IN-LB	Inch-Pound Units
SI	International System of Units

Strut-and-Tie Method Guidelines for ACI 318-19—Guide

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Strut-and-tie models (STMs) were first used at the end of the nineteenth century as a concrete design method. The method was added to ACI 318 in 2002 as Appendix A. In 2014, STM provisions were moved into the main body of the code as Chapter 23, Strut-and-Tie Method. This document focuses on the ACI 318-19 implementation of strut-and-tie modeling. The main objectives of this document are to: 1) explain the intent and application of ACI 318 STM provisions; 2) provide additional design guidance for the STM based on other design codes, specifications, and committee documents; and 3) present design recommendations from recent research publications. This document provides practical guidance to the structural design community.

Keywords: D-region; design; disturbed regions; model; node; strut; tie.

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CHAPTER 1—INTRODUCTION

1.1—Background

While the origins of strut-and-tie models date back to the end of the nineteenth century (Ritter 1899; Considère 1900; Mörsch 1909), the strut-and-tie design method was not formally introduced into ACI 318 until 2002. Up until the 2014 version of ACI 318, strut-and-tie model (STM) provisions were included in Appendix A of ACI 318. With the reorganization of ACI 318 in 2014, STM provisions were moved into the main body of the code as Chapter 23, in part to recognize the importance of this method in structural design practice. Subsequently, significant changes to the STM provisions occurred in ACI 318-19. Chapter 23 was renamed to "Strut-and-Tie Method." The abbreviation of STM only stands for strut-and-tie model.

In an effort to provide information on the use of strut-and-tie models in structural design, explanatory notes are included with the ACI 318 provisions. Additionally, two ACI special publications—ACI SP-208 and ACI SP-273—were developed by Subcommittee A, Strut & Tie, of Joint ACI-ASCE Committee 445, Shear and Torsion, in which the application of STM was illustrated through various design examples. Nevertheless, there is a need to provide additional guidance on the use of STM techniques.

1.2—Objectives

This document focuses on the ACI 318-19 implementation of strut-and-tie modeling. The main objectives of this document are to: 1) explain the intent and application of ACI 318 STM provisions; 2) provide additional design guidance for the STM based on other design codes, specifications, and committee documents; and 3) present design recommendations from recent research publications. This document is intended to provide practical guidance to the structural design community.

CHAPTER 2—NOTATION AND DEFINITIONS

2.1—Notation

This section defines notations used in this guide.