



HSS Reference Guide No. 1: Composite HSS

Design Manuals/Design Guides

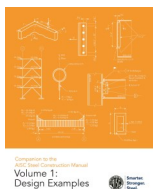
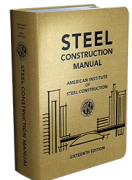


[STI HSS Design Manual, Volume 2A: Member Design](#)

- HSS composite column allowable axial compression tables for round, square, and rectangular A500 Grade C and A1085 HSS, with 4 ksi normal weight concrete fill, and no longitudinal reinforcing steel, up to a maximum ungraced length of 65 ft.
- HSS maximum dimensions for compact, non-compact, and slender composite columns.

[AISC 16th Ed. Steel Construction Manual and 360-22 Specification](#)

Specification 360-22: Chapter I, “DESIGN OF COMPOSITE MEMBERS” and Appendix 2, “DESIGN OF FILLED COMPOSITE MEMBERS (HIGH STRENGTH)”

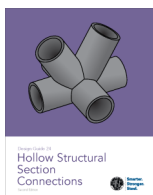


[Companion to the AISC Steel Construction Manual Volume 1: Design Examples, Version 16.0](#)

Examples in Chapter I , “DESIGN OF COMPOSITE MEMBERS”

[Companion to the AISC Steel Construction Manual Volume 2: Design Tables, Version 16.0](#)

Tables 4-A through 4-F : HSS composite column allowable axial compression tables for round, square, and rectangular A500 Grade C HSS, with 4 ksi or 5 ksi normal weight concrete, without longitudinal reinforcing steel, up to a maximum unbraced length of 40 ft.



[AISC Design Guide 24: Hollow Structural Section Connections \(Second Edition\)](#)

By Jeffrey A. Packer and Kimberley Olson, 2024
Chapter 1, Section 1.5.5, “Concrete Filling”

[CIDECT Design Guide 5 for Concrete Filled Hollow Section Columns Under Static and Seismic Loading](#)

By R. Bergmann, C. Matsui, C. Meinsma, and D. Dutta, 1995



Articles

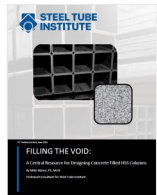


[STI Article: Composite Concrete Filled HSS: Design Considerations](#)

By Jason Ericksen, 2016

[STI Article: Practical Guidance for Concrete Filled HSS Columns](#)

By Kim Olson, 2015



STI HSS Insider Article:

[Filling the Void: A Central Resource for Designing Concrete Filled HSS Columns](#)

By Mike Manor, STI HSS Insider, June 2024

[STI / Informed Infrastructure Article: Composite Concrete Filled HSS: Design Considerations](#)

By Jason Ericksen, Kim Olson, Mike Manor

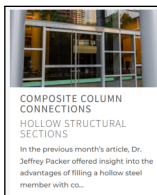
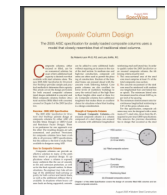


[STI Article: Concrete-Filled Double-Skin Tubes](#)

By Jeffrey A. Packer, 2015

[Modern Steel Construction Article: Composite Column Design](#)

By Roberto Leon and Larry Griffis, Modern Steel Construction, August 2005

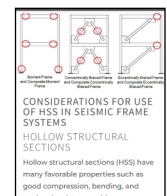


[STI Article: Composite Column Connections](#)

By Kim Olson, 2020

[STI Article: Considerations for Use of HSS in Seismic Frame Systems](#)

By Jason McCormick, 2017





[STI Article: Concrete-Filled HSS Connections](#)

By Jeffrey A. Packer, 2020

[STI HSS Insider Article: HSS Bollards](#)

By Jeffrey A. Packer, STI HSS Insider, October 2021



Webinars



[STI Webinar on Demand: Concrete Filled Tubes](#)

By Kim Olson, November 2020

[NASCC Presentation Proceeding: Concrete Filled HSS](#)

By Jason McCormick, April 2019



Software/Design Tools



[STI HSS Spreadsheet Design Aids: HSS Composite Column Design Aid](#)

This spreadsheet calculates the axial capacity of a composite HSS column section filled with concrete per AISC 360-22 Chapter I.

[ETABS - 07 Composite Columns: Watch & Learn \(youtube.com\)](#)

Learn about the ETABS 3D finite element based building analysis and design program and the options available for creating composite columns.



Research Papers/Conference Proceedings



[AISC Engineering Journal: Limit State Response of Composite Columns and Beam-Columns Part 1: Formulation of Design Provisions for the 2005 AISC Specification](#)

By Roberto T. Leon, Dong Keon Kim, and Jerome F. Hajjar, AISC Engineering Journal, 2007, Fourth Quarter

[ASCE Journal of Structural Engineering: High-Strength Rectangular CFT Members: Database, Modeling, and Design of Short Columns](#)

By Zhichao Lai and Amit Varma, ASCE Journal of Structural Engineering, Volume 144, Issue 5, May 2018



[Proceedings of the Annual Stability Conference Structural Stability Research Council: The Interaction of Section and Member Slenderness on the Behavior of High Strength Composite Filled Tube \(CFT\) Members](#)

By Abdullah Alghossoon and Amit Varma, April 2024

STI FAQs

[STI FAQ: Capacities of Composite Columns](#)

[FAQ – Rehabilitation of Concrete Columns using HSS Encasing](#)

Fire Resistance



[STI HSS Insider Article: Keeping Your Cool: How to Get Started With HSS Fire Ratings](#)

By Mike Manor, STI HSS Insider, Dec. 2022

[STI Article: Fire Protection of HSS](#)

By Brady Golinski, 2017



[STI HSS Insider Interview: How Fire Resistance and Progressive Collapse Shape the Steel Industry and Beyond](#)

Subject Matter Expert: Dr. Spencer Quiel, STI HSS Insider, Dec. 2022

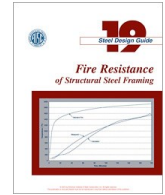


[STI Webinar on Demand: Fire Protection of HSS](#)

By Brady Golinski, 2018

[AISC Design Guide 19: Fire Resistance of Structural Steel Framing](#)

By John L. Ruddy, Joseph P. Marlo, Socrates A. Ioannides, and Farid Alfawakhiri, 2003
Chapter VI, Section VI.8.9, "Concrete-Filled HSS Columns"



[AISC Engineering Journal: Design of Concrete-Filled Hollow Structural Steel Columns for Fire Endurance](#)

By Venkatesh Kodur and David MacKinnon, AISC Engineering Journal, 2000, First Quarter

[International Journal of High-Rise Buildings: Enhancing the Fire Performance of Concrete-Filled Steel Columns Through System-Level Analysis](#)

By R.S. Fike1 and V.K.R. Kodur, et al, International Journal of High-Rise Buildings, 2013



[Architectural Record: Concrete-Filled Hollow Structural Sections \(HSS\), an Unbeatable Combination](#)

Architectural Record, 2017

[CIDECT Design Guide 4 for Structural Hollow Section Columns Exposed to Fire](#)

Section 4.3, "Assessment methods for unprotected columns" and Table 4.1, "Minimum cross-sectional dimensions, reinforcement ratios and axis distances of the re-bars for fire resistance classification for various degrees of utilization μ "

By L. Twilt, R. Hass, W. Klingsch, M. Edwards, and D. Dutta, 1994

