ASCE STANDARD ASCE/SEI 19-10

American Society of Civil Engineers

Structural Applications of Steel Cables for Buildings

This document uses both the International System of Units (SI) and customary units.

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STANDARDS

In 2003, the Board of Direction approved the revision to the ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Society's Codes and Standards Committee (CSC). The consensus process includes balloting by a balanced standards committee made up of Society members and nonmembers, balloting by the membership of the Society as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding five years.

The following standards have been issued:

ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
ASCE/EWRI 2-06 Measurement of Oxygen Transfer in Clean Water
ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
ASCE 4-98 Seismic Analysis of Safety-Related Nuclear Structures
Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and Specifications for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)
ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures
SEI/ASCE 8-02 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
ANSI/ASCE 9-91 listed with ASCE 3-91
ASCE 10-97 Design of Latticed Steel Transmission Structures
SEI/ASCE 11-99 Guideline for Structural Condition Assessment of Existing Buildings
ASCE/EWRI 12-05 Guideline for the Design of Urban Subsurface Drainage
ASCE/EWRI 13-05 Standard Guidelines for Installation of Urban Subsurface Drainage
ASCE/EWRI 14-05 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
ASCE 15-98 Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
ASCE 16-95 Standard for Load Resistance Factor Design (LRFD) of Engineered Wood Construction
ASCE 17-96 Air-Supported Structures
ASCE 18-96 Standard Guidelines for In-Process Oxygen Transfer Testing
ASCE/SEI 19-10 Structural Applications of Steel Cables for Buildings
ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations
ANSI/ASCE/T&DI 21-05 Automated People Mover Standards—Part 1
ANSI/ASCE/T&DI 21.2-08 Automated People Mover Standards—Part 2
ANSI/ASCE/T&DI 21.3-08 Automated People Mover Standards—Part 3
ANSI/ASCE/T&DI 21.4-08 Automated People Mover Standards—Part 4
SEI/ASCE 23-97 Specification for Structural Steel Beams with Web Openings
ASCE/SEI 24-05 Flood Resistant Design and Construction
ASCE/SEI 25-06 Earthquake-Actuated Automatic Gas Shutoff Devices
ASCE 26-97 Standard Practice for Design of Buried Precast Concrete Box Sections
ASCE 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
ASCE 28-00 Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction
ASCE/SEI/SFPE 29-05 Standard Calculation Methods for Structural Fire Protection
SEI/ASCE 30-00 Guideline for Condition Assessment of the Building Envelope
SEI/ASCE 31-03 Seismic Evaluation of Existing Buildings
SEI/ASCE 32-01 Design and Construction of Frost-Protected Shallow Foundations
EWRI/ASCE 33-01 Comprehensive Transboundary International Water Quality Management Agreement
EWRI/ASCE 34-01 Standard Guidelines for Artificial Recharge of Ground Water
EWRI/ASCE 35-01 Guidelines for Quality Assurance of Installed Fine-Pore Aeration Equipment
CI/ASCE 36-01 Standard Construction Guidelines for Microtunneling
SEI/ASCE 37-02 Design Loads on Structures during Construction
CI/ASCE 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data

EWRI/ASCE 39-03 Standard Practice for the Design and Operation of Hail Suppression Projects
ASCE/EWRI 40-03 Regulated Riparian Model Water Code
ASCE/SEI 41-06 Seismic Rehabilitation of Existing Buildings
ASCE/EWRI 42-04 Standard Practice for the Design and Operation of Precipitation Enhancement Projects
ASCE/SEI 43-05 Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities
ASCE/EWRI 44-05 Standard Practice for the Design and Operation of Supercooled Fog Dispersal Projects
ASCE/EWRI 45-05 Standard Guidelines for the Design of Urban Stormwater Systems
ASCE/EWRI 46-05 Standard Guidelines for the Installation of Urban Stormwater Systems
ASCE/EWRI 47-05 Standard Guidelines for the Operation and Maintenance of Urban Stormwater Systems
ASCE/SEI 48-05 Design of Steel Transmission Pole Structures
ASCE/EWRI 50-08 Standard Guideline for Fitting Saturated Hydraulic Conductivity Using Probability Density Functions
ASCE/EWRI 51-08 Standard Guideline for Calculating the Effective Saturated Hydraulic Conductivity
ASCE/SEI 52-10 Design of Fiberglass-Reinforced Plastic (FRP) Stacks
ASCE/G-I 53-10 Compaction Grouting Consensus Guide
ASCE/EWRI 54-10 Standard Guideline for the Geostatistical Estimation and Block-Averaging of Homogeneous and Isotropic Saturated Hydraulic Conductivity
ASCE/SEI 55-10 Tensile Membrane Structures
ASCE/T&DI/ICPI 58-10 Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

FOREWORD

This Standard is an updated and expanded version of ASCE Standard 19-96, which it replaces. It has been prepared in accordance with recognized engineering principles. This Standard should not be used without first securing competent advice with respect to its suitability for a given application. The publication of the material contained herein is not intended as a representation or warranty on the part of the American Society of Civil Engineers, or of any other person named herein, that this information is suitable for a general or particular use, nor does it promise freedom from infringement of any patent or patents. Anyone making use of this information assumes all liability for its use.

As background, development of this Standard can be traced to the *Tentative Criteria for Structural Applications of Steel Cables for Buildings* published by the American Iron and Steel Institute (AISI) in 1966. Later influential publications were *Design Fundamentals of Cable Roof Structures* published by AISI in 1969; the paper titled "Cable-Suspended Roof Construction State-of-the-Art" in the *Journal of the Structural Division*, ASCE, 1971; the *Manual for Structural Applications of Steel Cables for Buildings*, AISI, 1973; and the prior edition of this Standard, ASCE 19-96. References used to develop particular provisions of this Standard are included in the Selected Bibliography to be found in the Commentary.

ACKNOWLEDGMENTS

The American Society of Civil Engineers (ASCE) acknowledges the devoted efforts of the Structural Applications of Steel Cables for Buildings Standards Committee (the Committee) of the Codes and Standards Activities Committee. This group consists of individuals from many backgrounds, including consulting engineering, research, manufacturing, fabrication, education, and government.

This is the second edition of ASCE Standard 19 and supersedes ASCE Standard 19-96. It was prepared through the standards process by balloting in compliance with procedures of ASCE's Codes and Standards Committee. The membership of the Structural Applications of Steel Cables for Buildings Committee changed during the decade in which it developed this second edition of the Standard. There was also valuable input from industry outside the Committee. The Committee members who actively attended meetings and/or contributed significant material through correspondence are:

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CONTENTS

ASCE STANDARD 19-10
STRUCTURAL APPLICATIONS OF STEEL CABLES FOR BUILDINGS

1.0 GENERAL

1.1 SCOPE

This Standard provides requirements for the structural design, contract documents, shop drawings, fabrication, and installation of cables for use as static structural elements for the support and bracing of buildings and other cable-supported structures not subjected to vehicle loads. Parts of buildings to which this Standard is applicable include roofs, floors, curtain walls, masts, and nets. Guyed utility towers and vehicular bridges are not covered by this Standard. This Standard applies to carbon steel and stainless steel cables.

1.2 GLOSSARY

Anchorage: the structural connection at which the cable is terminated.
Cable: a flexible tension member, strand, or rope.
Clamp: a cable fitting that transfers force by friction.
Damper: an active or passive device attached to the cable structure that modifies the structural response to dynamic loads.
Deflector: a grooved cable support used to create an angle change in the cable. Also known as a saddle.
Fitting: any accessory used as an attachment to, or support for, the cable or its components.
Grade: classification of cable by nominal cable strength and/or metallic composition of wire.
Modulus of Elasticity: the slope of the secant to the stress–strain curve between the stress at 10% of the nominal cable strength and 90% of the prestretching force.
Nominal Cable Strength: strength of a cable in units of force, as given in ASTM or other applicable standards.
Prestressing: tensioning a cable at installation.
Prestretching: tensioning a helically twisted cable according to a predetermined program in order to minimize constructional stretch.
Prestretching Force: tensile force applied to a cable one or more times and held for a specified duration during prestretching.
Rope: a plurality of strands twisted about an axis, or about a core which may be a strand or another wire rope.
Strand: a plurality of wires helically twisted about an axis.
Termination: a device, also known as an end fitting, attached to a cable to transfer the tension in the cable to its supporting anchorage.
Wire: a single continuous length of steel with a circular or noncircular cross section. Wires of

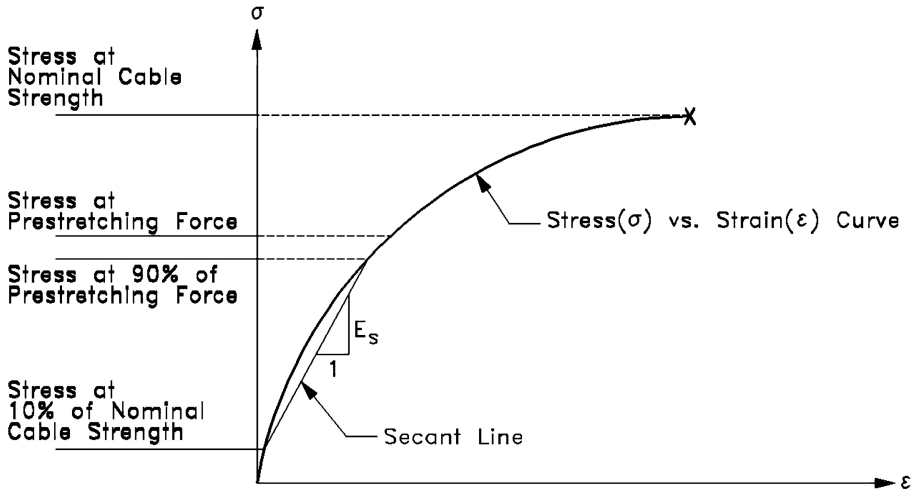

FIGURE 1-1. Nominal Cable Strength.