

# steelwise

## A RENOVATED RETROFIT GUIDE

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The second edition of AISC's Design Guide on rehabilitation and retrofits is now available.

**RENOVATION PROJECTS CAN** give new life to historic structures ranging from those that need a simple makeover to those that have fallen into neglect and disrepair.

And from a structural standpoint, steel offers significant retrofit advantages in terms of both existing framing to be retrofitted and new framing elements needed to replace old members or add new ones.

Luckily, AISC Design Guide 15: *Rehabilitation and Retrofit* has offered guidance on steel renovation projects. Even better, a new version—the second edition—is now available. Here, we'll review some of the major updates to the guide, which can enhance your next renovation or expansion project.

The most substantial change to the document is a new chapter of comprehensive examples to illustrate important design principles for the evaluation and retrofit of steel structures. In addition, the original Design Guide 15 material has been updated and reorganized to reflect changes and new knowledge developed over the past 15 years. Reference properties of discontinued steel and wrought-iron sections produced between 1873 and 2016 are included, and historical overviews of steel-related specifications and standards from the 1920s forward are provided. This collection of information constitutes the industry's most complete reference on the rehabilitation and retrofit of steel structures.

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### Evaluation and Enhancement

The newly available second edition organizes the updated information into seven chapters and a set of appendices.

**Chapter 1:** Evaluation of Existing Structures outlines general considerations in evaluation for gravity loads and seismic loads.

**Chapter 2:** Enhancement of Existing Structural Systems describes how strength and stiffness can be increased. Included are considerations for gravity systems, lateral systems and their connections. Typical methods of reinforcing riveted, bolted and welded connections are described. Concepts are offered for rehabilitation of existing welded steel moment frame buildings to improve their seismic resistance in future earthquakes. In addition, fabrication procedures such as welding, thermal cutting and drilling holes in existing members are reviewed.

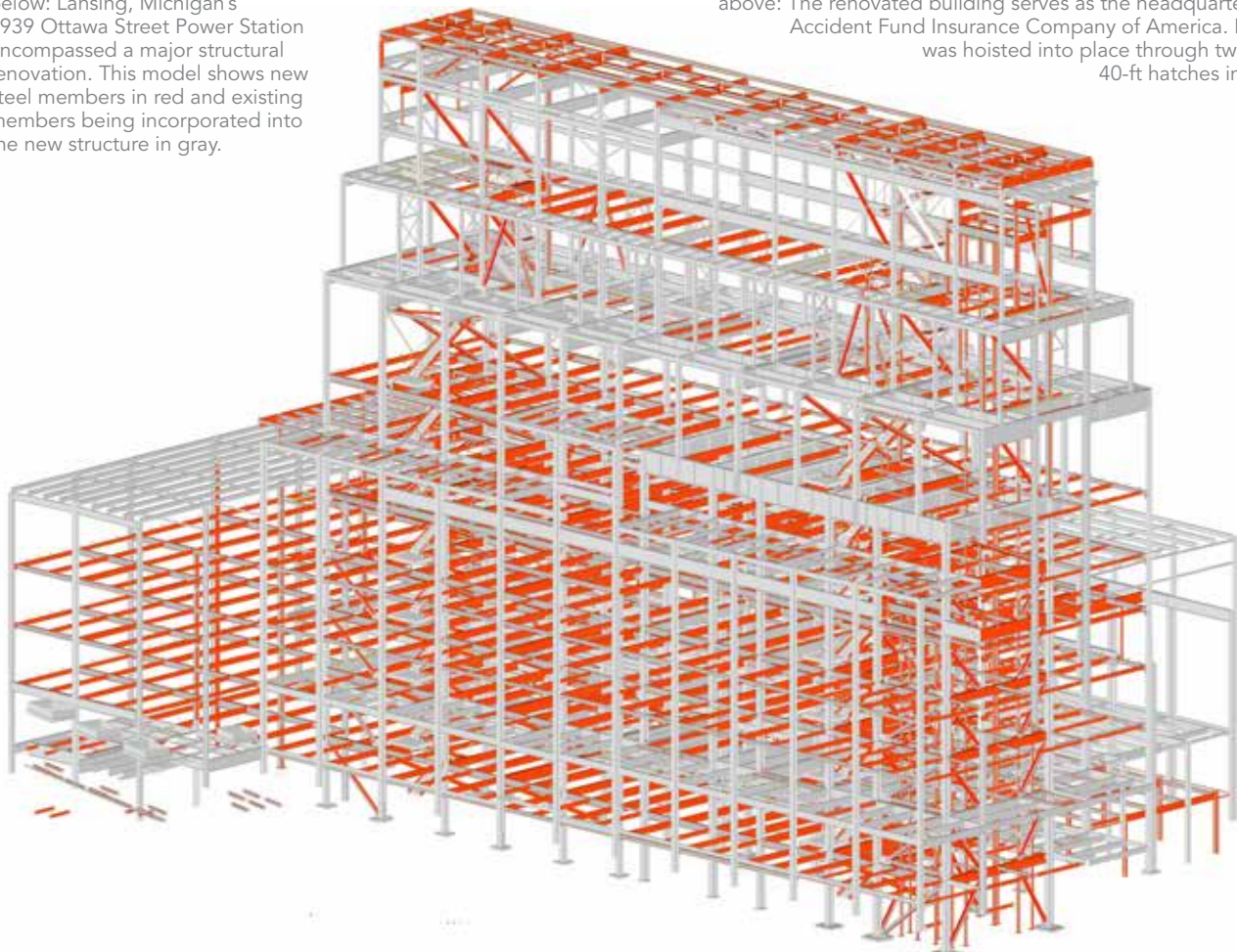
### Looking Back

**Chapter 3:** Historical Review of Changes in Specifications and Manuals provides a chronology of changes to steel-related specifications and standards, essential information when seeking an understanding of past practices. Included are changes to the AISC *Specification for Structural Steel Buildings* beginning in 1923; AISC *Steel Construction Manuals* published beginning in 1927; the AISC *Code of Standard Practice*



below: Lansing, Michigan's 1939 Ottawa Street Power Station encompassed a major structural renovation. This model shows new steel members in red and existing members being incorporated into the new structure in gray.

above: The renovated building serves as the headquarters for the Accident Fund Insurance Company of America. New steel was hoisted into place through two 14-ft by 40-ft hatches in the roof.



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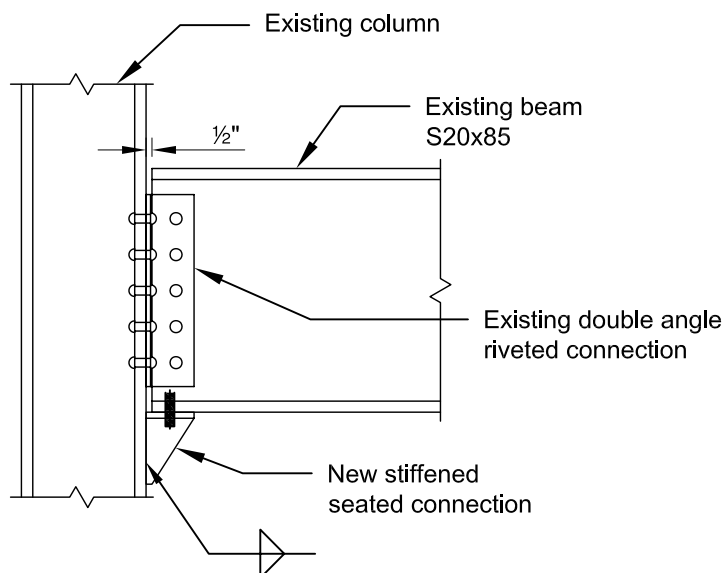
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above: New fourth-floor steel was attached to the crane rail in the building's turbine hall, with third-floor steel hung from the bottom.

below: Original rivets were replaced by bolts to create a new connection. Note the slotted hole in the beam seat.





The updated design guide includes several example details, such as this one for adding a seat to strengthen an existing connection (Figure 6-38 in the guide).

from 1924 forward; RCSC *Specifications* for high-strength bolted joints beginning in 1951; and a summary of design specifications for structural welding from 1934 forward. Appendices A1–A5 give extensive details of each.

**Chapter 4:** Historical Review of ASTM Standards and AISC ASD/LRFD Limits provides extensive information on material properties in standards published by ASTM International. This includes structural steel shapes and plates from 1900 forward, steel pipe and hollow structural sections (HSS) from 1915 and rivets and bolts from the 1930s. This information is essential for establishing minimum strengths of materials used in the past. A review is also provided of the basic AISC design limits—allowable stresses, allowable strengths and design strengths—for structural steel, rivets, bolts and welds, based on *AISC Specifications* from 1923 forward.

**Chapter 5:** Properties of Discontinued Steel and Wrought Iron Sections includes reference data (cross-sectional dimensions and properties) for steel shapes (wide-flange or I-shaped cross sections) that were once produced but have been discontinued sometime between 1887 and 2017. Chapter 5 tables identify steel producers for the various sections. Similar data is included for wrought-iron cross sections produced from 1873 to 1900. Design properties such as area, moment of inertia, radius of gyration, elastic and plastic modulus and torsion constants are all included, as are detailed dimensions that can be used to identify sections in the field.

### Design Examples and Case Studies

**Chapter 6:** Design Examples for the Evaluation and Retrofit of Steel Structures is entirely new to the second edition. This chapter includes fifteen design examples with step-by-step procedures illustrating how to evaluate and design strengthening for existing steel members.

The first set of examples focuses on the evaluation and retrofit of existing flexural members. Several strengthening options are presented including the addition of new beams between existing beams, welded reinforcement at the bottom flange of the beam and added steel headed stud anchors within the slab. Additional examples illustrate procedures for strengthening existing steel columns through the addition of welded steel plates and concrete encasement. The last set of examples demonstrates three different methods for strengthening an existing riveted double-angle connection.

In addition, the guide presents the examples in both ASD and LRFD, with references to applicable *AISC Specification* and *Manual* sections and academic research papers that support the presented methodologies.

**Chapter 7:** Summaries of References, presents summaries of the contents of the references listed at the end of the guide. These are organized into three categories: General Retrofit, Case Studies and Seismic Retrofit. Included are references to publications published by AISC, AWS, FEMA and others.

The second edition of *Design Guide 15* represents a comprehensive resource for engineers working on historic steel buildings. This updated version will better assist you in your quest to bring new prominence to historic steel edifices. AISC members can download the guide for free and nonmembers can purchase it at [www.aisc.org/dg](http://www.aisc.org/dg). ■