STEEL FRAME EXPERIENCE BY SICLA

Steel Codes, Innovation, and Construction in North America

En los Estados Unidos y Canadá, diseñadoresy constructores están utilizando estructurasde acero para construir edificios altos ycomplejos, manteniendo la rentabilidad entodo el proceso.

Don Allen, P.E., S.E., LEED® executive director Steel Framing Industry Association allen@steelframing.org













Molten

Cathode

Molten Oxide Electrolysis (MOE) www.bostonmetal.com



Building Codes

²24 BC

AISI 5100-16 (2020) w/52-20

American Iron and Steel Institute

AISI STANDARD

North American Specification for the Design of Cold-Formed Steel Structural Members

2016 Edition (Reaffirmed 2020) with Supplement 2

Approved in Canada by CSA Group Endorsed in Mexico by CANACERO



Nonstructural

American iron and Steel institute

AISI STANDARD

AISI \$240-20

North American Standard for Cold-Formed Steel Structural Framing

2020 Edition

AISI S240 Structural





Free download from www.cfsei.org



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What are we building in North America?

Composite Steel deck & Concrete

- Deck acts as permanent form and bottom steel
- Shoring required during pour
- Top track must be designed to carry wet concrete loads







Hollowcore Plank

1.0



Heritage Walk Baltimore, Maryland 5-story loadbearing CFS with Hollowcore Planks

Bearing & Nonbearing walls Insulated jambs Grouted & foamed plank joints





Hollowcore: Exterior Bearing Wall



Hollowcore: Interior Bearing Wall



Details courtesy of The Steel Network, Raleigh, NC

Hollowcore: Interior Bearing Wall



Details courtesy of The Steel Network, Raleigh, NC.

Nonbearing Wall: Overhang okay? Nonbearing Wall: Header okay? Nonbearing Wall:

Jamb Slip

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Nonbearing Wall: Jamb Slip



ALWAYS account for camber in precast!





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Consider reduced stud bearing capacity

Old LGSEA Newsletter



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Wood with Steel?



Photos courtesy Atlanta Journal-ConstitutionHighlands on Ponce fire,Atlanta, Georgia April 31, 2001



Bunker Hill Housing Redevelopment – Building M / Stantec McNamara • Salvia / photo McNamara • Salvia

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Composite deep deck: Apartments on Mercer Island, Washington

Podium: 1-story concrete

Walls: 5-story loadbearing CFS (approximately 200,000 square feet of floor space)

Seloors: Concrete & 3" Composite deck

Roof: CFS trusses







Combination CFS and structural steel where required



Reinforcement tied into shearwalls for lateral load transfer

Caps on end of deck flutes at span direction change and at slabbeams



Where shear not required, stair walls framed with loadbearing CFS framing
Deck span direction change and header/beam support from below

VIIIIII.



Brace Force Resolution: at ceiling and at brace

Loadbearing Walls: Bracing Beware of Plumbers and Electricians!

Use structural steel where it makes sense, rather than building up multiple CFS members.

Use structural steel for brace force resolution.



Panels: Lifting wires on top Track at bottom of opening Panels marked and numbered



Structural steel also marked with proper orientation

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Dormitories at Cal Poly San Luis Obispo, California &All loadbearing CFS floors, walls, and roof trusses

\$\overline\$9 buildings, 5 stories each, housing 2670 students https://buildsteel.org/projects/multi-familyresidential/steel-success-stories-poly-canyonvillage-student-housing/

Dormitories at Cal Poly San Luis Obispo, California







Tracking Lateral Loads

How these 5-story dormitories are designed to resist California's earthquakes



Multiple trusses above corridor

CIRCS.





















Detail at Rated Wall

Hotel in Central Ohio Steel Deck Floors (non-composite) ♦ Podium: All structural steel ♦ Walls: CFS ♦Floors: CFS joists ♦ Roof: CFS trusses ♦ Lateral – Mixed: Tilt-up concrete stair and elevator towers; CFS shearwalls sheathed with sheet steel









19.30









Ohio Hotel

ALC: NOTE:

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Barracks at Fort Benning, Georgia


- 3-level structural steel stairwell
- 2nd level panels in place
- 3rd level floor deck mostly complete







All floors: Composite Deck

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Firewall along Corridor

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With deck in place, and Furring channel below pour stop

With lighter load at upper floors, straps screwed rather than welded

Strap connection at top of 3rd Floor

Interior Shearwall

Alignment between floors is essential at shearwall studs



Alignment at regular bearing studs can be no more than 3/4" unless slab designed as load distribution member.





IMPORTANT SAFETY INFORMATION



Guide to Good Practice for Handling, Installing, Restraining & Bracing of Cold-Formed Steel Trusses







NOTICE! WARNING! CAUTION! DANGER





2008 EDITION PUBLISHED JUNE 2008 Derived from BCSI - created by WTCA & the Truss Plate Institute



CONSTRUCTION BRACING FOR WALLS

Summary: Temporary construction bracing may be necessary to assure structural stability of wall assemblies. This temporary bracing is required to resist loads imposed on a structure during construction. The purpose of this Technical Note is to provide design guidance.

Disclaimer: Designs cited herein are not intended to preclude the use of other materials, assemblies, structures or designs when these designs and materials demonstrate equivalent performance for the intended use; CFSEI documents are not intended to exclude the use and implementation of any other design or construction technique.

Temporary construction bracing may be necessary to as- These loads are generally gravity loads and horizontally sure structural stability of wall assemblies. This temporary bracing is required to resist loads imposed on a structure during construction. Although the engineer of record is typically not responsible for design of construction bracing, contractors may hire specialty engineers to specifically provide temporary bracing design.

imposed wind and impact loads. The gravity load may be either self-weight of the structure and/or live loads resulting from workers and their equipment during the construction operations.

Common illustrations of construction bracing utilized when installing cold-formed steel structures are illustrated by Figures 1, 2 and 3,

There are construction loads that require additional temporary bracing. However, for many applications it is unlikely that the building code specified design loads will occur during construction; therefore, care should be taken to choose a reasonable construction load.



Figure 1: In-Plane Temporary Braces

Cold-Formed Steel Engineers Institute

Consider how other trades will affect structural elements

1 1 M

Plumbers in Action





as load distribution members

at truss support

6-story Apartments on 3-Story Concrete Parking

Two buildings: one steel, one wood
Walls: 6-story loadbearing CFS
Floors: Concrete on composite dovetail deck
Roof: CFS trusses









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Alignment Framing: what is it? From S240:

B1.2.3 In-Line Framing

- B1.2.3.1 Each *joist, rafter, truss,* and structural wall *stud* (above or below) shall be aligned vertically in accordance
 with the limits depicted in Figure B1.2.3-1.

Alignment Framing: what is it? From S240:

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B1.2.3.2 The alignment tolerance shall not be required to be met when a structural *load* distribution member is specified in accordance with the *approved construction documents*.



Figure B1.2.3-1 In-Line Framing

Alignment Framing

How to avoid it: Load Distribution Members (LDMs)



DEEP LEG TRACK

Is the deep leg track continuous?

If not, detail track end or track splice.

Load Distribution Members (LDMs)



BUILT UP STUD IN TRACK




DEEP LEG TRACK OVER BUILT-UP STUD/TRACK







Single wall: check for "flange crippling"





Double wall: put screw here



In some early Australian residential construction: "hat" top track: both LDM and chase for horizontal wiring / piping.

Top track

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Z-shaped element that forms sides of beam

Deep deck with Concrete Formed Beam

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DECORCE OF



Deep deck with Concrete Formed Beam

LDM with Composite Open Web Joist









What are some issues with Ledger Framing?

- Proper design for eccentric loads
- ♦ Lots of screws at end support
- ♦ Load path for diaphragm
- ♦ Fire rated floor/wall intersection
- Compression loads through sheathing

















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Back to the Load distribution member: LDM with Composite Open Web Joist



LDM with Composite Open Web Joist

(Inter

LDM with Composite Open Web Joist

Why can't we do that with cold-formed steel?

We can.

And it has been done.























Composite Floor System from Canada

E.E.A.

SAN
















Composite Shear Fasteners

Floor Trusses: Worldwide







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Built-Up Floor Truss: Same Coil used for Web and Chord

Built-Up Floor Truss: Same Coil used for Web and Chord

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If one truss isn't enough, put in six.



This is why you should use deflection clips at nonstructural non-bearing walls.

USA Floor Trusses















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Guardrail Built Into Panels.



This is another panel with Pre-Installed Fall Protection.

Roof built on ground.

Davis-Monthan Air Force Base, Less than 11 miles from here.

Photos courtesy of Alpine TrusSteel.












































Image from Google maps, 2024

Completed Dormitory, 2004

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