

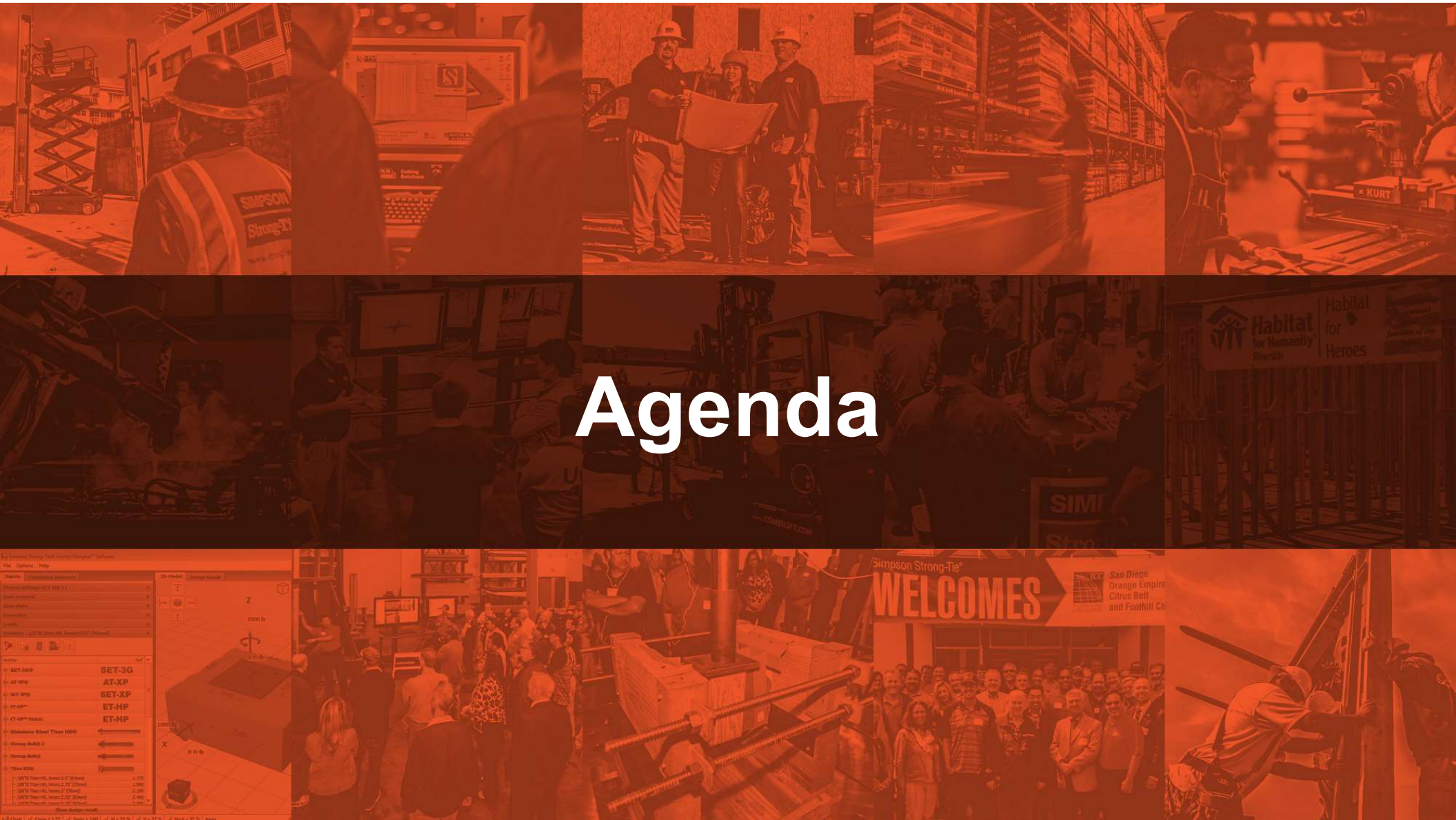


Design Tools

Herramientas para facilitar la especificación en edificios de madera

Diego Valdivieso Cascante
dvaldivieso@strongtie.com

En colaboración con el Equipo de Ingeniería SST Chile
Tomás Garay, Luciano Rodríguez y Matías Urrejola



Agenda

- Nuestra Compañía
- ¿Cómo lograr estructuras de madera seguras?
- Design Tools
- Breve revisión de Edificios de Madera Masiva
- Q&A



SIMPSON
Strong-Tie



Nuestra Compañía



Nuestra Misión

Entregar soluciones que ayuden a las personas a diseñar y construir estructuras seguras y resistentes.

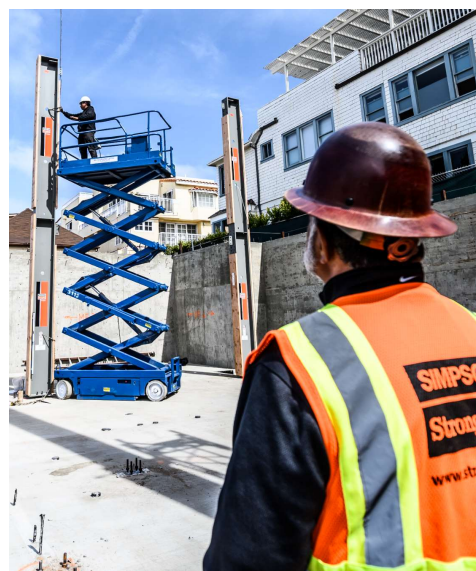
SIMPSON
Strong-Tie

The Simpson Strong-Tie logo is displayed in a white box. It consists of the word "SIMPSON" in white capital letters on a black background, and "Strong-Tie" in white capital letters on a red background.

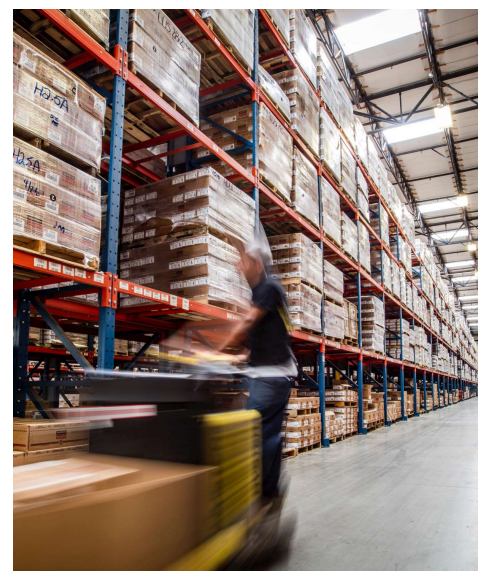
Nuestros Pilares



Investigación, Testeo e
Innovación



Servicio



Disponibilidad de
Producto

SIMPSON
Strong-Tie

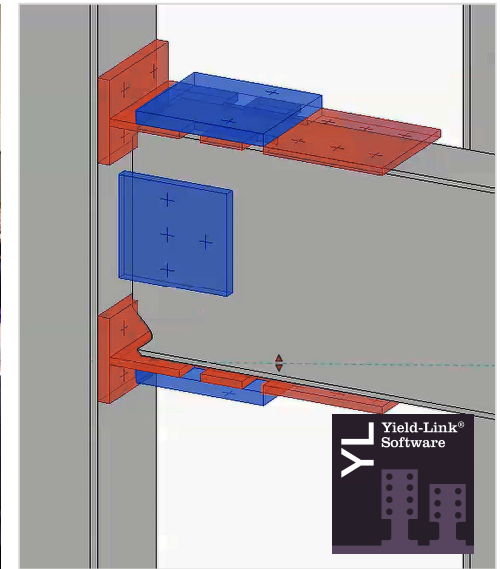
Nuestros Pilares



Soporte Técnico en
Terreno



Educación,
Entrenamientos,
Workshops & Webinars



Recursos y Tecnología

SIMPSON
Strong-Tie

Nuestros Partners



Habitat for Humanity



Build Change



Academia

Nuestros Partners



Habitat for Humanity

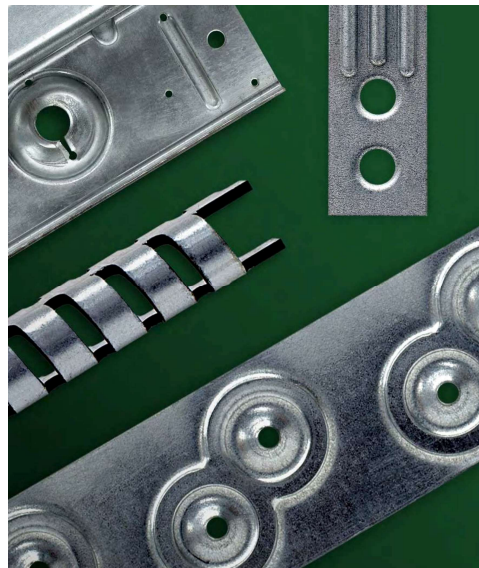


Build Change

Centro UC
de Innovación
en Madera



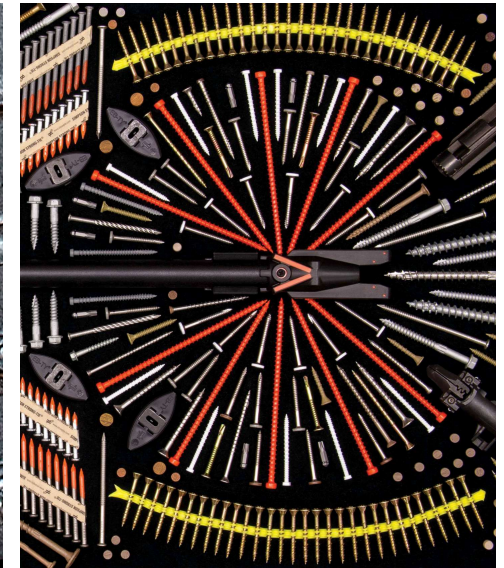
Soluciones



Conectores

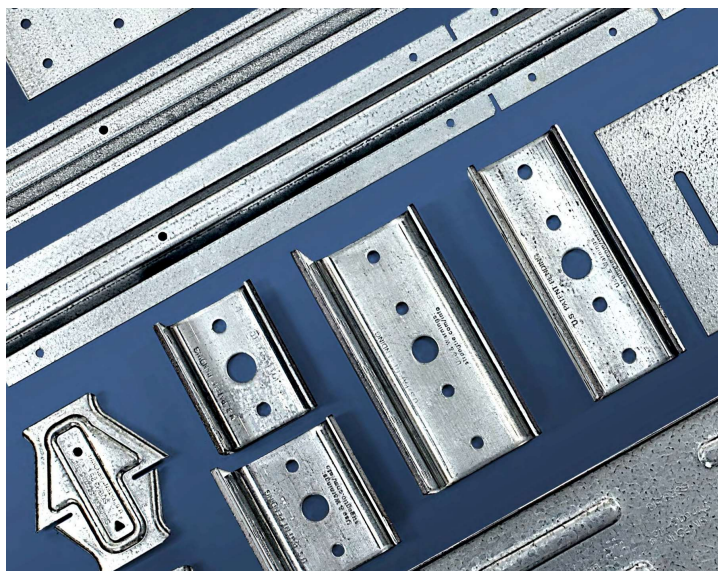


Sistemas de Anclaje

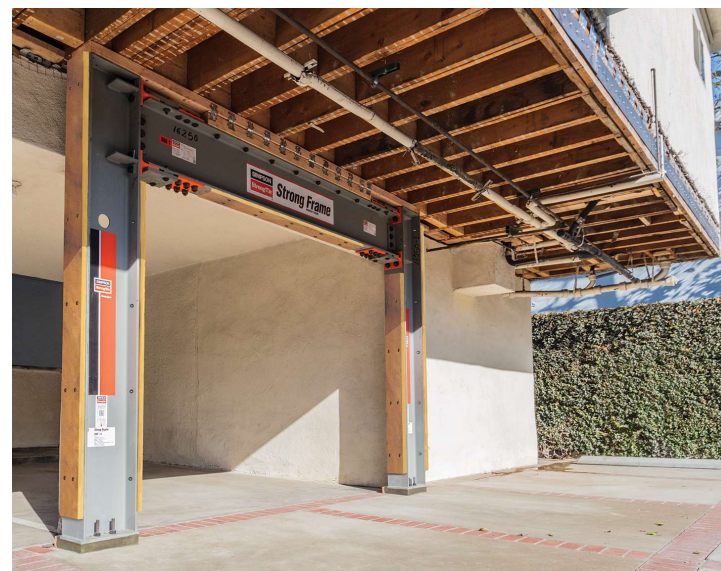


Fijaciones

Soluciones

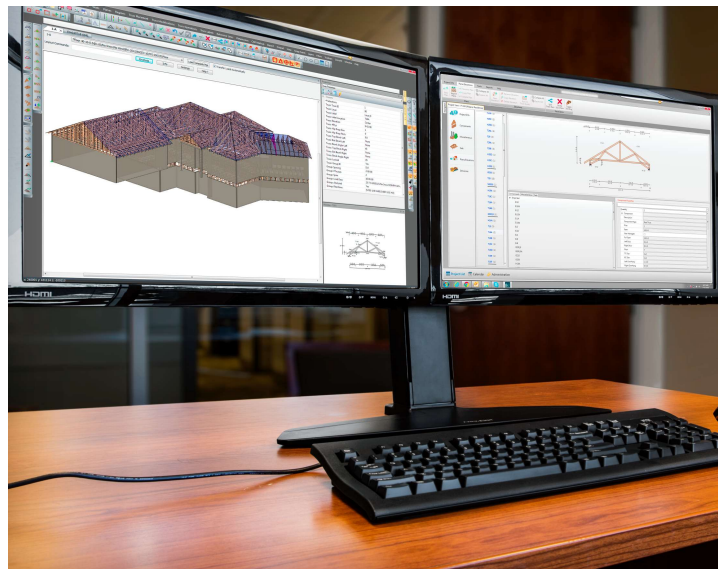


Conectores CFS

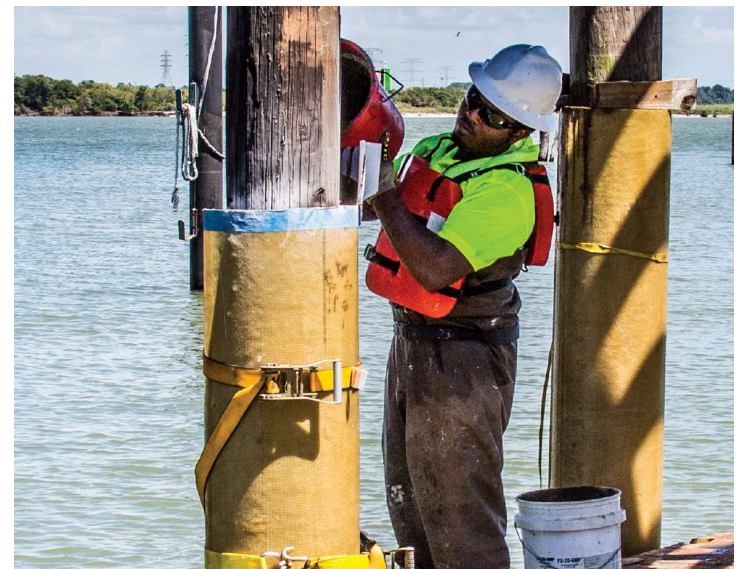


Sistemas Laterales

Soluciones



Sistemas Integrados de Diseño

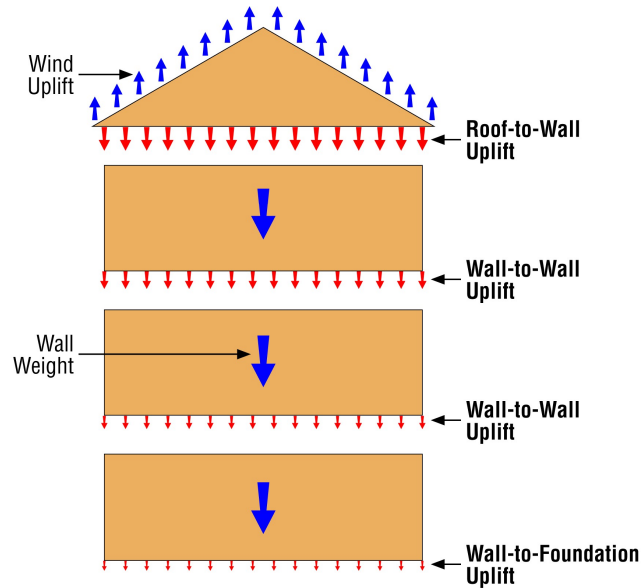


Reparación, Protección y
Reforzamiento

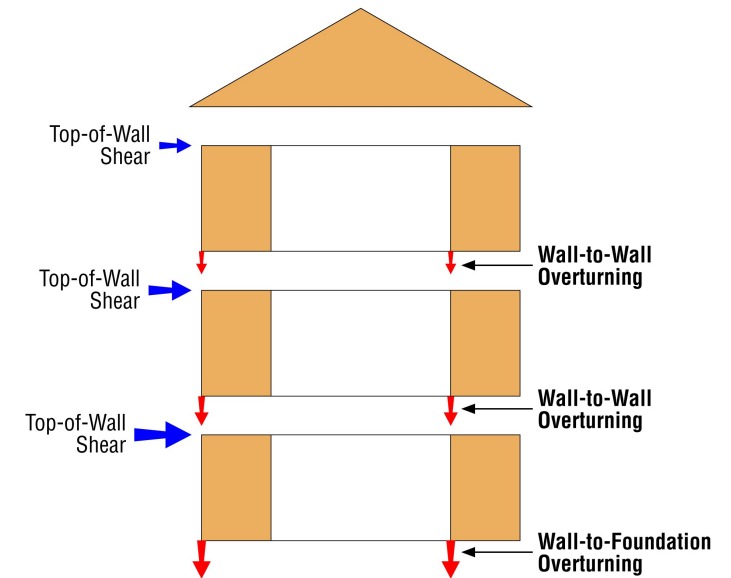


¿Cómo lograr estructuras de madera seguras?

Comportamiento de la estructura frente a levantamiento y volcamiento.

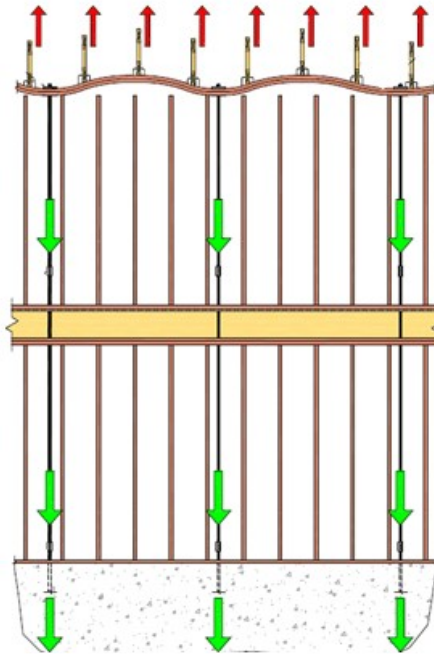


- Conectores se deben disponer de forma uniforme a lo largo del nivel

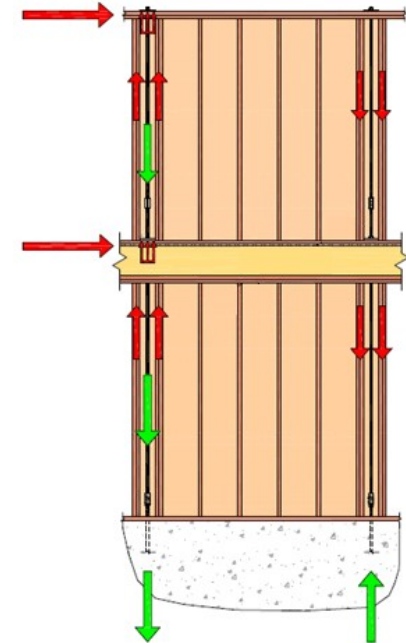


- Conectores se deben disponer en ambos extremos del muro de corte.

Comportamiento de la estructura frente a levantamiento y volcamiento.



- Conectores se deben disponer de forma uniforme a lo largo del nivel



- Conectores se deben disponer en ambos extremos del muro de corte.



Independiente de la naturaleza del movimiento, es necesario garantizar transferencia de carga continua



Independiente de la naturaleza del movimiento, es necesario garantizar transferencia de carga continua

Diafragma

Muros de Corte

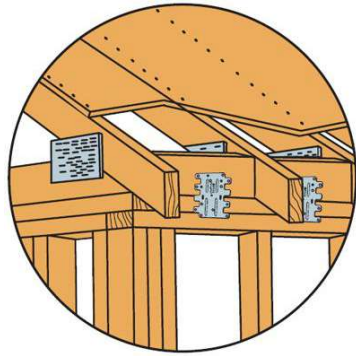
Solera de Piso

Anclajes a la Fundación

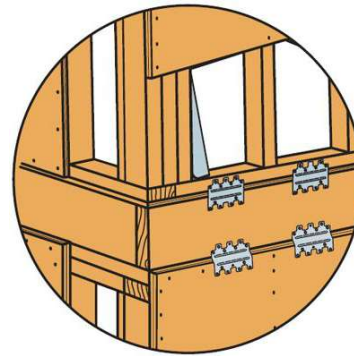
Junta de la Solera

Fundación

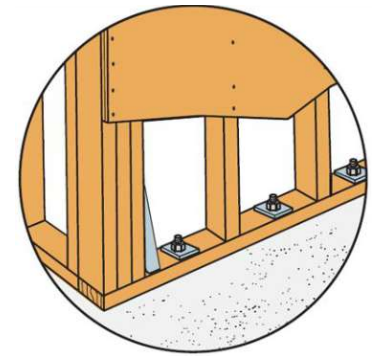
Independiente de la naturaleza del movimiento, es necesario garantizar transferencia de carga continua



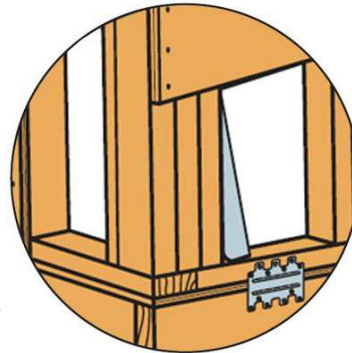
1 | Diafragma de Techo-
A Muro



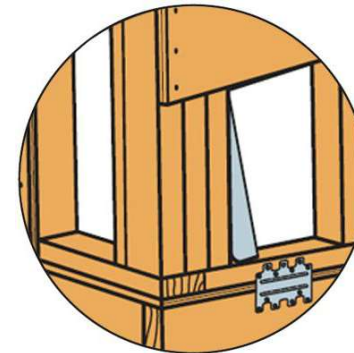
3 | Piso a Piso



5 | Muro-a-
Fundación

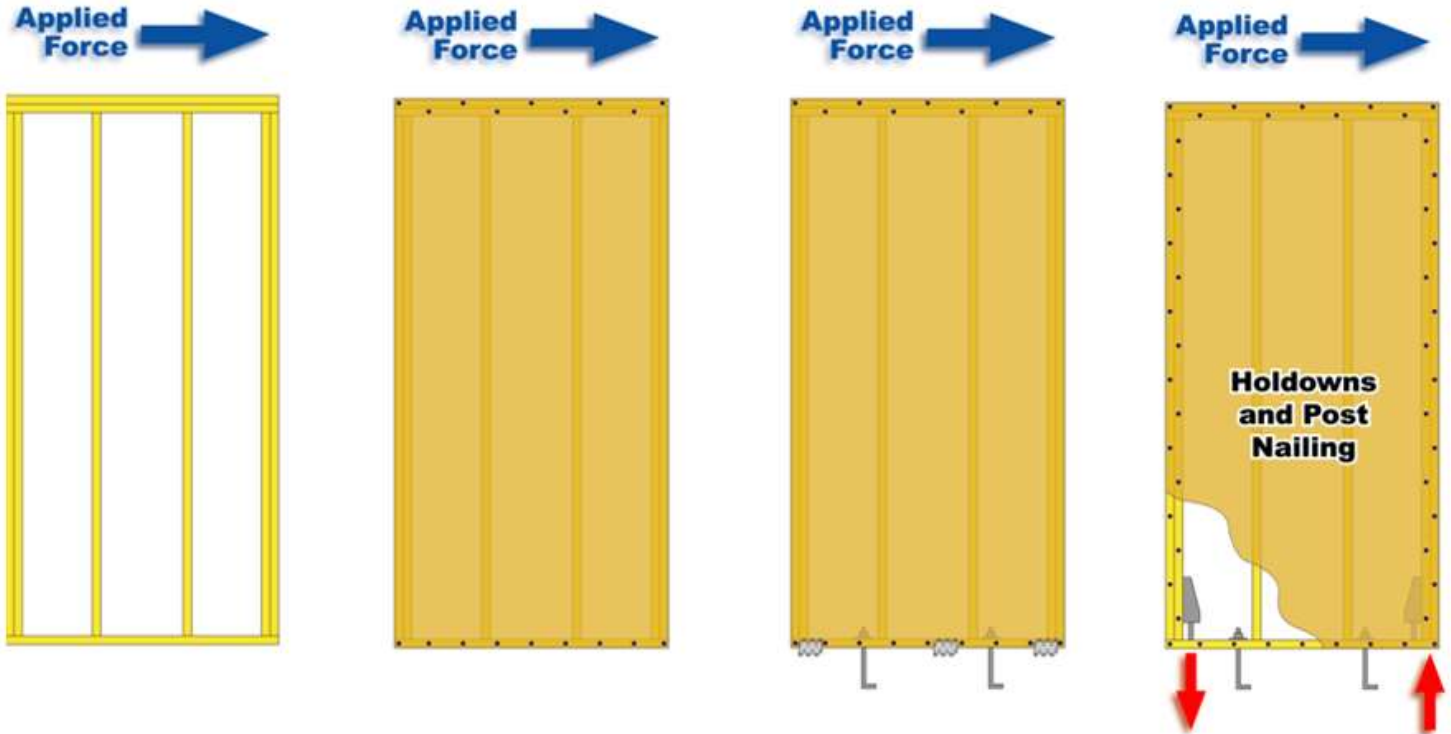


2 | A través
del Muro

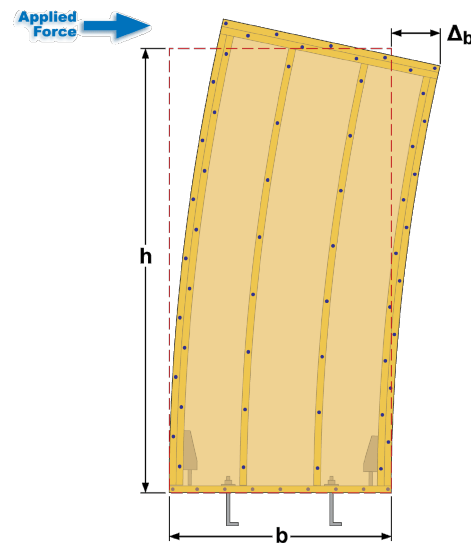


4 | A través
Del Muro

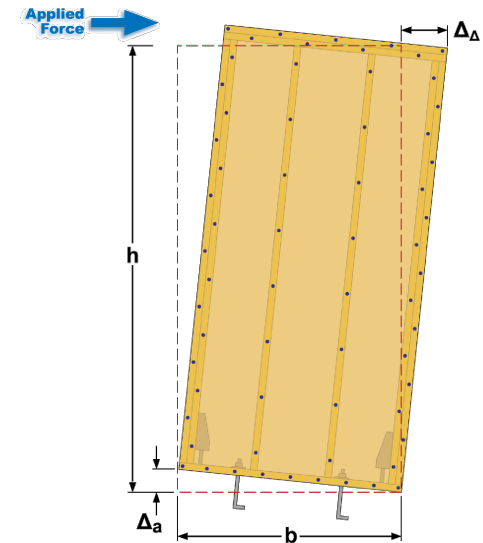
Muros de corte en estructuras de madera sometidas a carga lateral



Muros de corte en estructuras de madera sometidas a carga lateral

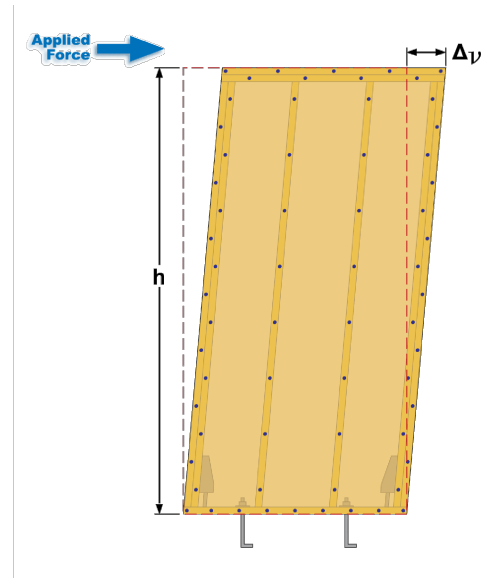


Flexión

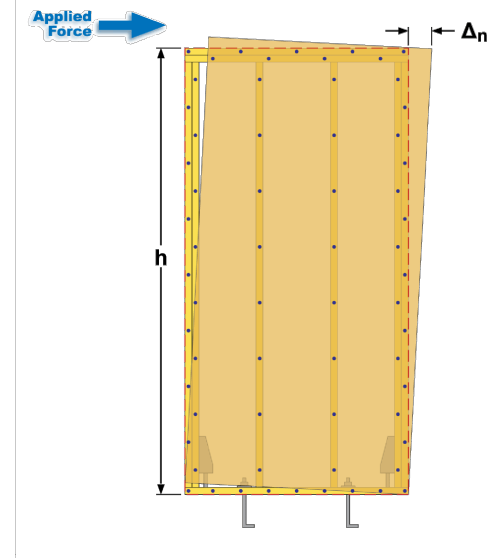


Levantamiento
Anclaje

Muros de corte en estructuras de madera sometidas a carga lateral

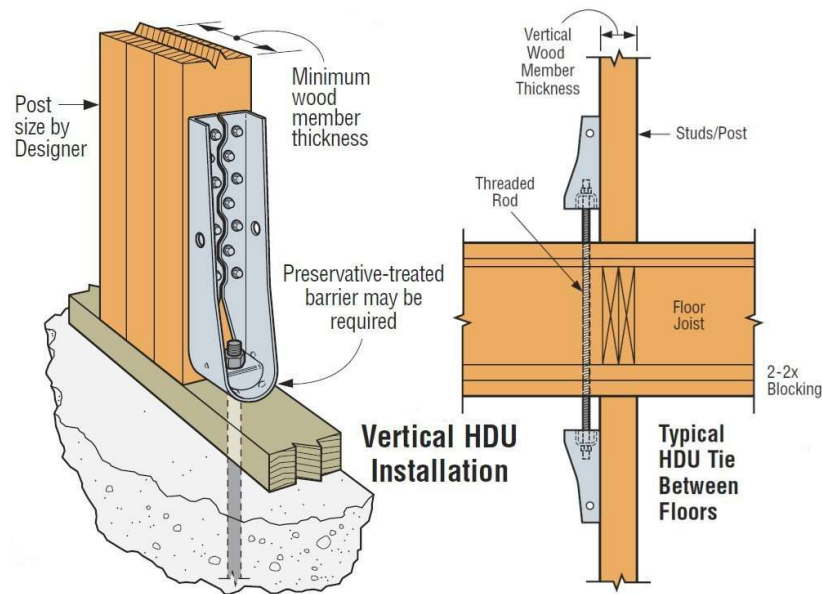


Corte



Deslizamiento
unión clavada

Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.



Sistema Discreto

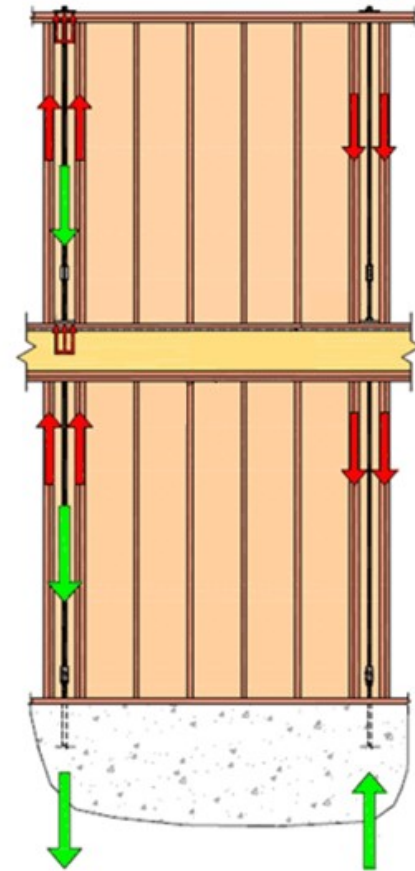


Sistema Continuo

AICE
INGENIEROS CIVILES ESTRUCTURALES DE CHILE A.G.

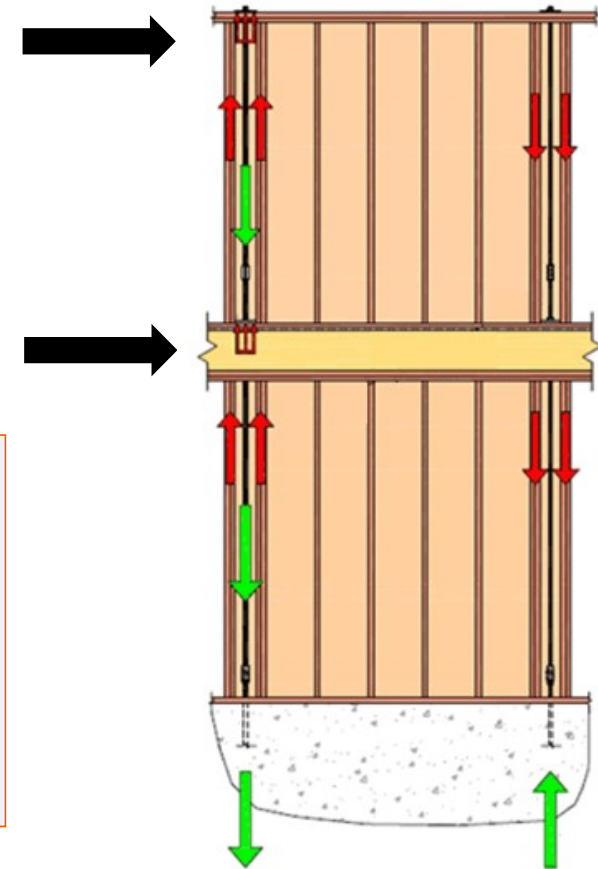
SIMPSON
Strong-Tie

Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.



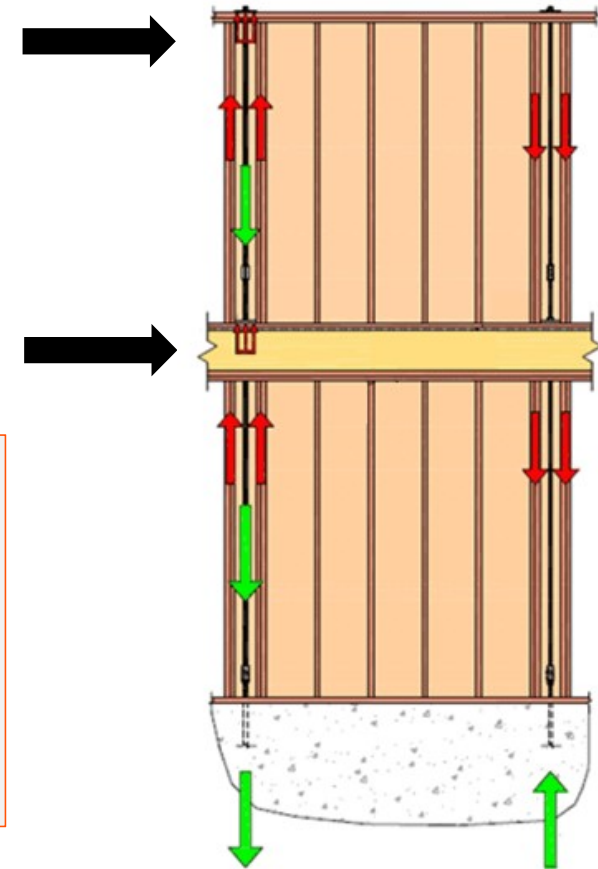
Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

- **Unión clavada** transfiere carga en los pie derecho de borde, generando **compresión** sobre las soleras y sistemas de bloqueo en la medida que el volcamiento ocurre.
- Fuerzas inducidas por el volcamiento son incrementales



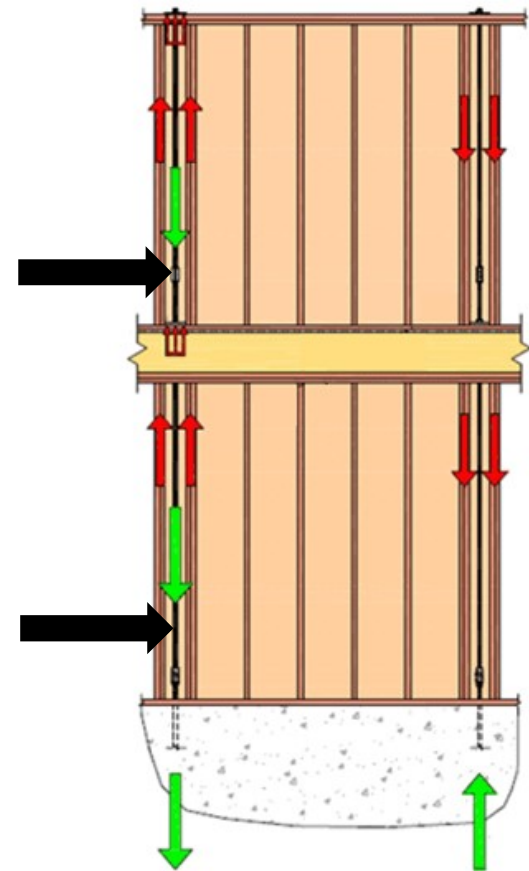
Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

- Pies derecho de borde (en cada nivel) transfieren fuerzas de **compresión** a los elementos de madera, esto genera una reacción en los BP



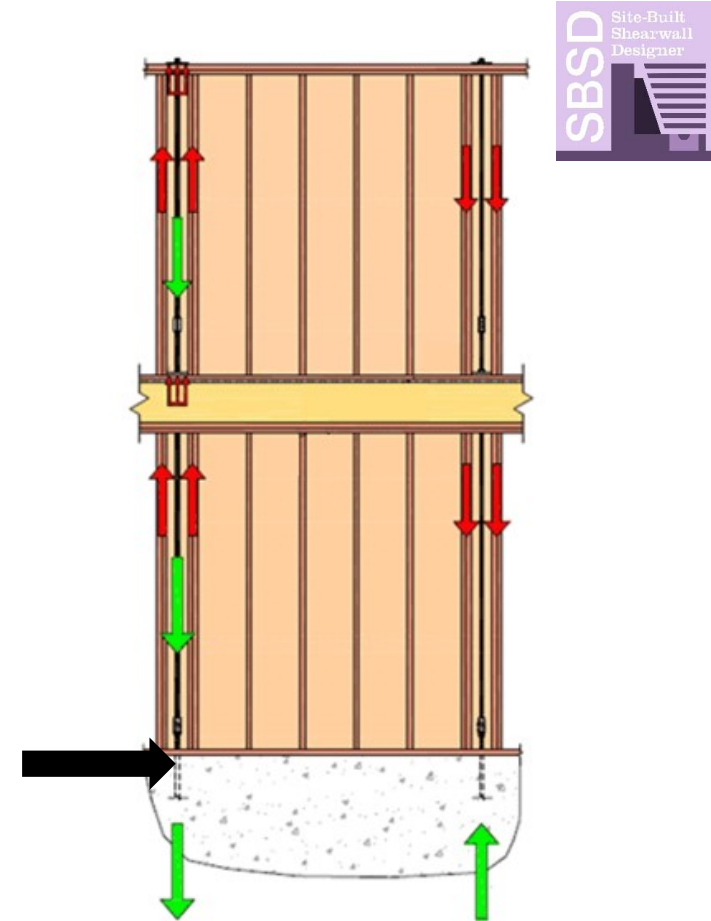
Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

- **Rods** descargan las fuerzas de tracción originadas por el volcamiento hacia los niveles inferiores



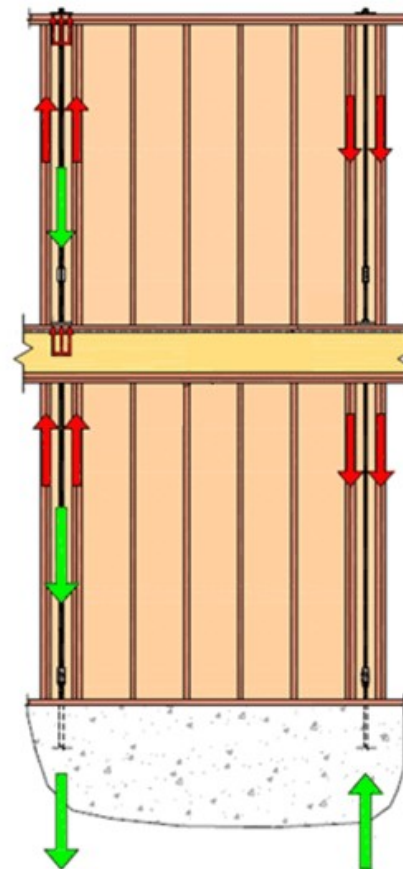
Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

- **Anclaje** transfiere las cargas originadas por el volcamiento a las fundaciones



Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

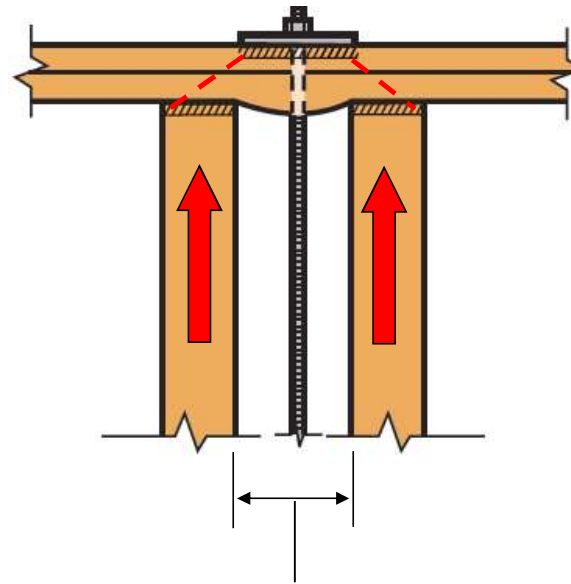
Este lado está en **TENSIÓN**.



Este lado está en **COMPRESIÓN**, las fuerzas son transferidas a la fundación por medio de los elementos de madera

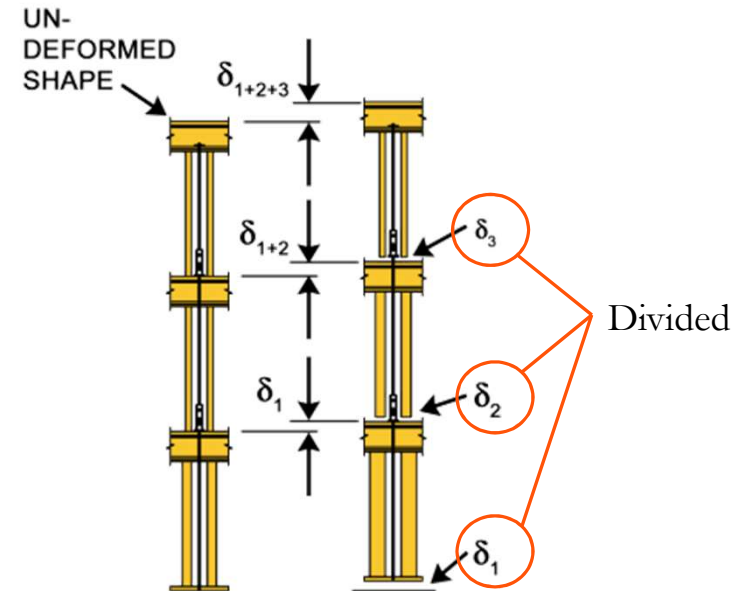
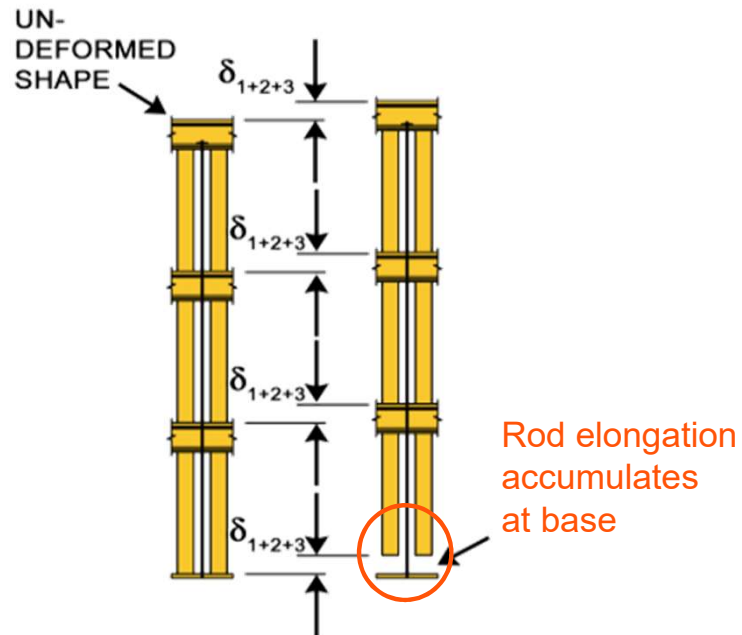


Se debe disponer de un sistema lateral resistente adecuado para resistir el volcamiento inducido por la carga lateral.

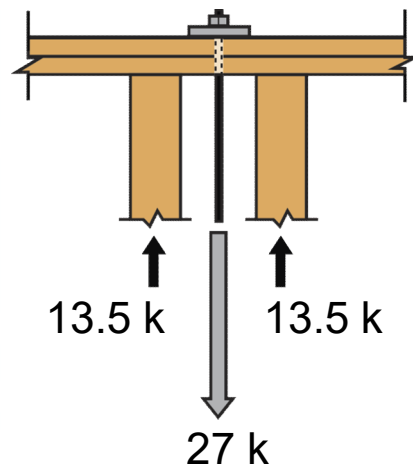


Controlar el espaciamiento
para evitar flexión en la
placa

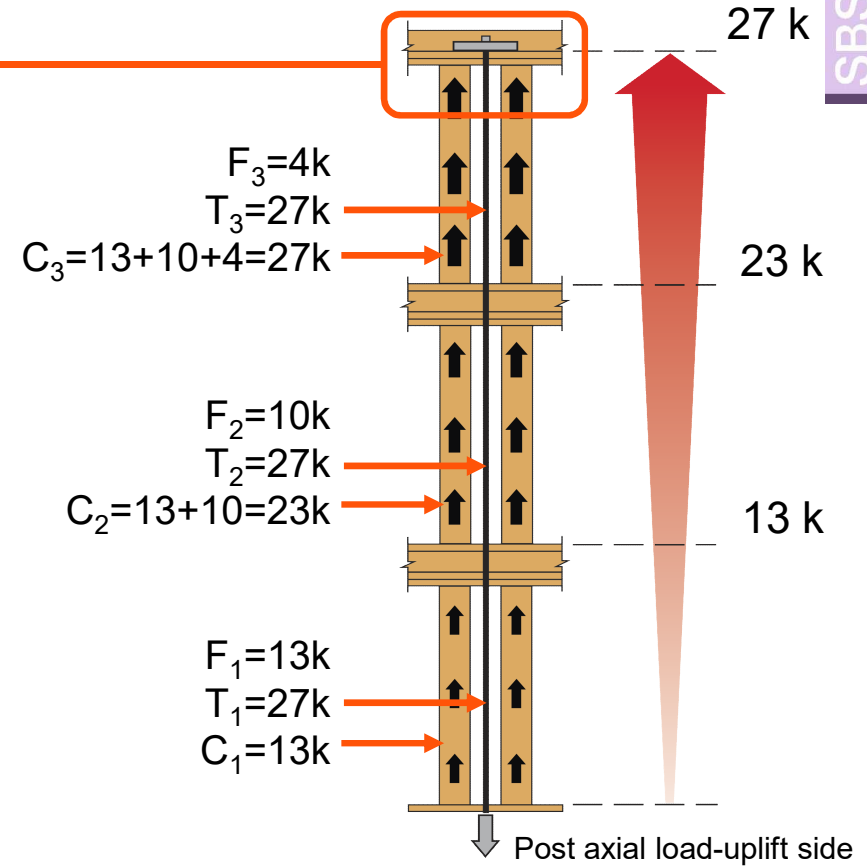
En caso de ser un sistema continuo, ¿es necesario fijar en cada uno de los niveles?



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Detail A

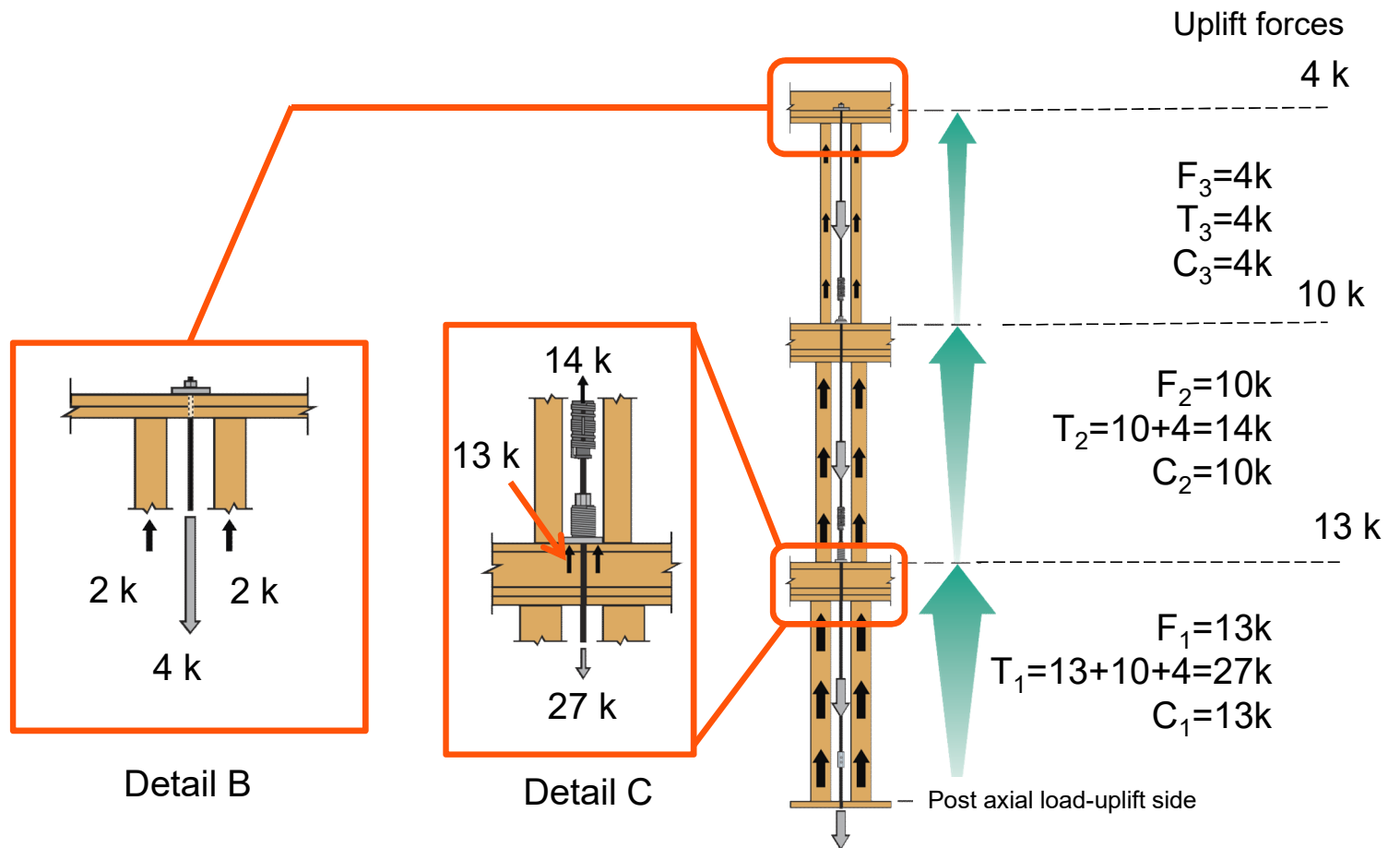


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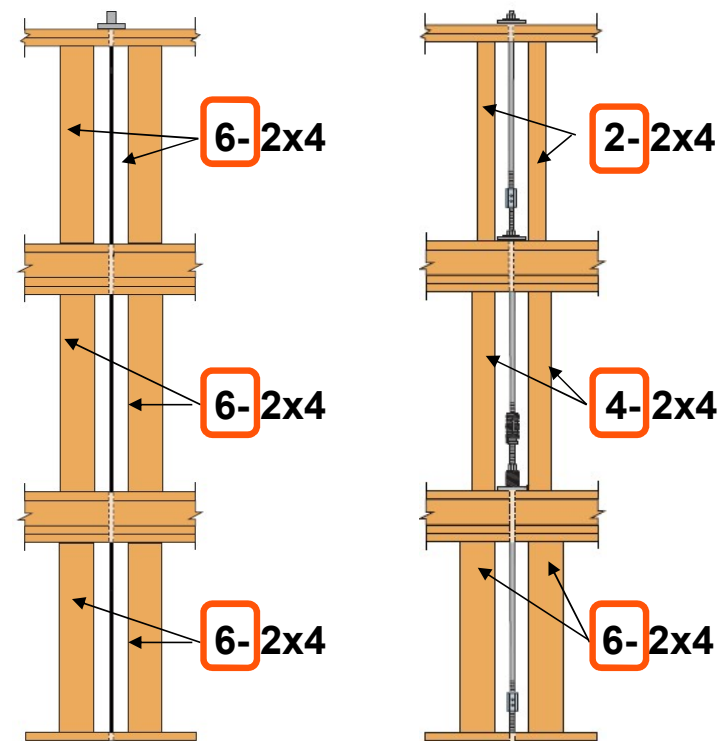


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SIMPSON
Strong-Tie

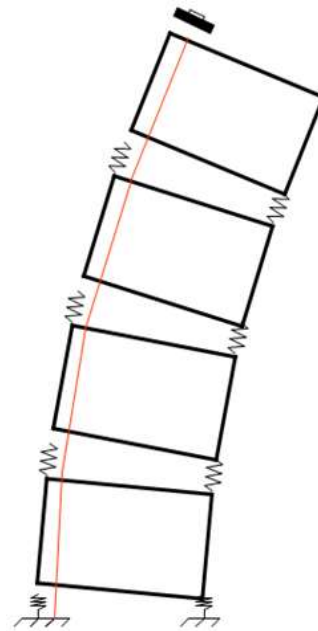


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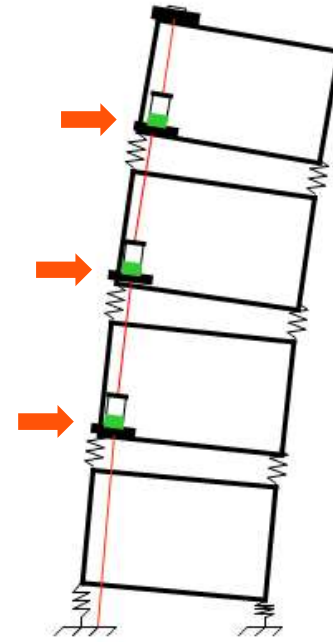


Tied-off

Al fijar en cada uno de los niveles entrego redundancia al sistema lateral resistente.



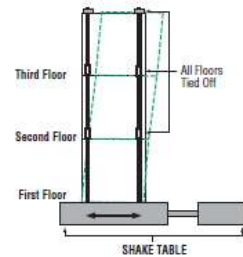
Sin Redundancia



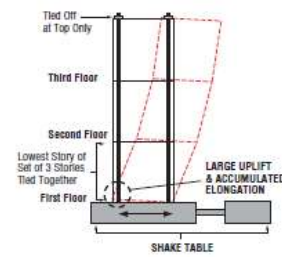
Redundancia

Al fijar en cada uno de los niveles entrego redundancia al sistema lateral resistente.

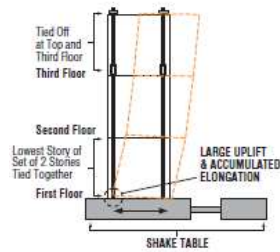
TIED OFF



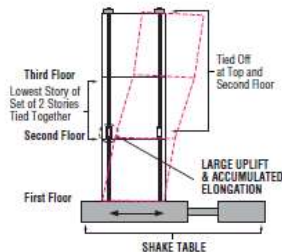
ALL FLOORS SKIPPED



SECOND FLOOR SKIPPED

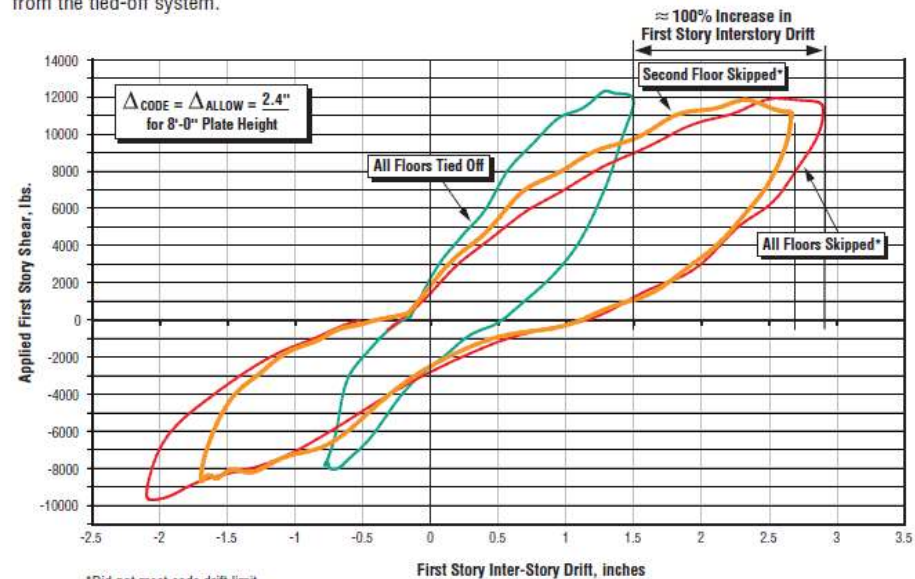


THIRD FLOOR SKIPPED



FIRST STORY INTER-STORY DRIFT COMPARISON

For the all-floors-skipped and the second-floor-skipped configurations, the first story is the bottom story of the group of stories tied together (see system illustrations on page 6). This story experiences the greatest increase in inter-story drift. The graph below compares this drift with that from the tied-off system.



Efecto de las pérdidas de humedad en estructuras de madera.

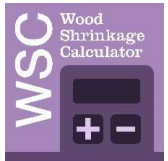
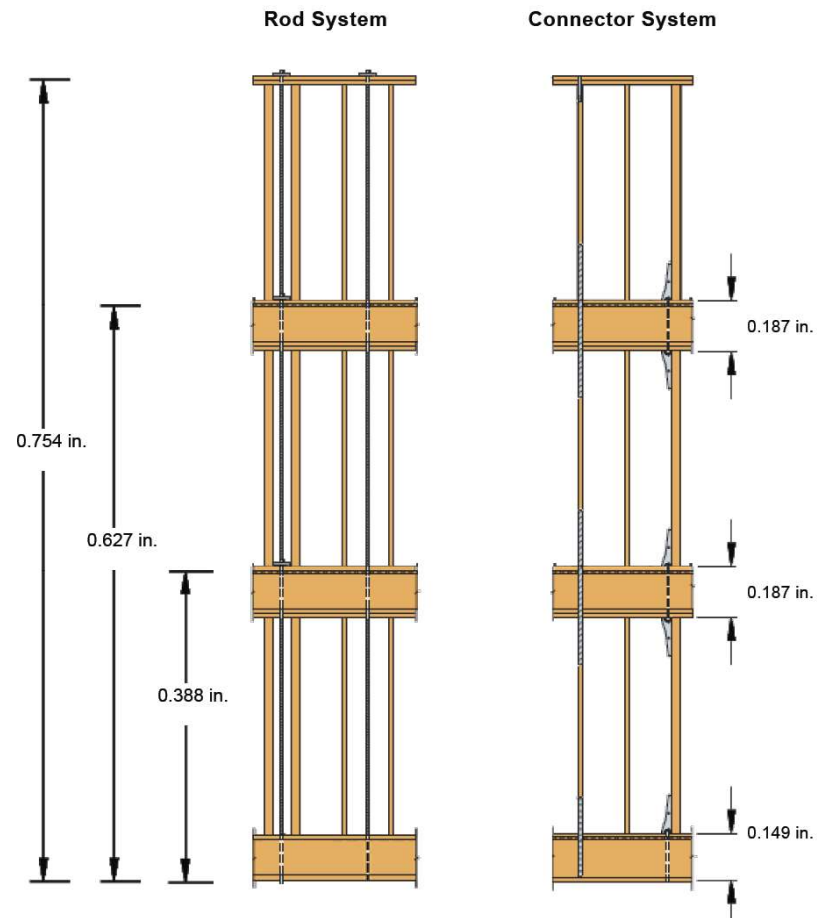


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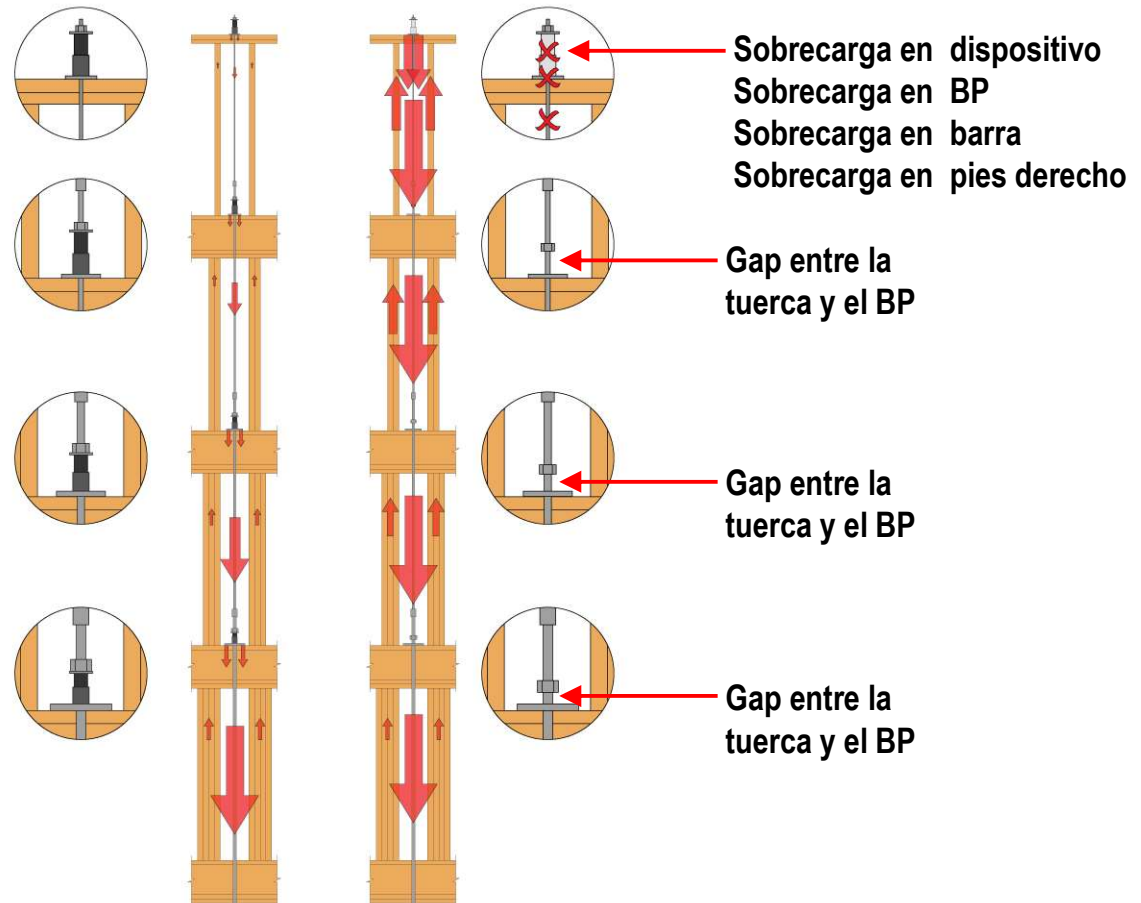


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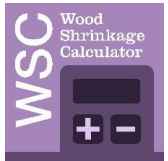
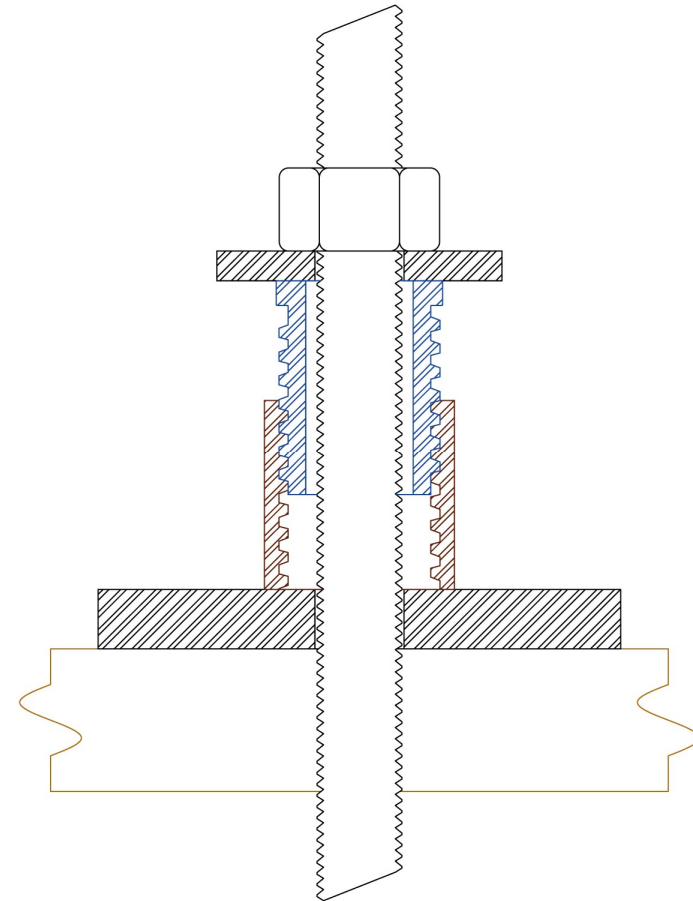
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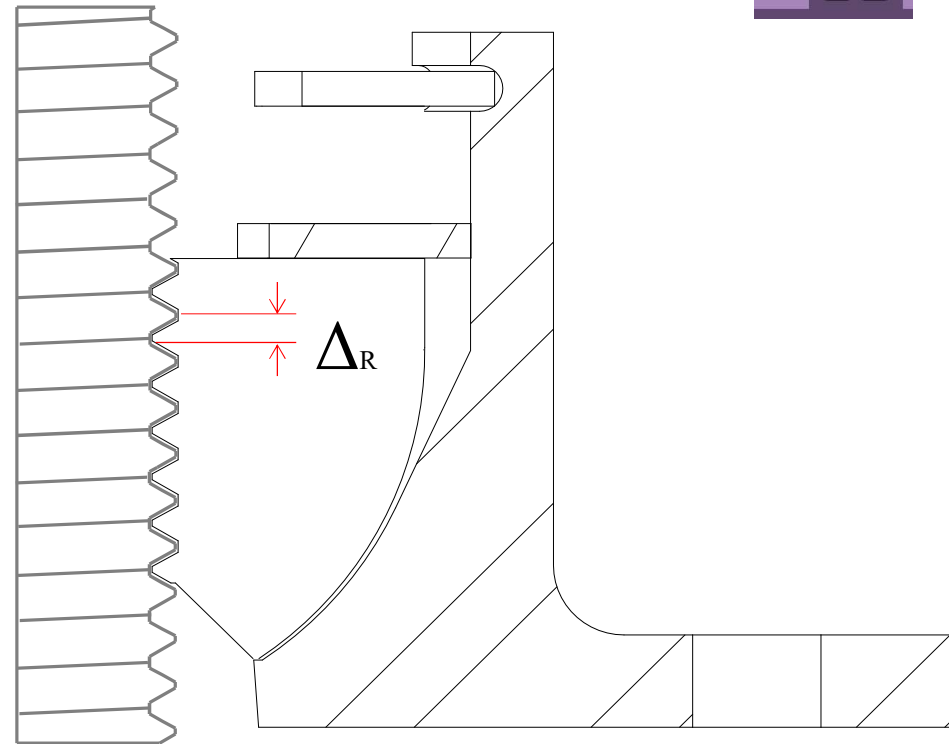
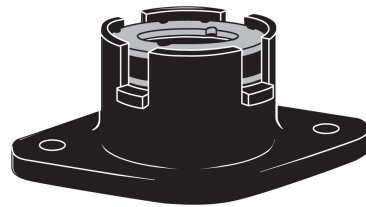
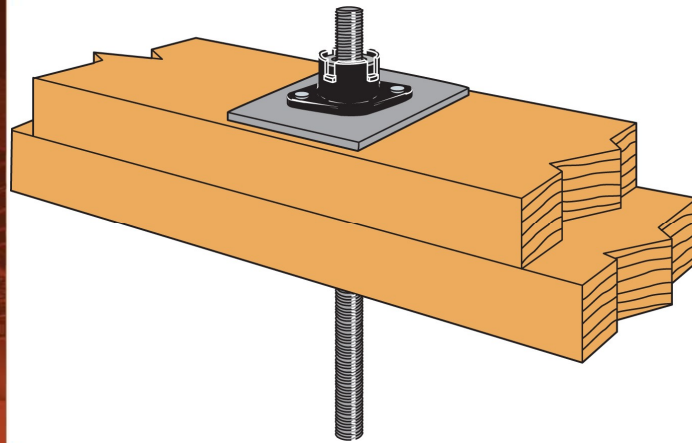
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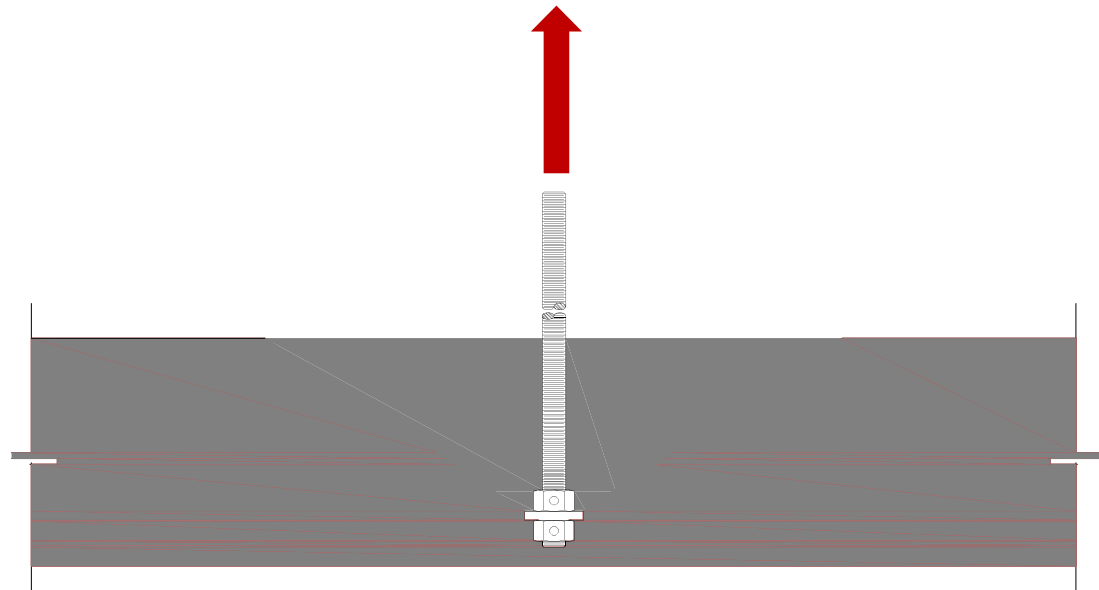
Se deben implementar dispositivos que permitan compensar estas pérdidas de humedad



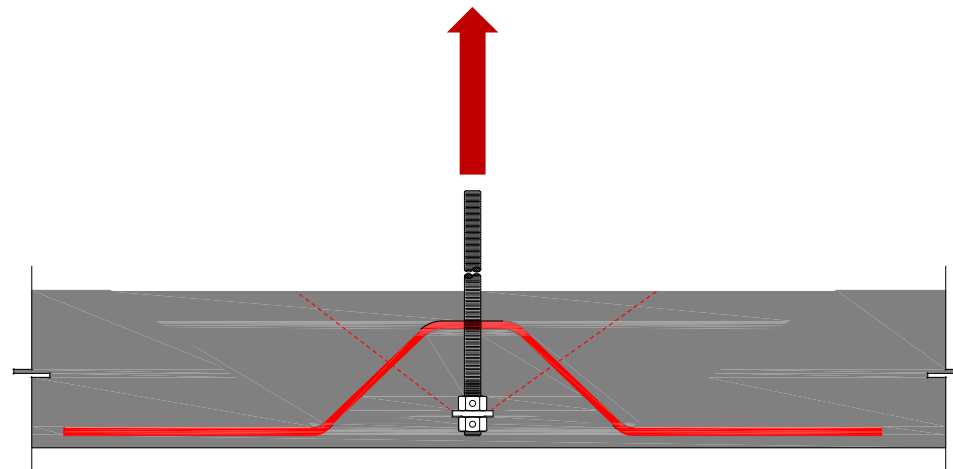
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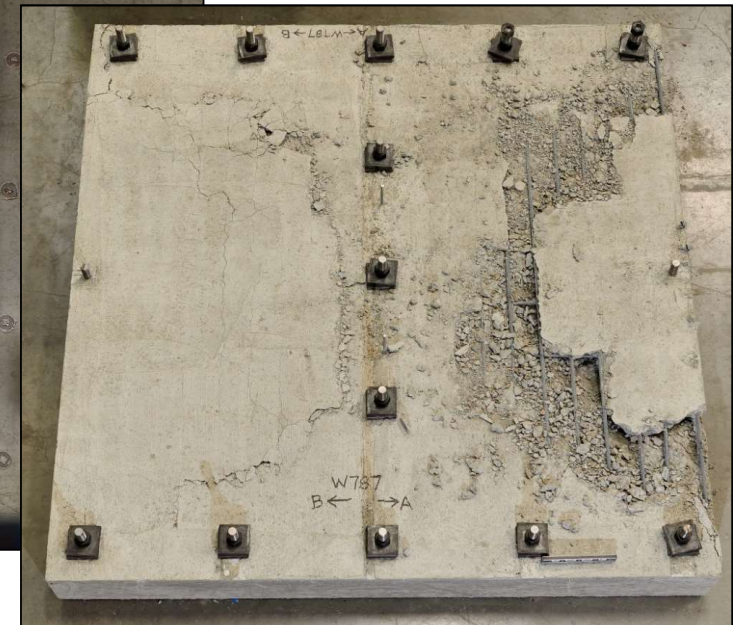
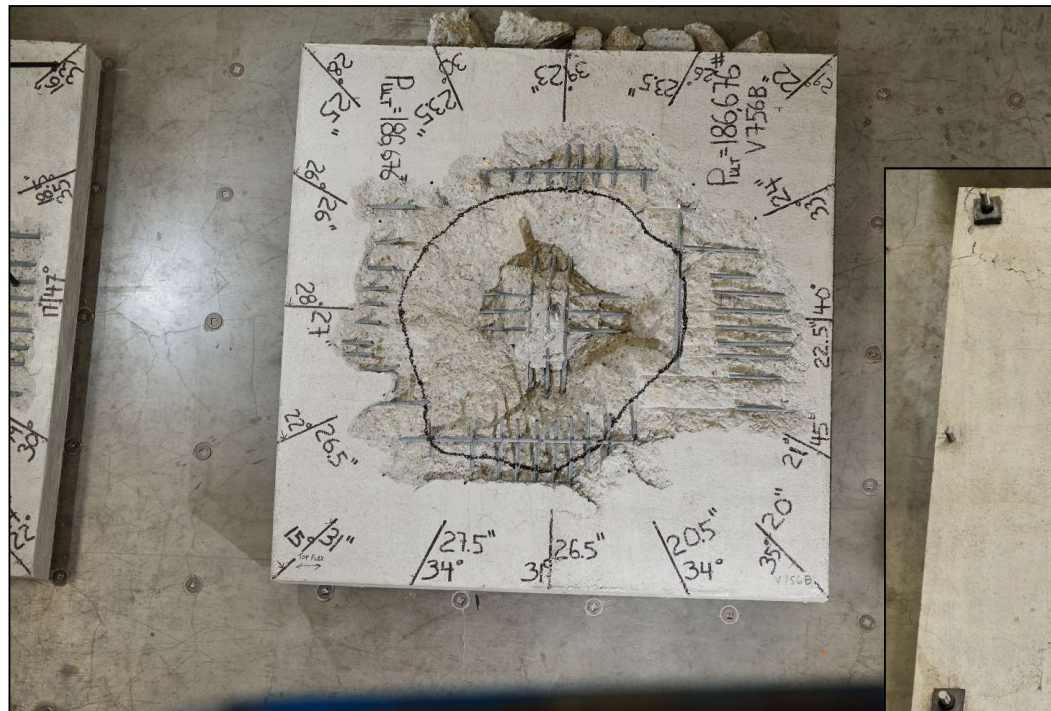
Al anclar el sistema a la fundación, el cono de falla por corte típicamente limita el diseño. Para esta situación el cono se proyecta en un ángulo de 35° .



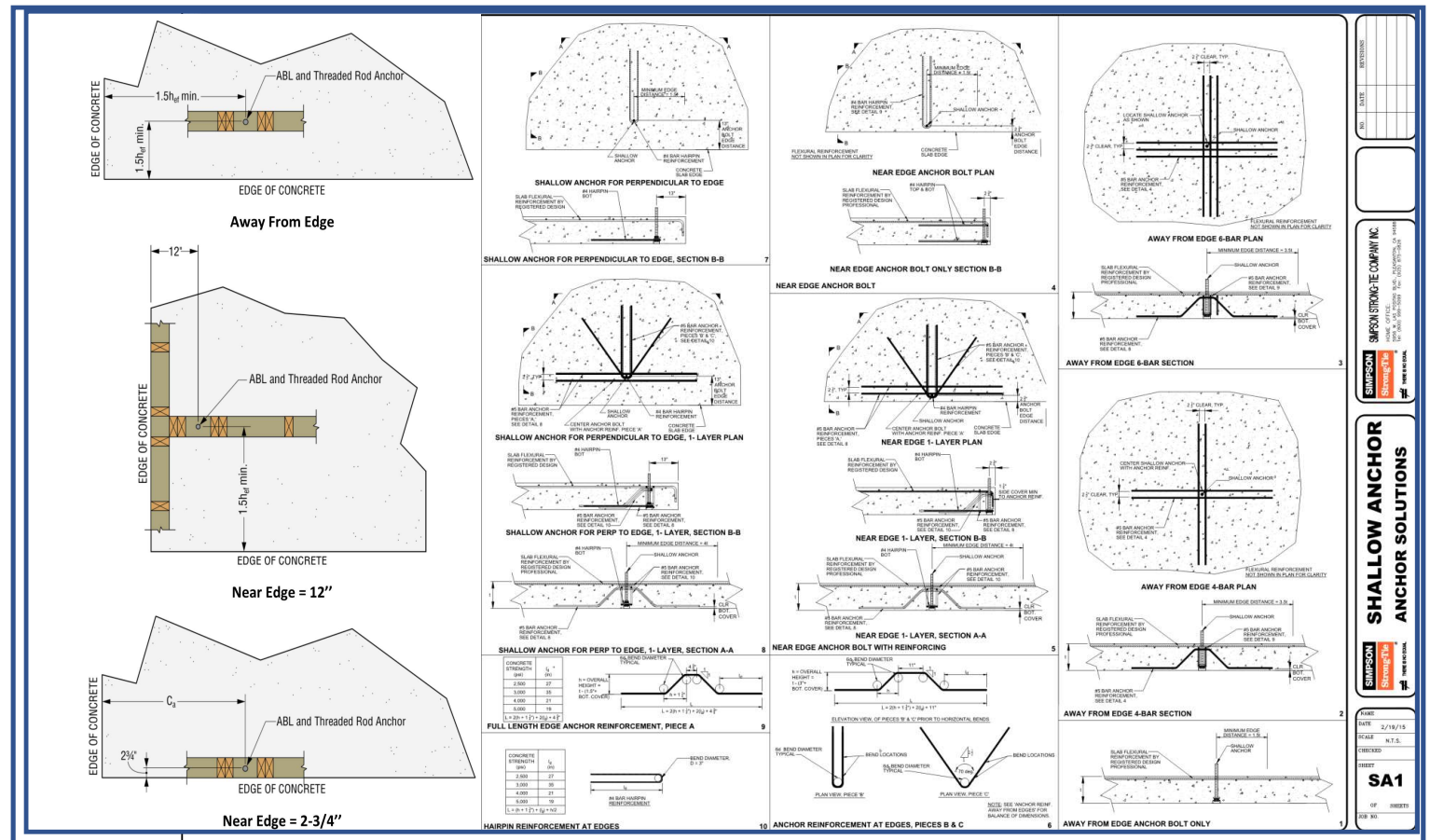
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Garantizar la estabilidad durante la construcción



A collage of construction-related images with a red overlay. The images include various hardware like bolts, nuts, and brackets; tools like a power drill and a circular saw; and building structures like a house, a spiral staircase, and a pergola. The text "Design Tools" is centered in white.

A fin de facilitar la aplicación de varios de los principios desarrollados anteriormente



Denotes
Desktop App



Denotes
Web-Based App

A fin de facilitar la aplicación de varios de los principios desarrollados anteriormente

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2015 and 2018 IBC®
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Drawings

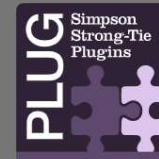
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Also in Software & Web Applications

Mobile Apps

Bringing Unmatched Product

With over 60 years of leadership in structural engineering, Simpson Strong-Tie, an American-based company to embrace the challenge, we're leveling the playing field.

> Build It Faster. Build It Better.

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A fin de facilitar la aplicación de varios de los principios desarrollados anteriormente

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Diseño de Muros de corte con base a SDPWS

Design Criteria

Wood Shearwall Selector: Solutions Report

Report Generated: August 25, 2019

Material Summary

Sheathing				Nailing ⁵		Holddown ⁶		Endpost		
Sheathing Material	Sheathing Type	Thickness	Number Of Sides	Type And Size	Edge / Field Spacing	Holddown Model	Fasteners	End Studs	Wood Species	Minimum Lumber Grade
Sheathing	OSB	19/32"	1	10d	3/12	HDU8-SDS2.5	20-SDS 1/4"x2 1/2"	3-2x4	DF	Stud

Design Summary

Loading Type	Allowable U_{ASD} (plf)	HD Capacity (lb)	Panel Shear DCR	Post Compression Parallel To Grain DCR	Post Compression Perpendicular To Grain DCR	Post Net Section Tension DCR	Holddown Tension DCR
Wind	698	7870	0.956	0.822	0.712	0.962	0.866
Seismic	499	7870	0	0	0.014	0	0

Shearwall Deflection Summary^{1,2,3}

Loading Type	Bending Term (in)	Panel Shear And Nail Slip Term (in)	Deflection Due To Vertical Components (in)	Total Wall Horizontal Deflection (in)	Shearwall Drift (in)	Allowable Drift (in)	Drift DCR
Wind	0.041	0.162	0.261	0.464	0.464	0.533	0.870
Seismic	0	0	0	0	0	2.400	0

Shear Anchorage⁷

Sill Plate Material		MASA Solution ⁴	
Wood Species	DF	Minimum Number of MASA	2
Minimum Lumber Grade	Stud	Side Fasteners	3-10dx1-1/2
Sill Size	2x	Top Fasteners	6-10dx1-1/2
Anchor Bolt Solution		Titen HD Solution	
Diameter	(2) - 1/2" Diameter	Model Number	(2) - THD50600H

Diagram: A cross-section diagram of a wood shearwall. It shows a vertical wall with a base. A horizontal load P_R is applied at the top. The height of the wall is labeled H with a value of 8 ft. The wall is supported by a foundation at the base.

SBSD Site-Built Shearwall Designer

Diseño de Muros de corte con base a SDPWS

Design Criteria

Wall ID: Design Code:

Seismic Lateral Demands

ASD Seismic Load, $0.7 \cdot E$: lb

Seismic Design Category:

Seismic Drift Limit:

Seismic Value, S_{DS} :

Importance Factor, I :

Redundancy Factor:

Wind Lateral Demands

ASD Wind Load, $0.6 \cdot W$: lb

Wind Drift Limit:

Shearwall Parameters

Wall Thickness (Nominal):

Stud Spacing:

Lumber Species:

Wood Structural Panel:

Sheathing Type:

Minimum Sheathing Thickness:

Wall Dead Load: psf

Double-Sided Shearwall:

Determinación de la elongación de las barras del sistema continuo de anclaje

Tension Load

Demand Load: lbs. ?

Rod Properties

Rod Diameter: ?

Length of Rod: ft - in ?

CALCULATE  **RESTART** 

Calculation Results

Elongation: 0.101 inches

1) Rod elongation = $PL/(A_e \times E)$

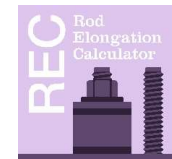
Where,

$P = 5500$ lbs.

$L = 120$ inches

$A_e = 0.226$ square inches which is the rod effective net area from AISC.

$E = 29000000$ psi



Distema discreto de anclaje

Post Installed Input Information

Demand Load [?] lbs Wood Species [?]

CALCULATE [?]

Post Installed Holdown Solutions

Holdown Application [?]	Holdown Model [?]	Holdown Capacity [?]	Deflection at Demand Load [?]	Minimum Post Thickness [?]	Anchor Bolt Diameter [?]	Required Fasteners [?]	Installed Cost Index* [?]
Screwed [?]	HDU11-SDS2.5	8045 lbs	0.128 in.	7.25 in.	1 in.	30-SDS 1/4"X2 1/2"	Lowest
Screwed	HDU14-SDS2.5	10350 lbs	0.128 in.	5.5 in.	1 in.	36-SDS 1/4"X2 1/2"	+23%
Screwed	HHQ11-SDS2.5	8505 lbs	0.116 in.	5.5 in.	1 in.	24-SDS 1/4"X2 1/2"	+125%
Screwed	HHQ14-SDS2.5	9370 lbs	0.086 in.	7.25 in.	1 in.	30-SDS 1/4"X2 1/2"	+128%
Bolted [?]	HD9B	8435 lbs	0.158 in.	4.5 in.	7/8 in.	3-7/8"x6" M.B.	+102%

Estimación de la pérdida de humedad

Project Name
Workshop Example

Moisture Content Data
Initial MC 19 % Final MC 9 %

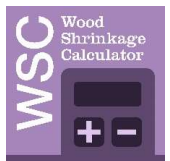
Wood Species Data
Top Plate Spruce Pine Fir Sole Plate Spruce Pine Fir Sill Plate Spruce Pine Fir

First Floor Data
Foundation Concrete Slab

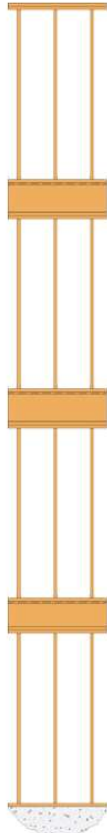
Wall Data
Number of Stories 4 Typical Plate Height 109 in

Upper Floor Data
Floor System Floor Truss

Optional Parameter
Include studs in shrinkage calculation? Yes



Estimación de la pérdida de humedad



4th Level Top Plate: 2-2x ▼

4th Level Plate Height: 109 in

4th Level Sole Plate: 2x ▼
4th Floor System: Floor Truss ▼

3rd Level Top Plate: 2-2x ▼

3rd Level Plate Height: 109 in

3rd Level Sole Plate: 2x ▼
3rd Floor System: Floor Truss ▼

2nd Level Top Plate: 2-2x ▼

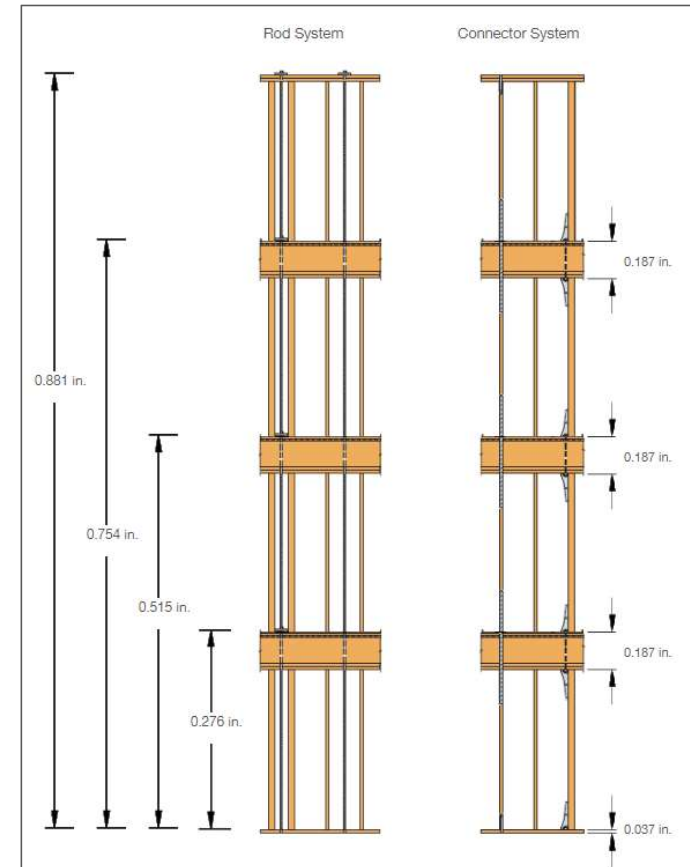
2nd Level Plate Height: 109 in

2nd Level Sole Plate: 2x ▼
2nd Floor System: Floor Truss ▼

1st Level Top Plate: 2-2x ▼

1st Level Plate Height: 109 in

Sill Plate: 2x ▼
Foundation: Concrete Slab ▼



Transferencia de carga continua

Load Data
Enter Demand Load
4580 lbs.

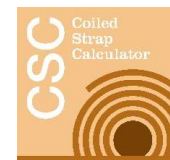
Strap Data
Coiled Strap Model
CMSTC16
☒ Installed over Sheathing

Nail Data
Nail Diameter 0.148 in. Nail length 2 1/2 in.
Wood Species SPF

CALCULATE

CALCULATION RESULTS		COILED STRAP DESIGNER	AUGUST 25, 2019
COILED STRAP MODEL	CMSTC16	NAIL SIZE	0.148 in. x 2 1/2 in.
END NAILS	28	TOTAL NAILS	56
NUMBER OF STUDS	Double	STRAP CAPACITY	4585 lbs
RESTART		PRINT	EXPORT DATA TO CUT LENGTH CALCULATOR

SIMPSON
Strong-Tie



Diseño de muros de alta resistencia



Design Criteria:

- * 2012 International Bldg Code
- * Seismic R=6.5
- * 2500 psi concrete
- * 2nd Story Wall Design Shear = 1000 lbs
- * 1st Story Wall Design Shear = 1000 lbs
- * Floor Joist Depth

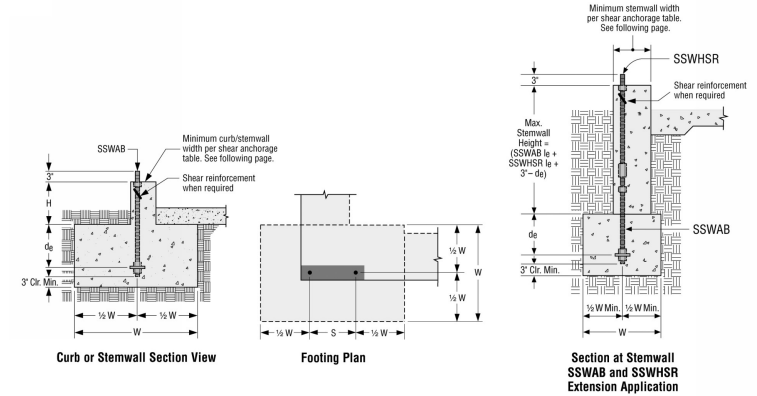
Selected Strong-Tie

Model
SSW18x8
SSW18x8
SSW18x8-STK
SSW18x8-STK

Actual Shear &

Model
SSW18x8
SSW18x8
SSW18x8-STK
SSW18x8-STK

Anchor Solution Details:



Anchor Solution Assuming Cracked Concrete Design:

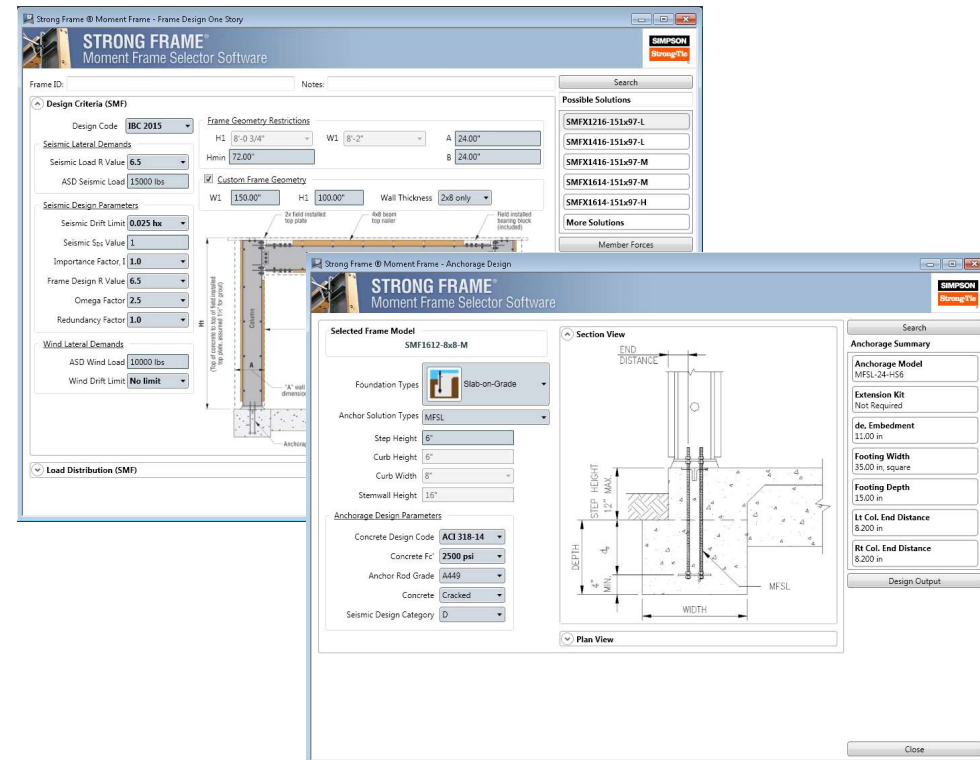
Model	W	de	S	Anchor Bolt	Strength
SSW18	33	11	12.25	SSWAB1	Standard

Anchor Solution Assuming Uncracked Concrete Design:

Model	W	de	S	Anchor Bolt	Strength
SSW18	28	10	12.25	SSWAB1	Standard

SIMPSON
Strong-Tie

SFS Strong Frame[®]
Moment Frame
Selector



Diseño de Fijaciones basado en modelo de fluencia de la NDS

General

Select Application

Fastener Substitution

OR

Load Entry
500 lb

Design Method

Allowable Stress Design (ASD)

Code

☐ NDS 2005
☒ NDS 2012/2015

Side Member

Side Member Type

☒ Wood ☐ Steel

Side Member Properties

Side Member Species

- Select One -

Specific Gravity

OR

0.42

Side Member Thickness

2

in

Main Member

Main Member Properties

Main Member Species

- Select One -

Specific Gravity

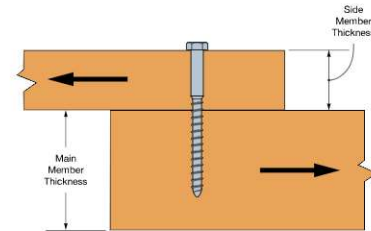
OR

0.42

Main Member Thickness

2

in



Lateral Load Parallel to Grain

Factors

Load Duration Factor

1.6

Temperature Factor

1

Wet Service Factor

1

RESTART

FASTENER SUBSTITUTION OPTIONS

SIMPSON
Strong-Tie

Diseño de Fijaciones basado en modelo de fluencia de la NDS

RESTART

FASTENER SUBSTITUTION OPTIONS

Simpson Strong-Tie Fastener Substitution Options

Fastener Type

- ☒ All Types
- ☐ DWP Wood SS Screw
- ☐ SDWS FRAMING Screw
- ☐ WSV Subfloor Screw
- ☐ SDWH TIMBER-HEX Screw
- ☐ SDWS TIMBER SS Screw
- ☐ SDWS TIMBER Screw

Fastener Type Corrosion Resistance ⓘ

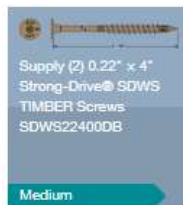
- ☒ All Types
- ☐ Low
- ☒ Medium
- ☐ High
- ☐ Severe

Click on a fastener tile below to view detailed information regarding the chosen fastener substitution

 Supply (2) #12 x 3-1/2" Deck-Drive™ DWP WOOD SS Screws T12350 Severe	 Supply (4) 0.160" x 3" Strong-Drive® SDWS FRAMING Screws SDWS16300 Medium	 Supply (2) #14 x 3-1/2" Deck-Drive™ DWP WOOD SS Screws T14350 Severe	 Supply (5) #9 x 3" Strong-Drive® WSV SUBFLOOR Screws WSV3S Low
 Supply (2) 0.195" x 4" Strong-Drive® SDWH TIMBER-HEX Screws SDWH19400DB Medium	 Supply (2) 0.276" x 4" Strong-Drive® SDWS TIMBER SS Screws SDWS27400SS Severe	 Supply (2) 0.22" x 4" Strong-Drive® SDWS TIMBER Screws SDWS22400DB Medium	

SIMPSON
Strong-Tie

Diseño de Fijaciones basado en modelo de fluencia de la NDS



Input	
Input	SST Fastener Capacity
Design Method	Allowable Stress Design (ASD)
Code	NDS 2012/2015
Main Member Thickness, t_m (in)	2
Side Member Thickness, t_s (in)	2
Dowel Length, l (in)	4.0
Main Member Bearing Angle, θ_m (deg)	0
Side Member Bearing Angle, θ_s (deg)	0
Main Member Specific Gravity, G_m	0.42
Side Member Specific Gravity, G_s	0.42
Actual Diameter, D (in)	0.219
Load (lb)	500
Load Duration Factor, C_D	1.6
Temperature Factor, C_t	1
Wet Service Factor, C_M	1
End Grain Factor, C_{eg}	1



Diseño de Fijaciones basado en modelo de fluencia de la NDS

Input	
Input	SST Fastener Capacity
Design Method	Allowable Stress Design (ASD)
Code	NDS 2012/2015
Main Member Thickness, t_m (in)	2
Side Member Thickness, t_s (in)	2
Dowel Length, l (in)	4.0
Main Member Bearing Angle, θ_m (deg)	0
Side Member Bearing Angle, θ_s (deg)	0
Main Member Specific Gravity, G_m	0.42
Side Member Specific Gravity, G_s	0.42
Actual Diameter, D (in)	0.219
Load (lb)	500
Load Duration Factor, C_D	1.6
Temperature Factor, C_t	1
Wet Service Factor, C_M	1
End Grain Factor, C_{sg}	1



Diseño de Fijaciones basado en modelo de fluencia de la NDS

Penetration Check

Penetration Check Detail	SST Fastener Capacity
Penetration, p (in)	1.78
Minimum Penetration Requirement, p_{min} (in)	$6D = 1.31$
Minimum Penetration Requirement Met	Yes

End/Edge Distance and Spacing

End Distance, Edge Distance, and Spacing	SST Fastener Capacity
	See figure below the fastener image for end distance, edge distance, and spacing requirements

Calculated Reference Design Value

Yield Mode ①	Yield Limit Equation ①	SST Fastener Capacity	
		Yield Limit, Z	Reduction Term, R_D
Mode I _m	$Z = \frac{Dl_m F_{em}}{R_d}$	Z = 478 lb	$R_D = 2.5$
Mode I _s	$Z = \frac{Dl_s F_{es}}{R_d}$	Z = 537 lb	$R_D = 2.5$
Mode II	$Z = \frac{k_1 Dl_s F_{es}}{R_d}$	Z = 211 lb	$R_D = 2.5$
Mode III _m	$Z = \frac{k_2 Dl_m F_{em}}{(1 + 2R_e) R_d}$	Z = 203 lb	$R_D = 2.5$
Mode III _s	$Z = \frac{k_3 Dl_s F_{em}}{(2 + R_e) R_d}$	Z = 219 lb	$R_D = 2.5$
Mode IV	$Z = \frac{D^2}{R_d} \sqrt{\frac{2F_{em}F_{yb}}{3(1 + R_e)}}$	Z = 212 lb	$R_D = 2.5$

Minimum Yield Value ②

Z = 203 lb

Tested Yield Value ②

Z = 285 lb

Adjusted Yield Value ②

Z = 456 lb

SIMPSON
Strong-Tie

40% de
ganancia
en
capacidad



Diseño de Fijaciones basado en modelo de fluencia de la NDS

Solution

Supply (2) 0.22" x 4" Strong-Drive® SDWS TIMBER Screws SDWS22400DB

Strong-Drive® SDWS TIMBER Screw

Structural Wood-to-Wood Connections Including Ledgers

Designed to provide an easy-to-install, high-strength alternative to through-bolting and traditional lag screws. The SDWS structural wood screws are ideal for the contractor and do-it-yourselfer alike.

Features:

- Bold thread design that provides superior holding power.
- Patented SawTooth™ point ensures fast starts, reduces installation torque and eliminates the need for pre-drilling in most applications.
- Under-head ribs that offer greater control when seating the head.
- Large low-profile washer head provides maximum bearing area (0.75" head dia.).
- Size identification on all SDWS screw heads.
- 6-lobe T-40 drive reduces driver-bit cam-outs, resulting in easier installations and longer bit life.

Double-barrier coating provides corrosion resistance equivalent to hot-dip galvanization, making it suitable for certain exterior and preservative-treated wood applications, as described in the evaluation report.

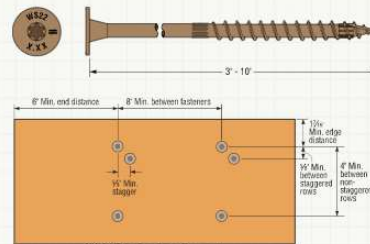
Notes:

1. Loads are based on installation into side grain of the wood with the screw axis perpendicular to the face of the member.
2. Adjusted yield value includes the adjustment factors selected above.
3. The tested yield value is based on testing conducted in accordance with AC208. It is the average ultimate test value divided by 5. If no testing was done for the selected thickness then the minimum yield value is calculated based on National Design Specification for Wood Construction.
4. View our literature for more information on [ledger connections](#).
5. For all other general information refer to the [Fastening Systems Catalog](#).

Codes/Standards: [IAPMO-UES ER-192](#), [State of Florida FL13975](#)

Product Information: [Strong-Drive SDWS TIMBER Screw](#)

U.S. Patents: 5,897,280 and 7,101,133



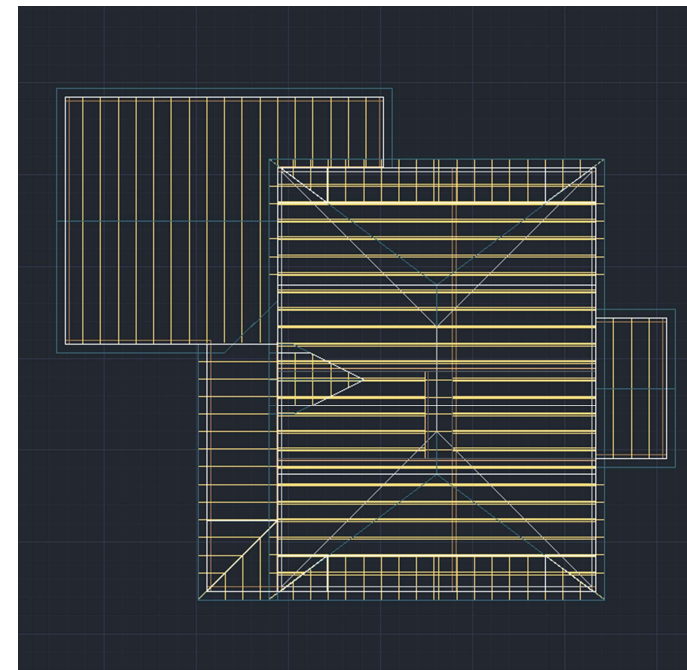
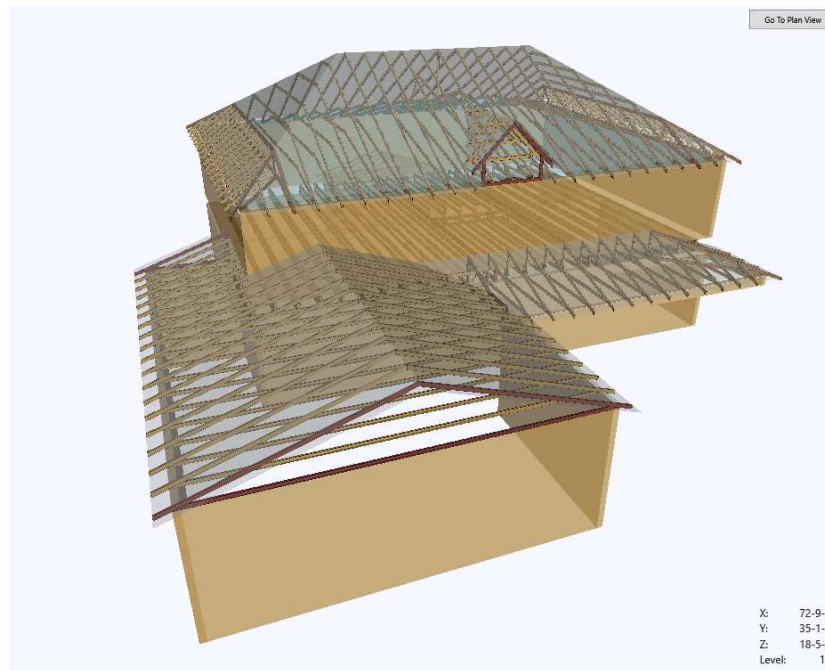
SDWS Spacing Requirements

SIMPSON
Strong-Tie

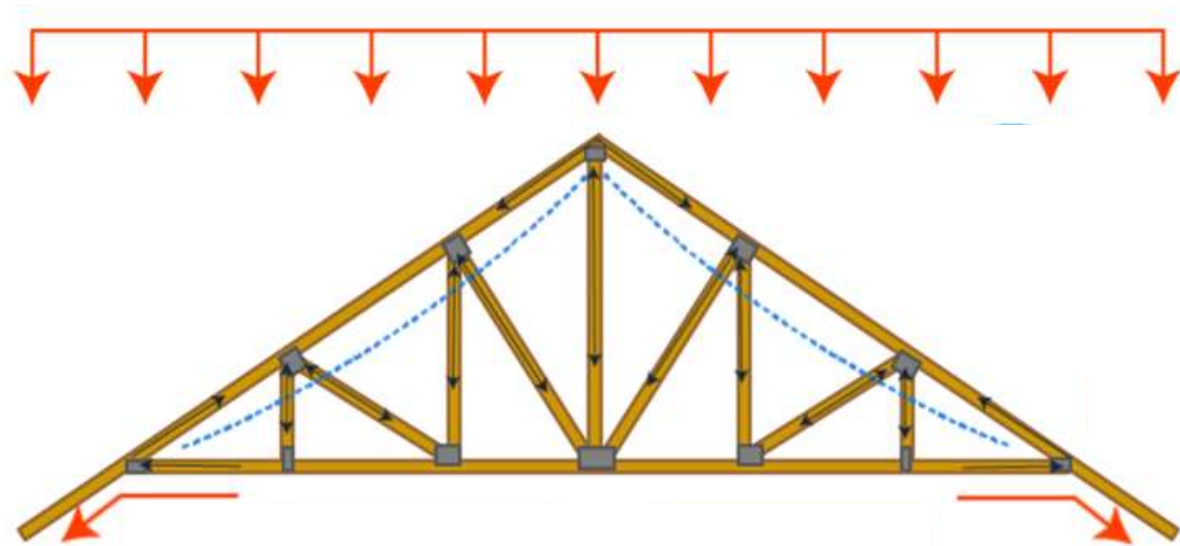
Sistema Integrado para el diseño de cerchas



Sistema Integrado para el diseño de cerchas



Sistema Integrado para el diseño de cerchas



Tensiones
Solicitantes

$\leq$

Tensiones
Admisibles

Sistema Integrado para el diseño de cerchas



Inputs para el Diseño:

- Carga Muerta
- Carga Viva
- Carga Nieve
- Carga Viento
- Deflexión

Truss Presets - Engineering / Design

Design | Standard/Auto Loads | Live Loads | Snow Loads | Wind Loads | Deflection | Plating | Bracing | Fasteners

Building Code: IBC 2015/TPI 1-2014 Special: None

☒ Design pitch break plates for moment ☐ Wet service
☒ Design off-panel splices for moment ☐ Green lumber
☒ Solid blocking at bearings

Bumping Rules

Top Chord: Segment Bottom Chord: Segment

☒ Hold Depth ☐ Hold Species / Grade

Snow / Wind Load Presets

Load Provisions: ASCE7-10
Terrain/Exposure Category: B
Building Category: II

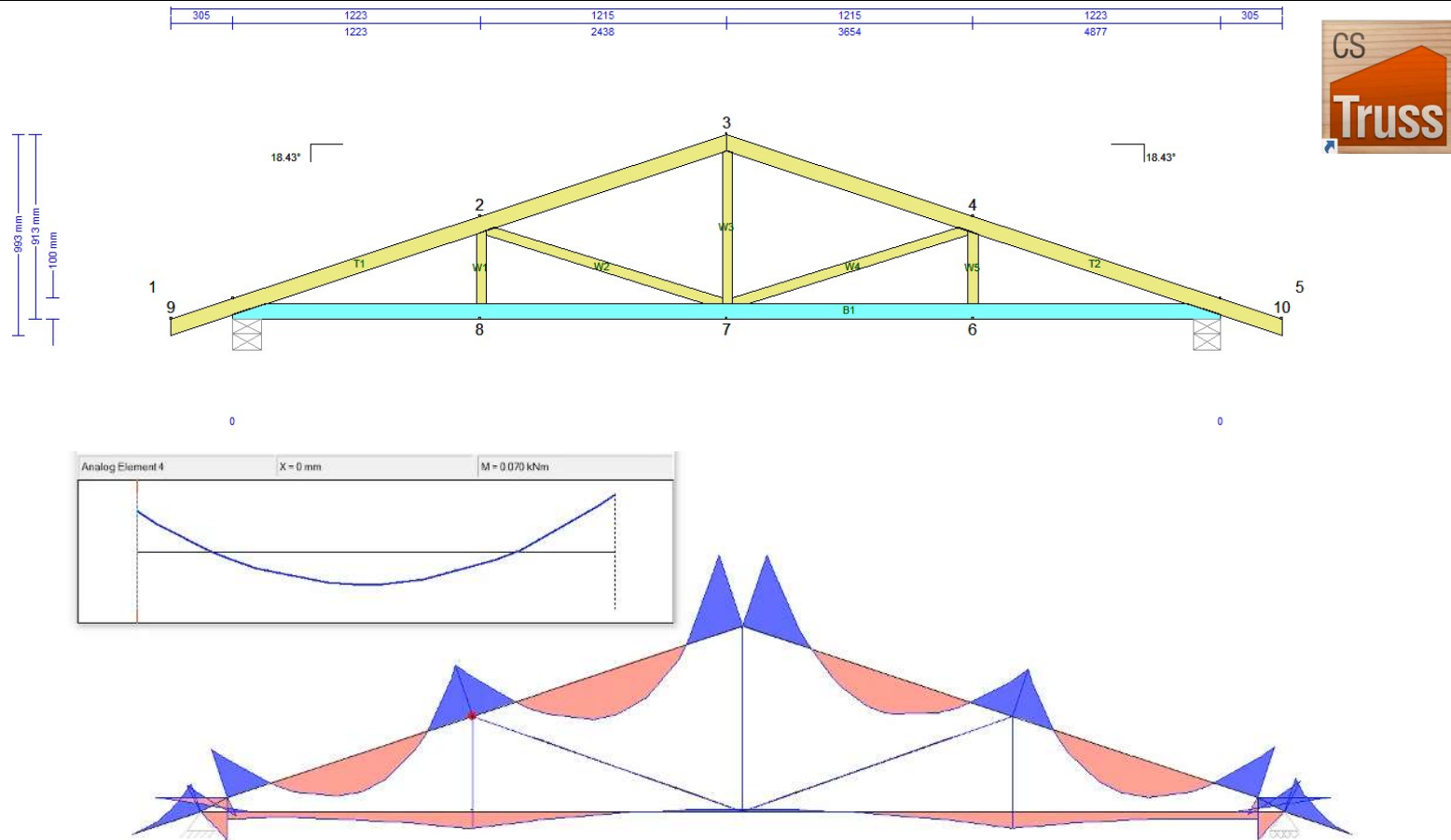
Analog Model

Requested Analysis Type: Force Matrix

Save as Defaults Restore Defaults

OK Cancel

Sistema Integrado para el diseño de cerchas



Sistema Integrado para el diseño de cerchas

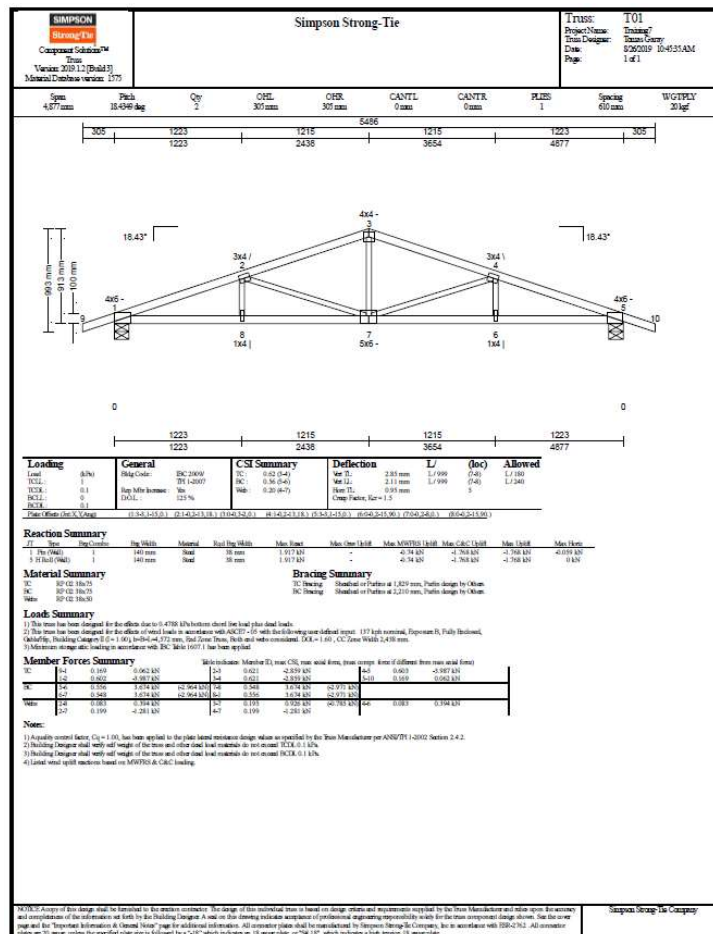


Elementos:

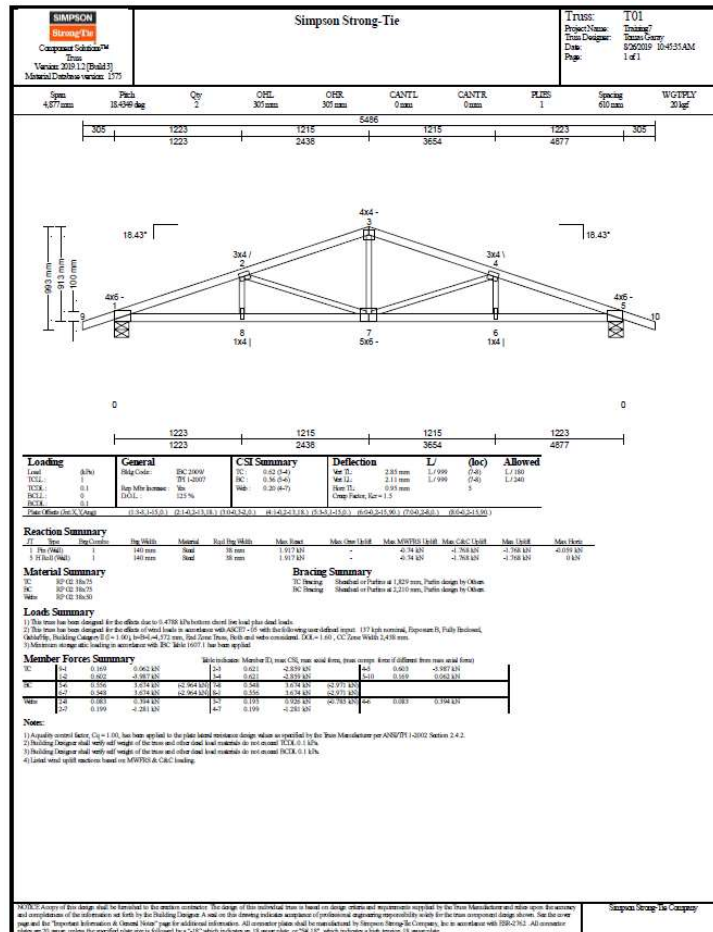
- Piezas de madera
- Placas dentadas

Análisis:

- Reacciones en apoyos
- Deflexión máxima
- Esfuerzos máximos



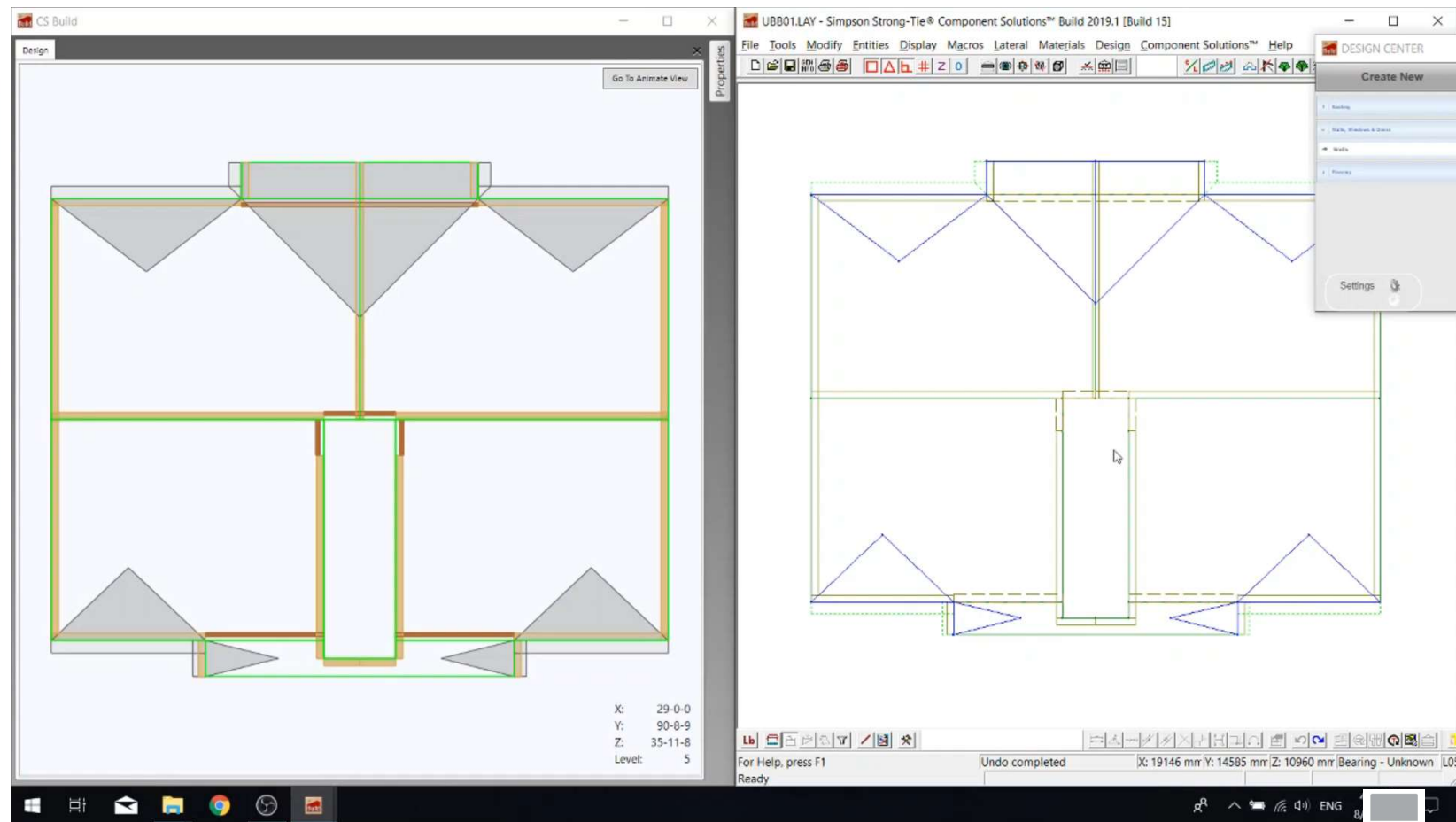
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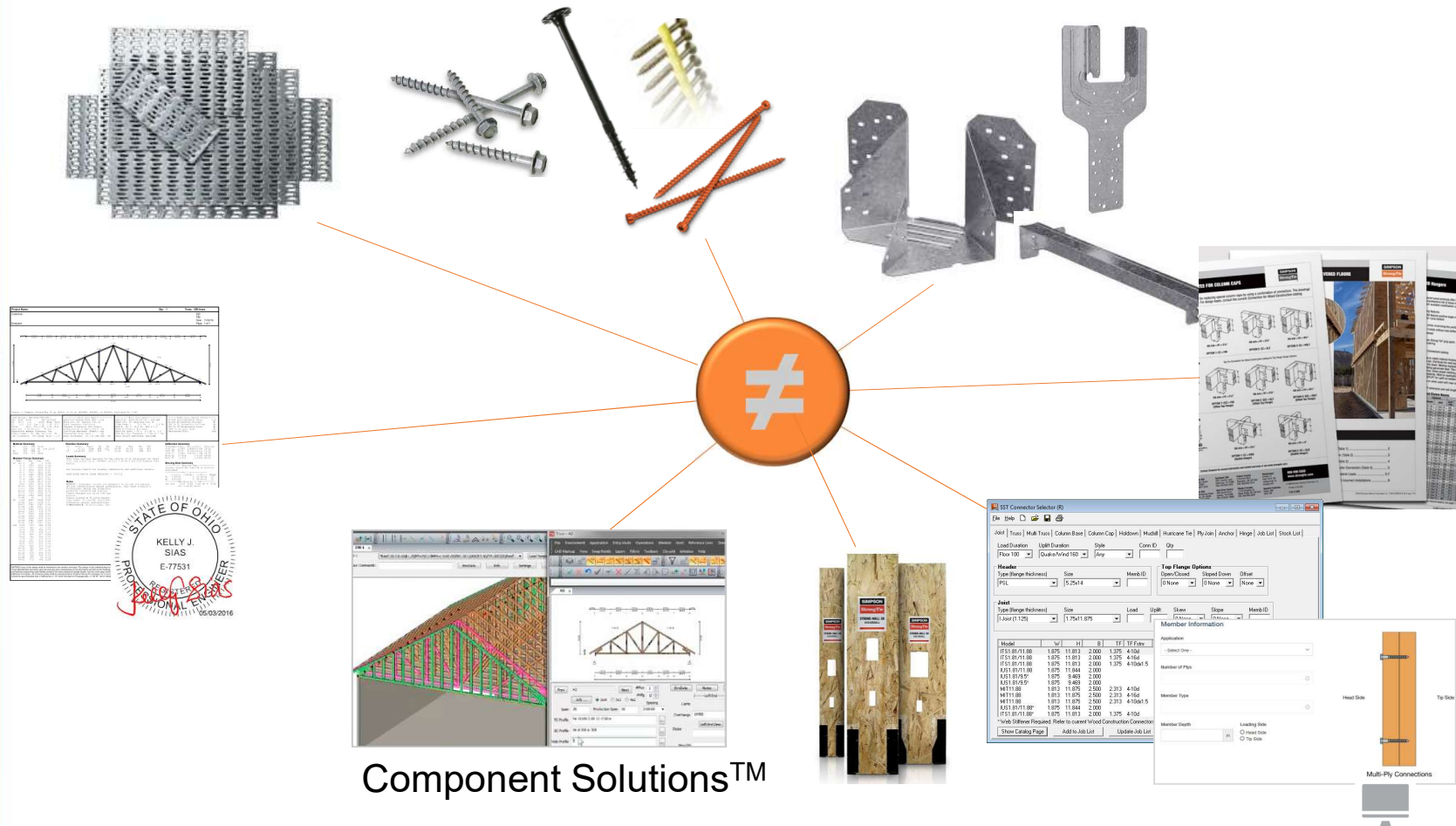
T1, T2	OL: 2,917 mm
71.6 / 2,892 mm ^ 71.6 /	
(4) 38x75 RP G2-3,000 mm	Default
W1	OL: 362 mm
90 345 mm 71.6 \	
(4) 38x50 RP G2-500 mm	Default
B1, B2	
SCARF: 171 mm	162 mm
BUTT: 21 mm	54 mm
W3	OL: 759 mm
90 759 mm 71.6 \	
(2) 38x50 RP G2-1,000 mm	Default



Sistema Integrado para el diseño de cerchas



Component Solutions™



Selección y diseño de conectores

SST Connector Selector (R)

File Help [Icons]

Joist Truss Multi Truss Column Base Column Cap Holdown Mud sill Hurricane Tie Ply Join Anchor Hinge Job List Stock List

Load Duration: Floor 100 Uplift Duration: Quake/Wind 160 Style: Any Conn ID: Qty:

Header

Type (flange thickness): Sawn DF Size: Memb ID:

Top Flange Options

Open/Closed: 0 None Sloped Down: 0 None Offset: None

Joist

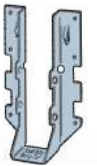
Type (flange thickness): Sawn DF Size: Load: Uplift: Skew: Slope: Memb ID:

Model	W	H	B	TF	TF Fstnr	Face Fstnr	Joist Fstnr	Load	Uplift	*Icost

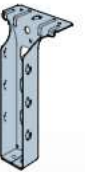
Invalid Header Type or Size

Show Catalog Page Add to Job List Update Job List

Selección y diseño de conectores



Face Mount



Top Flange



Concealed Flange

SST Connector Selector (R)

File Help [Icons]

Joist Truss Multi Truss Column Base Column Cap Holdown Mud sill Hurricane Tie Ply Join Anchor Hinge Job List Stock List

Load Duration: Floor 100 Uplift Duration: Normal 100 Style: Any Conn ID: Qty:

Header

Type (flange thickness): Ledger DF Size: Memb ID:

Sawn DF
Sawn HF
Sawn SP
Sawn SPF
Glulam DF/SP
I Joist DF (1.125)
I Joist DF (1.250)
I Joist DF (1.313)
I Joist DF (1.375)
I Joist DF (1.500)
I Joist SPF (1.500)
LSL
LVL DF/SP
PSL
Masonry
Concrete
Ledger DF
Ledger SP
Ledger SPF
Ledger LSL
Ledger LVL DF/SP
Ledger PSL
Floor Truss DF/SP
Floor Truss SPF/HF
Structural Steel
Wall DF Sheathed flush

Top Flange Options

Open/Closed: 0 None Sloped Down: 0 None Offset: None

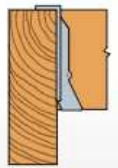
Size: 2x4 Load: Uplift: Skew: 0 None Slope: 0 None Memb ID:

H	B	TF	TF Fstnr	Face Fstnr	Joist Fstnr	Load	Uplift	*Icost
[Empty Table Body]								

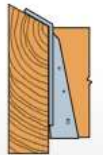
Job List Update Job List

SIMPSON
Strong-Tie

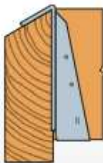
Selección y diseño de conectores

[illegible]

Normal Top-



Top-Flange Opened



Top-Flange Closed

Selección y diseño de conectores

SST Connector Selector (R)

File Help [Icons]

Joist | Truss | Multi Truss | Column Base | Column Cap | Holdown | Mud sill | Hurricane Tie | Ply Join | Anchor | Hinge | Job List | Stock List

Load Duration: Floor 100 | Uplift Duration: Normal 100 | Style: Any | Conn ID: | Qty:

Header
Type (flange thickness): Concrete | Size: | Memb ID:

Top Flange Options
Open/Closed: 0 None | Sloped Down: 0 None | Offset: None

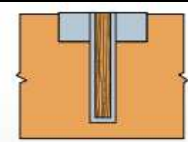
Joist
Type (flange thickness): Sawn DF | Size: 2x4 | Load: | Uplift: | Skew: 0 None

Top Flange Options (Sloped Down)
0 None
1 Left
1 Right
2 Left
2 Right
3 Left
3 Right
4 Left
4 Right
5 Left
5 Right
6 Left
6 Right
7 Left
7 Right
8 Left
8 Right
9 Left

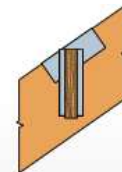
Model	W	H	B	TF	TF Fstnr	Face Fstnr	Joist Fstnr	Uplift	% Cost

Invalid Header Type or Size

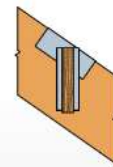
Show Catalog Page | Add to Job List | Update Job List



No
Slope



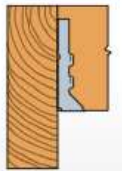
Sloped
Down



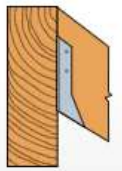
Sloped
Down Right

SIMPSON
Strong-Tie

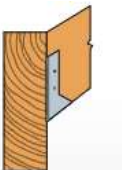
Selección y diseño de conectores

[illegible]

No Slope



Sloped



Sloped Up

Selección y diseño de conectores

SST Connector Selector (R)

File Help [Icons]

Joist | Truss | Multi Truss | Column Base | Column Cap | Holdown | Mud sill | Hurricane Tie | Ply Join | Anchor | Hinge | Job List | Stock List

Load Duration: Floor 100 | Uplift Duration: Normal 100 | Style: Any | Conn ID: | Qty: 1

Header
Type (flange thickness): Concrete | Size: 8 INCH or WIDER | Memb ID: | **Top Flange Options**
Open/Closed: 0 None | Sloped Down: 0 None | Offset: None

Joist
Type (flange thickness): Sawn SPF | Size: 2x4 | Load: | Uplift: | Skew: 0 None | Slope: 0 None | Memb ID: |

Model	W	H	B	TF	TF Fstnr*	Face Fstnr	Joist Fstnr	Load	Uplift	Icost
HU26	1.563	3.063	2.250			4-TTN25134H	2-10dx1.5	1545	220	100

Refer to current Wood Construction Connectors catalog for General Notes & Installation Instructions.

Show Catalog Page | **Add to Job List** | Update Job List

Conector

Dimensiones del conector (in)

Carga de levantamiento (lb)

Carga gravitacional (lb)

Fijaciones a la vigueta

Fijaciones a la viga principal

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Strong-Tie



Selección y diseño de conectores

SST Connector Selector (R)

File Help [Icons]

Joist | Truss | Multi Truss | Column Base | Column Cap | Holdown | Mud sill | Hurricane Tie | Ply Join | Anchor | Hinge | **Job List** | Stock List

Job Name:

Job Address:

Customer Name:

Customer Address:

Comments:

Conn ID*	Qty	Model	Fastener Schedule	Edge	Row	End	Offset	Member ID
001	1	HU26	H:4-TTN25134H J:2-10...					
		Fastener Summary						
	2	10dx1.5						
	4	TTN25134H						

1 connectors (1 pieces), 2 fasteners (6 pieces)

Edit Delete **Export** Add

Selección y diseño de conectores

 SOLID SAWN	 GLULAM	 LAMINATED STRAND LUMBER	 LAMINATED VENEER LUMBER
 PARALLEL STRAND LUMBER	 I-JOIST	 FLOOR TRUSS	 LEDGER
 MASONRY (GROUT FILLED)	 CONCRETE	 STRUCTURAL STEEL	 NAILER
 WALL, SHEATHED FLUSH	 WALL, SHEATHED GAP	 WALL, DRYWALL FLUSH	 WALL, DRYWALL GAP

Select Hanger Type

 FACE MOUNT
  TOP FLANGE
  CONCEALED FLANGE
  ALL TYPES

Header Member

 SOLID SAWN

Member Species: DF (Douglas Fir) Member Width: 2x (1 1/2") Member Depth: 4 (3 1/2") Member Type: Single

☐ Rough Sawn

Joist Member

 SOLID SAWN

Member Species: DF (Douglas Fir) Member Width: 2x (1 1/2") Member Depth: 4 (3 1/2") Member Type: Single

☐ Rough Sawn

Fastener Type

 ALL

Hanger Options (Slope, Skew, Etc...)

Design Information (Loads)

RESTART

CALCULATE

Selección y diseño de conectores

Slope of Main Roof
Pitch
:12 → 0°

Slope of Hip-End Roof
Pitch
:12 → 0°

Slope of Dormer Roof
Pitch
:12 → 0°

Main Rafter

Main Ridge

Valley

Hangar Mark (click for sketch)

Dormer Rafter

Dormer Ridge

Hip Skew

Hip Rafter

Hip

Valley Skew

CALCULATE

Hanger Mark	Carried Member	Carrying Member	Slope	Skew	Top Flange Slope (Top Flange Hangers Only)
A	Main Rafter	Main Ridge	SLD37°	N/A	N/A
B	Dormer Rafter	Dormer Ridge	SLD30°	N/A	N/A
C	Main Rafter	Valley	SLU37°	SKR38°	TFDL 25°
D	Main Rafter	Valley	SLU37°	SKL38°	TFDR 25°
E	Dormer Rafter	Valley	SLU30°	SKL52°	TFDR 25°
F	Dormer Rafter	Valley	SLU30°	SKR52°	TFDL 25°

Example: 9:12 Main Roof, 7:12 Dormer

Diseño de Anclajes



Códigos

- ACI318 (2005-2014)
- ETAG (Europa)
- EOTA (exposición al fuego)
- CSA (Canada)



Selección y diseño de conectores

Simpson Strong-Tie® Anchor Designer™ Software

File Options Help

Inputs

Project settings: ACI 318-14

Base material

Base plate

Geometry

Loads

Products - SET-3G w/ 5/8"Ø F1554 Gr. 36

Calculation summary

Input Data

Design method: ACI 318-14

Anchor: SET-3G w/ 5/8"Ø F1554 Gr. 36

Effective Embedment depth: 4.000 inch

Concrete: Normal-weight

State: Cracked

Compressive strength: 3000 psi

Seismic design: Yes

SET-3G

Governing tension ratio: 34.0% (Pass)

	Ratio	N_{ua} [lb]	ϕN_n [lb]
Steel strength	9.6%	943	9833
Concrete breakout	34.0%	1950	5732
Adhesive	25.5%	1950	7653

Governing shear ratio: 1.0% (Pass)

	Ratio	V_{ua} [lb]	ϕV_n [lb]
Steel strength	1.0%	38	3834
Concrete pryout	0.6%	150	26072

Interaction ratio: 34.0% (Pass)

	Ratio	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$
Sec. 17.6.1	34.0%	0.34	-

SET-3G w/ 5/8"Ø F1554 Gr. 36 with hef = 4.000 inch meets the selected design criteria.

3D-Model

Design Result

Inputs

Project settings: ACI 318-14

Base material

Base plate

Geometry

Loads

Products

Anchor

SET-3G

AT-XP®

Multiple design

Use this button to display the multiple design window.

For more information, please go to Help.

Chart

✓ Cmin ≥ 1.75

✓ Smin ≥ 3.00

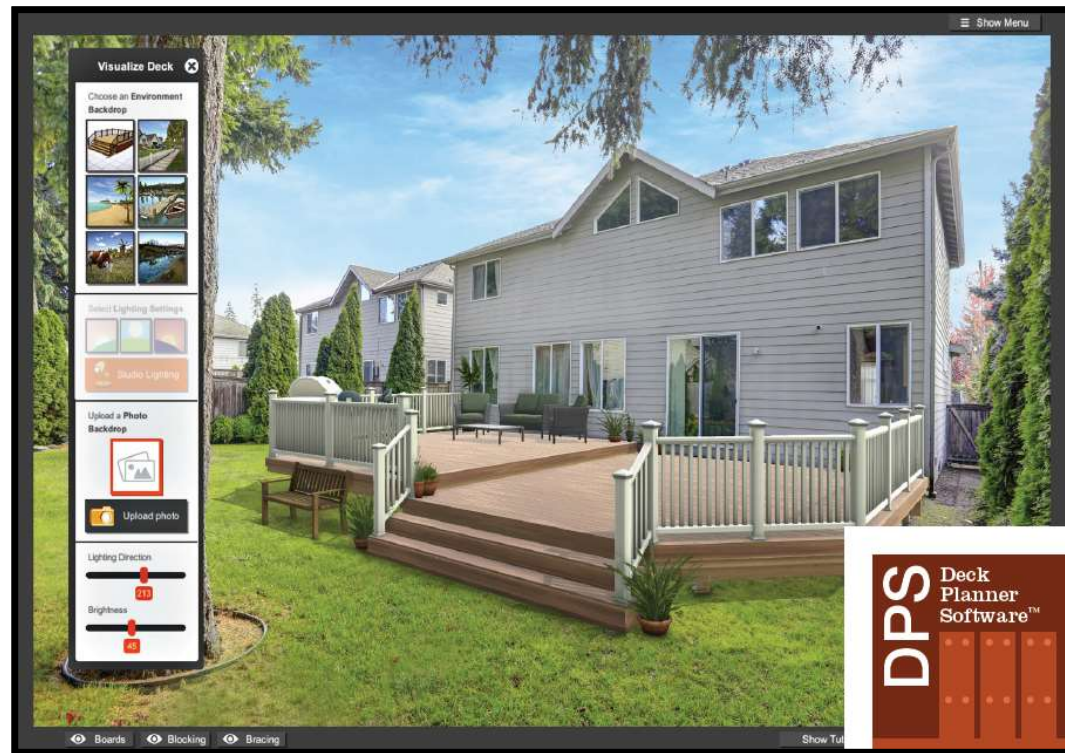
✓ N = 34%

✓ V = 1%

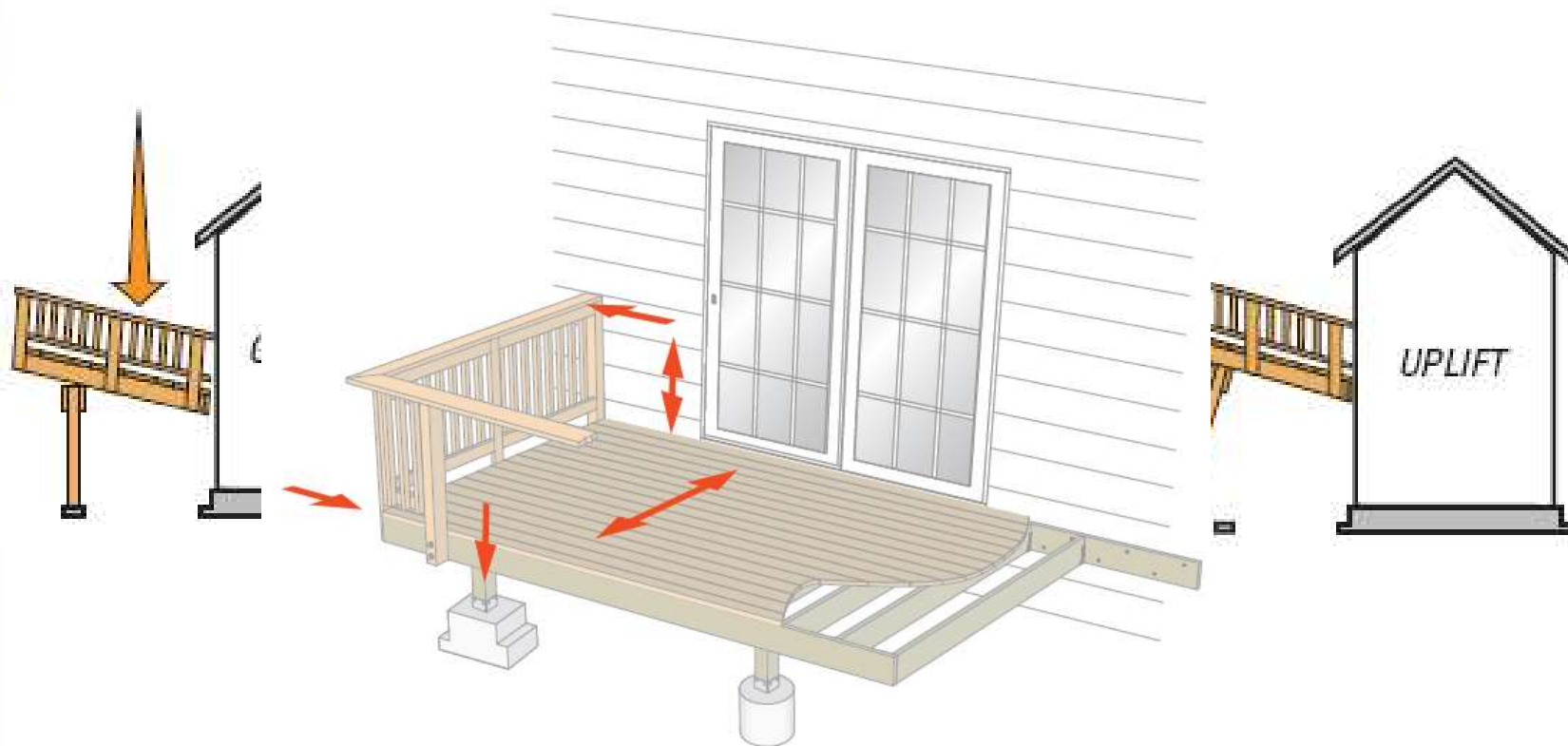
✓ N+V = 34%

Pass

Deck Planner y Pergola Planner



Deck Planner y Pergola Planner

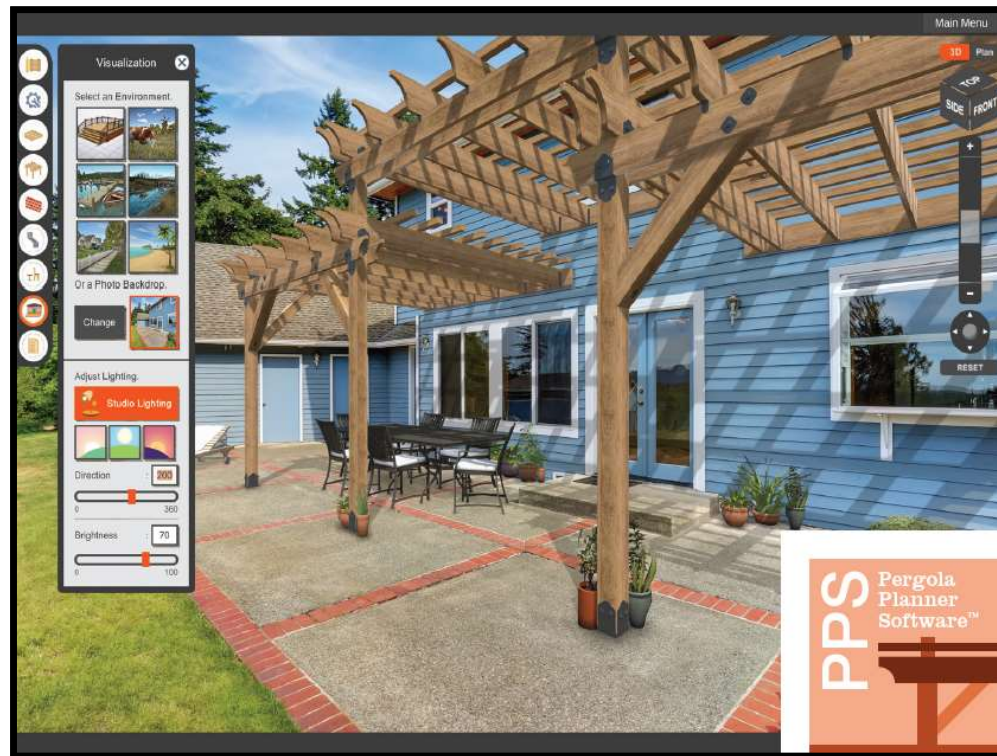


SIMPSON
Strong-Tie

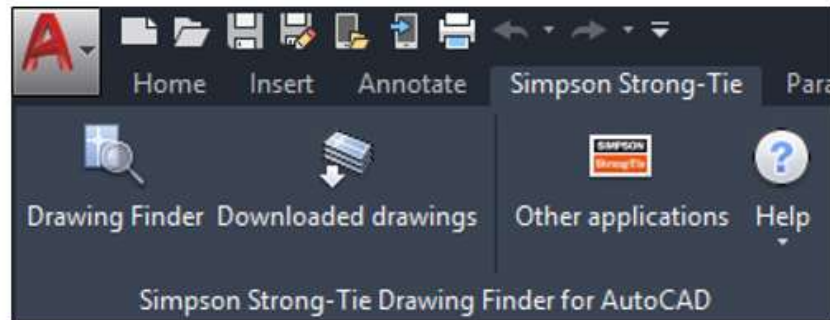
Deck Planner y Pergola Planner



Deck Planner y Pergola Planner



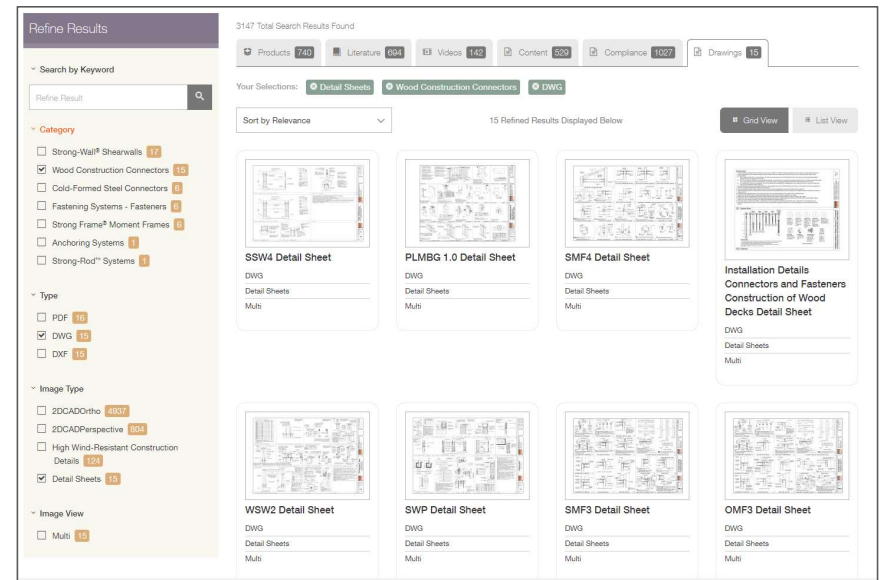
Detalles y notas de ingeniería



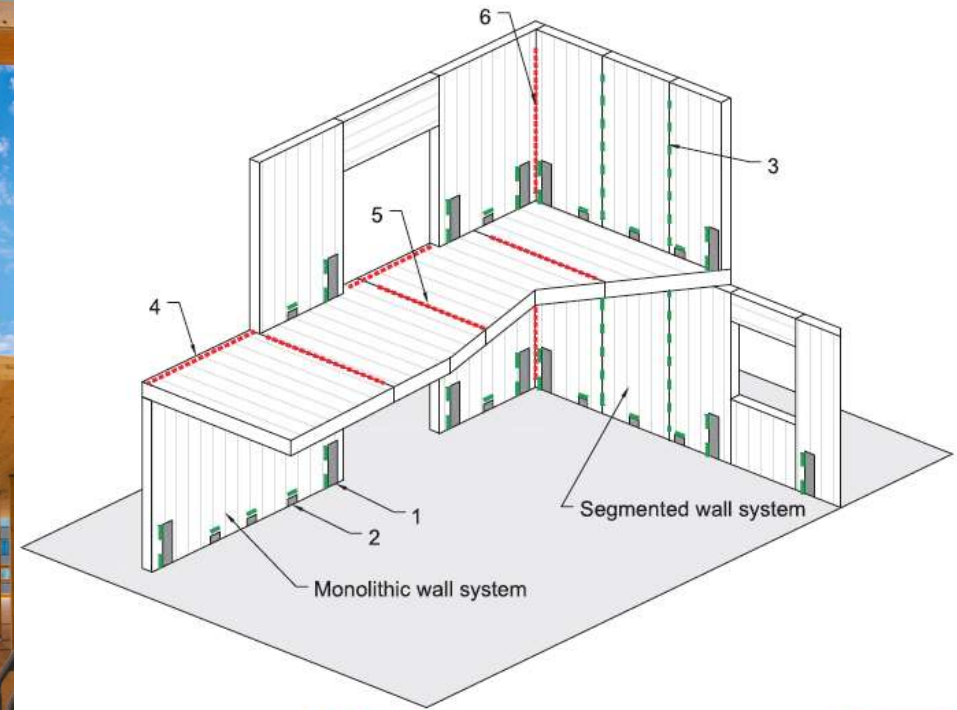
Screenshot — Drawing Finder for AutoCAD



File Format		
☒	DWG	6918
☒	DXF	6917
☒	PDF	6818
☒	Revit	3673
☒	IFC	1835
☒	SAT	1788
☒	STL	1606



Edificios de Madera Masiva



Dissipative connections ———

Non-dissipative connections - - - - -

1. Wall-to-floor connection against rocking
2. Wall-to-floor connection against sliding
3. Vertical joints between adjacent panels

4. Floor-to-wall panel connection
5. Floor-to-floor panel connection
6. Vertical joints between orthogonal panels

Fig. 4. Schematics of a CLT structure, with indication of the dissipative and non-dissipative connections.

Edificios de Madera Masiva

SDCF TIMBER-CF screws installed into a CLT butt-joint application

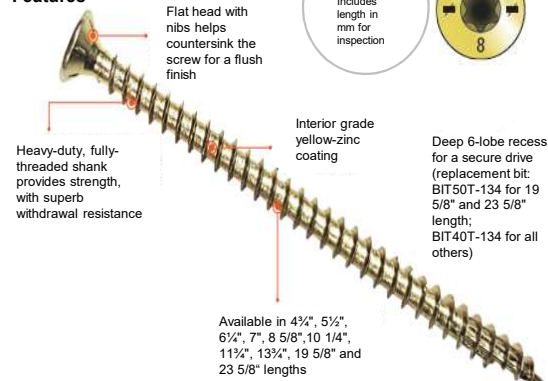


Applications

Beam Reinforcement, Wall to Wall, Floor to Floor, Support Beams, Butt Joints

Codes/Standards: ICC-ES ESR-3046 pending

Features



* The diameters listed represent the major diameter of the Strong-Drive SDCF Timber-CF screw. Verify that installation procedure ensures that tip of screw does not protrude panel.

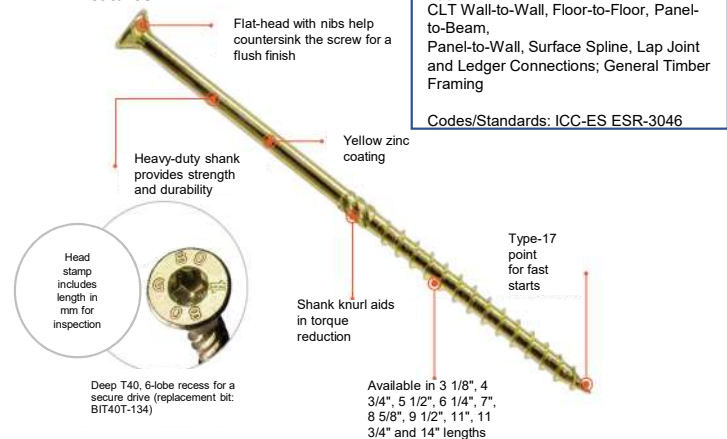
SDCP TIMBER-CP screws installed into a CLT lap joint.



SDCP TIMBER-CP screw installed into a CLT spline



Features



Applications

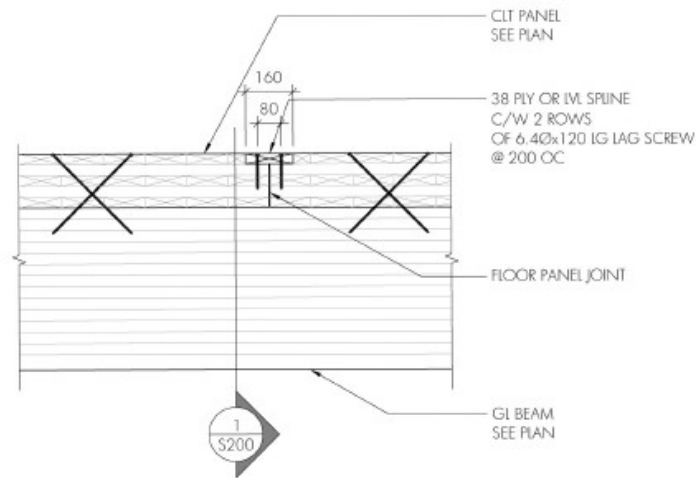
CLT Wall-to-Wall, Floor-to-Floor, Panel-to-Beam, Panel-to-Wall, Surface Spline, Lap Joint and Ledger Connections; General Timber Framing

Codes/Standards: ICC-ES ESR-3046

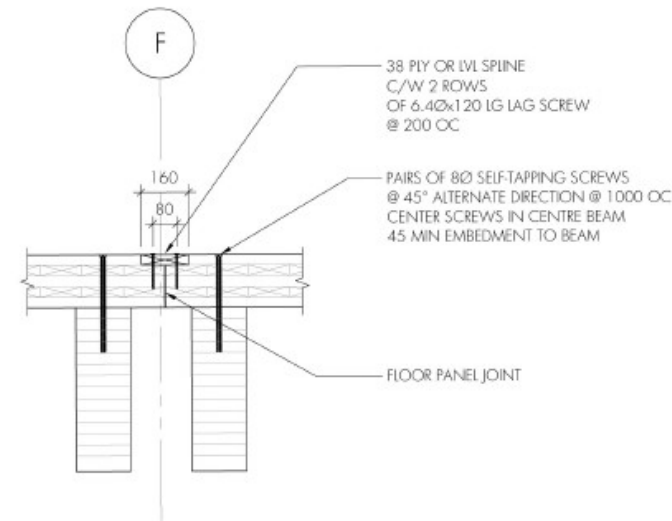
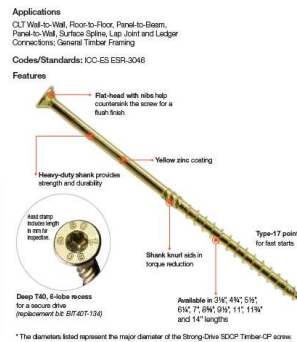
* The diameters listed represent the major diameter of the Strong-Drive SDCP Timber-CP screw.

SIMPSON
Strong-Tie

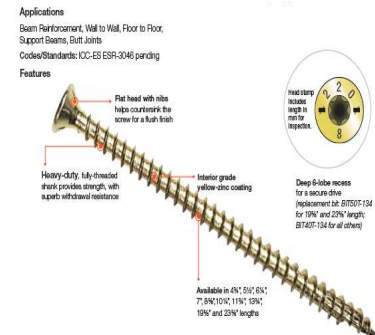
Edificios de Madera Masiva



2 SECTION
S200 1:20

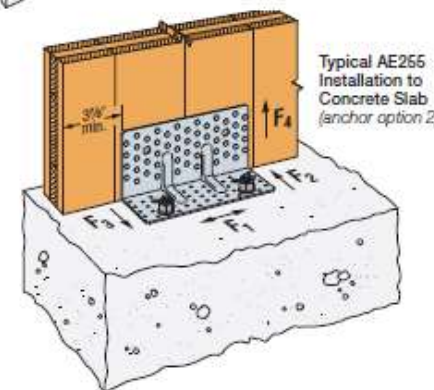
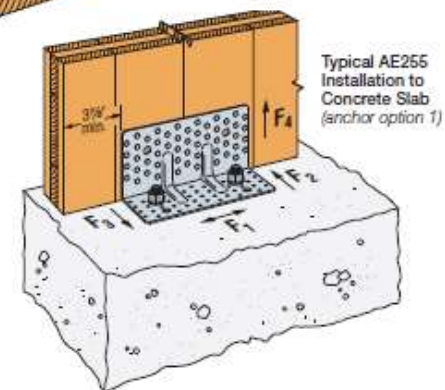
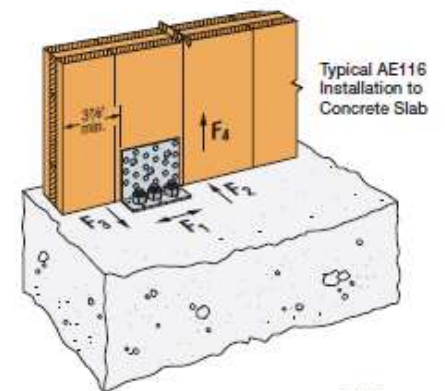
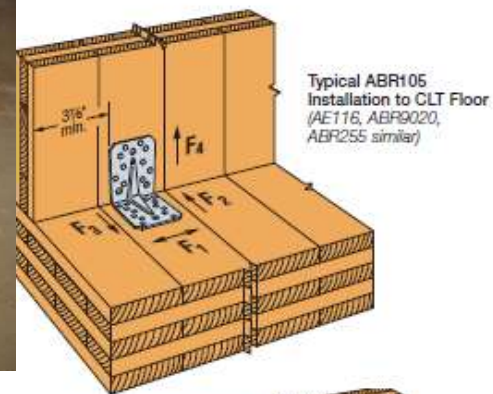


1 SECTION
S200 1:20

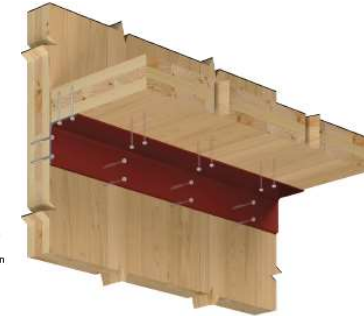
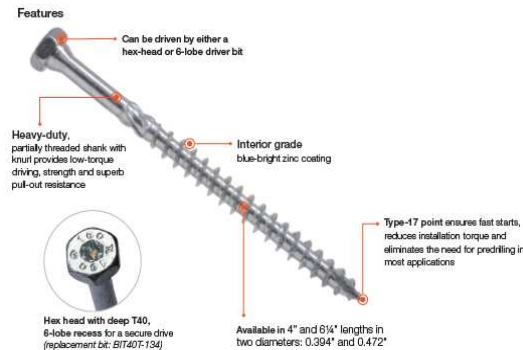


SIMPSON
Strong-Tie

Edificios de Madera Masiva



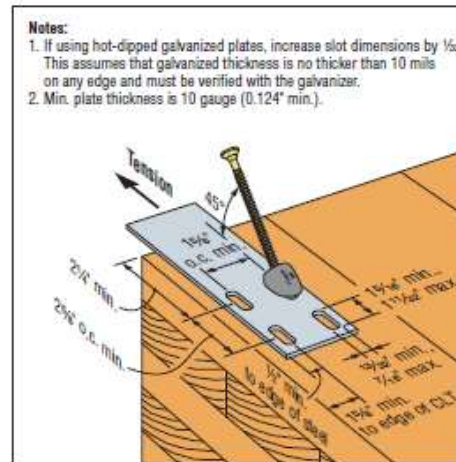
Edificios de Madera Masiva



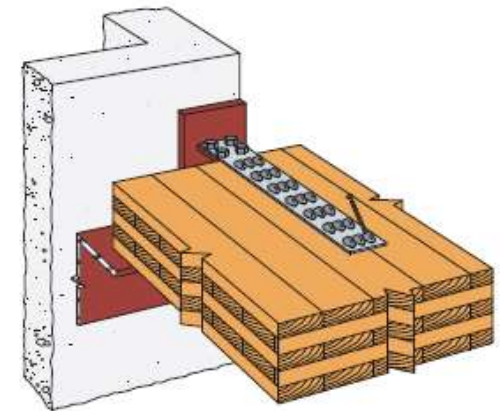
SDHR COMBO-HEAD screw installed for beam installations (steel design by others)



SDHR COMBO-HEAD screws installed into a CLT bracket assembly (steel design by others)

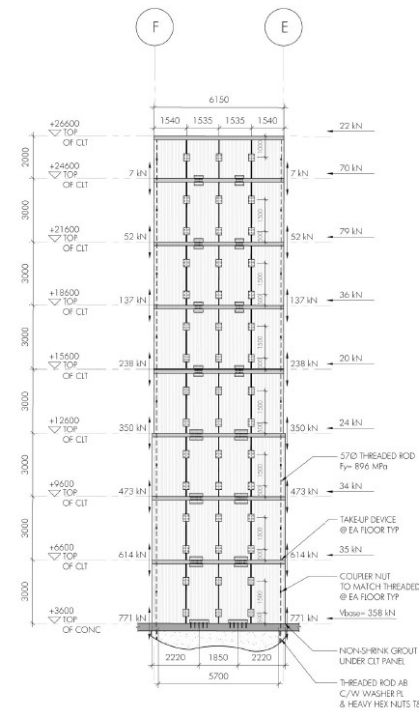
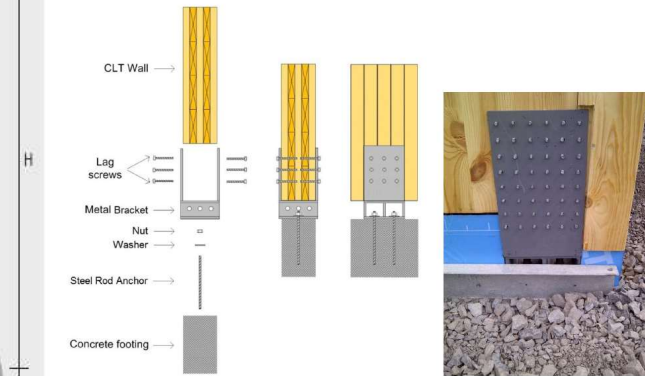
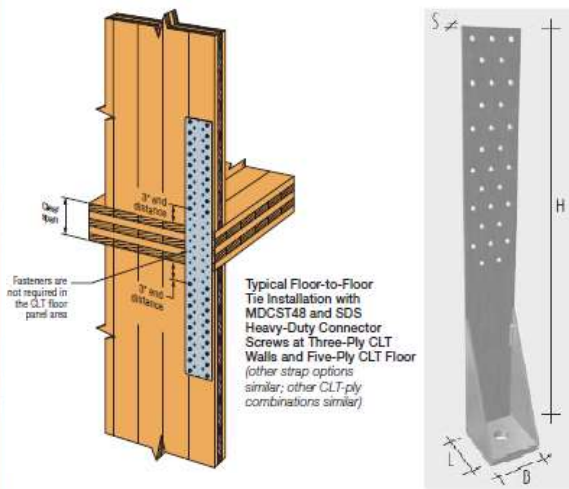


Recommended Plate Dimensions and Placement Relative to CLT End/Edge



Typical MDW45-8 Installation for CLT Floor Diaphragm Drag Strap at Concrete Core

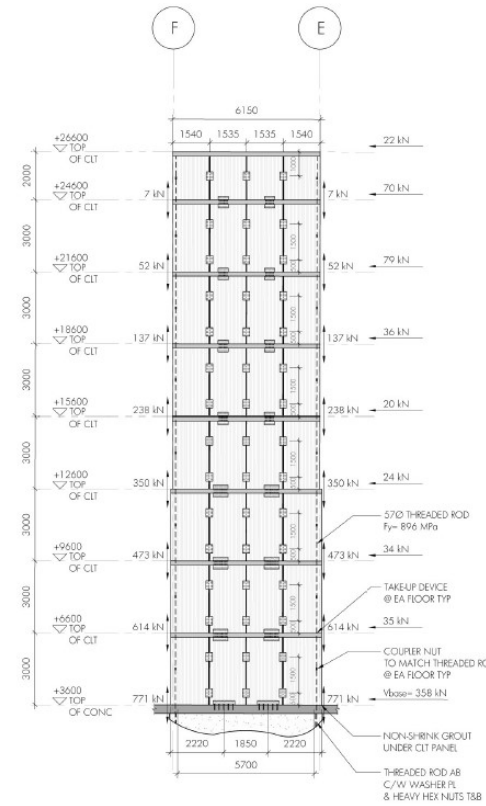
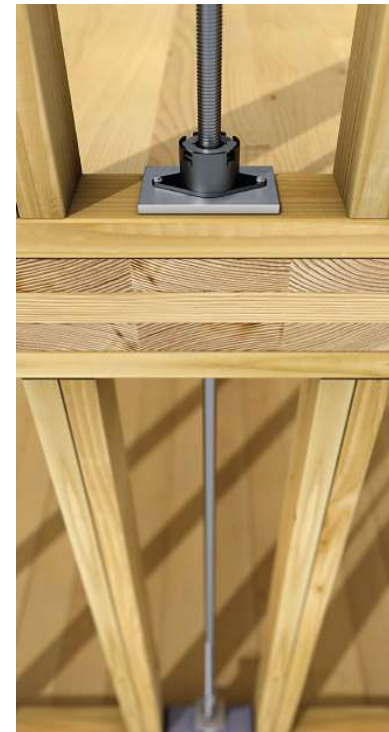
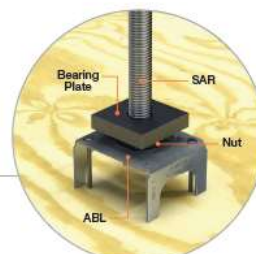
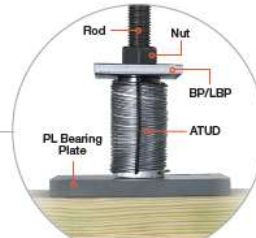
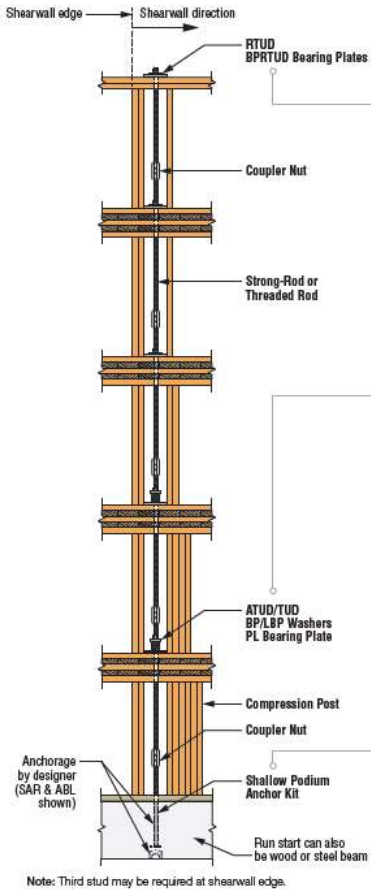
Edificios de Madera Masiva



Edificios de Madera Masiva

Roof to the Foundation Anchorage

Components for Anchor Tiedown System for Shearwall Overturning Restraint



OPTION 2
W/ CONTINUOUS HOLDOWNS

AICE
INGENIEROS CIVILES ESTRUCTURALES DE CHILE A.G.

SIMPSON

Strong-Tie

®