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The use of cold-formed steel members in building construction began in the 1850s in both the United States and Great Britain. In the 1920s and 1930s, acceptance of cold-formed steel as a construction material was still limited because there was no adequate design standard and there was limited information on material use in building codes. One of the first documented uses of cold-formed steel as a building material is the Virginia Baptist Hospital, constructed around 1925 in Lynchburg, Virginia, USA. The building structure was composed by masonry and the floors supported by cold-formed steel built-up joists of back-to-back lipped channel sections. Only some 20 years later, only, Lustron Corporation built in Albany, New York, with almost 2500 steel-framed homes, with the framing, finishes, cabinets and furniture made from cold-formed steel. These inexpensive houses were built for the veterans returning from the World War II. This was the beginning of cold-formed steel adventure in building.

In recent years, cold formed steel sections are used more and more as primary framing components. Wall stud systems in housing, trusses, building frames or pallet rack structures are some examples. As secondary structural systems they are used as purlins and side rails or floor joists, as well as in building envelopes. Cassette sections in modern housing systems play simultaneously the role of primary structure and envelope. Profiled decking is widely used as basic components in composite steel-concrete slabs.

Cold-formed steel members are efficient in terms of both their stiffness and strength. Additionally, because the base steel is thin, even less than 1mm thick when high strength steel is used, the members are lightweight. The use of thinner sections and high strength steel leads to design problems for structural engineers which may not normally be encountered in routine structural steel design. Further, the shapes which can be cold-formed are often considerably more complex than hot-rolled steel shapes such as I-
sections and plain channel sections. The cold-formed sections commonly have mono-symmetric or point symmetric shapes, and normally have stiffening lips on flanges and intermediate stiffeners in wide flanges and webs. Both simple and complex shapes can be formed for structural and non-structural applications.

Cold-formed steel design is dominated by two specific problems, i.e. (1) stability behaviour, which is dominant for design criteria of thin sections, and (2) connecting technology, which is specific and influences significantly the structural performance and design detailing.

Special design standards have been developed to cover the specific problems of cold-formed steel structures. In the USA, the Specification for the design of cold-formed steel structural members of the American Iron and Steel Institute was first produced in 1946 and has been regularly updated based on research to the most recent 2007 edition, AISI S100-07, entitled North American Specification for Design of Cold-Formed Steel Structural Members.

In Europe, the ECCS Committee TC7 originally produced the European Recommendations for the design of light gauge steel members in 1987 (ECCS, 1987). This European document has been further developed and published in 2006 as the European Standard Eurocode 3: Design of steel structures. Part 1-3: General Rules. Supplementary rules for cold-formed thin gauge members and sheeting (EN 1993-1-3, 2006).

In Australia and New Zealand, the last version of specification for the design of cold-formed steel structures, AS/NZS 4600, was published in December 2005, and the review of cold-formed steel design specification could be continued around the world.

The market share of cold-formed structural steelwork continues to increase in the developed world. The main reasons can be found in the improving technology of manufacture and corrosion protection which leads, in turn, to an increased competitiveness of resulting products as well as new applications. Recent studies have shown that the coating loss for galvanised
steel members is sufficiently slow, and indeed slows down to effectively zero, than a design life in excess of 60 years can be guaranteed.

The range of use of cold-formed steel sections specifically as load-bearing structural components is very wide. Besides building applications, cold-formed steel elements can be met in the Automotive industry, Shipbuilding, Rail transport, in Aircraft industry, Highway engineering, Agricultural and Industry equipment, Office equipment, Chemical, Mining, Petroleum, Nuclear and Space industries.

This book is primarily concerned with the design of cold-formed steel members and structures in building construction in Europe. For this reason it is mainly focused on the EN 1993-1-3, and the related parts of EN 1993 (e.g. EN 1993-1-1, EN 1993-1-5, EN 1993-1-8, etc.).

Generally, the book contains the theoretical background and design rules for cold-formed members and connections, accompanied by design oriented flow charts and worked examples for common building application.

The book was conceived primarily as a technical support for structural engineers in design and consulting offices, but it is expected to be of interest and useful for students and staff members of structural engineering faculties, as well as, for engineers working in steelwork industry.

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