The Steel Framing Industry Association

SFIA 102: Cold-Formed Steel and Mid-Rise Construction

Agenda

- Welcome & housekeeping
- A word about SFIA
- Speaker introduction
- Presentation
- Q&A

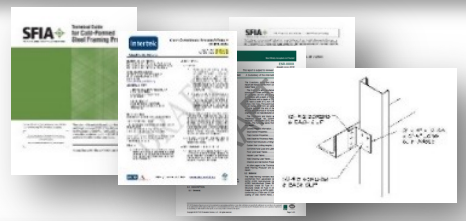
SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Welcome & Housekeeping

- Thank you for attending our webinar today!
- Mics are muted. Please ask any questions in the chat or Questions windows.
- A PDF of the presentation and a Certificate of Attendance will be available in your Steel Framing Learning Portal account after the webinar.
- Please submit your AIA number to Meredith Perez in the chat or email it to Meredith@CFSteel.org if you wish to have your learning units recorded.
- If you are a group viewing the presentation from a single computer, please email Meredith for the **Group AIA attendance form** so we can report LUs for everyone who attended. Meredith@CFSteel.org

Major Programs and Services: Tools, Information and Support

Technical Tools / Services



Marketing / Promotion

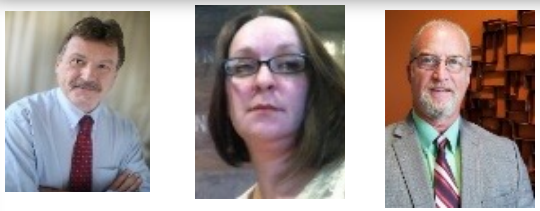
BuildSteel™
Powered by the Steel Framing Industry Association

Business Planning

Structural Tons Reported	Q1'19	Q2'19	Q3'19	Q4'19	Total 2019
East	51,100	52,368	-	-	103,468
North Central	18,368	20,529	-	-	38,897
South Central	27,605	28,445	-	-	56,050
West	34,441	35,854	-	-	70,295
Total					

NonStructural Tons Reported	Q1'19	Q2'19	Q3'19	Q4'19	Total 2019
East	64,593	66,000	-	-	130,593
North Central	21,539	23,172	-	-	44,711
South Central	22,240	24,899	-	-	47,139
West	24,017	27,806	-	-	51,823
Total	132,389	141,877	0	0	274,266

SFIA Staff

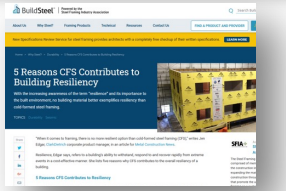


Architectural Services

Educational Programs

CONTINUING EDUCATION AIA

Sustainability



EPD VERIFIED

Research and Innovation

Advocacy

Certification

Introducing our Speaker!

Patrick W. Ford, P.E., S.E.
Technical Director of the Steel Framing Industry Association, overseeing the SFIA's code compliance certification programs and all technical resources, including the SFIA code reports and Technical Product Catalog.

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SFIA 102: Cold-Formed Steel and Mid-Rise Construction

Presenter: Patrick Ford, PE, SE

Date: February 15, 2023

AIA
Approved Continuing Education

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Approved
Continuing
Education

Course Description

This program will explore the use of cold-formed steel assemblies in mid-rise construction. It is intended to provide instruction on the capacity of cold-formed steel framed assemblies in both structural and non-structural applications found in mid-rise buildings.

Learning Objectives

1. Participants will explore the **capacity** of cold-formed steel structures to meet the requirements for Mid-Rise Construction
2. Participants will investigate the **building codes requirements** for cold-formed steel in Mid-Rise Construction
3. Participants will learn some basic **detailing** techniques for designing cold-formed steel assemblies
4. Participants will examine actual **examples** of Mid-Rise structures using cold-formed steel assemblies

Topics

- Cold-Formed Steel Background
- Cold-Formed Steel Capacity
- Building Codes
- Basic Details
- Case Studies

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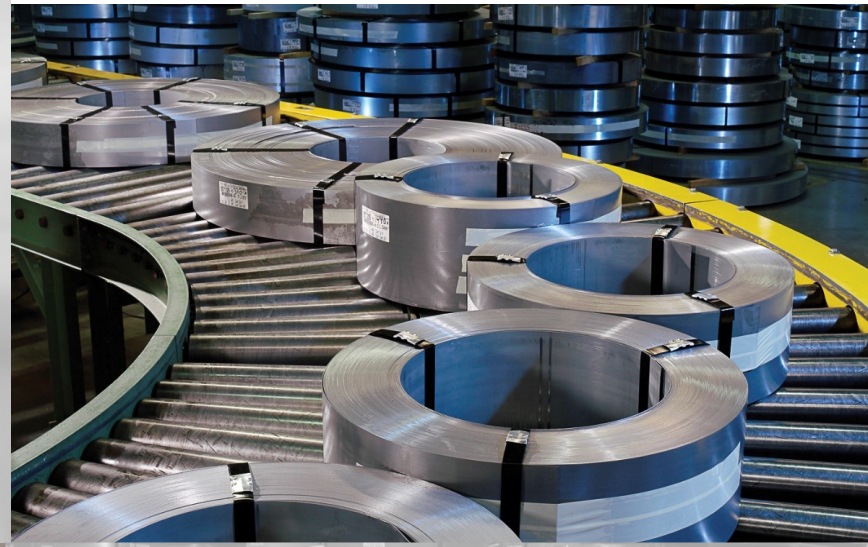
Cold-Formed Steel Background

Hot Dip Galvanized Coils

Slit to Width



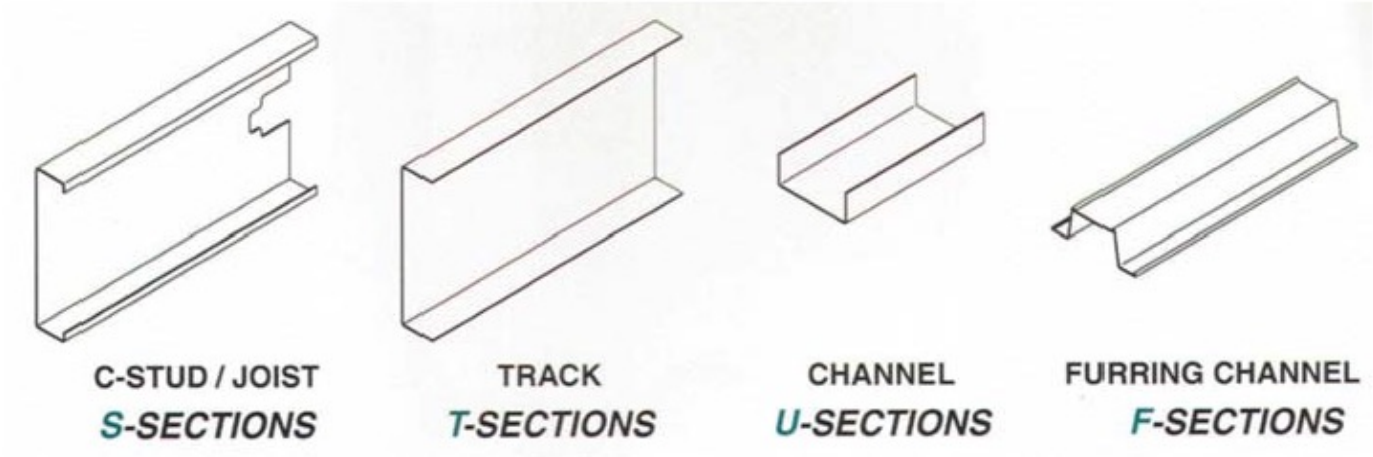



Cold-formed into the Final Product

Cold-Formed Steel Background

Typical Design Thicknesses:
0.0346”; 0.0451”; 0.0566”; 0.0713” & 0.1017”
Nominal Thicknesses -
(MINIMUM base steel thickness – exclusive of coating):

33 Mils=20ga 43 Mils=18ga 54 Mils=16ga



68 Mils=14ga 97 Mils=12ga

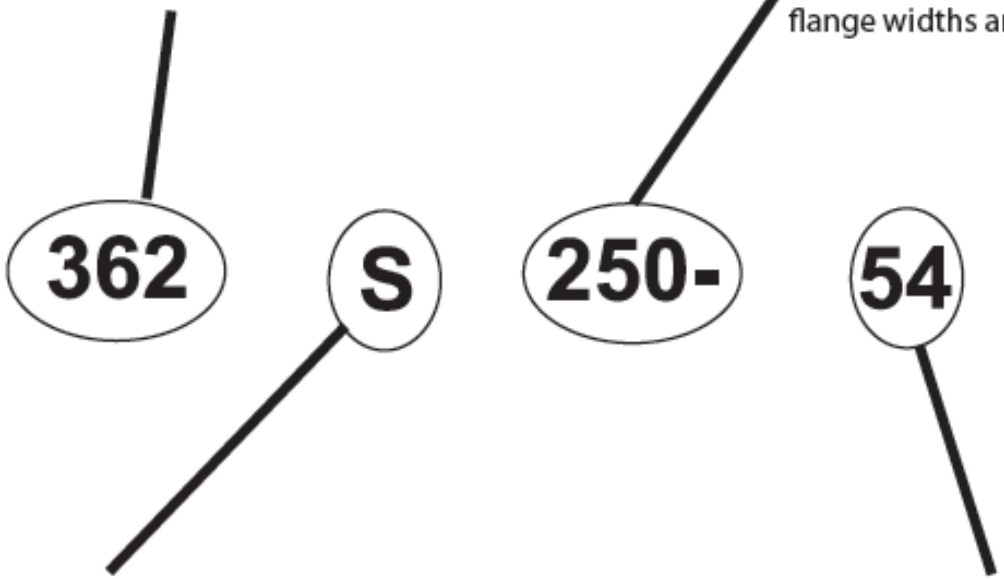
Cold-Formed Steel Background

MEMBER DEPTH:

(Example: 3-5/8" = 3.625" ~ 362 x 1/100 inches) All member depths are taken in 1/100 inches. For all "T" Sections, member depth is the inside- to- inside dimension.

FLANGE WIDTH:

(Example: 2-1/2" = x 1/100 inches) All flange widths are taken in 1/100 inches.



STYLE:

(Example: Stud or Joist section = S)
The four alpha characters utilized by the designator system are:
S = Stud or Joist Sections
T = Track Sections
U = Channel Sections
F = Furring Channel Sections

MATERIAL THICKNESS:

(Example: 0.054 in = 54 mils; 1 mil = 1/1000 in.) Material thickness is the minimum base steel thickness in mils.

Cold-formed Steel Capacity

- Walls Systems
- Floor Systems
- Wind Loads and Drift
- Fire Performance
- Acoustical Performance
- Matsen Tower

Wall Systems

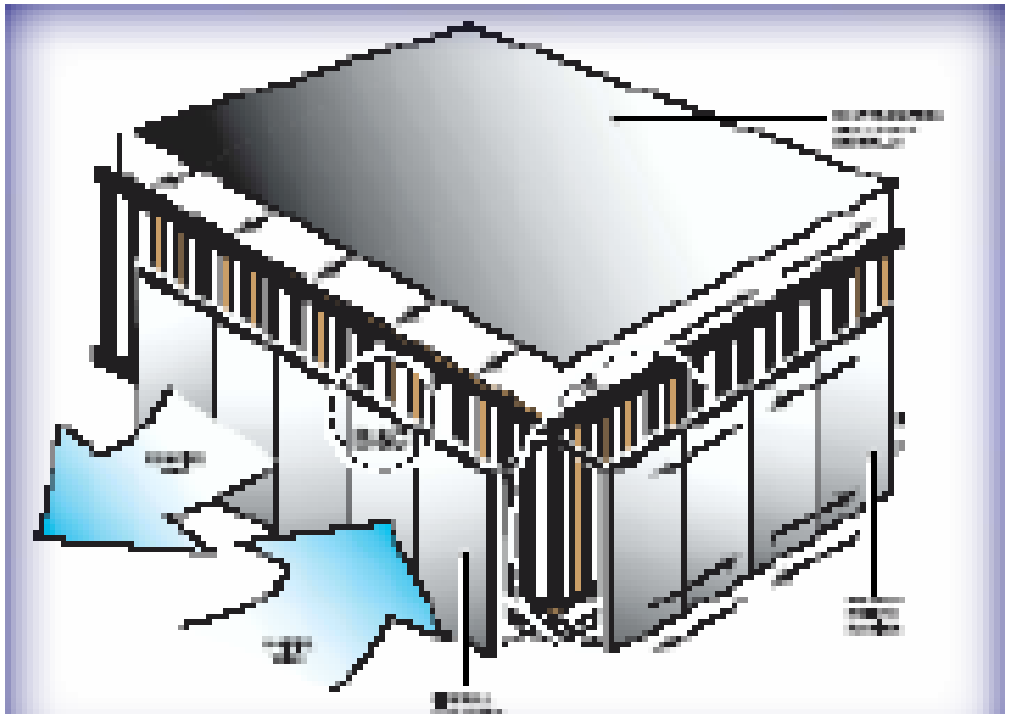
- A six inch deep stud framing assembly has the capacity to support a six story structure

Floor Systems

- Many variations available to meet many design requirements.
- Structural capacity to accommodate live and dead loads of multi-family applications.

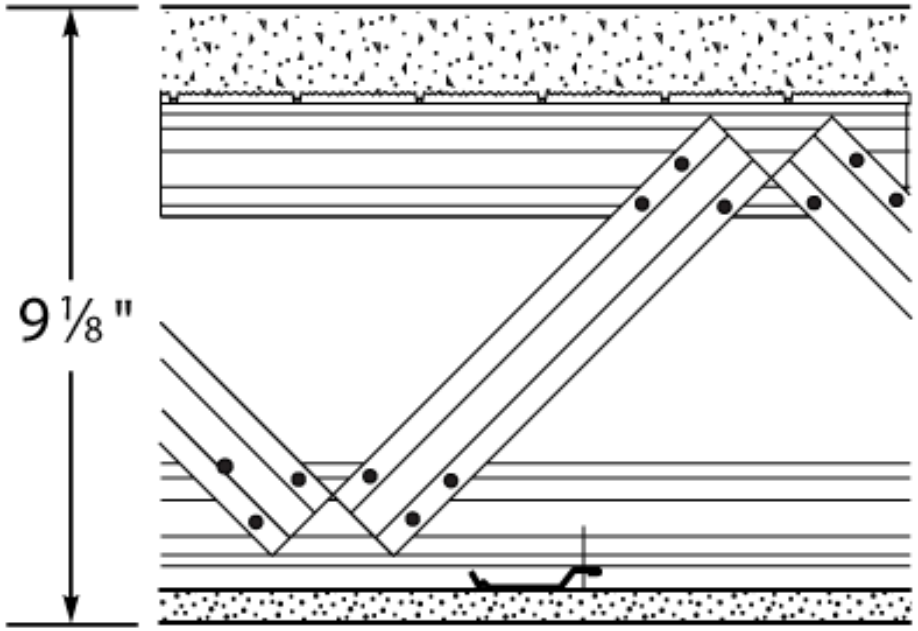
Wind Loads and Allowable Drift

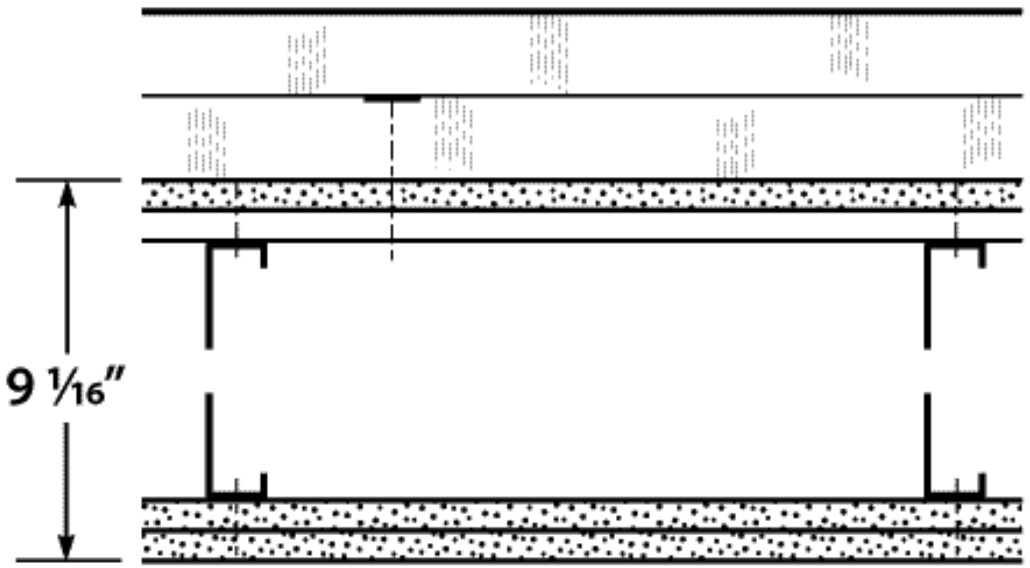
- Exterior walls designed for lateral wind loads
- Shear walls can be designed to meet wind loads and drift



Fire Resistance

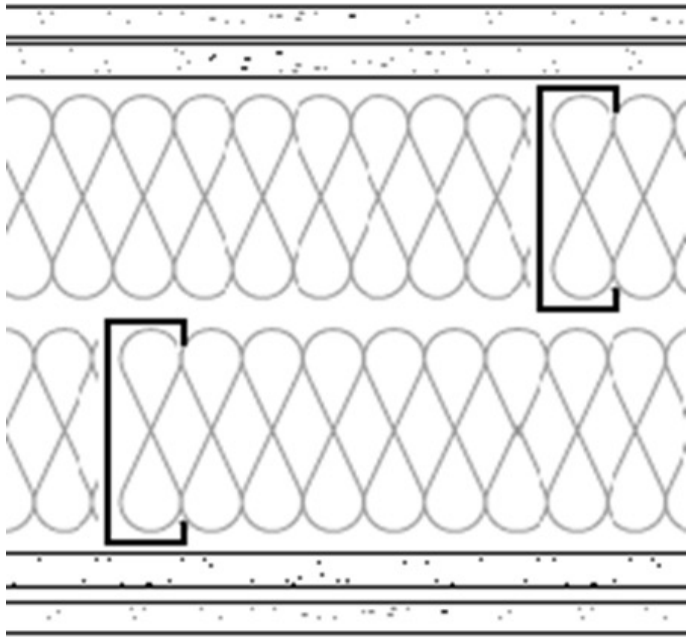
- Non-combustible construction
- Fire Resistant Walls
  - 1-4 hours load bearing and non-load bearing
- Fire Resistant Floors and Roofs

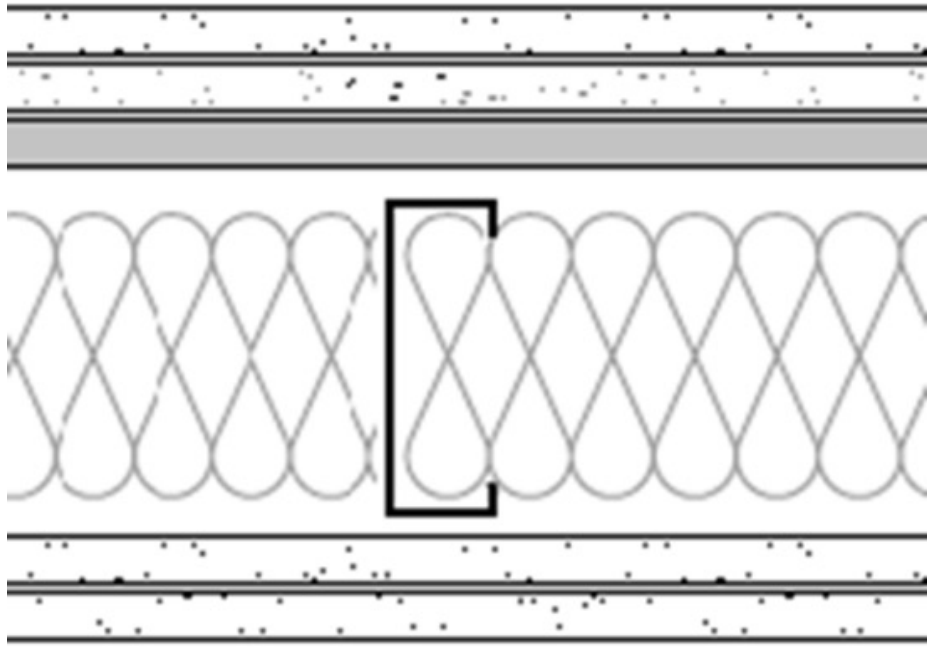




High Performance Acoustics

- Walls – STC up to 66
- Floor Systems
  - STC
  - IIC





Matsen Tower

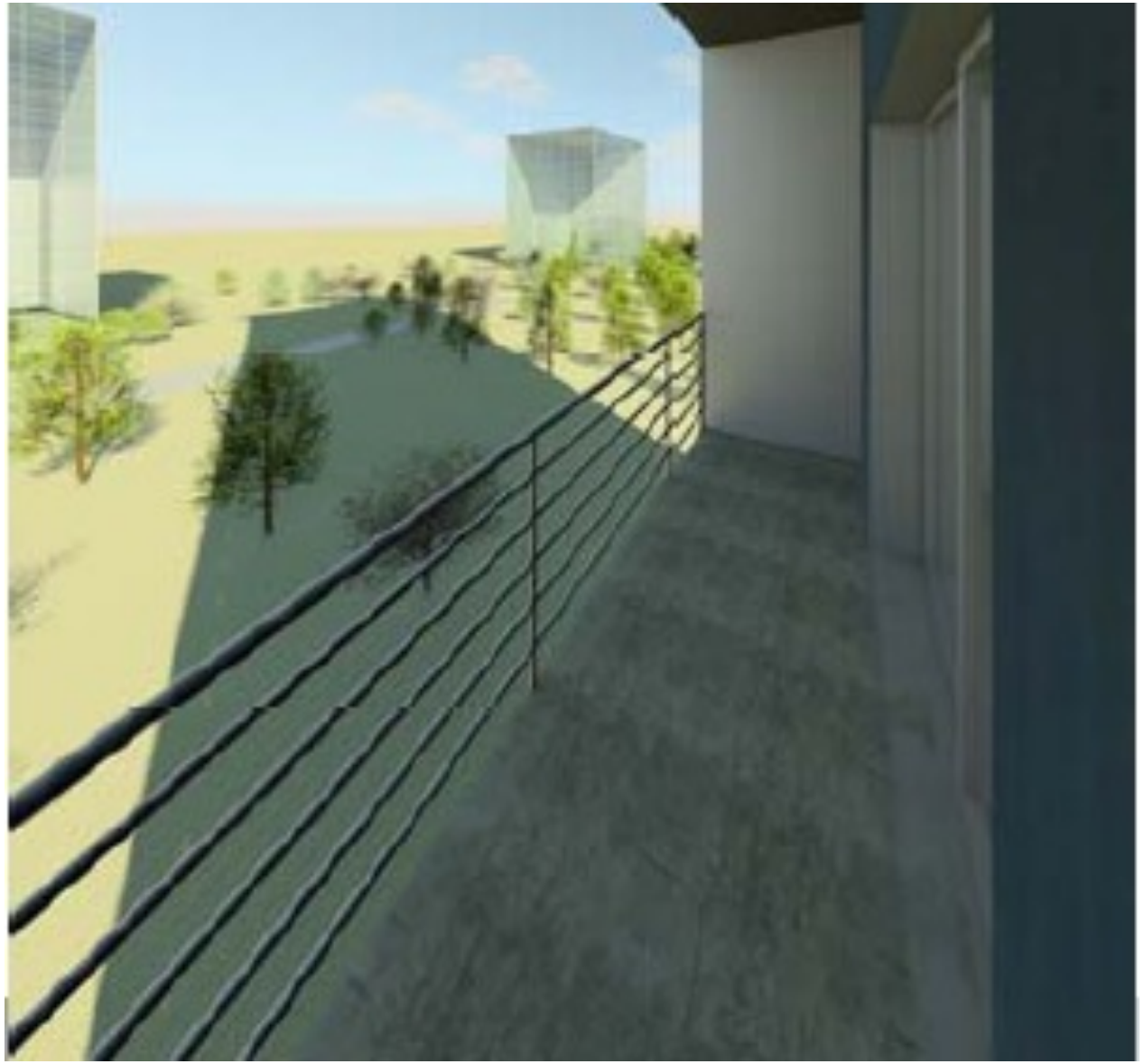
- How tall could CFS go overall?
- Conceptual Design
- Type R-3 Apartment Tower
- Conventional Materials
- Generic SFIA cold-formed steel profiles

Matsen Tower

- Physical description
  - 10’-0” story heights
  - 25’- 6” c-c demising walls
  - 2 stairwells (CIP)
  - 4 elevator central core (also CIP)
  - Central corridor

Matsen Tower

- 6” C Studs
- 12” C Joists
- 12”, 16”, 24” spacing
- Lightweight EPDM on metal roof deck
- 1-1/2” gypsum concrete on metal deck floors
- Lightweight exterior finishes
- Aluminum post balconies each floor



Building Codes & Standards

- North American Specification for the Design of Cold-Formed Steel Structures (AISI)
- ANSI Accredited Standards
- Height and Area Tables – Chapter 5 IBC
  - Tables 504.3 & 4 and 506.2

GROUP		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	HEIGHT (feet)	UL	160	65	55	65	55	65	50	40
		STORIES(S) AREA (A)								
M	S A	UL UL	11 UL	4 21,500	2 12,500	4 18,500	2 12,500	4 20,500	3 14,000	1 9,000
R-1	S A	UL UL	11 UL	4 24,000	4 16,000	4 24,000	4 16,000	4 20,500	3 12,000	2 7,000
R-2	S A	UL UL	11 UL	4 24,000	4 16,000	4 24,000	4 16,000	4 20,500	3 12,000	2 7,000
R-3	S A	UL UL	11 UL	4 UL	4 UL	4 UL	4 UL	4 UL	3 UL	3 UL
R-4	S A	UL UL	11 UL	4 24,000	4 16,000	4 24,000	4 16,000	4 20,500	3 12,000	2 7,000
S-1	S A	UL UL	11 48,000	4 26,000	2 17,500	3 26,000	2 17,500	4 25,500	3 14,000	1 9,000
S-2	S A	UL UL	11 79,000	5 39,000	3 26,000	4 39,000	3 26,000	5 38,500	4 21,000	2 13,500
U	S A	UL UL	5 35,500	4 19,000	2 8,500	3 14,000	2 8,500	4 18,000	2 9,000	1 5,500

Basic Details

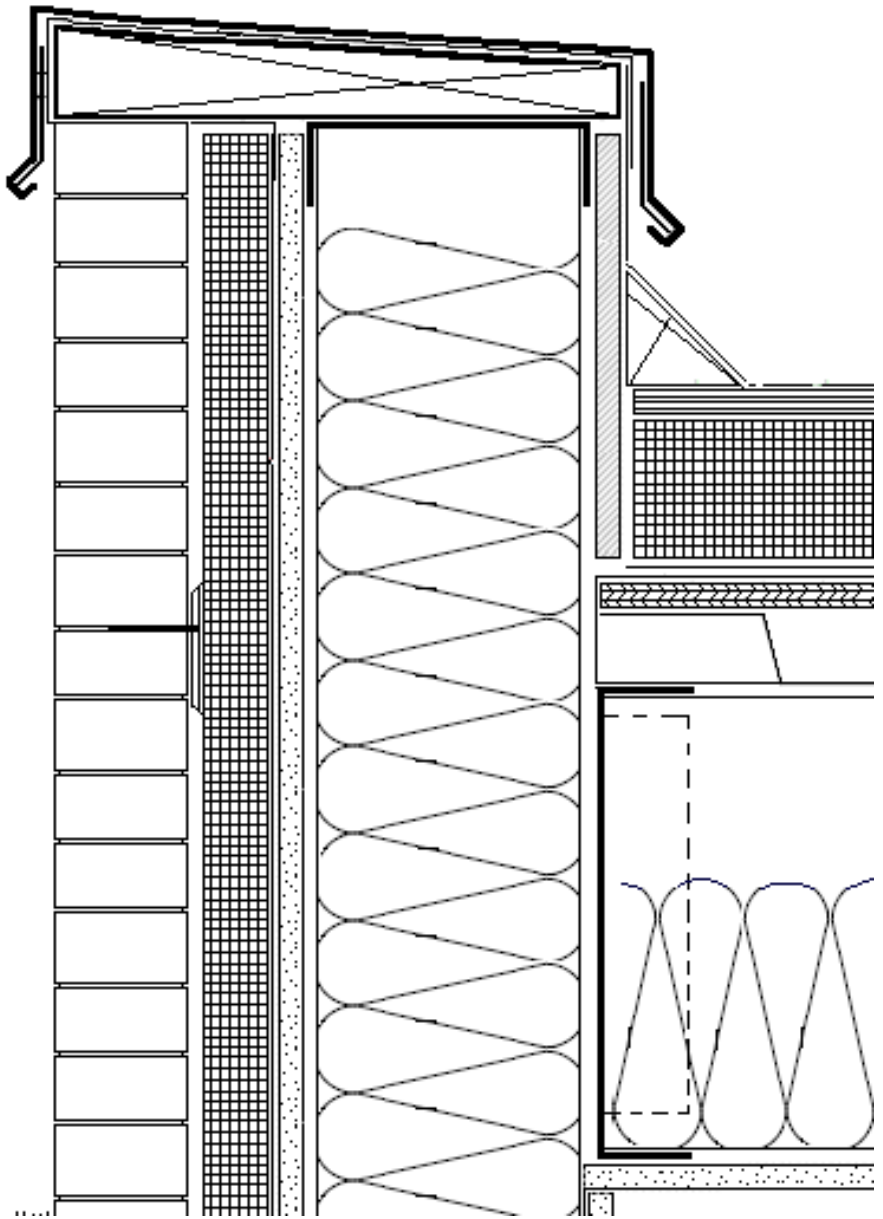
- C-shaped wall studs
  - 12”, 16”, or 24” on center
- Top and bottom tracks
  - Similar to top and bottom plates in wood frame constructions
- Bracing
  - Either channel shape through the punchout
  - Or flat strap on the flanges

Basic Details

- Brick Veneer Details
  - Roof Parapet
  - Window Head
  - Window Jamb
  - Window Sill
  - Intermediate Floor
  - Foundation

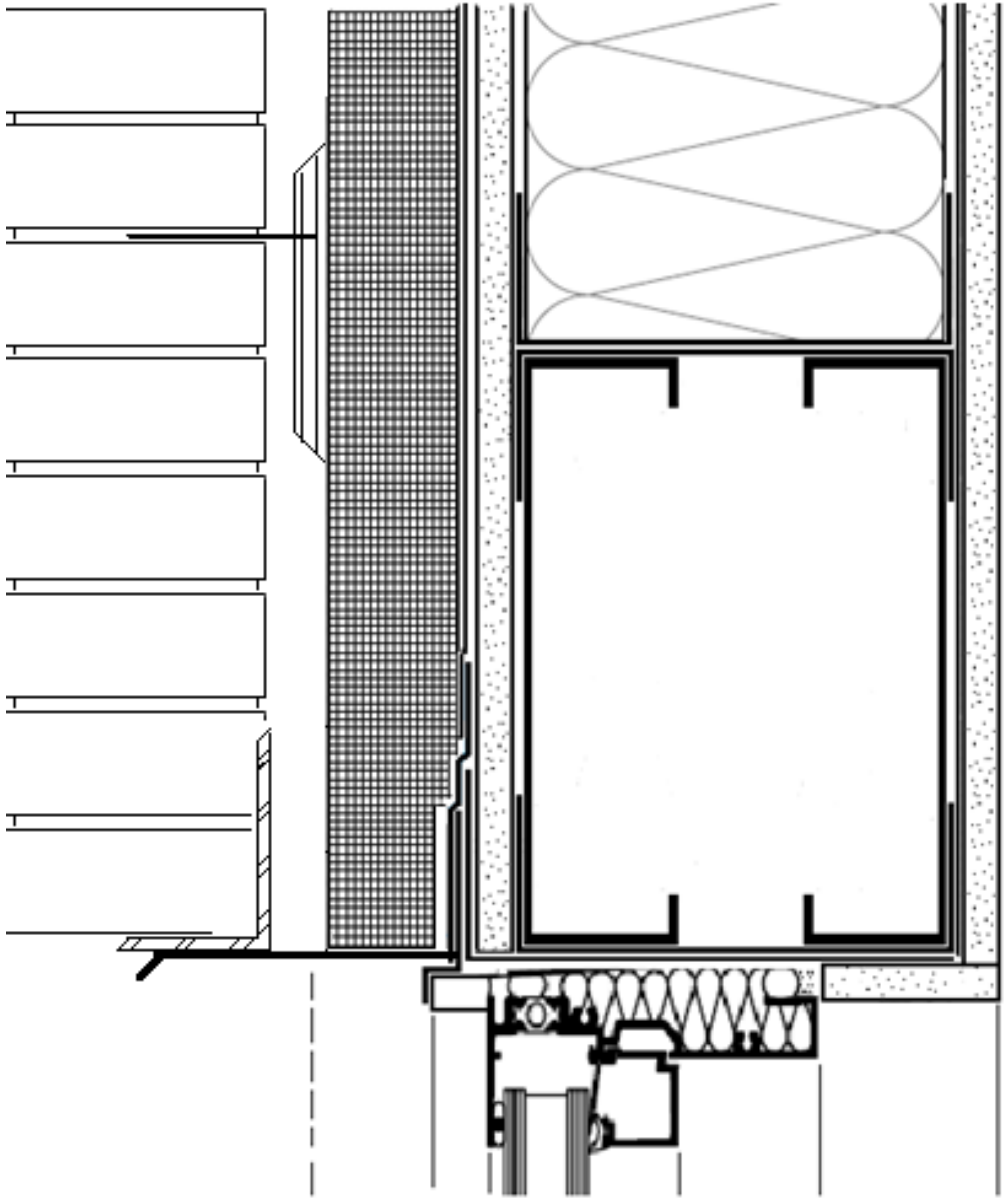
Basic Details

- Roof Parapet
  - Although expansion and contraction properties of the brick and steel are very good, the blocking for the top coping should not be fastened to the brick in any way



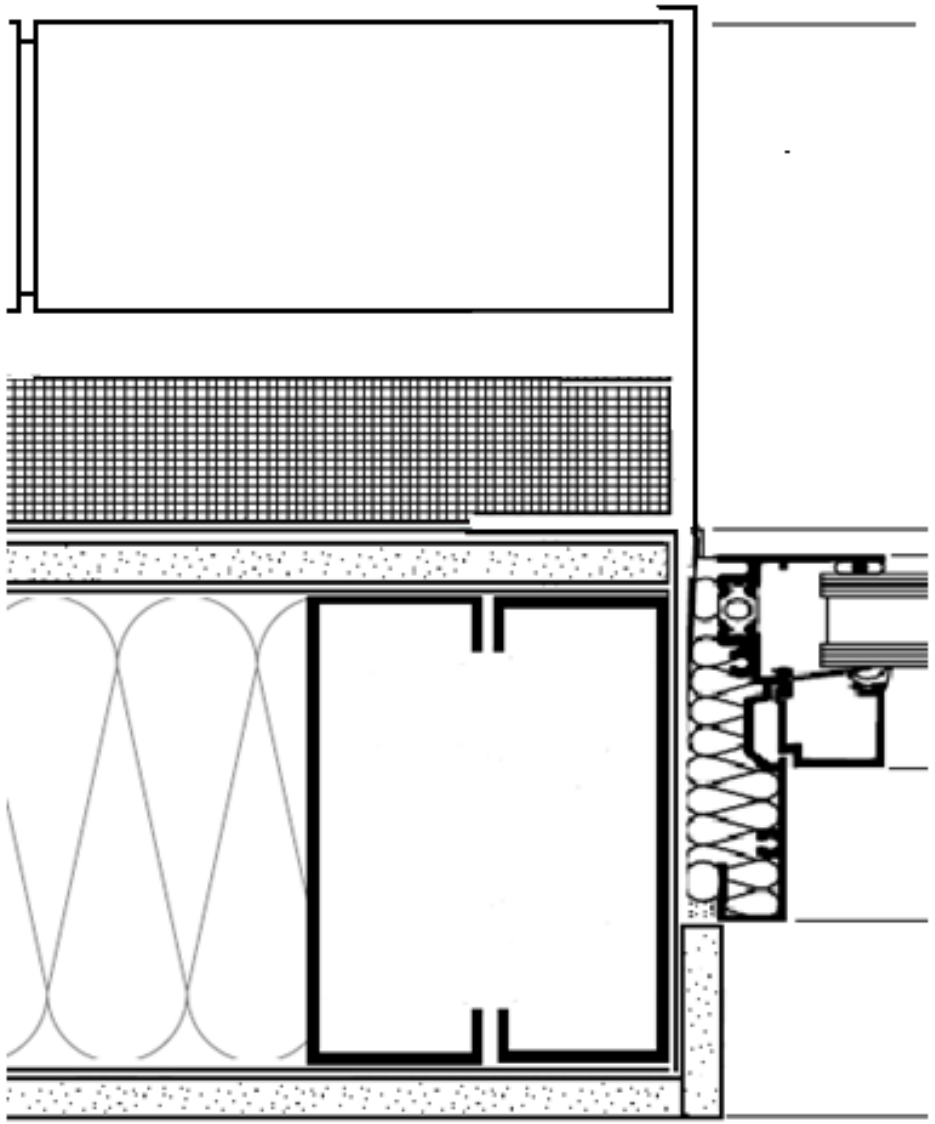
Basic Details

- Window head
  - Based on loose lintels (supported by the brick jambs, not the CFS jambs in all possible cases.



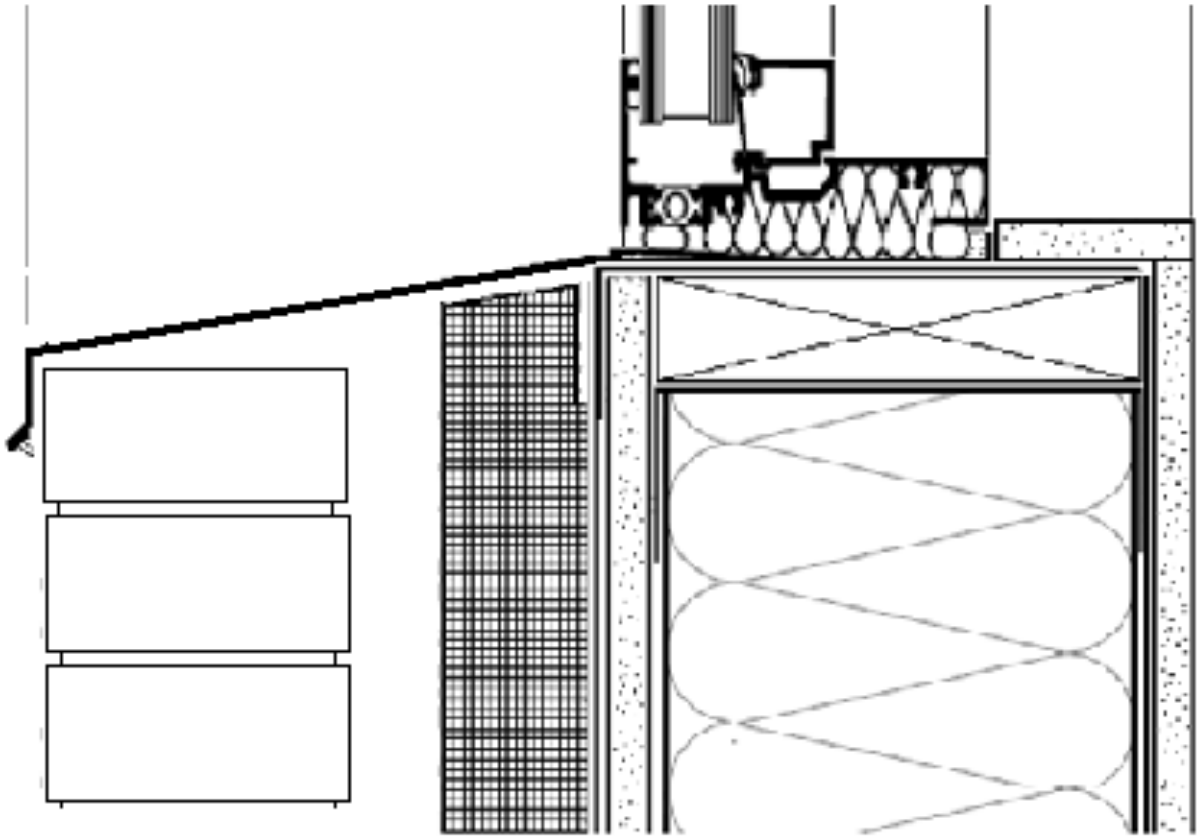
Basic Details

- Window jamb
  - Flashings and/or a brick return detail must close off the opening at the windows.



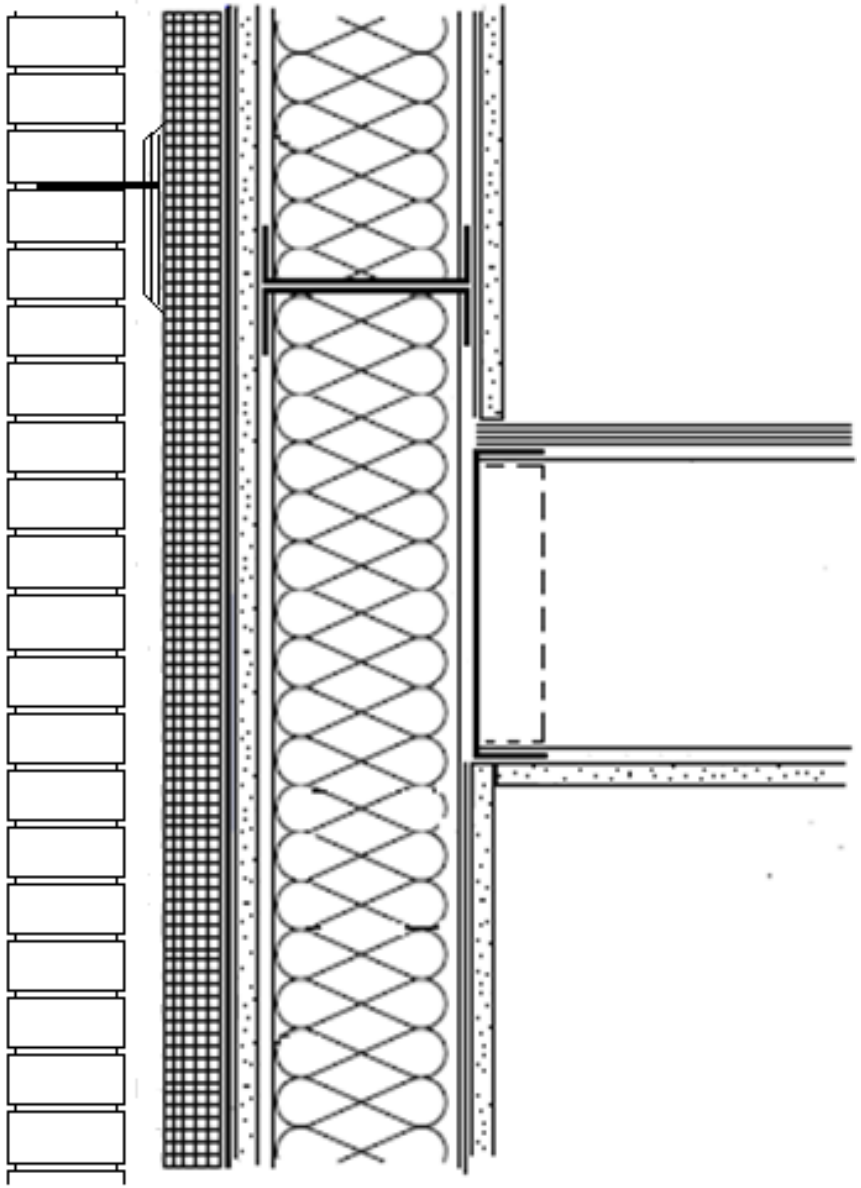
Basic Details

- Window sill
  - Again, no blocking should bridge the CFS and brick. In this detail, the flashing will weatherproof the junction and allow for any slight amount of differential movement.



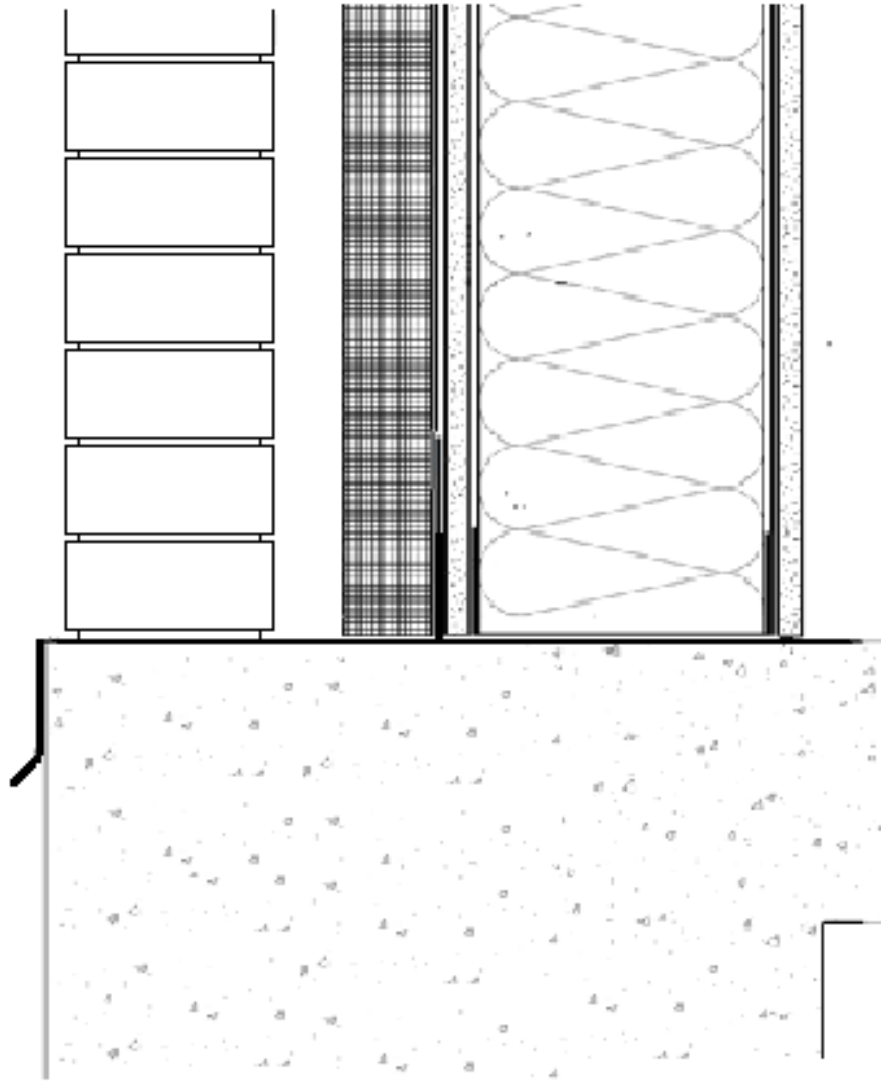
Basic Details

- Intermediate floor
  - Notice the lack of a brick relief angle, thanks to the engineered brick solution.
  - If required, the relief angle detail can become onerous, and nearly always requires welding.



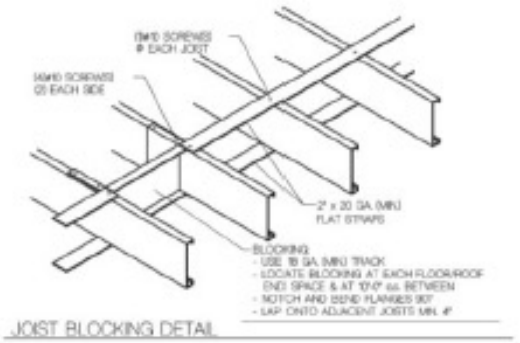
Basic Details

- Foundation
  - This location, or the podium level, provides the bearing for the entire brick veneer façade in this instance.

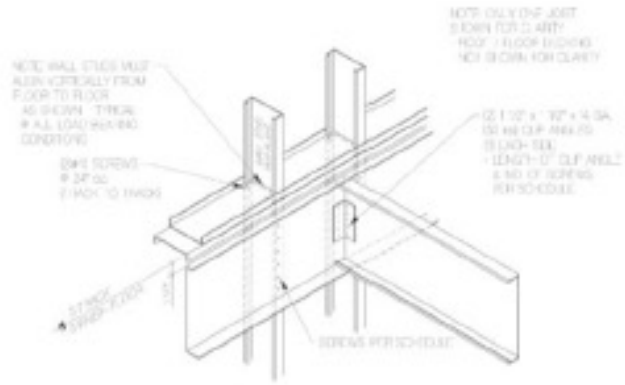


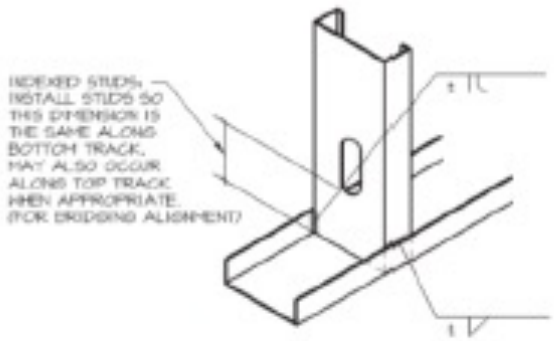
Basic Details

- Some sample structural CFS details:

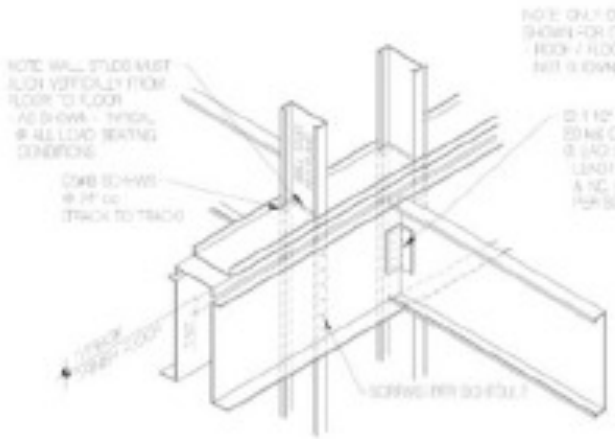


JOIST BLOCKING DETAIL


EXTERIOR BEARING JOIST TO WALL



TYPICAL STUD TO TRACK CONNECTION


INTERIOR BEARING JOIST TO WALL

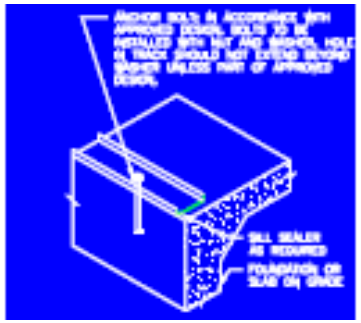
Construction Basics — Track to Slab Connection

- Pneumatic and Powder Driven Pins

- Threaded Anchor

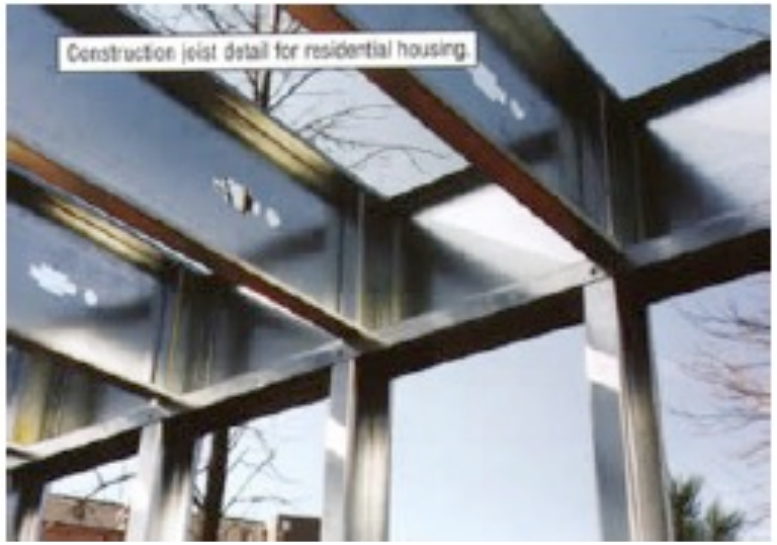
- Epoxy or Expansion

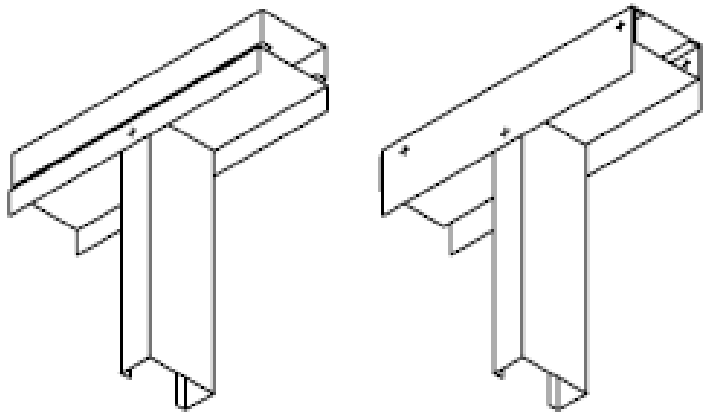
- Anchor Bolts



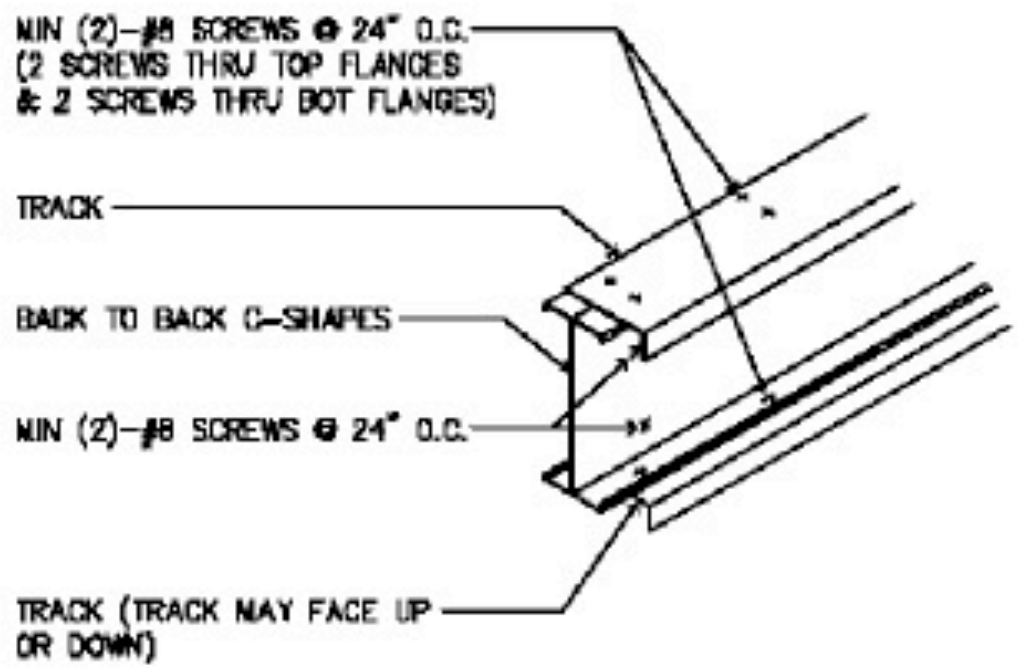
Construction Basics — Top Plate

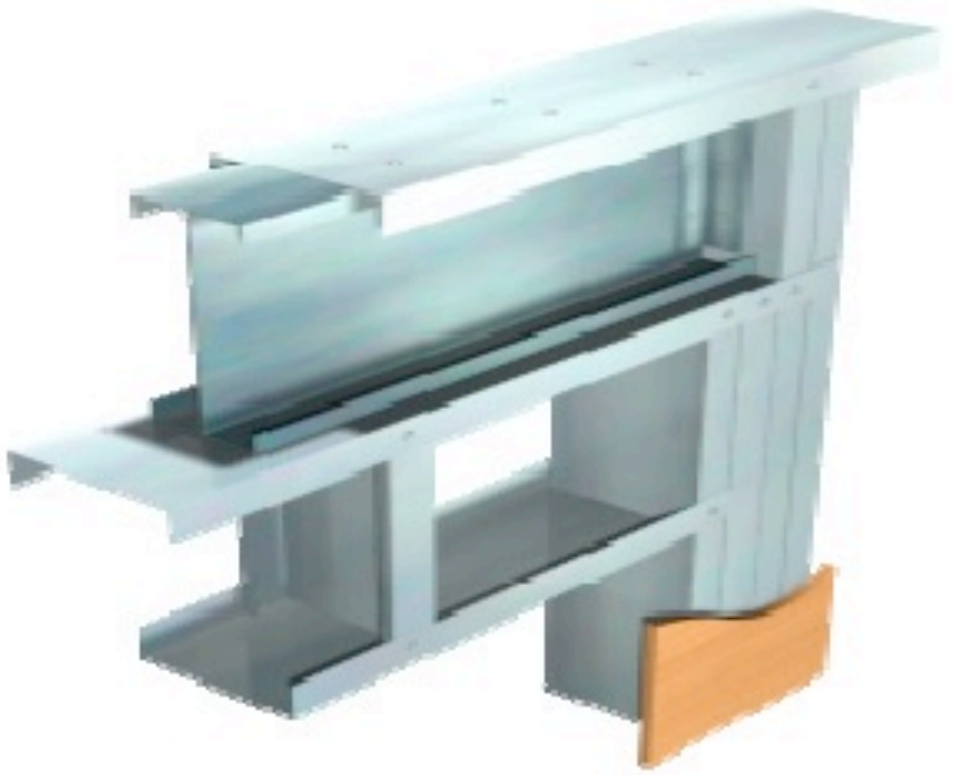
- Floor Joists and Trusses or Rafters must bear directly over wall stud members (in-line framing) or incorporate a load distribution top track to transfer forces to adjacent studs (typical mid-rise detail).





Construction Basics — Back-to-Back Headers





Construction Basics — Lateral Systems

Plywood, OSB, Gypsum

Flat Strap Steel X Bracing

Sheet Steel

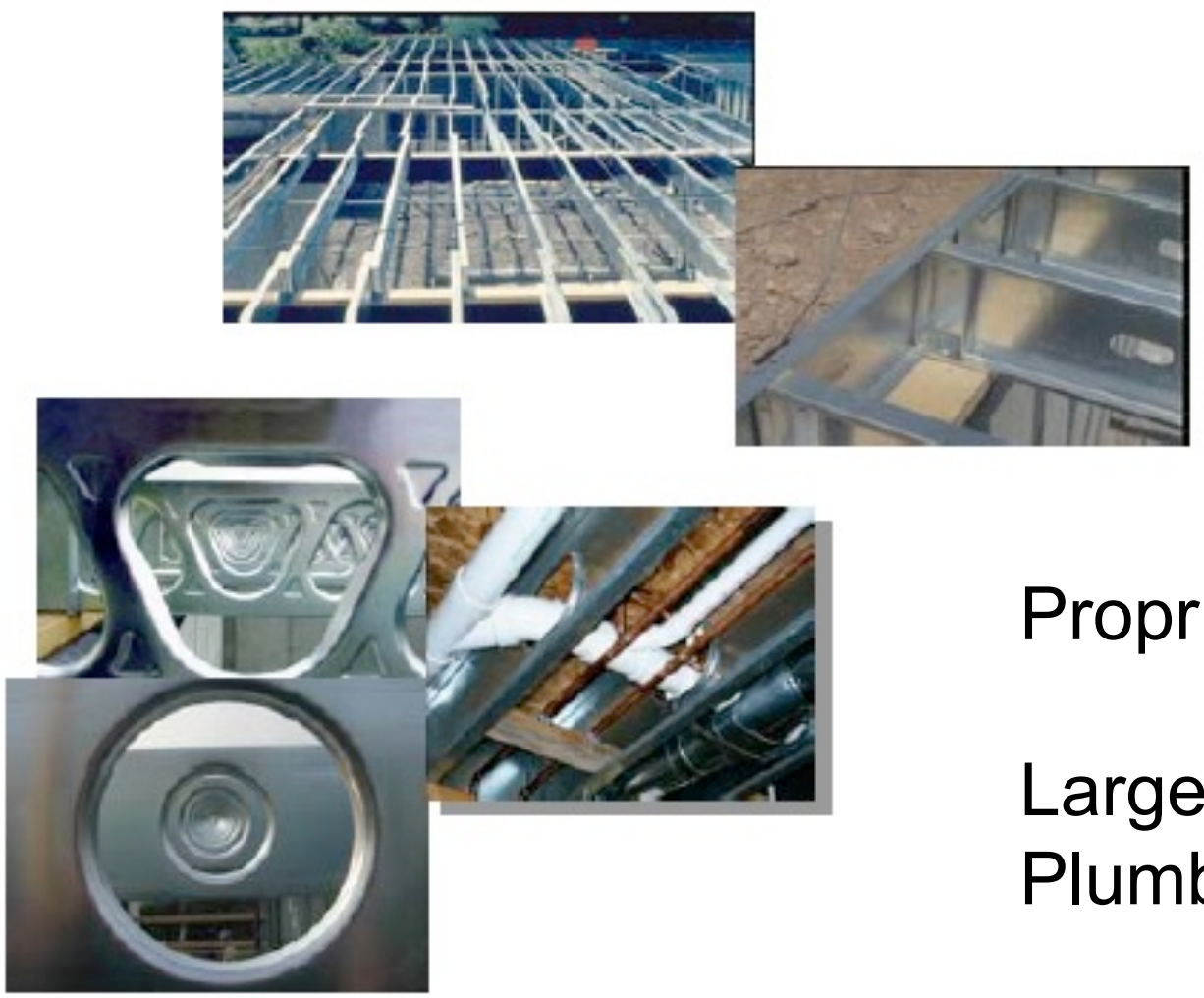
Proprietary Panels

Construction Basics — Roof Systems

Pre-Engineered Truss

C Section Rafter & Joist

Construction Basics — Floor Systems



Generic C Section
Joist and Track

Proprietary Sections:

Large Openings for
Plumbing and HVAC

Construction Basics — Floor Systems

Steel Floor Truss

Construction Basics — Common Floor Toppings

Combustible

- Plywood
- OSB
- Fire Retardant Treated Wood

Noncombustible

- Corrugated Metal Deck
  Poured Cementitious Toppings
- Cementitious Sheathing

Construction Basics — Alternate Floor System

Composite Steel Deck
with Poured Concrete

Case studies

Poly Canyon Village Student Housing

—

California Polytechnic State University

- Project Design-Build Team
  - Niles Bolton, MVE Institutional of Irvine, Clark Construction
- Steel Framing Installer
  - KHS&S
- Largest Cold-Formed Steel Project In California
- Housing for 2,700 Students on 30 Acre Site
- 820,000 Sq. Ft. 11,000 load-Bearing Panels
- 20 Month Schedule Shorten to 14 With CFS
- Earned LEED Points for Recycled Content & Regional Content




Poly Canyon Village Student Housing

—

California Polytechnic State University

“I would absolutely use the system again, especially for these kinds of projects. The manpower on site along with faster construction schedule makes the system with cold-formed steel ideal for low-rise and mid-rise multi-family construction projects.”

Mark Blackmon, Clark Design/Build of California, Inc.



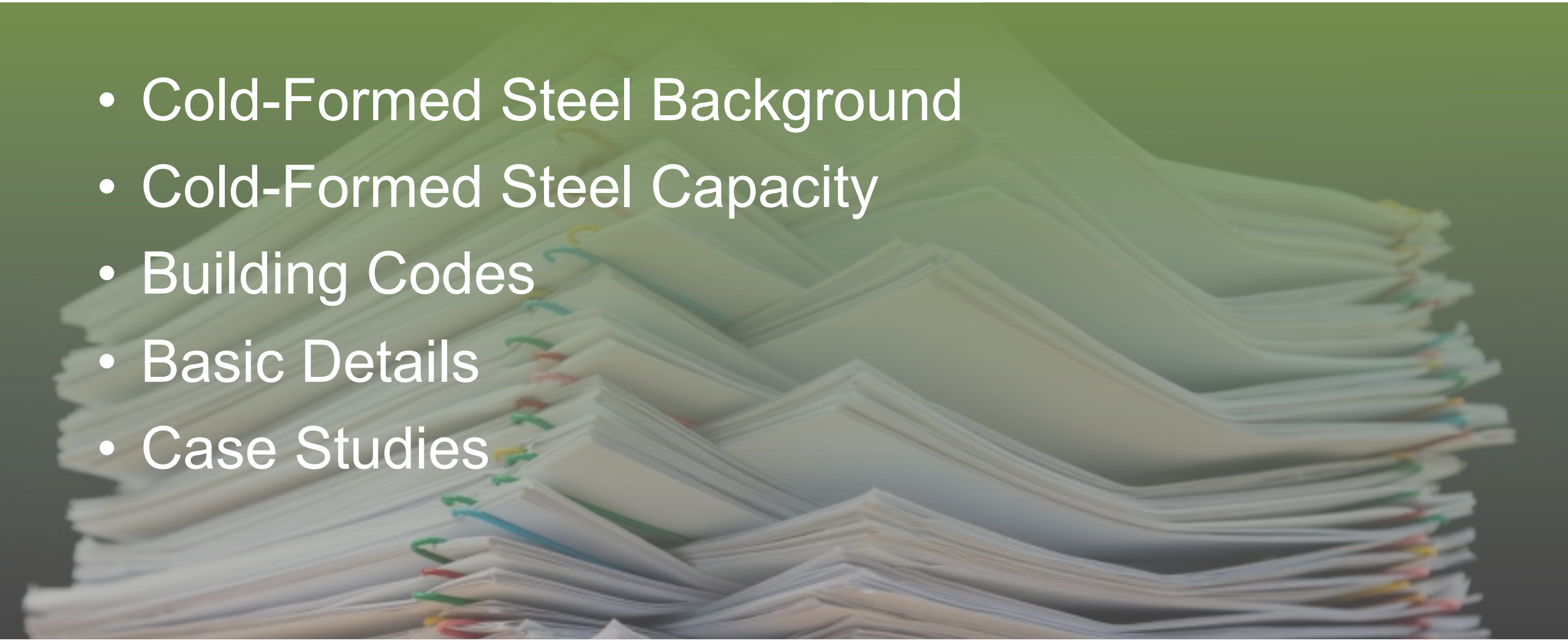

Sheridan College Student Residence Oakville, Ontario Canada

- Owner: Campus Living Centres, Toronto, ON
- Architect: Malhota Architects, London, ON
- CFS Steel Engineer & Contractor: Magest Building Systems
- CFS Fabricator: Nucor Steel

Sheridan College Student Residence Oakville, Ontario Canada

- 6 Stories, 186,000 sf
- Housing for 250 students
- $25 million construction cost
- 33-97 mil stud / track
- Panelized exterior walls
- Hollow core concrete floors

Summary



- Cold-Formed Steel Background
- Cold-Formed Steel Capacity
- Building Codes
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- Case Studies

Approved Continuing Education

This concludes The American Institute of Architects Continuing Education Systems Course

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