
Steel Essentials

Your pocket-sized guide to valuable advice
and useful references for building with steel

Contents

The topics covered in this guide are:

1. Health & Safety
2. Economics & Programme
3. Sustainability
4. Structural Design
5. Connections
6. Fire Protection & Engineering
7. Acoustic Performance
8. Corrosion Protection
9. Product Information
10. Codes & Standards
11. Fabrication & Erection
12. Project Specifications

Introduction

The Steel Essentials guide provides helpful advice and useful reference across a number of steel construction topics. This pocket-sized guide is complemented by a website, which includes links to reference works as well as sources of further information.

www.steelessentials.info

1. Health & Safety

The constructional steelwork industry has worked with the Health & Safety Executive (HSE) to deliver improvements in safety practices and systems. This has resulted in significant reduction in fatal and serious injuries while, at the same time maintaining the production and quality targets needed to achieve an efficient and valuable service.

Constructional steelwork is prefabricated away from the project site providing a high degree of accuracy and enabling significant use of mechanical processes. This also reduces the number of people needed on site and the transport requirements for deliveries.



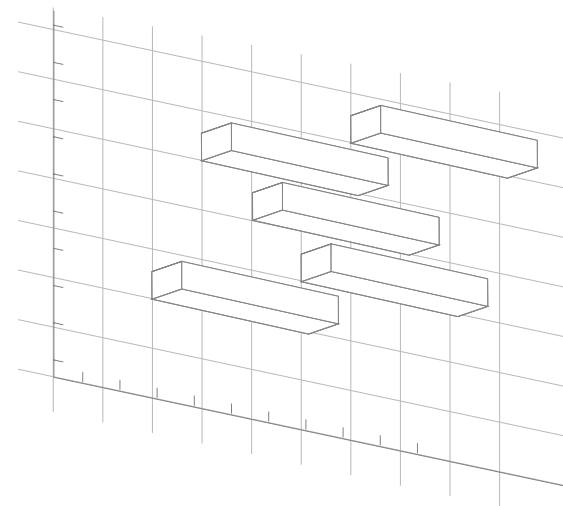
Information sources:

1. Steel the safe solution, Corus Construction & Industrial, 2004
2. Steel Buildings, Chapter 20, The British Constructional Steelwork Association Ltd., 2003
3. Steel Industry Guidance Notes (SIGNs), Health and Safety on Site, Corus, BCSA, SCI, 2006
4. Safe Site Handover Certificate, The British Constructional Steelwork Association Ltd., 2005
5. Health and Safety on Site, The British Constructional Steelwork Association Ltd., 2000

2. Economics & Programme

The steelwork requirements for a project usually develop in three stages: scheme design, structural frame design, and detail design. The cost plan develops from budget/guide price through tender/contract to final account in three parallel stages. Often, quantity surveyors, general contractors and steelwork contractors will use the overall tonnage of steel in the structure as the basis for estimates and bills of quantities. There are dangers in this approach if the structure is unusual, but databases of tender prices linked to types of work are published. Similarly regularly published surveys of steelwork contractors give guidance on programme.

Programme periods include two elements: off site lead-in needed to procure steel, produce details and fabricate the steel components; and the on-site period for erection.



Information sources:

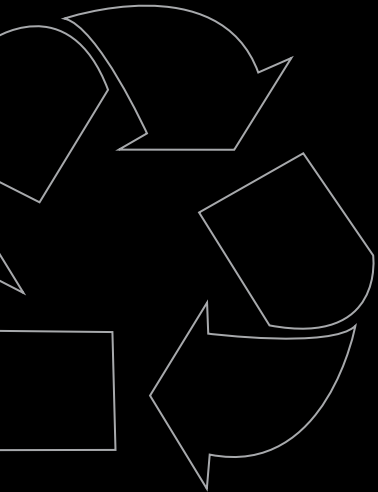
1. Steel Buildings, Chapters 1 & 19, The British Constructional Steelwork Association Ltd., 2003
2. Facts of Living, Comparing the cost of steel and concrete framing options for multi-storey residential buildings, Corus, 2004
3. Comparative Structure Cost of Modern Commercial Buildings, (2nd edition), The Steel Construction Institute, 2004
4. Design for Manufacture Guidelines, The Steel Construction Institute, 1995
5. Design for Construction, The Steel Construction Institute, 1997

3. Sustainability

Steel construction delivers quick, flexible, adaptable, low waste, off-site, dust free and efficient construction, which regularly receives the highest BREEAM ratings. This is consistent with the Government's sustainable development strategy of a construction industry that can deliver economic buildings, which can enhance our quality of life while reducing the burdens on the resources available to us.

Steel can be recycled or re-used repeatedly without ever degrading its quality. It is the most recycled of all construction materials. Worldwide, over 90% of scrap that becomes available is captured and UK studies indicate that up to 99% of steel sections are either recycled or re-used.

Sustainability is built into steel all along the supply chain, from an environmentally responsible approach to the sourcing of materials, through manufacturing processes that are based on a culture of continuous improvement, to the production of steel construction products that are modern and efficient.



Information sources:

1. Sustainable Steel Construction, Corus Construction & Industrial, 2007
2. The Right Direction, Corus Construction & Industrial, 2008
3. The Bigger Picture, Corus Construction & Industrial, 2008
4. www.corusconstruction.com
5. www.sustainablesteel.co.uk
6. www.targetzero.info

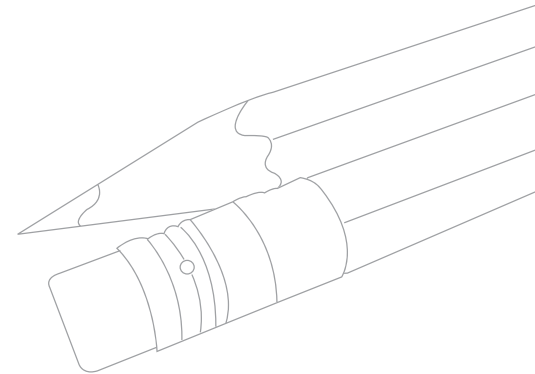
4. Structural Design

Three simple design steps to an efficient, economic steel frame:

Keep it light. Most structural design starts with assessing the loads to which the member/structure will be subject. Dead loads are a function of the materials and finishes used, and imposed loads relate to the occupancy class. Take advantage of legitimate imposed load reductions, based on area supported, for beams, and number of storeys supported for columns.

Keep it simple. With the exception of single storey portal frames, a braced frame approach is often the best and most economic solution. Member design is simple and straightforward, connections are easy to design and fabricate, and erection uses well-established safe procedures.

Keep it tight. For members that repeat, not only is it important to get it right, it's also got to be tight to maximise economy. Designs should utilise at least 90% of the members' capacity.



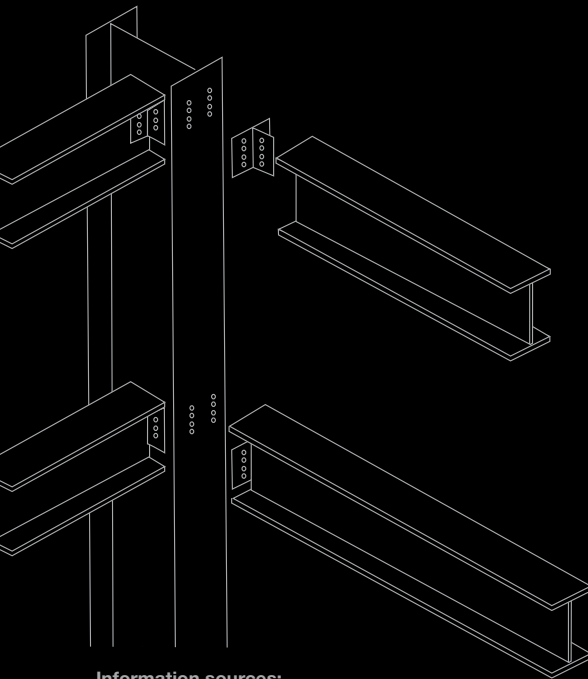
Information sources:

1. Steel Designers' Manual (6th Edition), The Steel Construction Institute, 2003
2. Steelwork Design Guide to BS 5950-1:2000 - Volume 2: Worked Examples, The Steel Construction Institute, 2003
3. Advance sections - Interactive Blue Book, The Steel Construction Institute, 2008
4. Design for Manufacture Guidelines, The Steel Construction Institute, 1995
5. Design for Construction, The Steel Construction Institute, 1997

5. Connections

The design and detailing of connections is a key issue for steel buildings. They are vital to the overall integrity of a steel frame and can influence between 40% and 60% of the frame costs. A range of standardised economic connections is available, and it is good practice to use these where possible.

For design, connections may be considered as either pinned (simple), fixed (moment) or semi rigid, and they can be made using bolts welds or a combination of both. Typically, bolted connections are used on site and welded connections used in the fabrication shop.



Information sources:

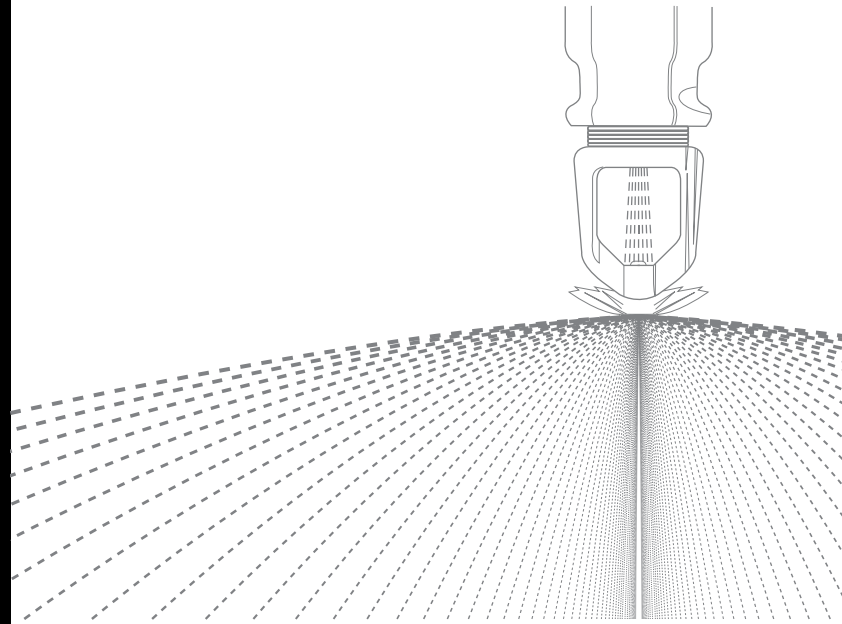
1. Joints in steel construction: Simple connections, The Steel Construction Institute and The BCSA, 2005
2. Joints in steel construction: Moment connections, The Steel Construction Institute and The BCSA, 1997
3. Steel Details, The British Constructional Steelwork Association Ltd., 2005
4. Steel Designers' Manual (6th Edition), Section 5, The Steel Construction Institute, 2003
5. Steel Buildings, Chapter 5, The British Constructional Steelwork Association Ltd., 2003
6. Interfaces: Connections between steel and other materials, The Steel Construction Institute, 1996
7. Castings in construction, The Steel Construction Institute, 1996

6. Fire Protection & Engineering

The UK has a highly competitive and efficient fire protection industry that has created a market for materials for fire protection of steel structures dominated by high volume, low margin supply.

For high-rise and complex buildings requiring long periods of fire resistance, the UK is fortunate to be home to many of the most innovative fire engineering specialists in the world.

They take advantage of the extensive research carried out on steel framed buildings to offer bespoke building solutions for fire which can be created at a cost much less than that incurred by following prescriptive advice.



Information sources:

1. Fire Resistance of Steel Framed Buildings, Corus Construction & Industrial, 2006
2. Fire Protection of Structural Steel in Buildings, Association for Specialist Fire Protection, 2007
3. Guide to the Advanced Fire Safety Engineering of Structures, Institution of Structural Engineers, 2007
4. Approved Document B, Department of Communities & Local Government, 2007
5. The one stop shop for information on materials in fire, University of Manchester www.structuralfiresafety.org

7. Acoustic Performance

The acoustic requirements of residential buildings are given in national building regulations (e.g. Part E). Associated guidance documents (e.g. Approved Document E) provide guidance on how the regulations may be satisfied and set acoustic performance standards for separating and internal walls and floors.

The acoustic performance of a building will depend not only on the materials involved but also the interface details and quality of workmanship as gaps or loss of insulation will severely impair sound insulation. Compliance with the regulations can be demonstrated by either on-site testing or by the adoption of robust details that have been shown to satisfy the requirements by rigorous testing.

Steel construction is widely used in residential developments, and a range of proven acoustic solutions are available that exceed the requirements of the building regulations.

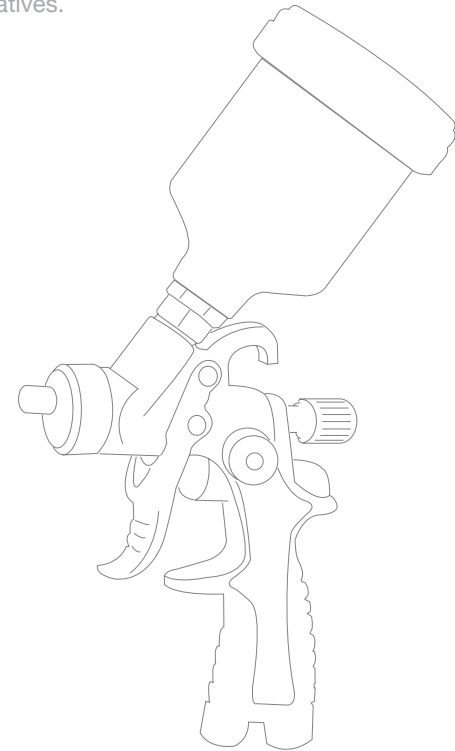
Information sources:

1. Acoustic Detailing for Steel Construction, The Steel Construction Institute, 2008
2. Robust Details Handbook, Robust Details Limited, 2008
3. Steel Details, Chapter 10, The British Constructional Steelwork Association Ltd., 2005

8. Corrosion Protection

Durability is an important issue to consider when designing and detailing steel structures. Various protection systems are currently available, and coating technology is advancing at a rapid pace. Consequently, cost effective corrosion protection of structural steelwork should present little difficulty for common applications and environments if the factors that affect durability are recognised at the outset.

The key to success lies in recognising the corrosivity of the environment to which the structure will be exposed, in defining clear and appropriate coating specifications, and in ensuring the correct application of coatings by trained operatives.



Information sources:

1. A Corrosion Protection Guide, Corus Construction & Industrial, 2004
2. Corrosion Protection of Steel Bridges, Corus Construction & Industrial, 2005
3. Steel Designers' Manual (6th Edition) Chapter 35, The Steel Construction Institute, 2003
4. Steel Bridge Group: Guidance notes on best practice in steel bridge construction (Issue 4) – Section 8, The Steel Construction Institute, 2006
5. Weathering Steel Bridges, Corus Construction & Industrial, 2005

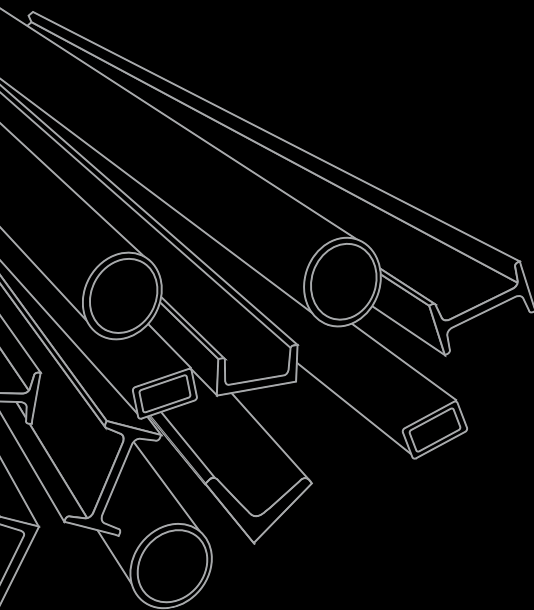
9. Product Information

All construction materials used in the UK, including fabrications, must comply with the EU Construction Products Directive (CPD 89/106/EEC). Corus offers a wide range of CE marked (CPD compliant) structural products including:

- Advance® sections (beams, columns, channels, angles etc.)
- Plates
- Celsius® structural hollow sections
- Composite floor decks

Corus has also actively developed a range of systems offering advantages to construction clients including:

- Slimdek® shallow depth integrated floor system
- Corefast modular lift/stair core system



Information sources:

1. Advance® sections, Corus Construction & Industrial, 2007
2. Celsius® structural hollow sections, Corus Tubes, 2006
3. Composite floor decks, Corus Panels and Profiles, 2007
4. Slimdek® Manual, Corus Construction & Industrial, 2008
5. Corus Advance® sections - Interactive Blue Book, The Steel Construction Institute, 2008

10. Codes & Standards

In the UK structural safety is controlled through a range of European and national regulations. Most of these regulations contain no information on structural design and instead reference is made to codes and standards, most of which are published by the British Standards Institute.

British Standards for structural design (eg BS 5950-1) will be withdrawn in March 2010, and European Standards called the Eurocodes (eg BS EN1993-1-1) will begin to be introduced. However, British Standards can continue to be used after March 2010.



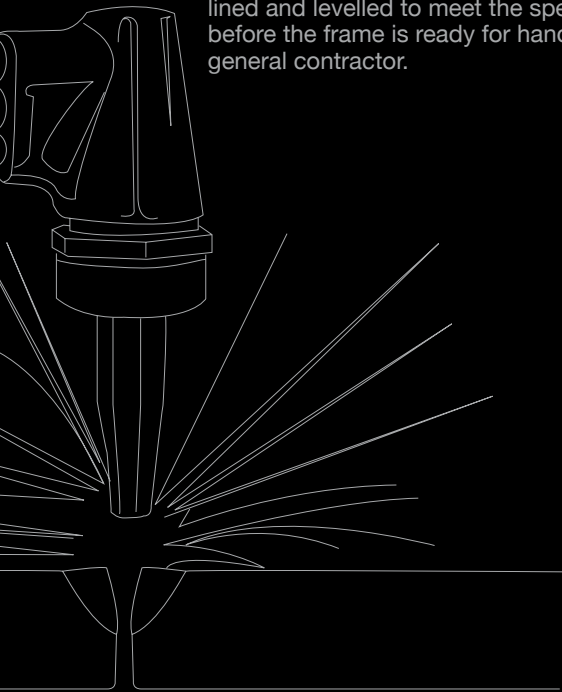
Information sources:

1. Approved Document A – Structure, (2004 edition), The Office of the Deputy Prime Minister (now the DCLG)
2. BS 5950: Structural use of steelwork in building - Part 1: Code of practice for design. Rolled and welded sections, 2000. - Part 3: Design in composite construction. Section 3.1: Code of practice for design of simple and continuous composite beams, 1990
3. BS EN 1993: 2005 Eurocode 3 Design of steel structures
 - Part 1.1 General rules and rules for buildings
 - Part 1.2 General rules. Structural fire design
 - Part 1.8 Design of joints
4. www.eurocodes.co.uk
5. www.access-steel.com
6. www.steel-ncci.co.uk

11. Fabrication & Erection

Most of the work needed to produce a steel structure for a building is undertaken offsite in the steelwork contractor's fabrication factory. There the steel sections and plates from the rolling mills are cut, drilled and welded to make the steel components that are then delivered to the project site.

The fabrication process is controlled using a computer model of the structure that generates electronic data for automatic machines and detailed fabrication drawings for assembly and welding. At the site the steelwork contractor uses cranes and access equipment to undertake the erection of these fabricated beams, columns, bracings etc. The structure has to be plumbed, lined and levelled to meet the specification before the frame is ready for handover to the general contractor.



Information sources:

1. National Structural Steelwork Specification for Building Construction (5th Edition), The British Constructional Steelwork Association Ltd. and The SCI, 2007
2. Commentary on the NSSS for Building Construction, (4th Edition), The British Constructional Steelwork Association Ltd. and The SCI, 2003
3. Steel Buildings, Chapters 11 & 14, The British Constructional Steelwork Association Ltd., 2003
4. Steel Details, Chapter 6, The British Constructional Steelwork Association Ltd., 2005

12. Project Specifications

A project specification is an essential part of the design, and states how the work should be executed to ensure that it meets the designer's assumptions. Each project generally requires its own project specification. In the simplest terms this might be an engineer's drawing with the specification written as notes on the drawing. On more complex projects the project specification is usually issued as a separate contract document.

The project specification should ideally conform to well-recognised 'standard' specifications, e.g. the National Structural Steelwork Specification for Building Construction (NSSS) and the Model Project Specification for the Execution of Steelwork in Bridge Structures. These have been developed by industry to reflect best practice, and their use will reduce uncertainty and minimise cost.



Information sources:

1. National Structural Steelwork Specification for Building Construction (5th Edition), The British Constructional Steelwork Association Ltd. and The SCI, 2007
2. Commentary on the NSSS for Building Construction, (4th Edition), The British Constructional Steelwork Association Ltd. and The SCI, 2003
3. Model Project Specification for the Execution of Steelwork in Bridge Structures, The Steel Construction Institute, 2008
4. Steel Buildings, Chapter 15, The British Constructional Steelwork Association Ltd., 2003

1. Health & Safety

1. The British Constructional Steelwork Association Ltd
T. +44 (0) 207 839 8566 www.steelconstruction.org
2. The Steel Construction Institute,
T. +44 (0) 1344 636 525 www.steel-sci.org
3. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
4. The Metal Cladding and Roofing Manufacturers
Association, T. +44 (0) 151 652 3846 www.mcrma.co.uk
5. The Advisory Committee for Roofwork
www.roofworkadvice.info

2. Economics & Programme

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org
3. BCSA's Member Companies are also available for advice
and may be approached directly using the contact
details on the BCSA website

3. Sustainability

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. Steel Construction Sustainability Charter,
T. +44 (0) 20 7839 8566 www.steelconstruction.org
3. Building Research Establishment
T. +44 (0) 1923 664 000 www.bre.co.uk

4. Structural Design

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org

5. Connections

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org
3. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org

6. Fire Protection & Engineering

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. Association for Specialist Fire Protection,
T. +44 (0) 1252 357 832 www.asfp.org.uk

7. Acoustic Performance

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org
3. Robust Details Limited,
T. +44 (0) 870 240 8210 www.robustdetails.com

8. Corrosion Protection

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Galvanizers Association,
T. +44 (0) 121 355 8838 www.hdg.org.uk
3. Thermal Spraying & Surface Engineering Association,
T. +44 (0) 870 760 5203 www.tssea.co.uk
4. The Paint Research Association,
T. +44 (0) 208 4870 800 www.pra-world.com
5. The Institute of Corrosion, T. +44 (0) 1525 851 771
www.icorr.org

9. Product Information

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org
3. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org

10. Codes & Standards

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org
3. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org

11. Fabrication & Erection

1. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org
2. BCSA's Member Companies are also available for advice and may be approached directly using the contact details on the BCSA website

12. Project Specifications

1. Corus Construction Services & Development,
T. +44 (0) 1724 405 060 www.corusconstruction.com
2. The Steel Construction Institute (SCI),
T. +44 (0) 1344 636 525 www.steel-sci.org
3. The British Constructional Steelwork Association Ltd.,
T. +44 (0) 207 839 8566 www.steelconstruction.org

www.steelessentials.info



Corus
PO Box 1
Brigg Road
Scunthorpe
North Lincolnshire
DN16 1BP



The British Constructional
Steelwork Association Ltd
4 Whitehall Court
Westminster
London
SW1A 2ES

Corus and BCSA care about the environment –
this brochure is printed with biodegradable
vegetable inks and using material with at least
50% recycled content.