CO-CONSTRUCT

Supporting Services from Structure

Guidance for a defect-free interface

Compiled by Roderic Bunn and Martin Heywood

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What is Co-Construct?

Co-Construct is a network of five leading construction research and information organisations - Concrete Society, BSRIA, CIRIA, TRADA and SCI - who are working together to produce a single point of communication for construction professionals.

BSRIA covers all aspects of mechanical and electrical services in buildings, including heating, air conditioning, and ventilation. Its services to industry include information, collaborative research, consultancy, testing and certification. It also has a worldwide market research and intelligence group, and offers hire calibration and sale of instruments to the industry.

The Construction Industry Research and Information Association (CIRIA) works with the construction industry to develop and implement best practice, leading to better performance. CIRIA's independence and wide membership base makes it uniquely placed to bring together all parties with an interest in improving performance.

The Concrete Society is renowned for providing impartial information and technical reports on concrete specification and best practice. The Society operates an independent advisory service and offers networking through its regions and clubs.

The Steel Construction Institute (SCI) is an independent, international, member-based organisation with a mission to develop and promote the effective use of steel in construction. SCI promotes best practice through a wide range of training courses, publications, and a members advisory service. It also provides internet-based information resources.

TRADA provides timber information, research and consultancy for the construction industry. The fully confidential range of expert services extends from strategic planning and market analysis through to product development, technical advice, training and publications.

For more information on Co-Construct visit www.construction.co.uk.

Supporting Services from Structure

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Introduction

Most new buildings require a labyrinth of ducts and pipes, together with miles and miles of cables. All of these need to be supported in a way that safely transfers the load without causing damage to the services or to the structure.

The numerous locations from which the services can be suspended provide the building services engineer with many options at the design stage and offer the flexibility to overcome unforeseen difficulties that may arise during installation. However, achieving the time and cost saving benefits of innovative suspension systems requires close and early co-ordination between the building services design and that of the structure. As is often the case in building design and construction, the success or failure of a project depends as much on the design of the interface as it does on the design of the individual beams, columns and building services systems.

This guide, the fourth in a series called Interface Engineering Publications, aims to provide guidance on the best ways to engineer the interface between structural design and services distribution. BSRIA and the SCI have pooled their technical knowledge to provide structural and services engineers with consistent, interlocking advice.

Much of the material in the publication is repackaged from existing BSRIA and SCI guidance. Details of the original publications, relevant European and British Standards and other references for further reading are provided at the end of this publication.

The publication begins with an introduction to the design issues faced by structural and building services engineers and examines the implications of certain key design decisions on the integration of the building services into the structure. There are many ways in which the services may be attached to the structure and several of the most common options are discussed in detail. These include fixings to beam flanges, steel decking and solid concrete slabs.

Many proprietary support systems have been developed in recent years to cater for all shapes, sizes and weights of building services. This publication does not give specific advice on the installation of particular systems or components, as most manufacturers produce comprehensive guidance for the design and installation of their products. However, much of the guidance presented in this publication will be applicable to the common types of support system available in the UK and elsewhere.

Martin Heywood, The Steel Construction Institute
Roderic Bunn, BSRIA

August 2004

How to use this guide

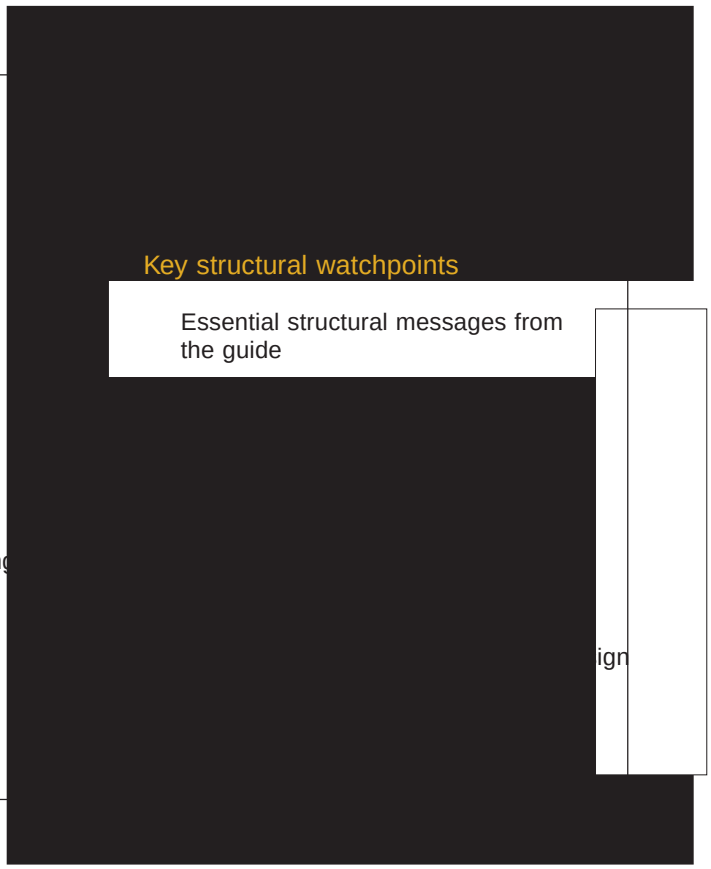
Advice about the requirements of the structure to facilitate the suspension of mechanical and electrical services will be found in yellow-tinted boxes.

Advice about suspending mechanical and electrical services from structural elements will be found in the blue-tinted boxes.

Comments marked by link to structural engineering sections listed under also see.

Comments marked by link to services engineering sections listed under also see.

Comments marked by denote a link common to both specialisms.



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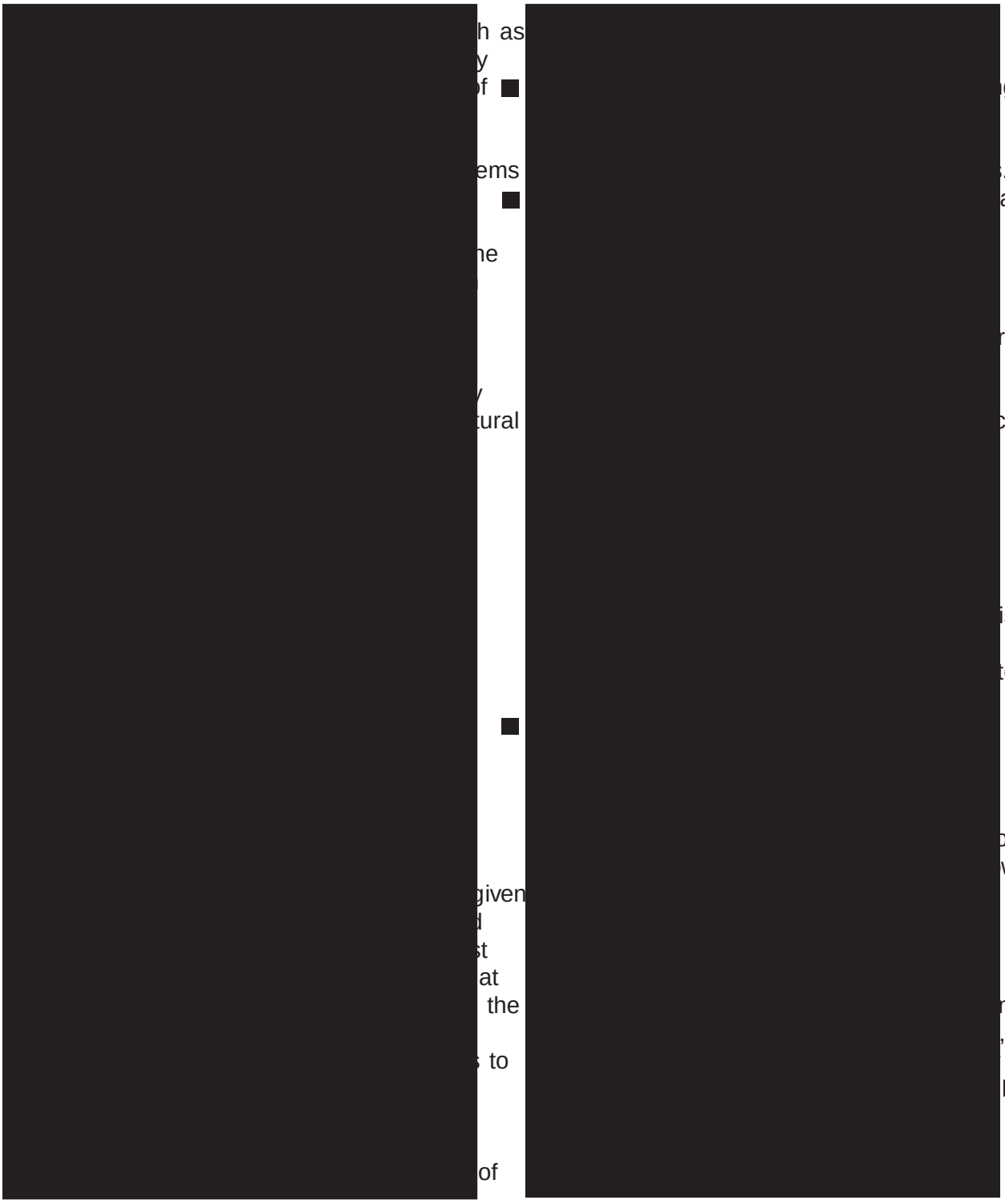
The clients' guide to

Services issues

Structural elements such as steel decking, concrete slabs and beams of all kinds are regularly used to support mechanical and electrical services in buildings. The method by which these services are supported by the structure will depend on the particular circumstances of each installation, such as the overall load, the position of suitable fixing points on the supporting structure and the attachment options for the item being suspended.

Key services issues



Services engineering issues

Structural issues

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Key services watchpoints

Before the design of a suspension system can begin, the suspension requirements – and the constraints imposed by the building structure and operating environment – need to be understood by the designer

Once a configuration has been selected, the system designer must calculate the loads on each fixing to ensure that suitably strong components are specified and check with the structural engineer that the design loads have not been exceeded

Designers should check that the weights given to the structural engineer reflect the actual loads to be experienced during building operation, such as fan coils full of water

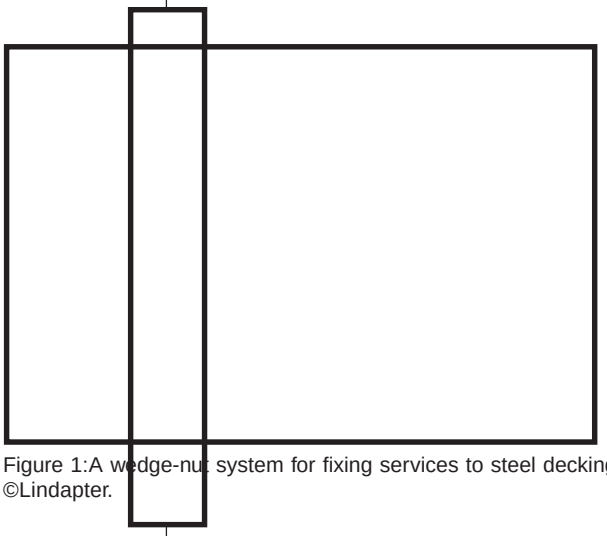

Figure 1:A wedge-nut system for fixing services to steel decking. ©Lindapter.

See also

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- Wire rope fixing systems, page 14
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Glossary

Building services terms

Fan coil unit	A device often fitted in the ceiling void and which comprises a fan, heating and/or cooling coil, and an air filter, all housed in a metal casing. The fan-coil unit may be supplied with fresh air from the main air supply ductwork.
Cable tray	Horizontal tray, usually of metal, used to carry power cables and voice and data cables above a suspended ceiling (also underneath a raised floor). Cables may be segregated over two or more trays to prevent electrical interference. Cable tray is commonly suspended from the soffit or from other plant items such as ductwork.
Busbar	A low voltage power cable usually run beneath raised floors or above suspended ceilings, with fittings that enable take-offs to electrical services such as lighting and air conditioning equipment.
Luminaires	A light fitting inclusive of lamp and control gear, housed within a suspended ceiling. Luminaires are often part of an integrated services module comprising fire detectors, public address speakers, motion sensors and acoustic panels. They will be heavier as a consequence.

Structural terms

Composite floor slab	A floor consisting of profiled steel decking and *in-situ* concrete. The two elements act together structurally.
Flange	The projecting element at the top and bottom of an I beam.
Intumescent coating	A coating applied to steel beams or columns that expands to many times its initial thickness when heated, thus providing an insulating layer to the steel.
Primary steelwork	The main structural frame comprising beams and columns.
Purlin	A horizontal beam in a roof, usually made from light gauge steel, which spans between the rafters and supports the roof cladding.
Secondary steelwork	Smaller steel members which transfer loads from the cladding (roof or wall) to the main structural frame.
Serviceability Limit State (SLS)	The point beyond which the specified service criteria are no longer met.
Steel decking	Profiled light gauge galvanised steel sheet which supports the wet concrete during construction and acts compositely with the concrete in service.
Ultimate Limit State (ULS)	The point beyond which the structure would fail.