

**Design of Simply-Supported  
Composite Beams for Strength**  
(To Australian Standard AS 2327.1–1996)

*Design Booklet DB1.1*

**OneSteel Market Mills  
Composite Structures Design Manual**

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## Foreword

OneSteel is a leading manufacturer of steel long products in Australia after its spin-off from BHP Pty Ltd on the 1st November 2000. It manufactures a wide range of steel products, including structural, rail, rod, bar, wire, pipe and tube products and markets welded beams.

OneSteel is committed to providing to design engineers, technical information and design tools to assist with the use, design and specification of its products. This design booklet “Design of Simply-Supported Composite Beams for Strength” was one of the first two design booklets of the Composite Structures Design Manual, which is now being completed and maintained by OneSteel.

The initial development work required to produce the design booklets was carried out at BHP Melbourne Research Laboratories before its closure in May 1998. OneSteel Market Mills is funding the University of Western Sydney’s Centre for Construction Technology and Research in continuing the research and development work to publish this and future booklets.

**The Composite Structures Design Manual refers specifically to the range of long products that are manufactured by OneSteel and plate products that continue to be manufactured by BHP. It is strongly recommended that OneSteel sections and reinforcement and BHP plate products are specified for construction when any of the design models in the design booklets are used, as the models and design formulae including product tolerances, mechanical properties and chemical composition have been validated by detailed structural testing using only OneSteel and BHP products.**

**To ensure that the Designer’s intent is met, it is recommended that a note to this effect be included in the design documentation.**

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## Preface

*This design booklet forms part of a suite of booklets covering the design of simply-supported and continuous composite beams, composite slabs, composite columns, steel and composite connections and related topics. The booklets are part of the OneSteel Market Mills' Composite Structures Design Manual which has been produced to foster composite steel-frame building construction in Australia to ensure cost-competitive building solutions for specifiers, builders and developers.*

Simply-supported composite beams have been favoured in the construction of composite steel-frame buildings in Australia. This is essentially because simple steel connections such as the web-side-plate connection (see design booklet DB5.1 – Design of the Web-Side-Plate Steel Connection) are very economical to use when the steel frame is erected.

This design booklet contains important explanatory information and worked examples about the strength design method in Section 6 of Australian Standard AS 2327.1-1996, Composite Structures, Part 1: Simply Supported Beams. It is intended that this information will assist structural design engineers to understand the engineering principles on which the design method is based. The coverage of the strength design method is continued in design booklet DB1.2 – Design of the Shear Connection of Simply-Supported Composite Beams (To Australian Standard AS 2327.1-1996).

Design aids have already been prepared to support the use of the design method, and are included in the Composite Beam Design Handbook (in Accordance with AS 2327.1-1996) [2] published jointly by the AISC and Standards Australia. These comprise Design Tables (Appendix A) and computer software (COMPBEAM™). Although these design aids are intended to make the design process more efficient, it is essential that the users have a clear understanding of the design concepts and design rules prior to using them.

The strength design method in AS 2327.1 is based on partial shear connection strength theory and rectangular stress block theory, and is applicable to the design of composite beams with compact steel sections and ductile shear connection. Non-compact steel sections can be catered for by representing them in design as equivalent compact sections. Slender steel sections are not permitted. Details for ensuring that ductile shear connection is achieved are given in Sections 8 and 9 of AS 2327.1, and explanatory information about these rules can be found in design booklet DB1.2. Computer program COMPSHEAR™ can be used in association with COMPBEAM™ to design the shear connection in accordance with DB1.2.

The method of strength design presented for simply-supported composite beams has also been extended to cover the design of continuous composite beams, noting that very similar principles apply. The reader is referred to design booklet DB2.1 – Design of Continuous and Semi-Continuous Composite Beams with Rigid Connections for Strength, and an associated computer program COMPSECT™. Partial shear connection strength theory is also applicable to the design of composite slabs with ductile shear connection, which is also covered in a separate design booklet DB3.1 – Design of Composite Slabs for Strength. Finally, it is important to point out that the strength design method in AS 2327.1 is in harmony with leading overseas Codes, Standards and Design Specifications which address the design of composite beams.

Edition 1.0 was published by BHP in May 1998. Edition 2.0 contains some minor corrections to the first edition, and is published by OneSteel.