STEEL CONSTRUCTION

MANUAL

AMERICAN INSTITUTE
OF
STEEL CONSTRUCTION

FOURTEENTH EDITION

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by

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FOREWORD

The American Institute of Steel Construction, founded in 1921, is the nonprofit technical standards developer and trade organization for the fabricated structural steel industry in the United States. AISC is headquartered in Chicago and has a long tradition of service to the steel construction industry providing timely and reliable information.

The continuing financial support and active participation of Members in the engineering, research and development activities of the Institute make possible the publishing of this *Steel Construction Manual.* Those Members include the following: Full Members engaged in the fabrication, production and sale of structural steel; Associate Members, who include erectors, detailers, service consultants, software developers and steel product manufacturers; Professional Members, who are structural or civil engineers and architects, including architectural and engineering educators; Affiliate Members, who include general contractors, building inspectors and code officials; and Student Members.

The Institute's objective is to make structural steel the material of choice, by being the leader in structural-steel-related technical and market-building activities, including specification and code development, research, education, technical assistance, quality certification, standardization and market development.

To accomplish this objective, the Institute publishes manuals, design guides and specifications. Best known and most widely used is the *Steel Construction Manual*, which holds a highly respected position in engineering literature. The Manual is based on the *Specification for Structural Steel Buildings* and the *Code of Standard Practice for Steel Buildings and Bridges*. Both standards are included in the Manual for easy reference.

The Institute also publishes technical information and timely articles in its *Engineering Journal*, Design Guide series, *Modern Steel Construction* magazine, and other design aids, research reports and journal articles. Nearly all of the information AISC publishes is available for download from the AISC web site at **www.aisc.org**.

PREFACE

This Manual is the 14th Edition of the AISC *Steel Construction Manual*, which was first published in 1927. It replaces the 13th Edition Manual originally published in 2005.

The following specifications, codes and standards are printed in Part 16 of this Manual:

- 2010 AISC *Specification for Structural Steel Buildings*
- 2009 RCSC *Specification for Structural Joints Using High-Strength Bolts*
- 2010 AISC *Code of Standard Practice for Steel Buildings and Bridges*

The following resources supplement the Manual and are available on the AISC web site at **www.aisc.org:**

- AISC *Design Examples*, which illustrate the application of tables and specification provisions that are included in this Manual.
- AISC *Shapes Database V14.0 and V14.0H.*
- Background and supporting literature (references) for the AISC *Steel Construction Manual.*

The following major changes and improvements have been made in this revision:

- All tabular information and discussions have been updated to comply with the 2010 *Specification for Structural Buildings* and the standards and other documents referenced therein.
- Shape information has been updated to ASTM A6-09 throughout the Manual, including a new HP shape series.
- Eccentrically loaded weld tables have been revised to indicate the strongest weld permitted by the three methods listed in Chapter J of the specification and supplemented to provide strengths for L-shaped welds loaded from either side.
- The procedure for the design of bracket plates in Part 15 has been revised.
- In Part 10, the procedure for the design of conventional single plate shear connections has been revised to accommodate the increased bolt shear strengths of the 2010 *Specification for Structural Steel Buildings.*
- In Part 10, for extended single plate shear connections, information is provided to determine if stiffening plates (stabilizers) are required.

In addition, many other improvements have been made throughout this Manual and the number of accompanying design examples has been expanded.

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SCOPE

The specification requirements and other design recommendations and considerations summarized in this Manual apply in general to the design and construction of steel buildings and other structures.

The design of seismic force resisting systems also must meet the requirements in the AISC *Seismic Provisions for Structural Steel Buildings*, except in the following cases for which use of the AISC *Seismic Provisions* is not required:

- Buildings and other structures in seismic design category (SDC) A
- Buildings and other structures in SDC B or C with $R = 3$ systems [steel systems not specifically detailed for seismic resistance per ASCE/SEI 7 Table 12.2-1 (ASCE, 2010)]
- Nonbuilding structures similar to buildings with $R = 1^1/_2$ braced-frame systems or $R = 1$ moment-frame systems; see ASCE/SEI 7 Table 15.4-1
- Nonbuilding structures not similar to buildings (see ASCE/SEI 7 Table 15.4-2), which are designed to meet the requirements in other standards entirely

Conversely, use of the AISC *Seismic Provisions* is required in the following cases:

- Buildings and other structures in SDC B or C when one of the exemptions for steel seismic force resisting systems above does not apply
- Buildings and other structures in SDC B or C that use composite seismic force resisting systems (those containing composite steel-and-concrete members and those composed of steel members in combination with reinforced concrete members)
- Buildings in SDC D, E or F
- Nonbuilding structures in SDC D, E or F when the exemption above does not apply

The AISC *Seismic Design Manual* provides guidance on the use of the AISC *Seismic Provisions*.

The Manual consists of seventeen parts addressing various topics related to steel building design and construction. Part 1 provides the dimensions and properties for structural products commonly used. For proper material specifications for these products, as well as general specification requirements and other design considerations, see Part 2. For the design of members, see Parts 3 through 6. For the design of connections, see Parts 7 through 15. For AISC Specifications and Codes, see Part 16. For other miscellaneous information, see Part 17.

REFERENCE

ASCE (2010), *Minimum Design Loads for Buildings and Other Structures*, ASCE/SEI 7-10, American Society of Civil Engineers, Reston, VA.