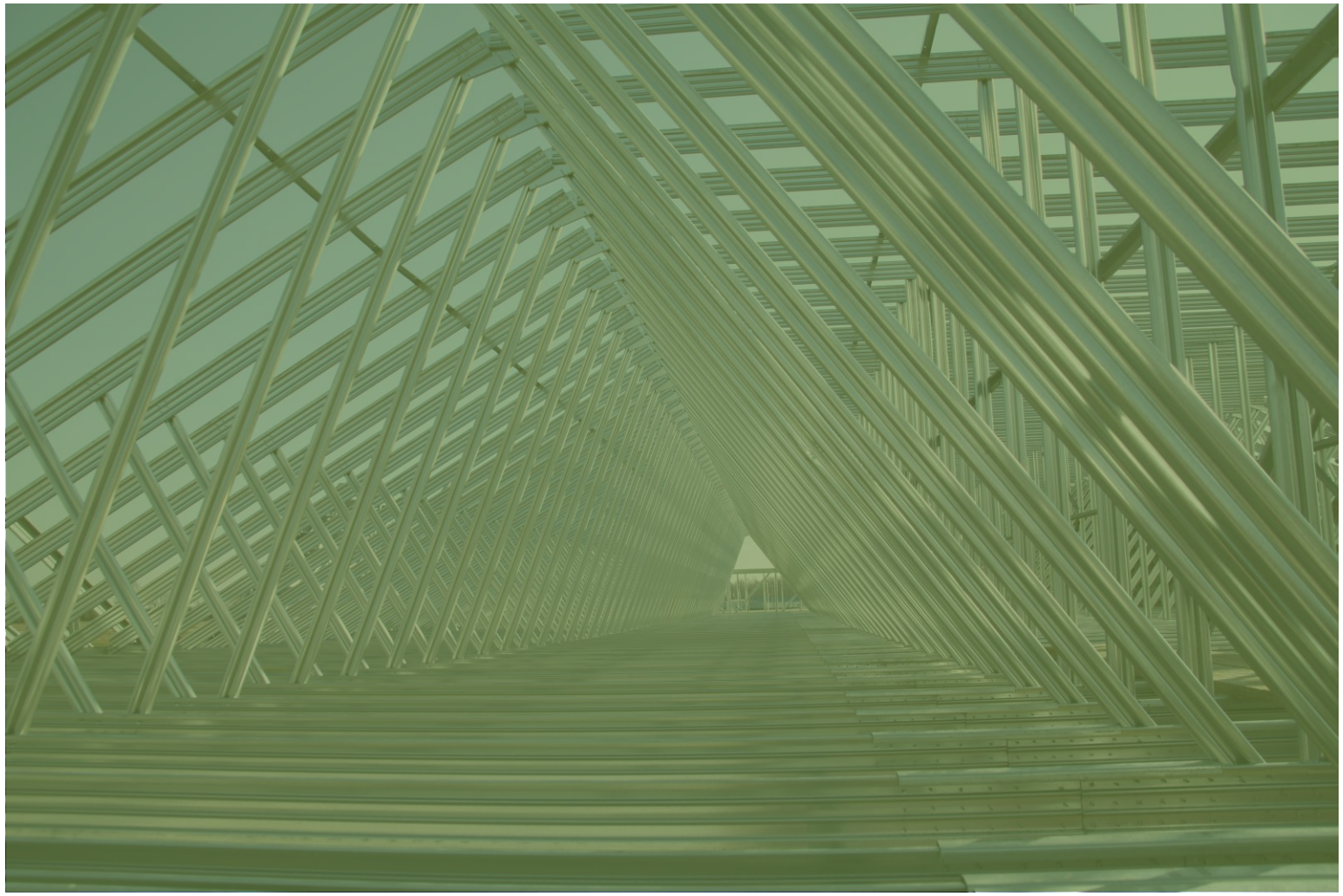


SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

SFIA 160: Specification and Design of Cold-Formed Steel Trusses

Presenter: Peter A. Humphrey, P.E.

Date: November 20, 2025

AIA
Approved Continuing Education

Overview

- Welcome & housekeeping
- A word about SFIA
- 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@steelframing.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@steelframing.org

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

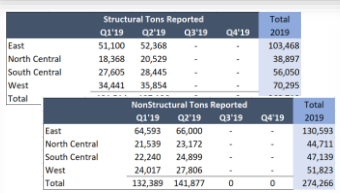
Major Programs and Services: Tools, Information and Support

Technical & Research Services

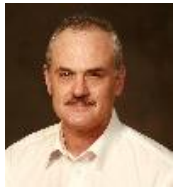
Marketing / Promotion

BuildSteel™
Powered by the Steel Framing Industry Association

Business Planning



SFIA Staff



Architectural & Project Assistance

RIB | SpecLink

Educational Programs

AIA Approved Continuing Education

Sustainability

EPD VERIFIED

Codes & Standards

ANSI
American National Standards Institute

Advocacy

Certification

Introducing our Speaker!

PETER A. HUMPHREY, P.E.

MiTek®

Peter is the Director of Engineering for MiTek's Structural Framing Systems group with over 30 years of experience in the Building & Construction Industry. Having practiced consulting structural engineering for 20 years prior to specializing in cold-formed steel on the manufacturing side of the business provides a unique insight and understanding of the industry.

He has extensive experience in cold-formed steel framing design with an emphasis on truss systems and has developed a passion for new product development. His consulting engineering experience includes significant work in educational facilities (K-12 and college/university), commercial & industrial projects, institutional & public facilities, multi-family housing & senior living projects, and restoration & renovation projects.

Peter holds a Bachelor's Degree in Architectural Engineering from Penn State University. He is a licensed Professional Engineer in multiple states.

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 course will provide an in-depth overview of cold-formed steel (CFS) truss systems, highlighting their performance capabilities, system benefits, and project applications. As delegated design is typically used with CFS truss systems, an overview of the process will be provided, highlighting the roles and responsibilities of the Engineer of Record and the Truss Design (Specialty) Engineer.

Recognizing the critical importance of aligning the design intent of the Engineer of Record and the delegated design of the cold-formed steel trusses by the Truss Design Engineer, an overview of the design criteria required to be specified will be presented. In addition, special loading and design conditions will be highlighted with an emphasis on the critical information required to be specified and/or coordinated.

By highlighting the overall capabilities of cold-formed steel truss systems, reviewing the delegated design process, and identifying special loading and design issues, a greater understanding and appreciation of CFS truss systems can be achieved along with an awareness of the critical coordination items and special loading conditions to be addressed to support the successful completion of projects incorporating cold-formed steel truss systems.

Learning Objectives

- Highlight the performance capabilities, benefits, and project applications of CFS truss systems.
- Review the delegated CFS truss design process, highlighting the roles & responsibilities of the Engineer of Record and the Truss Design (Specialty) Engineer.
- Review the design criteria required for the CFS truss design, highlighting the critical importance of aligning the component design intent with that of the overall building structure.
- Identify special loading and design conditions that may require additional review and coordination.

Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Presentation Outline

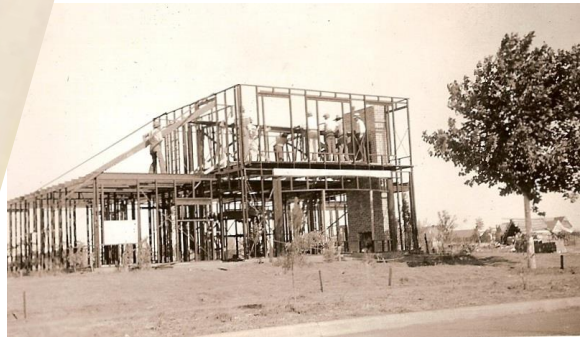
- **Cold-Formed Steel Overview**
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Cold-Formed Steel Overview

Birth of an Industry

- 1850's: Start of Cold-formed steel – "portable iron houses"
- 1933: "Home of the Future" World's Fair – Chicago



Early Adoption

- 1946: AISI Specification for Design of Light Gauge Steel Members
- 1950's: Increasing use of CFS studs and the self-drilling screw is developed
- 1960's: CFS used in curtain walls and exterior framing with brick veneer

Cold-Formed Steel Overview

Structural Applications

- 1980's: CFS Trusses designed by Engineers using C-Studs
- 1990's: Proprietary CFS truss systems developed
- 1994: Light Gauge Steel Engineers Association (LGSEA) founded

Structural System

- 2000's: Widespread adoption for structural applications: walls, floors and roofs
- 2000's: Increased focus on off-site construction for quality and productivity
- 2006: Cold-formed Steel Engineers Institute (CFSEI)
- 2011: Steel Framing Industry Association founded.
- 2025: CFS-NHERI Project - 10-story full CFS seismic testing at UC San Diego

Presentation Outline

- Cold-Formed Steel Overview
- **CFS Truss System Capabilities**
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

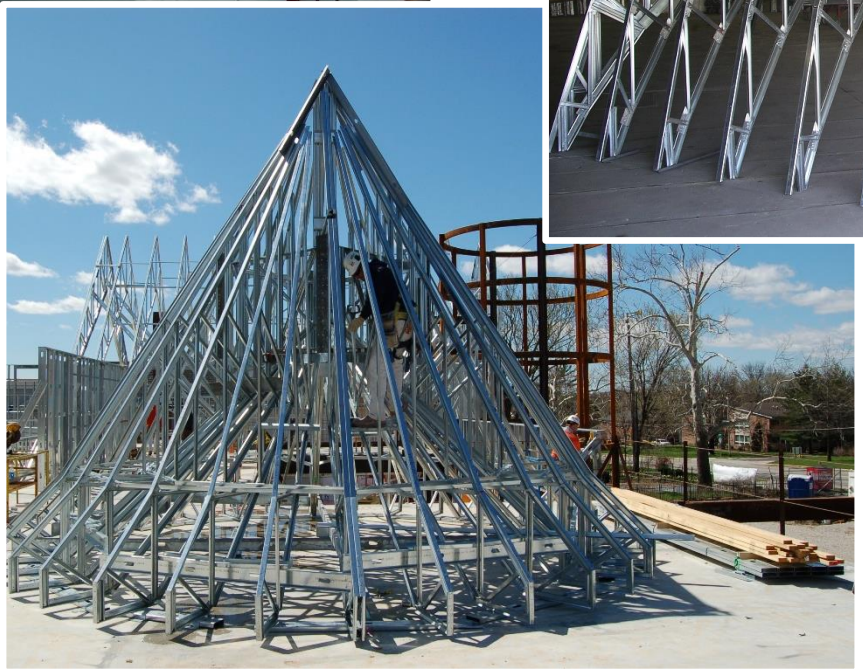
Cold-Formed Steel

…strong, safe, durable, versatile and cost-effective.

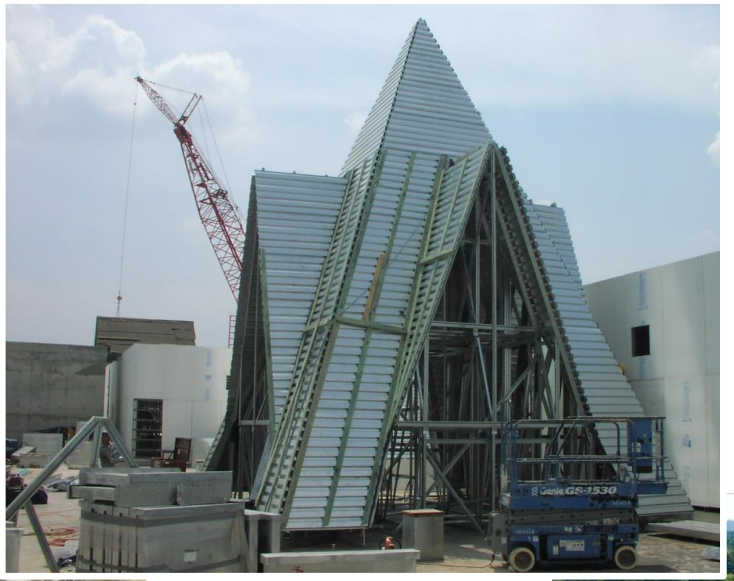
Cold-Formed Steel Trusses

- **Roof Trusses**
  - ✓ Highly versatile, complex roof and ceiling geometry
  - ✓ Spans of 80^{+} feet
  - ✓ Compatible with wide range of roof / decking assembles
  - ✓ Fire rated assemblies
  - ✓ Integration of MEP systems

Complex Roof Profiles



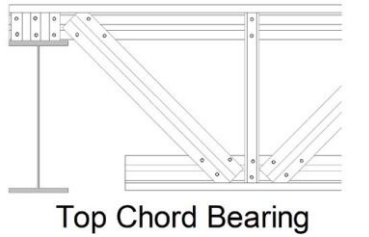
Complex Roof Profiles



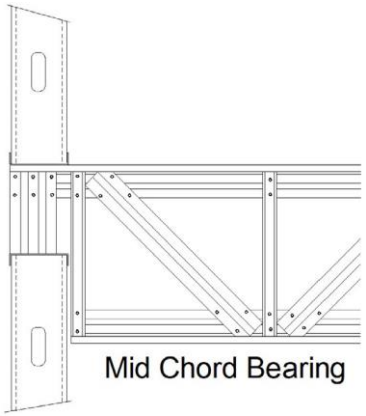
Cold-Formed Steel Trusses

- **Floor Trusses**
  - ✓ Design flexibility
  - ✓ Spans of 40+ feet
  - ✓ Compatible with multiple decking materials and slab assemblies
  - ✓ Multiple bearing configurations
  - ✓ MEP system integration
  - ✓ UL & Sound rated floor assemblies

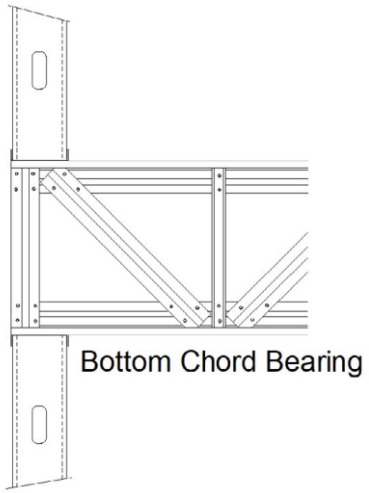
Floor Truss Applications



Top Chord Bearing



Mid Chord Bearing



Bottom Chord Bearing

Cold-Formed Steel

…strong, safe, durable, versatile and cost-effective.

Cold-Formed Steel Trusses

- **Specialty Applications**
  - ✓ Canopies
  - ✓ Seating Risers
  - ✓ Wall / Façade Treatments
  - ✓ Ceiling / Soffit Applications
  - ✓ Mezzanines
  - ✓ Overbuild Framing

Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- **Prefabrication Benefits**
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Cold-Formed Steel Trusses

- Benefits of Prefabrication:
  - ✓ Increased quality and productivity in fabrication
  - ✓ Expedited construction schedule & faster dry-in times
  - ✓ Reduced material waste
  - ✓ Reduced on-site labor requirements
  - ✓ Reduced site requirements / disturbance

Prefabrication

Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- **Project Applications**
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Cold-Formed Steel

…strong, safe, durable, versatile and cost-effective.

Project Applications

- ✓ **Assisted Living**
- ✓ **Commercial**
- ✓ **Military, Government & Municipal**
- ✓ **Multi-Family**
- ✓ **Education / K-12**
- ✓ **Infrastructure**
- ✓ **Hotel & Hospitality**
- ✓ **Industrial**
- ✓ **Religious**

Assisted Living

St. George Care and Retirement Home Atlanta, GA

Commercial

Georgia International Convention Center Atlanta, GA

Military

Camp Pendleton / Fort Bragg

Multi-Family

Villages of Squaw Peak, Phoenix, AZ

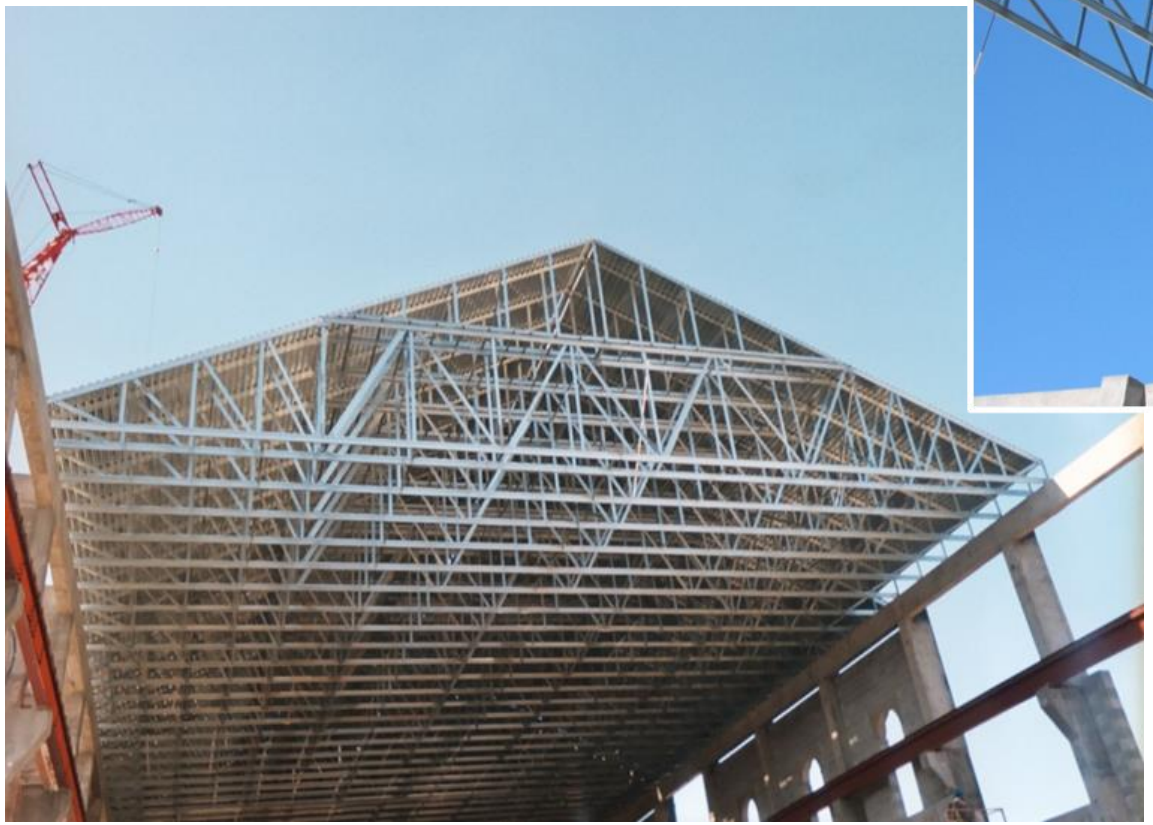
SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Education / K-12

Georgetown Christian School
Georgetown, DE

Infrastructure

Valley Creek Wastewater Treatment
Bessemer, AL



Hotel & Hospitality

Great Wolf Lodge
Perrysville, MD

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Industrial

Northrop Grumman Facility
Pascagoula, MS

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Religious

First Christian Church
Mayfield, KY

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

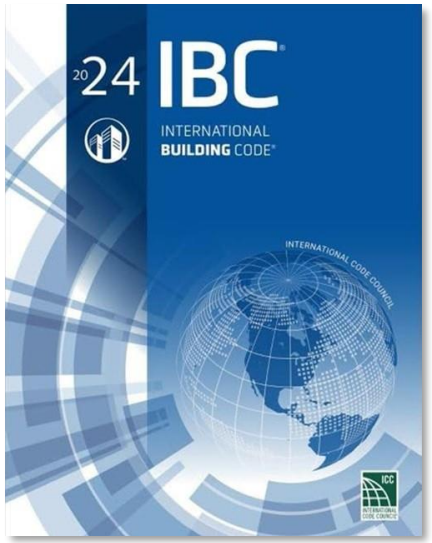
Presentation Outline

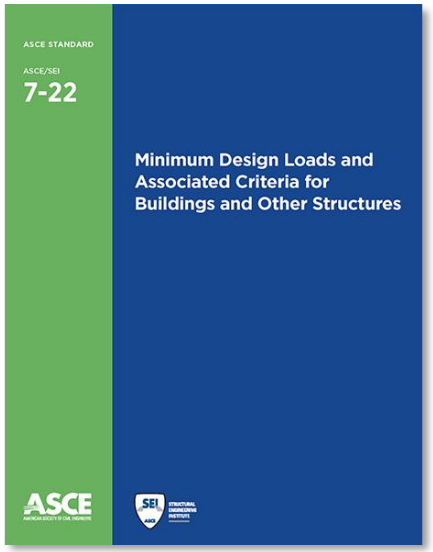
- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- **Project Basics**
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Project Basics

- **Authorities Having Jurisdiction (AHJ)**
- **Building Codes & Standards**
  - ✓ Building Code
    - International Building Code (IBC)
      - ✓ 2024 IBC (*as example*)
    - Referenced Standards (*per Building code*)
      - American Society of Civil Engineers (ASCE)
        - ✓ ASCE 7-16 with Supplement 1, Minimum Design Loads and Associated Criteria for Buildings and Other Structures





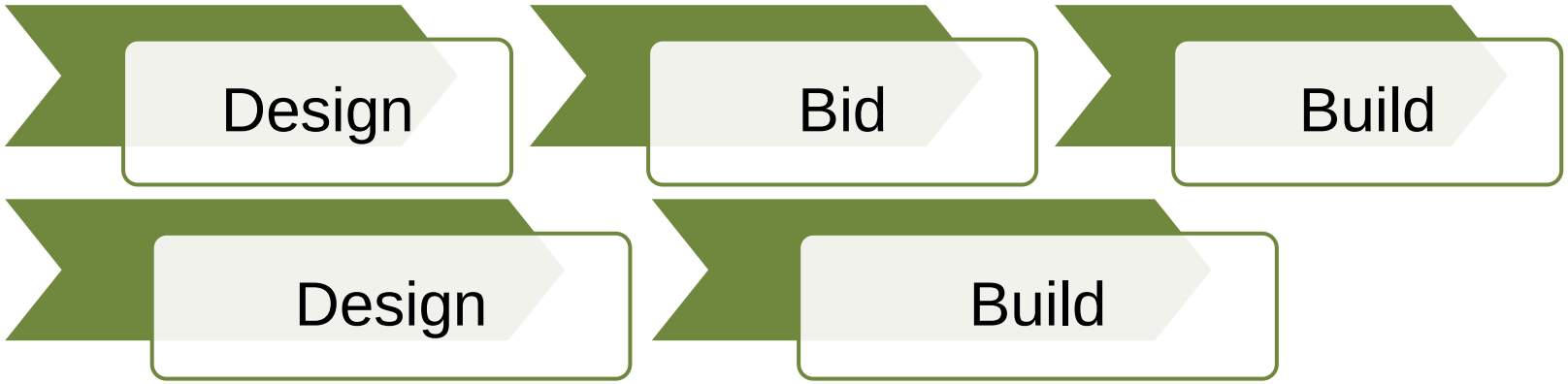
Project Basics

- **Building Codes & Standards**
  - ✓ Referenced Standards
    - American Iron and Steel Institute (AISI)
      - ✓ AISI S100-16 (2020) w/S2-20, North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020) With Supplement 2, 2020 Edition
      - ✓ AISI S202-20, Code of Standard Practice for Cold-Formed Steel Structural Framing, 2020 Edition
      - ✓ AISI S240-20, North American Standard for Cold-Formed Steel Structural Framing, 2020 Edition
      - ✓ AISI S400-20, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, 2020 Edition

Project Basics

- **Roles & Responsibilities**
  - ✓ Definitions: *AISI S202-20, Code of Standard Practice for Cold-Formed Steel Structural Framing*
  - ✓ Roles:
    - Building Designer / Engineer of Record (EOR): *Registered design professional responsible for the design of the structural system and the preparation of the construction documents.*
    - CFS Component Manufacturer/ Fabricator: *The entity responsible for the manufacturing of the CFS component assemblies.*
    - Truss Design Engineer / Specialty Designer: *The registered design professional having responsibility for the CFS truss design.*

Project Delivery



Design Assist

- Support AE Team
- Provide CFS Truss design guidance and recommendations
- EOR responsible for incorporating information
- EOR maintains responsibility for the overall design

…and / or…

Delegated Design

- Hired by the CFS Truss Component Manufacturer
- Collaborates with the project team
- Specialty Engineer design CFS Trusses based on performance specifications
- EOR retains final accountability for overall project

Project Delivery

- **Why Choose Design Assistance?**
  - ✓ Validate design capabilities
  - ✓ Establish project requirements
  - ✓ Optimize design
  - ✓ Enhance bidding
  - ✓ Improve project outcomes
  - ✓ Gain knowledge of capabilities and best practices

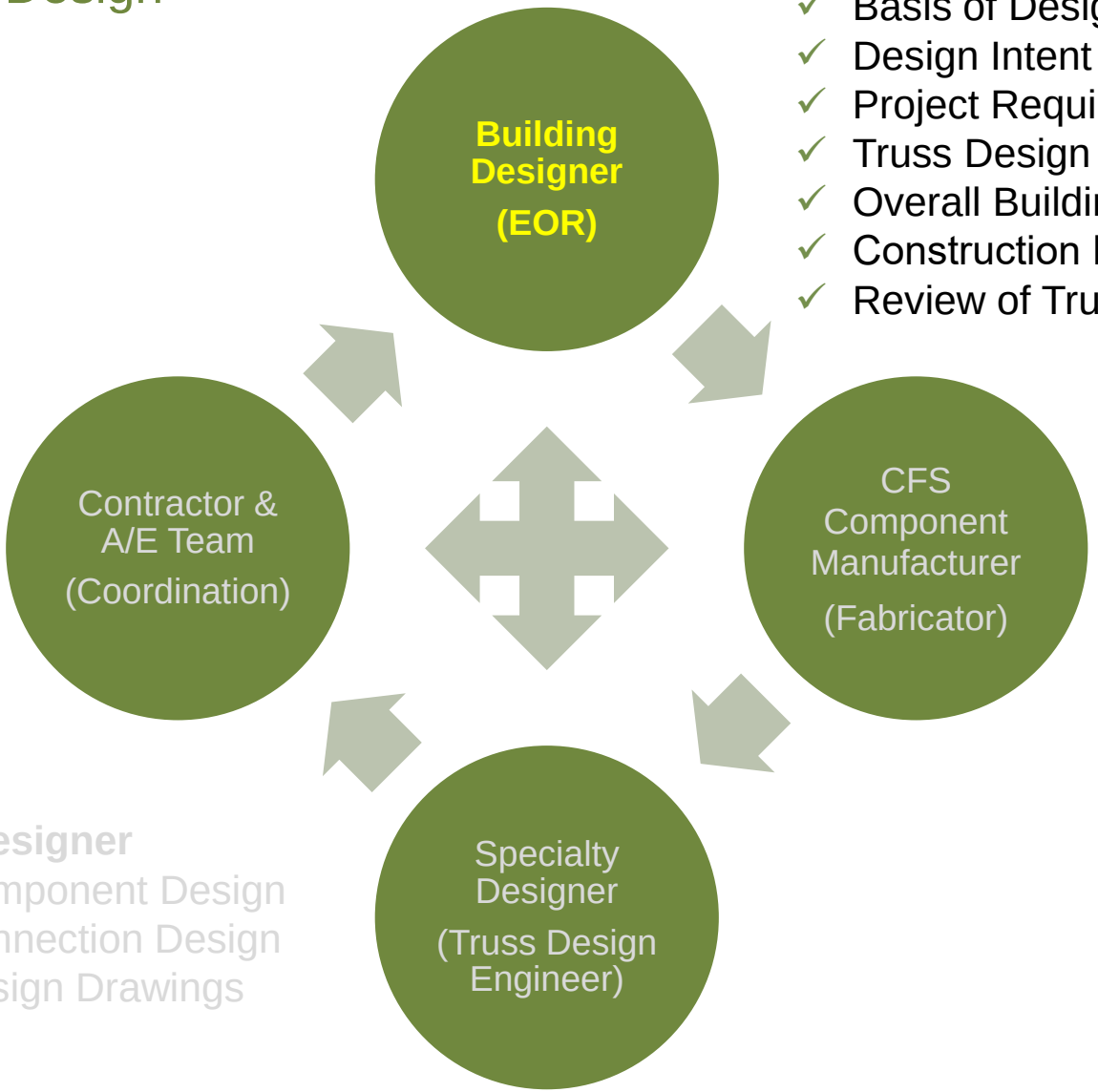
Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- **Roles & Responsibilities**
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Roles & Responsibilities

Delegated CFS Truss Design



Building Designer (EOR)

- ✓ Basis of Design
- ✓ Design Intent
- ✓ Project Requirements
- ✓ Truss Design Criteria
- ✓ Overall Building Design
- ✓ Construction Documents (CD's)
- ✓ Review of Truss Submittal Package

Contractor & A/E Team

- ✓ Project Information
- ✓ Project Coordination
- ✓ Review of Truss Submittal Package

CFS Component Mfr. (Fabricator)

- ✓ CFS Truss Scope of Work
- ✓ Truss Design Requirements from CD's
- ✓ Communication of Truss Requirements to Specialty Designer (Truss Design Engineer)
- ✓ Truss Submittal Package
- ✓ Fabrication

Specialty Designer

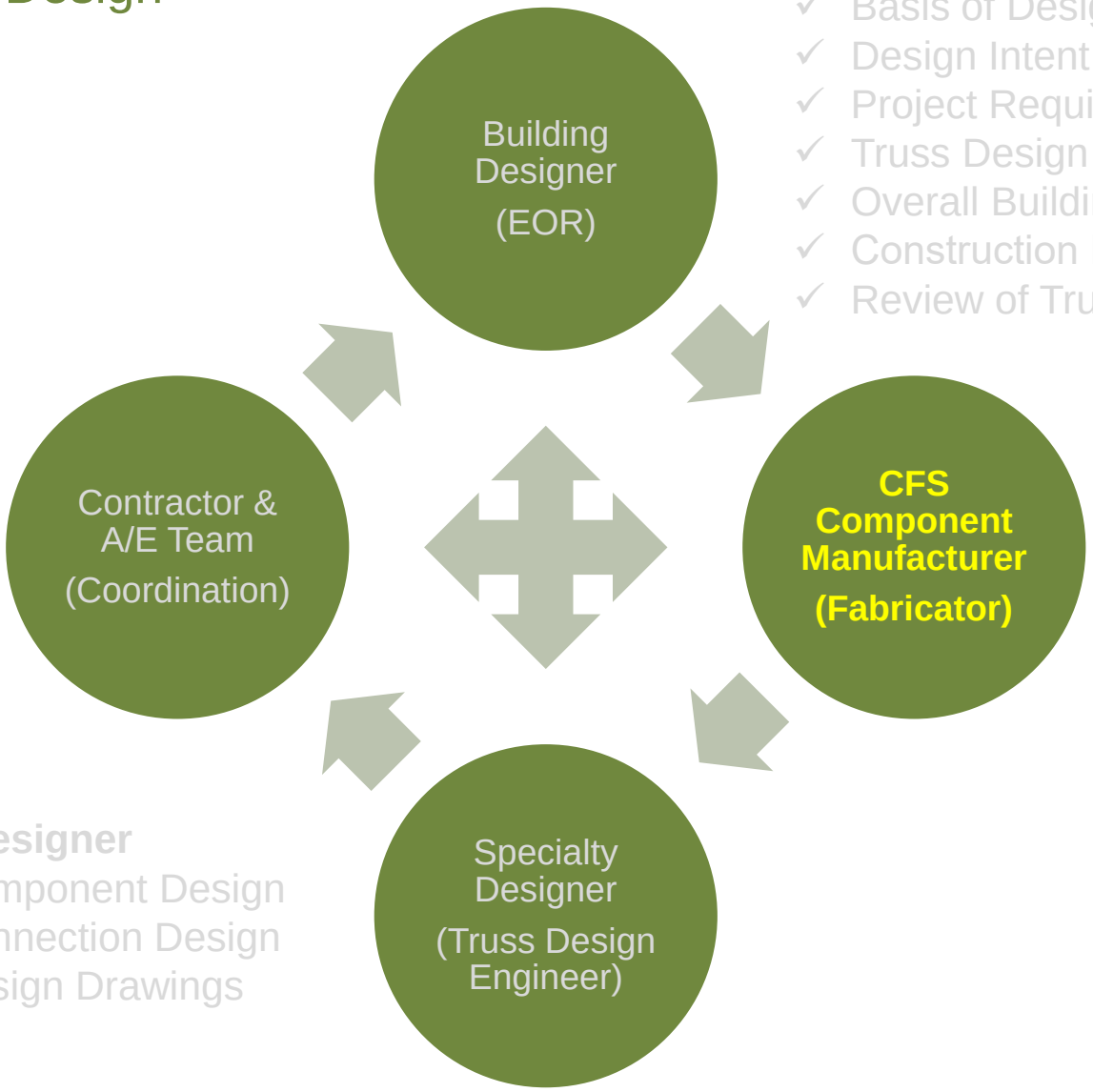
- ✓ Truss Component Design
- ✓ Truss Connection Design
- ✓ Truss Design Drawings

Roles & Responsibilities

Delegated CFS Truss Design

Building Designer (EOR)
- ✓ Basis of Design
- ✓ Design Intent
- ✓ Project Requirements
- ✓ Truss Design Criteria
- ✓ Overall Building Design
- ✓ Construction Documents (CD's)
- ✓ Review of Truss Submittal Package

Contractor & A/E Team
- ✓ Project Information
- ✓ Project Coordination
- ✓ Review of Truss Submittal Package

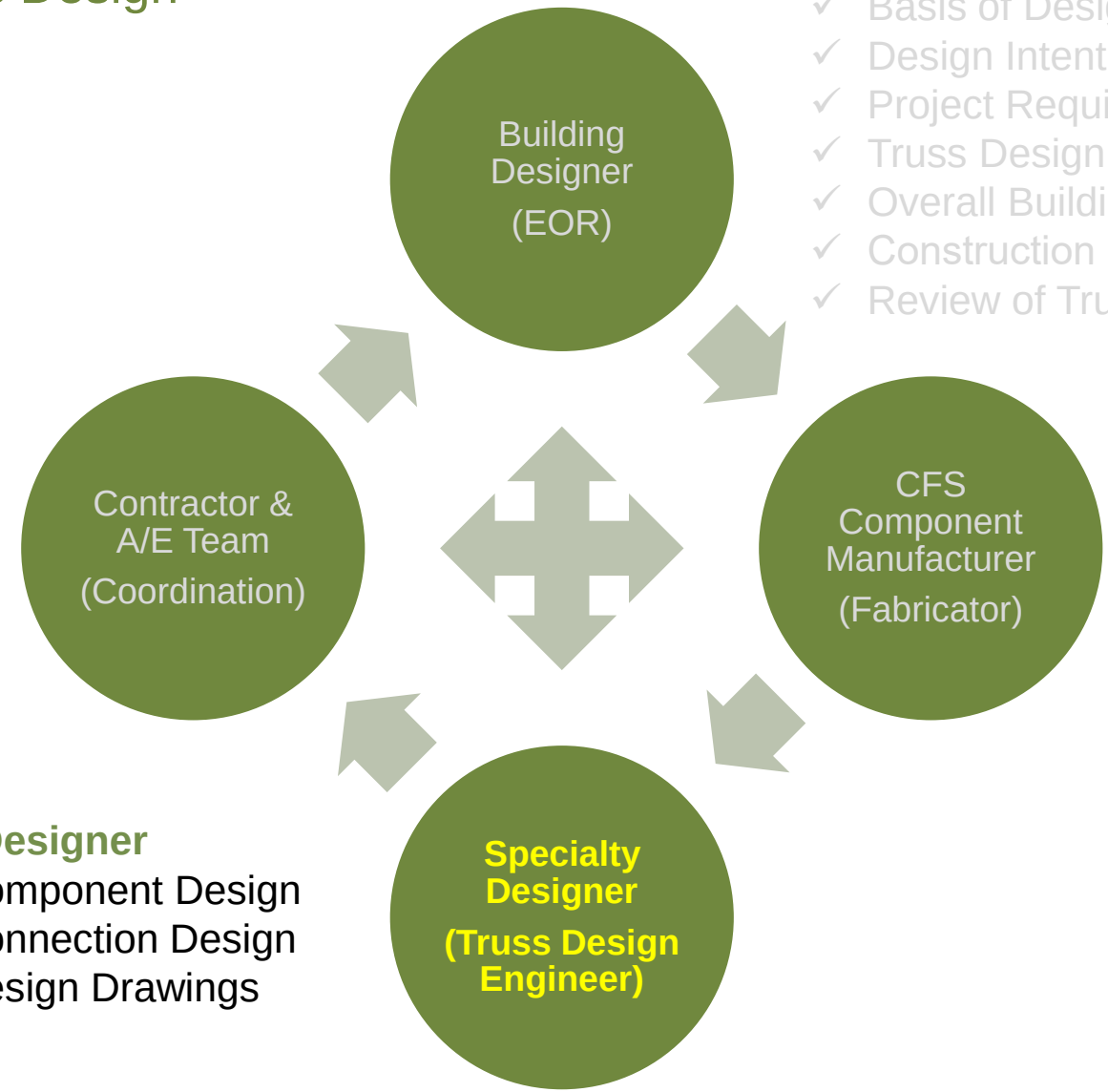


CFS Component Mfr. (Fabricator)
- ✓ CFS Truss Scope of Work
- ✓ Truss Design Requirements from CD's
- ✓ Communication of Truss Requirements to Specialty Designer (Truss Design Engineer)
- ✓ Truss Submittal Package
- ✓ Fabrication

Specialty Designer
- ✓ Truss Component Design
- ✓ Truss Connection Design
- ✓ Truss Design Drawings

Roles & Responsibilities

Delegated CFS Truss Design



Building Designer (EOR)
- ✓ Basis of Design
- ✓ Design Intent
- ✓ Project Requirements
- ✓ Truss Design Criteria
- ✓ Overall Building Design
- ✓ Construction Documents (CD's)
- ✓ Review of Truss Submittal Package

CFS Component Mfr. (Fabricator)
- ✓ CFS Truss Scope of Work
- ✓ Truss Design Requirements from CD's
- ✓ Communication of Truss Requirements to Specialty Designer (Truss Design Engineer)
- ✓ Truss Submittal Package
- ✓ Fabrication

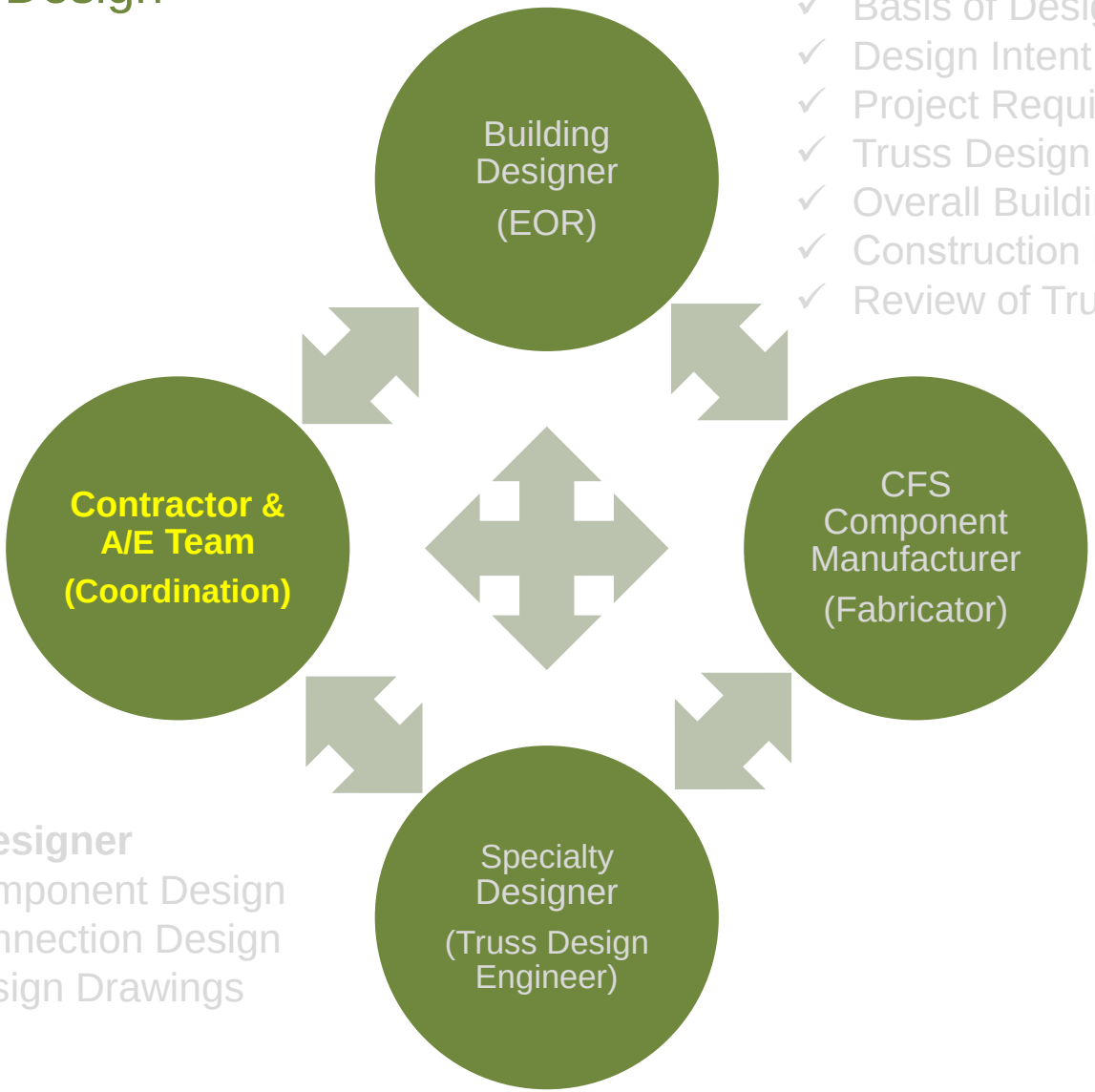
Contractor & A/E Team
- ✓ Project Information
- ✓ Project Coordination
- ✓ Review of Truss Submittal Package

Specialty Designer
- ✓ Truss Component Design
- ✓ Truss Connection Design
- ✓ Truss Design Drawings

Roles & Responsibilities

Delegated CFS Truss Design

Contractor & A/E Team
- ✓ Project Information
- ✓ Project Coordination
- ✓ Review of Truss Submittal Package



Building Designer (EOR)
- ✓ Basis of Design
- ✓ Design Intent
- ✓ Project Requirements
- ✓ Truss Design Criteria
- ✓ Overall Building Design
- ✓ Construction Documents (CD's)
- ✓ Review of Truss Submittal Package

CFS Component Mfr. (Fabricator)
- ✓ CFS Truss Scope of Work
- ✓ Truss Design Requirements from CD's
- ✓ Communication of Truss Requirements to Specialty Designer (Truss Design Engineer)
- ✓ Truss Submittal Package
- ✓ Fabrication

Specialty Designer
- ✓ Truss Component Design
- ✓ Truss Connection Design
- ✓ Truss Design Drawings

Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- **Design Requirements**
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Design Requirements

- **Project Design Criteria:**
  - ✓ IBC Chapter 16 Structural Design
    - 1603.1 General: Construction documents shall show the material, size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. *The design loads and other information pertinent to the structural design required by sections 1603.1.1 through 1603.1.9 shall be indicated on the construction documents.*

❖ ***The information required to be shown covers a large portion of the truss design criteria.***

Design Requirements

- **Project Design Criteria:**
  - ✓ IBC Chapter 16 Structural Design
    - 1603.1.1 Floor live load:
      - ✓ *Uniform, concentrated and impact loads… and live load reduction*
    - 1603.1.2 Roof live load
    - 1603.1.3 Roof snow load data
      - ✓ *Includes snow drift loading … drift surcharge loads (p_d) and width of drift (w)*
    - 1603.1.4 Wind and tornado design data
      - ✓ *Clarify Strength Design (LRFD) or Allowable Stress Design (ASD) forces specified*
    - 1603.1.5 Earthquake design data
      - ✓ *Clarify Strength Design (LRFD) or Allowable Stress Design (ASD) forces specified*

Design Requirements

- **Project Design Criteria:**
  - ✓ IBC Chapter 16 Structural Design
    - 1603.1.6 Geotechnical information
    - 1603.1.7 Flood design data
    - 1603.1.8 Special Loads
      - ✓ *Machinery or equipment loading …*
    - 1603.1.9 Roof rain load data

Design Requirements

- **Truss Design Criteria:**
  - ✓ AISI S202-20 Code of Standard Practice for Cold-Formed Steel Structural Framing
    - I. Practices Specific to CFS Component Assemblies
      - ✓ I1.4 Responsibilities of Building Designer
      - ✓ I1.4.4 Required Information in Construction Documents
        - *"The building designer, through the construction documents, shall provide information sufficiently accurate and reliable to be used for facilitating the supply of the structural elements and other information for developing the design of the trusses for the building and shall provide the following: …"*

Design Requirements

- **Truss Design Criteria:**
  - ✓ AISI S202-20 Code of Standard Practice for Cold-Formed Steel Structural Framing
    - I. Practices Specific to CFS Component Assemblies
      - ✓I1.4.4 Required Information in Construction Documents
        - Conceptual truss and structural element orientations and locations,
        - Information to fully determine or derive truss profiles,
        - Truss support locations and bearing conditions,
        - The location, direction, and magnitude of all dead, live, and lateral loads applicable to each truss including, but not limited to, loads attributed to: roof, floor, partition, mechanical, fire sprinkler, attic storage, rain and ponding, wind, snow, (including snow drift and unbalanced snow), seismic, and any other loads on the truss;

Design Requirements

- **Truss Design Criteria:**
  - ✓ AISI S202-20 Code of Standard Practice for Cold-Formed Steel Structural Framing
    - I. Practices Specific to CFS Component Assemblies
      - ✓ I1.4.4 Required Information in Construction Documents
        5) Truss anchorage required to resist uplift, gravity and lateral loads by specifying either
           a) Pre-engineered anchors or fasteners, or
           b) Methods designed by a registered design professional;
        6) Truss-to-structural element connections, but not truss-to-truss connections, by specifying either:
           a) Pre-engineered anchors or fasteners, or
           b) Methods designed by a registered design professional;

Design Requirements

- **Truss Design Criteria:**
  - ✓ AISI S202-20 Code of Standard Practice for Cold-Formed Steel Structural Framing
    - I. Practices Specific to CFS Component Assemblies
      - ✓ I1.4.4 Required Information in Construction Documents
        7) Permanent building stability bracing, including truss anchorage connections to the permanent building stability bracing,
        8) Criteria related to serviceability issues, including:
           a) Allowable vertical, horizontal, or other required deflection criteria
           b) Any dead and live load deflection criteria for flat roof subject to ponding loads,

Design Requirements

- **Truss Design Criteria:**
  - ✓ AISI S202-20 Code of Standard Practice for Cold-Formed Steel Structural Framing
    - I. Practices Specific to CFS Component Assemblies
      - ✓ I1.4.4 Required Information in Construction Documents

8) Criteria related to serviceability issues, including:

c) Any differential deflection criteria from truss-to-truss or truss-to-adjacent structural member,

d) Deflection and vibration criteria for floor trusses, including any strongback bridging requirements or any dead load and live load deflection criteria for floor trusses supporting stone or ceramic tile finishes, and

e) Anticipated moisture, temperature, corrosive chemicals and gases expected to affect the trusses and requirements for any additional corrosion protection.

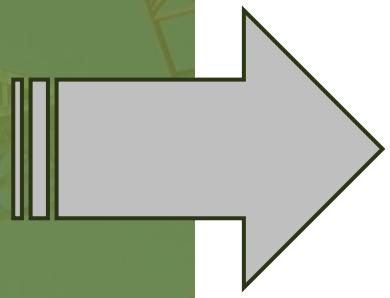
Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- **Align the Design!**
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Align the Design!

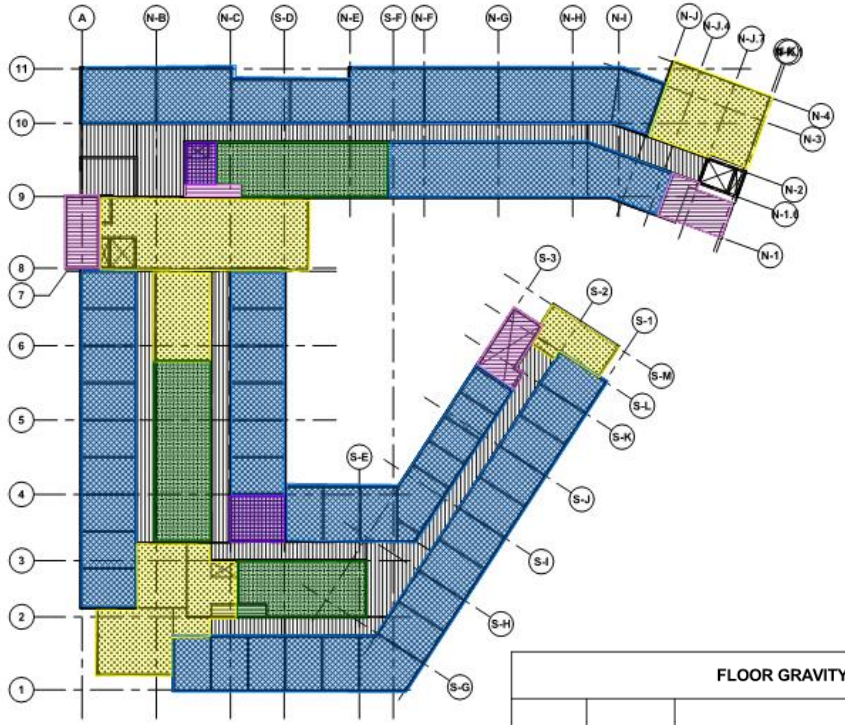
- Engineer of Record Design Intent
  - ✓ Building Design Criteria
  - ✓ Structural Performance Requirements
  - ✓ Structural Framing Layout
  - ✓ Loads Path
  - ✓ Lateral Load Systems



- Cold-Formed Steel Truss Design
  - ✓ CFS Truss Design Criteria
  - ✓ CFS Truss Performance Requirements
  - ✓ Truss Layout
  - ✓ Connections
  - ✓ Drag & Blocking Trusses, Bracing and Blocking

Align the Design!

- **Truss Loading:**
  - ✓ Dead & Live Loads
    - Designation based on use type and construction assemblies.
      - ✓ Structural General Notes
      - ✓ Loading Maps



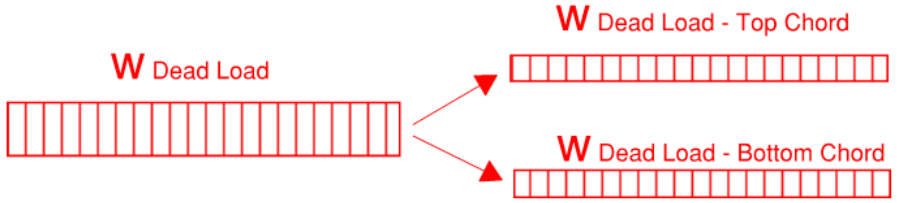
2 LOADING DIAGRAM LEVEL 4

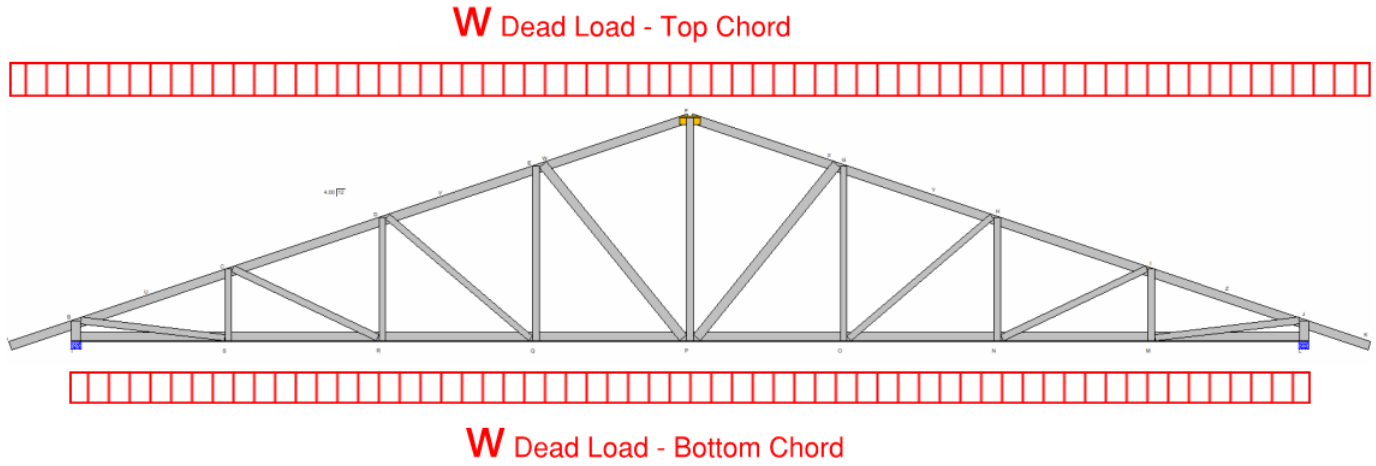
FLOOR GRAVITY LOAD SCHEDULE

MARK	HATCH	DESCRIPTION	LOADS SDL	LOADS LL	REMARKS
1		PRIVATE BEDROOMS	25	40	SEE NOTE 1
2		ASSEMBLY AREAS INCLUDING LOBBIES AND LOUNGE	25	100	SEE NOTE 1
3		STAIRS/EXITS/EGRESS PATHS	70	100	
4		CORRIDOR	25	50	SEE NOTE 1
5		BATHROOMS	25	60	SEE NOTE 1
6		LIGHT STORAGE / MECHANICAL	25	125	SEE NOTE 1
7		ROOF	28	20	
8		EXTENSIVE GREEN ROOF	58	20	

Align the Design!

- **Truss Loading:**
  - ✓ Dead & Live Loads
    - Allocation of Dead Loads between Top Chord and Bottom Chord

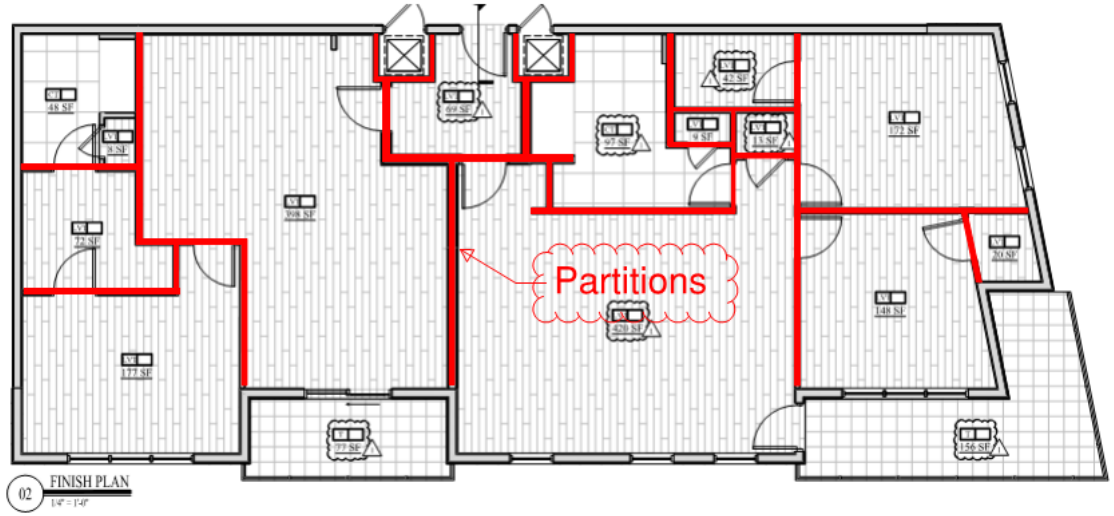




Align the Design!

- **Truss Loading:**
  - ✓ Dead & Live Loads
    - Partition Loads
      - ✓ IBC 2021: 1607.5 Partition Loads & ASCE 7-16: 4.3.2 Provision for Partitions

        In office buildings and in other buildings where partitions will be erected or rearranged, provision for partition weight shall be made, whether or not partitions are shown on the plans. Partition load shall not be less than 15 psf (0.72 kN/m2).

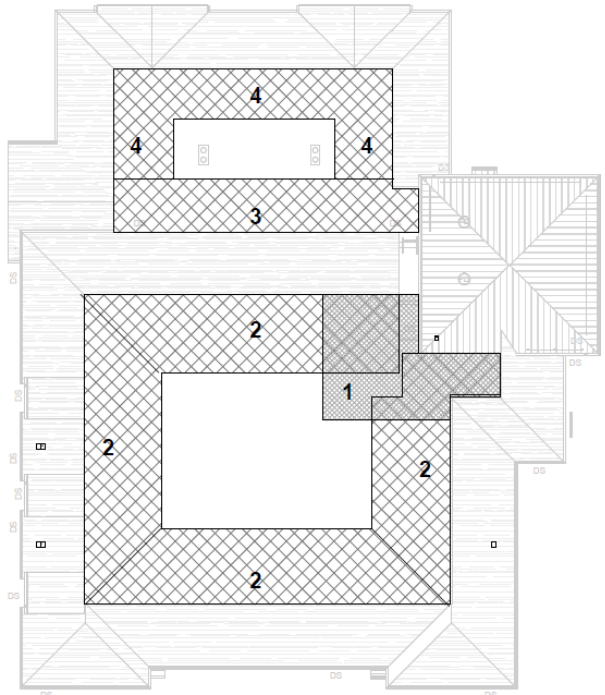


Options:

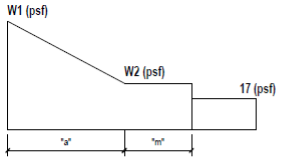
- ✓ ***Evaluate and incorporate into DL & LL envelope specified***
- ✓ ***Specify Partition Uniform Loads in addition to DL & LL***

Align the Design!

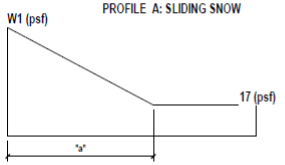
- **Truss Loading:**
  - ✓ Snow Loads
    - Information shown of Construction Documents per 1603.1.3 Roof snow load data
      - Snow load design criteria
        - ✓ Structural General Notes
      - Snow drift loading
        - ✓ Snow Drift Loading Maps
        - ✓ Structural Framing Plans



22 Snow Drift
SCALE: 1/16" = 1'-0"



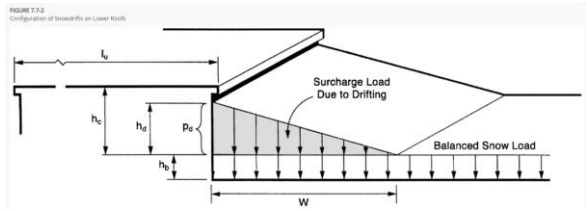
PROFILE A: SLIDING SNOW



PROFILE B: GENERAL SNOW DRIFT

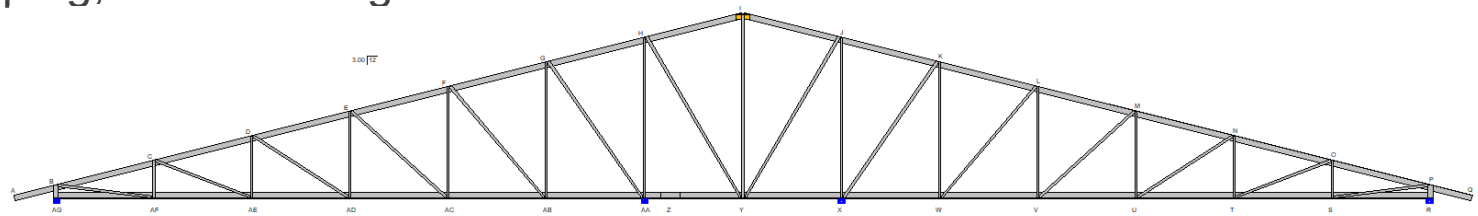
ROOF SNOW DRIFT LOADS

Zone	Profile	W1 (psf.)	W2 (psf.)	"a" (ft.)	"m" (ft.)
1	A	70	27	13.33	1.77
2	B	46	--	11.25	--
3	A	52	22	7.25	7.75
4	B	47	--	7.25	--

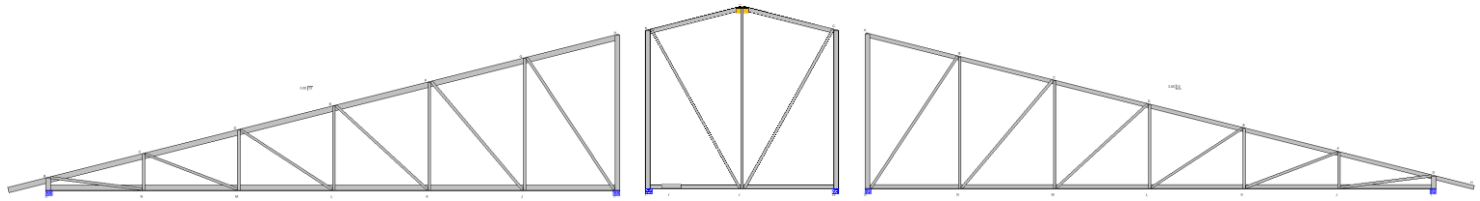


Align the Design!

- **Truss Framing:**
  - ✓ **Single Span vs. Multi-Span Conditions**
    - Design Intent vs. Construction Requirements
      - ✓ Structural framing and loading conditions
      - ✓ Fabrication, shipping, and handling considerations



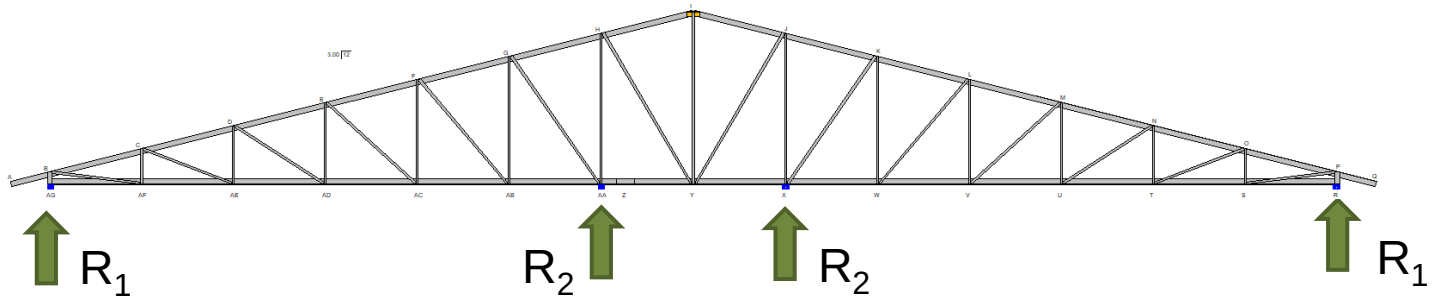
Multi-Span Truss



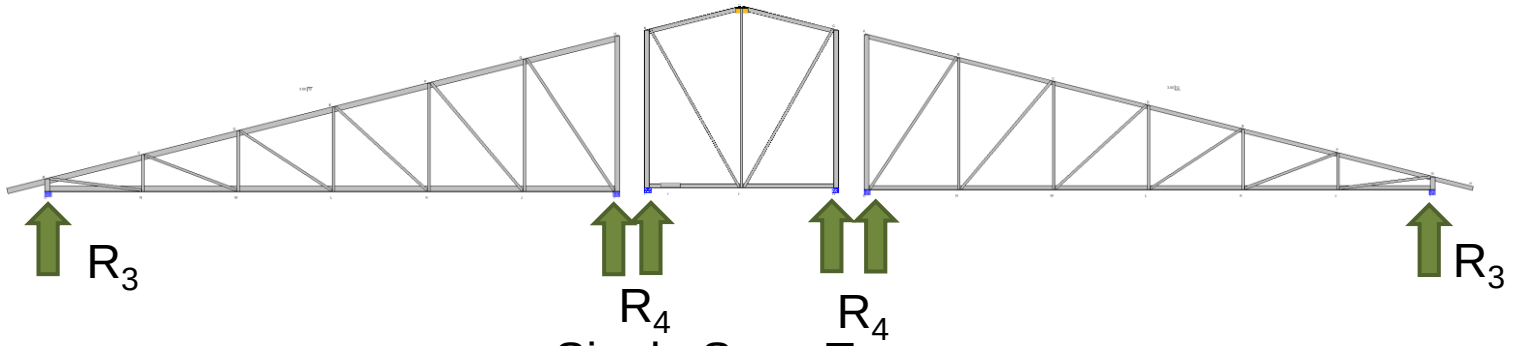
Single Span Trusses

Align the Design!

- **Truss Framing:**
  - ✓ **Single Span vs. Multi-Span Conditions**
    - Reactions / load distribution



Multi-Span Truss



Single Span Trusses

Differences in Load Distribution!

$R_1 < R_3$

$R_2 > R_4$

Align the Design!

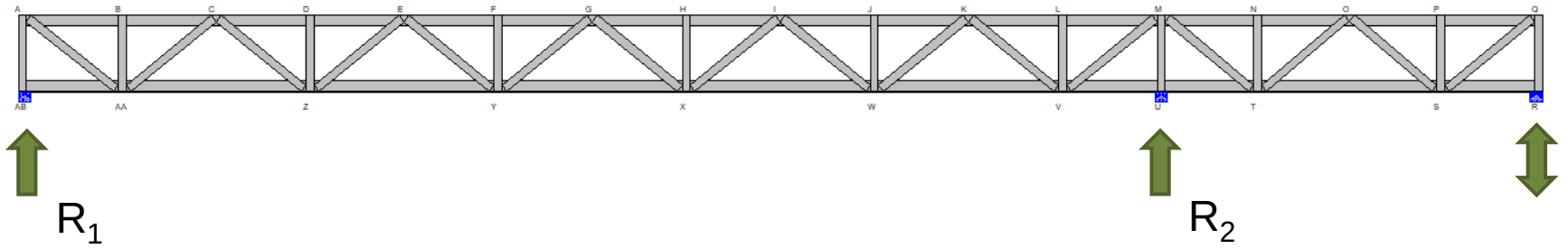
- **Truss Framing:**
  - ✓ **Single Span vs. Multi-Span Conditions**
    - Uplift due to unbalanced span & loading conditions

Differences in Load Distribution!

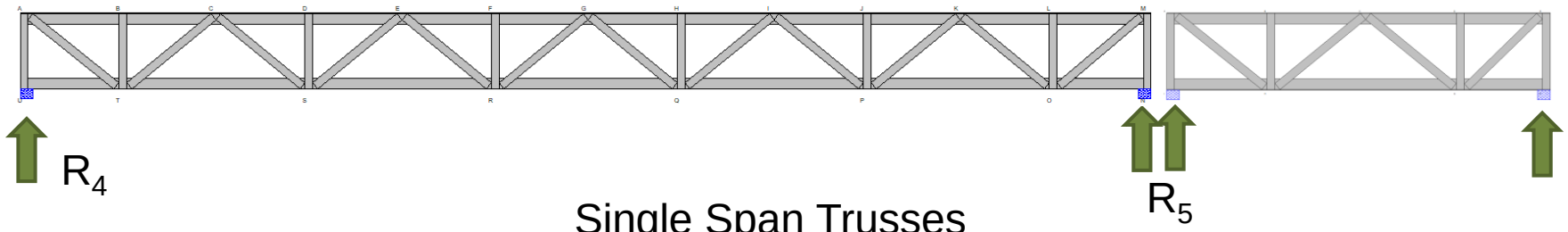
$R_1 < R_4$

$R_2 > R_5$

$R_3 < R_6$



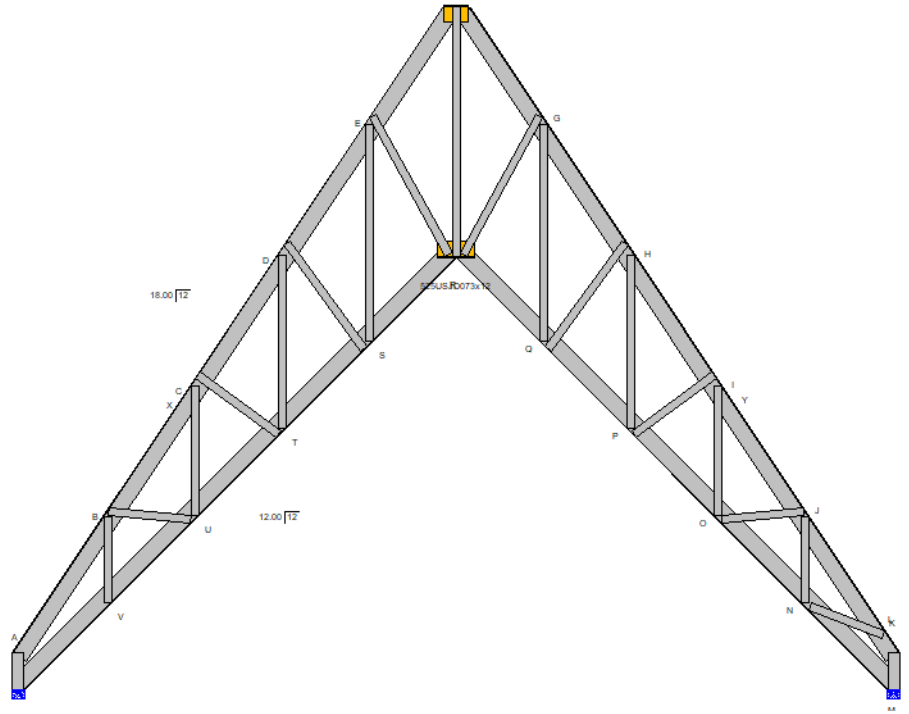
Multi-Span Truss



Single Span Trusses

Align the Design!

- **Load Path & Connections:**
  - ✓ **Scissor Trusses**
    - Pin-Pin vs. Pin-Roller
      - ✓ *Pin-Pin Base*
        - Horizontal thrust to be resisted by supporting structure
      - ✓ *Pin-Roller Base*
        - Accommodate horizontal movement

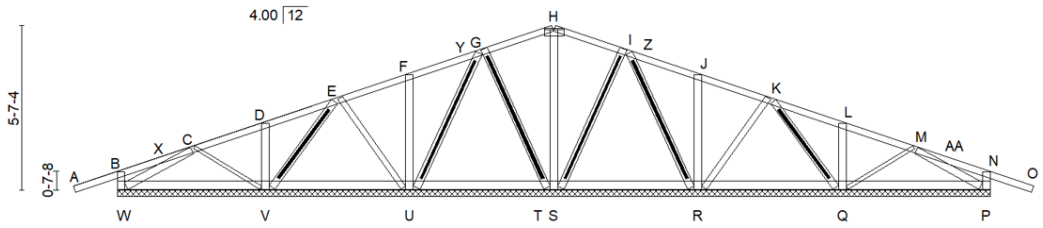


Pin-Pin: Resolve Horiz. Thrust

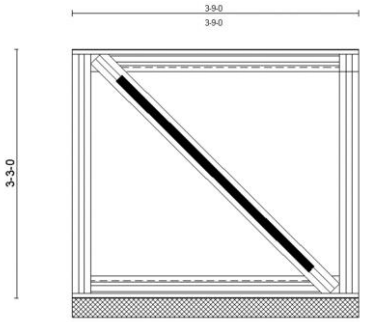
Pin-Roller: Account for Horiz. Movement

Align the Design!

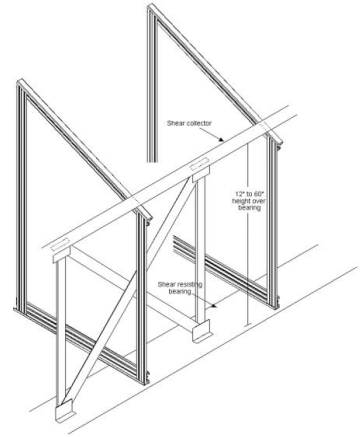
- **Lateral Load Systems:**
  - ✓ **Drag & Blocking Trusses, Bracing and Blocking**
    - Loading & Location
      - ✓ Specify on plan(s) with loading
      - ✓ Clarify wind/seismic and ASD/LRFD loading requirements
    - Load Path
      - ✓ Support Conditions
      - ✓ Location, magnitude and extent of shear transfer



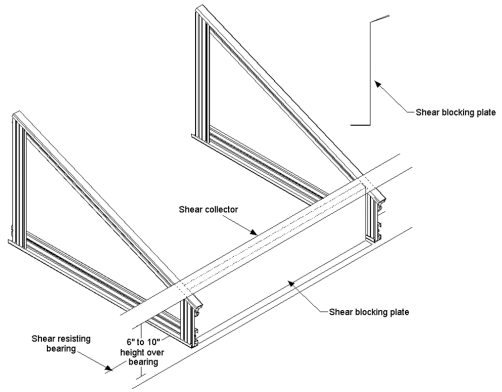
Common Shear Truss



Blocking Truss



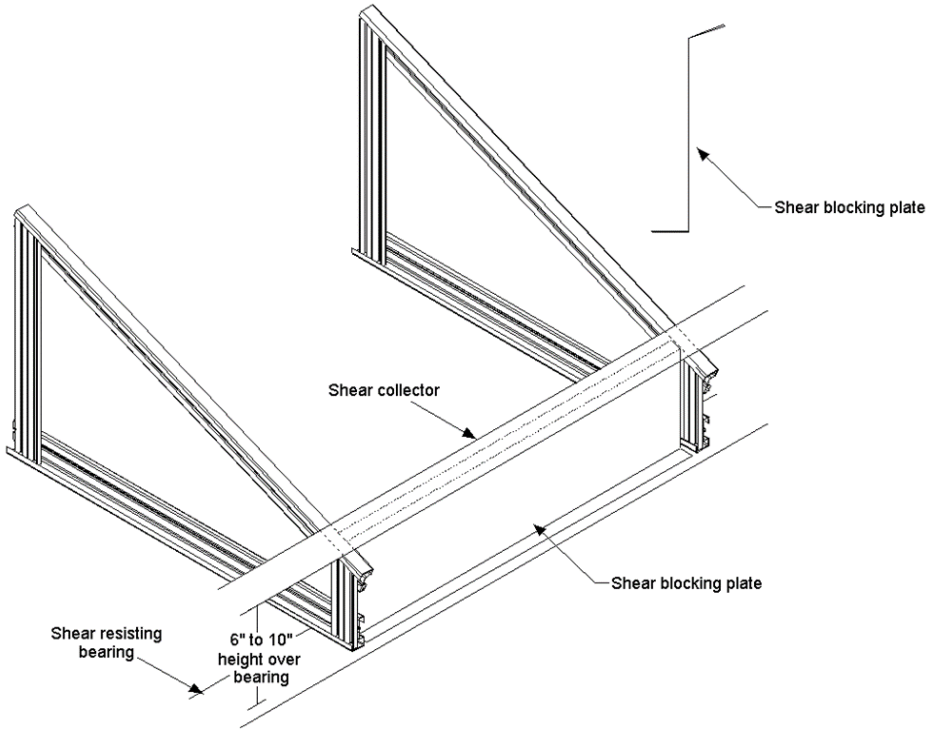
X-Bracing



Shear Blocking

Align the Design!

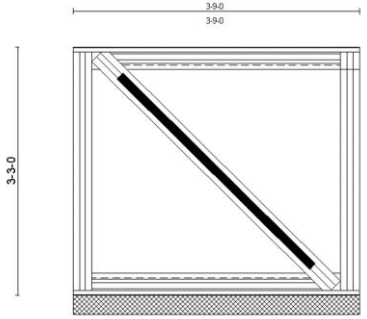
- **Lateral Load Systems:**
  - ✓ **Shear Blocking**
    - Loading & Location
      - ✓Specify on plan(s) and/or sections
    - Low heel heights
      - ✓Typical height of 6” to 10” over the bearing
  - ✓ Capacity
    - Design values based on LGSEA Research note
    - 1340 lbs maximum (054 mil)
    - Shear only transfer of load



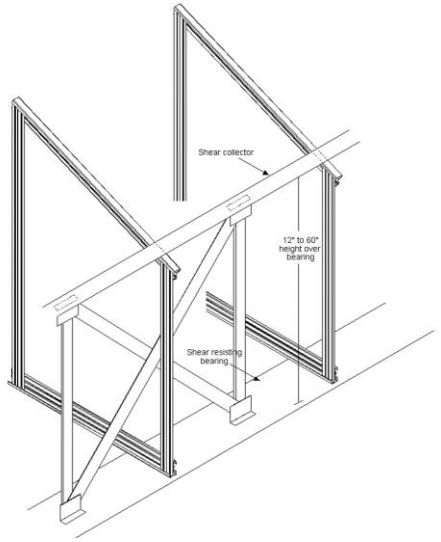
Shear Blocking

Align the Design!

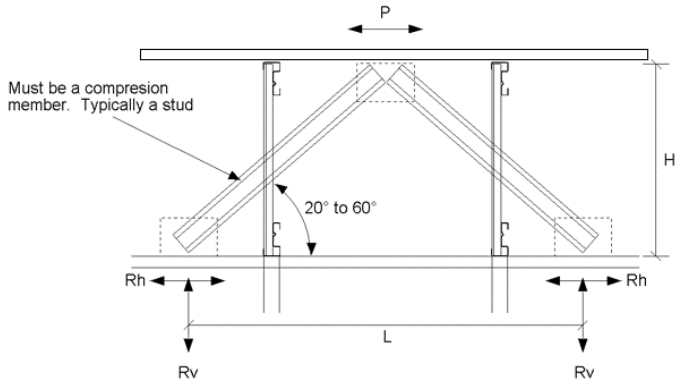
- **Lateral Load Systems:**
  - ✓ **Blocking Trusses & Bracing**
    - Loading & Location
      - ✓ Specify on plan(s) and/or sections
  - ✓ Mid-height Shear Transfer
    - Typical height of 1’-0” to 5’-0”
    - Aspect Ratio ≤ 3 Vertical : 1 Horizontal
  - ✓ Capacity
    - Engineered for project application
    - Typical Values of 50 plf to 500 plf



Blocking Truss



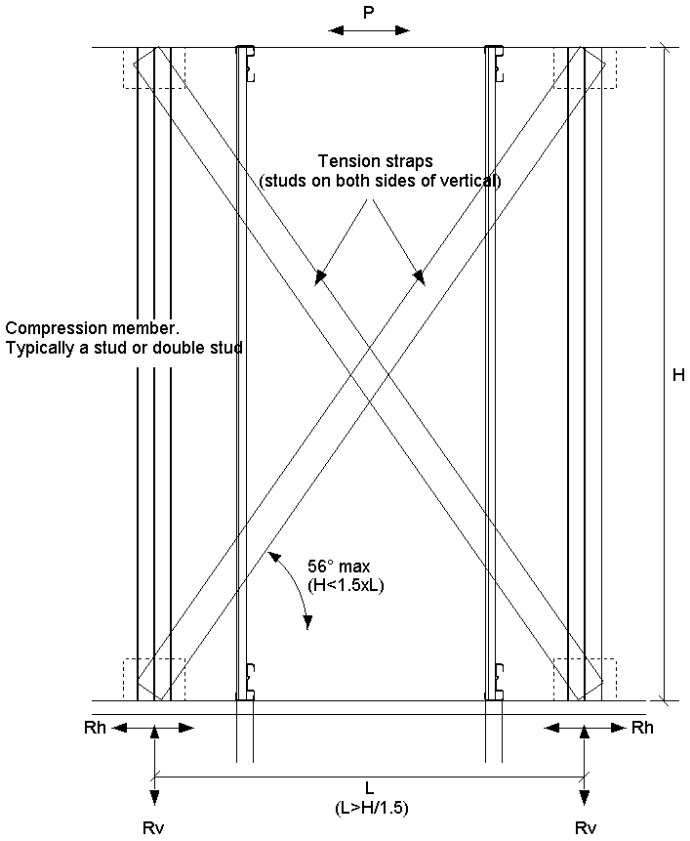
X-Bracing



Chevron Bracing

Align the Design!

- **Lateral Load Systems:**
  - ✓ **Blocking Trusses & Bracing**
    - Loading & Location
      - ✓ Specify on plan(s) and/or sections
  - ✓ Tall Shear Transfer
    - Typical height over 5’-0”
    - Aspect Ratio ≤ 1.5 Vertical : 1 Horizontal
  - ✓ Capacity
    - Engineered for project application
    - Typical Values of 50 plf to 500 plf



X-Bracing

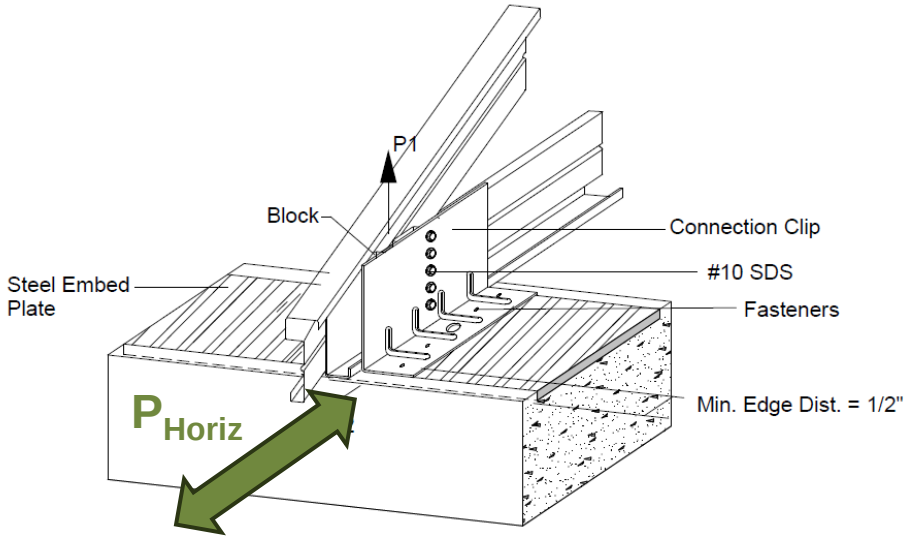
Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- **Special Design Conditions**

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

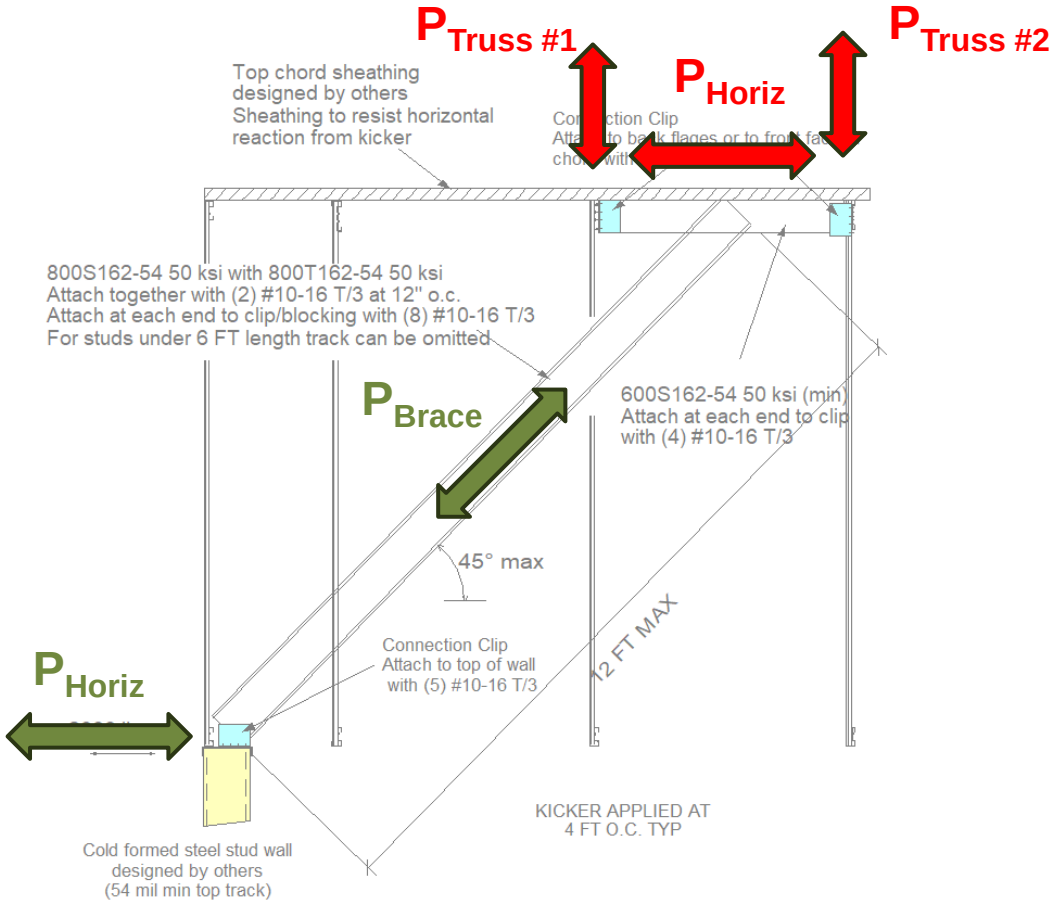
Special Design Conditions

- **Wall Bracing Conditions**
  - ✓ **Bearing / Perpendicular to Truss**
    - Lateral support typically required at top of wall
      - ✓ Transfer thru truss connection
      - ✓ Resisted by diaphragm
    - Design Criteria:
      - ✓ Lateral load at top of wall
      - ✓ Wind / Seismic (ASD/LRFD)



Special Design Conditions

- **Wall Bracing Conditions**
  - ✓ **Gable Walls**
    - Lateral support typically required at interface of the wall and gable truss
      - ✓ CFS Bracing
      - ✓ Horizontal “flat” truss
    - Design Criteria:
      - ✓ Brace Load / Top of wall load
        - Wind / Seismic (ASD/LRFD)
      - ✓ Brace spacing



Special Design Conditions

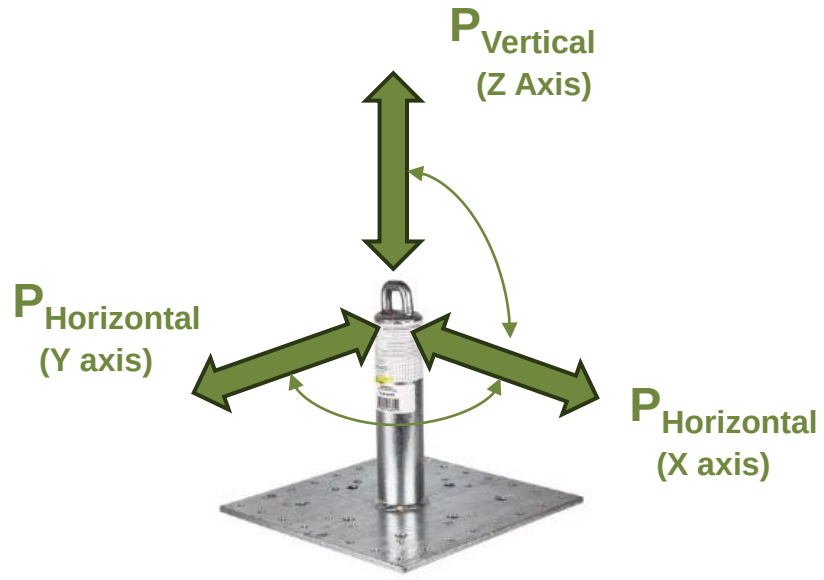
- **Fall Protection**
  - ✓ Design Criteria
    - ASCE 7-22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures
    - 4.6.5 Fall Arrest, Lifeline, and Rope Descent System Anchorages “
      - ✓ “Fall arrest, lifeline, and rope descent system anchorages and the structural elements that support these anchorages shall be designed for a ***live load of 3,100 lb. (13.8 kN) for each attached line in any direction that the load may be applied***. Anchorages of horizontal lifelines and the structural elements that support the anchorages shall be designed for the maximum tension that develops in the horizontal lifeline from these live loads.”

❖ ***3,100 pounds equates to the 5,000-pound ultimate load required by OSHA.***

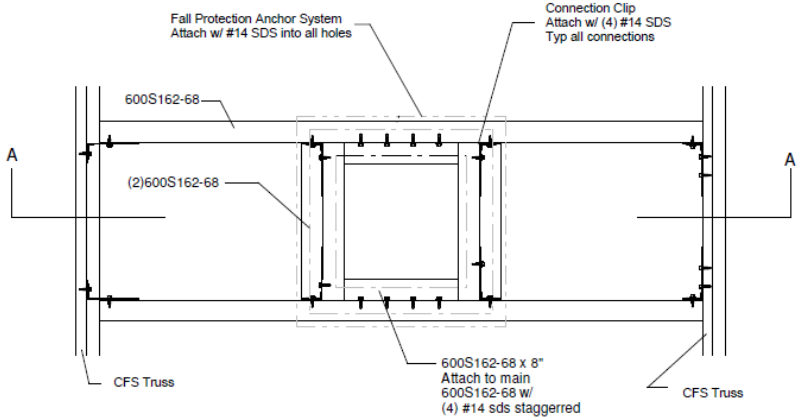
(3,100 pounds x 1.6 = 4,960 pounds ≈ 5,000 pounds ultimate)

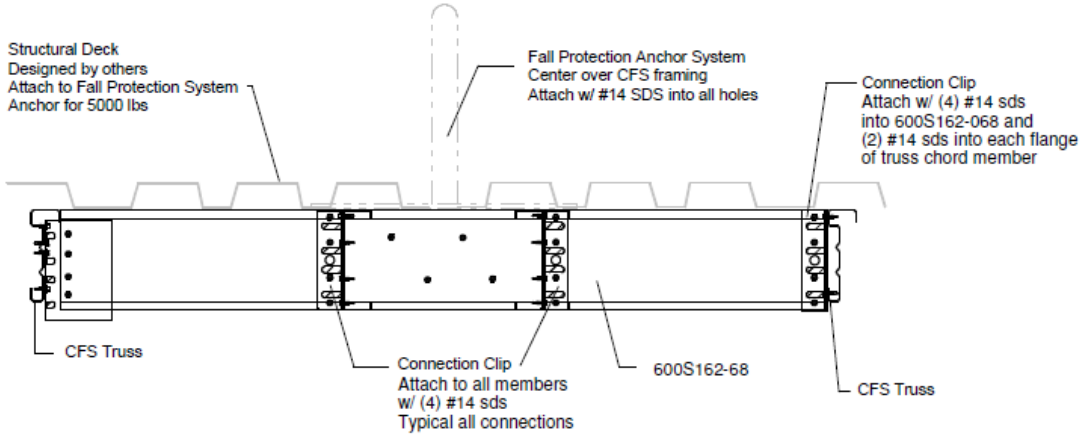
Special Design Conditions

- **Fall Protection**
  - ✓ Fall Protection Anchor
    - Select fall protection anchor compatible with cold-formed steel
    - Anchor / system layout must be defined and coordinated with CFS truss
    - CFS Support frame provided between trusses



Anchor Post
(Multi-purpose)





CFS Support Frame Detail

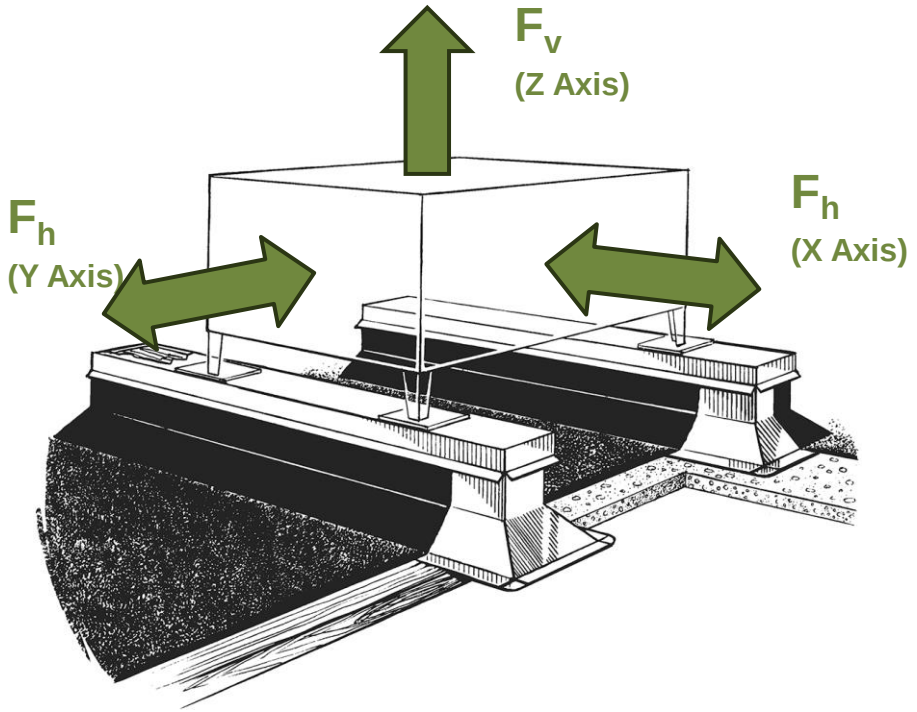
SECTION A-A

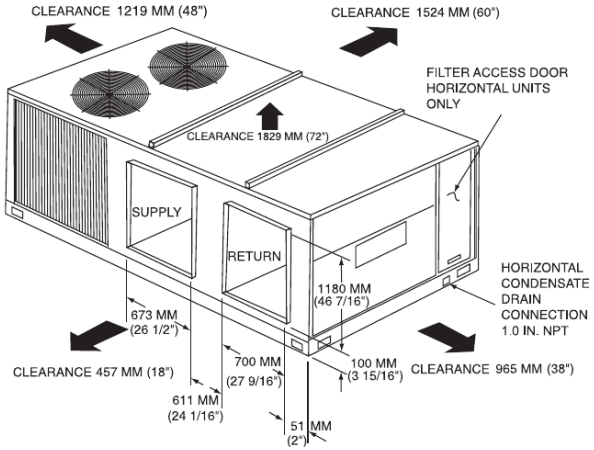
Special Design Conditions

- **MEP Systems**
  - ✓ HVAC / MEP Equipment
    - Roof Supported
    - Hung units
  - ✓ Roof Top (Exterior) Ductwork
  - ✓ Plumbing, Piping & Sprinkler Systems
    - Water / Supply Lines
    - Sprinkler Loading
    - Seismic sprinkler system braces

Special Design Conditions

- **MEP Systems**
  - ✓ HVAC / MEP Equipment
    - Support conditions, operating weight, plan location & dimensions
  - ✓ Snow drifting
  - ✓ Wind : ASCE 7-22
    - 29.4 Design Wind Loads: Other Structures (MWFRS)
    - 30.8 Rooftop Structures and Equipment for Buildings (C&C)
  - ✓ Seismic loading
    - ASCE 7-22, 13.6 Mechanical & Electrical Components
  - ✓ Special requirements
    - Vibration / vibration isolation





Special Design Conditions

- **Plumbing, Piping & Sprinkler Systems**
  - ✓ Pipe Hanger Loads
    - Piping layout based on MEP drawings
    - Special loading locations (heavy loads / high density piping locations) to be noted on structural drawings
    - Hanger spacing based on project specific design criteria
    - Maximum spacing by pipe size
    - Maximum pipe hanger load vs. equivalent uniform load (moving point load)
    - Recommend requirement to provide additional hangers as required to be within defined loading parameters
    - Coord. connection to CFS truss and requirements for supplemental framing where required

Special Design Conditions

- **Plumbing, Piping & Sprinkler Systems**
  - ✓ Sprinkler Loads
    - Per NFPA 13 Standard for the Installation of Sprinkler Systems a 250-pound concentrated live load is required in addition to the sprinkler load (installation worker)
    - Applied to any single fire sprinkler support but not simultaneously to all support points
    - Live Load need not be simultaneous with other live loads
  - ✓ Seismic Sprinkler Bracing
    - Requirement for seismic bracing dictated by NFPA 13, IBC, and ASCE 7 codes
    - Longitudinal (parallel to pipe) sway bracing and lateral (perpendicular to pipe) sway bracing to prevent excessive movement

Steel Pipe Size (in)	Schedule	Weight of Water-Filled Pipe (lb/ft)	NFPA 13 Added Load (lb)	Length (ft)	Total Point Load (lb)
1	40	2.05	250	12	274.6
1¼	40	2.93	250	12	285.16
1½	40	3.61	250	15	304.15
2	40	5.13	250	15	326.95
4	10	11.78	250	15	426.7
6	10	23.03	250	15	595.45
8	10	40.08	250	15	851.2

Figure 4. Sample load calculation for sprinkler piping hung to shared support structure.

Sprinkler Loads

Seismic Sprinkler Brace

Special Design Conditions

- **Fire Rated Assemblies**
  - ✓ UL Fire Rated Assemblies:
    - Underwriters Laboratory
      - ✓ UL Product iQ
      - ✓ Product iQ | UL Solutions (ulprospector.com)
    - Floor Assemblies
      - ✓ 1-Hour, 1-1/2 Hour and 2-Hour Assemblies
    - Roof Assemblies
      - ✓ 1-Hour, 1-1/2 Hour and 2-Hour Assemblies

Design No. P575

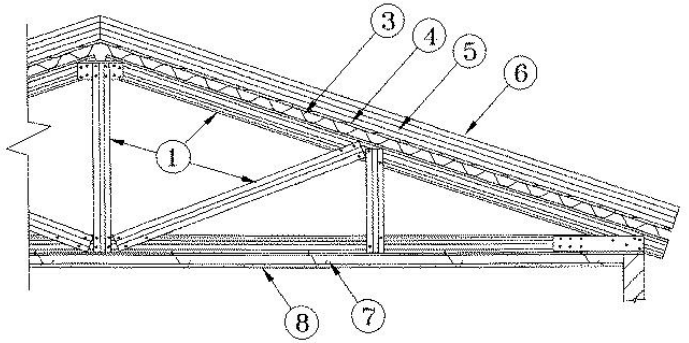
November 18, 2019

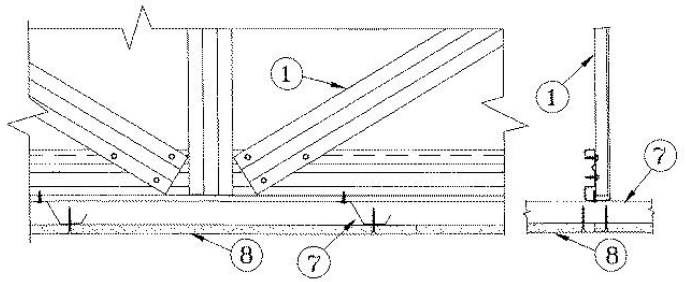
Restrained Assembly Rating - 1, 1-1/2 Hr (See Item 5)

Unrestrained Assembly Rating - 1, 1-1/2 Hr (See Item 5)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**





Presentation Outline

- Cold-Formed Steel Overview
- CFS Truss System Capabilities
- Prefabrication Benefits
- Project Applications
- Project Basics
- Roles & Responsibilities
- Design Requirements
- Align the Design!
- Special Design Conditions

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

Learning Objectives

- Highlight the performance capabilities, benefits, and project applications of CFS truss systems.
- Review the delegated CFS truss design process, highlighting the roles & responsibilities of the Engineer of Record and the Truss Design (Specialty) Engineer.
- Review the design criteria required for the CFS truss design, highlighting the critical importance of aligning the component design intent with that of the overall building structure.
- Identify special loading and design conditions that may require additional review and coordination.

Questions?

- Contact Information:

Peter A. Humphrey, P.E.

Director of Engineering – Steel Framing Systems

MiTek®

phumphrey@mii.com

This concludes The American Institute of Architects Continuing Education Systems Course

---

SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

WWW.STEELFRAMING.ORG