National Structural Steelwork Specification for Building Construction

Annex J - Sustainability Specification

BCSA

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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.

Foreword

The Sustainability Specification for structural steelwork for building construction is presented here in its 1st edition. This document will constitute a new Annex J to the National Steelwork Specification for Building Construction (NSSS) when revised in its 8th edition.

Given the current demands to promote more sustainable construction, and particularly in the context of the *climate emergency*, the BCSA is publishing this document which specifies general requirements and practices for achieving environmentally sustainable steelwork building construction. This Sustainability Specification can be incorporated separately to the NSSS to be specified in the contract documentation. This may be done by specifying the following:

> *Fabrication in accordance with (i) National Structural Steelwork Specification for Building Construction (NSSS), 7th edition and (ii) NSSS – Annex J — Sustainability Specification.*

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

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Throughout this Sustainability Specification, the specific clauses from the 7th edition of the NSSS are referred to in bold font.

Contents

Disclaimer ii
Foreword iii
Contents v
J.1 Introduction 7
J.1.1 Scope 7
J.1.2 Principles of sustainable steelwork building construction 7
J.1.3 Requirements for supply chain members 8
J.1.4 Specific terminology 9
J.2 Guidance for sustainable design of structural steelwork 11
J.2.1 General 11
J.2.2 Life-cycle assessment 11
J.2.3 Minimising material quantities 12
J.2.4 Design for adaptability and deconstruction 13
J.2.5 Reuse of structural components 13
J.3 Specification for sustainable fabrication of structural steelwork 15
J.3.1 Provision of information 15
J.3.2 Sustainable specification using new steel material 16
J.3.2.1 Responsible sourcing 16
J.3.2.2 Traceability, labelling and marking 16
J.3.2.3 Environmental Product Declaration (EPD) 16
J.3.3 Sustainable specification using reclaimed steel material 17
J.3.3.1 Procurement 17
J.3.3.2 Assessment of existing paint coating systems 17
J.3.3.3 Assessment of existing hot dip galvanized systems 18
J.3.3.4 Restrictions on fabrication 19
J.3.4 Sustainable fabrication of steelwork 19
J.3.4.1 Fabrication waste management 19
J.3.4.2 Welding procedures 19
J.3.5 Sustainable specification for protective treatment systems (corrosion and fire) 20
J.3.5.1 Untreated steelwork 20
J.3.5.2 Paint systems 20
J.3.5.3 Intumescent systems 20
J.3.5.4 Hot-dip galvanizing 20
J.3.6 Quality management 21
J.3.6.1 Competence of Steelwork Contractor 21
J.3.6.2 Environmental management system 21
References 23

J.1 Introduction

J.1.1 Scope

This Annex specifies general requirements and practices for achieving environmentally sustainable steelwork building construction. This Annex supplements the requirements of Clauses **1** to **11** of the National Steelwork Specification for Building Construction (NSSS).

Note: Further guidance will be given in a separate publication on Design for sustainable construction*.*

J.1.2 Principles of sustainable steelwork building construction

The basic principles to be followed for sustainable steelwork building construction are set out below.

1. The aim of structural design is to provide a structure capable of fulfilling its intended function and sustaining the specified loads for its intended life, with due regard to sustainability, robustness, economy, health and safety.
2. Environmental considerations of sustainable construction should take into account the following fundamental requirements:
   - Structural adequacy of the design of the structure in the completed project;
   - Safety during fabrication, transportation, handling, and erection;
   - Temporary stability of the structural steel frame.
3. All parties in the supply chain for structural steelwork should take practical steps to reduce the greenhouse gas emissions of the processes over which they have control, to contribute to meeting UK national commitments to reach net zero carbon by 2050.
4. Structural steelwork should be designed, procured, detailed and fabricated to minimise material use and to reduce waste, to the extent that this is reasonably practicable.
5. Steelmaking makes full use of available secondary material (scrap); decisions regarding the choice of steel product to be used — such as plate, section, sheet, reinforcement —, and the particular supply chain, should take into account that globally, this secondary material is a highly constrained resource.
6. Structural steelwork should be designed and detailed to facilitate its recovery for reuse at its end-of-life as part of the circular economy, to the extent that this is reasonably practicable.

7. Practical aspects of construction in the design — including minimum dimensions of elements — is recommended, e.g. floor beams designed where their flanges are too narrow to install shear studs, or their flanges too thin to weld shear studs.

Note: Although the focus of this Specification is the environmental sustainability of structural steelwork, it is important for the Engineer and Employer's team to consider the broader, holistic implications of their decisions. This can include impacts on other parts of the building and other aspects of sustainability, for example cost and societal consequences, e.g. of maintenance. In all cases, any steps to reduce the environmental impact of steel structures cannot impinge upon the fundamental requirement for a safe and structurally efficient structure.

J.1.3 Requirements for supply chain members

Where possible, implementation of the following practices to minimise the environmental impacts of steelwork construction should be considered.

The Project Specification may include requirements for the Employer to:

- Appoint key contractors, e.g. steelwork, cladding, Mechanical and Electrical (M&E), and glazing contractors, as early as possible to ensure packages are fully coordinated and to avoid unnecessary re-work and abortive effort;
- Ensure early engagement with the Steelwork Contractor to increase lead-in periods. This will enable more efficient planning and coordination of site operations, material supply and collaboration with the design team;
- Maximise structural zones that facilitate lean, efficient designs;
- Ensure early engagement with the coating system manufacturer and supplier to ensure that the coating system used is adequate and its durability is maximised, i.e. appropriate maintenance to minimise whole life environmental impacts. For hot dip galvanizing, ensure early consultation with the galvanizer to ensure suitability of the design for galvanizing such that all work is efficiently processed;
- If reclaimed materials are to be considered/specified then flexibility in the design should be provided to allow for design iterations to reflect the availability of reclaimed materials.

The Project Specification may include requirements for the Main Contractor to:

- Ensure early engagement with the supply chain and subcontractors;
- Provide adequate set down areas to enable transport of fully loaded lorries to site, where possible;
- Ensure that the site infrastructure is able to accommodate energy efficient plant;
- Appoint sub-contractors with systems that encourage sustainable procurement.

The Project Specification may include requirements for the Engineer to:

- Design for material efficiency, with due regard to the practicality and cost of fabrication, see J.2.3;

- Design for longevity so that the upfront embodied carbon associated with the structure yields extended building life times;
- Design to facilitate building flexibility and adaptability;
- Ensure that where complex connections are being considered to reduce material usage, the full fabrication and installation implications have been considered (and any additional waste is considered in material usage and environmental impact assessments);
- Design with full consideration of any temporary works requirements. The use of temporary works, particularly bespoke items requiring manufacture that are unlikely to be reused, will increase carbon emissions and should be considered in environmental impact assessments;
- Assess the need for protective treatment of steelwork against fire and corrosion, see J.3.5.1, and specify a system to avoid or minimise maintenance;
- Confirm the critical temperature or design utilisation per section size in the fire condition, if relevant, to avoid over-specification of intumescent coatings or under-specification of the section for the given fire duration. Where hot dip galvanizing has been specified, the possible favourable effect of the galvanized coating on fire resistance should be checked to avoid over specification.

The Project Specification may include requirements for the Steelwork Contractor to:

- Publish a company Carbon Reduction Plan;
  Note 1: *The BCSA has published a Carbon Reduction Plan template*;
  Note 2: *The Carbon Reduction Plan can require the Steelwork Contractor to e.g. (i) transport steelwork using low carbon emission vehicles, (ii) maximise steelwork loads, taking account of the load capacity of the vehicles used and any construction site storage or programme constraints, (iii) optimise haulage for example by avoiding empty return trips, (iv) switch from diesel-powered to low carbon emission mobile machinery*;
- Responsibly source structural material, see J.3.2.1;
- Engage with the Engineer to explore options for increasing material efficiency;
- Reduce waste generated during fabrication by re-evaluating internal processes, equipment types, and sourcing of stock materials, see J.3.4.1.

J.1.4 Specific terminology

For the purposes of this Annex, the following terms and definitions apply.

embodied carbon	Life-cycle greenhouse gas emissions (expressed as carbon dioxide equivalents – CO_2e) that occur during the manufacture and transport of construction materials and components, as well as the construction process itself and end-of-life aspects of the building; in recent years, the term *embodied carbon* of construction materials and products has become synonymous with the term *carbon footprint*

deconstruction (or disassembly, or demounting)	Deconstruction is the process of taking a building apart into its components in such a way that they can be more readily reused; it minimises the destructive aspects of the process of removing buildings, preserving components and materials not wasting them, and treating them as a resource
Design for Deconstruction (DfD)	Designing for deconstruction is considering, at the design stage, how a building can be taken apart
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
material efficiency	Optimising the use of the steel by avoiding waste during fabrication and avoiding over specification of steel in the design *Note: Weight is frequently used as a proxy for environmental impact, e.g. embodied carbon. However, in a broader sustainability context, the impact of steel weight reduction is more nuanced and requires a more holistic assessment that takes into account different consequential impacts. These can include, for example, cost and environmental impacts of additional material such as fittings, welding and fire protection.*
recycling	Process of converting waste materials into new materials and products; recycling steel involves re-melting of scrap to form new semi-finished products
responsible sourcing	Management of sustainable development in the provision or procurement of a product *BS* 8902:2009
reuse	Use of previously used components with little or no reprocessing, largely in their original form; they may be reused for the original function (a conventional reuse scenario), or repurposed
sustainable development	An enduring, balanced approach to economic activity, environmental responsibility and social progress *BS* 8902:2009
traceability	Ability to trace the history, application or location of an object

J.2 Guidance for sustainable design of structural steelwork

J.2.1 General

The environmental impacts associated with steelwork building construction may be greatly reduced by taking appropriate decisions during the design process regarding reduction of material in the structure and minimising fabrication, and avoidance of maintenance during service life. Environmental improvements should be identified at the conceptual design stage where generally the greatest savings are achievable. This requires the key involvement from the Steelwork Contractor during all stages of the design. Minimising structural weight may necessitate greater fabrication activity. Although, in general, weight saving will lead to environmental savings, the net benefit needs to be assessed both in the context of environmental impact and cost.

Building design and structural steel fabrication are closely integrated, especially through the use of Building Information Modelling (BIM). Collaborative design processes result in materials being used more efficiently, fewer on-site changes and reduced environmental impacts.

There are many different environmental impacts associated with structural steelwork. Of these, greenhouse gas or carbon emissions are currently the priority. Greenhouse gas emissions occur throughout the supply chain and therefore action is required by all parts of the supply chain for the sector to decarbonise in line with national targets. This includes supply-side measures, in particularly decarbonising steel-making and also demand-side measures including more efficient design and design for longevity, deconstruction and reuse.

J.2.2 Life-cycle assessment

A whole building Life-Cycle Assessment (LCA) should be integrated into the design process, rather than focusing on just “upfront” or cradle-to-gate impacts.

The calculation methods for assessing the environmental performance of a building should be based on BS EN 15978. The assessment should include whole-life (cradle-to-grave and Module D) impacts, which measure all life-cycle phases, including the building’s deconstruction and disposal of the materials as waste or through recycling and reuse.

Modules — or life-cycle stages — A, B1-B5, C, and D should be calculated and reported separately (not aggregated) and assumed scenarios for estimating future impacts reported. When making comparative assessments between materials, products, systems, or design options, the comparison should be done in the context of the whole building, and including all life-cycle stages with functional equivalence defined and justified.

A UK consumption average emission factor is appropriate for embodied carbon assessments during the early design stage where the steel supplier is not known.

Note: The BCSA publishes a UK average consumption mix for rolled structural sections in https://www.steelconstruction.info/Sustainability#Steel_embodied_carbon_and_LCA_data, which is reviewed regularly.

J.2.3 Minimising material quantities

Where practicable, the Engineer should review design options with the Steelwork Contractor, that may contribute to minimising material quantities, such as:

- Avoiding over-specification of design loads;
- Optimising spans and grids: adapt the building layout to take full advantage of the structural steelwork's attributes;
- Minimising complex load paths and transfers in order to maximise direct load paths to ground;
- Ensuring that structural deflection and vibration criteria, coordination zones and member depths are appropriate and allow for efficient structural solutions that avoid excessive material use;
- Aiming to design for utilisations as close to 1.0 as practically possible, with due regard to permanent and temporary conditions;
- Specifying higher strength steel grades in members or part of members not governed by serviceability criteria;
- Considering key load paths, anticipated connection types and accurate loading criteria, in order to facilitate lean design principles;

  Note: Unnecessary end fixity and over-rationalised connection loads can result in a requirement to reinforce members; this will lead to an uplift to cost and can impact embodied carbon;
- Avoiding the over rationalisation of steel member sizes to ensure efficient use of material, with due consideration of minimum economic quantities for procurement;

  Note: Due consideration of coexistent stresses in complex joints should be made to avoid over stressing the member, resulting in the need for excessive reinforcing using stiffeners/compensation plates.
- Reviewing section sizes and minimising weight, whilst complying with safe methods of erection and fire protection requirements;
- Semi-continuous design, which assumes that the joints transfer moments from the beam to the column and allow rotation between the connected members as the load is resisted;

  Note 1: The benefits of semi-continuous design can only be fully realised in an integrated design approach, i.e. when both members and joints are designed by a single party, or when both parties — the Engineer and the Steelwork Contractor — are engaged from early stage design. Clause NA.2.6 of the UK National Annex to BS EN 1993-1-8:2005 states that semi-continuous design should only be used where either supported by test evidence or where it is based on satisfactorily performance in a similar situation.

Note 2: *This design option can result in material saving in the member design, but can require local strengthening of members at joints locations, and can lead to increased joint fabrication content, e.g. additional welding and possibly additional materials to provide local strengthening of the joint.*

Note: It is recognised that minimum steelwork weight design may have practical and cost implications for the supply chain. Historically, steelwork design and fabrication has mainly been driven by cost however, sustainability and particularly the climate emergency, are likely to change this with more clients willing or mandated to pay more for sustainable and low carbon buildings. Reducing the carbon impact of steel structures through lean and less conservative design is technically achievable but can require more design effort and more complex fabrication.

J.2.4 Design for adaptability and deconstruction

Where practicable, the Engineer should review design options with the Steelwork Contractor that may contribute to future flexibility, adaptability, deconstruction and reuse of the building structure, such as:

- How the building design and information records about the materials and members can facilitate future deconstruction and recovery for reuse and recycling;
- Ensuring accessibility to members and connections to allow for deconstruction and for ease of strengthening in the future;
- Greater standardisation of sections sizes, lengths and connections since this is likely to facilitate the future reuse of structural steelwork. Note however that this strategy may be in conflict with J.2.3 and therefore a balanced solution addressing both material efficiency and design for deconstruction and reuse strategies is required.

J.2.5 Reuse of structural components

The Engineer should review design options with the Steelwork Contractor to identify opportunities for reusing reclaimed steelwork, see J.3.3.1, either in temporary or permanent works.

Note: The environmental benefit that is obtained through the reuse of reclaimed steel sections comes from avoiding the energy needed to produce new steel and the associated carbon emissions. However, by far the largest source of carbon emissions from steelmaking industry are currently associated with the chemical reduction of iron ore in primary steel production. Every tonne of scrap steel makes a valuable contribution to reducing the demand for primary steel and therefore it is important to make efficient use of all reclaimed steel whether this is to be reused or recycled as scrap. As a rule of thumb, if reuse of reclaimed sections involves an increase of steel weight of more than 20% *compared to an efficient solution using new steel, then any benefit in terms of global carbon emissions could be lost.*

J.3 Specification for sustainable fabrication of structural steelwork

J.3.1 Provision of information

The non-exhaustive checklists given in Table J.1 set out information to be given in the Project Specification, and the information to be provided by the Steelwork Contractor on completion of the contract.

Table J.1 Sustainability Specification – Checklist

Information required by the Steelwork Contractor: (i) Any part of the steelwork that is to incorporate reclaimed steel products, see J.3.3; (ii) Any part of the steelwork that is to be left untreated, see J.3.5.1; (iii) Any details of the fire design, namely the design utilisation per section size in the fire condition; (iv) Any workshop waste targets; (v) A Life Cycle Assessment of the whole building, see J.2.2; (vi) Any specific material sourcing requirements, e.g. products to be sourced from within 500 miles of the project site, see also J.3.2.1.
Information provided by the Steelwork Contractor: (i) All relevant EPDs for the steel and other products, see J.3.2.3; (ii) The embodied carbon of the fabricated steelwork; (iii) Digital records of the "As erected" structure, which should include all environmental, material quality and quantity data, including batch traceability for main structural members, to facilitate future reuse (to be included in the Operation and Maintenance (O+M) manual, see Clause **3.8.4** of NSSS and J.3.2.2); (iv) Evidence of having in place an Environmental Management System, see J.3.6.2.

Note: The specification of a minimum recycled content for steel products is not recommended. For metals, where there is a limited supply of recycled feedstocks, market stimulation is ineffective and may result in inefficient processing and unnecessary transportation, see the declaration on recycling principles by the metals industry (Atherton 2007).

J.3.2 Sustainable specification using new steel material

J.3.2.1 Responsible sourcing

All structural steel should be procured based on the principles of responsible sourcing as defined in BES 6001 — or equivalent —, and requiring the supplier to have an Environmental Management System that follows the principles of BS EN ISO 14001 — or equivalent.

Where possible, structural steel should be sourced from steel producers who have defined and are implementing, a strategy to reduce greenhouse gas emissions and have made a public commitment to decarbonise in line with national and/or international carbon reduction targets. This includes but is not limited to:

- An emissions reduction pathway compatible with the goals of the Paris Agreement;
- A validated science-based target, for example a target approved by the Science Based Target Initiative (SBTi);
- ResponsibleSteel Certified Steel or steel meeting an equivalent international standard.

J.3.2.2 Traceability, labelling and marking

The records of the “As erected” structure, see Clause **3.8** of NSSS, shall contain all relevant information that allows identification of the origin and properties of the completed components to facilitate their reuse in the future, including:

- Geometrical properties for all components;
- Inspection certificates of all steel products, see Clause **2.2.2** of NSSS;
- EPDs for all steel products and any protective treatment systems used, see J.3.2.3;
- Information on protective treatment, including coating thickness;
- A schedule of proprietary items;
- The erection method statement and any information relevant to the disassembly and reclamation of members for reuse, e.g. an IFC copy of the fabrication detail model, any components that may be unsuitable for reuse such as fatigue-critical members.

Note: The inclusion of a building project Operation and Maintenance manual (O+M manual) is recommended by Clause **3.8.4** *of NSSS.*

J.3.2.3 Environmental Product Declaration (EPD)

The Steelwork Contractor shall submit producer- or mill-specific EPDs in line with BS EN 15804 for each steel product, see Clause **2.2** of NSSS. The additional impacts resulting from further transportation to the workshop and the manufacturing operations may also be included.

Where available, the Steelwork Contractor shall submit EPDs for the corrosion and fire protection systems.

Note: *For sub-contract of hot dip galvanizing, the latest sector EPD provided by the Galvanizers Association is considered representative.*

J.3.3 Sustainable specification using reclaimed steel material

J.3.3.1 Procurement

Reclaimed steel material incorporated into complete structural components shall comply with the requirements of the *Model specification for the purchase of reclaimed steel sections* published by the BCSA. All properties required by Clause 5.1 of BS EN 1090-2:2018 shall be specified.

In the case of in-situ reuse of the steelwork, i.e. refurbishment, and where available, the use of applicable project documents is permitted to reduce or eliminate the need for testing, see also SCI-P427.

J.3.3.2 Assessment of existing paint coating systems

Inspection

Coatings on reclaimed steel sections should be inspected and assessed to establish:

(i) Any visible corrosion, see guidance given in Clause **10.4.1** of NSSS;

(ii) The extent of any breakdown within the existing coatings — existing coatings should be in sound condition without any loss of adhesion or any visible defects;

(iii) The generic type of existing coatings for compatibility with the new coatings.

Compatibility of new coatings with the existing coating should be evaluated if there are no records detailing the original paint specification, as follows:

(i) Create a reference panel of at least 1 m^2, apply the new coatings and evaluate compatibility between old and new systems;

(ii) Any wrinkling, cracking, blistering, or detachment would indicate the systems are not suitable/compatible.

Note: *Inspection should be carried out by a competent / qualified paint inspector (AMPP or ICOrr Level* 3*).*

Removal of existing paint coatings

Where removal of existing paint coatings is required, such systems should typically be removed by blast cleaning and the surface prepared in accordance with Clause **10.4** of NSSS.

Note: Satisfactory removal methods for intumescent coatings from reclaimed steelwork are still to be established.

Where the reclaimed steel material is to be welded, the existing coating should be removed by blast cleaning to BS EN ISO 8501-1 Sa2½ over an area extending at least 150 mm from the weld area.

Note: Abrasive blasting involves propelling a stream of abrasive material at high speed against a surface using compressed air, centrifugal wheels or paddles to clean or change the original appearance or condition of the surface.

The most common method uses compressed air to propel abrasive material from a blast pot, through a blasting hose to a nozzle that is manually controlled by the operator.

Automated abrasive blasting machines such as centrifugal wheel systems and tumblers are also used. Blasting is generally performed in enclosed environments like blasting chambers, cabinets, or on open sites.

Overcoating

Where overcoating is permitted, a new paint specification is required, see Clause **10.2.2** of NSSS. Application of the new paint system should comply with Clause **10.5.4** of NSSS. The existing coated surfaces shall be cleaned to remove any dust, oil or grease, and shall be dry.

Note: It is good practice to consult with the paint manufacturer’s technical service department regarding overcoating.

J.3.3.3 Assessment of existing hot dip galvanized systems

Hot dip galvanized coatings should be assessed for compliance with the requirements and methods of assessment given in BS EN ISO 1461.

Where the measured galvanized coating thickness is different to that required by BS EN ISO 1461, an assessment should be made of the predicted remaining coating life, with reference to BS EN ISO 14713-1 and BS EN ISO 9224.

If the predicted life of the remaining coating is not adequate for the intended design, the galvanized components may be re-galvanized to meet the required specification.

J.3.3.4 Restrictions on fabrication

When using reclaimed steel material, the following fabrication restrictions should be applied:

(i) The spacing of new holes for fasteners in relation to existing holes should comply with the requirements given in BS EN 1993-1-8;

(ii) New welds should not be placed on existing welds.

J.3.4 Sustainable fabrication of steelwork

J.3.4.1 Fabrication waste management

Where possible, the Steelwork Contractor should consider ordering directly from mills to minimise offcuts. Alternatively, if stock lengths are ordered, these should be used efficiently to minimise waste. Splice locations in steel members, where possible, should be coordinated to fall within standard stock length sizes.

All steel fabrication waste, e.g. off-cuts, swarf, should either be reused or recycled.

The Steelwork Contractor should consider if off-cuts of material, particularly from plate, can be used elsewhere e.g. temporary works, connection fittings, shims, packs, rather than simply scrapping for recycling. Reuse should always be prioritised over recycling.

Where possible, the Steelwork Contractor should consider the use of machines that facilitate common line cutting of fittings.

Note: The use of rectilinear fitting types is advised, as these can be more readily nested efficiently and allows for more common line cutting.

The Steelwork Contractor should have procedures in place to reuse timber load bearers. Good practice is to re-use timber bearers 3~5 times. Alternatively, steel bearers may be used — along with anti-slip materials —, which could also form part of an integrated lifting system for loading and off-loading.

To minimise coating waste and coating packaging waste, intermediate bulk containers (IBCs) should be used.

Overspray of coatings should be minimised by ensuring that operatives are properly trained and that the appropriate and properly maintained equipment is used.

J.3.4.2 Welding procedures

Where practicable, the Steelwork Contractor should consider the following practices to minimise the impact of welding procedures:

- Avoid low productivity processes; automatic and semi-automatic processes with continuous wire feed are more materially efficient and avoid energy waste;
- Adopt energy saving processes e.g. inverter-based power sources instead of older regulator/rectifier-based sources, electrically powered pre-heating with temperature control instead of gas flame;
- Minimise pre-heat in the welding procedure specification;
- If pre-heat is required, weld continuously to avoid the need to re-heat.

Welding techniques and weld procedures should be periodically reviewed to make best use of the latest advancements in welding equipment and consumables. This might include the selection of joint set-ups and consumables that allow for deeper penetration fillet welds to be achieved, thus potentially reducing the number of weld runs required.

J.3.5 Sustainable specification for protective treatment systems (corrosion and fire)

J.3.5.1 Untreated steelwork

Any part of the steelwork that is to be left untreated shall be identified in the Project Specification. Typically, steelwork in a corrosivity category no more aggressive than C1 to BS EN ISO 12944-2 may be left untreated.

J.3.5.2 Paint systems

The protective coating system shall satisfy the requirements from Clauses **10.2**, **10.4** and **10.5** of NSSS.

J.3.5.3 Intumescent systems

The intumescent system shall satisfy the requirements from Clause **10.3** of NSSS.

As water-based acrylic intumescent is low VOC and also tends to have a lower DFT for the same fire resistance period, when compared to solvent-based acrylic intumescent, water-based intumescent will therefore likely have a lower environmental impact.

J.3.5.4 Hot-dip galvanizing

Hot dip galvanizing shall be carried out according to BS EN ISO 1461 and satisfy the requirements of Clause **10.7** of NSSS.

Requirements for thicker coatings, e.g. by prior grit blasting, should be avoided by prior assessment of the predicted galvanized coating life and the minimum thickness required, to avoid overspecification. For certain steel members (e.g. with higher reactivity during galvanizing and/or larger section thickness), thicker coatings may also be achieved without grit blasting.

Note: *Guidance on coating life and specification of thicker coatings is available from the Galvanizers Association.*

Design and fabrication considerations for hot dip galvanizing given in BS EN ISO 14713-2 should be followed to ensure adequate drainage and optimise material efficiency.

A logistical plan should be established with the galvanizer to optimise transport distances and provide direct delivery to the construction works, where feasible.

J.3.6 Quality management

J.3.6.1 Competence of Steelwork Contractor

The Steelwork Contractor shall demonstrate that the management of its operations address sustainability issues relevant to structural steelwork. This can be demonstrated by membership of the BCSA Steel Construction Sustainability Charter.

Note: *This requirement is reproduced from Clause* **11.1.2** *of NSSS and clarifies ways of achieving it.*

Note: *The BCSA recommends that the Steelwork Contractor should report the carbon footprint related to its direct operations to the BCSA on an annual basis for statistical purposes.*

J.3.6.2 Environmental management system

The Steelwork Contractor should have in place an Environmental Management System that follows the requirements of BS EN ISO 14001.

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