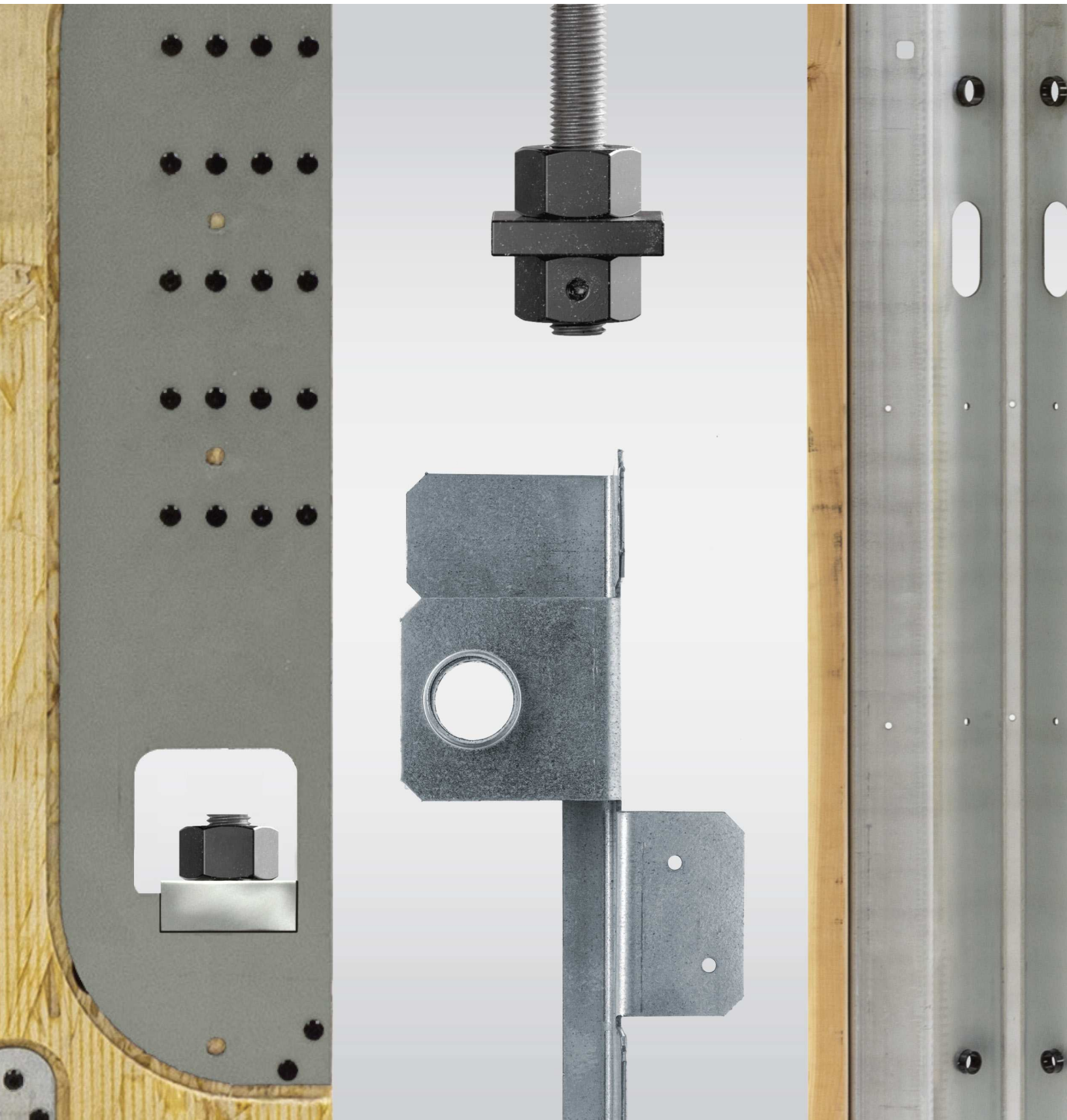
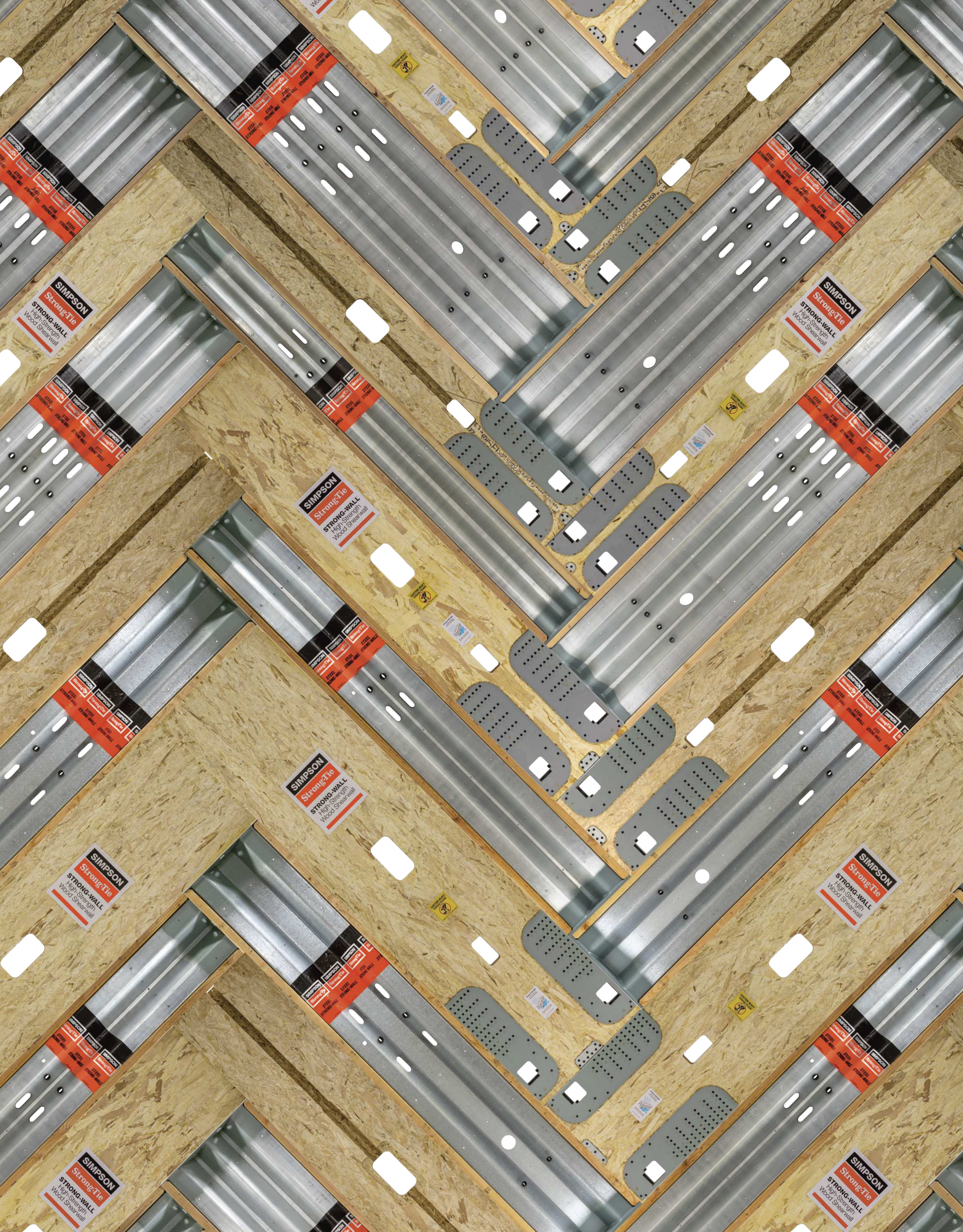
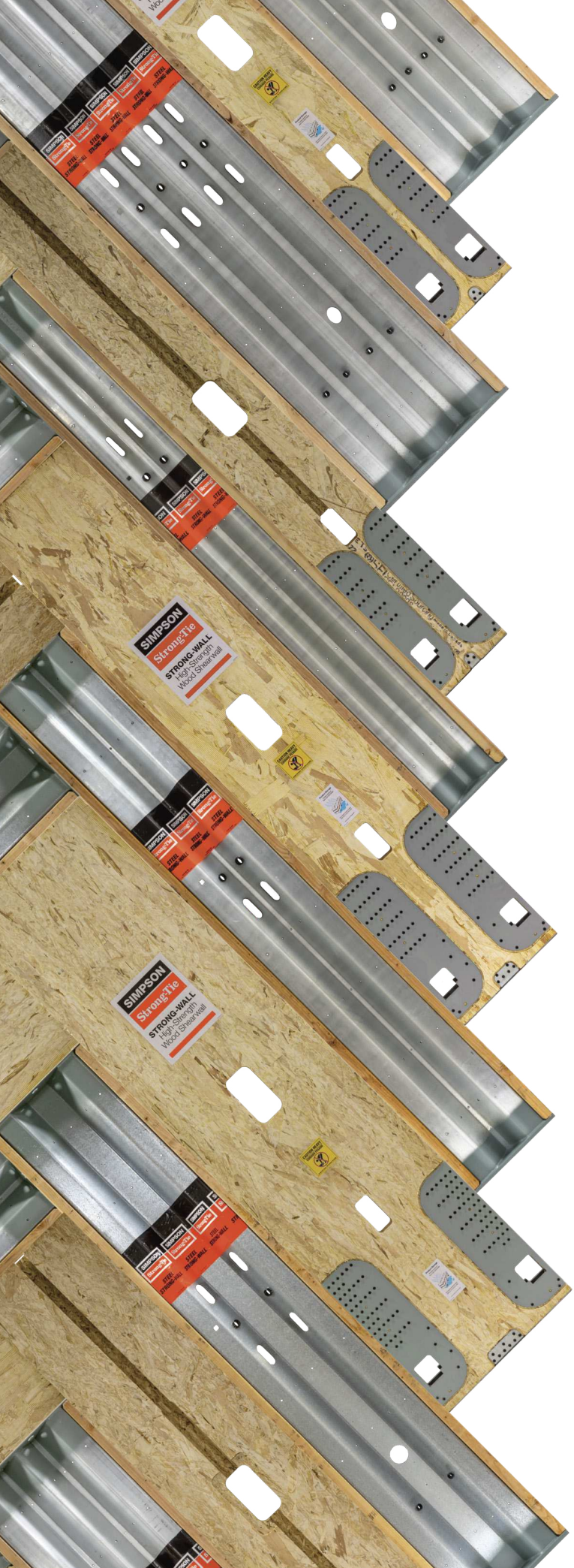
Strong-Wall® Shearwalls

C-L-SW21 | (800) 999-5099 | strongtie.com

SIMPSON Strong-Tie®




SIMPSON
Strong-Tie
STRONG-WALL
High-Strength Wood Shearwall



Innovations in strength and versatility.

From design, to application, to load requirements — every project presents unique challenges. Strong-Wall® shearwalls from Simpson Strong-Tie offer consistent, reliable performance no matter what the variables are. Our innovative wood and steel options provide maximum flexibility, ease of installation and code-listed, industry-leading strength for every job. And backed by our unparalleled technical and field support, your shearwall installations will be faster, stronger and smarter than ever.

SIMPSON
Strong-Tie®

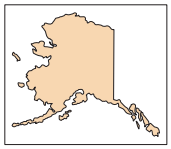
Introduction

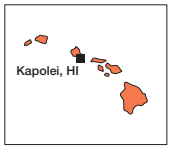
For more than 60 years, Simpson Strong-Tie has focused on creating structural products that help people build safer and stronger homes and buildings. A leader in structural systems research and technology, Simpson Strong-Tie is one of the largest suppliers of structural building products in the world. The Simpson Strong-Tie commitment to product development, engineering, testing and training is evident in the consistent quality and delivery of its products and services.

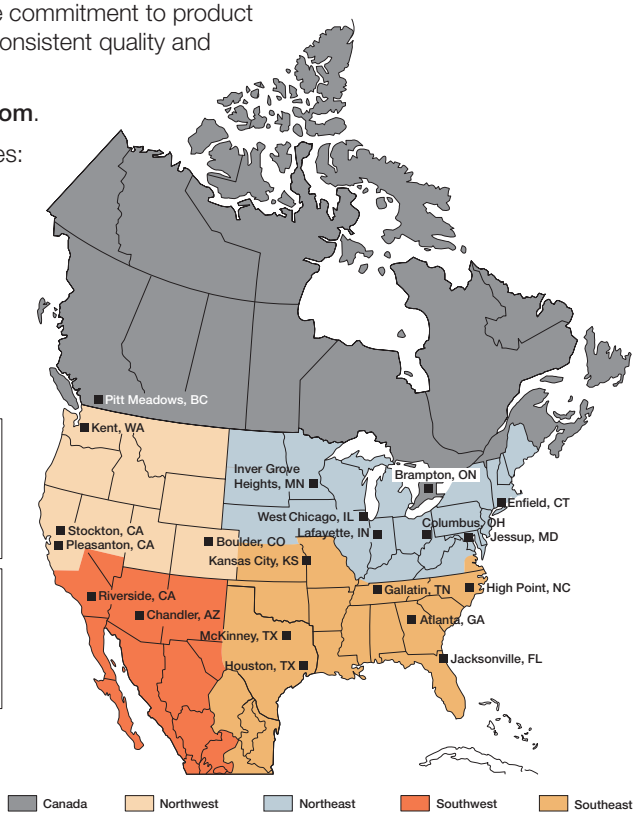
For more information, visit the company's website at **strongtie.com**.

The Simpson Strong-Tie Company Inc. No-Equal Pledge® includes:

- Quality products value-engineered for the lowest installed cost at the highest-rated performance levels
- The most thoroughly tested and evaluated products in the industry
- Strategically located manufacturing and warehouse facilities
- National code agency listings
- The largest number of patented connectors in the industry
- Global locations with an international sales team
- In-house R&D and tool and die professionals
- In-house product testing and quality control engineers
- Support of industry groups including AISI, AITC, ASTM, ASCE, AWC, AWPA, ACI, AISC, CSI, CFSEI, ICFA, NBMDA, NLBMDA, SDI, SETMA, SFA, SFIA, STAFDA, SREA, NFBA, TPI, WDSC, WIJMA, WTCA and local engineering groups







The Simpson Strong-Tie Quality Policy

We help people build safer structures economically. We do this by designing, engineering and manufacturing No-Equal® structural connectors and other related products that meet or exceed our customers' needs and expectations. Everyone is responsible for product quality and is committed to ensuring the effectiveness of the Quality Management System.

Karen Colonias
Chief Executive Officer

Getting Fast Technical Support

When you call for engineering technical support, we can help you quickly if you have the following information at hand. This will help us to serve you promptly and efficiently.

- Which Simpson Strong-Tie® catalog are you using? *(See the front cover for the form number.)*
- Which Simpson Strong-Tie product are you using?
- What are the design requirements (i.e., loads, anchor diameter, base material, edge/spacing distance, etc.)?

We Are ISO 9001:2015 Registered

Simpson Strong-Tie is an ISO 9001:2015 registered company. ISO 9001:2015 is an internationally recognized quality assurance system that lets our domestic and international customers know they can count on the consistent quality of Simpson Strong-Tie® products and services.

800-999-5099 | strongtie.com

Table of Contents

Strong-Wall® High-Strength Wood Shearwalls 10

Steel Strong-Wall® 40

10—39 ▶
40—78 ▶

What's New

Simpson Strong-Tie® Strong-Wall® High-Strength Wood Shearwall (WSWH)

The new Strong-Wall high-strength wood shearwall (WSWH) retains the field customization features of the Strong-Wall wood shearwall while dramatically improving performance. Patented wood fuse technology provides predictable behavior and delivers increased strength, stiffness, ductility and design values. The top of wall shear transfer is now accomplished with a single plate that is fastened with custom shearwall screws, which are supplied with the wall. All walls 100" and less are also supplied with portal straps for use in portal applications.

The WSWH series is effective in resisting forces resulting from high wind and earthquakes. New and improved reusable templates locate the holdown anchor bolts accurately for multiple footing types. The WSWH series is suitable for residential, multi-family and light-frame commercial construction for both single and back-to-back installations. The WSWH series replaces the WSW series of wood shearwalls.

Strong-Wall Wood Shearwall (WSW) Being Phased Out in 2021

The WSW is being replaced by the patented, next generation Strong-Wall high-strength wood shearwall. Availability of the WSW is guaranteed until June 30, 2021. Please use either the Strong-Wall high-strength wood shearwall or Steel Strong-Wall shearwall as a replacement.

Strong-Wall® Shearwall Selector Application

This application helps design professionals select an appropriate Simpson Strong-Tie Steel Strong-Wall or Strong-Wall High-Strength Wood Shearwall.

Optimized Solution

Provides the most cost-effective Strong-Wall solution based on the input shear load.

Manual Solution

Allows designers to choose which type and number of walls to meet their requirements.

- ✦ Finds lowest cost solution
- ✦ Provides actual drift and uplift values
- ✦ Provides solutions for different model Codes
- ✦ Includes new anchorage solutions
- ✦ Saves, exports and prints solutions

You can find the Strong-Wall Shearwall Selector application at **strongtie.com/swss**.

Strong-Wall® Bracing Selector

The Strong-Wall Bracing Selector (SWBS) provides pre-engineered Strong-Wall alternatives to code-prescribed braced wall panels. Strong-Wall model numbers and foundation anchorage designs are determined to meet job specific requirements and provide the narrowest bracing solutions possible. This app can be used with the Wall-Bracing-Length Calculator: Start with the WBLC to determine wall bracing length requirements then export project information and bracing requirements to the SWBS.

Important Information and General Notes

Warning

Simpson Strong-Tie Company Inc. structural connectors, anchors, and other products are designed and tested to provide specified design loads. To obtain optimal performance from Simpson Strong-Tie Company Inc. products and achieve maximum allowable design load, the products must be properly installed and used in accordance with the installation instructions and design limits provided by Simpson Strong-Tie Company Inc. To ensure proper installation and use, designers and installers must carefully read the following General Notes, General Instructions for the Installer and General Instructions for the Designer, as well as consult the applicable catalog pages for specific product installation instructions and notes.

Proper product installation requires careful attention to all notes and instructions, including these basic rules:

1. Be familiar with the application and correct use of the product.
2. Follow all installation instructions provided in the applicable catalog, website, Installer's Pocket Guide or any other Simpson Strong-Tie publications.
3. Install all required fasteners per installation instructions provided by Simpson Strong-Tie Company Inc.: a) use proper fastener type; b) use proper fastener quantity; c) fill all fastener holes; d) do not overdrive or underdrive nails, including when using gun nailers; and e) ensure screws are completely driven.
4. Only bend products that are specifically designed to be bent. For those products that require bending, do not bend more than once.

In addition to following the basic rules provided above as well as all notes, warnings and instructions provided in the catalog, installers, designers, engineers and consumers should consult the Simpson Strong-Tie Company Inc. website at www.strongtie.com to obtain additional design and installation information, including:

- Instructional builder/contractor training is available in both English and Spanish;
- Information on workshops Simpson Strong-Tie conducts at various training centers throughout the country;
- Product specific installation videos;
- Specialty catalogs;
- Code reports;
- Technical fliers and bulletins;
- Engineering letters;
- Master format specifications;
- Material safety data sheets;
- Corrosion information;
- Simpson Strong-Tie Drawing Finder;
- Simpson Strong-Tie Strong-Wall® Selector web application; and
- Answers to frequently asked questions and technical topics.

Failure to fully follow all of the notes and instructions provided by Simpson Strong-Tie Company Inc. may result in improper installation of products. Improperly installed products may not perform to the specifications set forth in this catalog and may reduce a structure's ability to resist the movement, stress, and loading that occurs from gravity loads as well as impact events such as earthquakes and high velocity winds.

Simpson Strong-Tie Company Inc. does not guarantee the performance or safety of products that are modified, improperly installed or not used in accordance with the design and load limits set forth in this catalog.

General Notes

These general notes are provided to ensure proper installation of Simpson Strong-Tie Company Inc. products and must be followed fully.

a. Simpson Strong-Tie Company Inc. reserves the right to change specifications, designs and models without notice or liability for such changes.

b. Steel used for each Simpson Strong-Tie® product is individually selected based on the product's steel specifications, including strength, thickness, formability, finish and weldability. Contact Simpson Strong-Tie for steel information on specific products.

c. Unless otherwise noted, dimensions are in inches, loads are in pounds.

d. Unless otherwise noted, welds, screws, bolts and nails may not be combined to achieve highest load value. 8d (0.131" x 2½"), 10d (0.148" x 3") and 16d (0.162" x 3½") specify common nails that meet the requirements of ASTM F1667. When a shorter nail is specified, it will be noted (for example 8d x 1½"). Refer to Simpson Strong-Tie Nailing Guide, NDS (National Design Specification) and ASTM F1667 (American Society of Testing and Materials) for more nail information.

e. Do not overload. Do not exceed catalog allowable loads, which would jeopardize the connection.

f. Unless otherwise noted, allowable loads are for Douglas fir–larch under continuously dry conditions. Allowable loads for other species or conditions must be adjusted according to the code. The section from the AC13 criteria indicating the range of specific gravity reads as follows: A3.2.3. The species of lumber used shall have a specific gravity not greater than 0.55 as determined in accordance with the NDS. This chart shows specific gravity and perpendicular-to-grain compression capacities for the different wood species:

Species	$F_{c\perp}$	Specific Gravity
Douglas Fir–Larch (DF)	625 psi	0.50
Southern Pine (SP)	565 psi	0.55
Spruce-Pine-Fir (SPF)	425 psi	0.42
Spruce-Pine-Fir South (SPF-S)	335 psi	0.36
Hem-Fir (HF)	405 psi	0.43
Glulam	650 psi	0.50
LVL (DF/SP)	750 psi	0.50
LSL ($E = 1.3 \times 10^6$)	680 psi	0.50
LSL ($E \geq 1.5 \times 10^6$)	880 psi	0.50
Parallam® PSL	750 psi	0.50

g. All references to bolts or machine bolts (MBs) are for structural quality through bolts (not lag screws or carriage bolts) equal to or better than ASTM Standard A307, Grade A.

h. Unless otherwise noted, bending steel in the field may cause fractures at the bend line. Fractured steel will not carry load and must be replaced.

i. A fastener that splits the wood will not resist the design load. Evaluate splits to determine if the connection will perform as required. Dry wood may split more easily and should be evaluated

Important Information and General Notes

as required. If wood tends to split, consider pre-boring holes with diameters not exceeding 0.75 of the nail diameter (2018 NDS Section 12.1.6.2). Use a 5⁄32" bit for Strong-Drive® SDS Heavy-Duty Connector screws and a 3⁄32" bit for Strong-Drive SD9/SD10 and Strong-Wall SWS16150 Connector screws.

j. Wood shrinks and expands as it loses and gains moisture, particularly perpendicular to its grain. Take wood shrinkage into account when designing and installing connections. Simpson Strong-Tie manufactures products to fit common dry lumber dimensions. If you need a connector with dimensions other than those listed in this catalog, Simpson Strong-Tie may be able to vary connector dimensions; contact Simpson Strong-Tie. The effects of wood shrinkage are increased in multiple lumber connections, such as floor-to-floor installations. This may result in the vertical rod nuts becoming loose, requiring post-installation tightening. (Contact Simpson Strong-Tie for information on Takeup Devices.)

k. Built-up lumber (multiple members) must be fastened together to act as one unit to resist the applied load (excluding the connector fasteners). This must be determined by the designer.

l. Some model configurations may differ from those shown in this catalog. Contact Simpson Strong-Tie for details.

m. Do not weld products listed in this catalog unless this publication specifically identifies a product as acceptable for welding, or unless specific approval for welding is provided in writing by Simpson Strong-Tie. Some steels have poor weldability and a tendency to crack when welded. Cracked steel will not carry load and must be replaced.

General Instructions for the Installer

These general instructions for the installer are provided to ensure proper selection and installation of Simpson Strong-Tie Company Inc. products and must be followed carefully. These general instructions are in addition to the specific installation instructions and notes provided for each particular product, all of which should be consulted prior to and during installation of Simpson Strong-Tie Company Inc. products.

a. All specified fasteners must be installed according to the instructions in this catalog. Incorrect fastener quantity, size, placement, type, material, or finish may cause the connection to fail. Prior to using a particular fastener, please consult the Fastener Guide on our website at **strongtie.com**.

- 16d fasteners are common nails (0.162" dia. x 3½" long) and cannot be replaced with 16d sinkers (0.148" dia. x 3¼" long) for full load value unless otherwise specified.
- Unless otherwise noted screws may not be used to replace nails in connectors unless approved and recommended by the Designer/Engineer of Record. Unless stated otherwise, Simpson Strong-Tie cannot and does not make any representations regarding the suitability of use or load-carrying capacities of connectors with screws replacing nails.
- When using stainless-steel connectors, use stainless-steel fasteners. When using ZMAX®/HDG galvanized connectors, use fasteners that meet the zinc coating specifications of ASTM A153 or other fasteners allowed in this catalog.

b. Fill all fastener holes as specified in the installation instructions for that product.

c. Do not overdrive nails. Overdriven nails reduce shear capacity.

d. Use the materials specified in the installation instructions. Substitution of or failure to use specified materials may cause the connection to fail.

e. Do not add fastener holes or otherwise modify Simpson Strong-Tie Company Inc. products. The performance of modified products may be substantially weakened. Simpson Strong-Tie will not warrant or guarantee the performance of such modified products.

f. Install products in the position specified in the catalog.

g. Do not alter installation procedures from those set forth in this catalog.

h. Bolt holes shall be at least a minimum of 1⁄32" and no more than a maximum of 1⁄16" larger than the bolt diameter (per the 2018 NDS, Section 12.1.3.2 and AISI S100-16, Table J3-1 if applicable).

i. Install all specified fasteners before loading the shearwall.

j. Some hardened fasteners may have premature failure if exposed to moisture. These fasteners are recommended to be used in dry interior applications.

k. Use proper safety equipment.

l. Welding galvanized steel may produce harmful fumes; follow proper welding procedures and safety precautions. Welding should be in accordance with A.W.S. (American Welding Society) standards. Unless otherwise noted Simpson Strong-Tie® connectors cannot be welded.

m. Pneumatic or powder-actuated fasteners may deflect and injure the operator or others. Pneumatic nail tools may be used to install connectors, provided the correct quantity and type of nails (length and diameter) are properly installed in the nail holes. Tools with nail hole-locating mechanisms should be used. Follow the manufacturer's instructions and use the appropriate safety equipment. Overdriving nails may reduce allowable loads. Contact Simpson Strong-Tie. Powder-actuated fasteners should not be used to install connectors, unless noted otherwise.

n. For cold-formed steel applications, all screws shall be installed in accordance with the screw manufacturer's recommendations. All screws shall penetrate and protrude through the joined materials a minimum of 3 full exposed threads per AISI Standard for Cold Formed Steel Framing — General Provisions, Section D1.3, if applicable.

o. Nuts shall be installed such that the end of the threaded rod or bolt is at least flush with the top of the nut.

p. To achieve tabulated values for embedded concrete/masonry products, full consolidation of concrete or grout is required.

q. Drilling, sawing, sanding or machining wood products generates wood dust, a substance known to the State of California to cause cancer. For more information on Proposition 65, visit oehha.ca.gov.

r. For additional installation information, visit the Simpson Strong-Tie page at youtube.com/strongtie.

Important Information and General Notes

General Instructions for the Designer

These general instructions for the designer are provided to ensure proper selection and installation of Simpson Strong-Tie Company Inc. products and must be followed carefully. These general instructions are in addition to the specific design and installation instructions and notes provided for each particular product, all of which should be consulted prior to and during the design process.

a. The term "designer" used throughout this catalog is intended to mean a licensed/certified building design professional, a licensed professional engineer, or a licensed architect.

b. All connected members and related elements shall be designed by the designer.

c. All installations should be designed only in accordance with the allowable load values set forth in this catalog.

d. Simpson Strong-Tie strongly recommends the following addition to construction drawings and specifications: "Simpson Strong-Tie® products are specifically required to meet the structural calculations of the plan. Before substituting another brand, confirm load capacity based on reliable published testing data or calculations. The Engineer/Designer of Record should evaluate and give written approval for substitution prior to installation."

e. For cold-formed steel applications, as a minimum all screws must comply with Society of Automotive Engineers (SAE) Standard J78, Steel Self-Drilling/Tapping Screws, and must have a Type II coating in accordance with ASTM B 633, Electrodeposited Coatings of Zinc on Iron and Steel. Screw strength shall be calculated in accordance with AISI S100-16 Section J4, if applicable, or shall be based on the manufacturer's design capacity determined from testing.

f. Local and/or regional building codes may require meeting special conditions. Building codes often require special inspection of anchors installed in concrete and masonry. For compliance with these requirements, it is necessary to contact the local and/or regional building authority. Except where mandated by code, Simpson Strong-Tie products do not require special inspection.

g. For Masterformat® specifications, visit strongtie.com/literature/masterformat.html.

Limited Warranty

Simpson Strong-Tie Company Inc. warrants catalog products to be free from defects in material or manufacturing. Simpson Strong-Tie Company Inc. products are further warranted for adequacy of design when used in accordance with design limits in this catalog and when properly specified, installed and maintained. This warranty does not apply to uses not in compliance with specific applications and installations set forth in this catalog, or to non-catalog or modified products, or to deterioration due to environmental conditions.

Simpson Strong-Tie® connectors are designed to enable structures to resist the movement, stress and loading that results from impact events such as earthquakes and high-velocity winds. Other Simpson Strong-Tie products are designed to the load capacities and uses listed in this catalog. Properly-installed Simpson Strong-Tie products will perform in accordance with the specifications set forth in the applicable Simpson Strong-Tie catalog. Additional performance limitations for specific products may be listed on the applicable catalog pages.

Due to the particular characteristics of potential impact events, the specific design and location of the structure, the building materials used, the quality of construction, and the condition of the soils involved, damage may nonetheless result to a structure and its contents even if the loads resulting from the impact event do not exceed Simpson Strong-Tie catalog specifications and Simpson Strong-Tie connectors are properly installed in accordance with applicable building codes.

All warranty obligations of Simpson Strong-Tie Company Inc. shall be limited, at the discretion of Simpson Strong-Tie Company Inc., to repair or replacement of the defective part. These remedies shall constitute Simpson Strong-Tie Company Inc.'s sole obligation and sole remedy of purchaser under this warranty. In no event will Simpson Strong-Tie Company Inc. be responsible for incidental, consequential, or special loss or damage, however caused.

This warranty is expressly in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose, all such other warranties being hereby expressly excluded. This warranty may change periodically — consult our website strongtie.com for current information.

Terms and Conditions of Sale

Product Use

Products in this catalog are designed and manufactured for the specific purposes shown, and should not be used with other connectors not approved by a qualified designer. Modifications to products or changes in installations should only be made by a qualified designer. The performance of such modified products or altered installations is the sole responsibility of the designer.

Indemnity

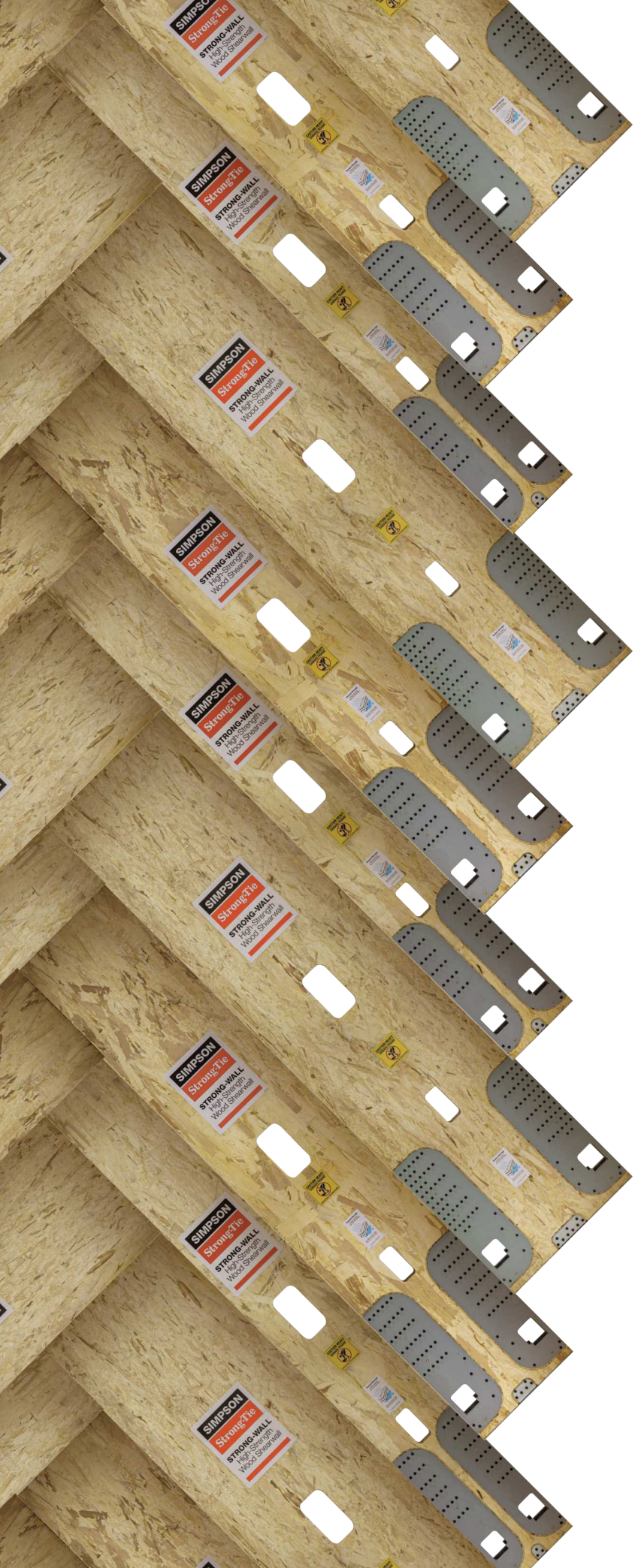
Customers or designers modifying products or installations, or designing non-catalog products for fabrication by Simpson Strong-Tie Company Inc. shall, regardless of specific instructions to the user, indemnify, defend and hold harmless Simpson Strong-Tie Company Inc. for any and all claimed loss or damage occasioned in whole or in part by non-catalog or modified products.

Non-Catalog and Modified Products

Consult Simpson Strong-Tie Company Inc. for applications for which there is no catalog product, or for connectors for use in hostile environments, with excessive wood shrinkage, or with abnormal loading or erection requirements.

Non-catalog products must be designed by the customer and will be fabricated by Simpson Strong-Tie in accordance with customer specifications.

Simpson Strong-Tie cannot and does not make any representations regarding the suitability of use or load-carrying capacities of non-catalog products. Simpson Strong-Tie provides no warranty, express or implied, on non-catalog products.



Stronger.
Easier.
More versatile.

The code-listed Strong-Wall® high-strength wood shearwall is an extremely versatile solution for lateral-force resistance in residential, multi-family and light-frame commercial construction. Field-trimmable to suit your exact design needs and code-listed, its patented new design provides higher allowable loads for every application.

All Strong-Walll® high-strength wood shearwalls are supplied with top-of-wall shear transfer plates and required fasteners, heavy hex nuts, heavy bearing plates, and installation instructions. Additionally, shearwalls 100 inches or less in height are supplied with four portal straps.

Standard and Balloon Framing on Concrete Foundations

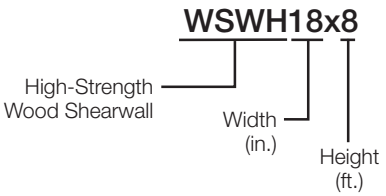
Simpson Strong-Tie® Strong-Wall® high-strength wood shearwalls combine design flexibility with performance. Field trimmable, they can be customized to accommodate varying heights or rake walls. They are evaluated to the 2018 IRC/IBC and are listed by ICC-ES.

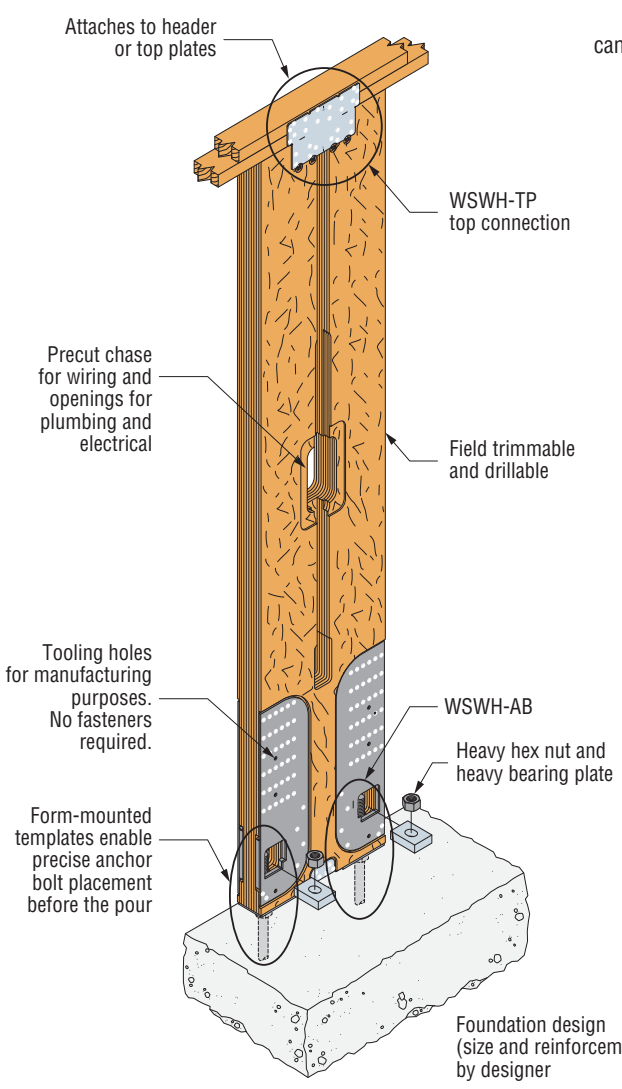
Installation

- All panels may be field trimmed to a minimum of 74½". Trim height from top of panel only, do not trim from sides or bottom. Drilling holes in the Strong-Wall high-strength wood shearwalls is not allowed except as shown on p. 36.
- Anchor bolt nuts should be finger tight plus ⅛ turn.
- Maximum shim thickness between the shearwall and top plates or header is ⅞". For additional shim thicknesses, see detail 9/WSWH2 on p. 35.
- Walls may also be used in 2x6 wall framing. Install the panel flush to the outside face of the framing and add furring to the opposite face as required to accommodate finish material. See detail 6/WSWH2 on p. 33.
- Top connection installs with a combination of SDS25600 Heavy-Duty Connector screws and SWS16150 Strong-Wall screws.

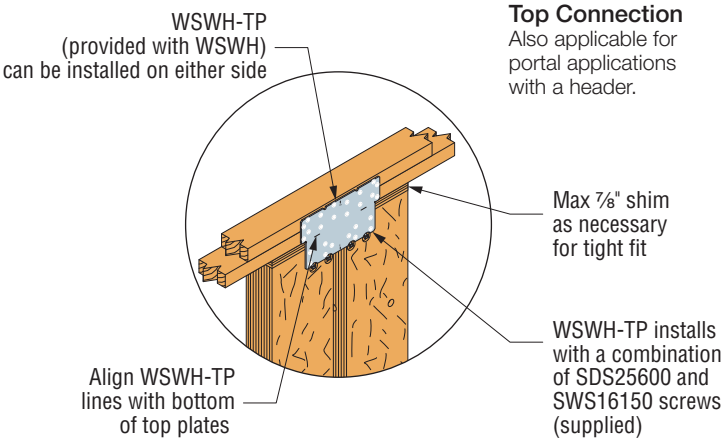
Codes: ICC-ES ESR-2652, City of LA Building Code Supplement and State of Florida FL5113

Strong-Wall High-Strength Wood Shearwall Naming Legend

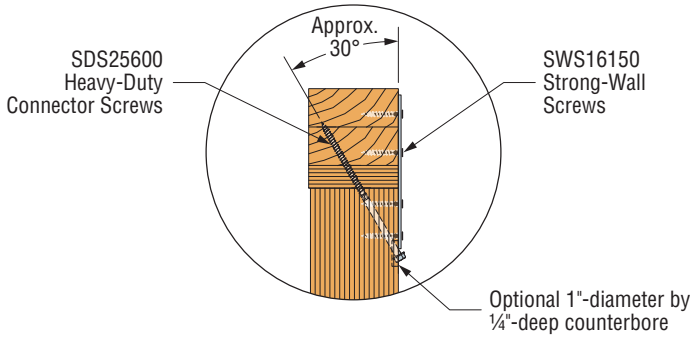




Standard Installation
US Patent 10,711,477



Top Connection
Also applicable for portal applications with a header.



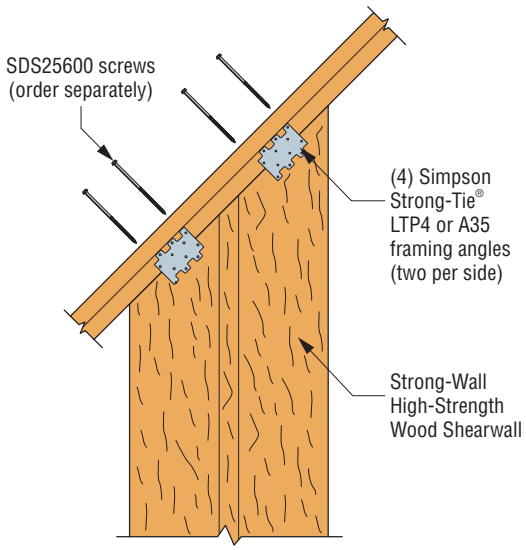
Top Connection
Section View

Standard and Balloon Framing on Concrete Foundations

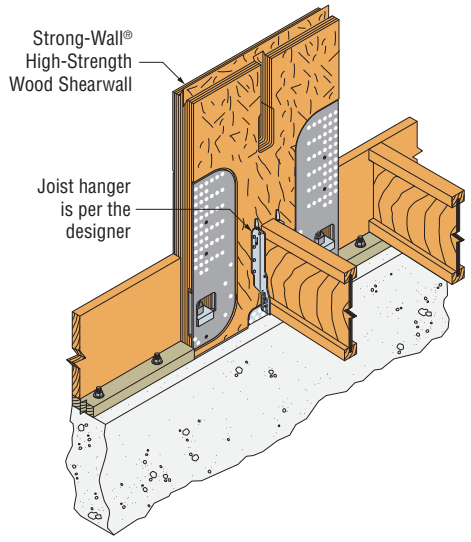
Strong-Wall® High-Strength Wood Shearwall Product Data

Model No.	Panel Information			Anchor Bolts	
	Width (in.)	Height (in.)	Weight (lb.)	Quantity	Diameter (in.)
WSWH12x7	12	84	105	2	1
WSWH18x7	18	84	155	2	1
WSWH12x8	12	96	120	2	1
WSWH18x8	18	96	175	2	1
WSWH24x8	24	96	225	2	1
WSWH12x9	12	108	130	2	1
WSWH18x9	18	108	195	2	1
WSWH24x9	24	108	250	2	1
WSWH12x10	12	120	145	2	1
WSWH18x10	18	120	210	2	1
WSWH24x10	24	120	275	2	1
WSWH12x12	12	144	165	2	1
WSWH18x12	18	144	245	2	1
WSWH24x12	24	144	325	2	1
WSWH18x14	18	168	285	2	1
WSWH24x14	24	168	370	2	1
WSWH24x16	24	192	420	2	1
WSWH18x20	18	240	390	2	1
WSWH24x20	24	240	520	2	1

1. To achieve evaluated panel heights listed in the allowable load table or for those not listed, order the next tallest panel and trim to fit. Minimum trimmed height for all panels is 74½".
2. All panels are supplied with preattached holdowns, two heavy hex nuts, two heavy bearing plates, one WSWH-TP top connection plate (width based on panel model), required fasteners and installation instructions.
3. All panels are 3½" thick.

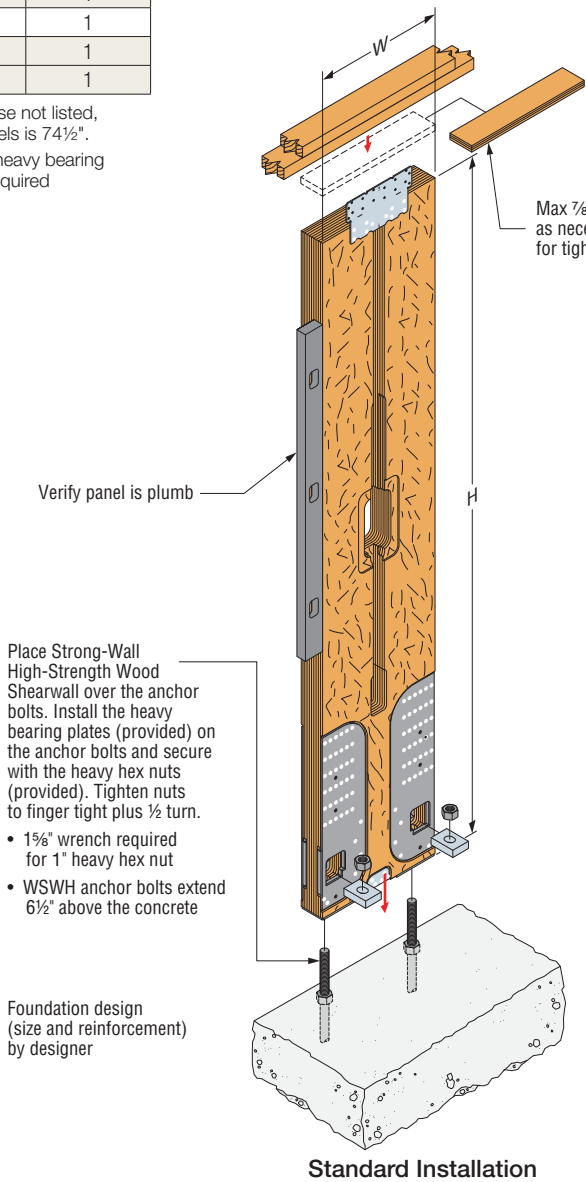


Rake Wall Application



First-Story Installation with Wood Floor System

Specify panel height from top of foundation to underside of the top plates or beam.



Standard Installation

Standard and Balloon Framing on Concrete Foundations

Strong-Wall High-Strength Wood Shearwall Model No.	Panel Evaluation Height, H_e (lb.)[6]	Allow Vertical Load, P (lb.)[4]	2,500 psi Concrete						3,000 psi Concrete					
			Seismic[3]			Wind			Seismic[3]			Wind		
			Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]
WSWH12x7	78	1,000	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
		4,000	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
		7,500	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
WSWH18x7	78	1,000	3,795	0.32	23,680	4,470	0.39	27,890	3,795	0.32	23,680	4,470	0.39	27,890
		4,000	3,795	0.32	23,680	4,365	0.38	27,245	3,795	0.32	23,680	4,470	0.39	27,890
		7,500	3,795	0.32	23,680	4,050	0.36	25,285	3,795	0.32	23,680	4,470	0.39	27,890
WSWH24x7	78	1,000	7,450	0.30	33,210	7,795	0.34	34,755	7,450	0.30	33,210	7,795	0.34	34,755
		4,000	7,450	0.30	33,210	7,565	0.33	33,715	7,450	0.30	33,210	7,795	0.34	34,755
		7,500	7,115	0.28	31,715	7,115	0.31	31,715	7,450	0.30	33,210	7,795	0.34	34,755
WSWH12x8	93.25	1,000	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
		4,000	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
		7,500	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
WSWH18x8	93.25	1,000	3,060	0.39	22,835	3,880	0.52	28,925	3,060	0.39	22,835	3,955	0.53	29,490
		4,000	3,060	0.39	22,835	3,650	0.49	27,245	3,060	0.39	22,835	3,955	0.53	29,490
		7,500	3,060	0.39	22,835	3,390	0.46	25,285	3,060	0.39	22,835	3,955	0.53	29,490
WSWH24x8	93.25	1,000	6,240	0.37	33,240	6,650	0.43	35,430	6,240	0.37	33,240	6,910	0.45	36,815
		4,000	6,240	0.37	33,240	6,330	0.41	33,715	6,240	0.37	33,240	6,910	0.45	36,815
		7,500	5,950	0.35	31,715	5,950	0.38	31,715	6,240	0.37	33,240	6,910	0.45	36,815
WSWH12x9	105.25	1,000	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
		4,000	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
		7,500	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
WSWH18x9	105.25	1,000	2,575	0.45	21,680	3,325	0.60	27,975	2,575	0.45	21,680	3,325	0.60	27,975
		4,000	2,575	0.45	21,680	3,235	0.58	27,245	2,575	0.45	21,680	3,325	0.60	27,975
		7,500	2,575	0.45	21,680	3,005	0.54	25,285	2,575	0.45	21,680	3,325	0.60	27,975
WSWH24x9	105.25	1,000	5,150	0.43	30,975	5,890	0.52	35,430	5,150	0.43	30,975	6,120	0.54	36,815
		4,000	5,150	0.43	30,975	5,605	0.50	33,715	5,150	0.43	30,975	6,120	0.54	36,815
		7,500	5,150	0.43	30,975	5,275	0.47	31,715	5,150	0.43	30,975	6,120	0.54	36,815
WSWH12x10	117.25	1,000	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
		4,000	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
		7,500	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
WSWH18x10	117.25	1,000	2,140	0.50	20,055	2,755	0.67	25,840	2,140	0.50	20,055	2,755	0.67	25,840
		4,000	2,140	0.50	20,055	2,755	0.67	25,840	2,140	0.50	20,055	2,755	0.67	25,840
		7,500	2,140	0.50	20,055	2,695	0.65	25,285	2,140	0.50	20,055	2,755	0.67	25,840
WSWH24x10	117.25	1,000	4,010	0.48	26,860	5,215	0.67	34,935	4,010	0.48	26,860	5,215	0.67	34,935
		4,000	4,010	0.48	26,860	5,030	0.64	33,715	4,010	0.48	26,860	5,215	0.67	34,935
		7,500	4,010	0.48	26,860	4,735	0.61	31,715	4,010	0.48	26,860	5,215	0.67	34,935
WSWH12x11	129.25	1,000	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
		4,000	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
		7,500	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
WSWH18x11	129.25	1,000	1,960	0.55	20,240	2,520	0.73	26,060	1,960	0.55	20,240	2,520	0.73	26,060
		4,000	1,960	0.55	20,240	2,520	0.73	26,060	1,960	0.55	20,240	2,520	0.73	26,060
		7,500	1,960	0.55	20,240	2,445	0.71	25,285	1,960	0.55	20,240	2,520	0.73	26,060
WSWH24x11	129.25	1,000	4,000	0.54	29,550	4,795	0.68	35,430	4,000	0.54	29,550	4,985	0.70	36,815
		4,000	4,000	0.54	29,550	4,565	0.64	33,715	4,000	0.54	29,550	4,985	0.70	36,815
		7,500	4,000	0.54	29,550	4,295	0.60	31,715	4,000	0.54	29,550	4,985	0.70	36,815

See foonotes on p. 15.

Standard and Balloon Framing on Concrete Foundations

(cont.)

Strong-Wall High-Strength Wood Shearwall Model No.	Panel Evaluation Height, H_e (lb.)[6]	Allow Vertical Load, P (lb.)[4]	2,500 psi Concrete						3,000 psi Concrete					
			Seismic[3]			Wind			Seismic[3]			Wind		
			Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]
WSWH12x12	144	1,000	505	0.61	9,495	645	0.80	12,150	505	0.61	9,495	645	0.80	12,150
		4,000	505	0.61	9,495	645	0.80	12,150	505	0.61	9,495	645	0.80	12,150
		7,500	505	0.61	9,495	645	0.80	12,150	505	0.61	9,495	645	0.80	12,150
WSWH18x12	144	1,000	1,705	0.61	19,665	2,195	0.80	25,285	1,705	0.61	19,665	2,195	0.80	25,285
		4,000	1,705	0.61	19,665	2,195	0.80	25,285	1,705	0.61	19,665	2,195	0.80	25,285
		7,500	1,705	0.61	19,665	2,195	0.80	25,285	1,705	0.61	19,665	2,195	0.80	25,285
WSWH24x12	144	1,000	3,525	0.60	29,015	4,305	0.75	35,430	3,525	0.60	29,015	4,475	0.78	36,815
		4,000	3,525	0.60	29,015	4,100	0.72	33,715	3,525	0.60	29,015	4,475	0.78	36,815
		7,500	3,525	0.60	29,015	3,855	0.67	31,715	3,525	0.60	29,015	4,475	0.78	36,815
WSWH18x13	156	1,000	1,490	0.66	18,575	1,910	0.87	23,855	1,490	0.66	18,575	1,910	0.87	23,855
		4,000	1,490	0.66	18,575	1,910	0.87	23,855	1,490	0.66	18,575	1,910	0.87	23,855
		7,500	1,490	0.66	18,575	1,910	0.87	23,855	1,490	0.66	18,575	1,910	0.87	23,855
WSWH24x13	156	1,000	3,110	0.65	27,705	3,975	0.86	35,430	3,110	0.65	27,705	4,025	0.87	35,885
		4,000	3,110	0.65	27,705	3,780	0.81	33,715	3,110	0.65	27,705	4,025	0.87	35,885
		7,500	3,110	0.65	27,705	3,560	0.77	31,715	3,110	0.65	27,705	4,025	0.87	35,885
WSWH18x14	168	1,000	1,180	0.72	15,890	1,515	0.93	20,370	1,180	0.72	15,890	1,515	0.93	20,370
		4,000	1,180	0.72	15,890	1,515	0.93	20,370	1,180	0.72	15,890	1,515	0.93	20,370
WSWH24x14	168	1,000	2,620	0.71	25,160	3,365	0.93	32,290	2,620	0.71	25,160	3,365	0.93	32,290
		4,000	2,620	0.71	25,160	3,365	0.93	32,290	2,620	0.71	25,160	3,365	0.93	32,290
WSWH18x16	192	1,000	985	0.82	15,160	1,265	1.07	19,395	985	0.82	15,160	1,265	1.07	19,395
		4,000	985	0.82	15,160	1,265	1.07	19,395	985	0.82	15,160	1,265	1.07	19,395
WSWH24x16	192	1,000	2,130	0.82	23,345	2,735	1.07	29,990	2,130	0.82	23,345	2,735	1.07	29,990
		4,000	2,130	0.82	23,345	2,735	1.07	29,990	2,130	0.82	23,345	2,735	1.07	29,990
WSWH18x18	216	1,000	750	0.93	12,965	960	1.20	16,550	750	0.93	12,965	960	1.20	16,550
		4,000	750	0.93	12,965	960	1.20	16,550	750	0.93	12,965	960	1.20	16,550
WSWH24x18	216	1,000	1,655	0.93	20,400	2,110	1.20	26,060	1,655	0.93	20,400	2,110	1.20	26,060
		4,000	1,655	0.93	20,400	2,110	1.20	26,060	1,655	0.93	20,400	2,110	1.20	26,060
WSWH18x20	240	1,000	605	1.04	11,640	770	1.33	14,825	605	1.04	11,640	770	1.33	14,825
		4,000	605	1.04	11,640	770	1.33	14,825	605	1.04	11,640	770	1.33	14,825
WSWH24x20	240	1,000	1,350	1.04	18,500	1,720	1.33	23,590	1,350	1.04	18,500	1,720	1.33	23,590
		4,000	1,350	1.04	18,500	1,720	1.33	23,590	1,350	1.04	18,500	1,720	1.33	23,590

1. Allowable shear loads are applicable to installations on concrete with specifed compressive strengths as listed using the ASD basic (IBC Section 1605.3.1) or the alternative basic (IBC Section 1605.3.2) load combinations.
2. Load values include evaluation of bearing stresses on concrete foundations and do not require further evaluation by the designer. For installations on masonry foundations, bearing capacity shall be evaluated by the designer.
3. Seismic design based on 2018 IBC using R = 6.5. For other codes, use the seismic coeffcients corresponding to light-frame bearing walls with wood structural panels or sheet-steel panels.
4. Allowable vertical load denotes the total maximum concentric vertical load permitted on the panel acting in combination with the allowable shear loads.
5. Allowable shear, drift and anchor tension values may be interpolated for intermediate height or vertical loads. For panels 74½"–78" tall, use the values for a 78"-tall panel.
6. To achieve required WSWH panel evaluation height, trim next tallest full-height panel defined in table on p. 13.
7. Drifts at lower design shear may be linearly reduced.
8. See p. 16 for allowable out-of-plane and axial capacities.
9. Angled SDS screws may be omitted from the WSWH-TP top connection for all panels taller than 100"; see p. 16 as reduced allowable out-of-plane loads may apply.
10. High-strength anchor bolts are required for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 22–23. See pp. 21–29 for WSWH-AB anchor bolt information and anchorage solutions.
11. Tabulated anchor tension values assume no resisting vertical load. Anchor tension loads at design shear values and including the effect of vertical load may be determined using the following equation:
    T = [(V x H) / B] – P/2, where:
    T = Anchor tension load (lb.)
    V = Design shear load (lb.)
    P = Applied vertical load (lb.)
    H = Panel height (in.)
    B = Moment arm (in.); 7.625" for WSWH12, 12.50" for WSWH18, 17.50" for WSWH24.

Standard and Balloon Framing on Concrete Foundations

Allowable Out-of-Plane Loads for Single-Story Walls on Concrete Foundations (psf)

Panel Attachment	WSWH-TP Top Connection Fastening[4]	Strong-Wall High-Strength Wood Shearwall Model No.	Nominal Height of Shearwall (ft.)										
			7	8	9	10	11	12	13	14	16	18	20
Top Plates	Angled SDS Screws Omitted	WSWH12	N/A	N/A	85	75	70	35	N/A	N/A	N/A	N/A	N/A
		WSWH18	N/A	N/A	125	115	105	80	65	50	35	25	15
		WSWH24	N/A	N/A	120	110	100	80	65	50	35	25	15
	Angled SDS Screws Installed	WSWH12	420	290	205	145	95	35	N/A	N/A	N/A	N/A	N/A
		WSWH18	395	290	205	145	110	80	65	50	35	25	15
		WSWH24	370	290	205	145	110	80	65	50	35	25	15
Header[5,6]	Angled SDS Screws Installed	WSWH12	330	205	150	110	85	45	N/A	N/A	N/A	N/A	N/A
		WSWH18	285	205	150	110	85	65	N/A	N/A	N/A	N/A	N/A
		WSWH24	215	180	150	110	85	65	N/A	N/A	N/A	N/A	N/A

1. Loads shown are at ASD level in pounds per square foot with no further increase allowed.
2. Loads consider a maximum deflection limit of H/240.
3. Allowable out-of-plane loads can be applied in combination with the allowable vertical loads shown on pp. 14–15.
4. Angled SDS screws may be omitted for WSWH panels taller than 100" in standard applications; however, SWS16150 screws must be installed for all fastening conditions. When angled SDS screws are omitted, a reduced allowable out-of-plane load may apply.
5. Allowable values for header panel attachment assume a maximum header depth of 12". Use a load reduction factor of 0.94, 0.88 and 0.82 for 14", 16" and 18" deep headers respectively.
6. Allowable values shown for header panel attachment require the use of the portal straps to resist header rotation.
7. N/A = Not Applicable.

Allowable Axial Loads for Single-Story Walls on Concrete Foundations (lb.)

Strong-Wall High-Strength Wood Shearwall Model No.	Nominal Height of Shearwall (ft.)										
	7	8	9	10	11	12	13	14	16	18	20
WSWH12	30,700	22,400	17,900	14,600	12,100	9,800	N/A	N/A	N/A	N/A	N/A
WSWH18	53,500	39,100	31,200	25,400	21,000	17,000	14,500	12,600	9,600	7,600	6,200
WSWH24	72,000	56,100	44,700	36,400	30,200	24,400	20,900	18,000	13,900	11,000	8,900

1. Allowable ASD vertical load is the lesser of the WSWH panel buckling capacity and concrete bearing capacity beneath the holdowns assuming a minimum specified concrete compressive strength f'_c = 2,500 psi.
2. Allowable vertical loads assume concentric point load or uniformly distributed load without lateral loads present. For combined lateral and vertical loads, see pp. 14–15.
3. Tabulated loads apply to single-story panels on concrete foundations.
4. N/A = Not Applicable.

Garage Portal Systems on Concrete Foundations

The Strong-Wall® high-strength wood shearwall garage portal system provides higher allowable shear load with reduced concrete anchorage requirements. Portal walls may be used in single- or double-portal applications and shall be installed with a minimum 3" x 11¼" single- or multi-ply header depending upon loading and span requirements.

Codes: ICC-ES ESR-2652, City of LA Building Code Supplement and State of Florida FL5113

For product data and naming scheme information, see pp. 12–13.

Garage Header Rough Opening Height

Model No.	Trimmed Panel Height (in.)	H Curb (in.)	Rough Opening Height (in.)
WSWH12x7 WSWH18x7 WSWH24x7	78	5½	6'-11½"[1]
		6	7'-0"[1]
WSWH12x8 WSWH18x8 WSWH24x8	85½	0	7'-1½"
	93¼	5½	8'-2¾"[2]
		6	8'-3¼"[2]

1. If required rough opening height exceeds table value, specify next taller panel and trim as necessary. The Strong-Wall high-strength wood shearwalls may be trimmed to a minimum height of 74½".
2. Furring down garage header may be required for correct rough opening height.

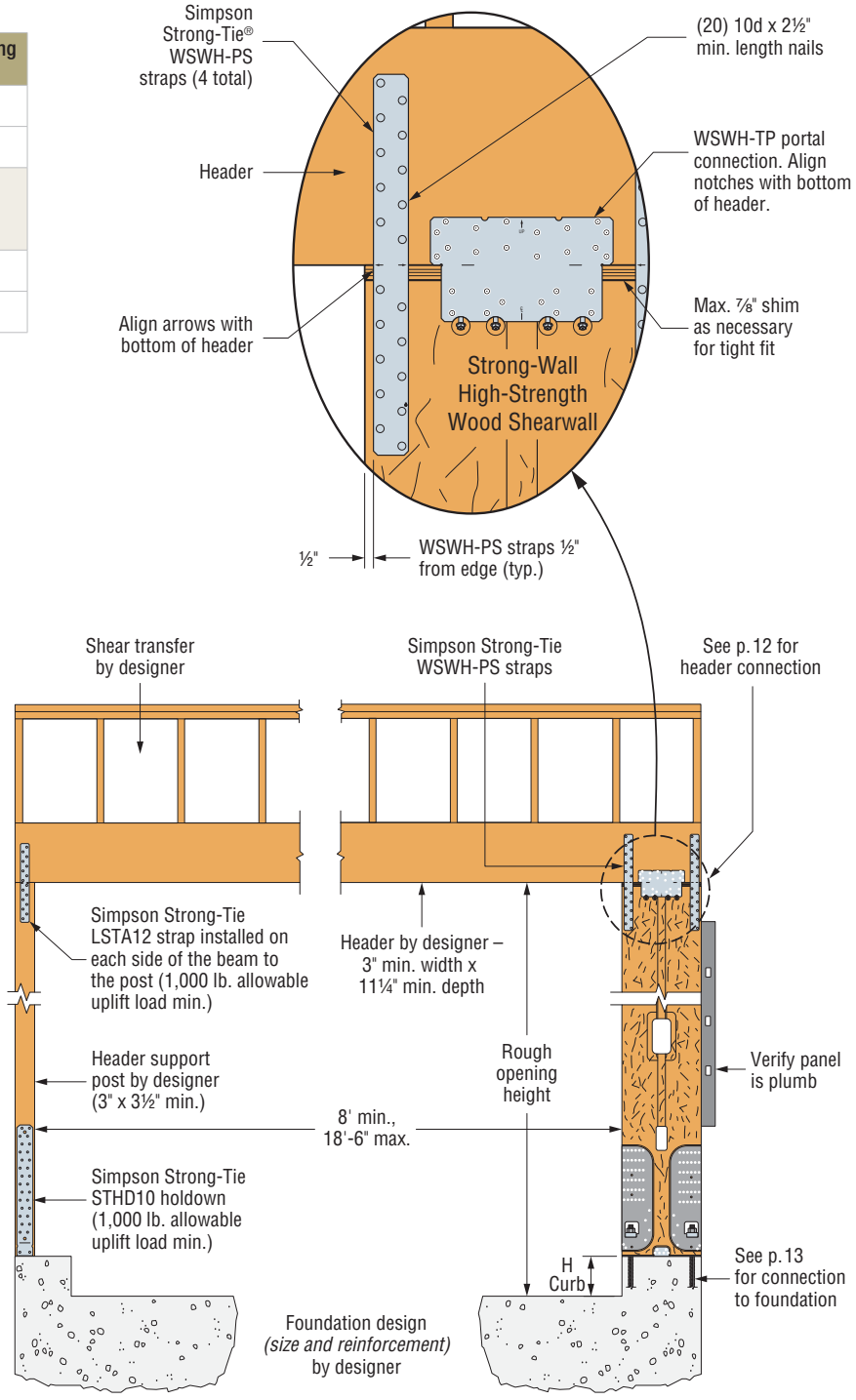
Installation

- Portal-frame connection kit is required for portal-frame applications.
- All panels may be trimmed to a minimum of 74½". Trim height from top of panel only, do not trim from sides or bottom. Drilling holes in the Strong-Wall high-strength wood shearwalls is not allowed except as shown on p. 36.
- Anchor bolt nuts should be finger tight plus ½ turn.
- Maximum shim thickness between Strong-Wall high-strength wood shearwalls and the top plates or header is ⅞".
- Top connection installs with a combination of ¼" x 6" SDS Heavy-Duty Connector screws and SWS16150 Strong-Wall screws.
- Walls may also be used in 2x6 wall framing. Install the panel flush to the outside face of the framing and add furring to the opposite side.
- Walls may be installed with solid or multi-ply headers, see details 3, 4, 5, 6/WSWH4 for fastening and furring requirements on pp. 38–39.

Portal Frame Connection Kit

Model No.	Contents
WSWH-PK	4 (10-gauge) WSWH-PS straps

1. Portal-frame connection kit comes with panels that are 100" or less in height. The kit must be ordered separately for panels over 100" tall.



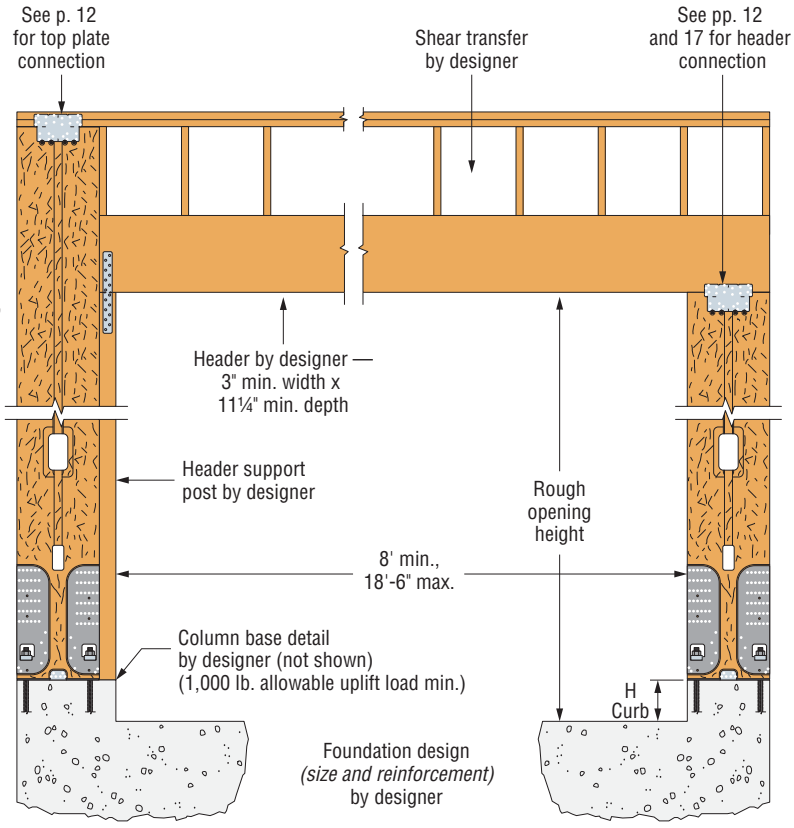
Single Portal Installation
US Patent 10,711,477

Garage Portal Systems on Concrete Foundations

Portal Design Information

A portal frame under lateral loads causes the portal header to experience internal stresses in addition to those created by the primary loads (live, dead and snow). These additional stresses are called induced forces and must be considered when designing portal headers. To account for the induced forces from lateral loads, a concentrated end moment equal to the top-of-panel moment must be placed at the end of the header that is connected to the WSWH panel. For the WSWH12, WSWH18 and WSWH24, the moment induced into the portal header must be taken as 20%, 10% and 0%, respectively, of the total lateral moment at the base. The total lateral moment is calculated as the design shear times the panel height. For headers with typical residential uniform loads, the induced moment and shear forces from a portal-frame system do not control the design. This is due to the 1.60 load duration factor (C_D) used in design when wind and seismic loads are included.

The lateral and vertical loads shown on p. 19 for portal frames assume that the header size falls within the portal-frame parameters listed in the table below.



Alternate Garage Front Option 1

Alternate Garage Front Option 2

US Patent 10,711,477

Strong-Wall® High-Strength Wood Shearwall Portal Header Design Parameters

Header Design Parameter	Allowable Range
Width	3" – 5½"
Depth	11¼" – 18"
Clear Span	8' – 18' 6"
K	90 lb./in. – 4,000 lb./in.

1. Single- or multi-ply header members may be used.
2. Maximum clear span for multi-ply 2x DF/SP header shall be limited to 16'-4".
3. Secondary moment, shear and axial forces shall be considered in header design.
4. Header design shall be by designer and assume gravity loads only induce simple span moments in beam.
5. Header stiffness (K) for use in WSWH portal system may be determined using the following equation:
   $K = (E \times b \times d^3) / 12L^3$ where:
   E = Header modulus of elasticity (psi)
   b = Header width (in.)
   d = Header depth (in.)
   L = Header clear span (in.)

Alternative Garage Front Options

These alternative garage-front options may be used for applications when the Strong-Wall® high-strength wood shearwall is installed at the full height (option 1) or without the additional Portal-Frame Kit (option 2), when higher allowable load or reduced concrete anchorage is not needed. Refer to the Standard Application on Concrete Foundations on pp. 12–16 for product data and allowable load values.

For Garage Wall Option 2, the designer shall design for:

1. Shear transfer
2. Out-of-plane loading effect
3. Increased overturning and drift due to additional height

Garage Portal Systems on Concrete Foundations

Single-Wall Garage Portal System on Concrete Foundation

Strong-Wall High-Strength Wood Shearwall Model No.	Panel Evaluation Height, H_e (in.)[7]	Allowable Vertical Load, P (lb.)[5]	2,500 psi Concrete						3,000 psi Concrete					
			Seismic[3]			Wind			Seismic[3]			Wind		
			Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[8]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[8]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[8]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[8]	Anchor Tension at Allowable Shear, T (lb.)[11]
WSWH12x7	78	1,000	1,780	0.39	14,550	2,285	0.53	18,715	1,780	0.39	14,550	2,285	0.53	18,715
		4,000	1,780	0.39	14,550	2,285	0.53	18,715	1,780	0.39	14,550	2,285	0.53	18,715
		7,500	1,780	0.39	14,550	2,285	0.53	18,715	1,780	0.39	14,550	2,285	0.53	18,715
WSWH18x7	78	1,000	3,980	0.38	22,345	4,580	0.47	25,715	3,980	0.38	22,345	4,580	0.47	25,715
		4,000	3,980	0.38	22,345	4,580	0.47	25,715	3,980	0.38	22,345	4,580	0.47	25,715
		7,500	3,980	0.38	22,345	4,505	0.46	25,285	3,980	0.38	22,345	4,580	0.47	25,715
WSWH24x7	78	1,000	7,450	0.30	33,210	7,950	0.35	35,430	7,450	0.30	33,210	8,260	0.36	36,815
		4,000	7,450	0.30	33,210	7,565	0.33	33,715	7,450	0.30	33,210	8,260	0.36	36,815
		7,500	7,115	0.28	31,715	7,115	0.31	31,715	7,450	0.30	33,210	8,260	0.36	36,815
WSWH12x8	85.5	1,000	1,590	0.42	14,280	2,065	0.57	18,520	1,590	0.42	14,280	2,065	0.57	18,520
		4,000	1,590	0.42	14,280	2,065	0.57	18,520	1,590	0.42	14,280	2,065	0.57	18,520
		7,500	1,590	0.42	14,280	2,065	0.57	18,520	1,590	0.42	14,280	2,065	0.57	18,520
WSWH18x8	85.5	1,000	3,550	0.41	21,845	4,580	0.56	28,185	3,550	0.41	21,845	4,580	0.56	28,185
		4,000	3,550	0.41	21,845	4,425	0.54	27,245	3,550	0.41	21,845	4,580	0.56	28,185
		7,500	3,550	0.41	21,845	4,110	0.50	25,285	3,550	0.41	21,845	4,580	0.56	28,185
WSWH24x8	85.5	1,000	6,425	0.33	31,385	7,250	0.41	35,430	6,425	0.33	31,385	7,535	0.43	36,815
		4,000	6,425	0.33	31,385	6,900	0.39	33,715	6,425	0.33	31,385	7,535	0.43	36,815
		7,500	6,425	0.33	31,385	6,490	0.37	31,715	6,425	0.33	31,385	7,535	0.43	36,815
WSWH12x8	93.25	1,000	1,435	0.45	14,050	1,860	0.60	18,190	1,435	0.45	14,050	1,860	0.60	18,190
		4,000	1,435	0.45	14,050	1,860	0.60	18,190	1,435	0.45	14,050	1,860	0.60	18,190
		7,500	1,435	0.45	14,050	1,860	0.60	18,190	1,435	0.45	14,050	1,860	0.60	18,190
WSWH18x8	93.25	1,000	3,170	0.44	21,290	4,130	0.60	27,735	3,170	0.44	21,290	4,130	0.60	27,735
		4,000	3,170	0.44	21,290	4,060	0.59	27,245	3,170	0.44	21,290	4,130	0.60	27,735
		7,500	3,170	0.44	21,290	3,765	0.55	25,285	3,170	0.44	21,290	4,130	0.60	27,735
WSWH24x8	93.25	1,000	6,240	0.37	33,240	6,650	0.43	35,430	6,240	0.37	33,240	6,910	0.45	36,815
		4,000	6,240	0.37	33,240	6,330	0.41	33,715	6,240	0.37	33,240	6,910	0.45	36,815
		7,500	5,950	0.35	31,715	5,950	0.38	31,715	6,240	0.37	33,240	6,910	0.45	36,815

1. Allowable shear loads are applicable to installations on concrete with specified compressive strengths as listed using the ASD basic (IBC Section 1605.3.1) or the alternative basic (IBC Section 1605.3.2) load combinations.
2. Load values include evaluation of bearing stresses on concrete foundations and do not require further evaluation by the designer. For installations on masonry foundations, bearing capacity shall be evaluated by the designer.
3. Seismic design based on 2018 IBC using R = 6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet-steel panels.
4. Allowable values shown apply to single-wall garage portal systems. The allowable shear load for a double-wall garage portal system, which consists of two walls with a header continuous across both panels, may be taken as twice the table value.
5. Allowable vertical load denotes the total maximum concentric vertical load permitted on the panel acting in combination with the allowable shear loads.
6. Allowable shear, drift and anchor tension values may be interpolated for intermediate height or vertical loads. For panels 74½"–78" tall, use the values for a 78"-tall panel.
7. To achieve required WSWH panel evaluation height, trim next tallest full-height panel defined in table on p. 13.
8. Drifts at lower design shear may be linearly reduced.
9. See p. 16 for allowable out-of-plane and axial capacities.
10. High-strength anchor bolts are required for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 22–23. See pp. 21–29 for WSWH-AB anchor bolt information and anchorage solutions.
11. Tabulated anchor tension values assume no resisting vertical load. Anchor tension loads at design shear values and including the effect of vertical load may be determined using the following equation:
    T = [(k x V x H) / B] – P/2, where:
    T = Anchor tension load (lb.)
    V = Design shear load (lb.)
    P = Applied vertical load (lb.)
    H = Panel height (in.)
    B = Moment arm (in.); 7.625" for WSWH12, 12.50" for WSWH18 and 17.50" for WSWH24
    k = Portal factor; 0.80 for WSWH12 panels 93¼" or less in height,
    0.90 for WSWH18 panels 93¼" or less in height,
    1.00 for all other panels.

Back-to-Back Installations on Concrete Foundations

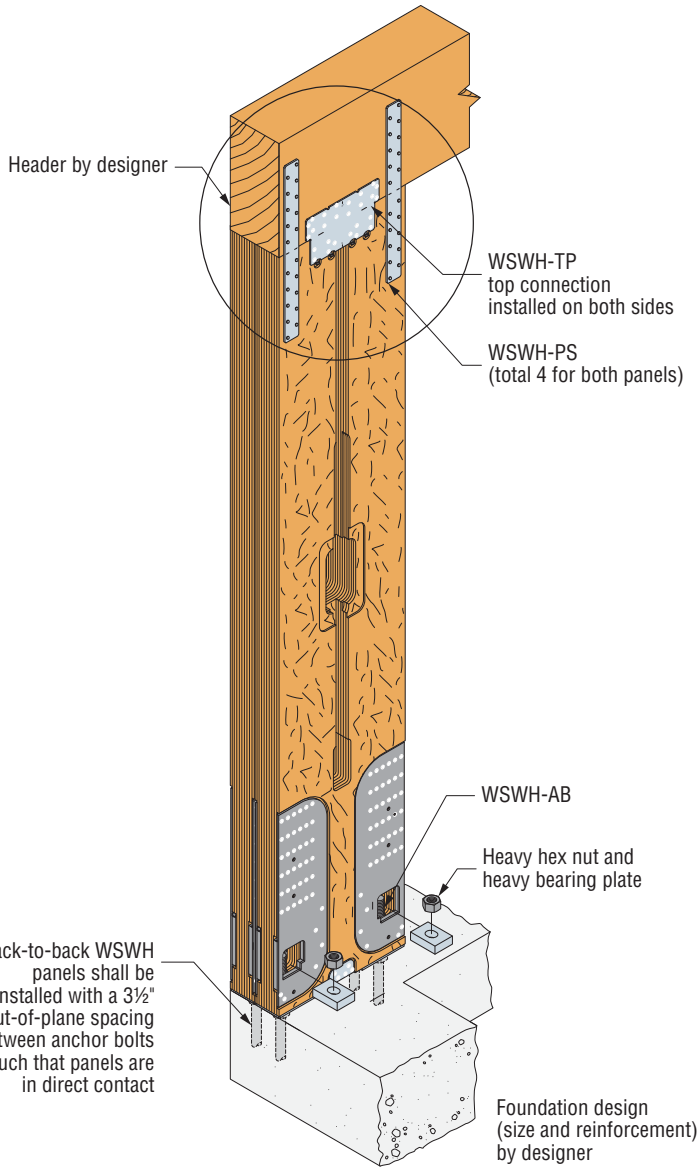
The Strong-Wall® high-strength wood shearwall may be installed in a back-to-back orientation in residential, multi-family and light-commercial applications for cases where maximum allowable loads are required and a special moment frame might otherwise be specified. The allowable ASD shear loads for back-to-back installations may be taken as twice those listed for standard applications in the table on pp. 14–15. Double 2x8 top plates are required for standard applications and a minimum 7" x 11¼" header is required for single- or double-portal applications depending upon loading and span requirements. Back-to-back anchorage solutions for spread footings and reinforced grade beam foundations are provided in detail sheets WSWH1.2 and WSWH1.3, and may be downloaded in PDF, DWG or DXF format at **strongtie.com**.

Codes: ICC-ES ESR-2652, City of LA Building Code Supplement and State of Florida FL5113

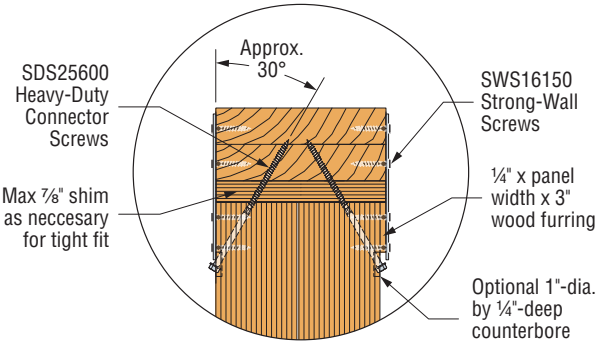
For product data and naming scheme, see pp. 12–13.

Installation

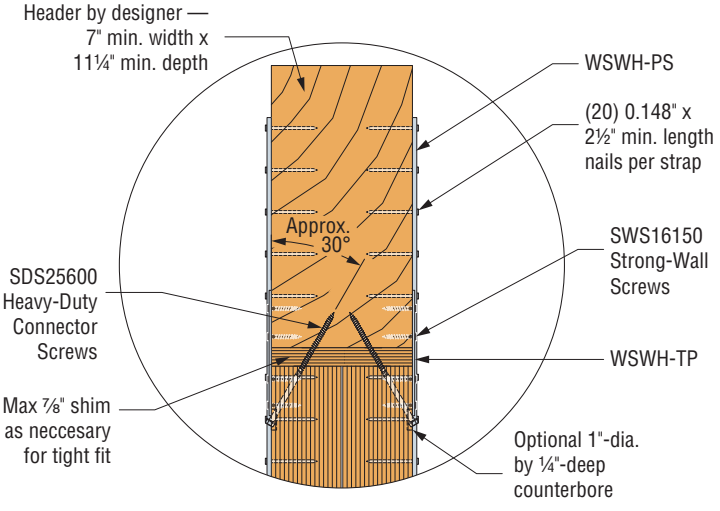
- Portal-frame connection kit is required for portal frame applications (one WSWH-PK kit required for both panels; straps installed on outside panel faces only).
- Allowable out-of-plane loads listed on p. 16 for single-story walls on concrete foundations shall apply and may not be increased.
- See garage header rough opening height table on p. 17.
- All panels may be field trimmed to a minimum of 74½". Trim height from top of panel only, do not trim from sides or bottom. Drilling holes in the Strong-Wall high-strength wood shearwalls is not permitted except as shown on p. 36.
- Anchor bolt nuts should be finger tight plus ½ turn.
- Maximum shim thickness between the shearwall and top plates or header is ⅞". For additional thicknesses, see detail 9/WSWH2 on p. 35.
- Top connection installs with a combination of ¼" x 6" SDS Heavy-Duty Connector screws and SWS16150 Strong-Wall screws. See details 7/WSWH2 and 3/WSWH4 on pp. 33 and 38 for standard and portal applications, respectively.



Back-to-Back Portal Installation (Standard Installation Similar)



Top Connection for Back-to-Back Standard Installation



Top Connection for Back-to-Back Portal Installation

High-Strength Wood Shearwall Anchorage Solutions

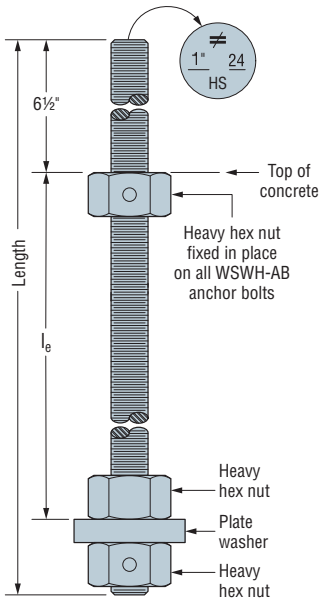
WSWH-AB Anchor Bolts

WSWH-AB anchor bolts in 1" diameters offer flexibility to meet specific project demands. Inspection is easy; the head is stamped with a No-Equal® symbol for identification, bolt length, bolt diameter, and optional "HS" for "High-Strength" if specified.

Material: ASTM F1554 Grade 36; High-Strength (HS) ASTM A193 Grade B7

An additional nut for template installation is provided with each WSWH-AB.

Strong-Wall® High-Strength Wood Shearwall Model No.	Model No.	Dia. (in.)	Total Length (in.)	l_e (in.)
WSWH12 WSWH18 WSWH24	WSWH-AB1x24	1	24	15½
	WSWH-AB1x24HS	1	24	15½
	WSWH-AB1x30	1	30	21½
	WSWH-AB1x30HS	1	30	21½
	WSWH-AB1x36	1	36	27½
	WSWH-AB1x36HS	1	36	27½



WSWH-AB

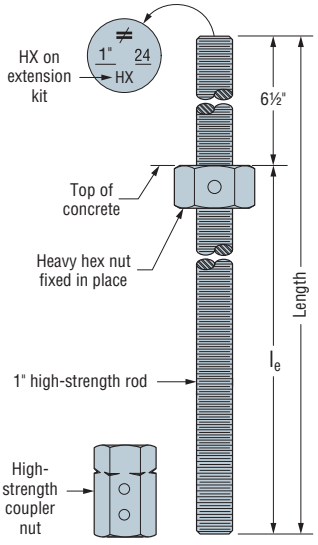
WSWH-HSR Extension Kit

WSWH-HSR allows for anchorage in tall stemwall applications where full embedment of a WSWH-AB into the footing is required. The head is stamped for identification like a WSWH-AB. Kit includes ASTM A193 Grade B7 high-strength rod with heavy hex nut fixed in place and high-strength coupler nut.

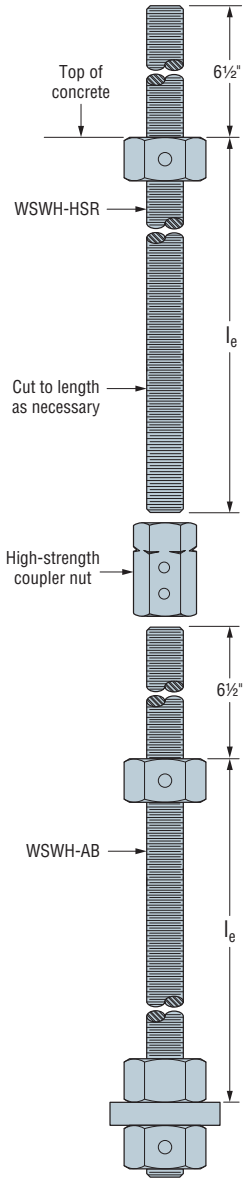
Strong-Wall High-Strength Wood Shearwall Model No.	Model No.	Dia. (in.)	Total Length (in.)	l_e (in.)
WSWH12 WSWH18 WSWH24	WSWH-HSR1x24KT	1	24	17½
	WSWH-HSR1x36KT	1	36	29½

Note: Do not use in place of WSWH-AB.

Total l_e = WSWH-HSR l_e + WSWH-AB l_e + 6½"



WSWH-HSRXXKT



WSWH-HSR and WSWH-AB Assembly

High-Strength Wood Shearwall Anchorage Solutions

Tension Anchorage Solutions — 2,500 psi Concrete[1,5,6]

Design Criteria	Concrete Condition	Anchor Strength[2]	WSWH-AB1 Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[3]	Cracked	Standard	16,000	33	11
			17,100	35	12
		High-Strength	34,100	52	18
			36,800	55	19
	Uncracked	Standard	15,700	28	10
			17,100	30	10
		High-Strength	33,500	45	15
			36,800	48	16
Wind[4]	Cracked	Standard	6,200	16	6
			11,400	24	8
			17,100	32	11
		High-Strength	21,100	36	12
			27,300	42	14
			34,100	48	16
			36,800	51	17
	Uncracked	Standard	6,400	14	6
			12,500	22	8
			17,100	28	10
		High-Strength	22,900	33	11
			26,400	36	12
			34,200	42	14
			36,800	44	15

See footnotes on p. 23.

Tension Anchorage Solutions — 3,000 psi Concrete[1,5,6]

Design Criteria	Concrete Condition	Anchor Strength[2]	WSWH-AB1 Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[3]	Cracked	Standard	16,000	31	11
			17,100	33	11
		High-Strength	33,900	49	17
			36,800	52	18
	Uncracked	Standard	16,300	27	9
			17,100	28	10
		High-Strength	34,000	43	15
			36,800	46	16
Wind[4]	Cracked	Standard	5,600	14	6
			10,200	21	7
			17,100	30	10
		High-Strength	20,000	33	11
			26,500	39	13
			33,600	45	15
			36,800	48	16
	Uncracked	Standard	6,200	13	6
			12,800	21	7
			17,100	26	9
		High-Strength	21,800	30	10
			28,900	36	12
			33,100	39	13
			36,800	42	14

See footnotes on p. 23.

High-Strength Wood Shearwall Anchorage Solutions

Tension Anchorage Solutions — 4,500 psi Concrete[1,5,6]

Design Criteria	Concrete Condition	Anchor Strength[2]	WSWH-AB1 Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[3]	Cracked	Standard	16,000	27	9
			17,100	29	10
		High-Strength	34,700	44	15
			36,800	46	16
	Uncracked	Standard	15,700	23	8
			17,100	25	9
		High-Strength	33,900	38	13
			36,800	40	14
Wind[4]	Cracked	Standard	6,800	14	6
			11,600	20	7
			17,100	26	9
		High-Strength	21,400	30	10
			28,400	36	12
			32,400	39	13
			36,800	43	15
	Uncracked	Standard	6,800	12	6
			12,400	18	6
			17,100	23	8
		High-Strength	22,800	27	9
			26,700	30	10
			30,700	33	11
			36,800	37	13

1. Anchorage designs conform to ACI 318-14 Chapter 17 and ACI 318-11 Appendix D with no supplementary reinforcement for cracked and uncracked concrete as noted.
2. Anchor strength indicates required grade of WSWH-AB anchor bolt. Standard (ASTM F1554 Grade 36) or high strength (HS) (ASTM A193 Grade B7).
3. Seismic indicates Seismic Design Categories C through F. Detached one- and two-family dwellings in SDC C may use wind anchorage solutions. Seismic anchorage designs conform to ACI 318-14 Section 17.2.3.4.3 and ACI 318-11 Section D.3.3.4.
4. Wind includes Seismic Design Categories A and B and detached one- and two-family dwellings in SDC C.
5. Foundation dimensions are for anchorage only. Foundation design (size and reinforcement) by others. The registered design professional may specify alternative embedment, footing size or anchor bolt.
6. Refer to slab on grade, curb, stemwall and interior footing details for W and d_e as shown on pp. 25–26.

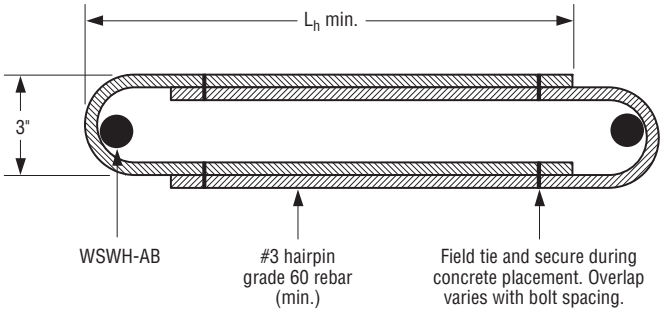
High-Strength Wood Shearwall Anchorage Solutions

Foundation shear reinforcement to resist shear forces from Strong-Wall® high-strength wood shearwalls located at the edge of concrete is shown in the table below. The WSWH12 used in wind applications does not require shear reinforcement when the panel design shear force is less than the anchorage allowable shear load shown in the table below.

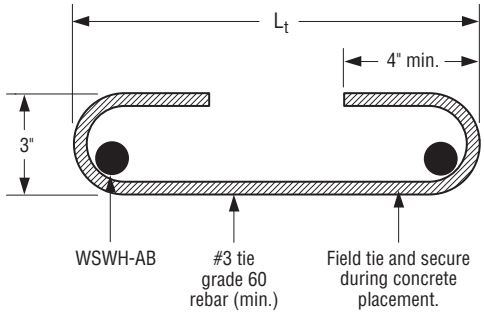
Shear Anchorage Solutions

Strong-Wall High-Strength Wood Shearwall Model No.	L_t or L_h (in.)	Seismic[3]		Wind[4]			
		Shear Reinforcement	Minimum Curb/ Stemwall Width (in.)	Shear Reinforcement	Minimum Curb/ Stemwall Width (in.)	ASD Allowable Shear Load, V (lb.)[7]	
						Uncracked	Cracked
WSWH12	10¼	(1) #3 Tie	6	See Note 7	6	1,080	770
WSWH18	15	(2) #3 hairpins[5, 6]	6	(1) #3 hairpin	6	Hairpin reinforcement achieves maximum allowable shear load of the Strong-Wall® WSWH	
WSWH24	19	(2) #3 hairpins[5]	6	(2) #3 hairpins[5]	6		

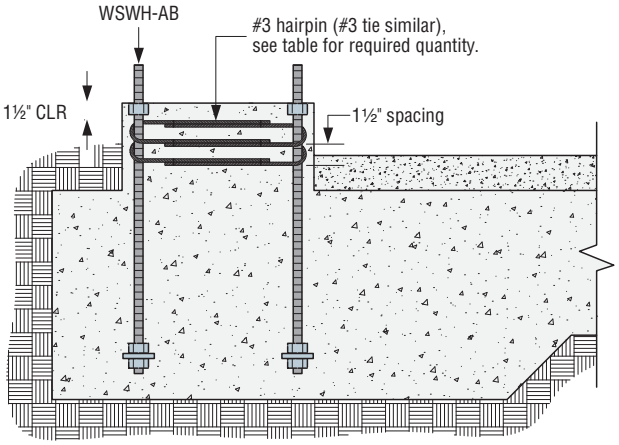
1. Shear anchorage designs conform to ACI 318-14 Chapter 17 and ACI 318-11 and assume minimum 2,500 psi concrete. See pp. 22–23 for tension anchorage.
2. Shear reinforcement is not required for interior foundation applications (panel installed away from edge of concrete), or braced wall panel applications.
3. Seismic indicates seismic design category C through F. Detached one- and two-family dwellings in SDC C may use wind anchorage solutions. Seismic shear reinforcement designs conform to ACI 318-14, section 17.2.3.5.3 and ACI 318-11 section D.3.3.5.
4. Wind includes seismic design category A and B and detached one- and two-family dwellings in SDC C.
5. Additional ties may be required at garage curb or stemwall installations below anchor reinforcement per designer.
6. Use (1) #3 hairpin for WSWH18 when standard strength anchor is used.
7. Use (1) #3 tie for WSWH12 when panel design shear force exceeds tabulated anchorage allowable shear load.
8. No. 4 grade 40 shear reinforcement may be substituted for WSWH shear anchorage solutions.
9. Concrete edge distance for anchors must comply with ACI 318-14 section 17.7.2 and ACI 318-11 section D.8.2.
10. The designer may specify alternate shear anchorage.



Hairpin Shear Reinforcement



Tie Shear Reinforcement

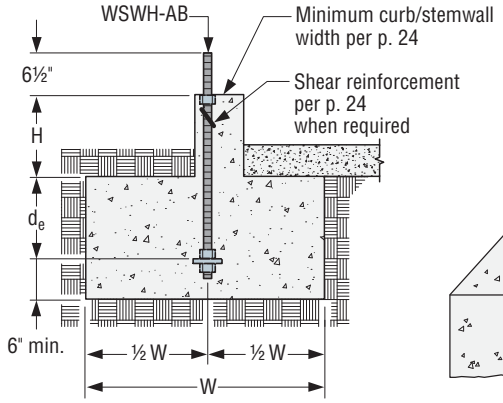


Hairpin Installation

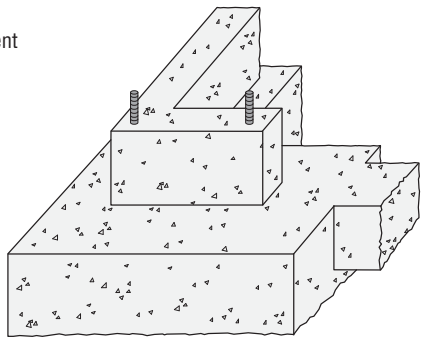
(Garage curb shown, other footing types similar)

High-Strength Wood Shearwall Anchorage Solutions

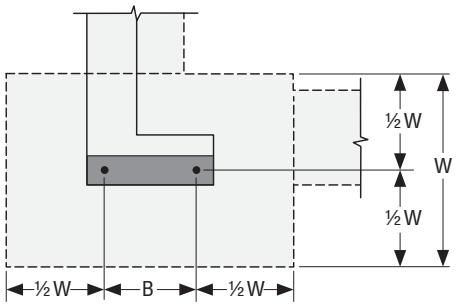
Curb or Stemwall Installation



Curb or Stemwall Section View

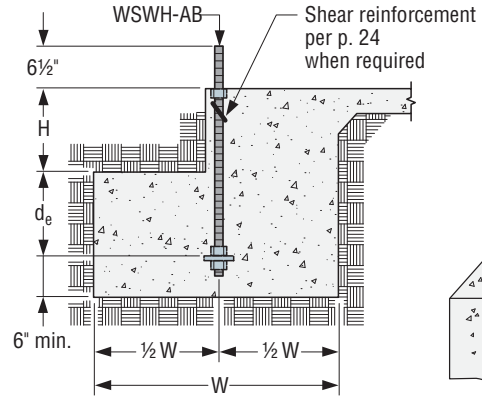


Perspective View
(Slab not shown for clarity)

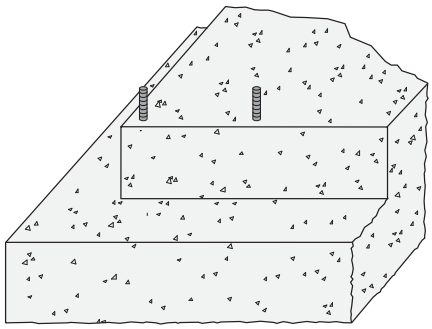


Footing Plan

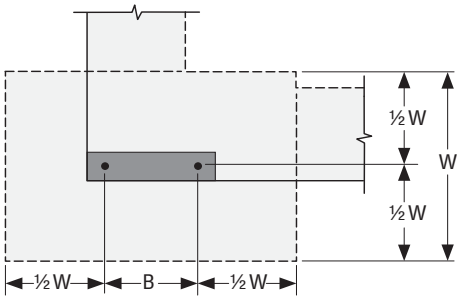
Slab-on-Grade Installation



Slab-on-Grade Section View

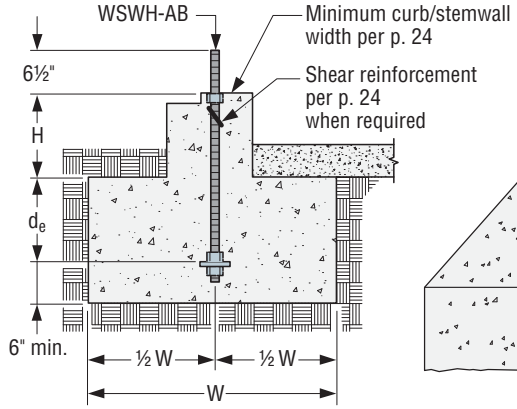


Perspective View

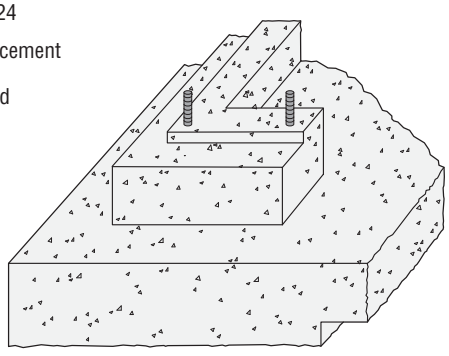


Footing Plan

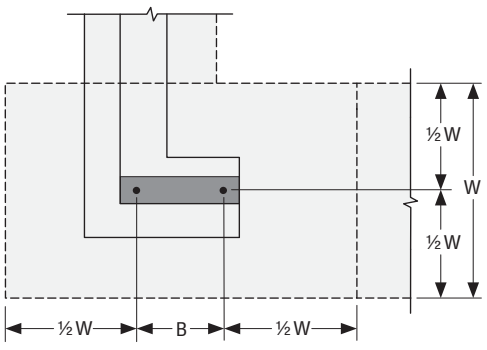
Brick Ledge Installation



Brick Ledge Section View



Perspective View



Footing Plan

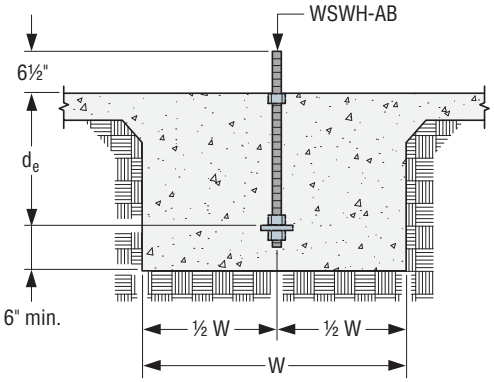
Anchorage Solutions General Notes

1. The designer may specify alternate embedment, footing size or bolt grade.
2. Footing dimensions and rebar requirements are for anchorage only.
3. See pp. 22–23 for W and d_e and p. 26 for B definitions.

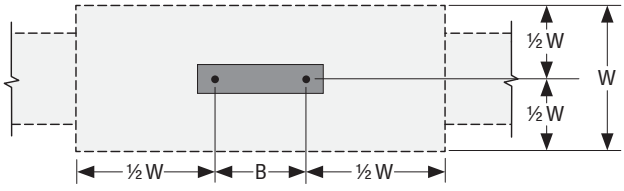
Foundation design *(size and reinforcement)* by designer.

High-Strength Wood Shearwall Anchorage Solutions

Interior Installation

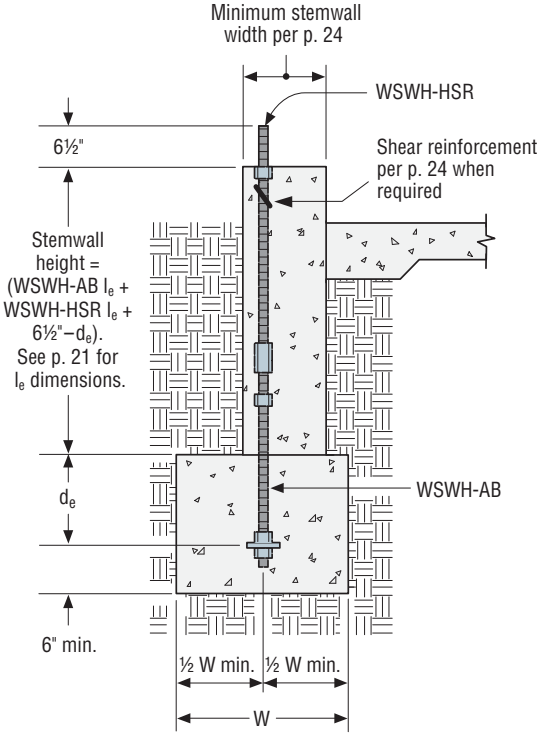


Interior Section View



Footing Plan

Stemwall Extension Installation



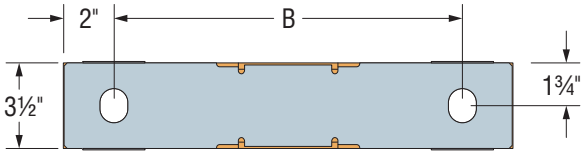
Section at Stemwall
WSWH-AB and WSWH-HSR
Extension Application

Anchorage Solutions General Notes

1. The designer may specify alternate embedment, footing size or bolt grade.
2. Footing dimensions and rebar requirements are for anchorage only.
3. See pp. 22–23 for W and d_e definitions.

Anchor Bolt Layout

Strong-Wall High-Strength Wood Shearwall Model No.	Distance from Center-to-Center of WSWH-AB, B (in.)
WSWH12	8⅛
WSWH18	14
WSWH24	20



WSWH Plan View
Anchorage Layout

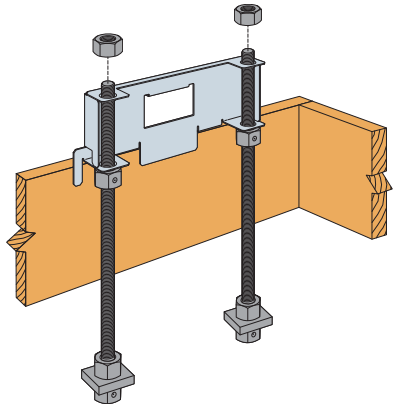
High-Strength Wood Shearwall Anchor Bolt Templates

Simpson Strong-Tie patented reusable anchor bolt templates help ensure accurate anchor bolt placement for the Strong-Wall® high-strength wood shearwalls. They are available in multiple configurations to accommodate common concrete foundation types.

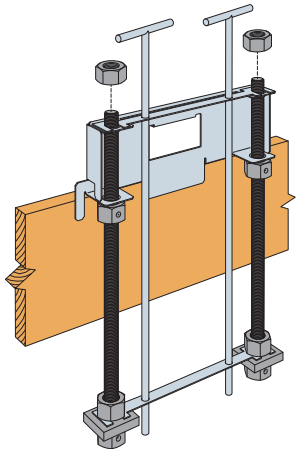
Anchor Bolt Templates

Strong-Wall High-Strength Wood Shearwall Model No.	Model Width (in.)	Anchor Bolt Stabilizer Model No.	Strong-Wall High-Strength Wood Shearwall Template Model No.			
			Reversible	Panel Form	Brick Ledge	Extended Leg
WSWH12	12⅛	WSWH-BS12	WSWH-RT12	WSWH-RTPF12	WSWH-RTBL12	WSWH-RTEL12
WSWH18	18	WSWH-BS18	WSWH-RT18	WSWH-RTPF18	WSWH-RTBL18	WSWH-RTEL18
WSWH24	24	WSWH-BS24	WSWH-RT24	WSWH-RTPF24	WSWH-RTBL24	WSWH-RTEL24

1. Templates are recommended and are required in some jurisdictions.
2. Foundation design by the designer.

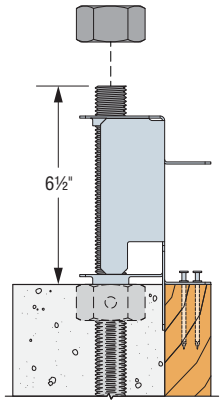


WSWH-RT Exterior Installation*
US Patent 7,445,192

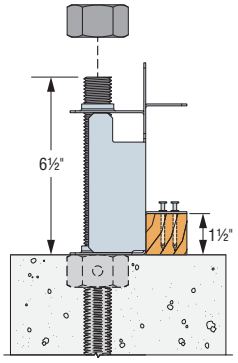


WSWH-RT with Anchor Bolt Stabilizers
(Anchor bolt stabilizers are sold separately. Optional T-shape dowel by others.)

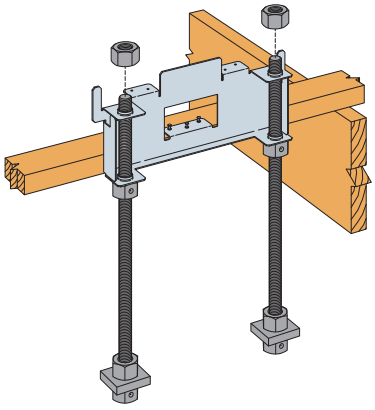
An additional nut for template installation is provided with each WSWH-AB



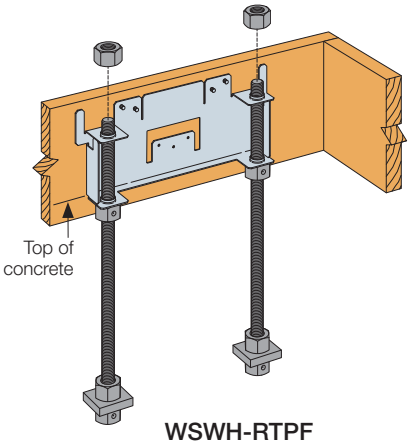
Anchor Bolt Height (Exterior)



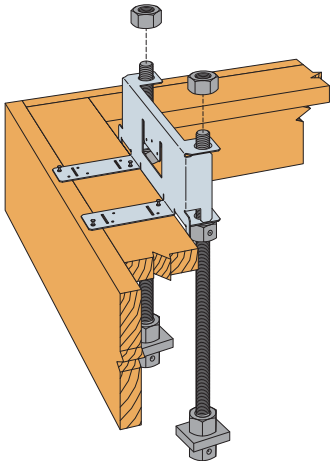
Anchor Bolt Height (Interior)



WSWH-RT Interior Installation*
US Patent 7,445,192



WSWH-RTPF
(Panel form)
US Patent 7,445,192



WSWH-RTBL
(Brick ledge)
US Patent 7,445,192

*WSWH-RT templates are reversible. Use the same template for interior or exterior applications.

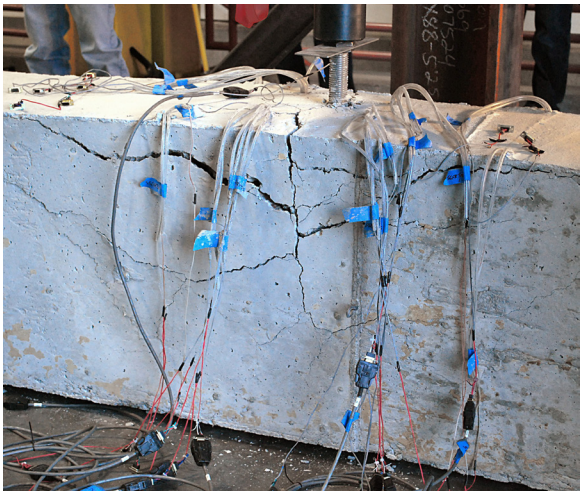
Anchor Reinforcement Solutions on Grade Beams

Simpson Strong-Tie® provides grade beam anchorage solutions for the Strong-Wall® high-strength wood shearwalls, which have been calculated to conform to ACI 318-14. Through funding from the Structural Engineers Association of Northern California, initial testing at Scientific Construction Laboratories Inc. confirmed the need to comply with ACI 318 requirements to prevent plastic hinging at anchor locations. Follow-up testing at the Simpson Strong-Tie Tyrell Gilb Research Laboratory was then used to confirm these findings and validate performance. The testing consisted of specimens with closed tie anchor reinforcement, non-closed u-stirrups and control specimens without anchor reinforcement. Flexural and shear reinforcement were designed to resist amplified anchorage forces and compared to test beams designed for non-amplified strength level forces. The test program has proven the performance of the anchor reinforcement details developed by Simpson Strong-Tie.

Signifcant Findings from Testing

Grade beam flexural and shear capacity is critical to anchor performance and must be designed to exceed the demands created by the attached structure. In wind load applications, this demand includes the factored demand from the Strong-Wall high-strength wood shearwalls (WSHW). In seismic applications, testing and analysis have shown that in order to achieve the anchor performance expected by ACI 318 anchorage design methodologies, the concrete member design strength needs to resist the amplifed anchor design demand from ACI 318-14 Section 17.2.3.4.3 and ACI 318-11 Appendix D Section D.3.3.4.3. To help designers achieve this, Simpson Strong-Tie recommends designers apply the seismic design moment listed in the table below at the WSWH location when evaluating the grade beam design strength under seismic loads. The tabulated moment correlates to the lowest of the anchor tension design limits defined in the sections listed above as they relate to each WSWH model.

Closed tie anchor reinforcement is critical to maintain the integrity of the reinforced core where the anchor is located. Testing with u-stirrups that did not include complete closed ties showed premature splitting failure of the grade beam.



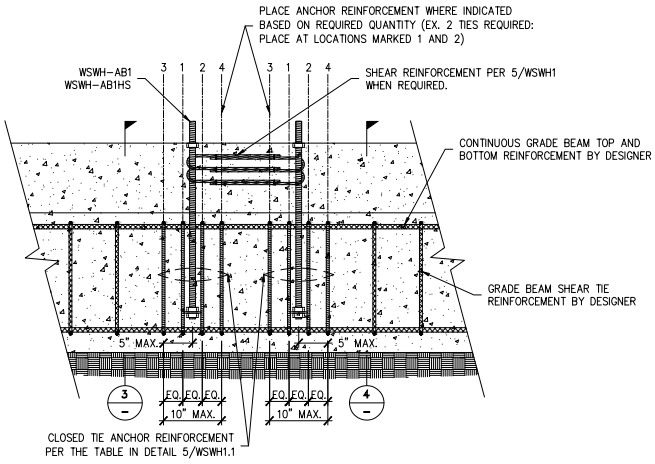
Grade Beam Testing

Grade-Beam Anchorage Solutions

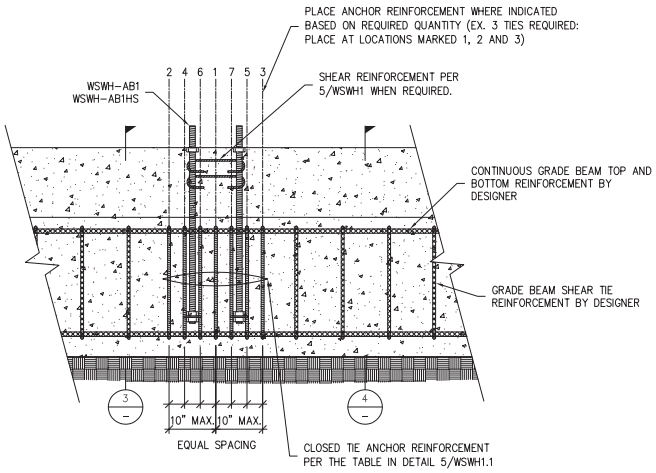
Strong-Wall High-Strength Wood Shearwall Model No.	Anchor Bolt Model No.	Anchor Diameter (in.)	Anchor Reinforcement for Wind and Seismic[3,8,9]		Amplified LRFD Applied Design Seismic Moment (ft.-lb.)[4,5,6,7]	
			Standard-Strength WSWH-AB	High-Strength WSWH-ABHS	Standard-Strength WSWH-AB	High-Strength WSWH-ABHS
WSWH12	WSWH-AB1 WSWH-AB1HS	1	(3) #4 Closed Ties / Wall	(7) #4 Closed Ties / Wall	29,500	31,300
WSWH18			(2) #4 Closed Ties / Anchor	(4) #4 Closed Ties / Anchor	48,000	72,900
WSWH24					67,100	103,500

1. Anchor reinforcement conforms to ACI 318-14 Section 17.4.2.9 and ACI 318-11 Section D.5.2.9. Full-scale testing was used to validate anchor reinforcement configuration and placement.
2. Minimum concrete compressive strength, f'c = 2,500 psi.
3. Closed-tie anchor reinforcement to be ASTM A615 Grade 60 (min.) #4 rebar.
4. Grade-beam longitudinal and tie reinforcement shall be specified by the designer for flexure and shear loading. Design should consider project-specific design loads and allowable soil pressure.
5. Simpson Strong-Tie recommends using the tabulated minimum amplified LRFD applied seismic design moment to ensure grade-beam design flexure and shear strength is adequate to prevent plastic hinge formation under demands associated with anchorage forces corresponding to ACI 318-14 Section 17.2.3.4.3 and ACI 318-11 Section D.3.3.4.3.
6. Designer may use reduced moment due to applied WSWH lateral load. Minimum moment shall be the lesser of the tabulated moment or the amplified LRFD design moment for seismic: (ASD design demand shear/0.7) x Ω_o x WSWH wall height for grade-beam design.
7. Minimum grade-beam design moment for wind and seismic in Seismic Design Category A and B and detached one- and two-family dwellings in SDC C: (ASD design demand shear/0.6) x WSWH wall height.
8. Closed tie may be single-piece hoop or two-piece assembly with a u-stirrup with standard 135° hooks and a top cross-tie cap. See detail 6/WSWH1.1.
9. See details for grade-beam anchor reinforcement placement, installation and spacing requirements. Closed tie anchor reinforcement quantity is per wall for the 12" wall model, and per anchor for the 18" and 24" models.

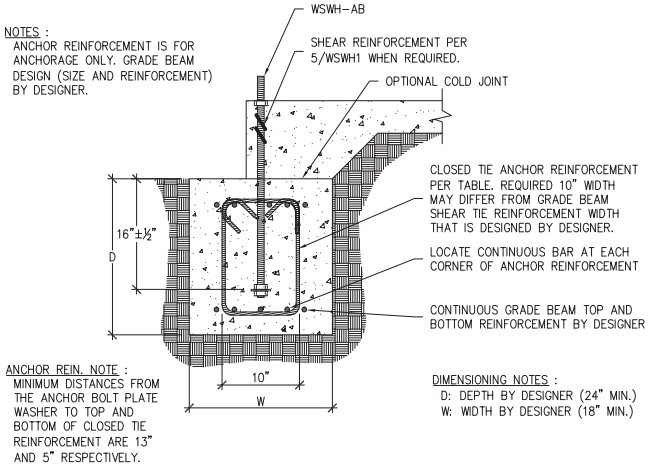
High-Strength Wood Shearwall Anchorage Solutions



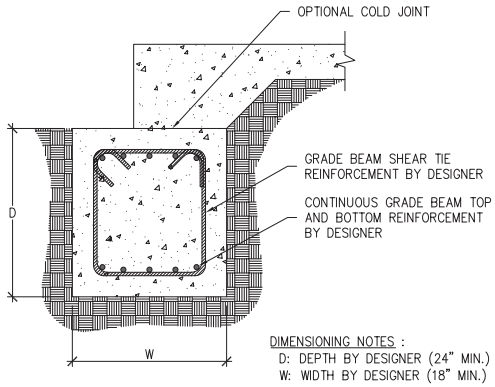
GRADE BEAM ELEVATION AT 18" AND 24" WALL MODEL	1/WSWH1.1



GRADE BEAM ELEVATION AT 12" WALL MODEL	2/WSWH1.1

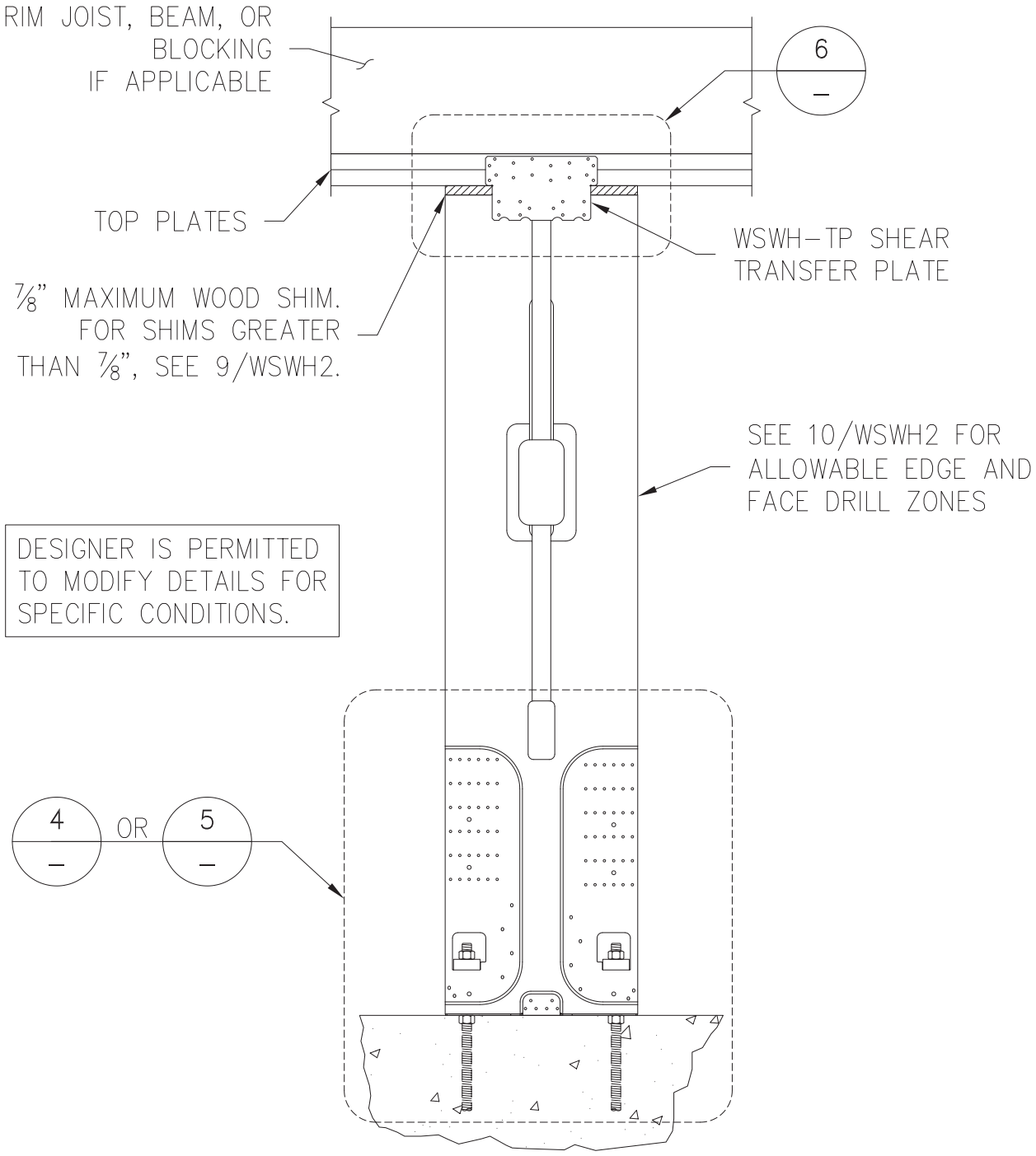


GRADE BEAM SECTION AT ANCHOR REINFORCEMENT	3/WSWH1.1



GRADE BEAM SECTION AWAY FROM ANCHOR REINFORCEMENT	4/WSWH1.1

Structural Installation Details

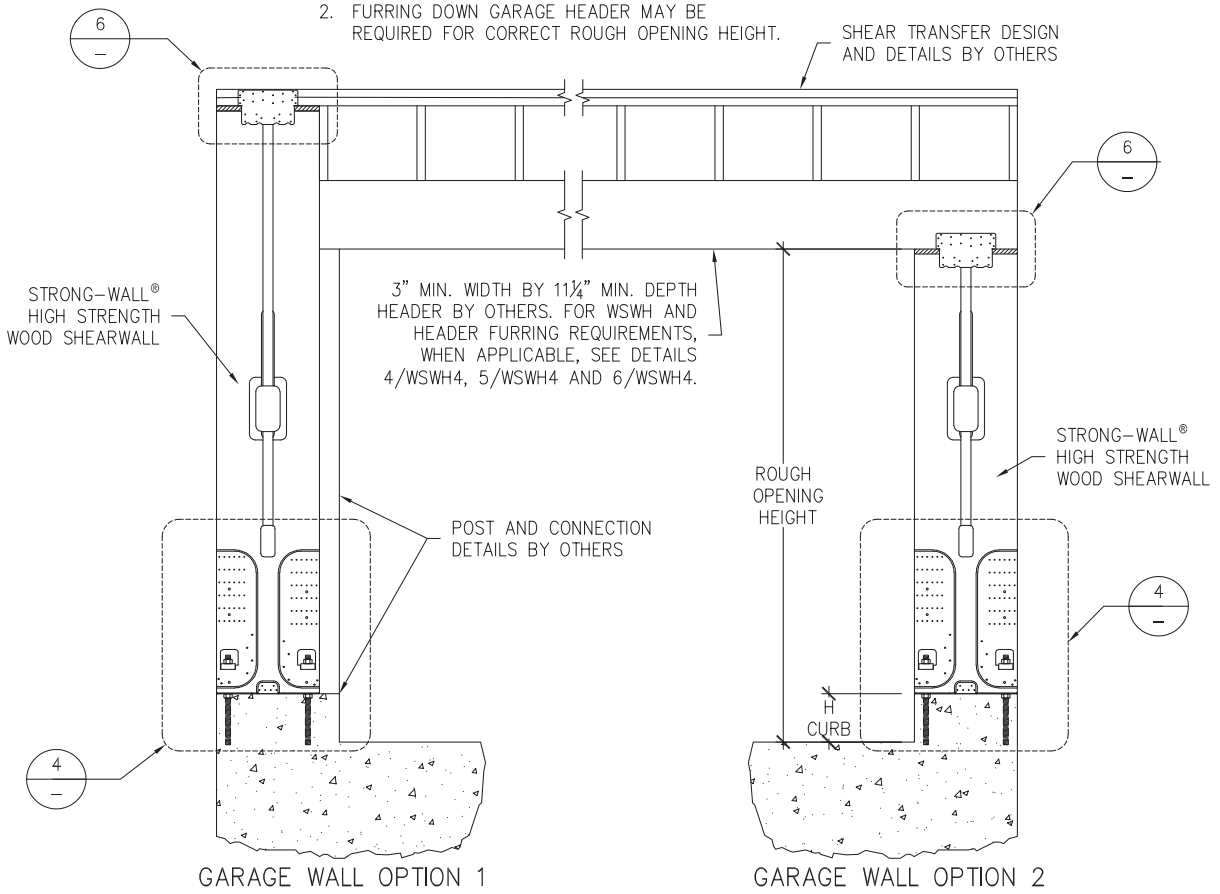


SINGLE-STORY STRONG-WALL® HIGH-STRENGTH WOOD SHEARWALL ON CONCRETE | 2/WSWH2

Structural Installation Details

GARAGE HEADER ROUGH OPENING HEIGHT			
MODEL NO.	TRIMMED PANEL HEIGHT	H CURB	ROUGH OPENING HEIGHT
WSWH12x7 WSWH18x7 WSWH24x7	78"	5½"	6'–11½"
		6"	7'–0"
WSWH12x8 WSWH18x8 WSWH24x8	85½"	0"	7'–1½"
	93¼"	5½"	8'–2¾"
		6"	8'–3¼"

NOTES :
1. IF REQUIRED ROUGH OPENING HEIGHT EXCEEDS TABLE VALUE, SPECIFY NEXT TALLER PANEL AND TRIM AS NECESSARY. THE STRONG–WALL® HIGH STRENGTH WOOD SHEARWALL MAY BE TRIMMED TO A MINIMUM HEIGHT OF 74½".
2. FURRING DOWN GARAGE HEADER MAY BE REQUIRED FOR CORRECT ROUGH OPENING HEIGHT.



GARAGE WALL OPTION 1

GARAGE WALL OPTION 2

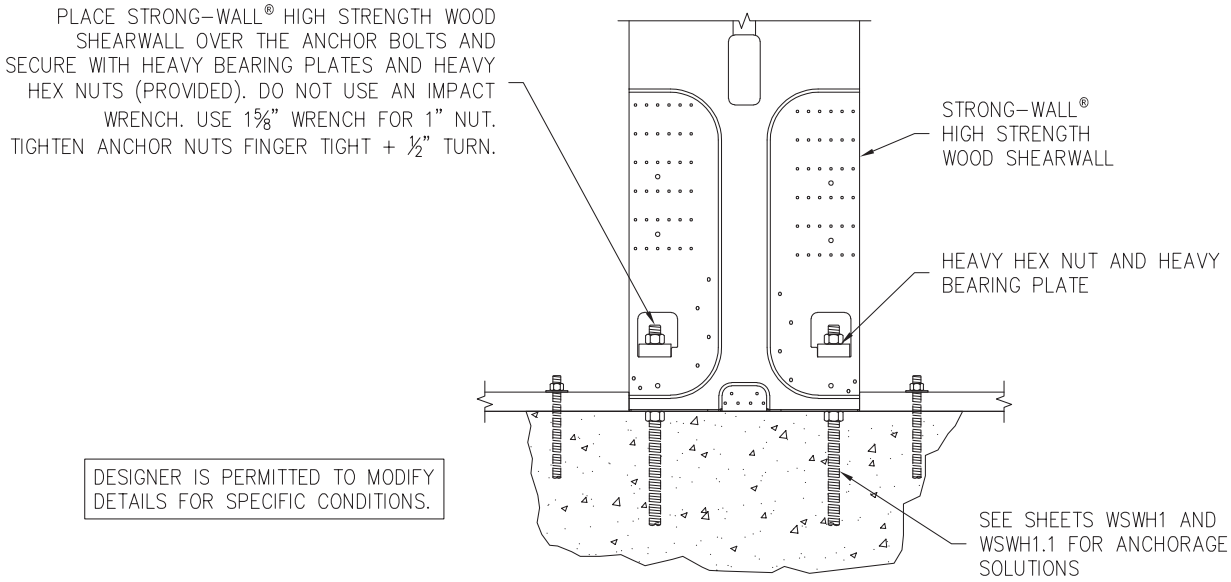
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

WHEN WSWH–PS STRAPS OMITTED, ALLOWABLE SHEAR VALUES FOR STANDARD PANEL APPLY.

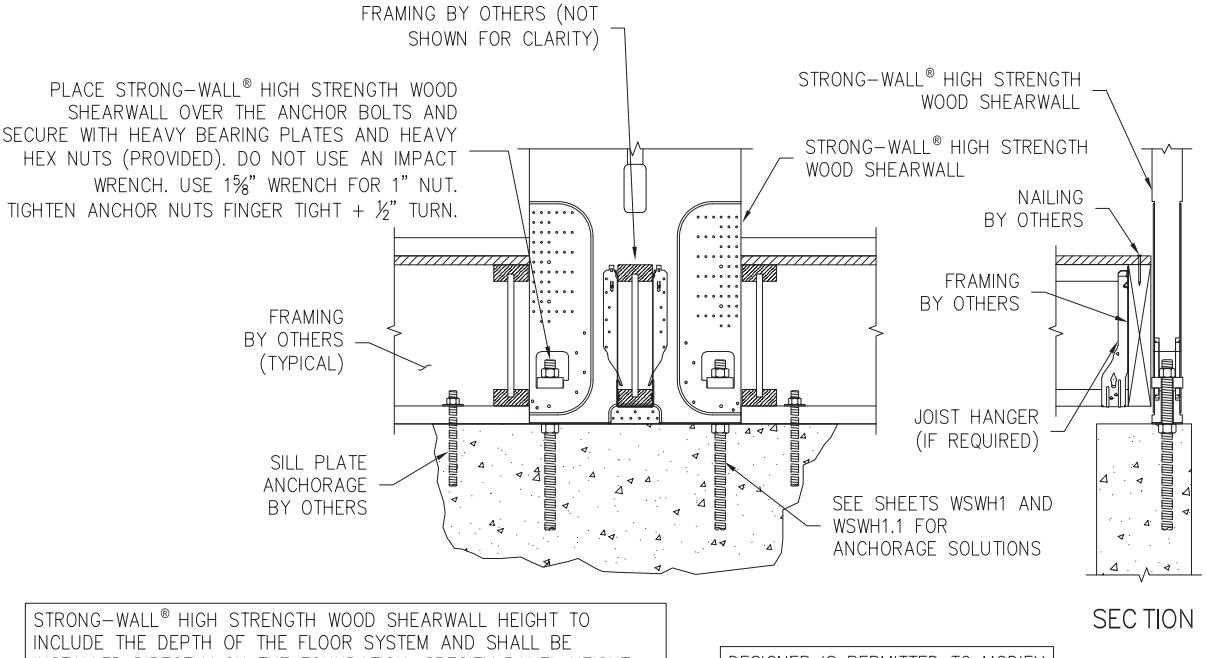
FOR GARAGE WALL OPTION 2, DESIGNER SHALL DESIGN AND DETAIL FOR:
1. SHEAR TRANSFER
2. OUT–OF–PLANE LOADING EFFECT
3. INCREASED OVERTURNING AND DRIFT DUE TO ADDITIONAL HEIGHT

ALTERNATE WSWH GARAGE FRONT OPTIONS | 3/WSWH2

Structural Installation Details



STANDARD INSTALLATION BASE CONNECTION | 4/WSWH2

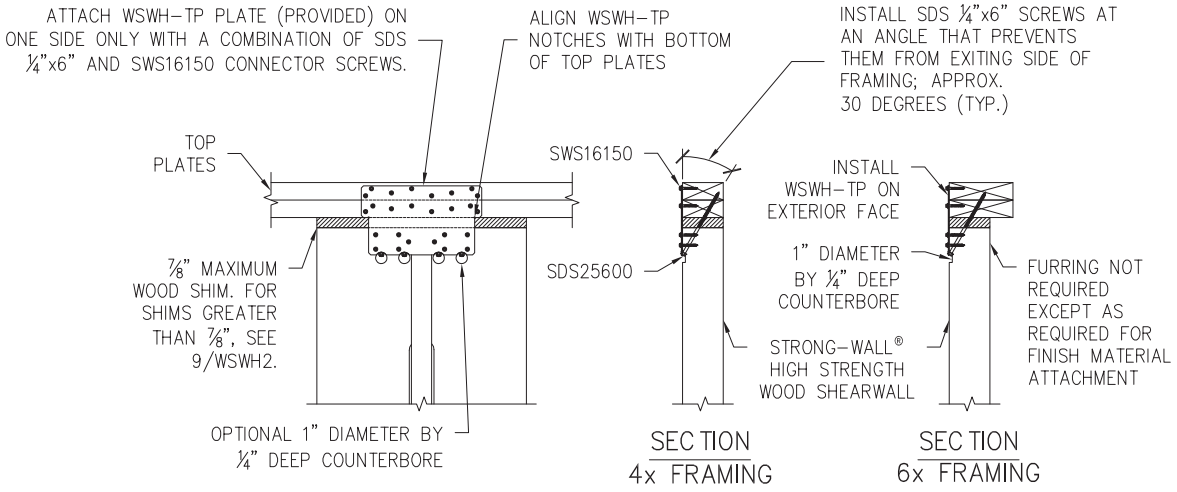


WOOD FLOOR SYSTEM BASE CONNECTION | 5/WSWH2

Structural Installation Details

WSWH–TP CONNECTION		
MODEL NO.	FASTENER QUANTITY	
	SWS16150	SDS25600
WSWH–TP12	14	2
WSWH–TP18	26	4
WSWH–TP24	46	8

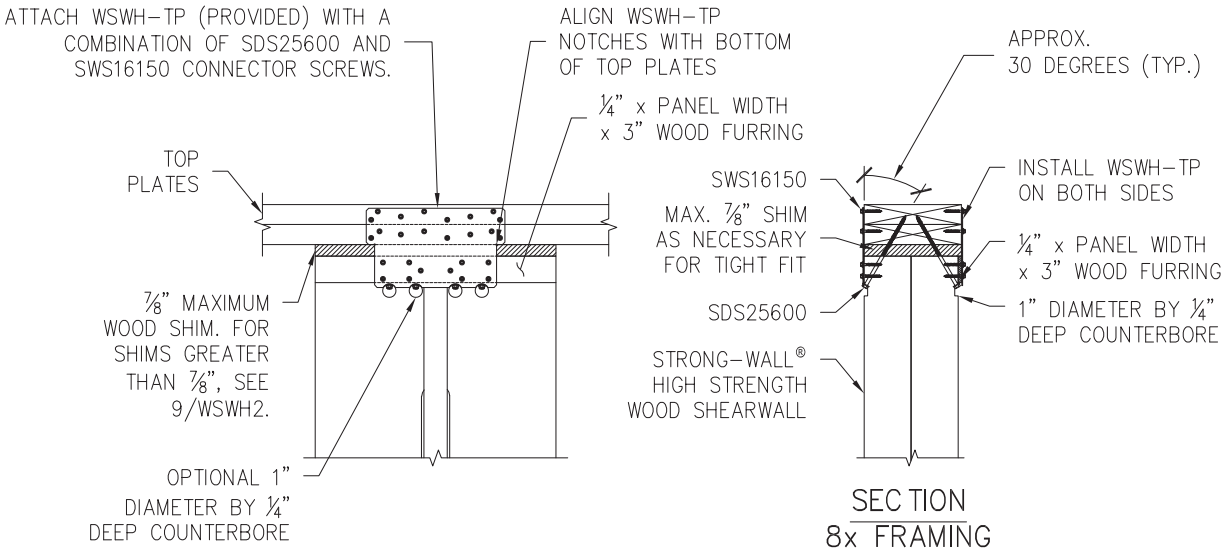
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.



TOP CONNECTION | 6/WSWH2

WSWH–TP CONNECTION		
MODEL NO.	FASTENER QUANTITY	
	SWS16150	SDS25600
WSWH–TP12	28	4
WSWH–TP18	52	8
WSWH–TP24	92	16

DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.



BACK-TO-BACK TOP CONNECTION | 7/WSWH2

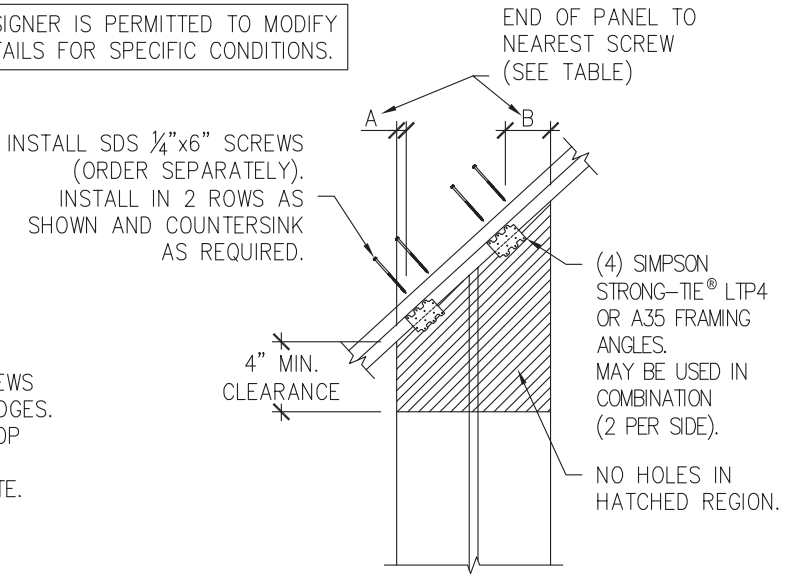
Structural Installation Details

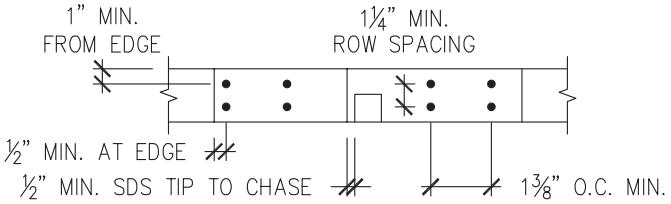
QTY. OF SDS¼"x6" SCREWS REQ'D.	
WSWH12	4
WSWH18	8
WSWH24	16

EDGE DISTANCE FOR SCREWS		
SLOPE	A (in.)	B (in.)
0:12–4:12	2	3
5:12–8:12	1½	4½
9:12–12:12	1½	5½

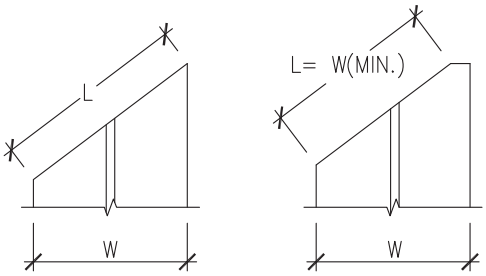
NOTES :
1. MAINTAIN END DISTANCES TO PREVENT SCREWS FROM PENETRATING THROUGH THE OUTER EDGES.
2. INSTALL SCREWS PERPENDICULAR TO THE TOP PLATE.
3. EDGE DISTANCES ASSUME DOUBLE TOP PLATE.

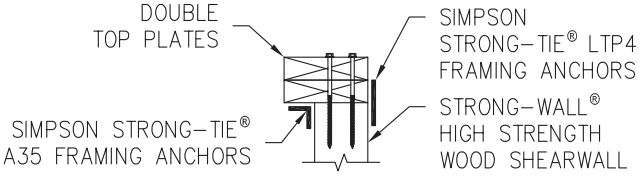
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.





PLAN VIEW
SDS SCREW SPACING

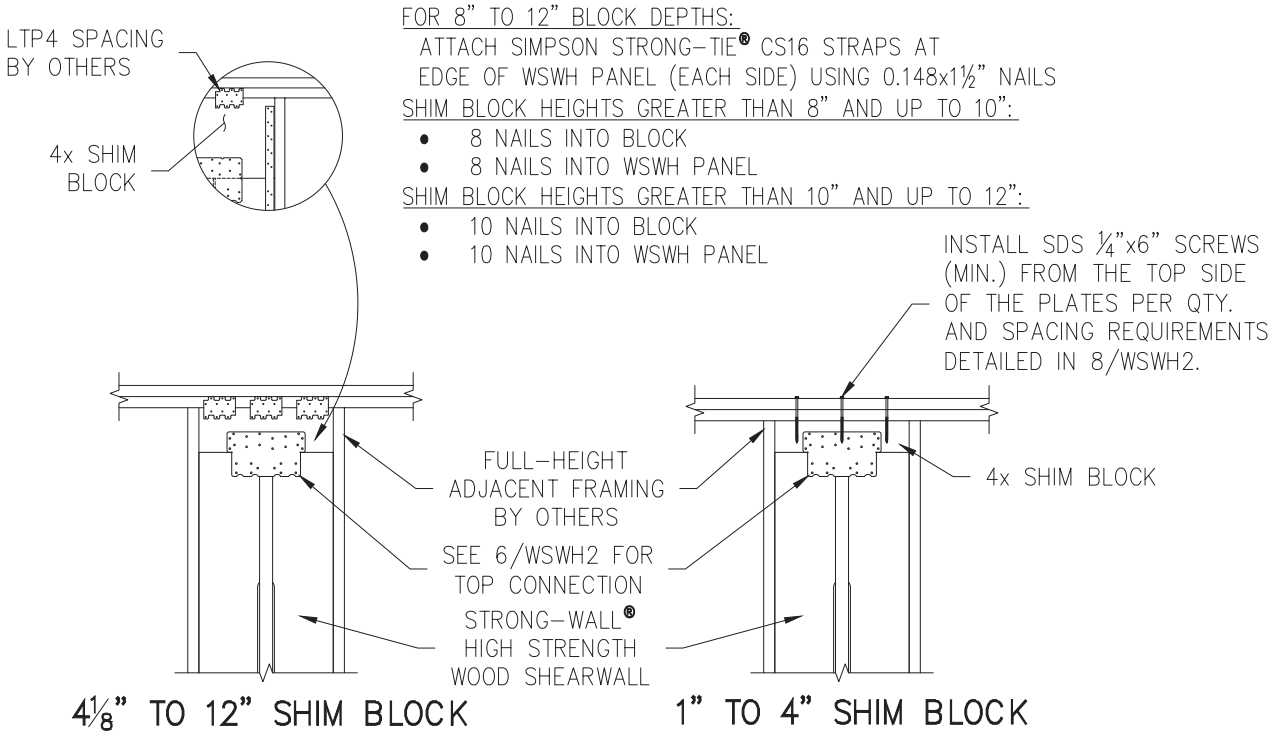




SECTION VIEW
2X6 OR WIDER FRAMING

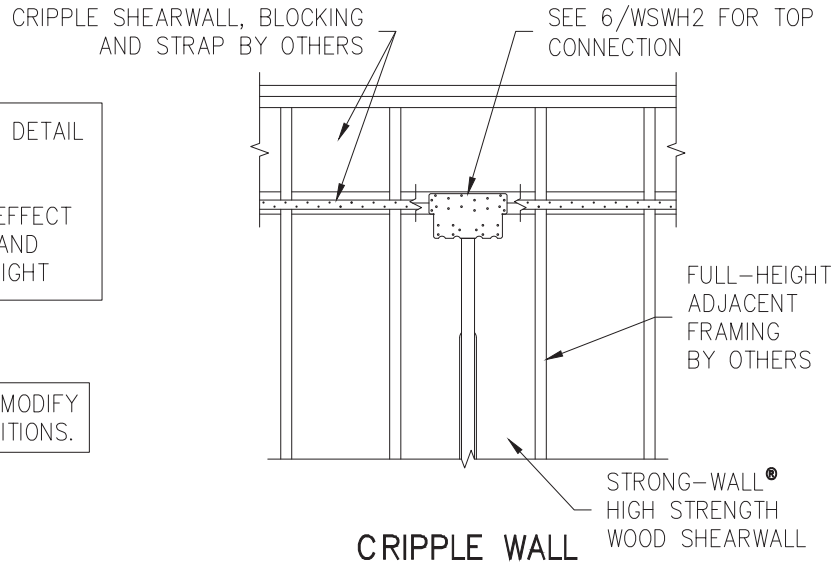
INSTALLATION NOTES :
1. ACTUAL CUT LENGTH (L) MUST BE GREATER THAN OR EQUAL TO PANEL WIDTH (W).
2. THIS DETAIL APPLICABLE FOR SLOPES UP TO 12:12.
3. PANELS TALLER THAN 12' MUST BE DESIGNED FOR THE APPLICATION.

Structural Installation Details

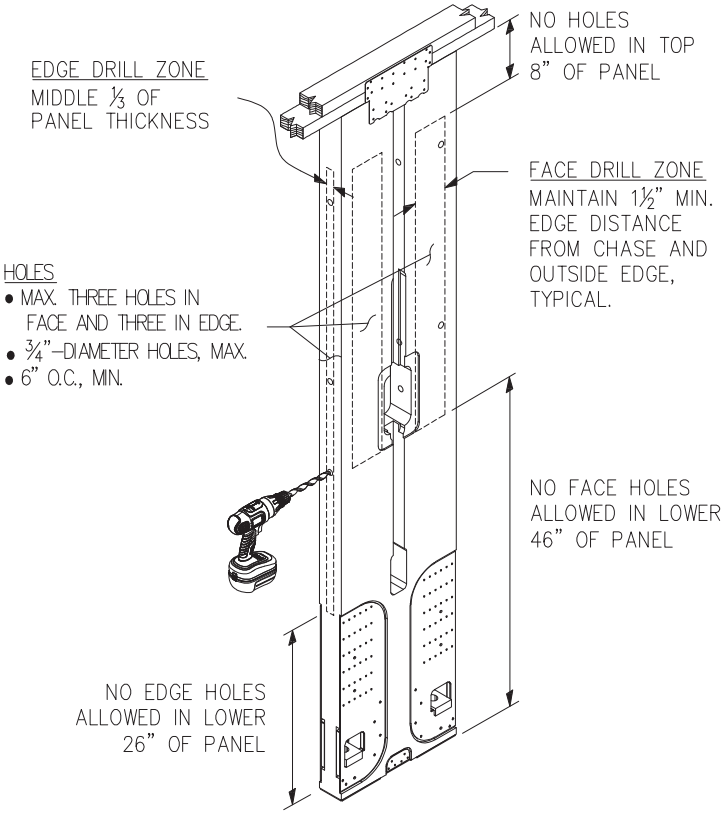


DESIGNER SHALL DESIGN AND DETAIL FOR:
1. SHEAR TRANSFER
2. OUT-OF-PLANE LOADING EFFECT
3. INCREASED OVERTURNING AND DRIFT DUE TO ADDITIONAL HEIGHT

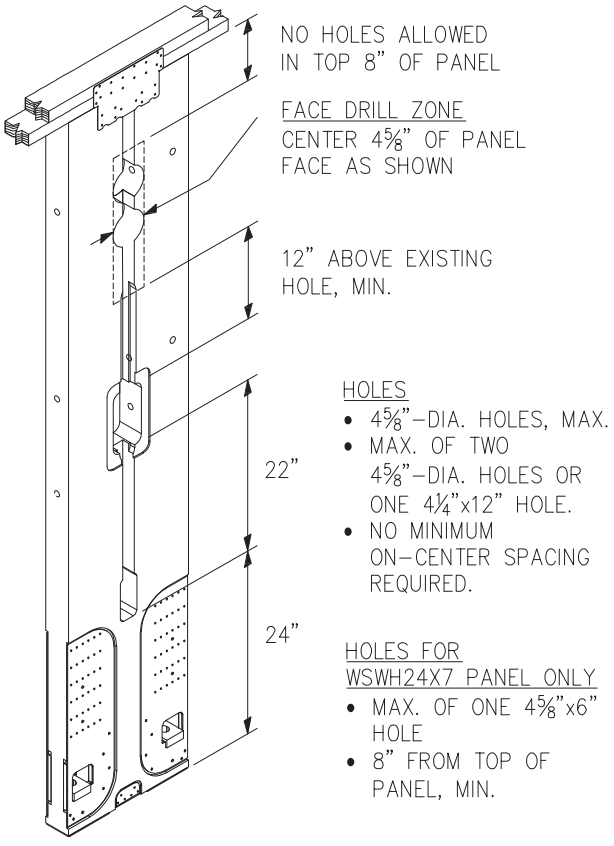
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.



Structural Installation Details



ALLOWABLE SMALL HOLES
FACE AND EDGE DRILL ZONES



ALLOWABLE LARGE HOLES
IN ADDITION TO ALLOWABLE
SMALL HOLES

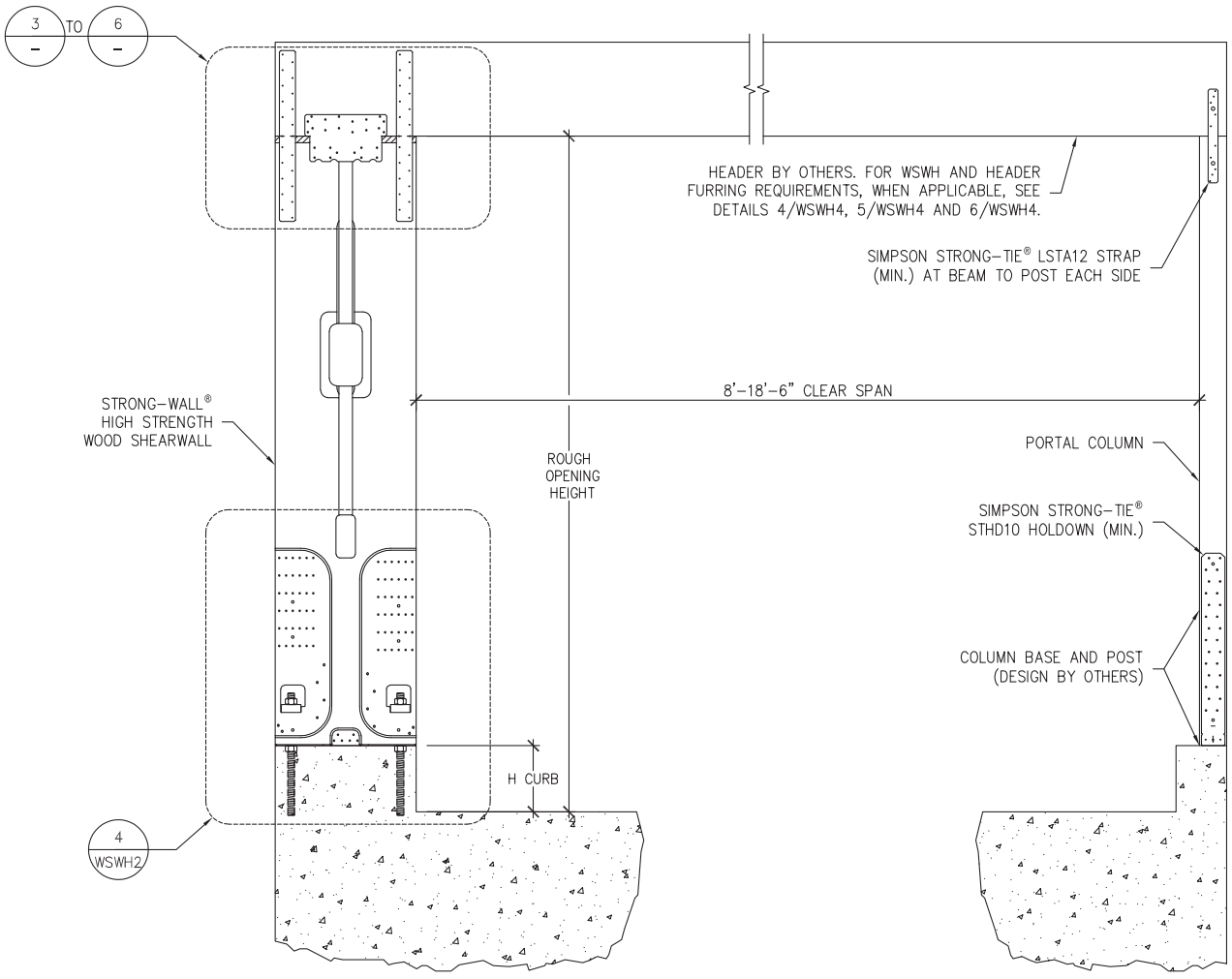
Structural Installation Details

GARAGE HEADER ROUGH OPENING HEIGHT			
MODEL NO.	TRIMMED PANEL HEIGHT	H CURB	ROUGH OPENING HEIGHT
WSWH12x7 WSWH18x7 WSWH24x7	78"	5½"	6'–11½"
		6"	7'–0"
WSWH12x8 WSWH18x8 WSWH24x8	85½"	0"	7'–1½"
	93¼"	5½"	8'–2¾"
		6"	8'–3¼"

NOTES :
1. IF REQUIRED ROUGH OPENING HEIGHT EXCEEDS TABLE VALUE, SPECIFY NEXT TALLER PANEL AND TRIM AS NECESSARY. THE STRONG–WALL® HIGH STRENGTH WOOD SHEARWALL MAY BE TRIMMED TO A MINIMUM HEIGHT OF 74½".
2. FURRING DOWN GARAGE HEADER MAY BE REQUIRED FOR CORRECT ROUGH OPENING HEIGHT.

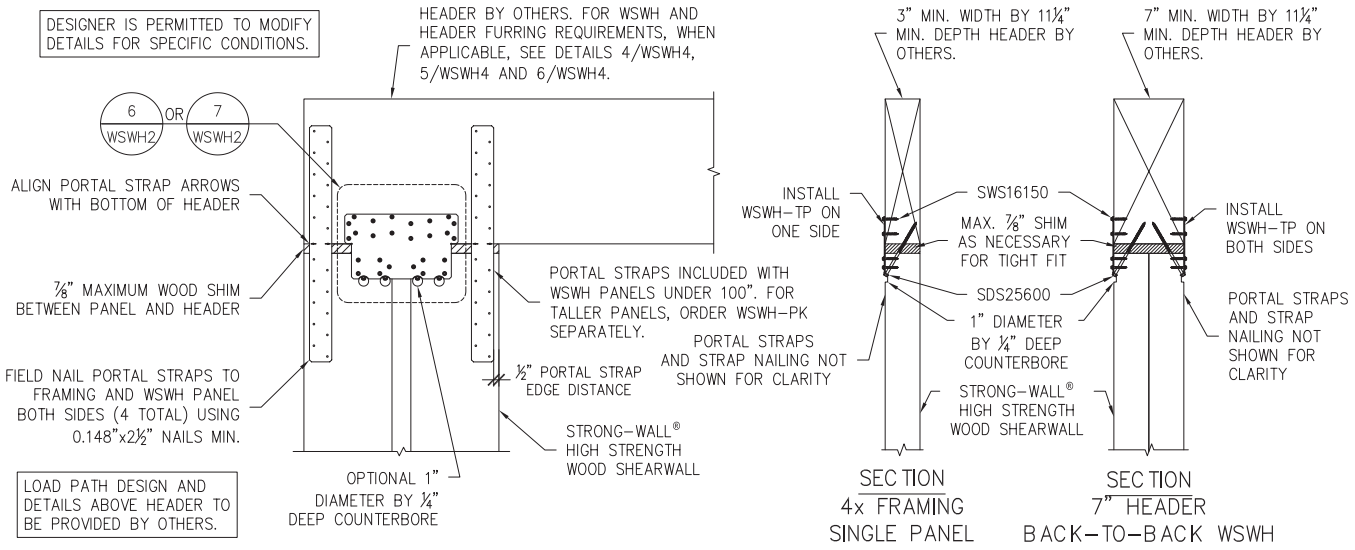
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

ENSURE CONCRETE IS LEVEL AND SMOOTH BENEATH PANEL. GRIND OR FILL AS NECESSARY.

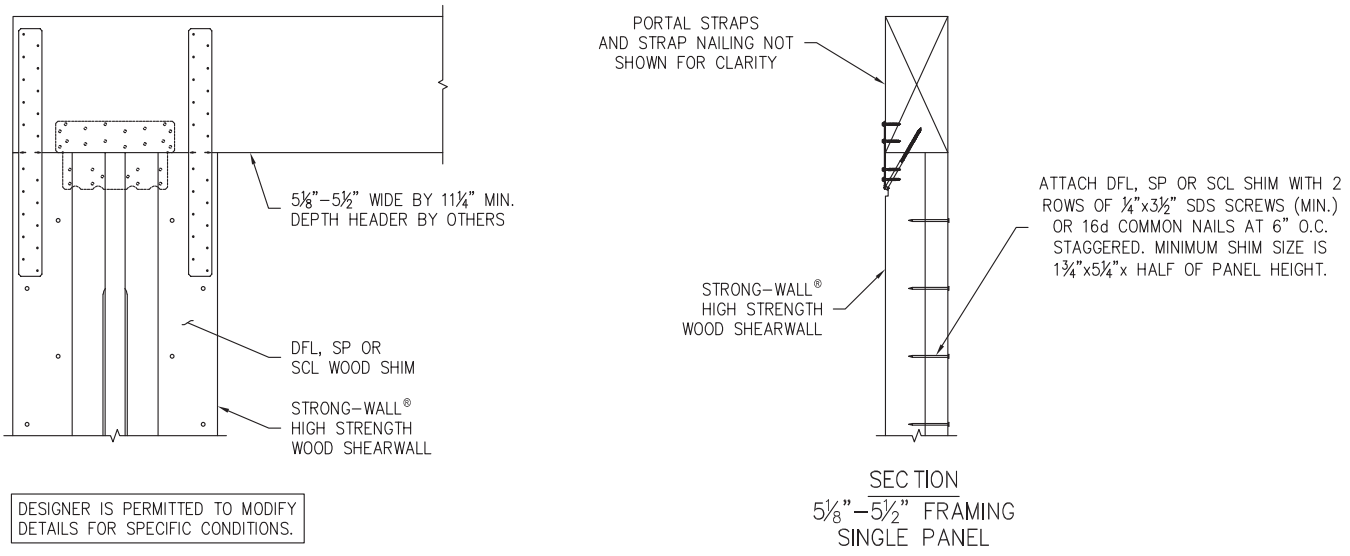


STRONG-WALL® HIGH-STRENGTH WOOD SHEARWALL SINGLE PORTAL ASSEMBLY | 1/WSWH4

Structural Installation Details

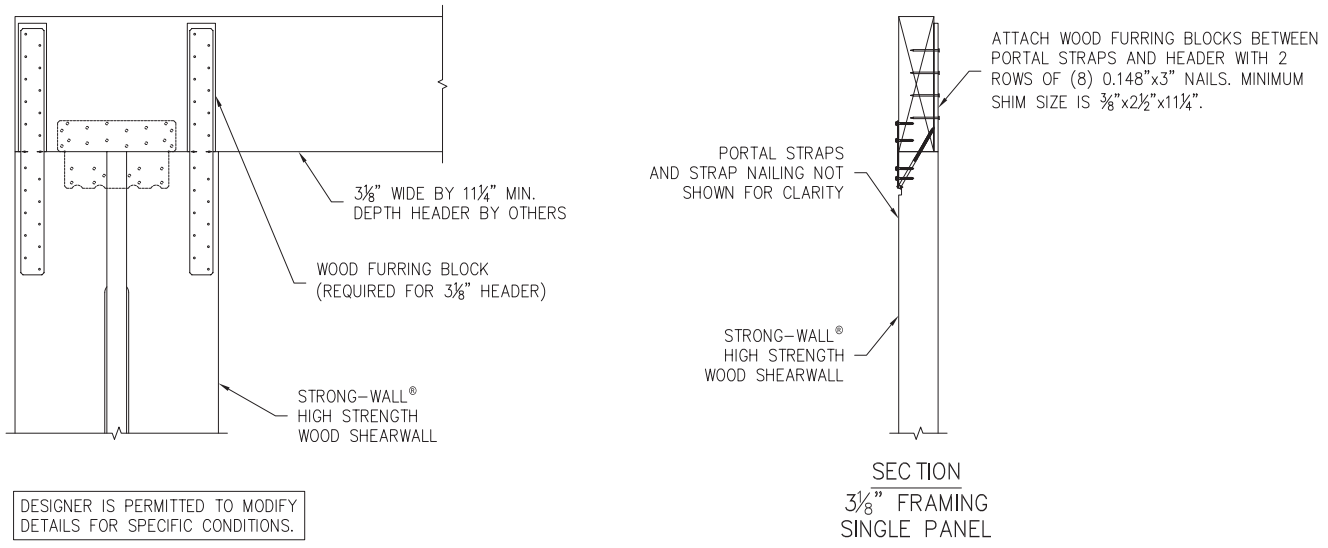


PORTAL TOP CONNECTION | 3/WSWH4

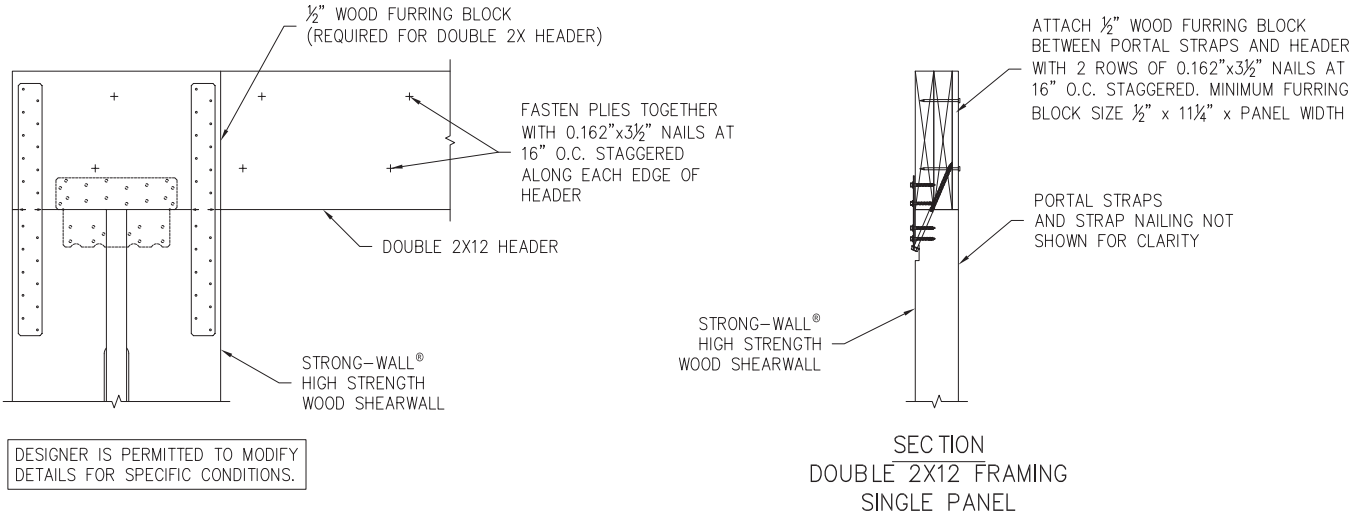


FURRING FOR 5⅛" TO 5½" HEADER | 4/WSWH4

Structural Installation Details



FURRING FOR 3⅛" HEADER	5/WSWH4



FURRING FOR DOUBLE 2X12 HEADERS	6/WSWH4

Shaped for strength.

With a patented shape for better performance and available in a wide variety of sizes, our prefabricated and code-listed Steel Strong-Wall® shearwall offers some of the highest allowable loads in the industry. Its cutting-edge design provides strength, stiffness and ductility, and allows easy access to anchor bolts for fast and efficient installation.

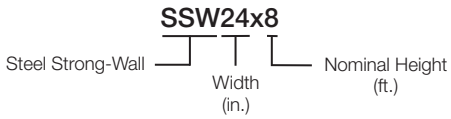
Standard Application on Concrete Foundations

Simpson Strong-Tie® Steel Strong-Wall® shearwalls provide superior performance, design flexibility and ease of installation. All Steel Strong-Wall shearwalls are evaluated to the 2018 IRC/IBC and are listed by ICC-ES.

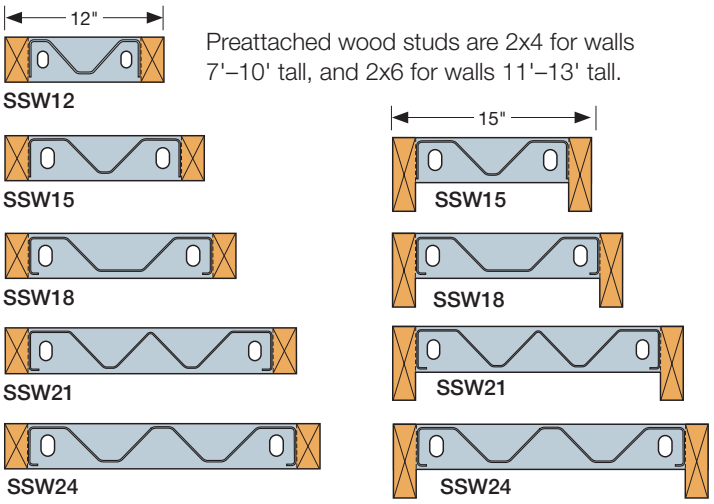
Material: Vertical Panel—10 gauge

Finish: Vertical Panel—Galvanized
Top and Base Plates—Simpson Strong-Tie gray paint
Codes: ICC-ES ESR-1679;
City of LA Building Code Supplement;
State of Florida FL5113

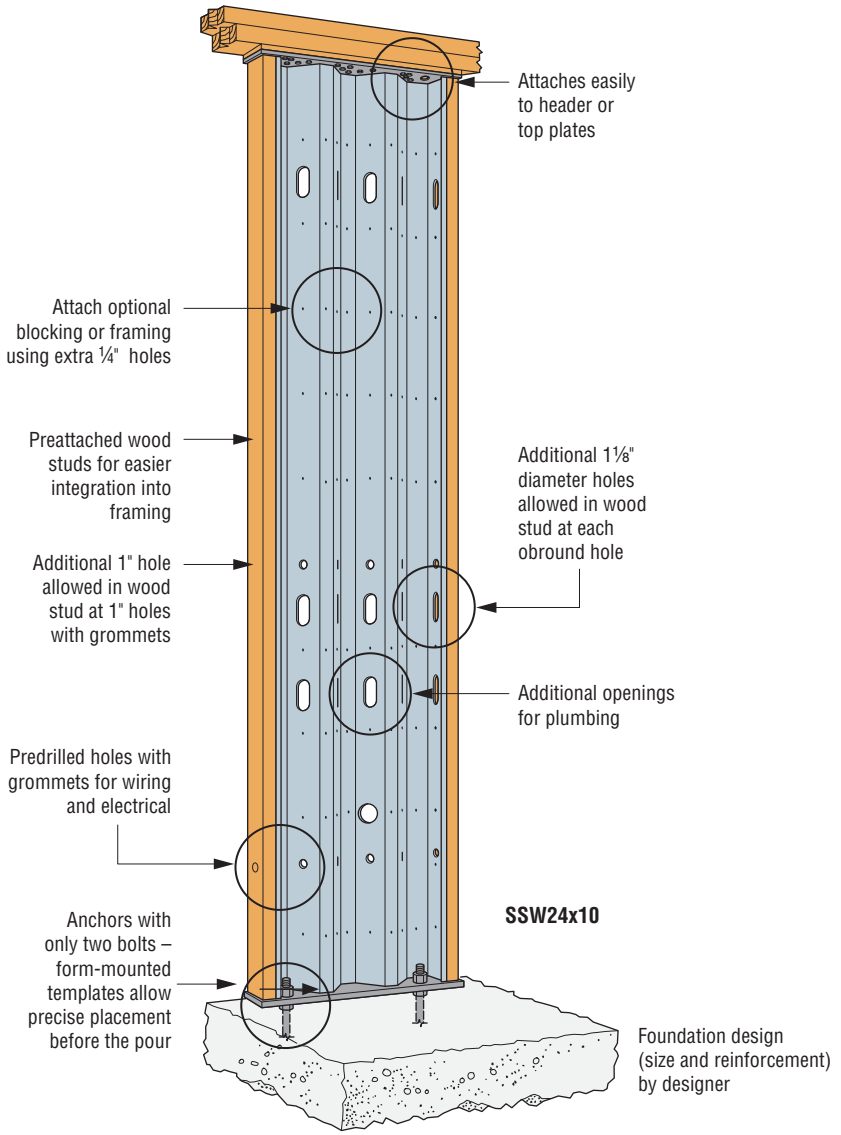
Naming Legend



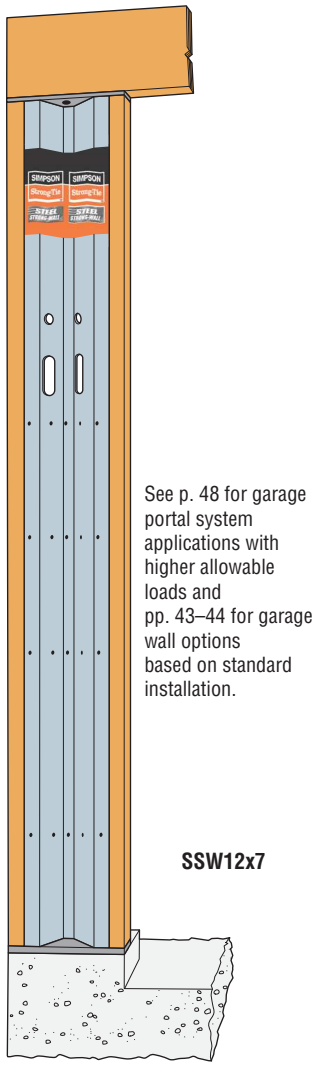
Wall Profiles



Preattached wood studs are 2x4 for walls 7'–10' tall, and 2x6 for walls 11'–13' tall.



Standard Installation
US Patent 8,281,551
Canadian Patent 2,489,845



Garage Installation
US Patent 8,281,551
Canadian Patent 2,489,845

See p. 48 for garage portal system applications with higher allowable loads and pp. 43–44 for garage wall options based on standard installation.

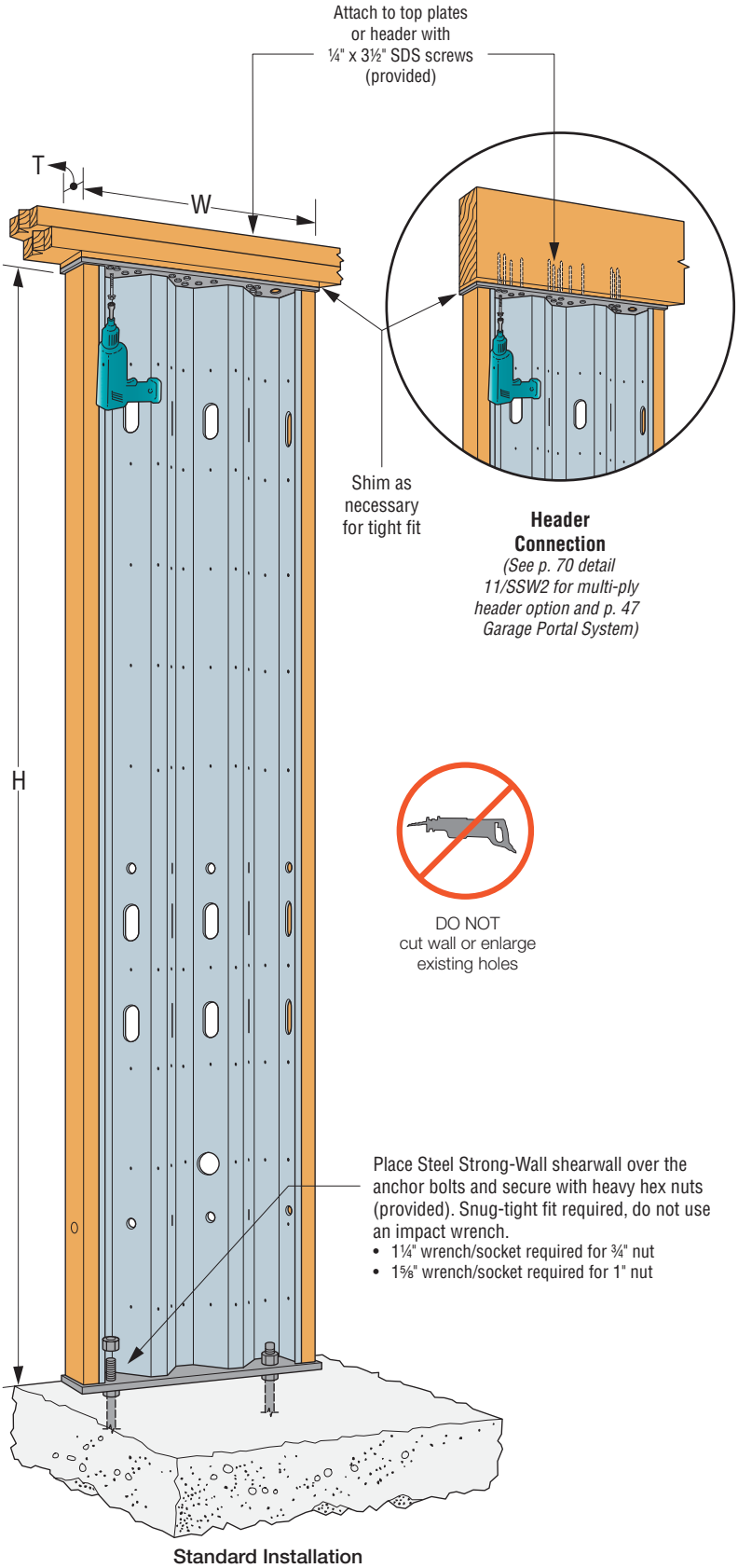
Standard Application on Concrete Foundations

Installation Information

- Do not cut the Steel Strong-Wall® or enlarge existing holes. Doing so will compromise the performance of the wall.
- Do not use an impact wrench to tighten nuts on the anchor bolts.
- Maximum shim thickness between the Steel Strong-Wall and top plates or header is ⅞" using Simpson Strong-Tie® Strong-Drive® ¼" x 3½" SDS Heavy-Duty Connector screws. For top of wall height adjustment, see detail 5/SSW2 on p. 69.
- Walls with 2x4 preattached studs may also be used in 2x6 or 2x8 wall framing. Install the wall flush to one face of the framing and add furring to the opposite side.
- Walls may be installed with solid or multi-ply headers, see detail 11/SSW2 on p. 70 for details.

Steel Strong-Wall® Product Data

Model No.	W (in.)	H (in.)	T (in.)	Anchor Bolts		Number of Screws in Top of Wall	Total Wall Weight (lb.)
				Qty.	Dia. (in.)		
SSW12x7	12	80	3½	2	¾	4	74
SSW15x7	15	80	3½	2	1	6	86
SSW18x7	18	80	3½	2	1	9	99
SSW21x7	21	80	3½	2	1	12	117
SSW24x7	24	80	3½	2	1	14	127
SSW12x7.4	12	85½	3½	2	¾	4	78
SSW15x7.4	15	85½	3½	2	1	6	91
SSW18x7.4	18	85½	3½	2	1	9	104
SSW21x7.4	21	85½	3½	2	1	12	122
SSW24x7.4	24	85½	3½	2	1	14	134
SSW12x8	12	93¼	3½	2	¾	4	85
SSW15x8	15	93¼	3½	2	1	6	99
SSW18x8	18	93¼	3½	2	1	9	113
SSW21x8	21	93¼	3½	2	1	12	132
SSW24x8	24	93¼	3½	2	1	14	144
SSW12x9	12	105¼	3½	2	¾	4	94
SSW15x9	15	105¼	3½	2	1	6	110
SSW18x9	18	105¼	3½	2	1	9	125
SSW21x9	21	105¼	3½	2	1	12	147
SSW24x9	24	105¼	3½	2	1	14	160
SSW12x10	12	117¼	3½	2	¾	4	104
SSW15x10	15	117¼	3½	2	1	6	121
SSW18x10	18	117¼	3½	2	1	9	138
SSW21x10	21	117¼	3½	2	1	12	162
SSW24x10	24	117¼	3½	2	1	14	177
SSW15x11	15	129¼	5½	2	1	6	148
SSW18x11	18	129¼	5½	2	1	9	167
SSW21x11	21	129¼	5½	2	1	12	193
SSW24x11	24	129¼	5½	2	1	14	209
SSW15x12	15	141¼	5½	2	1	6	160
SSW18x12	18	141¼	5½	2	1	9	180
SSW21x12	21	141¼	5½	2	1	12	208
SSW24x12	24	141¼	5½	2	1	14	225
SSW18x13	18	153¼	5½	2	1	9	194
SSW21x13	21	153¼	5½	2	1	12	224
SSW24x13	24	153¼	5½	2	1	14	243



Header Connection
(See p. 70 detail 11/SSW2 for multi-ply header option and p. 47 Garage Portal System)

Standard Installation

US Patent 8,281,551
Canadian Patent 2,489,845

Standard Application on Concrete Foundations

Model No.	Allowable Axial Load (lb.)	Seismic[2]			Wind		
		Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[5] (lb.)	Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[5] (lb.)
SSW12x7	1,000	955	0.36	9,840	1,215	0.46	13,620
	4,000	955	0.36	9,840	1,095	0.42	11,765
	7,500	890	0.34	9,010	890	0.34	9,010
SSW15x7	1,000	1,855	0.36	15,655	1,860	0.36	15,715
	4,000	1,665	0.33	13,550	1,665	0.33	13,550
	7,500	1,445	0.28	11,340	1,445	0.28	11,340
SSW18x7	1,000	2,905	0.34	19,660	3,480	0.41	25,805
	4,000	2,905	0.34	19,660	3,250	0.38	23,135
	7,500	2,905	0.34	19,660	2,980	0.35	20,370
SSW21x7	1,000	4,200	0.32	23,755	4,440	0.34	25,710
	4,000	4,200	0.32	23,755	4,440	0.34	25,710
	7,500	4,200	0.32	23,755	4,310	0.33	24,635
SSW24x7	1,000	5,495	0.29	26,270	5,730	0.31	27,835
	4,000	5,495	0.29	26,270	5,730	0.31	27,835
	7,500	5,495	0.29	26,270	5,730	0.31	27,835
SSW12x7.4	1,000	870	0.39	9,515	1,105	0.49	13,070
	4,000	870	0.39	9,515	970	0.43	10,940
	7,500	750	0.33	7,940	750	0.33	7,940
SSW15x7.4	1,000	1,685	0.39	15,035	1,700	0.39	15,215
	4,000	1,500	0.34	12,905	1,500	0.34	12,905
	7,500	1,270	0.29	10,510	1,270	0.29	10,510
SSW18x7.4	1,000	2,700	0.37	19,475	3,255	0.44	25,790
	4,000	2,700	0.37	19,475	3,040	0.42	23,125
	7,500	2,700	0.37	19,475	2,790	0.38	20,390
SSW21x7.4	1,000	3,890	0.35	23,420	4,230	0.38	26,405
	4,000	3,890	0.35	23,420	4,230	0.38	26,405
	7,500	3,890	0.35	23,420	4,035	0.36	24,655
SSW24x7.4	1,000	5,330	0.34	27,610	5,450	0.34	28,485
	4,000	5,330	0.34	27,610	5,450	0.34	28,485
	7,500	5,330	0.34	27,610	5,450	0.34	28,485
SSW12x8	1,000	775	0.42	9,180	985	0.53	12,560
	4,000	775	0.42	9,180	865	0.47	10,550
	7,500	665	0.36	7,630	665	0.36	7,630
SSW15x8	1,000	1,505	0.42	14,515	1,530	0.43	14,835
	4,000	1,345	0.37	12,545	1,345	0.37	12,545
	7,500	1,135	0.32	10,190	1,135	0.32	10,190
SSW18x8	1,000	2,480	0.41	19,525	2,985	0.50	25,795
	4,000	2,480	0.41	19,525	2,790	0.47	23,160
	7,500	2,480	0.41	19,525	2,560	0.43	20,410
SSW21x8	1,000	3,560	0.39	23,360	3,960	0.43	27,240
	4,000	3,560	0.39	23,360	3,960	0.43	27,240
	7,500	3,560	0.39	23,360	3,700	0.41	24,660
SSW24x8	1,000	4,865	0.37	27,435	5,105	0.39	29,370
	4,000	4,865	0.37	27,435	5,105	0.39	29,370
	7,500	4,865	0.37	27,435	5,055	0.39	28,960
SSW12x9	1,000	660	0.47	8,745	840	0.60	11,915
	4,000	660	0.47	8,745	705	0.50	9,485
	7,500	505	0.36	6,380	505	0.36	6,380
SSW15x9	1,000	1,315	0.45	14,250	1,315	0.47	14,250
	4,000	1,130	0.38	11,740	1,130	0.40	11,740
	7,500	925	0.31	9,235	925	0.33	9,235
SSW18x9	1,000	2,145	0.47	18,890	2,645	0.58	25,800
	4,000	2,145	0.47	18,890	2,470	0.54	23,130
	7,500	2,145	0.47	18,890	2,265	0.50	20,370
SSW21x9	1,000	3,145	0.46	23,265	3,590	0.52	28,215
	4,000	3,145	0.46	23,265	3,530	0.51	27,490
	7,500	3,145	0.46	23,265	3,280	0.47	24,680
SSW24x9	1,000	4,285	0.44	27,210	4,605	0.47	30,150
	4,000	4,285	0.44	27,210	4,605	0.47	30,150
	7,500	4,285	0.44	27,210	4,480	0.46	28,970

See footnotes on p. 44.

Standard Application on Concrete Foundations

Model No.	Allowable Axial Load (lb.)	Seismic[2]			Wind		
		Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[3] (lb.)	Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[5] (lb.)
SSW12x10	1,000	570	0.52	8,345	725	0.67	11,300
	4,000	570	0.52	8,345	570	0.52	8,345
	7,500	360	0.33	4,930	360	0.33	4,930
SSW15x10	1,000	1,110	0.53	13,150	1,145	0.54	13,690
	4,000	960	0.45	10,975	960	0.45	10,975
	7,500	715	0.34	7,775	715	0.34	7,775
SSW18x10	1,000	1,860	0.53	18,030	2,360	0.67	25,545
	4,000	1,860	0.53	18,030	2,215	0.63	23,095
	7,500	1,860	0.53	18,030	2,035	0.57	20,395
SSW21x10	1,000	3,045	0.50	25,905	3,265	0.56	28,795
	4,000	3,045	0.50	25,905	3,170	0.54	27,510
	7,500	2,780	0.45	22,780	2,780	0.47	22,780
SSW24x10	1,000	3,835	0.50	27,100	4,205	0.55	30,920
	4,000	3,835	0.50	27,100	4,205	0.55	30,920
	7,500	3,790	0.49	26,660	3,790	0.49	26,660
SSW15x11	1,000	975	0.58	12,625	1,015	0.60	13,285
	4,000	815	0.48	10,135	815	0.48	10,135
	7,500	550	0.33	6,470	550	0.33	6,470
SSW18x11	1,000	1,635	0.58	17,295	2,075	0.73	24,280
	4,000	1,635	0.58	17,295	2,010	0.71	23,110
	7,500	1,635	0.58	17,295	1,730	0.61	18,645
SSW21x11	1,000	2,485	0.58	22,325	2,990	0.70	29,230
	4,000	2,485	0.58	22,325	2,785	0.65	26,220
	7,500	2,305	0.54	20,205	2,305	0.54	20,205
SSW24x11	1,000	3,475	0.57	27,055	3,845	0.63	31,285
	4,000	3,475	0.57	27,055	3,710	0.60	29,680
	7,500	3,205	0.52	24,260	3,205	0.52	24,260
SSW15x12	1,000	815	0.63	11,280	905	0.70	12,855
	4,000	690	0.53	9,245	690	0.53	9,245
	7,500	390	0.30	4,905	390	0.30	4,905
SSW18x12	1,000	1,450	0.63	16,605	1,845	0.80	23,220
	4,000	1,450	0.63	16,605	1,815	0.79	22,650
	7,500	1,435	0.62	16,380	1,435	0.62	16,380
SSW21x12	1,000	2,210	0.63	21,485	2,755	0.79	29,555
	4,000	2,210	0.63	21,485	2,420	0.69	24,335
	7,500	1,900	0.54	17,690	1,900	0.54	17,690
SSW24x12	1,000	3,150	0.63	26,710	3,540	0.71	31,575
	4,000	3,150	0.63	26,710	3,250	0.65	27,890
	7,500	2,705	0.54	21,855	2,705	0.54	21,855
SSW18x13	1,000	1,335	0.68	16,580	1,695	0.87	23,105
	4,000	1,335	0.68	16,580	1,580	0.81	20,830
	7,500	1,180	0.60	14,195	1,180	0.60	14,195
SSW21x13	1,000	1,985	0.68	20,765	2,520	0.87	29,200
	4,000	1,985	0.68	20,765	2,110	0.73	22,530
	7,500	1,555	0.53	15,300	1,555	0.53	15,300
SSW24x13	1,000	2,830	0.68	25,795	3,275	0.79	31,755
	4,000	2,830	0.68	25,795	2,860	0.69	26,165
	7,500	2,280	0.55	19,545	2,280	0.55	19,545

1. Allowable shear loads and anchor tension forces are applicable to installation on concrete with minimum f'_c = 2,500 psi using the ASD basic (Section 1605.3.1) or the alternative basic (Section 1605.3.2) load combinations. Load values include evaluation of bearing stresses on the foundation and do not require further evaluation by the designer.
2. For seismic designs based on the 2018 IBC using R = 6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet steel panels.
3. Allowable shear, drift, and anchor tension values may be interpolated for intermediate height or axial loads.
4. High-strength anchor bolts are required for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 60–61. High-strength anchor bolts are required for SSW12 when the seismic overturning moment (seismic shear x shearwall height) exceeds 61,600 in.-lb. See pp. 60–67 for SSWAB anchor bolt information and anchorage solutions.
5. Tabulated anchor tension loads assume no resisting axial load. For anchor tension loads at design shear values and including the effect of axial load, refer to the Strong-Wall Selector web application or use the equations on p. 46. Drifts at lower design shear may be linearly reduced.
6. See p. 45 for allowable out-of-plane loads and axial capacities.

Standard Application on Concrete Foundations

Allowable Out-of-Plane Loads (psf) for Single-Story Walls on Concrete Foundations

Model Width (in.)	Axial Load (lb.)	Nominal Height of Shearwall (ft.)					
		8	9	10	11	12	13
12	1,000	200	140	105	N/A	N/A	N/A
	4,000	150	105	70	N/A	N/A	N/A
	7,500	90	55	25	N/A	N/A	N/A
15	1,000	165	130	100	80	70	N/A
	4,000	130	95	70	50	40	N/A
	7,500	95	65	45	30	15	N/A
18	7,500	310	215	160	120	90	70
21	7,500	260	185	135	100	70	50
24	7,500	275	195	135	105	80	65

1. Loads shown are at ASD level in pounds per square foot (psf) of wall with no further increase in load allowed.
2. Axial load denotes maximum gravity load permitted on entire panel acting in combination with the out-of-plane load.
3. Load considers a deflection limit of h/240.
4. Values are applicable to either the ASD basic or alternative basic load combinations.
5. Allowable out-of-plane loads for the 12- and 15-inch walls may be linearly interpolated between the axial loads shown.
6. Table loads apply only to single-story walls on concrete foundations.
7. N/A =Not Applicable.

Axial Capacities for Single-Story Walls on Concrete Foundations

Model Width (in.)	Compression Capacity with No Lateral Loads (lb.)							
	Nominal Height of Shearwall (ft.)							
	7	7.4	8	9	10	11	12	13
12	20,200	19,000	17,200	14,500	11,800	N/A	N/A	N/A
15	25,300	24,200	22,600	20,000	17,400	14,900	12,600	N/A
18	42,500	40,400	37,500	32,900	28,400	24,100	20,200	17,200
21	43,700	41,100	37,500	32,000	26,700	22,000	18,400	15,700
24	51,600	48,800	44,800	38,700	32,900	27,400	22,900	19,500

1. Compression capacity is lesser of wall buckling capacity or 2,500 psi concrete bearing limit.
2. Compression capacity of wall assumes no lateral loads present. See allowable in-plane or out-of-plane load tables for combined lateral and axial loading conditions.
3. Values are applicable to either the ASD basic or alternative basic load combinations.
4. Table loads apply only to single-story walls on concrete foundations.
5. N/A =Not Applicable.

Allowable Tension Loads for Walls with Wood Jamb Stud

Model Width (in.)	Tension Capacity per Jamb Stud (lb.)							
	Nominal Height of Shearwall (ft.)							
	7	7.4	8	9	10	11	12	13
12	1,535	1,535	1,845	2,150	2,500	N/A	N/A	N/A
15	1,845	2,150	2,460	2,500	2,500	3,070	3,685	N/A
18	1,845	1,845	2,150	2,500	2,500	3,380	3,685	3,980
21	1,845	1,845	2,150	2,500	2,500	3,070	3,685	3,980
24	1,845	1,845	2,150	2,500	2,500	3,070	3,685	3,980

1. Allowable tension load is based on capacity of the lesser of the connection between the stud and the steel shearwall or stud tension capacity. The capacity of the SSW wall anchor bolt and anchorage to the foundation must be adequate to transfer the additional tension.
2. Loads include a 1.60 load duration increase for wood subjected to wind or earthquake. Reductions for other load durations must be taken according to the applicable code.
3. N/A =Not Applicable.

Anchor Tension Equations

SIMPSON Strong-Tie

Calculating Anchor Tension Forces at Base of Wall

These equations may be used to calculate anchor tension forces at the base of the first-story wall to aid designers in developing anchorage solutions other than those shown on pp. 60–67.

12 in. wall $T = \left[11.2f_c' - \sqrt{126f_c'^2 - 2.38f_c'(3.44P + Vhk)}\right] - P$

15 in. wall $T = \left[14.4f_c' - \sqrt{208f_c'^2 - 2.38f_c'(4.63P + Vhk)}\right] - P$

18 in. wall $T = \left[18.0f_c' - \sqrt{324f_c'^2 - 2.38f_c'(6.13P + Vhk)}\right] - P$

21 in. wall $T = \left[21.6f_c' - \sqrt{465f_c'^2 - 2.38f_c'(7.63P + Vhk)}\right] - P$

24 in. wall $T = \left[25.1f_c' - \sqrt{632f_c'^2 - 2.38f_c'(9.13P + Vhk)}\right] - P$

Where:

T = Resulting anchorage tension force (kips)

V = Design shear (kips)

P = Total vertical load (kips)

h = Wall height (inches)

f'_C = Concrete compressive Strength (ksi)

k = 1.0 for all applications except Garage Portal Systems

For Garage Portal Systems using the SSWP-KT Portal Kit:

k = 0.80 for SSW12

k = 0.85 for SSW15

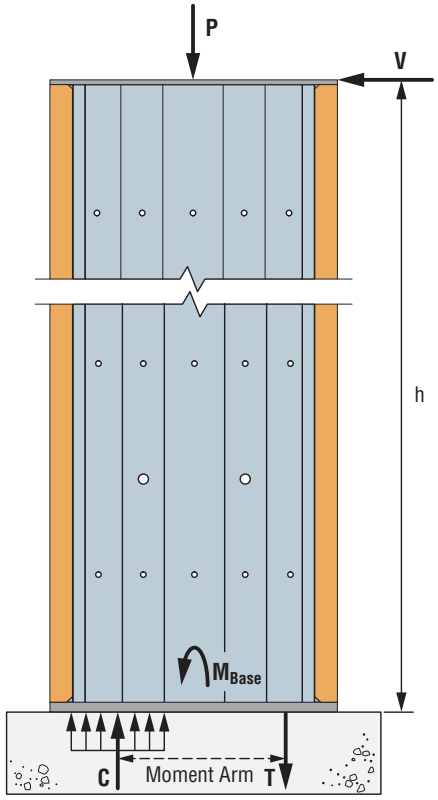
k = 0.90 for SSW18

For two-story stacked applications,

substitute M_{base} for Vh:

$Vh = M_{base}\left(\frac{12}{1000}\right)$ kip - in.

Where M_{base} = Design moment at base of wall (ft.-lb.)



Forces at Base of Wall

Notes:

1. Equations may be used to calculate anchor tension forces at the base of first-story walls on concrete foundations.
2. Equations are based on the design methodology contained in AISC Steel Design Guide 1 – Base Plate and Anchor-Rod Design, second edition using a rectangular compression stress block.
3. Equations are based on concrete bearing on a 3½"-wide base plate at the edge of the concrete.

Example 1 — Single-Story SSW

Given:

- SSW18x9 wall on 2.5 ksi concrete
- Seismic Loading
- Design Shear (V) = 2.0 kips < 2.15 kips ($V_{allowable}$)
- P (Vertical Load) = 1.0 kip
- h = Wall height = 105.25"
- k = 1.0

$$T = \left[18.0f_c' - \sqrt{324f_c'^2 - 2.38f_c'(6.13P + Vhk)}\right] - P$$

$$T = \left[18.0(2.5) - \sqrt{324(2.5)^2 - 2.38(2.5)(6.13\times1.0 + 2.0\times105.25\times1.0)}\right] - 1.0 = 16.9 \text{ kips}$$

Example 2 — Two-Story Stacked SSW Condition

Given:

- See Two-Story Design Example on p. 59
- SSW18x9-STK wall on 2.5 ksi concrete
- Wind Loading
- M_{base} = 17,550 ft-lb. (Moment at base of two-story stacked wall)
- Vh = 17,550 x $\left(\frac{12}{1000}\right)$ kip-in = 210.6 kip-in.
- P (Vertical Load) = 2.0 kips
- k = 1.0

$$T = \left[18.0f_c' - \sqrt{324f_c'^2 - 2.38f_c'(6.13P + Vhk)}\right] - P$$

$$T = \left[18.0(2.5) - \sqrt{324(2.5)^2 - 2.38(2.5)(6.13\times2.0 + 210.6\times1.0)}\right] - 2.0 = 16.6 \text{ kips}$$

Garage Portal Systems on Concrete Foundations

Simpson Strong-Tie offers a Steel Strong-Wall® shearwall option for garage portal systems which combines simplified installation with superior performance.

- Higher allowable loads with reduced concrete anchorage requirements *(see Alternate Garage Front Options on p. 48 for other options)*
- Same anchor bolt template
- Complete kit available to simplify the connection to the header or beam

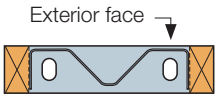
For product data and naming scheme information, see pp. 41–42.

Suggested Example Specification: SSW12x7 with SSWP-KT

Garage Header Rough Opening Height

Model No.	H Curb	Rough Opening Height
SSW12x7 SSW15x7 SSW18x7	5½"	7'-1½"
	6"	7'-2"
SSW12x7.4 SSW15x7.4 SSW18x7.4	0"	7'-1½"
SSW12x8 SSW15x8 SSW18x8	5½"	8'-2¾"[3]
	6"	8'-3¼"[3]

1. The height of the garage curb above the garage slab is critical for rough header opening at garage return walls.
2. Shims are not provided with Steel Strong-Wall.
3. Furring down garage header may be necessary for correct rough opening height.
4. Refer to p. 42 for wall dimensions.



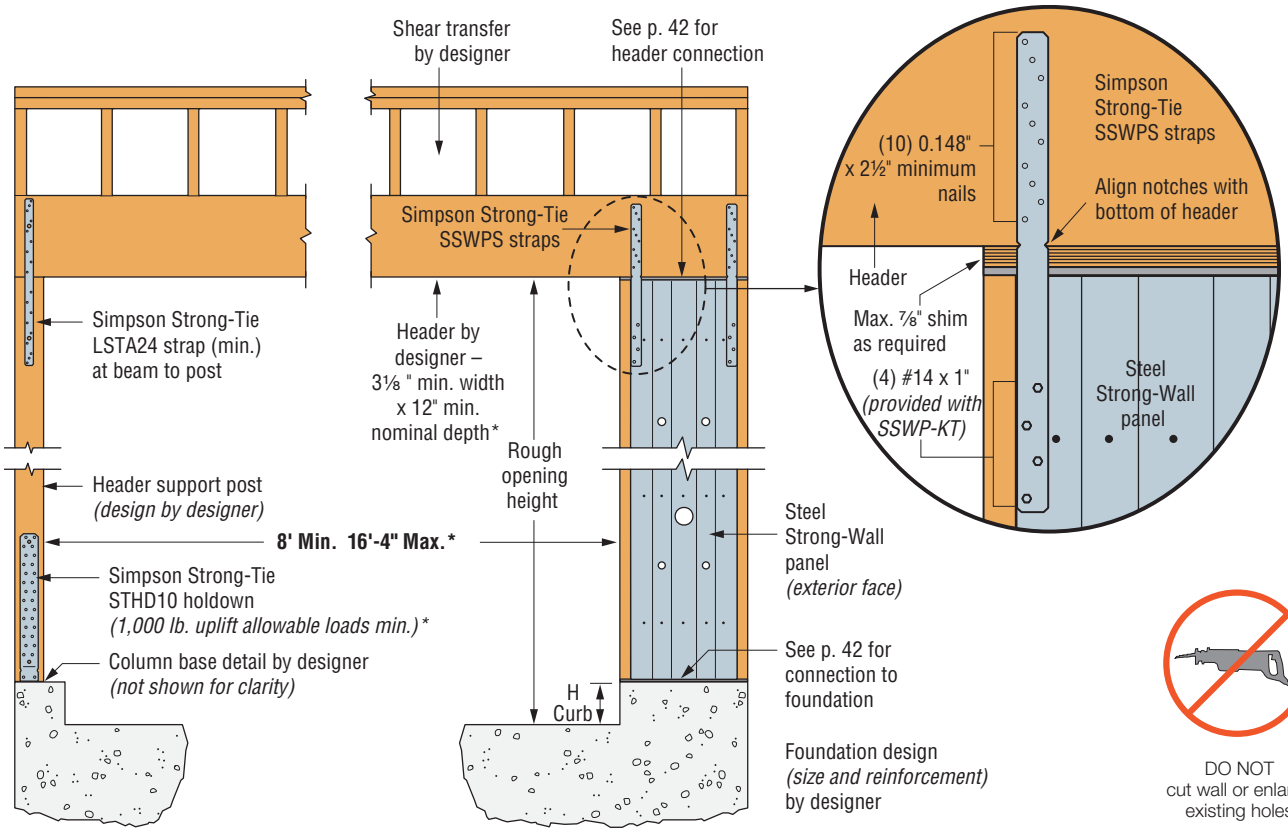
For a complete set of wall profile drawings, see p. 41.

Installation

- Portal Frame Connection Kit is required to achieve increased load values listed for portal frame system.
- SSWPS straps must be installed on exterior face of the Steel Strong-Wall shearwall. Position header flush with exterior face of the Steel Strong-Wall shearwall.
- Do not cut the Steel Strong-Wall or enlarge existing holes. Doing so will compromise the performance of the wall.
- Do not use an impact wrench to tighten nuts on the anchor bolts.
- Maximum shim thickness between the Steel Strong-Wall and header is ⅞" using Simpson Strong-Tie® Strong-Drive® ¼" x 3½" SDS Heavy-Duty Connector screws.
- Walls with 2x4 preattached studs may also be used in 2x6 wall framing. Install the wall flush to exterior face of the framing and add furring to the opposite side.
- Walls may be installed with solid headers in all cases or multi-ply headers in Wind and SDC A-C, see detail 11/SSW2 on p. 70 for details.

Portal Frame Connection Kit

Model No.	Contents
SSWP-KT	(2) 10-Gauge SSWPS Straps (8) #14 x 1" Self-Drilling Screws Installation Instructions



DO NOT cut wall or enlarge existing holes

*This installation reflects lateral load requirements of a single-wall portal system. It is the designer's responsibility to provide a complete load path for all loads in accordance with the governing codes. Refer to footnotes 2, 4 and 9 on p. 48.

US Patent 8,281,551
Canadian Patent 2,489,845

Garage Portal Systems on Concrete Foundations

Model No.	Allowable Axial Load (lb.)	Single-Wall Garage Portal System[2]					
		Seismic[3]			Wind		
		Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[8] (lb.)	Allowable ASD Shear Load V (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[8] (lb.)
SSW12x7 w/ SSWP-KT	1,000	1,350	0.42	11,550	1,645	0.51	15,390
	4,000	1,350	0.42	11,550	1,435	0.45	12,560
	7,500	1,185	0.37	9,750	1,185	0.37	9,750
SSW15x7 w/ SSWP-KT	1,000	2,210	0.38	15,930	2,210	0.38	15,930
	4,000	2,000	0.34	13,925	2,000	0.34	13,925
	7,500	1,760	0.30	11,835	1,760	0.30	11,835
SSW18x7 w/ SSWP-KT	1,000	3,865	0.40	25,785	3,865	0.40	25,785
	4,000	3,610	0.38	23,125	3,610	0.38	23,125
	7,500	3,315	0.35	20,405	3,315	0.35	20,405
SSW12x7.4 w/ SSWP-KT	1,000	1,275	0.45	11,695	1,535	0.54	15,320
	4,000	1,275	0.45	11,695	1,310	0.46	12,135
	7,500	1,045	0.37	9,055	1,045	0.37	9,055
SSW15x7.4 w/ SSWP-KT	1,000	2,065	0.42	15,900	2,065	0.42	15,900
	4,000	1,855	0.37	13,765	1,855	0.37	13,765
	7,500	1,590	0.32	11,330	1,590	0.32	11,330
SSW18x7.4 w/ SSWP-KT	1,000	3,615	0.45	25,770	3,615	0.45	25,770
	4,000	3,380	0.42	23,150	3,380	0.42	23,150
	7,500	3,100	0.38	20,390	3,100	0.38	20,390
SSW12x8 w/ SSWP-KT	1,000	1,180	0.46	11,845	1,375	0.55	14,770
	4,000	1,140	0.45	11,305	1,140	0.45	11,305
	7,500	875	0.35	8,110	875	0.35	8,110
SSW15x8 w/ SSWP-KT	1,000	1,865	0.42	15,570	1,865	0.42	15,570
	4,000	1,640	0.37	13,130	1,640	0.37	13,130
	7,500	1,380	0.31	10,600	1,380	0.31	10,600
SSW18x8 w/ SSWP-KT	1,000	3,280	0.47	25,325	3,315	0.48	25,775
	4,000	3,100	0.45	23,160	3,100	0.45	23,160
	7,500	2,840	0.41	20,365	2,840	0.41	20,365

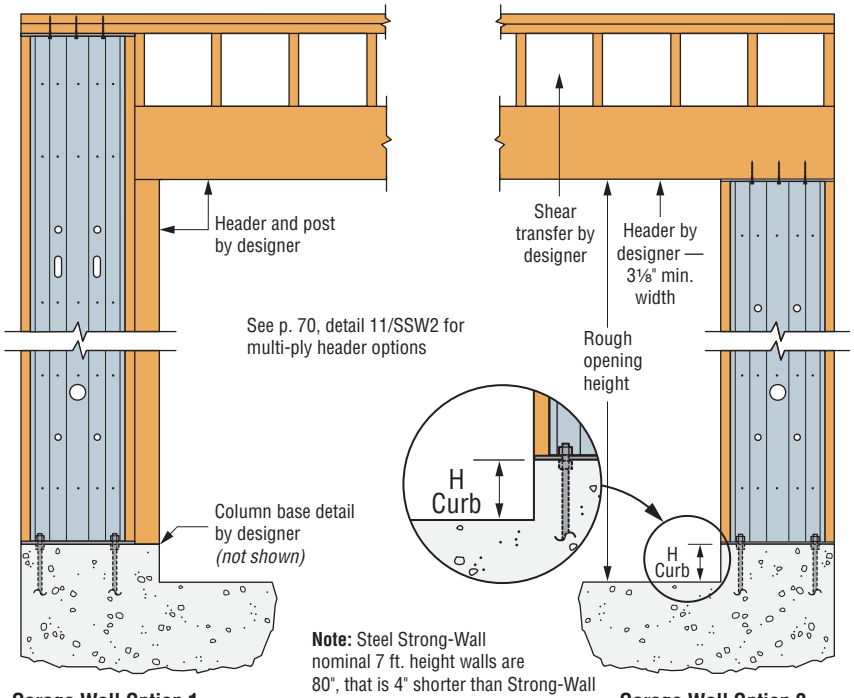
1. Allowable shear loads and anchor tension forces are applicable to Single-Wall Garage Portal System installation on concrete with minimum f'_c = 2,500 psi using the ASD basic (Section 1605.3.1) or the alternative basic (Section 1605.3.2) load combinations. Load values include evaluation of bearing stresses.
2. A Double-Wall Garage Portal System consists of two walls with a header continuous across both panels. The allowable load is twice the Single-Wall Portal value.
3. For seismic designs based on the 2018 IBC using R=6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet steel panels.
4. The minimum header size shown in the details is the minimum required for lateral rigidity of the portal system. Larger headers may be required due to vertical loading. Support post uplift connectors may be reduced where justified by calculations.
5. Recommended header moisture content is 19% or less at time of installation.
6. Allowable shear, drift and anchor tension values may be interpolated for intermediate height or axial loads.
7. High-strength anchor bolts are required for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 60–61. High-strength anchor bolts are required for SSW12 when the seismic overturning moment (seismic shear x shearwall height) exceeds 61,600 in.-lb. See pp. 60–67 for SSWAB anchor bolt information and anchorage solutions.
8. Tabulated anchor tension loads assume no resisting axial load. For anchor tension loads at design shear values and including the effect of axial load, refer to the Strong-Wall Selector web application or use the equations on p. 46 *(include K factor in uplift calculations)*. Drifts at lower design shear may be linearly reduced.
9. Longer header spans can be accommodated if larger headers are used such that equivalent stiffness is equal to or greater than that provided by the minimum header size and maximum length indicated.

Alternate Garage Front Options

These alternate garage front options may be used for applications when the Steel Strong-Wall® shearwall is installed at the full height *(option 1)* or without the additional Portal Frame Kit *(option 2)*, when higher capacity or reduced concrete anchorage are not needed. Refer to the Standard Application on Concrete Foundations on pp. 41–44 for product data and allowable load values.

For Garage Wall Option 2, the designer shall design for:

1. Shear transfer
2. Out-of-plane loading effect
3. Increased overturning and drift due to additional height



Garage Wall Option 1

Note: Steel Strong-Wall nominal 7 ft. height walls are 80", that is 4" shorter than Strong-Wall high-strength wood shearwalls.

Garage Wall Option 2

First-Story Wood Floor Systems

Steel Strong-Wall® shearwalls designed for use on concrete foundations can be used with wood floor systems by extending the anchor bolts and installing compression nuts and solid blocking below the wall.

Material & Finish: See p. 41.

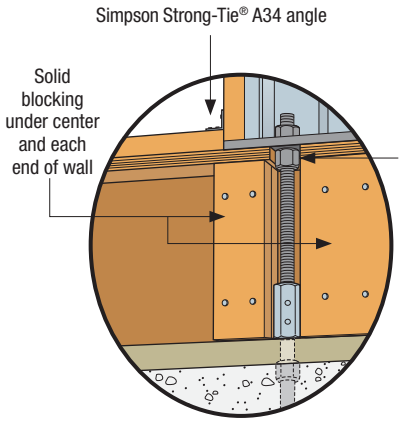
Codes: ICC-ES ESR-1679:
City of LA Building Code Supplement;
State of Florida FL5113

For product data and naming scheme information, see pp. 41–44.

Wood First-Floor Wall Connection Kit

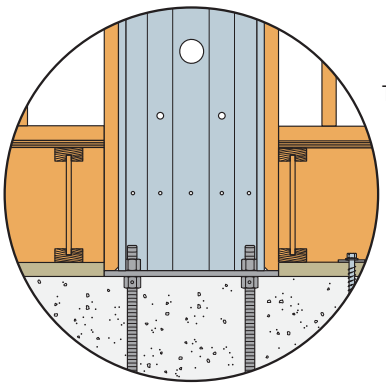
Wall Width (in.)	Model No.	Contents
12	SSW12-1KT	(1) Shear-Transfer Plate (with #14 self-drilling screws) (2) ¾" or 1" x 18" Threaded Rods F1554 Grade 36 (2) Coupler Nuts (2) Heavy Hex Nuts Installation Instructions
15	SSW15-1KT	
18	SSW18-1KT	
21	SSW21-1KT	
24	SSW24-1KT	

1. Two heavy hex nuts included with each wall.



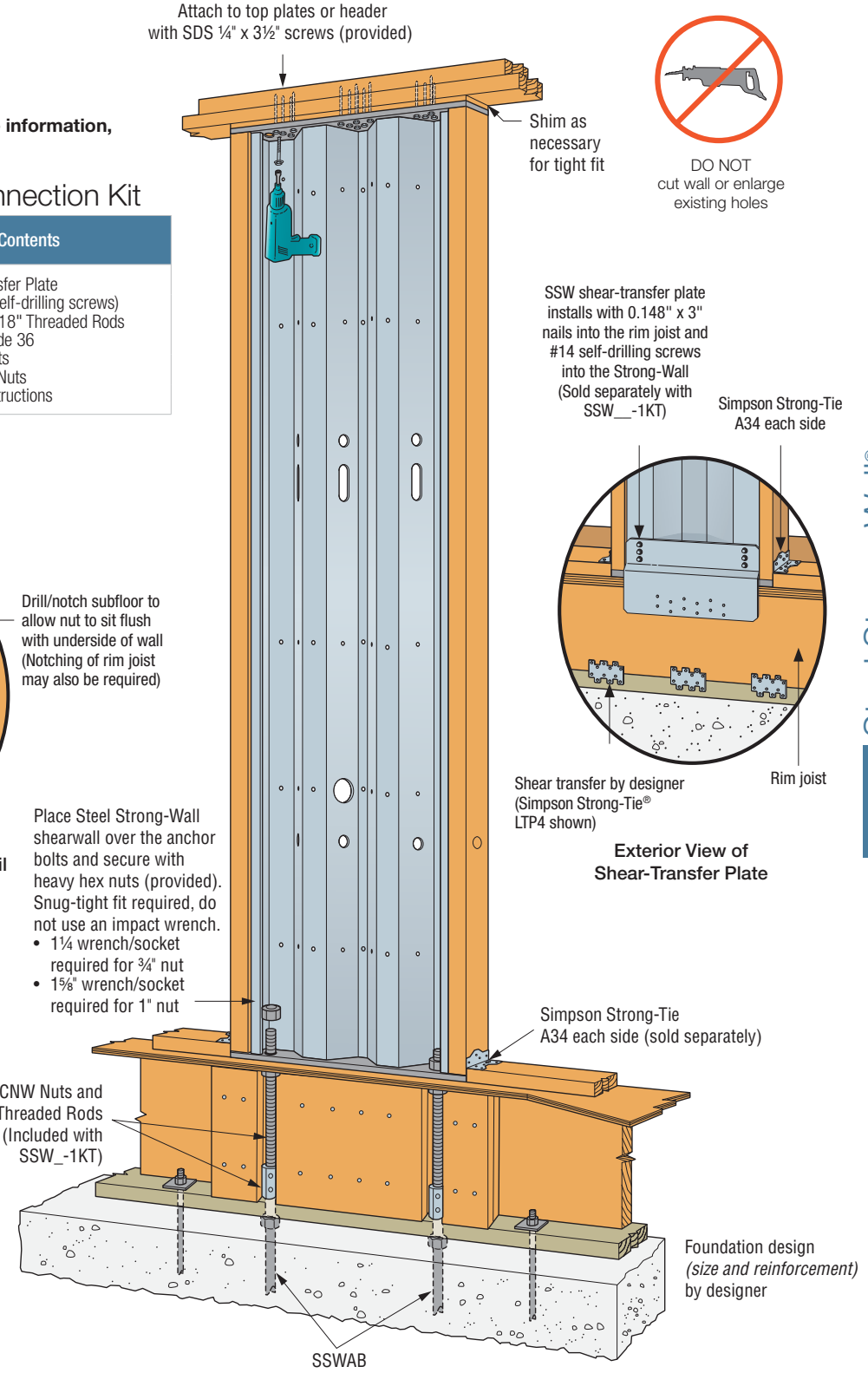
Blocking/Connection Detail

(See Detail 10/SSW2 on p. 74 for perpendicular blocking where required)



Alternate First-Story Installation

Installation for first-story wood-floor system. Specify taller wall model to allow for floor framing and use load values for installation on concrete on pp. 43–44.



First-Story Wood Floor Installation

US Patent 8,281,551
Canadian Patent 2,489,845

Exterior View of Shear-Transfer Plate

First-Story Wood Floor Systems

Model No.	Seismic[2]			Wind		
	Allowable ASD Shear Load V[5,6] (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[4] (lb.)	Allowable ASD Shear Load V[5,6] (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[4] (lb.)
SSW12x7	525	0.30	6,110	525	0.30	6,110
SSW15x7	1,385	0.35	11,980	1,385	0.35	11,980
SSW18x7	1,830	0.27	11,950	1,830	0.27	11,950
SSW21x7	2,100	0.21	11,015	2,100	0.21	11,015
SSW24x7	2,450	0.17	10,740	2,450	0.17	10,740
SSW12x8	450	0.36	6,105	450	0.36	6,105
SSW15x8	1,185	0.42	11,945	1,185	0.42	11,945
SSW18x8	1,570	0.33	11,950	1,570	0.33	11,950
SSW21x8	1,955	0.27	11,955	1,955	0.27	11,955
SSW24x8	2,340	0.23	11,955	2,340	0.23	11,955
SSW12x9	400	0.42	6,125	400	0.42	6,125
SSW15x9	1,050	0.47	11,945	1,050	0.47	11,945
SSW18x9	1,390	0.38	11,945	1,390	0.38	11,945
SSW21x9	1,735	0.31	11,975	1,735	0.31	11,975
SSW24x9	2,075	0.26	11,965	2,075	0.26	11,965
SSW12x10	360	0.48	6,140	360	0.48	6,140
SSW15x10	885	0.52	11,220	945	0.56	11,980
SSW18x10	1,250	0.44	11,965	1,250	0.44	11,965
SSW21x10	1,555	0.33	11,955	1,555	0.33	11,955
SSW24x10	1,860	0.30	11,950	1,860	0.30	11,950
SSW15x11	780	0.58	10,900	855	0.63	11,945
SSW18x11	1,135	0.50	11,975	1,135	0.50	11,975
SSW21x11	1,410	0.40	11,950	1,410	0.40	11,950
SSW24x11	1,690	0.34	11,970	1,690	0.34	11,970
SSW15x12	670	0.63	10,230	785	0.74	11,985
SSW18x12	1,035	0.55	11,935	1,035	0.55	11,935
SSW21x12	1,290	0.45	11,950	1,290	0.45	11,950
SSW24x12	1,545	0.38	11,960	1,545	0.38	11,960
SSW18x13	955	0.60	11,945	955	0.60	11,945
SSW21x13	1,190	0.50	11,960	1,190	0.50	11,960
SSW24x13	1,425	0.42	11,965	1,425	0.42	11,965

1. Loads are applicable to first-story raised wood floor installations supported on concrete or masonry foundations using the ASD basic (Section 1605.3.1) or the alternative basic (Section 1605.3.2) load combinations. Load values include evaluation of anchor rod compression capacity and do not require further evaluation by the designer.
2. For seismic designs based on the 2018 IBC using R = 6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet steel panels.
3. Minimum standard-strength anchor bolts required. See pp. 60–67 for SSWAB anchor bolt information and anchorage solutions.
4. Tabulated anchor tension loads assume no resisting axial load. Anchor rod tension at design shear load and including the effect of axial load may be determined using the Strong-Wall® Shearwall Selector web application or the following equation:
   T = [(V x h) / B] - P/2 , where:
   T = Anchor rod tension load (lb.)
   V = Design shear load (lb.)
   h = Strong-Wall height per p. 42 (in.)
   P = Applied axial load (lb.)
   B = Anchor bolt centerline dimension (in.)
   (6⅞" for SSW12, 9¼" for SSW15, 12¼" for SSW18, 15¼" for SSW21, and 18¼" for SSW24)
5. Allowable shear loads assume a maximum first-floor joist depth of 12". For allowable shear load with joists up to 16" deep, multiply table values by 0.93 for SSW12x models and 0.96 for other SSW widths.
6. Allowable shear loads are based on 1,000 lb. total uniformly distributed axial load acting on the entire panel in combination with the shear load. For allowable shear loads at 2,000 lb. uniformly distributed axial load, multiply table values by 0.92 for SSW12x models, and 0.96 for other SSW widths.

Balloon Framing on Concrete Foundations

Simpson Strong-Tie offers a complete stacked-wall solution for balloon-framing applications. The Steel Strong-Wall® option for heights up to 20' combines simplified installation with superior performance.

- Some of the highest loads in the industry
- Same anchor bolt template as single-story installation
- Complete kit available to simplify the connection between the walls

Material & Finish: See p. 41.

Codes: ICC-ES ESR-1679;
City of LA Building Code Supplement;
State of Florida FL5113

Top Wall:

Naming Legend

SSW18x8

- Steel Strong-Wall
- Width (in.)
- Nominal Height (ft.)

Bottom Wall:

SSW18x10-STK

- Steel Strong-Wall
- Width (in.)
- Nominal Height (ft.)
- Stacked Wall (for bottom walls only)

Suggested Example Specification: SSW18x8 over SSW18x10-STK

Balloon Framing Stacked-Wall Product Data — Bottom Walls

Model No.	W (in.)	H (in.)	T (in.)	Anchor Bolts	
				Qty.	Dia. (in.)
SSW15x8-STK	15	93¼	3½	2	1
SSW15x10-STK	15	117¼	3½	2	1
SSW18x8-STK	18	93¼	3½	2	1
SSW18x10-STK	18	117¼	3½	2	1
SSW21x8-STK	21	93¼	3½	2	1
SSW21x10-STK	21	117¼	3½	2	1
SSW24x8-STK	24	93¼	3½	2	1
SSW24x10-STK	24	117¼	3½	2	1

1. Specific wall combinations provided. See load table on p. 53. Contact Simpson Strong-Tie for additional wall combinations.
2. See pp. 41–42 for product data on top walls.

Balloon-Framing Wall Connection Kit

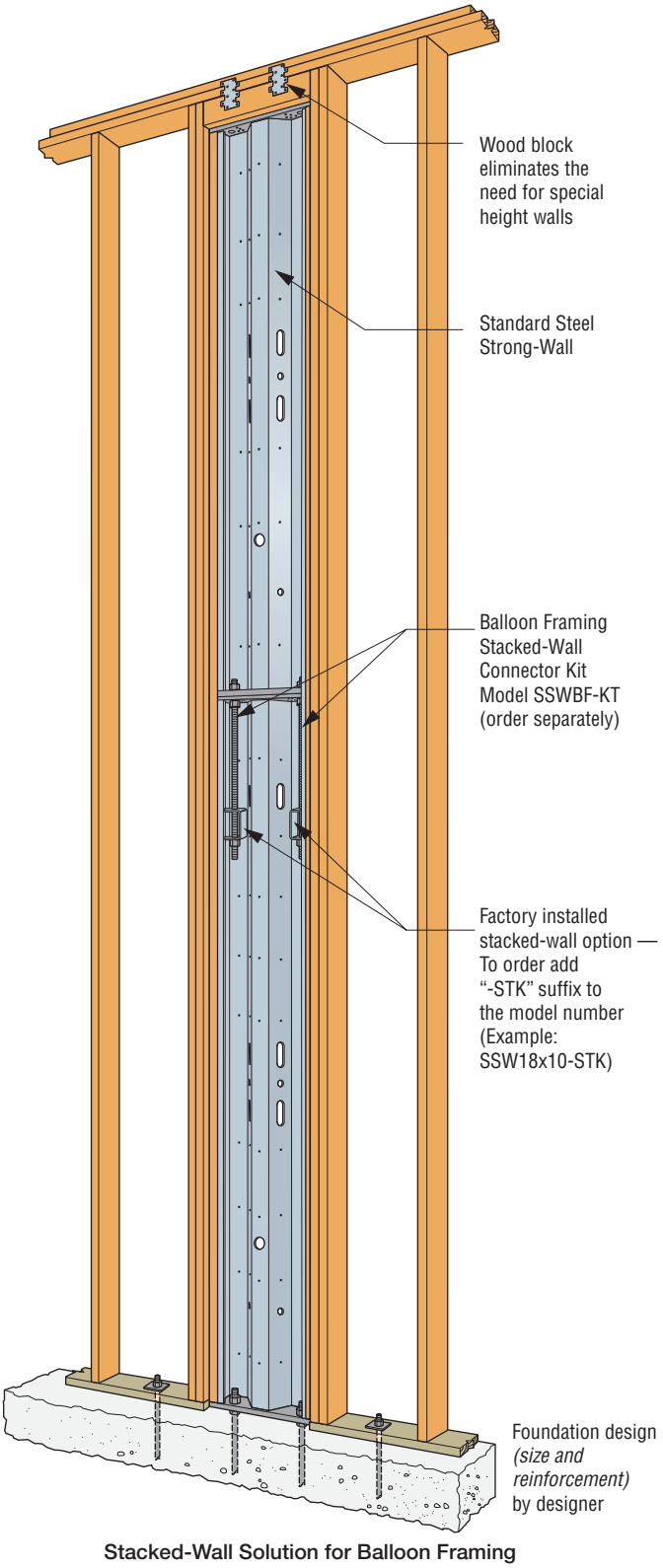
Model No.	Contents
SSWBF-KT	(2) 1" x 25" Threaded Rods F1554 Grade 36 (4) Heavy Hex Nuts Installation Instructions

1. Two heavy hex nuts included with each wall.

Wood Block-to-Top Plate Connection

Strong-Wall Width	Total Connectors	Recommended Connectors
15" Wall	4 (2 Each Side)	Simpson Strong-Tie® LTP4 or A35
18" Wall	4 (2 Each Side)	
21" Wall	6 (3 Each Side)	
24" Wall	6 (3 Each Side)	

1. Alternate connectors with equivalent shear capacity may be specified by the designer.



Stacked-Wall Solution for Balloon Framing

US Patents 8,281,551; 8,689,518
Canadian Patent 2,489,845

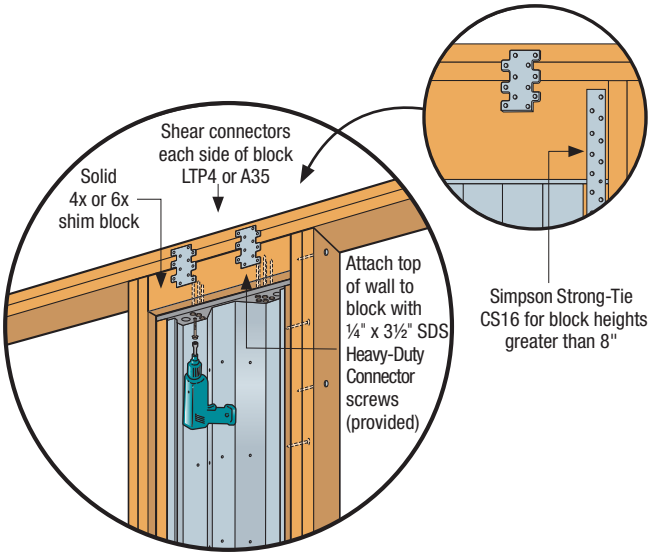
Balloon Framing on Concrete Foundations

Installation

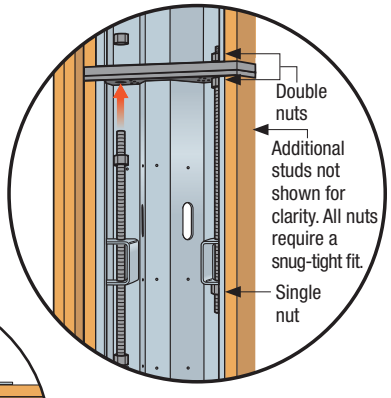
- Do not cut the Steel Strong-Wall® or enlarge existing holes, doing so will compromise the performance of the wall.
- Do not use an impact wrench to tighten nuts on the anchor bolts.
- Maximum top block height between the Steel Strong-Wall and top plates is 12". See detail 4/SSW3 on p. 77.
- Full height studs are required for balloon-framed wall installation *(by designer)*. Two 2x6 minimum each side with 0.148" x 3" nails at 16" o.c.

Block Height (H)	CS16 Nailing	
	Into Block	Into SSW Nailer Stud
H ≤ 8"	N/A	N/A
8" < H ≤ 10"	(8) 0.148" x 1½"	(8) 0.148" x 1½"
10" < H ≤ 12"	(10) 0.148" x 1½"	(10) 0.148" x 1½"

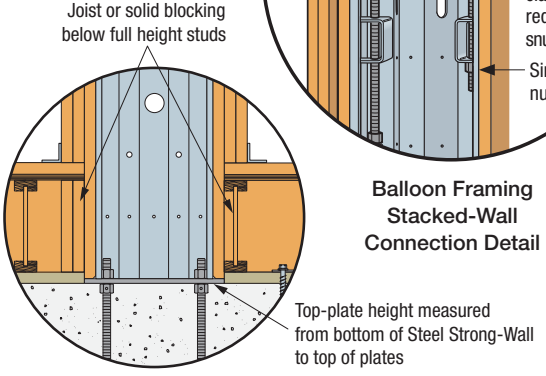
1. **Fasteners:** Nail dimensions in the table are listed diameter x length.



Top-of-Wall Connection

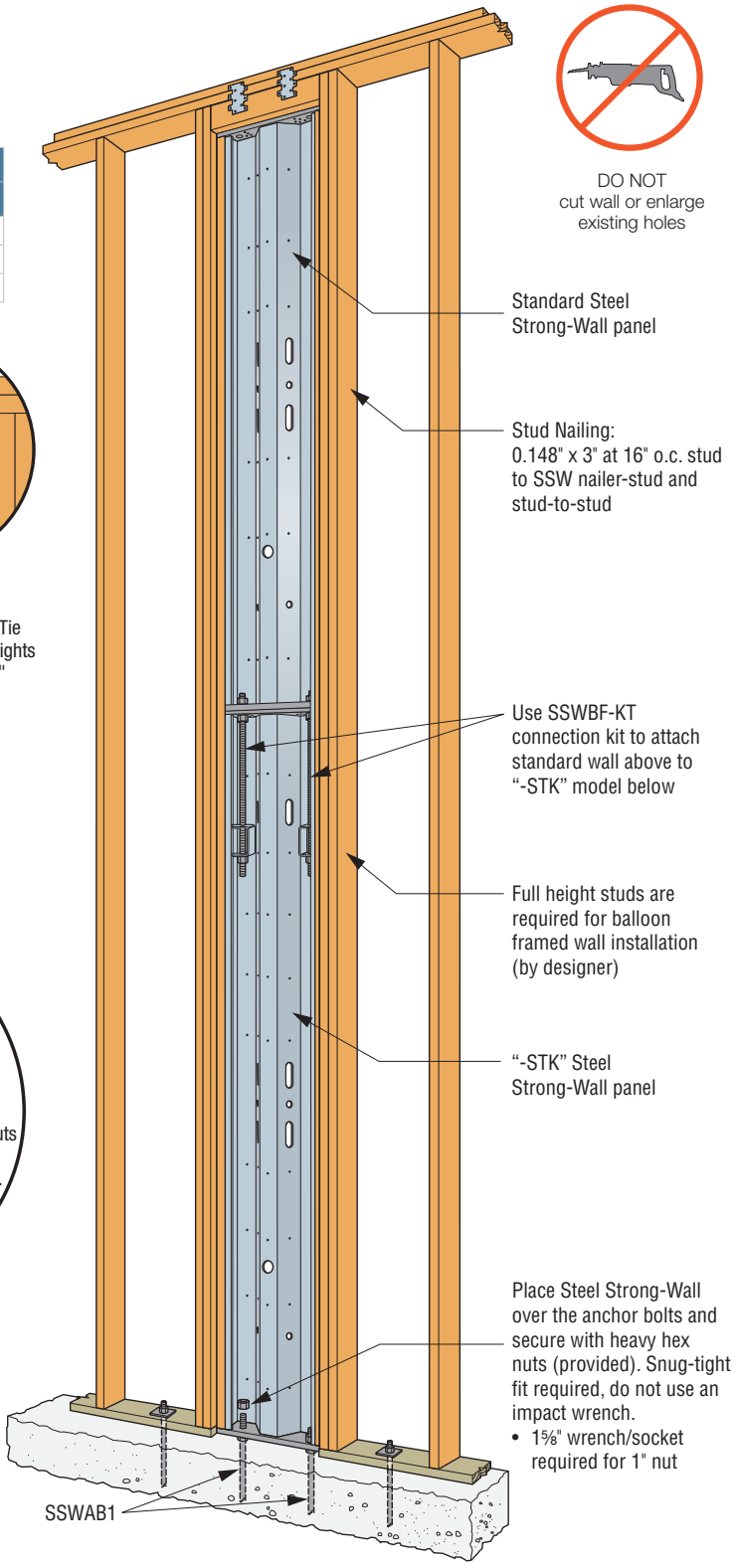


Balloon Framing Stacked-Wall Connection Detail



Balloon Framing on Concrete Through Wood Floor

Installation for first-story wood-floor system, specify taller wall model to allow for floor framing.



Baloon Framing Installation

US Patents 8,281,551; 8,689,518
Canadian Patent 2,489,845

Balloon Framing on Concrete Foundations

Nominal Wall Height (ft.)	Actual Stacked SSW Height[4] (ft. - in.)	Bottom Wall SSW Model	Top Wall SSW Model	Seismic[2]			Wind		
				Allowable ASD Shear Load V[6] (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[8] (lb.)	Allowable ASD Shear Load V[6] (lb.)	Drift at Allowable Shear (in.)	Anchor Tension at Allowable Shear[8] (lb.)
15"-Wide Walls									
15	14 - 5 ¼	SSW15x8-STK[6]	SSW15x7[6]	—	—	—	705	1.00	12,465
16	15 - 6 ½	SSW15x8-STK[6]	SSW15x8[6]	—	—	—	645	1.06	12,105
17	16 - 5 ¼	SSW15x10-STK[6]	SSW15x7[6]	—	—	—	595	1.11	11,820
18	17 - 6 ½	SSW15x10-STK[6]	SSW15x8[6]	—	—	—	555	1.17	11,655
19	18 - 6 ½	SSW15x10-STK[6]	SSW15x9[6]	—	—	—	520	1.23	11,505
20	19 - 6 ½	SSW15x10-STK[6]	SSW15x10[6]	—	—	—	485	1.29	11,260
18"-Wide Walls									
15	14 - 5 ¼	SSW18x8-STK	SSW18x7	890	0.79	12,020	1,130	1.00	16,105
16	15 - 6 ½	SSW18x8-STK	SSW18x8	825	0.84	11,875	1,050	1.07	15,945
17	16 - 5 ¼	SSW18x10-STK	SSW18x7	770	0.89	11,770	980	1.13	15,795
18	17 - 6 ½	SSW18x10-STK	SSW18x8	—	—	—	915	1.20	15,585
19	18 - 6 ½	SSW18x10-STK	SSW18x9	—	—	—	860	1.27	15,440
20	19 - 6 ½	SSW18x10-STK	SSW18x10	—	—	—	810	1.33	15,290
21"-Wide Walls									
15	14 - 5 ¼	SSW21x8-STK	SSW21x7	1,295	0.78	14,605	1,670	1.00	20,000
16	15 - 6 ½	SSW21x8-STK	SSW21x8	1,220	0.84	14,710	1,550	1.07	19,770
17	16 - 5 ¼	SSW21x10-STK	SSW21x7	1,135	0.89	14,520	1,445	1.13	19,550
18	17 - 6 ½	SSW21x10-STK	SSW21x8	1,065	0.95	14,425	1,350	1.20	19,300
19	18 - 6 ½	SSW21x10-STK	SSW21x9	1,000	1.00	14,285	1,270	1.27	19,145
20	19 - 6 ½	SSW21x10-STK	SSW21x10	940	1.05	14,120	1,195	1.33	18,930
24"-Wide Walls									
15	14 - 5 ¼	SSW24x8-STK	SSW24x7	1,680	0.72	16,100	2,295	1.00	23,645
16	15 - 6 ½	SSW24x8-STK	SSW24x8	1,630	0.81	16,790	2,155	1.07	23,730
17	16 - 5 ¼	SSW24x10-STK	SSW24x7	1,545	0.87	16,950	2,005	1.13	23,405
18	17 - 6 ½	SSW24x10-STK	SSW24x8	1,470	0.94	17,115	1,875	1.20	23,130
19	18 - 6 ½	SSW24x10-STK	SSW24x9	1,390	1.00	17,095	1,765	1.27	22,960
20	19 - 6 ½	SSW24x10-STK	SSW24x10	1,310	1.05	16,945	1,660	1.33	22,685

1. Allowable shear loads and anchor tension forces are applicable to installation on concrete with minimum f'c = 2,500 psi using the ASD basic (Section 1605.3.1) or the alternative basic (Section 1605.3.2) load combinations. Load values include evaluation of bearing stresses on the foundation and do not require further evaluation by the designer.
2. For seismic designs based on the 2018 IBC using R = 6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet steel panels.
3. Allowable shear, drift, and anchor tension values apply to the nominal wall heights listed and may be linearly interpolated for intermediate heights.
4. Solid shim blocks (12" maximum) shall be used to attain specified nominal wall height. See detail 4/SSW3 on p. 77 for additional details.
5. Full-height studs are required for balloon framed wall installation, which must be designed for out-of-plane loads in accordance with the applicable code. Two 2x6 minimum are required on each side and fastened together with 0.148" x 3" common nails at 16 inches on center.
6. Loads are based on a 1,000 lb. maximum axial load acting on the entire panel in combination with the shear load. For shear loads at 2,000 lb. maximum axial load, multiply allowable shears by 0.91 for SSW15x models; no reduction required for other wall models.
7. High-strength anchor bolts are required for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 60–61. See pp. 60–67 for SSWAB anchor bolt information and anchorage solutions.
8. Tabulated anchor tension loads assume no resisting axial load. For anchor tension loads at design shear values and including the effect of axial load, refer to the Strong-Wall Shearwall Selector web application or use the equations on p. 46. Drifts at lower design shear may be linearly reduced.

Cumulative Overturning

Key Consideration in Strong-Wall® Shearwall Specification Process

When specifying a premanufactured shearwall for a project, several factors need to be considered, such as load values, seismic/wind requirements, wall width and height, wall placement, etc. Cumulative Overturning is another critical factor often overlooked in multi-story applications.

Calculating Cumulative Overturning for Pre-Manufactured Shearwalls

Designers are accustomed to accounting for cumulative overturning when specifying multi-story, site-built plywood shearwalls. However, when specifying premanufactured shearwalls, designers typically calculate shear loads based on the building geometry and code loading requirements. A wall is then selected based on its ability to meet or exceed the required shear load using manufacturer-provided allowable shear load tables.

What can get lost when considering shear capacity only is that the shearwall is not only governed by shear, but also by a combination of other limit states, including *drift, tension and compression, flexure, anchor rod tension, and concrete or wood bearing stress.* For single-story walls, the allowable shear given in the load tables is the lowest value of the various limit states. However, additional care must be taken in the analysis of multi-story shearwalls to account for the way the loads are distributed over the height of the building.

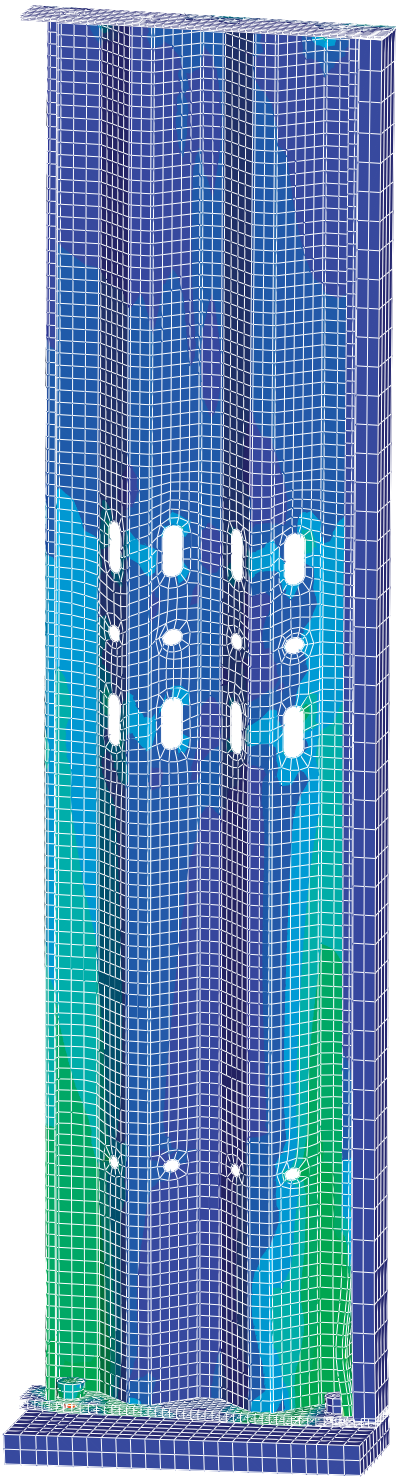
Cumulative Overturning and Stacked-Wall Applications

In multi-story structures, shear and the associated overturning forces due to seismic/wind requirements must be carried down to the foundation by the building's lateral force resisting system. These forces are cumulative over the height of the building, and shear forces applied at the second or third levels of a structure will generate much larger base overturning moments than the same shears applied at the first story. If cumulative overturning is not considered, the design may result in forces several times higher than the capacity of the lower wall, anchor bolts and foundation anchorage.

When specifying stacked shearwall applications, it's imperative to consider cumulative overturning. The load values for Simpson Strong-Tie® stacked Steel Strong-Wall shearwall applications reflect the impact of cumulative overturning and thus appear significantly different than other shearwall manufacturers.

The effects of cumulative overturning are automatically taken into account when designing shearwalls with the Strong-Wall Shearwall Selector web application. For more information on this design tool, visit **strongtie.com/swss**.

To learn more about cumulative overturning and Simpson Strong-Tie Strong-Wall shearwall testing, visit strongtie.com/co.



Simpson Strong-Tie Steel Strong-Wall shearwall rendered in Finite Element Analysis (FEA). When evaluating the performance of complex structural components, our engineers use this computer simulation to complement our full-scale testing program.

Cumulative Overturning

Shear Only vs. Shear and Cumulative Overturning Analysis

The graphic illustration below compares how the total allowable shear load is impacted when the effects of cumulative overturning are included in the analysis. As a point of reference (Figure A), a one-story, nine-foot tall shear wall with a 5,000-lb. lateral load capacity is used. The reference wall has a resulting base overturning moment capacity of 45,000 ft.-lb. and an overturning force of 22,500 lb. assuming a 2 ft. moment arm. As illustrated, if the same base shear is applied over two stories, the overturning at the base of the wall exceeds the one-story application by 60% (Figure B). When proper consideration of cumulative overturning is included in the design, the total allowable shear load on a stacked wall is reduced (Figure C).

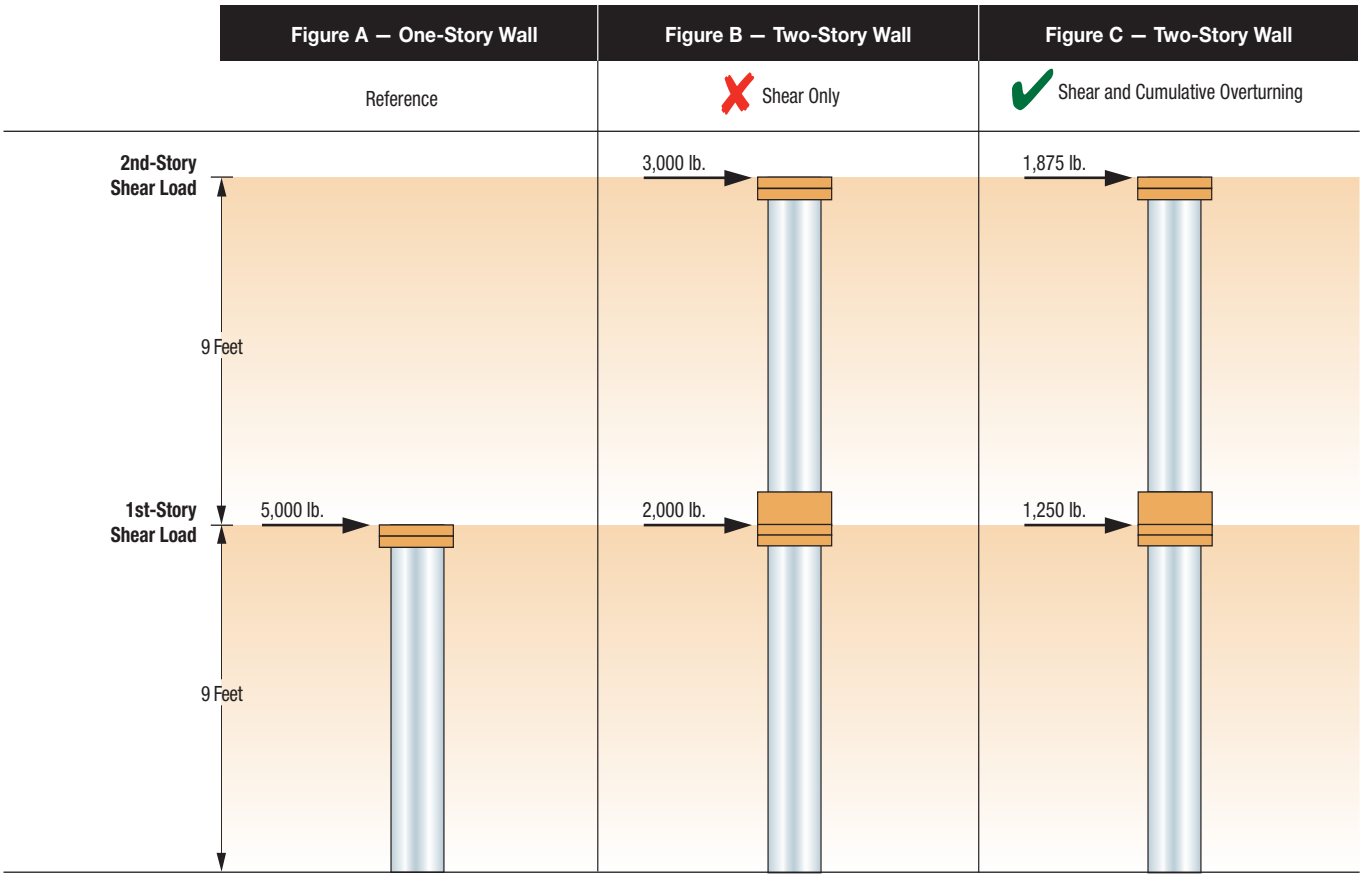


	Figure A — One-Story Wall (Reference)	Figure B — Two-Story Wall (Shear Only)	Figure C — Two-Story Wall (Shear and Cumulative Overturning)
Total Base Shear Reaction	**5,000 lb.** Maximum Shear Capacity	**5,000 lb.** Adequate Design for Shear	**3,125 lb.** Adequate Design for Shear
Overturning Moment	**45,000 ft.-lb.** Maximum Moment Capacity	**72,000 ft.-lb.** Exceeds Moment by 60%*	**45,000 ft.-lb.** Adequate Design for Moment
Overturning Force (Assumes 2 ft. Moment Arm)	**22,500 lb.** Maximum Overturning Force	**36,000 lb.** Exceeds Overturning Force by 60%*	**22,500 lb.** Adequate Design for Overturning Force

***Example calculations:**

(2nd-Story Shear Load x Total Story Height) + (1st-Floor Shear Load x 1st-Story Height) = Overturning Moment > Baseline Limit of the Lowest Panel
(3,000 lb. x 18') + (2,000 lb. x 9') = 72,000 ft.-lb. > 45,000 ft.-lb.
(Overturning Moment) ÷ (Moment Arm) = Overturning Force > Baseline Limit of the Lowest Panel (72,000 ft.-lb.) ÷ (2 ft.) = 36,000 lb. > 22,500 lb.

Note: Loads shown are for illustrative purposes only. Redistribution of earthquake loads per building code requirements will compound the effects of cumulative overturning.

Two-Story Stacked-On Concrete Foundations

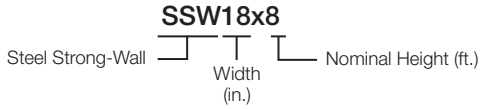
Simpson Strong-Tie offers a complete stacked-wall solution for two-story applications. This Steel Strong-Wall® Shearwall option combines simplified installation with superior performance.

- Some of the highest loads in the industry and design procedures that account for cumulative overturning, see pp. 54–55 for more information.
- Complete concrete-anchorage designs for two-story applications *(foundation design by designer)*
- No bearing plates to install, walls can now be placed flush against a corner.
- Uses the same anchor bolt template as single-story installation.
- Compression loads transferred by nut/rod — reducing wood crushing under load.

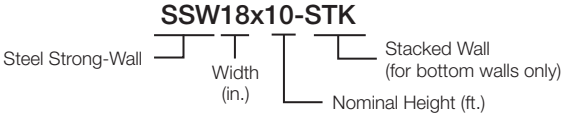
Material & Finish: See p. 41.

Codes: ICC-ES ESR-1679:
City of LA Building Code Supplement;
State of Florida FL5113

Top Wall: **Naming Legend**



Bottom Wall:



Suggested Example Specification: SSW18x8 over SSW18x10-STK

Two-Story Stacked-Wall Product Data — Bottom Walls

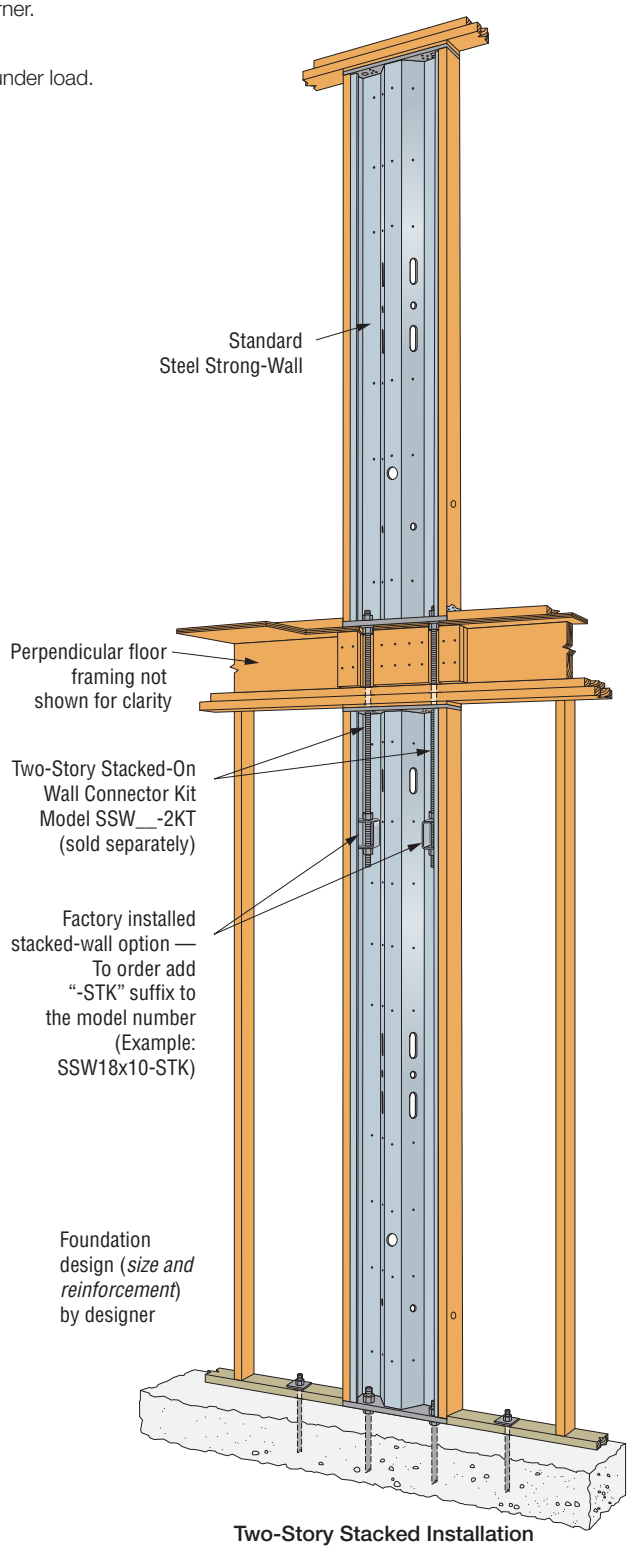
Model No.	W (in.)	H (in.)	T (in.)	Anchor Bolts		Number of Screws in Top of Wall
				Qty.	Dia. (in.)	
SSW15x8-STK	15	93¼	3½	2	1	6
SSW18x8-STK	18	93¼	3½	2	1	9
SSW21x8-STK	21	93¼	3½	2	1	12
SSW24x8-STK	24	93¼	3½	2	1	14
SSW15x9-STK	15	105¼	3½	2	1	6
SSW18x9-STK	18	105¼	3½	2	1	9
SSW21x9-STK	21	105¼	3½	2	1	12
SSW24x9-STK	24	105¼	3½	2	1	14
SSW15x10-STK	15	117¼	3½	2	1	6
SSW18x10-STK	18	117¼	3½	2	1	9
SSW21x10-STK	21	117¼	3½	2	1	12
SSW24x10-STK	24	117¼	3½	2	1	14
SSW15x11-STK	15	129¼	5½	2	1	6
SSW18x11-STK	18	129¼	5½	2	1	9
SSW21x11-STK	21	129¼	5½	2	1	12
SSW24x11-STK	24	129¼	5½	2	1	14
SSW15x12-STK	15	141¼	5½	2	1	6
SSW18x12-STK	18	141¼	5½	2	1	9
SSW21x12-STK	21	141¼	5½	2	1	12
SSW24x12-STK	24	141¼	5½	2	1	14
SSW18x13-STK	18	153¼	5½	2	1	9
SSW21x13-STK	21	153¼	5½	2	1	12
SSW24x13-STK	24	153¼	5½	2	1	14

1. See p. 42 for product data on top wall.

Two-Story Stacked-Wall Connection Kit

Wall Width (in.)	Model No.	Contents
15	SSW15-2KT	(1) Shear-Transfer Plate (with #14 self-drilling screws) (2) 1" x 48" Threaded Rods F1554 Grade 36 (6) Heavy Hex Nuts Installation Instructions
18	SSW18-2KT	
21	SSW21-2KT	
24	SSW24-2KT	

1. Two heavy hex nuts included with each wall.



Two-Story Stacked Installation

US Patents 8,281,551; 8,689,518
Canadian Patent 2,489,845

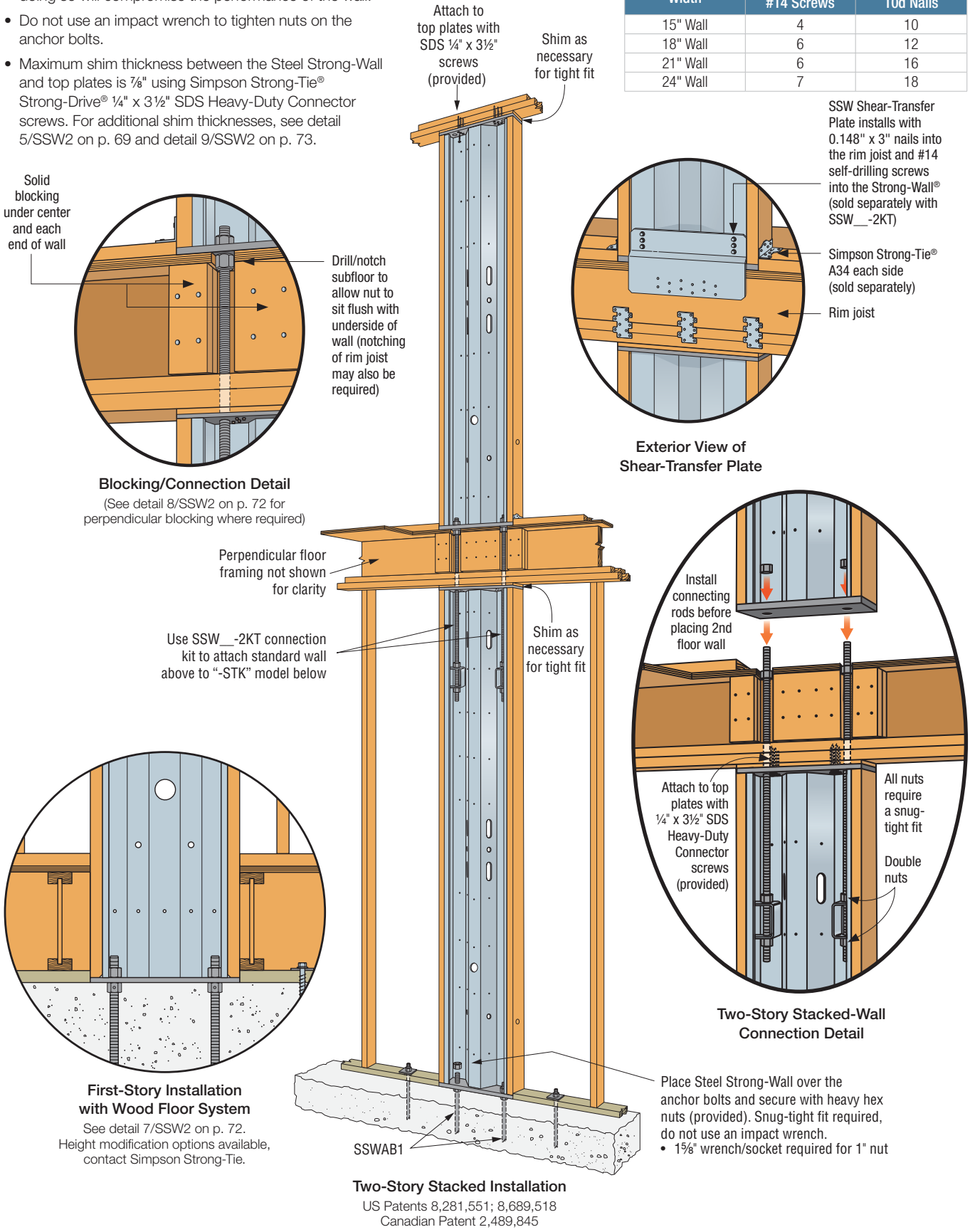
Two-Story Stacked-On Concrete Foundations

Installation Notes

- Do not cut the Steel Strong-Wall® or enlarge existing holes, doing so will compromise the performance of the wall.
- Do not use an impact wrench to tighten nuts on the anchor bolts.
- Maximum shim thickness between the Steel Strong-Wall and top plates is ⅞" using Simpson Strong-Tie® Strong-Drive® ¼" x 3½" SDS Heavy-Duty Connector screws. For additional shim thicknesses, see detail 5/SSW2 on p. 69 and detail 9/SSW2 on p. 73.

Shear-Transfer Plate Fasteners

Strong-Wall Width	Fastener Quantity	
	#14 Screws	10d Nails
15" Wall	4	10
18" Wall	6	12
21" Wall	6	16
24" Wall	7	18



Blocking/Connection Detail
(See detail 8/SSW2 on p. 72 for perpendicular blocking where required)

Exterior View of Shear-Transfer Plate

Two-Story Stacked-Wall Connection Detail

First-Story Installation with Wood Floor System
See detail 7/SSW2 on p. 72.
Height modification options available, contact Simpson Strong-Tie.

Two-Story Stacked Installation
US Patents 8,281,551; 8,689,518
Canadian Patent 2,489,845

Two-Story Stacked-On Concrete Foundations

Second-Story Walls[6]

Second-Story Wall Models	Seismic[2]		Wind	
	Allowable ASD Shear Load V[6] (lb.)	Drift at Allowable Shear (in.)	Allowable ASD Shear Load V[6] (lb.)	Drift at Allowable Shear (in.)
SSW15x7	600	0.21	600	0.21
SSW18x7	1,210	0.24	1,390	0.28
SSW21x7	1,735	0.23	1,815	0.24
SSW24x7	2,330	0.22	2,330	0.22
SSW15x8	550	0.26	550	0.26
SSW18x8	1,130	0.32	1,315	0.37
SSW21x8	1,625	0.30	1,715	0.32
SSW24x8	2,050	0.26	2,050	0.26
SSW15x9	510	0.31	510	0.31
SSW18x9	1,070	0.39	1,220	0.45
SSW21x9	1,520	0.36	1,520	0.36
SSW24x9	1,815	0.30	1,815	0.30
SSW15x10	470	0.37	470	0.37
SSW18x10	1,010	0.47	1,095	0.51
SSW21x10	1,365	0.39	1,365	0.39
SSW24x10	1,630	0.35	1,630	0.35
SSW15x11	440	0.43	440	0.43
SSW18x11	960	0.55	995	0.57
SSW21x11	1,235	0.46	1,235	0.46
SSW24x11	1,480	0.39	1,480	0.39
SSW15x12	405	0.50	405	0.50
SSW18x12	900	0.63	910	0.64
SSW21x12	1,130	0.52	1,130	0.52
SSW24x12	1,355	0.43	1,355	0.43
SSW18x13	830	0.68	840	0.69
SSW21x13	1,045	0.57	1,045	0.57
SSW24x13	1,250	0.48	1,250	0.48

1. Allowable base moment and anchor tension are applicable to installation on concrete foundations with minimum f'_c = 2,500 psi using the ASD basic (Section 1605.3.1) or the alternative basic (Section 1605.3.2) load combinations. Load values include evaluation of anchor rod compression at second story and bearing stresses at foundation.
2. For seismic designs based on the 2018 IBC using R = 6.5. For other codes, use the seismic coefficients corresponding to light-frame bearing walls with wood structural panels or sheet steel panels.
3. Two-story stacked-wall installations may consist of any height-combination of equal width wall models listed in these tables.
4. Loads are based on a 1,000 lb. maximum uniformly distributed total axial load acting on the second-story panel and a 2,000 lb. maximum uniformly distributed total axial load acting on the first-story panel in combination with the tabulated shear load and base moment.
5. The designer must verify that the cumulative overturning moment at the base of the first-story Steel Strong-Wall® does not exceed the allowable base moment capacity. See design example on p. 55 for procedure.
6. The allowable second-story shear loads assume a maximum floor joist depth of 14". For allowable shear load with up to 18" joists, multiply second-story allowable shear loads by 0.98 for SSW15x models and by 0.94 for other SSW widths. For bottom wall shims greater than ⅞" thick, see detail 9/SSW2 on p. 73.
7. Allowable shear, drift, and base moment values may be interpolated for intermediate heights.
8. Minimum ASTM F1554 Grade 36 threaded rods are required at the second-story wall anchorage.
9. High-strength anchor bolts are required at the first-story wall for anchor tension forces exceeding the allowable load for standard-strength bolts tabulated on pp. 60–61. See pp. 60–67 for SSWAB anchor bolt information and anchorage solutions.
10. Tabulated anchor tension loads assume no resisting axial load. For anchor tension loads at design shear values and including the effect of axial load, refer to the Strong-Wall Selector web application or use the equations on p. 46. Drifts at lower design shear or base moment may be linearly reduced.

First-Story Walls on Concrete Foundations[5,9]

First-Story Wall Models	Seismic[2]			Wind		
	Allowable ASD Base Moment (ft.-lb.)	Drift at Allowable Base Moment (in.)	Anchor Tension at Allowable Base Moment[10] (lb.)	Allowable ASD Base Moment (ft.-lb.)	Drift at Allowable Base Moment (in.)	Anchor Tension at Allowable Base Moment[10] (lb.)
SSW15x8-STK	9,665	0.35	11,385	9,665	0.35	11,385
SSW18x8-STK	19,270	0.41	19,520	22,690	0.49	24,875
SSW21x8-STK	27,665	0.39	23,360	30,775	0.43	27,240
SSW24x8-STK	37,805	0.37	27,435	39,670	0.39	29,370
SSW15x9-STK	9,490	0.37	11,130	9,490	0.38	11,130
SSW18x9-STK	18,815	0.47	18,890	22,685	0.57	24,870
SSW21x9-STK	27,585	0.46	23,265	31,310	0.52	27,970
SSW24x9-STK	37,585	0.44	27,215	40,390	0.47	30,150
SSW15x10-STK	9,225	0.45	10,755	9,225	0.45	10,755
SSW18x10-STK	18,175	0.53	18,030	22,585	0.65	24,690
SSW21x10-STK	29,750	0.50	25,905	31,485	0.55	28,210
SSW24x10-STK	37,470	0.50	27,100	40,925	0.55	30,740
SSW15x11-STK	9,025	0.50	10,475	9,025	0.50	10,475
SSW18x11-STK	17,610	0.58	17,295	22,115	0.73	23,880
SSW21x11-STK	26,765	0.58	22,325	30,860	0.67	27,355
SSW24x11-STK	37,430	0.57	27,060	40,260	0.61	30,005
SSW15x12-STK	8,675	0.57	9,990	8,675	0.57	9,990
SSW18x12-STK	17,070	0.63	16,605	21,600	0.80	23,030
SSW21x12-STK	26,015	0.63	21,490	30,195	0.73	26,475
SSW24x12-STK	37,080	0.63	26,710	39,545	0.67	29,235
SSW18x13-STK	17,050	0.68	16,580	21,155	0.85	22,315
SSW21x13-STK	25,350	0.68	20,765	29,505	0.79	25,590
SSW24x13-STK	36,140	0.68	25,790	38,795	0.73	28,450

See footnotes above.

Two-Story Stacked-On Concrete Foundations

Two-Story Design Example

Example: Standard Two-Story Wall Design

Given:

Wind, f'_c = 2,500 psi

$V_{2nd\text{-}story\ wall}$ = 650 lb.

$V_{1st\text{-}story\ wall}$ = 650 lb.

V_{total} = 650 lb. + 650 lb. = 1,300 lb.

M_{allow} = Allowable ASD Base Moment (ft.-lb.)
(See Two-Story Stacked Tables)

V_{allow} = Allowable ASD Shear Load V (lb.)
(See Two-Story Stacked Tables)

Step 1 – Select First-Story Wall *(See tables on p. 58)*

M_{base} = (650 lb. x 18 ft.) + (650 lb. x 9 ft.) = 17,550 ft.-lb.

Using First-Story Wall Table, select a 9-foot wall with $M_{allow} \geq M_{base}$

Select SSW18x9-STK

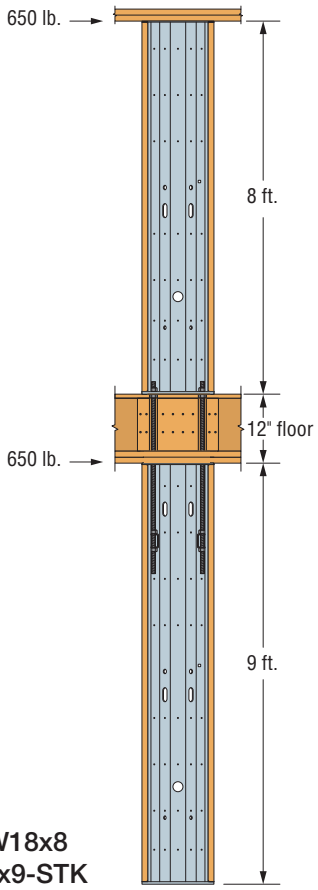
M_{allow} = 22,685 ft.-lb. > 17,550 ft.-lb. **OK**

Step 2 – Check Second-Story Wall

Using the Second-Story Wall Table on p. 58, check the capacity of an 8-foot wall with the same width as the First-Story Wall selected in Step 1:

Select SSW18x8

V_{allow} = 1,315 lb. > 650 lb. **OK**



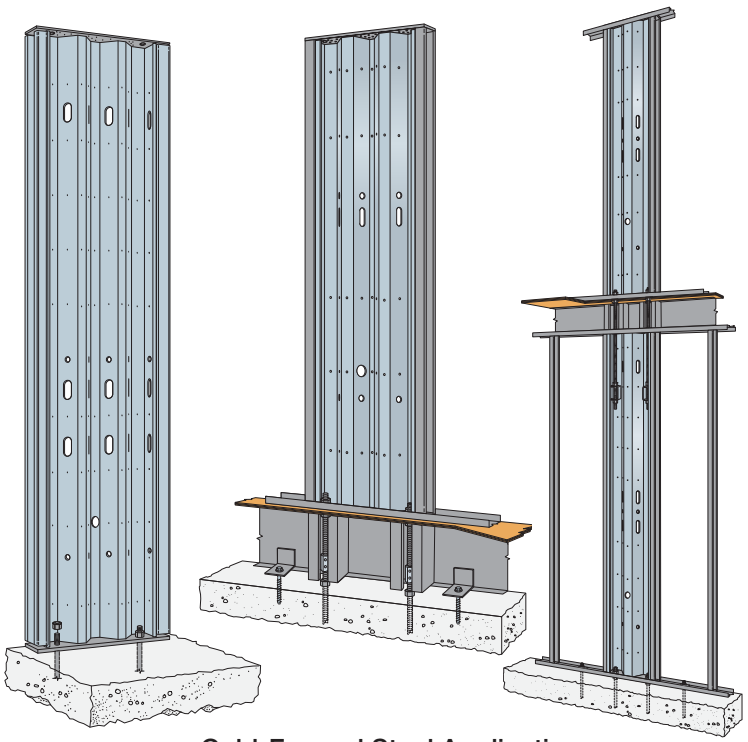
››› Use SSW18x8 over SSW18x9-STK

Cold-Formed Steel on Concrete Foundations

The Steel Strong-Wall® provides high-capacity, narrow-wall solutions for cold-formed steel (CFS) framing. Wall models for this application, designated by the S/SSW model prefix, install easily in CFS framing, and preattached steel studs allow easy attachment of interior and exterior finishes. Simpson Strong-Tie offers Steel Strong-Wall solutions for standard CFS applications on concrete, first-story floor systems, and two-story stacked applications on concrete.

Cold-Formed Steel Connectors

All of the design, specification and installation information you need on our Steel Strong-Wall for CFS applications can be found at **strongtie.com/cfs**.



Cold-Formed Steel Applications (Standard, Raised Floor and Two-Story)

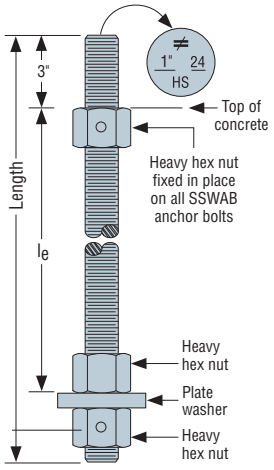
Steel Strong-Wall® Anchorage Solutions

SSWAB Anchor Bolts

SSWAB anchor bolts in ¾" and 1" diameters offer flexibility to meet specific project demands. Inspection is easy; the head is stamped with a No-Equal® symbol for identification, bolt length, bolt diameter, and optional "HS" for High Strength if specified.

Material: ASTM F1554 Grade 36; High Strength (HS) ASTM A449

An additional nut for template installation is provided with each SSWAB. It may also be used for SSW installation.

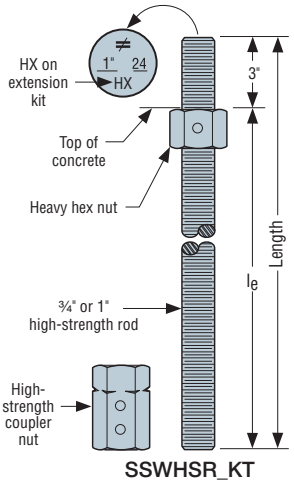


SSWAB

Steel Strong-Wall® Width (in.)	Model No.	Dia. (in.)	Total Length (in.)	l_e (in.)
12	SSWAB¾x24	¾	24	19
	SSWAB¾x24HS	¾	24	19
	SSWAB¾x30	¾	30	25
	SSWAB¾x30HS	¾	30	25
	SSWAB¾x36HS	¾	36	31
15, 18, 21, 24	SSWAB1x24	1	24	19
	SSWAB1x24HS	1	24	19
	SSWAB1x30	1	30	25
	SSWAB1x30HS	1	30	25
	SSWAB1x36HS	1	36	31

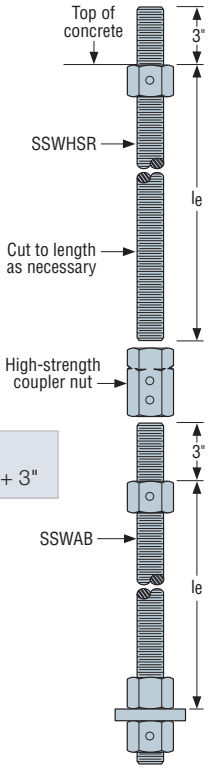
SSWHSR Extension Kit

SSWHSR allows for anchorage in tall stemwall applications where full embedment of an SSWAB into the footing is required. The head is stamped for identification like an SSWAB. Kit includes ASTM A449 high-strength rod with heavy hex nut fixed in place and high strength coupler nut. Do not use in place of SSWAB.



SSWHSR_KT

Total l_e = SSWHSR l_e + SSWAB l_e + 3"



SSWHSR and SSWAB Assembly

Steel Strong-Wall Width (in.)	Model No.	Dia. (in.)	Total Length (in.)	l_e (in.)
12	SSWHSR¾x2KT	¾	24	21
	SSWHSR¾x3KT	¾	36	33
15, 18, 21, 24	SSWHSR1x2KT	1	24	21
	SSWHSR1x3KT	1	36	33

Steel Strong-Wall® Anchorage Solutions — 2,500 psi Concrete[1,2,6]

Design Criteria	Concrete Condition	Anchor Strength[3]	SSWAB ¾" Anchor Bolt			SSWAB 1" Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)	ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[4]	Cracked	Standard	8,800	22	8	16,100	33	11
			9,600	24	8	17,100	35	12
		High-Strength	18,500	36	12	33,000	51	17
			19,900	38	13	35,300	54	18
	Uncracked	Standard	8,800	19	7	15,700	28	10
			9,600	21	7	17,100	30	10
		High-Strength	18,300	31	11	32,300	44	15
			19,900	33	11	35,300	47	16
Wind[5]	Cracked	Standard	5,100	14	6	6,200	16	6
			7,400	18	6	11,400	24	8
			9,600	22	8	17,100	32	11
		High-Strength	11,400	24	8	21,100	36	12
			13,600	27	9	27,300	42	14
			15,900	30	10	31,800	46	16
			19,900	35	12	35,300	50	17
	Uncracked	Standard	5,000	12	6	6,400	14	6
			7,800	16	6	12,500	22	8
			9,600	19	7	17,100	28	10
		High-Strength	12,500	22	8	21,900	32	11
			14,300	24	8	26,400	36	12
			17,000	27	9	31,500	40	14
			19,900	30	10	35,300	43	15

See footnotes on p. 61.

Steel Strong-Wall® Anchorage Solutions

Steel Strong-Wall® Anchorage Solutions — 3,500 psi Concrete[1,2,6]

Design Criteria	Concrete Condition	Anchor Strength[3]	SSWAB ¾" Anchor Bolt			SSWAB 1" Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)	ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[4]	Cracked	Standard	9,000	20	7	15,700	29	10
			9,600	21	7	17,100	31	11
		High-Strength	18,200	32	11	32,900	46	16
			19,900	34	12	35,300	48	16
	Uncracked	Standard	8,800	17	6	15,700	25	9
			9,600	19	7	17,100	27	9
		High-Strength	18,600	28	10	32,600	40	14
			19,900	30	10	35,300	42	14
Wind[5]	Cracked	Standard	6,000	14	6	7,300	16	6
			7,300	16	6	13,500	24	8
			9,600	20	7	17,100	29	10
		High-Strength	11,800	22	8	22,700	34	12
			13,500	24	8	27,400	38	13
			17,000	28	10	32,300	42	14
			19,900	32	11	35,300	45	15
	Uncracked	Standard	6,000	12	6	7,500	14	6
			7,500	14	6	12,800	20	7
			9,600	17	6	17,100	25	9
		High-Strength	12,800	20	7	21,300	28	10
			14,800	22	8	26,000	32	11
			16,900	24	8	31,300	36	12
			19,900	27	9	35,300	39	13

Steel Strong-Wall® Anchorage Solutions — 4,500 psi Concrete[1,2,6]

Design Criteria	Concrete Condition	Anchor Strength[3]	SSWAB ¾" Anchor Bolt			SSWAB 1" Anchor Bolt		
			ASD Allowable Tension (lb.)	W (in.)	d_e (in.)	ASD Allowable Tension (lb.)	W (in.)	d_e (in.)
Seismic[4]	Cracked	Standard	8,700	18	6	16,000	27	9
			9,600	20	7	17,100	29	10
		High-Strength	17,800	29	10	32,100	42	14
			19,900	32	11	35,300	45	15
	Uncracked	Standard	9,100	16	6	15,700	23	8
			9,600	17	6	17,100	25	9
		High-Strength	17,800	25	9	32,500	37	13
			19,900	27	9	35,300	39	13
Wind[5]	Cracked	Standard	5,400	12	6	6,800	14	6
			8,300	16	6	11,600	20	7
			9, 600	18	6	17,100	26	9
		High-Strength	11,600	20	7	21,400	30	10
			13,400	22	8	25,800	34	12
			17,300	26	9	31,000	38	13
			19,900	29	10	35,300	42	14
	Uncracked	Standard	6,800	12	6	6,800	12	6
			8,500	14	6	12,400	18	6
			9,600	16	6	17,100	23	8
		High-Strength	12,400	18	6	21,600	26	9
			14,500	20	7	26,700	30	10
			16,800	22	8	32,200	34	12
			19,900	25	9	35,300	36	12

1. See pp. 63–64 for foundation illustrations showing W and d_e dimensions.
2. Anchorage designs conform to ACI 318-14 Chapter 17 and ACI 318-11 Appendix D with no supplementary reinforcement and cracked or uncracked concrete as noted.
3. Anchor strength indicates required grade of SSWAB anchor bolt. Standard or High-Strength (HS).
4. Seismic indicates Seismic Design Category C through F. Detached 1 and 2 family dwellings in SDC C may use wind anchorage solutions. Seismic anchorage designs conform to ACI 318-14 Section 17.2.3.4.3 and ACI 318-11 Section D.3.3.4.
5. Wind includes seismic design category A and B and detached one- and two-family dwellings in SDC C.
6. Foundation dimensions are for anchorage only. Foundation design *(size and reinforcement)* by designer. The registered design professional may specify alternate embedment, footing size or anchor bolt.

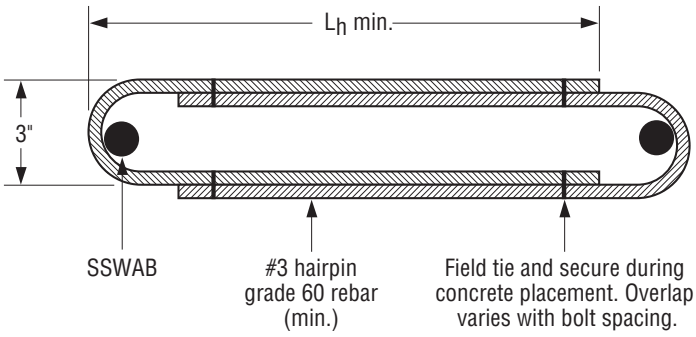
Steel Strong-Wall® Anchorage Solutions

Foundation shear reinforcement to resist shear forces from Strong-Wall shearwalls located at the edge of concrete is shown in the table below. The SSW12 and SSW15 used in wind applications do not require shear reinforcement when the shearwall design shear force is less than the anchorage allowable shear load shown in the table below.

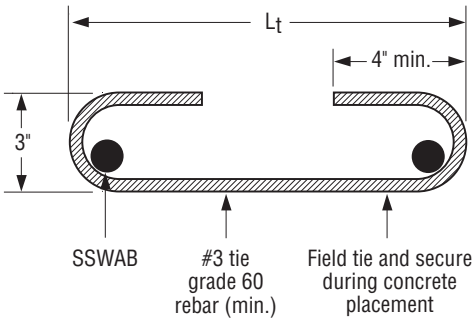
Shear Anchorage Solutions

Model No.	L_t or L_h (in.)	Seismic[3]		Wind[4]					
		Shear Reinforcement	Minimum Curb/ Stemwall Width (in.)	Shear Reinforcement	Minimum Curb/ Stemwall Width (in.)	ASD Allowable Shear Load V[6] (lb.)			
						6" Minimum Curb/Stemwall		8" Minimum Curb/Stemwall	
						Uncracked	Cracked	Uncracked	Cracked
SSW12	9	(1) #3 Tie	6	See Note 6	—	1,230	880	1,440	1,030
SSW15	12	(2) #3 Ties	6	See Note 6	—	1,590	1,135	1,810	1,295
SSW18	14	(1) #3 Hairpin	8[5]	(1) #3 Hairpin	6	Hairpin reinforcement achieves maximum allowable shear load of the Steel Strong-Wall.			
SSW21	15	(2) #3 Hairpins	8[5]	(1) #3 Hairpin	6				
SSW24	17	(2) #3 Hairpins	8[5]	(1) #3 Hairpin	6				

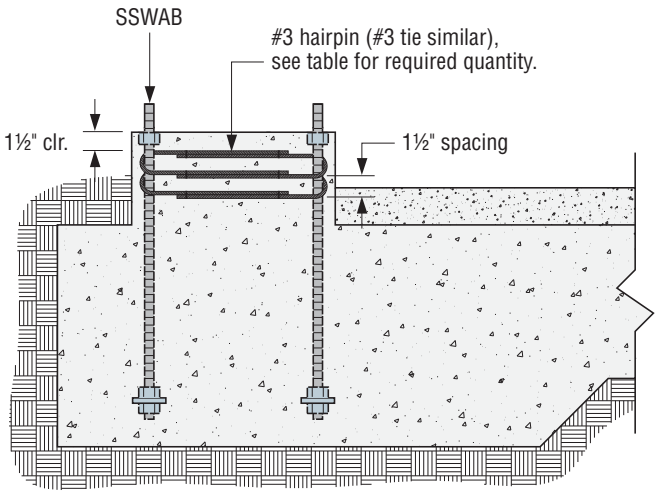
1. Shear anchorage designs conform to ACI 318-14 Chapter 17 and 318-11 and assume minimum f'_c = 2,500 psi concrete. See pp. 60–61 for tension anchorage.
2. Shear reinforcement is not required for panels installed on a wood floor, interior foundation applications *(panel installed away from edge of concrete)*, or braced-wall panel applications.
3. Seismic indicates Seismic Design Category C through F. Detached 1 and 2 family dwellings in SDC C may use wind anchorage solutions. Seismic shear reinforcement designs conform to ACI 318-14 Section 17.2.3.5.3 and ACI 318-11 Section D.3.3.5.
4. Wind includes seismic design category A and B and detached one- and two-family dwellings in SDC C.
5. Where noted minimum curb/stemwall width is 6" when standard-strength SSWAB is used.
6. Use (1) #3 tie for SSW12 and SSW15 when the Steel Strong-Wall design shear force exceeds the tabulated anchorage allowable shear load.
7. No. 4 grade 40 shear reinforcement may be substituted for SSW shear anchorage solutions.
8. The registered design professional may specify alternate shear anchorage.



Hairpin Shear Reinforcement



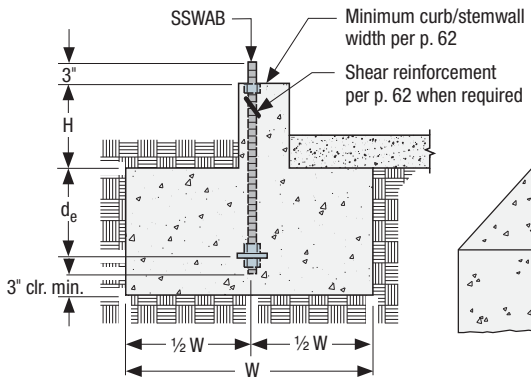
Tie Shear Reinforcement



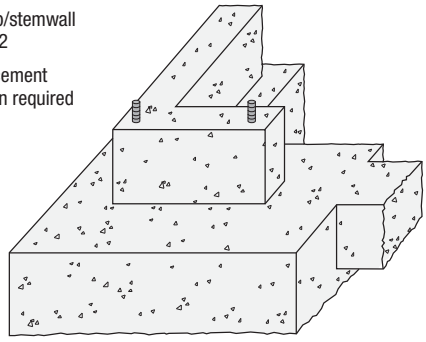
Hairpin Installation
(Garage curb shown, other footing types similar)

Steel Strong-Wall® Anchorage Solutions

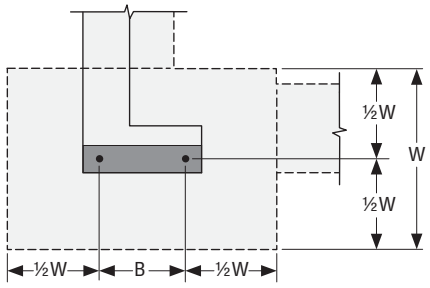
Curb or Stemwall Installation



Curb or Stemwall Section View

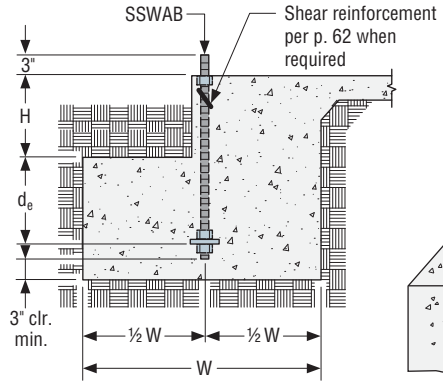


Perspective View
(Slab not shown for clarity)

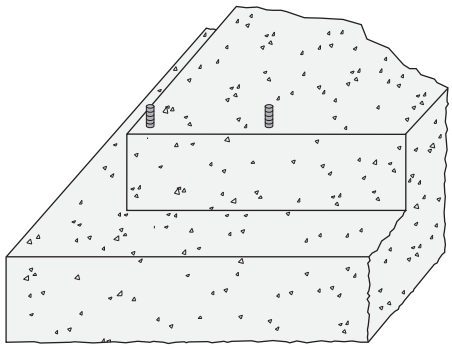


Footing Plan

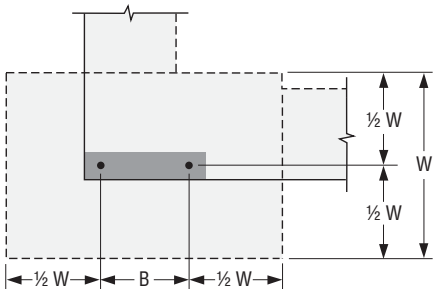
Slab-on-Grade Installation



Slab-on-Grade Section View

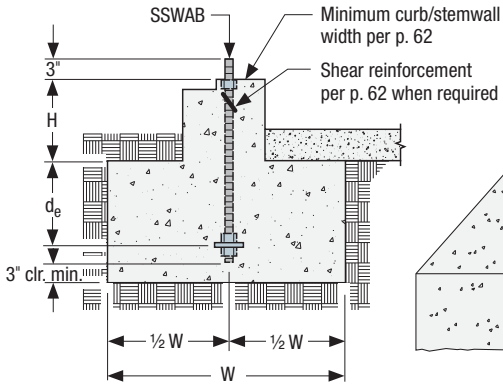


Perspective View

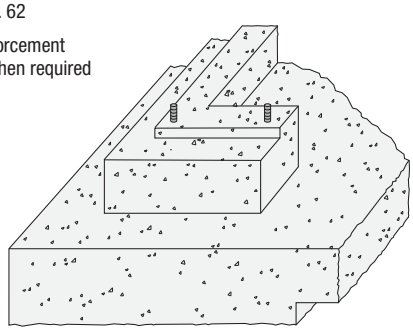


Footing Plan

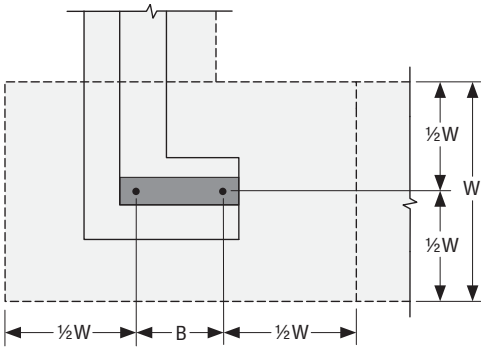
Brick Ledge Installation



Brick Ledge Section View



Perspective View



Footing Plan

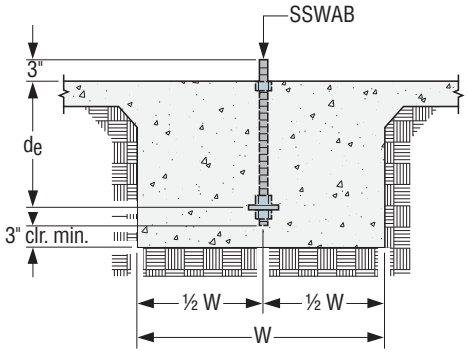
Anchorage Solutions General Notes

1. The designer may specify alternate embedment, footing size or bolt grade.
2. Footing dimensions and rebar requirements are for anchorage only.
3. See pp. 60–61 for W and d_e and p. 64 for B definitions.

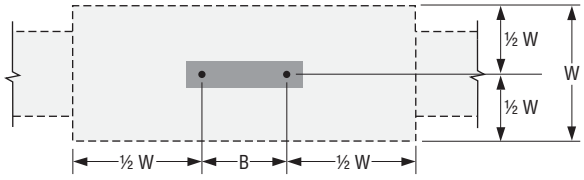
Foundation design *(size and reinforcement)* by designer.

Steel Strong-Wall® Anchorage Solutions

Interior Installation

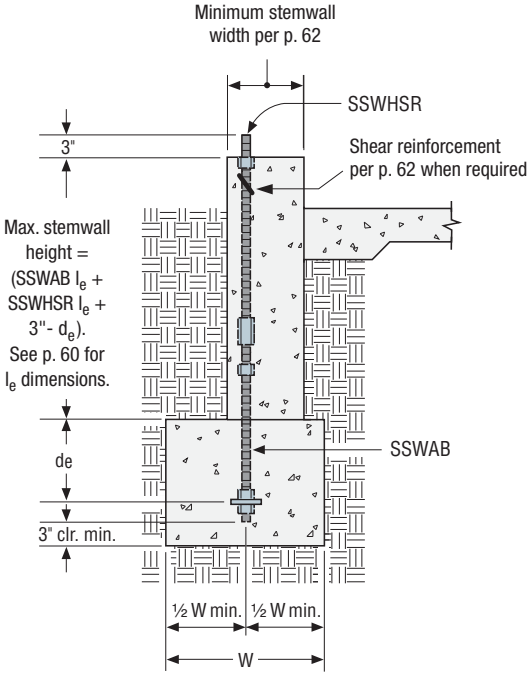


Interior Section View



Footing Plan

Stemwall Extension Installation



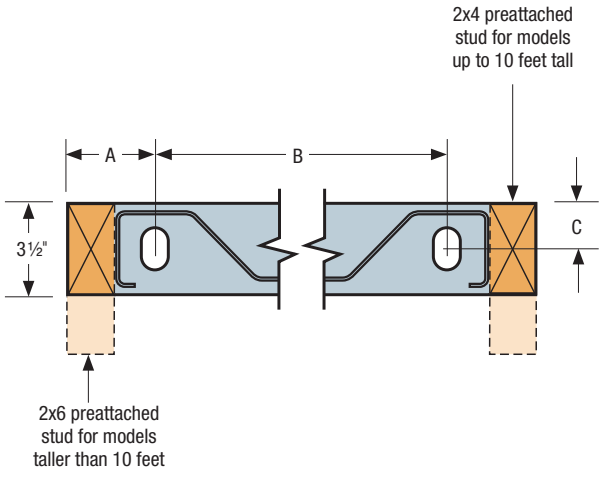
Section at Stemwall
SSWAB and SSWHSR
Extension Application

Anchorage Solutions General Notes

1. The designer may specify alternate embedment, footing size or bolt grade.
2. Footing dimensions and rebar requirements are for anchorage only.
3. See pp. 60–61 for W and d_e definitions.

Steel Strong-Wall® Anchor Bolt Layout

Model No.	Distance from End of Wall to Center of SSWABs, A (in.)	Distance from Center to Center of SSWABs, B (in.)	Distance from Exterior Face of Wall to Center of All SSWABs, C (in.)
SSW12	2 9/16	6 7/8	2
SSW15	2 7/8	9 1/4	1 7/8
SSW18	2 7/8	12 1/4	1 7/8
SSW21	2 7/8	15 1/4	1 7/8
SSW24	2 7/8	18 1/4	1 7/8



SSW Plan View
Anchorage Layout

Steel Strong-Wall® Anchor Bolt Templates

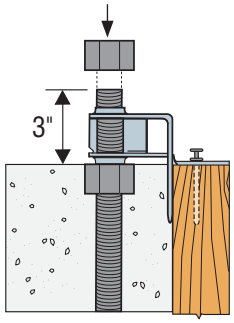
Simpson Strong-Tie has developed a reusable anchor bolt template for common foundation types for the Steel Strong-Wall. The templates help to accurately locate the SSWAB preassembled anchor bolts, which simplifies installation and greatly reduces the chances of voids in the concrete. In addition, Simpson Strong-Tie offers anchor bolt stabilizers that enable the Steel Strong-Wall anchorage to be installed without being tied to the footing rebar cage by helping to eliminate movement of the anchor bolts during concrete placement. Two bolt stabilizers are used for each SSW anchor assembly; one at the embedded plate washer and the other above the template. Half-inch diameter dowels (not supplied) are then driven down through the bolt stabilizers and into the ground to ensure plumb installation of the anchors and prevent movement during concrete placement. Immediately following concrete placement, the dowels are removed and reused in other locations.

Anchor Bolt Templates

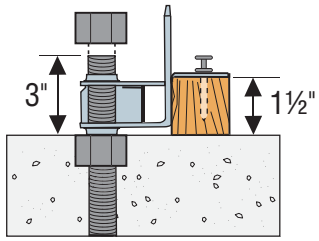
Steel Strong-Wall Model No.	Width (in.)	Anchor Bolt Stabilizer Model No.	Steel Strong-Wall Template Model			
			Reversible	Panel Form	Brick Ledge	Extended Leg
SSW12	12	SSWBS12	SSWT12	SSWTPF12	SSWTBL12	SSWTEL12
SSW15	15	SSWBS15	SSWT15	SSWTPF15	SSWTBL15	SSWTEL15
SSW18	18	SSWBS18	SSWT18	SSWTPF18	SSWTBL18	SSWTEL18
SSW21	21	SSWBS21	SSWT21	SSWTPF21	SSWTBL21	SSWTEL21
SSW24	24	SSWBS24	SSWT24	SSWTPF24	SSWTBL24	SSWTEL24

1. The height of the garage curb above the garage slab is critical for rough header opening at garage return walls.
2. See Garage Header Rough Opening Height table on p. 47.
3. Templates are recommended and are required in some jurisdictions.
4. Foundation design by designer.
5. Reversible, panel form and brick ledge templates are the same for 4"- or 6"-thick walls.

An additional nut for template installation is provided with each SSWAB. It may also be used for SSW installation.

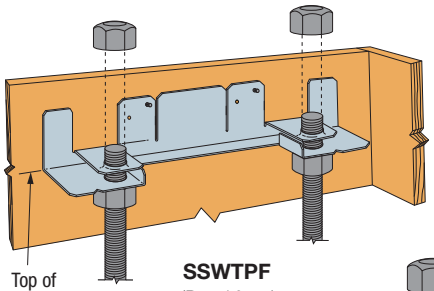


Anchor Bolt Height (Exterior)

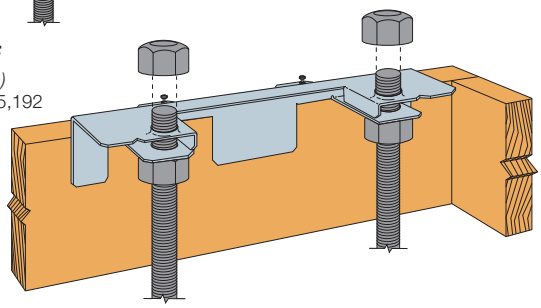


Anchor Bolt Height (Interior)

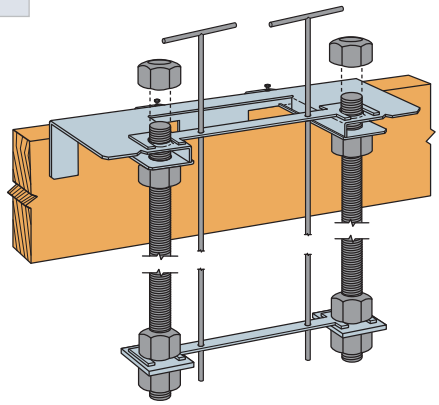
*SSWTXX templates are reversible. Use the same template for interior or exterior applications.



SSWTPF
(Panel form)
US Patent 7,445,192

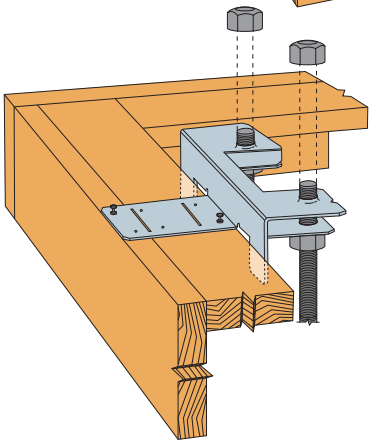


SSWT Exterior Installation*
(May be used for steel form systems)
US Patent 7,445,192

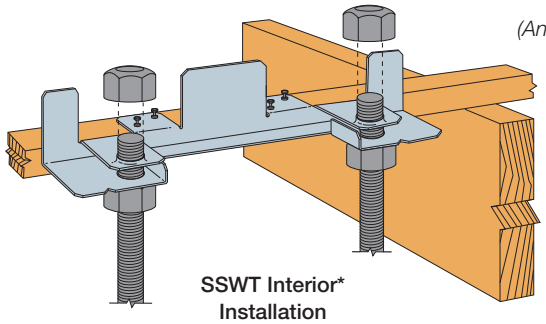


SSWTEL with Anchor Bolt Stabilizers
(Extended Leg)
Allows for placement of Steel Strong-Wall flush with inside face of 2x6 framed exterior wall
US Patent 7,445,192

(Anchor bolt stabilizers are sold separately. Optional T-shape dowel by others.)



SSWTBL
(Brick ledge)
US Patent 7,445,192



SSWT Interior* Installation
US Patent 7,445,192

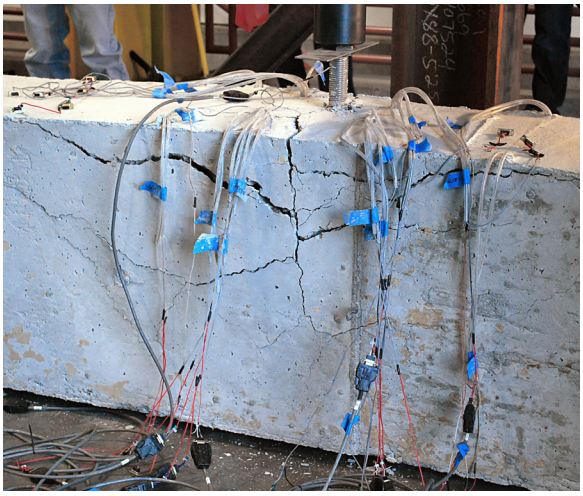
Anchor Reinforcement Solutions on Grade Beams

Simpson Strong-Tie now provides grade beam anchorage solutions for the Steel Strong-Wall®, which have been calculated to conform to ACI 318-14. Through funding from the Structural Engineers Association of Northern California, initial testing at Scientific Construction Laboratories Inc. confirmed the need to comply with ACI 318 requirements to prevent plastic hinging at anchor locations. Follow-up testing at the Simpson Strong-Tie Tyrell Gilb Research Laboratory was then used to confirm these findings and validate performance. The testing consisted of specimens with closed tie anchor reinforcement, non-closed u-stirrups and control specimens without anchor reinforcement. Flexural and shear reinforcement were designed to resist amplified anchorage forces and compared to test beams designed for non-amplified strength level forces. The test program has proven the performance of the anchor reinforcement details developed by Simpson Strong-Tie.

Signifcant Findings from Testing

Grade beam flexural and shear capacity is critical to anchor performance and must be designed to exceed the demands created by the attached structure. In wind load applications, this demand includes the factored demand from the Steel Strong-Wall (SSW) shearwall. In seismic applications, testing and analysis have shown that in order to achieve the anchor performance expected by ACI 318 anchorage design methodologies, the concrete member design strength needs to resist the amplified anchor design demand from ACI 318-14 Section 17.2.3.4.3 and ACI 318-11 Appendix D Section D.3.3.4.3. To help designers achieve this, Simpson Strong-Tie recommends designers apply the seismic design moment listed in the table below at the SSW location when evaluating the grade beam design strength under seismic loads. The tabulated moment correlates to the lowest of the anchor tension design limits defined in the sections listed above as they relate to each SSW model.

Closed tie anchor reinforcement is critical to maintain the integrity of the reinforced core where the anchor is located. Testing with u-stirrups that did not include complete closed ties showed premature splitting failure of the grade beam.



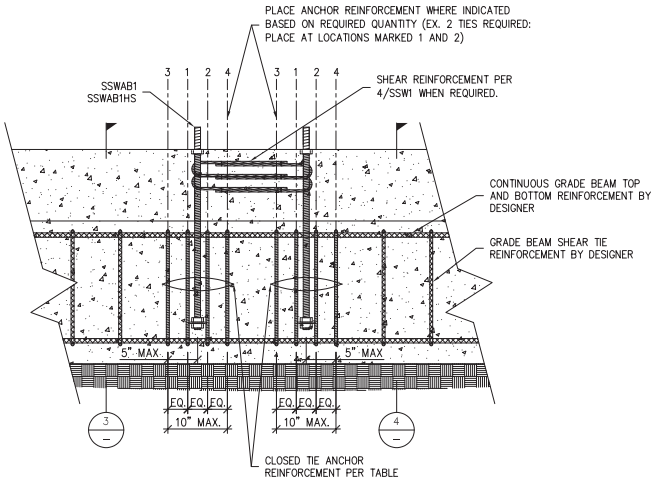
Grade Beam Testing

Steel Strong-Wall Grade Beam Anchorage Solutions

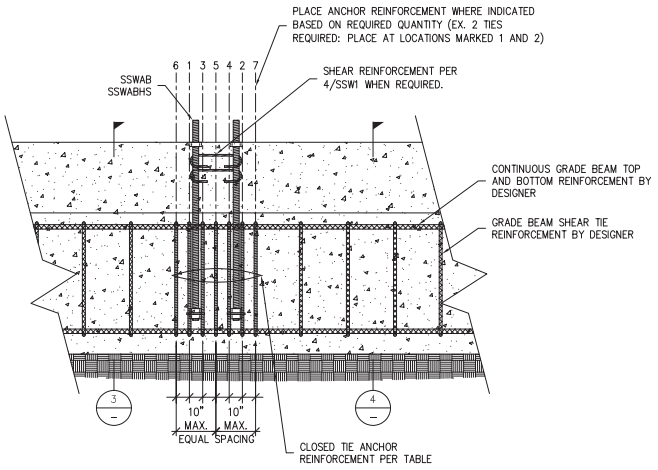
Steel Strong-Wall Model No.	Anchor Bolt Model No.	Anchor Diameter (in.)	Anchor Reinforcement for Wind and Seismic		Amplified LRFD Applied Design Seismic Moment (ft.-lb.)	
			Standard-Strength SSWAB	High-Strength SSWABHS	Standard-Strength SSWAB	High-Strength SSWABHS
SSW12	SSWAB¾	¾	(2) #4 Closed Ties / Wall	(5) #4 Closed Ties / Wall	16,700	23,000
SSW15	SSWAB1	1	(4) #4 Closed Ties / Wall	(7) #4 Closed Ties / Wall	37,000	44,000
SSW18			(2) #4 Closed Ties / Anchor	(4) #4 Closed Ties / Anchor	48,700	61,000
SSW21					60,300	77,000
SSW24					72,000	87,000

1. Anchor reinforcement conforms to ACI 318-14 Section 17.2.4.9 and ACI 318-11, section D.5.2.9. Full-scale testing was used to validate anchor reinforcement configuration and placement.
2. Minimum concrete compressive strength, f'_c = 2,500 psi.
3. Closed-tie anchor reinforcement to be ASTM A615 Grade 60 (min.) #4 rebar.
4. Grade beam longitudinal and tie reinforcement shall be specified by the registered design professional for flexure and shear loading. Design should consider project specific design loads and allowable soil pressure.
5. Simpson Strong-Tie recommends using the tabulated minimum LRFD-applied seismic design moment to ensure grade-beam design flexure and shear strength is adequate to prevent plastic hinge formation under demands associated with anchorage forces corresponding to ACI 318-14 Section 17.2.3.4.3 and ACI 318-11, Section D.3.3.4.3.
6. Designer may use reduced moment due to applied SSW lateral load. Minimum moment shall be the lesser of the tabulated moment or the amplified LRFD design moment for seismic: (ASD design demand Shear/0.7) x Ω_o x SSW height for grade beam design.
7. Minimum grade beam design moment for wind and seismic in Seismic Design Category A and B and detached one- and two-family dwellings in SDC C: (ASD design demand Shear/0.6) x SSW height.
8. Closed tie may be single piece hoop or two piece assembly with a u-stirrup with 135 degree hooks and a top cross tie cap. See detail 6/SSW1.1.
9. See details for grade-beam anchor reinforcement placement, installation and spacing requirements. Closed-tie anchor reinforcement quantity is per wall for the 12" and 15" wall models, and per anchor for the 18", 21" and 24" models.

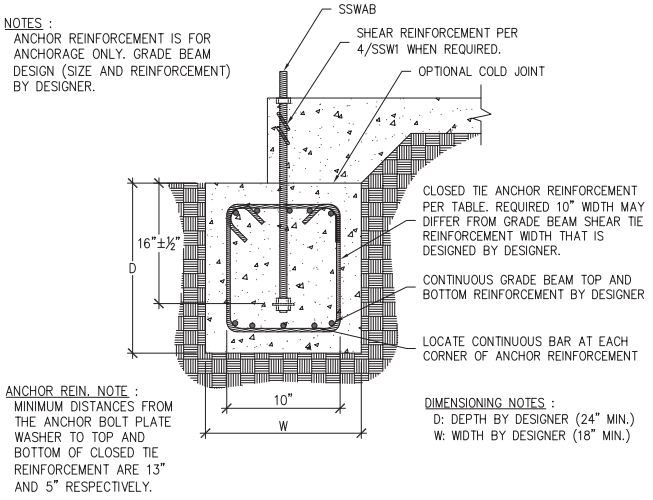
Anchor Reinforcement Solutions on Grade Beams



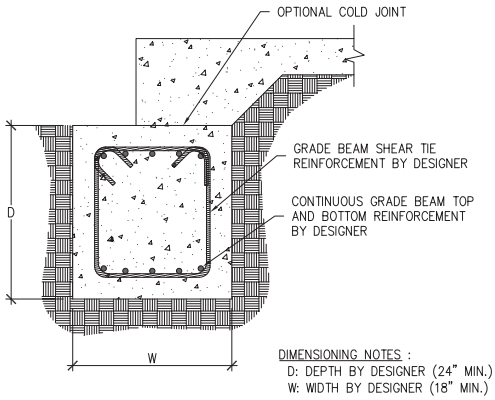
GRADE BEAM ELEVATION AT 18", 21" AND 24" WALL MODELS	1/SSW1.1



GRADE BEAM ELEVATION AT 12" AND 15" WALL MODELS	2/SSW1.1

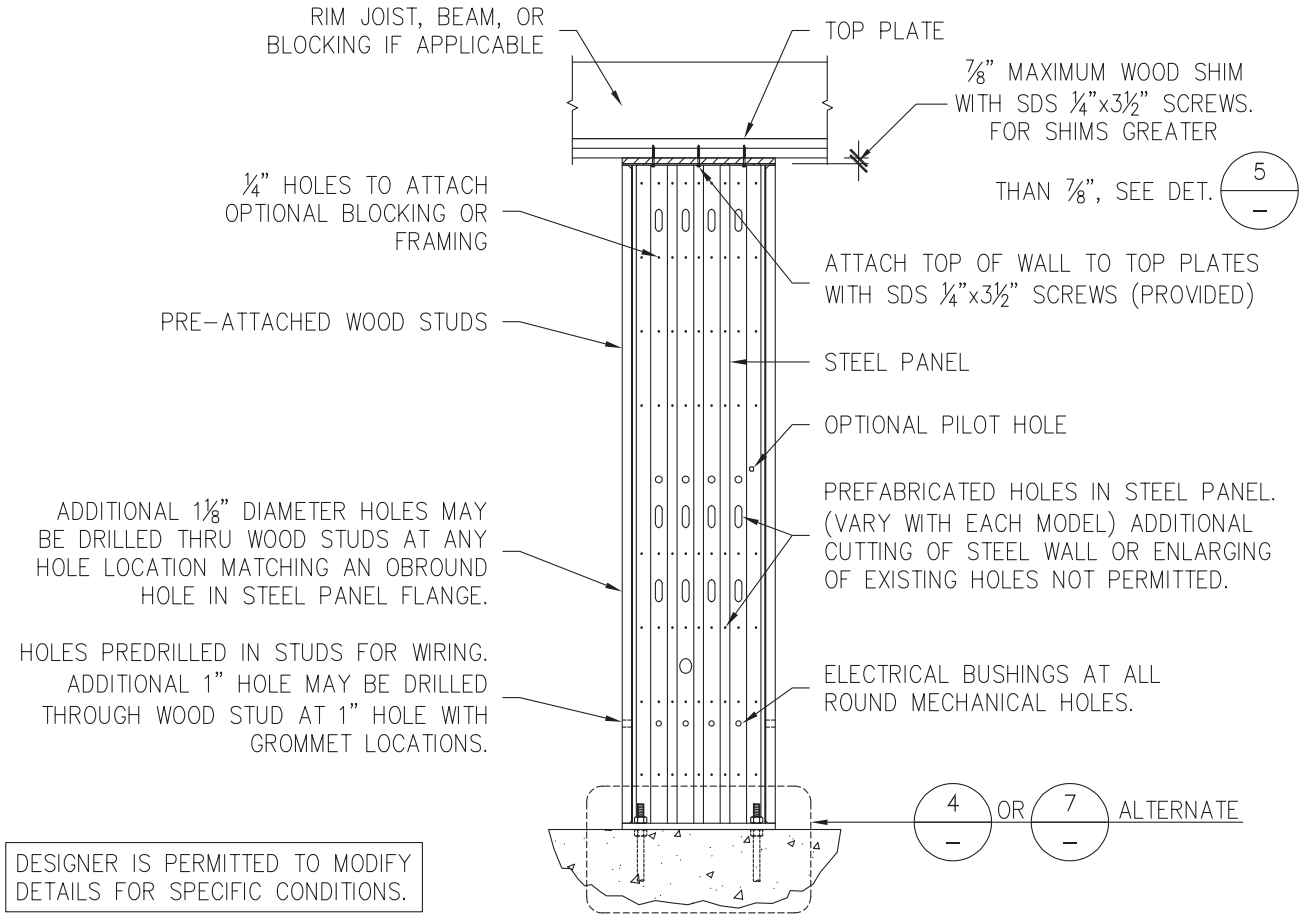


GRADE BEAM SECTION AT ANCHOR REINFORCEMENT	3/SSW1.1

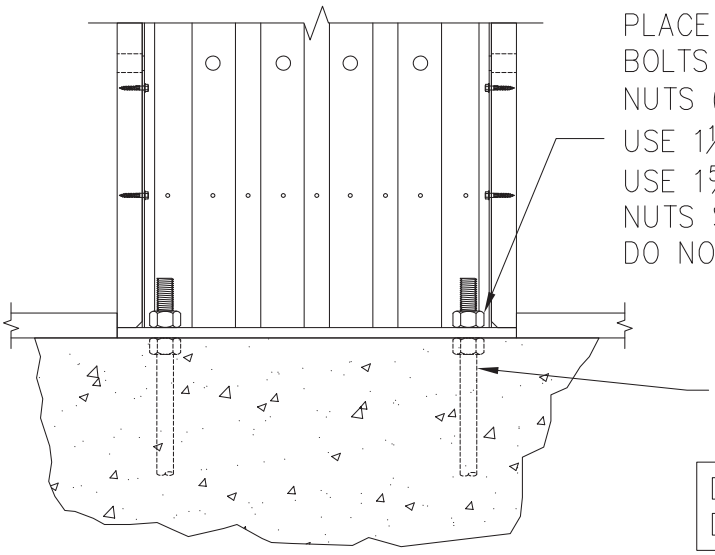


GRADE BEAM SECTION AWAY FROM ANCHOR REINFORCEMENT	4/SSW1.1

Steel Strong-Wall® Structural Details



SINGLE-STORY STEEL STRONG-WALL® SHEARWALL ON CONCRETE	2/SSW2



STEEL STRONG-WALL® SHEARWALL ON CONCRETE	4/SSW2

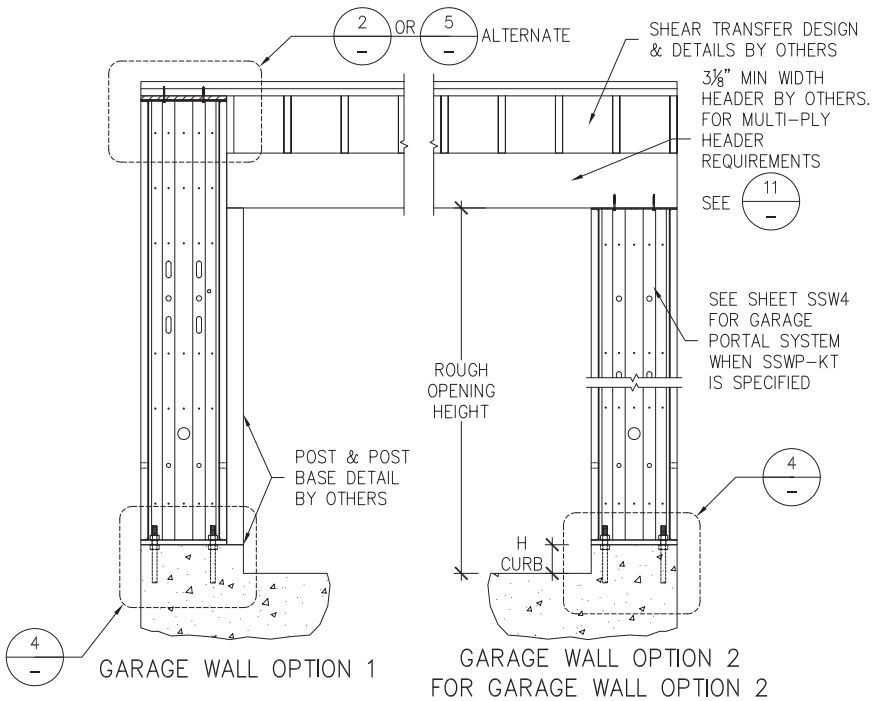
Steel Strong-Wall® Structural Details

GARAGE HEADER
ROUGH OPENING HEIGHT

MODEL NO.	H CURB	ROUND OPENING HEIGHT
SSW12X7 SSW15X7 SSW18X7 SSW21X7 SSW24X7	5½"	7'–1½"
	6"	7'–2"
SSW12X7 SSW15X7 SSW18X7 SSW21X7 SSW24X7	5½"	8'–2¾"
	6"	8'–3¼"

1. THE HEIGHT OF THE GARAGE CURB ABOVE THE GARAGE SLAB IS CRITICAL FOR THE ROUGH HEADER OPENING AT GARAGE RETURN WALLS.
2. SHIMS ARE NOT PROVIDED WITH STEEL STRONG–WALL.
3. FURRING ON UNDERSIDE OF GARAGE HEADER MAY BE NECESSARY FOR LESSER ROUGH OPENING HEIGHTS.

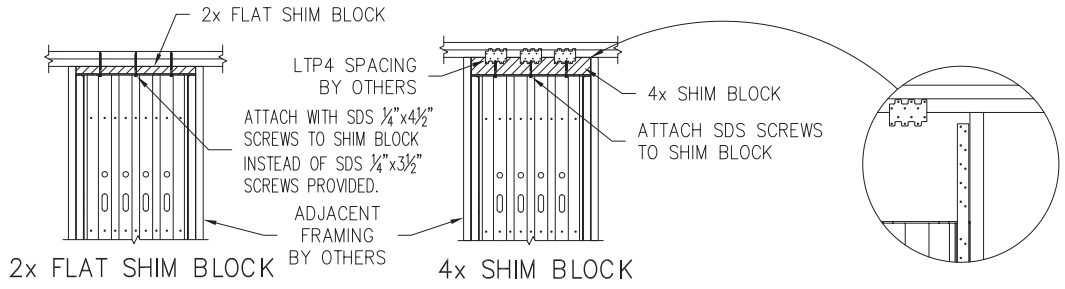
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.



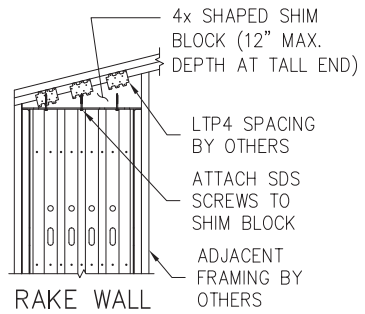
NOTE:
7–FT. HIGH STEEL STRONG–WALL MODELS ARE 80", 4" SHORTER THAN 7–FT. HIGH STRONG–WALL HIGH–STRENGTH WOOD SHEARWALLS

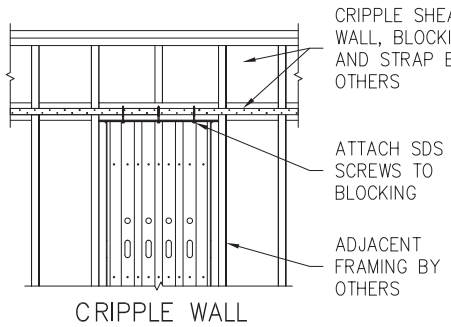
DESIGNER SHALL DESIGN FOR:
1. SHEAR TRANSFER
2. OUT OF PLANE LOADING EFFECT
3. INCREASED OVERTURNING AND DRIFT DUE TO ADDITIONAL HEIGHT

ALTERNATE GARAGE WALL OPTIONS — 3/SSW2



FOR 8" TO 12" BLOCK DEPTHS:
SIMPSON CS16 STRAPS REQUIRED WITH 0.148x1½ NAILS
SHIM BLOCK HEIGHTS GREATER THAN 8" AND UP TO 10":
8 NAILS INTO BLOCK
8 INTO SSW NAILER STUD
SHIM BLOCK HEIGHTS GREATER THAN 10" AND UP TO 12":
10 NAILS INTO BLOCK
10 INTO SSW NAILER STUD



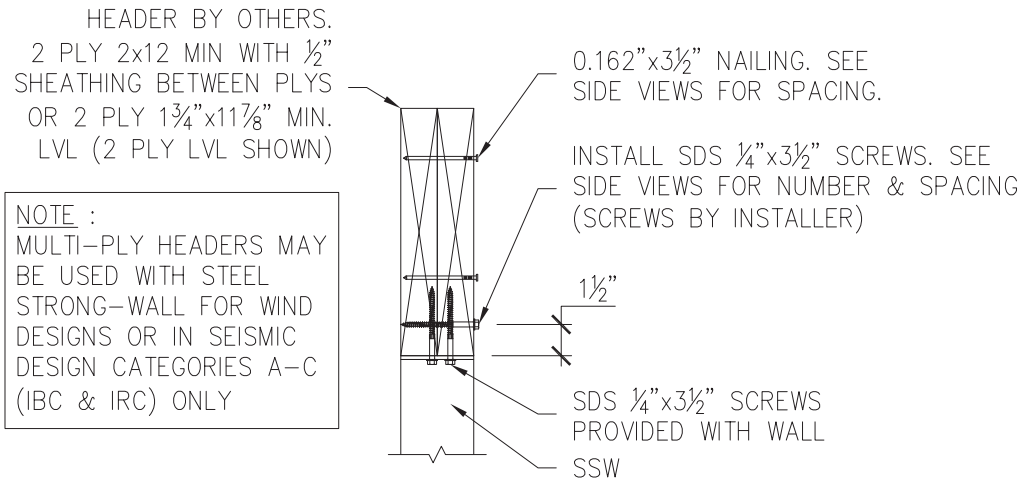


DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

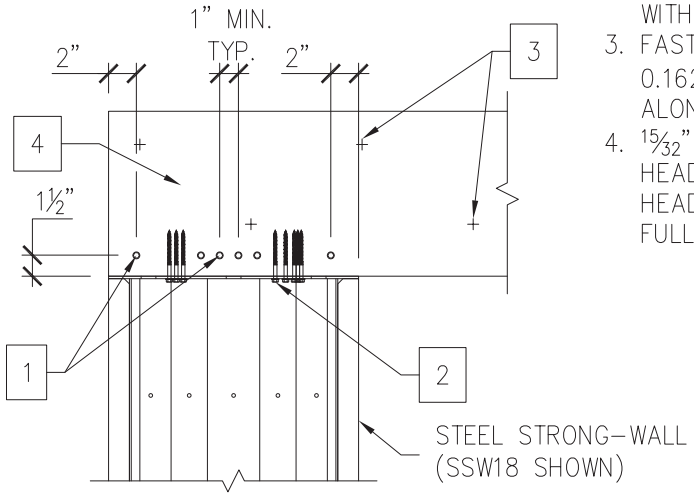
DESIGNER SHALL DESIGN FOR:
1. SHEAR TRANSFER
2. OUT OF PLANE LOADING EFFECT
3. INCREASED OVERTURNING AND DRIFT DUE TO ADDITIONAL HEIGHT

TOP OF WALL HEIGHT ADJUSTMENTS — 5/SSW2

Steel Strong-Wall® Structural Details



SSW MULTI-PLY HEADER CROSS SECTION

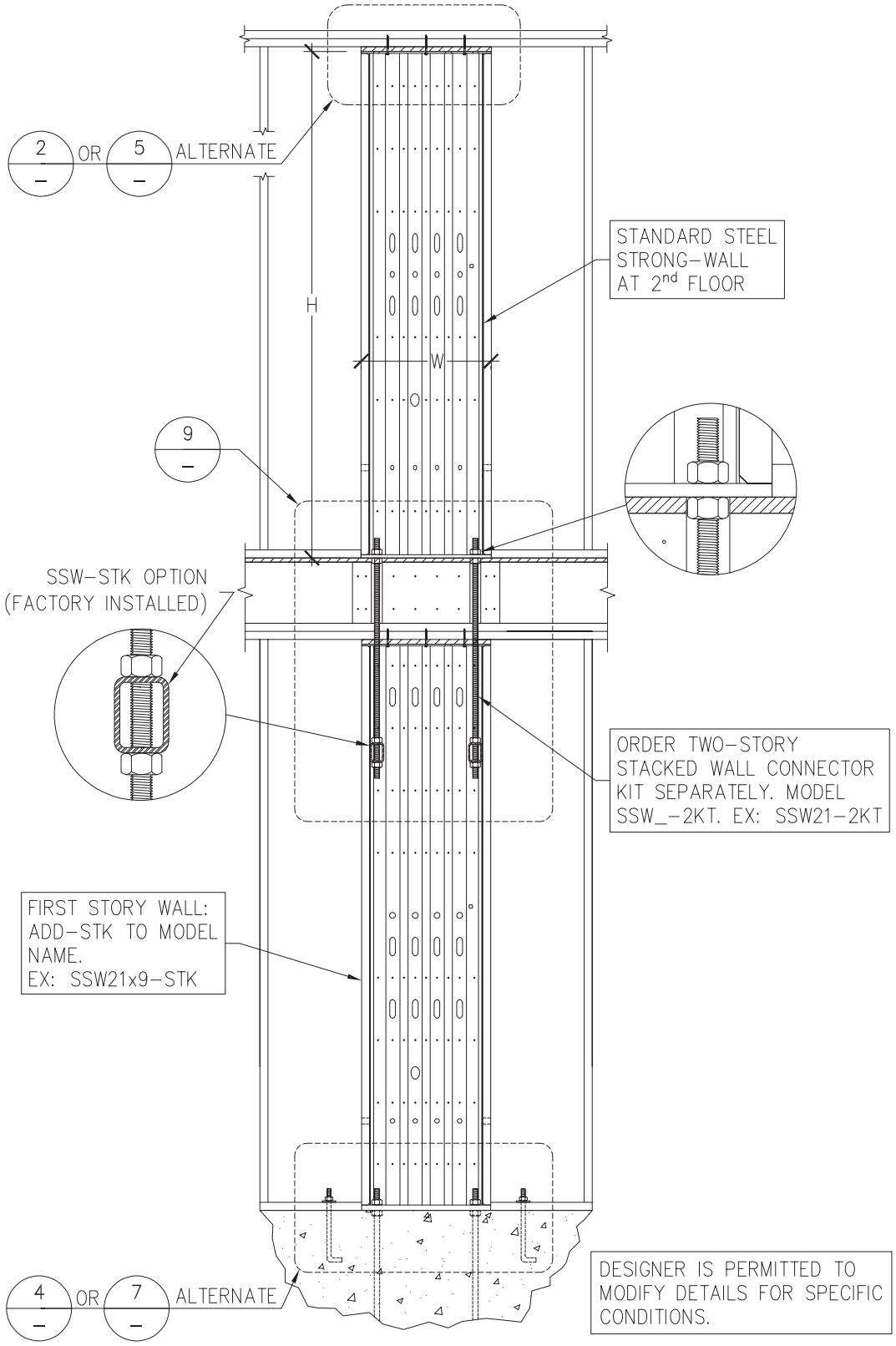


SIDE VIEW
SSW WITH MULTI-PLY HEADER

1. INSTALL SDS ¼"x3½" SCREWS HORIZONTALLY THROUGH LVL OR 2x LUMBER HEADER PLYS. 4 SCREWS TOTAL FOR SSW12, 6 SCREWS TOTAL FOR SSW15, SSW18, SSW21 AND SSW24.
2. SDS ¼"x3½" SCREWS PROVIDED WITH WALL
3. FASTEN PLYS TOGETHER WITH 0.162"x3½" NAILS AT 16" O.C. ALONG EACH EDGE OF BEAM.
4. 15/32" SHEATHING BETWEEN 2x HEADER PLYS SHALL MATCH HEADER DEPTH AND EXTEND FULL WIDTH OF SSW, MINIMUM.

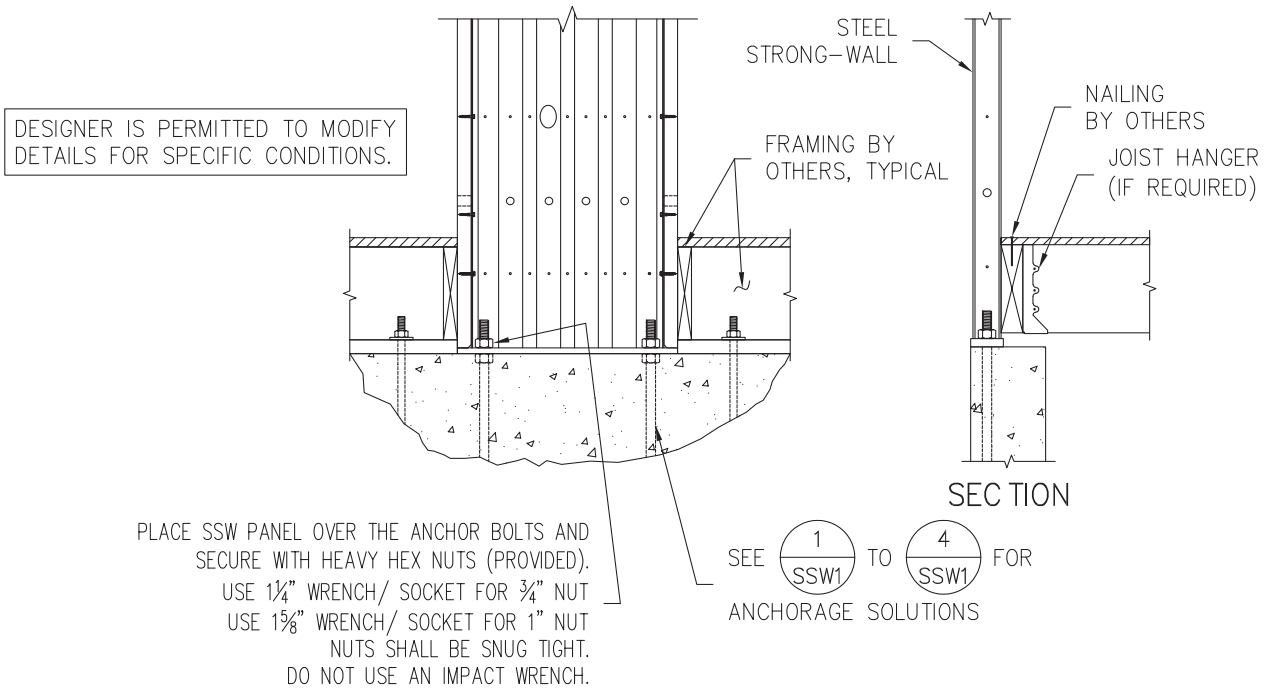
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

Steel Strong-Wall® Structural Details

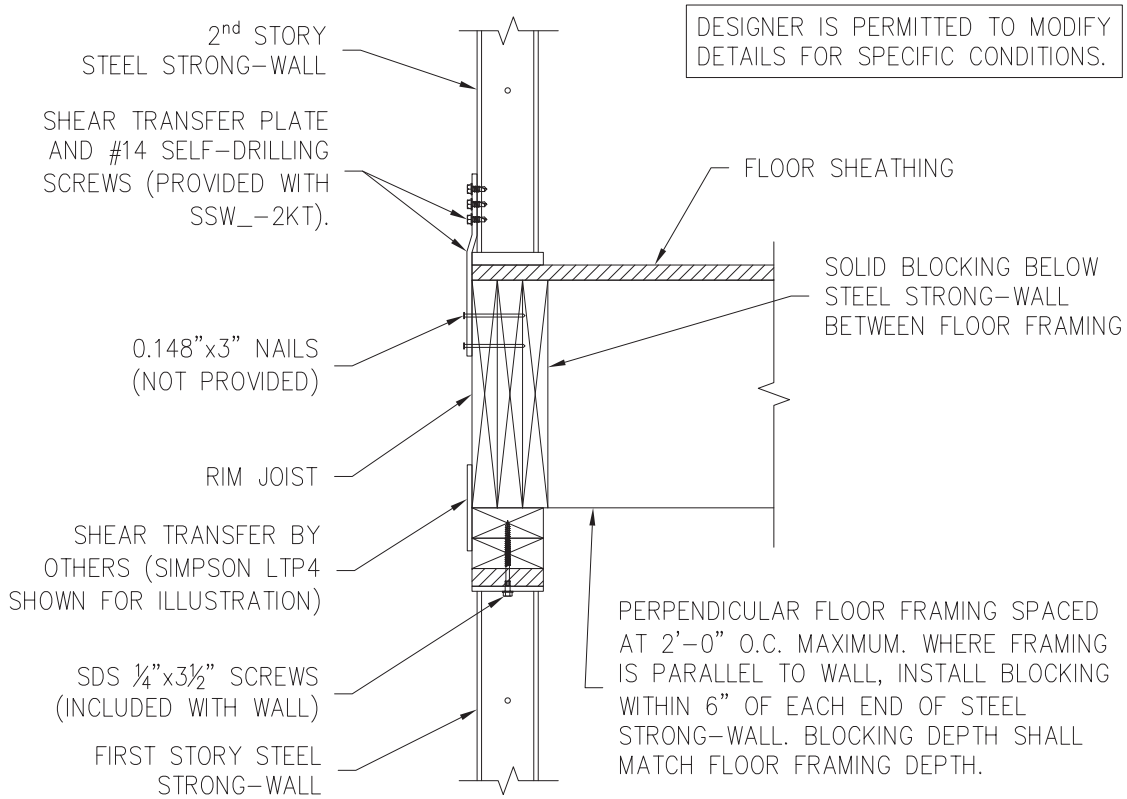


TWO-STORY STACKED	6/SSW2

Steel Strong-Wall® Structural Details

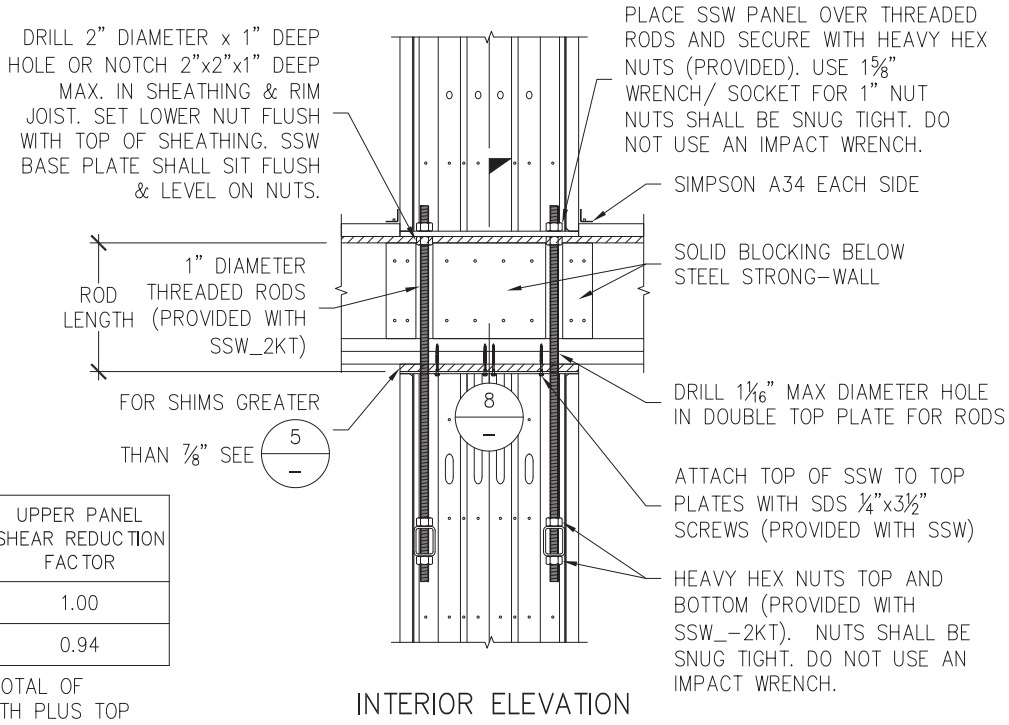


ALTERNATE 1ST FLOOR WOOD FRAMING	7/SSW2



TWO-STORY STACKED FLOOR SECTION	8/SSW2

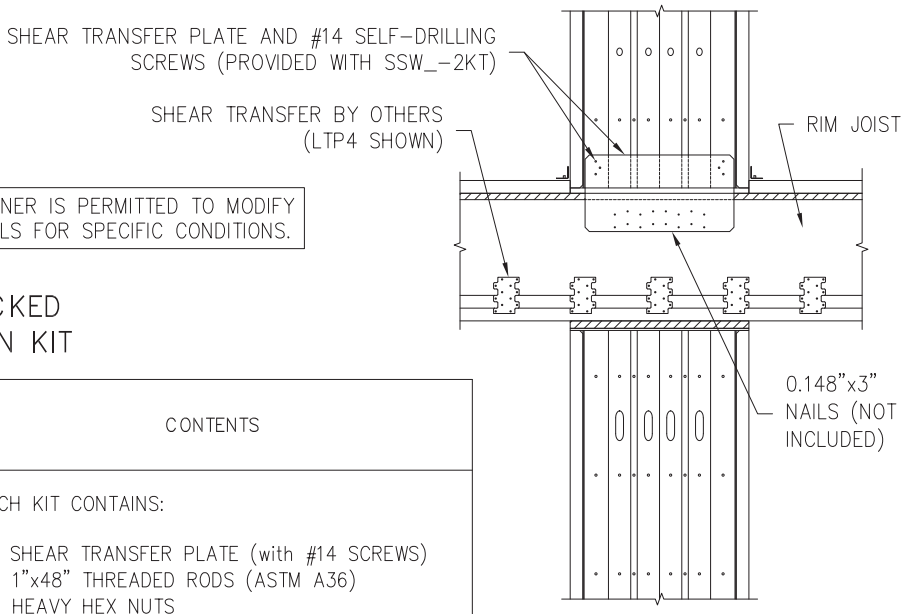
Steel Strong-Wall® Structural Details



INTERIOR ELEVATION

MAXIMUM ROD LENGTH	UPPER PANEL SHEAR REDUCTION FACTOR
18 INCHES	1.00
21 INCHES	0.94

ROD LENGTH IS TOTAL OF FLOOR JOIST DEPTH PLUS TOP PLATES PLUS SHIM THICKNESS.



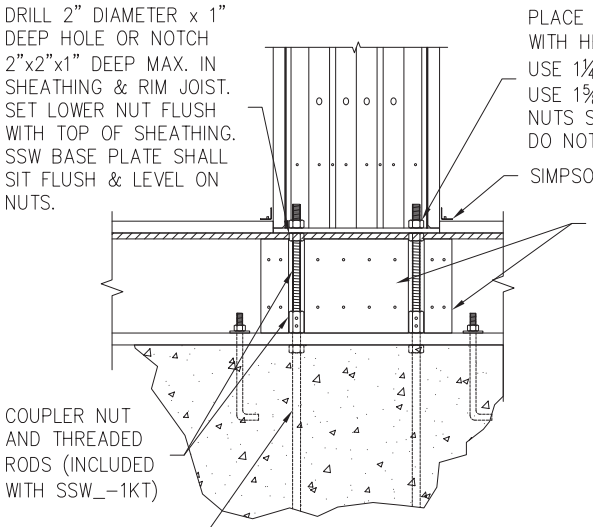
DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

EXTERIOR ELEVATION

TWO-STORY STACKED WALL CONNECTION KIT

WALL WIDTH (in)	MODEL NO.	CONTENTS
15	SSW15-2KT	EACH KIT CONTAINS: (1) SHEAR TRANSFER PLATE (with #14 SCREWS) (2) 1"x48" THREADED RODS (ASTM A36) (6) HEAVY HEX NUTS INSTALLATION INSTRUCTIONS
18	SSW18-2KT	
21	SSW21-2KT	
24	SSW24-2KT	

Steel Strong-Wall® Structural Details

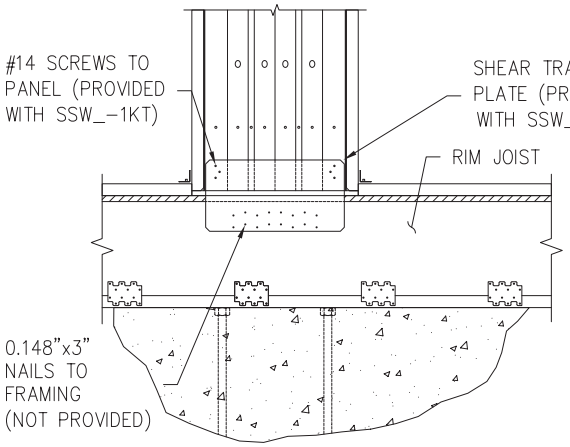


INTERIOR ELEVATION

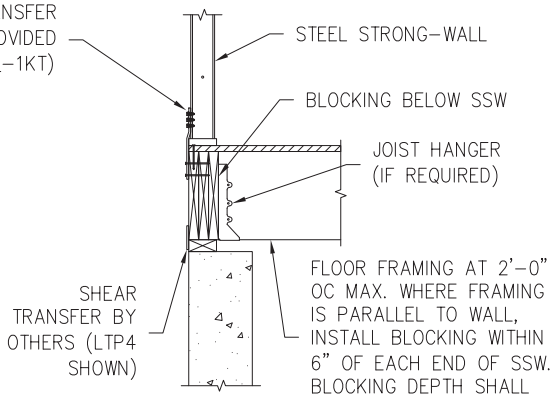
WOOD FIRST-FLOOR WALL CONNECTION KIT

WALL WIDTH (IN)	MODEL NO.	CONTENTS
12	SSW12-1KT	EACH KIT CONTAINS: (1) SHEAR TRANSFER PLATE (with #14 SCREWS) (2) ¾"x18" or 1"x18" THREADED RODS (ASTM A36) (2) COUPLER NUTS (2) HEAVY HEX NUTS INSTALLATION INSTRUCTIONS
15	SSW15-1KT	
18	SSW18-1KT	
21	SSW21-1KT	
24	SSW24-1KT	

ORDER FIRST FLOOR CONNECTOR KIT SEPARATELY.
MODEL SSW_-1KT. EXAMPLE: SSW21-1KT



EXTERIOR ELEVATION



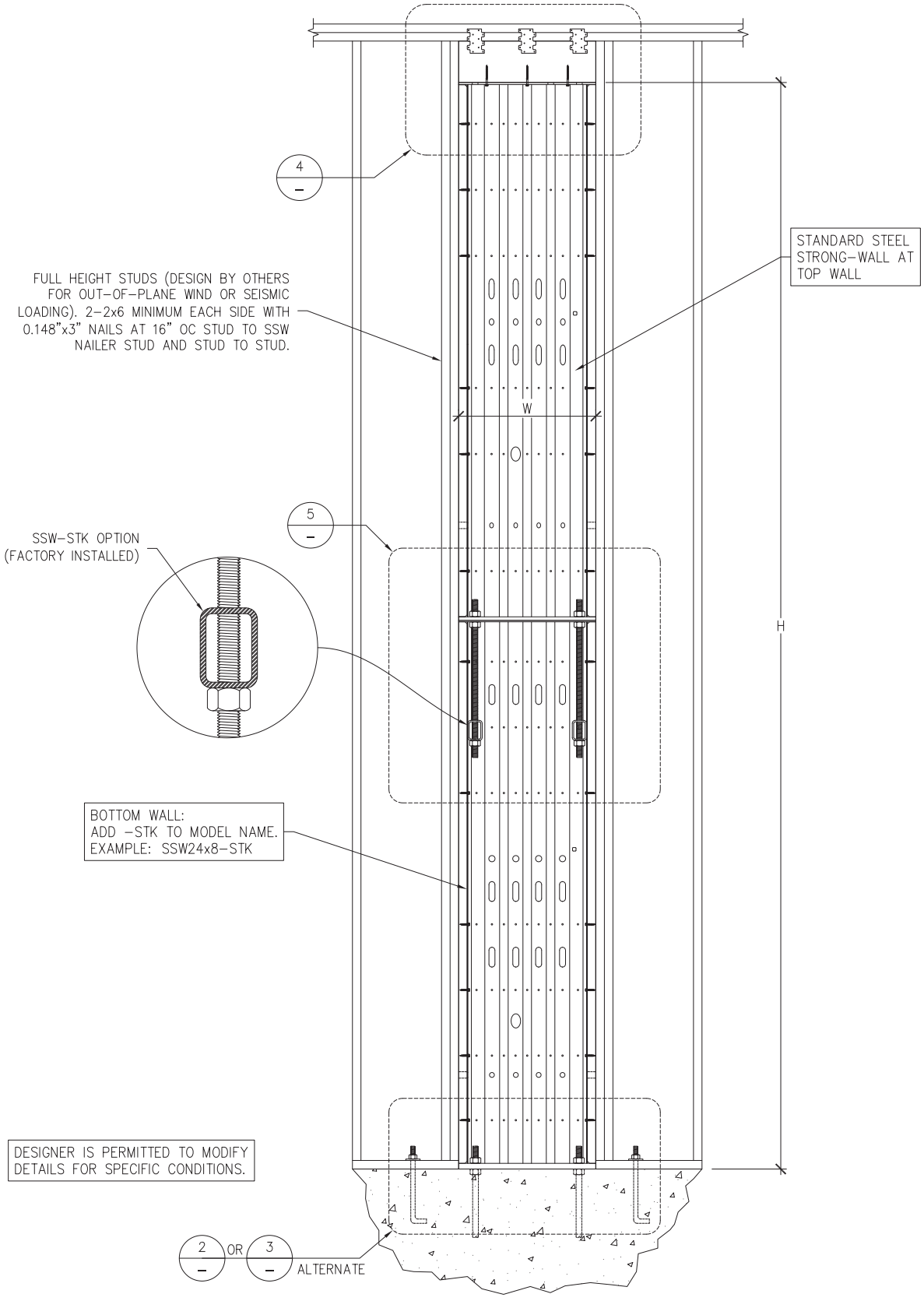
SECTION

FIRST FLOOR AT WOOD FRAMING NOTES :
1. USE WOOD FIRST-FLOOR ALLOWABLE LOAD TABLES FROM THE STRONG-WALL CATALOG FOR THIS INSTALLATION.
2. USE ALTERNATE DETAIL 7/- TO ACHIEVE MAXIMUM ON-CONCRETE ALLOWABLE LOADS.
3. FOR TWO-STORY STACKED STEEL STRONG-WALLS WITH WOOD FIRST FLOOR, USE ALTERNATE DETAIL 7/-
4. DESIGNER SHALL DESIGN FOR SHEAR TRANSFER FROM RIM JOIST TO SILL PLATE AND SILL PLATE TO FOUNDATION.

DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

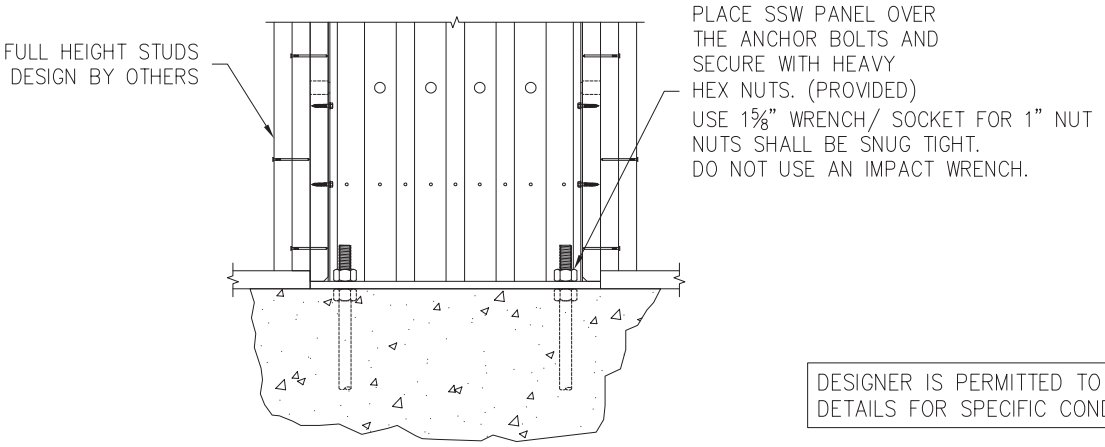
FIRST FLOOR AT WOOD FRAMING | 10/SSW2

Steel Strong-Wall® Structural Details

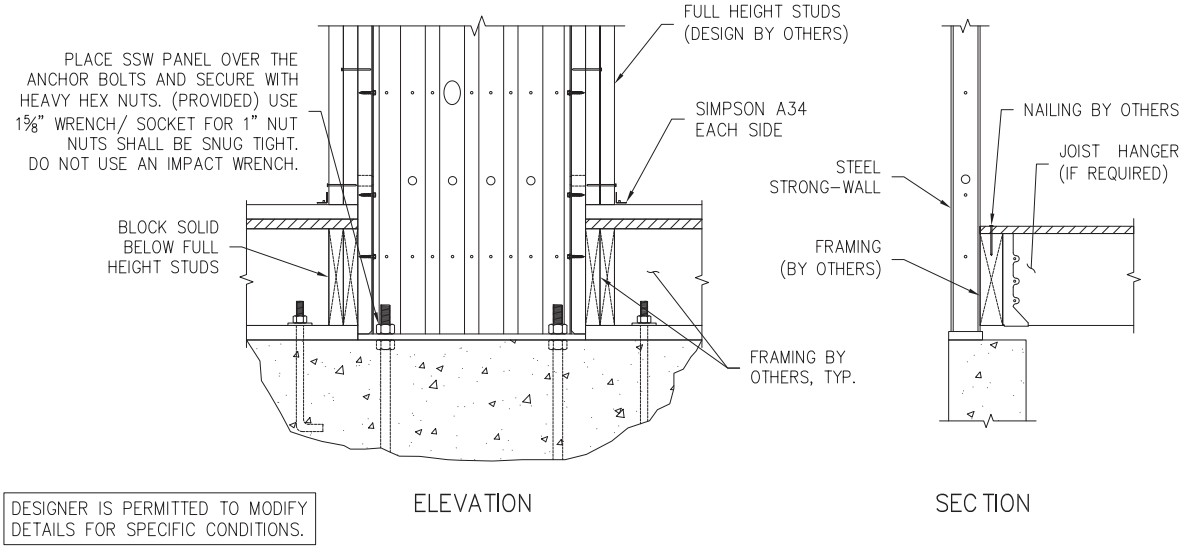


BALLOON FRAMING | 1/SSW3

Steel Strong-Wall® Structural Details

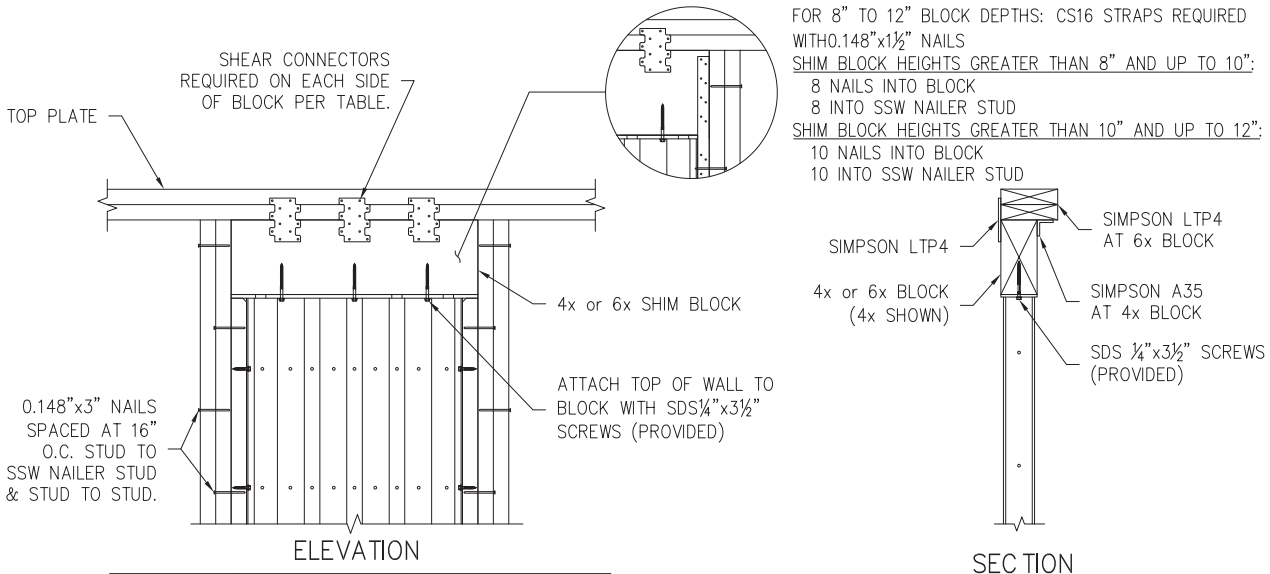


BALLOON FRAMING BASE PLATE CONNECTION	2/SSW3



BALLOON FRAMING AT WOOD FLOOR	3/SSW3

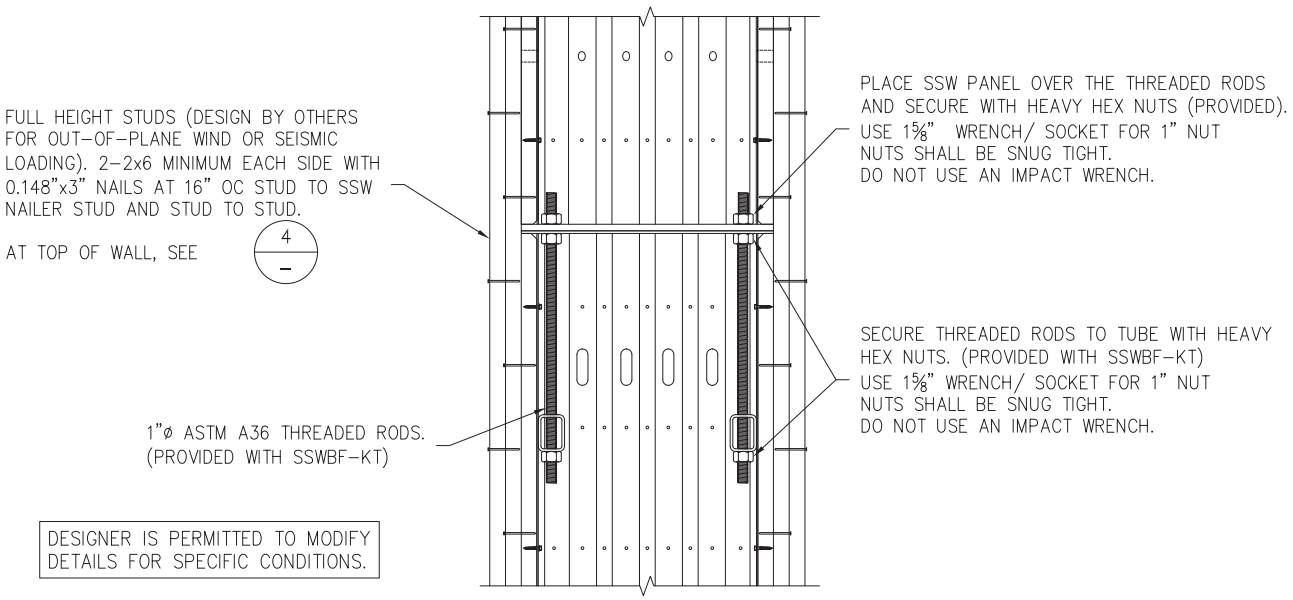
Steel Strong-Wall® Structural Details



WALL MODEL	TOTAL CONNECTORS	BLOCK TO TOP PLATE SHEAR CONNECTORS
15" WALL	4 (2 each side)	LTP4 OR A35
18" WALL	4 (2 each side)	LTP4 OR A35
21" WALL	6 (3 each side)	LTP4 OR A35
24" WALL	6 (3 each side)	LTP4 OR A35

DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

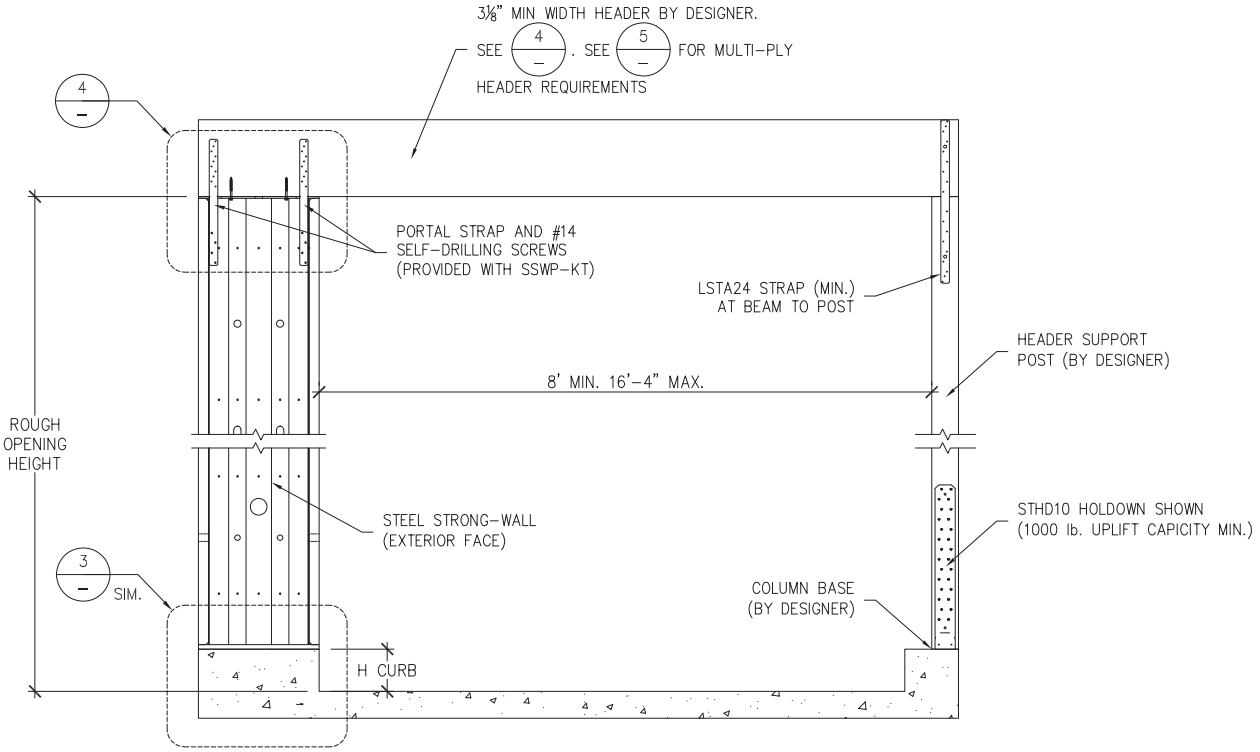
BALLOON FRAMING TOP OF WALL CONNECTION — 4/SSW3



DESIGNER IS PERMITTED TO MODIFY DETAILS FOR SPECIFIC CONDITIONS.

BALLOON FRAMING WALL TO WALL CONNECTION — 5/SSW3

Steel Strong-Wall® Structural Details



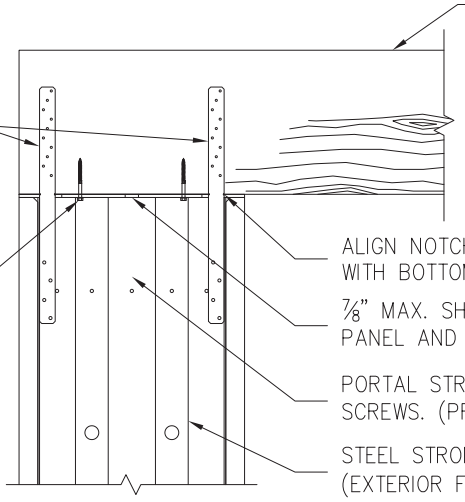
SINGLE PORTAL ASSEMBLY | 1/SSW4

NOTE :
LOAD PATH DESIGN AND DETAILS ABOVE HEADER TO BE PROVIDED BY DESIGNER.

FIELD NAIL PORTAL STRAP TO HEADER WITH (10) 0.148"x2½" MIN. NAILS. FASTEN STRAP TO PANEL WITH (4) #14 SELF-DRILLING SCREWS. (SCREWS PROVIDED WITH SSWP-KT)

SDS ¼"X3½" SCREWS (PROVIDED)

NOTE :
STRAPS MUST BE INSTALLED ON EXTERIOR FACE OF SSW PANEL. POSITION HEADER FLUSH WITH EXTERIOR FACE OF SSW PANEL.



FULL LENGTH GARAGE HEADER (BY DESIGNER)
MINIMUM SIZE SHALL BE:
4x12 DFL
3 1/8X12 GLB
ALTERNATE HEADERS ALLOWED. (BY DESIGNER) FOR MUITI-PLY HEADER REQUIREMENTS
SEE 5/–

ALIGN NOTCH ON STRAP WITH BOTTOM OF HEADER.

⅞" MAX. SHIM ALLOWED BETWEEN PANEL AND BEAM (NOT SHOWN).

PORTAL STRAP AND #14 SELF-DRILLING SCREWS. (PROVIDED WITH SSWP-KT)

STEEL STRONG-WALL (EXTERIOR FACE)

PORTAL TOP CONNECTION | 4/SSW4

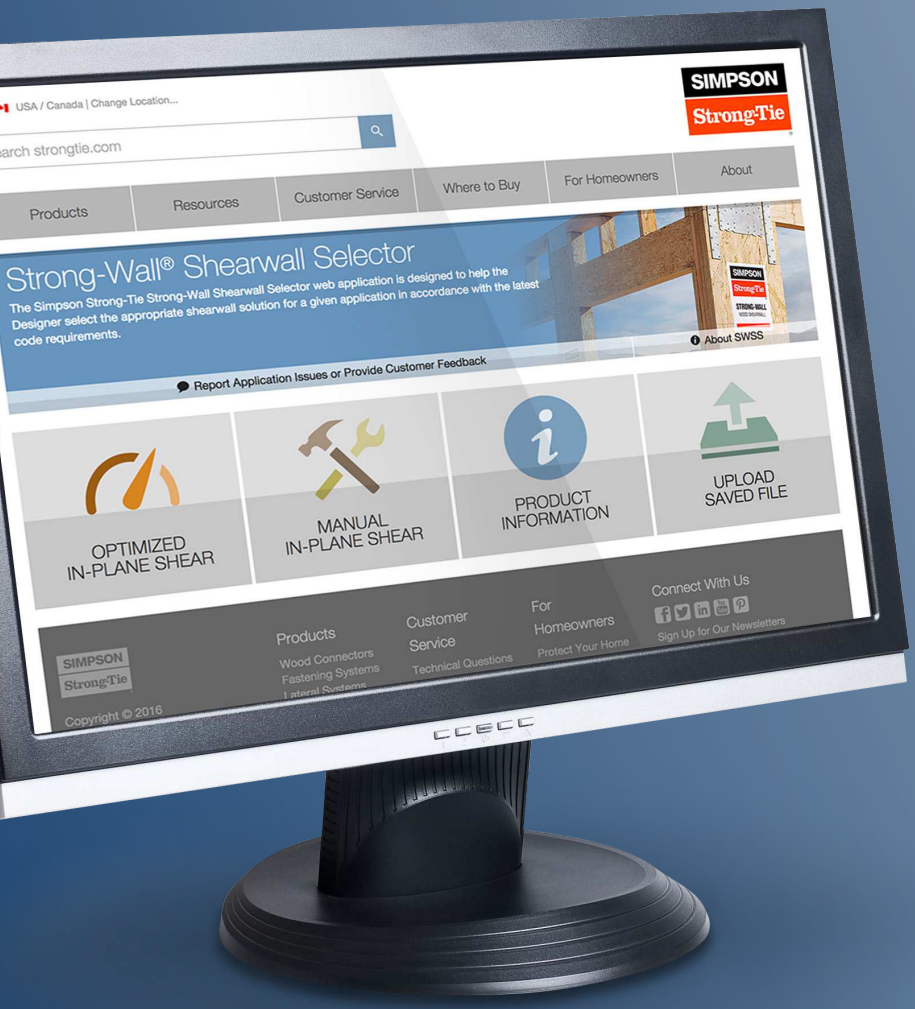
Notes

Notes

Notes

Notes

Simplify the process.



Select the right shearwall with the Strong-Wall® Shearwall Selector.

The Simpson Strong-Tie® Shearwall Selector web application helps designers choose shearwall solutions based on usage and building code. The web app complies with the 2018 International Building Code and includes our new Strong-Wall® high-strength wood shearwall.

For more information, call (800) 999-5099 or visit **strongtie.com/swss**.

SIMPSON
Strong-Tie®