2.6 Pre-set wall bolt or bolt groups if not prepared for adjustment

Deviation Δ_p of bolt protrusion relative to intended position.

Δ_p = -5mm (inward) / +45mm (outward)

Deviation Δ_y or Δ_z from specified position at face of concrete.

Note: The permitted deviation for the location of the centre of the foundation bolt group is also +/-3mm. These measurements are measured locally relative to the achieved verticality of the wall.

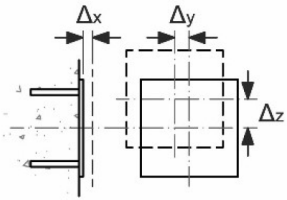


9.2.7 Embedded cast-in fixing plates

Deviations Δ_x, Δ_y or Δ_z of centrelines of the plate relative to the specified positions.

Δ_x, Δ_y or Δ_z = +/-10mm

Note: These measurements are measured locally relative to the achieved verticality of the wall.



9.3 Foundation inspection

The Light Gauge Steelwork Installer shall inspect the prepared foundations and holding down bolts for position and level before installation of steelwork starts. The Employer shall be informed if any discrepancies are found which are outside the deviations specified in 9.2, and remedial work shall be requested to be carried out before installation commences.

The compliance survey used to check the position of the foundation supports shall be documented.

9.4 Measurement of Light Gauge Steelwork

Methods and instruments used for dimensional measurement shall be selected, as appropriate, from those listed in ISO 7976-1 and ISO 7976-2 (BS 7307-1 and BS 7307-2). Alternatively, point cloud surveys may be used. Accuracy shall be assessed in accordance with the relevant part of ISO 17123.

Note: ISO 17123 is not issued as a BS but it supersedes ISO 8322 which was issued as BS 7334.

A survey of the completed structure shall be made. This survey shall be related to the system for setting out the building established in accordance with 8.1.3.

Measurements will only be taken of the position of components adjacent to site interconnection nodes as set out below, unless otherwise specified in the Project Specification. The location and frequency of measurements shall be agreed between the Light Gauge Steelwork Installer and The Employer.

The positional accuracy of the erected light gauge steelwork shall be measured under self-weight of steelwork only unless otherwise specified in the Project Specification.

Permitted maximum deviations in erected steelwork shall be as specified in 9.7 taking account of the following:

(i) All measurements to be taken in calm weather, and due note is to be taken of temperature effects on the structure, see 8.6.2;

(ii) The deviations shown for C-sections apply also to other cross section shapes.

Note: Components supplied as an erected kit that is UK/CE Marked by the Light Gauge Steelwork Manufacturer are warranted as conforming to the permitted deviations for the installation of structural components that are indicated below with an 'E' as essential tolerances.

9.5 Deviations

The Principal Contractor or Employer shall inform the Light Gauge Steelwork Installer, Light Gauge Steelwork Manufacturer and/or the Light Gauge Steelwork Designer of any deviations of erected light gauge steelwork which are greater than the permitted deviation in 9.7.

The Light Gauge Steelwork Designer shall evaluate the design implications of the deviations and inform the Employer.

Note: BS 6954-1 *to BS* 6954-3 *give guidance on tolerances for buildings and the implications of variabilities (including manufacturing, setting-out and installation deviations) on the fit between components.*

9.6 Information for other contractors

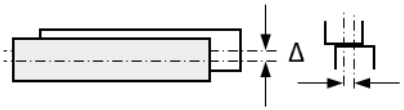
The Principal Designer shall advise contractors engaged in operations following light gauge steel frame installation of the deviations acceptable in this document in manufacture and installation, so that they can provide the necessary clearances and adjustments.

9.7 Permitted deviations of erected light gauge steel components (Δ)

9.7.1 Position of wall base track

Deviations Δ of base track centrelines from the specified position

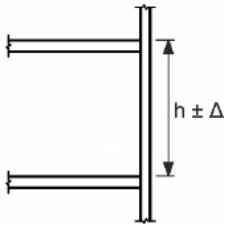
Δ = ± 5mm



9.7.2 Storey height

Deviation Δ of storey height h measured relative to adjacent levels.

Δ = 5mm



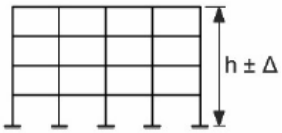
9.7.3 Overall height

Deviation Δ of overall height h.

Δ = 20mm if h ≤ 20m

Δ = 0.5(h + 20) if 20m < h < 100m

Note: Value in metres for h in formulae.



9.7.4 Multi-storey walls overall plumb (E)

Location Δ of a wall centreline in plan at each storey n relative to a vertical line through wall centre at its base.

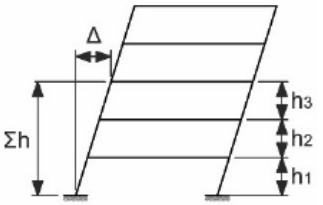
For h < 3.5m

Δ = 5mm per storey

For h > 3.5mm

$$\Delta = \pm \frac{\sum h}{300\sqrt{n}} \quad \text{and} \quad \sum h = h_1 + h_2 + h_3 + etc.$$

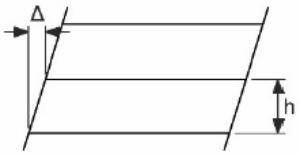
Where h is in mm.



9.7.5 Multi-storey columns plumb over storey (E)

Location Δ of a column centreline in plan relative to a vertical line through its centre at the next lower level.

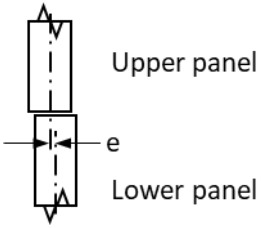
$\Delta = \pm h/300$



9.7.6 Eccentricity at vertical wall panel splice (section)

Non-intended eccentricity e.

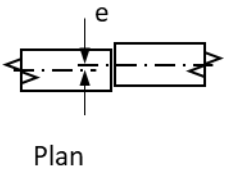
$e \leq 5mm$



9.7.7 Eccentricity at horizontal wall panel splice (plan)

Non-intended eccentricity e.

$e \leq 5mm$



9.7.8 Overall length of building

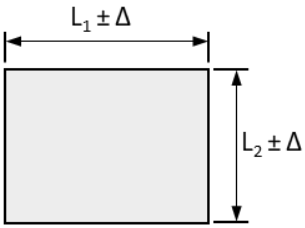
Deviation Δ in distance $L = L_1$ or L_2, between end walls in each line at base level.

$\Delta = 20mm$ if $L \leq 30m$

$\Delta = 0.25(L + 50)$ if $30m < L < 250m$

$\Delta = 0.1(L + 500)$ if $L \geq 250m$

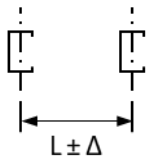
Note: Value in metres for L in formulae.



9.7.9 Member spacing of site assembled components

Deviation Δ from intended distance L between adjacent members measured at corresponding ends.

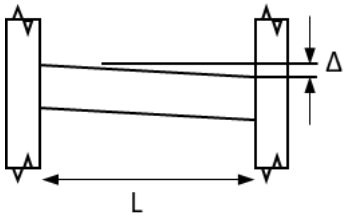
Δ = 5mm



9.7.10 Member slope

Intended height Δ relative to the other end of a member of length L.

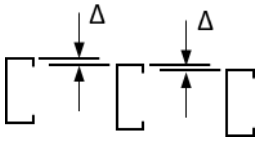
Δ = ± L/500 but not greater than 10mm



9.7.11 Relative joist level

Relative level Δ of adjacent joists measured at corresponding ends.

Δ = ± 5mm

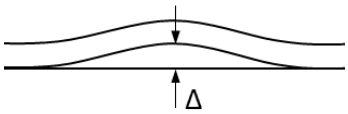


9.7.12 Flatness of light steel joisted floors

Deviations Δ of floor level from a straight edge position

Δ = ± 5mm for 2m straight edge

Note: Deviation is measured from a straight edge with equal offsets at each end.



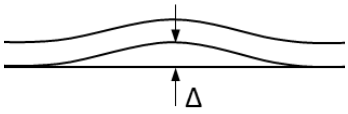
9.7.13 Straightness on plan

Deviations Δ of wall base track from the straight line position

Δ = ± 5mm for wall length ≤ 10m

Δ = ± 10mm for wall length > 10m

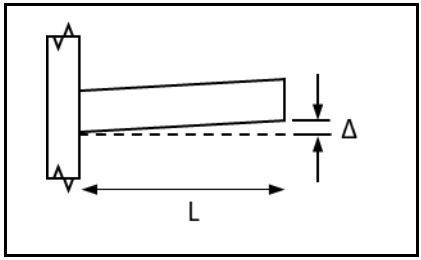
Note: Deviation is measured from a straight edge with equal offsets at each end.



9.7.14 Cantilever

Deviations Δ of intended position of the end of an erected cantilever of length L.

$\Delta = \pm L/200$



10 Protective treatment - corrosion

10.1 General

The coating system for corrosion protection and associated surface preparation required for the light gauge steelwork shall be as specified on the Design Drawings or in the Project Specification.

The requirements for the corrosion protective treatment of continuously hot-dip coated light gauge steel components are given in 10.2.

The requirements for protective treatment of hot-rolled steel sections or structural hollow sections are provided in the NSSS.

10.2 Continuously hot-dip coated products

10.2.1 Specification

Continuously hot-dip coating of products shall be carried out in accordance with BS EN 10346.

The predicted design life for Z275 corrosion protective coating in different applications and environmental conditions are given in Table 10.1. When choosing the coating specification, allowance should be made for the environmental conditions during execution and construction stages.

The coating specification examples given in Table 10.1 are in accordance with BS EN 10346. The letters represent the coating material; Z for zinc, AZ for aluminium-silicon alloy. The numbers represent the total weight of coating on both surfaces in g/m^2.

Table 10.1 Examples of predicted design life of corrosion protective coating specifications in different applications (from SCI P262)

Product application	Environmental conditions	Coating Specifications	Predicted design life
Walls and floors in warm frame applications	No risk of water ingress or condensation	Z275, or AZ150	250 years
Insulated roof structures	Low risk of condensation	Z275, or AZ150	200 years
Suspended ground floors with over-site membrane	Low risk of water ingress; some risk of condensation	Z275, or AZ150	100 years
Uninsulated roof structures	Some risk of condensation	Z275, or AZ150	100 years
Suspended ground floors without over-site membrane	Low risk of water ingress; higher risk of condensation	Z275, or AZ150	50 years

Note: Some warranty providers may have additional corrosion protection requirements.

10.2.2 Inspection

Steelwork shall be visual inspected to ensure that it meets the surface finish requirements of EN 10346 and EN 1090-4.

10.2.3 Repairs after welding

If coating has been removed or damaged by welding, the surfaces shall be cleaned, prepared and treated with a zinc rich primer and paint system offering an equivalent level of corrosion protection as the specified coating for the conditions.

Note: It is not necessary to repair metallic coatings at cut or drilled edges as the coating in close proximity to the edge will continue to provide protection through galvanic or sacrificial protection. Further information is provided in SCI publication P262 (Second edition).

11 Protective treatment - fire

11.1 General

The fire protection system for the light gauge steelwork shall be as specified on the Design Drawings or in the Project Specification.

The requirements for the board fire protection and intumescent fire protection for light gauge steel framing are given in 11.2 and 11.3.

The requirements for exposed protective treatment of hot-rolled steel sections or structural hollow sections are provided in the NSSS.

Note: SCI publication P424 provides guidance on fire protection provided by the light gauge steel frame board protection to hot-rolled steel sections or structural hollow sections which are encased in light gauge steel frame walls or floors.

11.2 Board fire protection

Board protection is commonly used to provide fire protection to light gauge steel framing. Product specific fire testing is required to specify board protection to provide fire protection for light gauge steel components.

The specification for the complete wall or floor build-up and relevant test reports and data should be shared with the Light Gauge Steelwork Designer for the structural fire design of the system.

Note: SCI publication P424 provides guidance on fire testing and the use of test data for the design of fire resistance for light gauge steel framing.

11.3 Intumescent coating

Intumescent coatings are rarely used to provide fire protection for light gauge steel components. Product specific fire testing is required to specify intumescent coatings to provide fire protection for light gauge steel components.

Intumescent products are commonly used with light gauge steel framing in proprietary products such as cavity barriers and service penetration collars.

Note: If required, intumescent coatings are suitable for hot-rolled steelwork used within the overall light gauge steel frame.

12 Quality management

12.1 Competence of Light Gauge Steelwork Designer, Manufacturer and Installer

12.1.1 General

Prior to design, the competence of the Light Gauge Steelwork Designer shall be demonstrated by an assessment that evaluates whether the Light Gauge Steelwork Designer has the resources and capability to undertake design.

Prior to manufacturing, the competence of the Light Gauge Steelwork Manufacturer shall be demonstrated by an assessment that evaluates whether the Light Gauge Steelwork Manufacturer has the resources and capability to undertake manufacturing.

Prior to installation, the competence of the Light Gauge Steelwork Installer shall be demonstrated by an assessment that evaluates whether the Light Gauge Steelwork Installer has the resources and capability to undertake installation.

It is recommended that the Light Gauge Steelwork Manufacturer and the Light Gauge Steelwork Installer be specified from the members of BCSA or the SCI Light Steel Forum. A full list of BCSA members and SCI Light Steel Forum members are given at the end of this Specification, and up-to-date lists can be found in www.steelconstruction.org and www.lightsteelforum.co.uk.

12.1.2 Sustainability

The Light Gauge Steelwork Manufacturer shall demonstrate that the management of its operations address the sustainability issues relevant to light gauge steel framing.

Note: This may be demonstrated by membership of the BCSA Steel Construction Sustainability Charter.

12.1.3 Environmental management system

The Light Gauge Steelwork Manufacturer should have in place an Environmental Management System that follows the fundamentals of BS EN ISO 14001.

12.1.4 Building Information Modelling (BIM)

If required by the Project Specification, the Light Gauge Steelwork Manufacturer shall demonstrate that the management of its operations address the BIM competence and maturity issues relevant to light gauge steelwork.

12.2 Quality system

12.2.1 System requirements

The Light Gauge Steelwork Designer shall maintain and operate a management system to ensure that the procedures for design and detailing of light gauge steel components and structures can provide completed work that conforms to the requirements of this Specification.

The Light Gauge Steelwork Manufacturer shall maintain and operate a management system to ensure that the procedures for detailing, purchasing and manufacture of light gauge steel components and structures can provide completed work that conforms to the requirements of this Specification.

The Light Gauge Steelwork Installer shall maintain and operate a management system to ensure that the procedures for installation of light gauge steel components and structures can provide completed work that conforms to the requirements of this Specification.

The Light Gauge Steelwork Manufacturer shall provide an inspection plan considering the requirements and checks necessary on prepared constituent steel products and manufactured components.

The Light Gauge Steelwork Manufacturer shall review the requirements of the Project Specification prior to commencing work and shall provide a project-specific quality plan to supplement the quality management system if necessary.

12.2.2 System acceptance

The Factory Production Control (FPC) system for controlling the conformity of manufactured components shall be certified as complying with the requirements of BS EN 1090-1.

Note: The application of BS EN 1090-1 is explained in the BCSA Guide to the CE Marking - or UK equivalent - of Structural Steelwork.

The other elements of the system shall be either:

(i) Assessed and certified as complying with the requirements of BS EN ISO 9001 by an accredited certification body; or

(ii) Open to audit and acceptance by the Employer.

12.2.3 Scope

The system shall cover all procedures as detailed in BS EN ISO 9001.

12.2.4 Mechanical fasteners coordination

Mechanical fasteners coordination should be undertaken according to a fasteners plan which shall be supplemented by a project-specific fasteners plan if necessary.

12.3 Additional inspections and tests

The Light Gauge Steelwork Manufacturer shall provide the necessary facilities for any tests and inspections required by the Project Specification.

12.4 Records

All records made in accordance with the system described in 12.2 shall be available for the Employer and the accredited certification body to examine during the contract period.

12.5 Modifications

The Light Gauge Steelwork Manufacturer may make proposals to improve or modify the work and any proposal shall be carefully considered by the Light Gauge Steelwork Designer. The Light Gauge Steelwork Designer shall confirm acceptance of the proposal in writing before any modifications are carried out.

Annex A

13 Referenced standards