

ASCE STANDARD

American Society of Civil Engineers

Design of Latticed Steel Transmission Structures

This document uses both Système International (SI) units and customary units.

ASCE 10-97

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ABSTRACT

This standard provides requirements for the design of guyed and self-supporting latticed steel electrical transmission structures. They are applicable for hot-rolled and cold-formed steel shapes. Analysis techniques are outlined for the geometrical configurations presently in use. Procedures for the design of individual members reflect extensive experience and test data on steels with yield points up to 65 ksi. Connection design procedures allow the engineer to match connection capability to the most suitable end and edge distances for detailing. If full-scale structure testing is required, procedures are outlined to assist in obtaining critical information. Design procedures cover structural steel members and connections used in foundations. The commentary provides supporting background data.

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FOREWORD

The material presented in this Standard has been prepared in accordance with recognized engineering principles. This Standard and Commentary should not be used without first securing competent advice with respect to their suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty on the

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ACKNOWLEDGMENTS

In 1971, the American Society of Civil Engineers (ASCE) published the *Guide for Design of Steel Transmission Towers, Manuals, and Reports on Engineering Practice—No. 52*. Manual 52 has been used extensively in the United States and abroad as the basis for design specifications. In 1984, an ASCE task committee was established for updating Manual 52 to reflect new design procedures, availability of new shapes and materials, changes in loading criteria, and results of new test data. The second edition was published in 1988. In 1986, it was proposed that ASCE form a committee to develop a standard. The committee was established in 1987 and was chaired by Gene M. Wilhoite. The second edition of Manual 52 served as a resource in developing this Standard, although some of the formulas and examples differ slightly from those in the Manual. The previous work of the ASCE task committee on Manual 52 is greatly

appreciated. The first edition of ANSI/ASCE 10 was approved by ANSI on December 9, 1991.

In 1992 the committee began considering revisions to the first edition. At that time it was determined that the Standard had not been in use long enough to warrant substantial changes to the design requirements; however, it was decided that all relevant illustrations and examples from previous editions of Manual 52 required for the proper implementation of the standard would be incorporated into this revision.

This Standard was prepared through the consensus standards process by balloting in compliance with procedures of ASCE's Management Group F on Codes and Standards. Those individuals who serve on the Design of Steel Transmission Towers Standards Committee are:

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Design of Latticed Steel Transmission Structures

1.0 GENERAL

1.1 SCOPE

Design of Latticed Steel Transmission Structures specifies requirements for the design, fabrication, and testing of members and connections for electrical transmission structures. These requirements are applicable to hot-rolled and cold-formed steel shapes. Structure components (members, connections, guys) are selected to resist design-factored loads at stresses approaching yielding, buckling, fracture, or any other limiting condition specified in this Standard.

1.2 APPLICABLE DOCUMENTS

The following standards are referred to in the body of this document.

American Society for Testing and Materials (ASTM) Standards:

A6/A6M REV A-96 *Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.*

A36/A36M REV B-96 *Standard Specifications for Structural Steel.*

A123 REV A-89 *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.*

A143-74 *Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.*

A153/A153M-95 *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.*

A242/A242M REV A-93 *Standard Specification for High-Strength Low-Alloy Structural Steel.*

A394-93 *Standard Specification for Zinc-Coated Steel Transmission Tower Bolts, Zinc-Coated and Bare.*

A529/A529M-94 *Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.*

A563-94 *Standard Specification for Carbon and Alloy Steel Nuts.*

A563M-93 *Standard Specification for Carbon and Alloy Steel Nuts (Metric).*

A570/A570M-95 *Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled Structural Quality.*

A572/A572M REV C-94 *Standard Specification for High-Strength Low-Alloy Columbium–Vanadium Structural Steel.*

A588/A588M-94 *Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick.*

A606-96 *Standard Specification for Steel, Sheet and Strip, High-Strength Low-Alloy Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.*

A607-96 *Standard Specification for Steel, Sheet and Strip, High-Strength Low-Alloy Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled.*

A715-96 *Standard Specification for Steel, Sheet and Strip, High-Strength Low-Alloy Hot-Rolled and Cold-Rolled, and Steel Sheet, Cold-Rolled, High-Strength Low-Alloy with Improved Formability.*

American Welding Society Standard:

AWS D1.1-96 *Structural Welding Code Steel.*

1.3 DEFINITIONS

Block shear: a combination of shear and tensile failure through the end connection of a member caused by high bolt forces acting on the material; also called rupture.

Deformed bars: steel bars meeting the requirements of ACI 318 for reinforcing bars.

Design-factored load: unfactored load multiplied by a specified load factor to establish the design load on a structure.

Downthrust: the downward vertical component of the loads on a foundation.

Leg member: a primary member that serves as the main corner support member of a structure; sometimes called a post member.

Line security: criteria established to prevent a progressive (cascade) failure of structures.

Load factor: a multiplier used with the assumed loading condition, or unfactored load, to establish the design-factored load.

Primary members: tension or compression members that carry the loads on the structure to the foundation.

Redundant members: members that reduce the unbraced length of primary members by providing intermediate support.