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Structural Applications of Steel Cables for Buildings

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This Standard is an updated and expanded version of ASCE Standard 19-10, which it replaces. Development of Standard ASCE 19 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 entitled "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 editions of this Standard, ASCE 19-96 and ASCE/SEI 19-10. References used to develop particular provisions of this Standard are included in the Selected Bibliography to be found in the Commentary.

Standard ASCE/SEI 19-16 includes a new appendix to address small diameter cables used for seismic bracing of nonstructural building elements, updates the nomenclature for consistency with industry standards, and incorporates other miscellaneous additions and rearrangements.

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

This edition of Standard ASCE 19 supersedes Standard ASCE 19-96 and Standard ASCE/SEI 19-10. It was prepared through the standards process by balloting in compliance with procedures of ASCE's Codes and Standards Committee.

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CHAPTER 1
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. In addition, Appendix A addresses cables and fittings, Appendix B discusses saddles, Appendix C addresses clamps, and Appendix D reviews cable fatigue. Guyed utility towers and vehicular bridges are not covered by this standard. This standard applies to carbon-steel and stainless-steel cables. Requirements for earthquake load resistant sway bracing design for nonstructural components of buildings are contained in Appendix E.

1.2 GLOSSARY

Anchorage—The structural connection at which the cable is terminated

Cable—A flexible tension member, either strand or rope

Cable Assembly—A cable with all permanent shop attached fittings

Cable Assembly Strength—The minimum breaking strength multiplied by the fitting reduction factor or by the deflector reduction factor

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—See Saddle

End Fitting—A device, also known as a Termination, attached to a cable to transfer tension between the cable and its supporting anchorage

Fitting—Any accessory used as an attachment to or support for the cable or its components

Grade—Classification of cable by minimum breaking strength and/or metallic composition of wire

Minimum Breaking Force—See Minimum Breaking Strength

Minimum Breaking Strength—Strength of a cable in units of force, as given in ASTM or other applicable standards; also known as Minimum Breaking Force or Nominal Cable Strength (see Fig. 1-1)

Modulus of Elasticity—The slope of the secant to the stress-strain curve between the stress at 10% of the minimum breaking strength and 90% of the prestretching force

Nominal Cable Strength—See Minimum Breaking Strength

Prestressing—Tensioning a cable at installation

Prestretching—Tensioning and detensioning a cable according to a predetermined program to minimize subsequent constructional (in-service) stretch

Prestretching Force—Tensile force applied to a cable one or more times and held for a specified duration during prestretching

Proof Load—A predetermined load prescribed by the engineer and applied in the shop to the cable assembly in performance of the proof test during the fabrication process

Proof Test—A nondestructive tension test to verify integrity and workmanship of an individual cable assembly

Rope—A plurality of strands twisted about an axis or about a core that may be a strand or another wire rope

Saddle—A grooved cable support used to create an angle change in the cable; also known as a Deflector

Strand—A plurality of wires helically twisted about an axis

Termination—See End Fitting

Wire—A single continuous length of steel with a circular or noncircular cross section; wires of circular cross section cold-drawn from rod; wires of noncircular cross section either cold-drawn or cold-rolled from rod

1.3 SYMBOLS AND NOTATION

C = erection or temporary load during construction
D = dead load due to weight of the structure and the permanent features on the structure
D_i = weight of ice
E = earthquake load
E_s = modulus of elasticity (secant)
L = live load due to occupancy and movable equipment
L_r = roof live load
N_d = deflector reduction factor
N_f = fitting reduction factor
P = prestress force
R = rain load

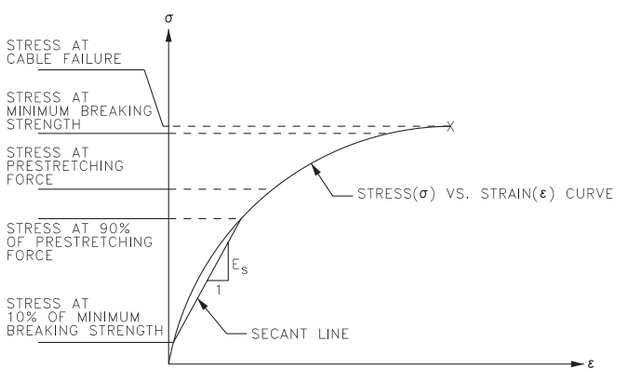

FIGURE 1-1. Cable Minimum Breaking Strength