16

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June 2, 2023

Ron Buchner
386.623.0175
bgbranch1@yahoo.com

re: ELEVATION LETTER – TBD SW SR 247, LAKE CITY, FL

As requested, I inspected the building site for the proposed construction at the above referenced site. The building pad was being constructed at the time of the inspection. The topography of the site drains to the west. The attached flood report shows no flood zones on the property; however, a special flood hazard area (SFHA) is shown. Per the attached site plan by others, the home will be placed outside of the SFHA.

The minimum finished floor elevation shall be 12" above the adjacent ground for the entire perimeter of the structure. The finished floor elevation will be below the required 1' above

the adjacent road; however, it is sufficient to protect the home from water damage in a base flood event.

I certify that the minimum finished floor elevation will protect the structure against water damage from a base flood event, as defined in Article 8 of the Land Development Regulations.

Should you have any questions, please don't hesitate to contact me.

Respectfully,

Digitally signed by Carol Chadwick
DN: c=US, o=Florida, dnQualifier=A01410D0000017EB6D924CE0005954C, cn=Carol Chadwick
Date: 2023.06.02 12:59:39 -04'00'

Carol Chadwick, P.E.

attachment: SRWMD Flood Report, site plan by others

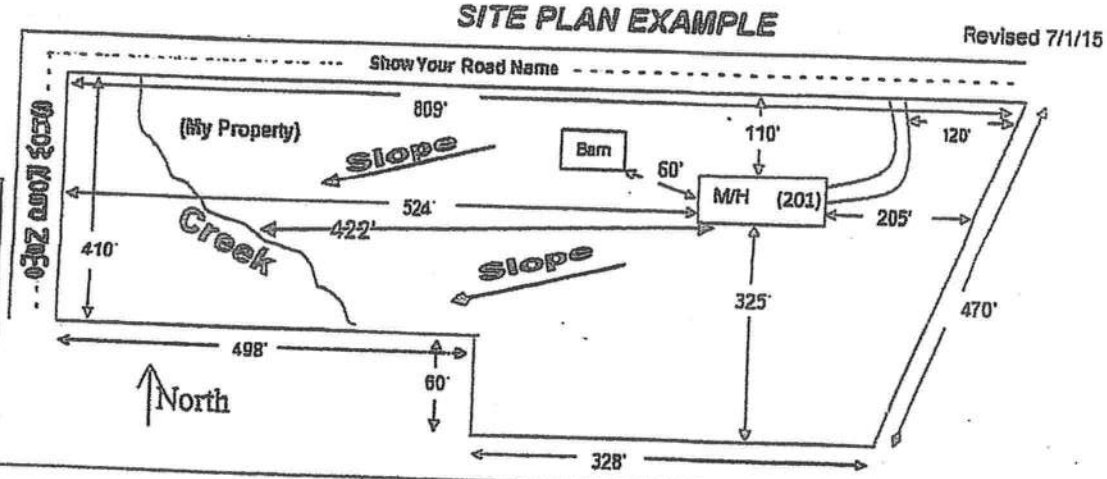
CC Job #FL23234

SITE PLAN CHECKLIST

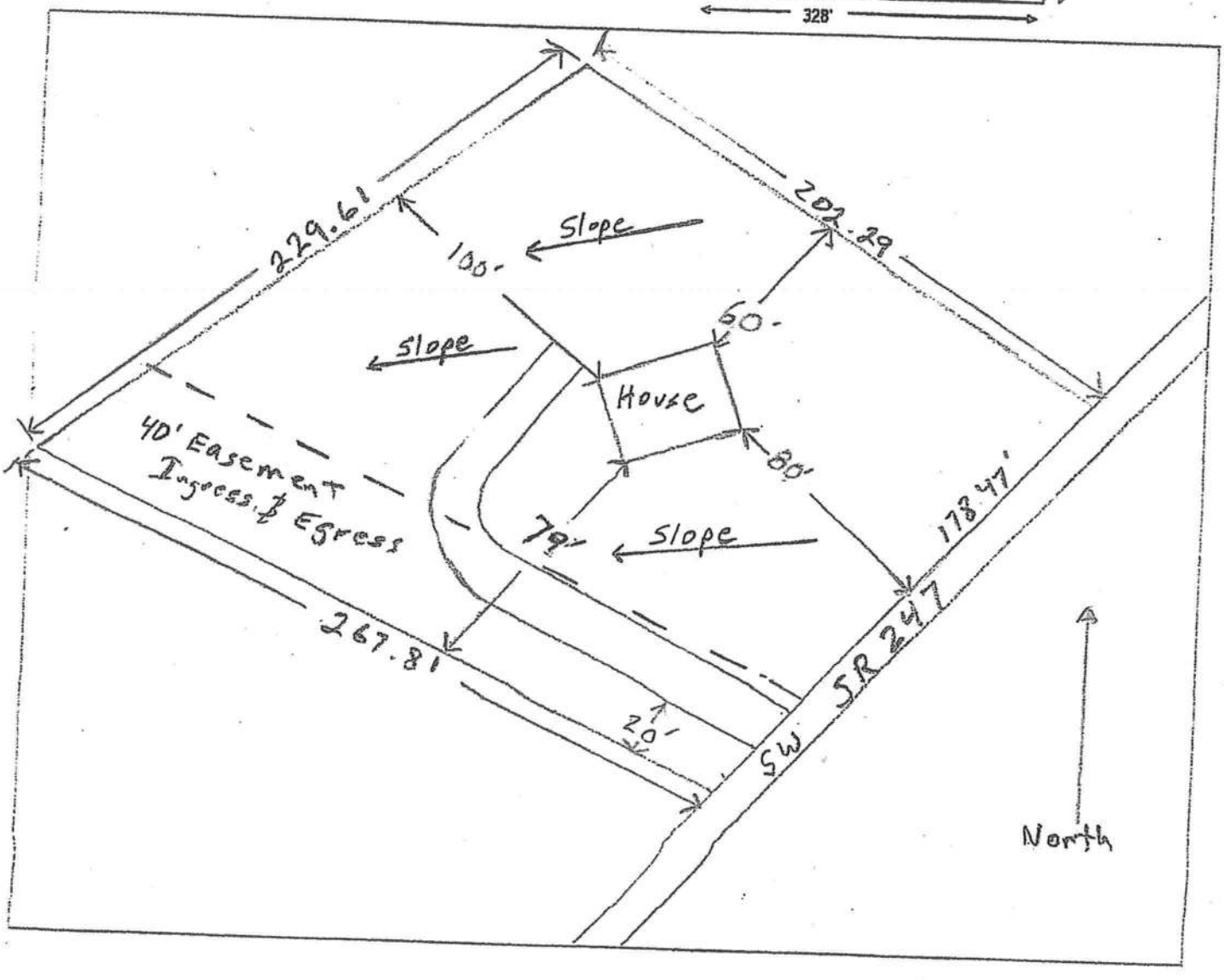
___1) Property Dimensions
___2) Footprint of proposed and existing structures (including decks), label these with existing addresses
___3) Distance from structures to all property lines
___4) Location and size of easements
___5) Driveway path and distance at the entrance to the nearest property line
___6) Location and distance from any waters; sink holes; wetlands; and etc.
___7) Show slopes and or drainage paths
___8) Arrow showing North direction

SITE PLAN EXAMPLE

Revised 7/1/15



NOTE:
This site plan can be copied and used with the 911 Addressing Dept. application forms.



EFFECTIVE FLOOD INFORMATION REPORT

Location Information

County:	**COLUMBIA**
Parcel:	**16-4S-16-03046-002**
Flood Zone:	**X**
Flood Risk:	**LOW**

1% Annual Chance Base Flood Elev*	**Not Applicable**
10% Annual Chance Flood Elev*	**Not Applicable**
50% Annual Chance Flood Elev*	**Not Applicable**

* Flood Elevations shown on this report are in NAVD 88 and are derived from FEMA flood mapping products, rounded to the nearest tenth of a foot. For more information, please see the note below

Legend with Flood Zone Designations

1% Flood -Floodway (High Risk)	Area Not Included	CrossSections	Wetlands
1% Flood - Zone AE (High Risk)	SFHA Decrease	County Boundaries	
1% Flood - Zone A (HighRisk)	SFHA Increase	FIRM Panel Index	
1% Flood - Zone VE (HighRisk)	Depressions	Parcels	
0.2% Flood-Shaded Zone X (Moderate Risk)	BaseFlood Elevations (BFE)	River Marks	

Supplemental Information

Watershed	Santa Fe	Map Effective Date	11/2/2018	Special Flood Hazard Area	No
FIRM Panel(s)	12023C0289D				

Anywhere it can rain, it can flood
Know your risk.

www.srwmdfloodreport.com

The information herein represents the best available data as of the effective map date shown. The Federal Emergency Management Agency (FEMA) Flood Map Service Center (https://msc.fema.gov) maintains the database of Flood Insurance Studies and Digital Flood Insurance Rate Maps, as well as additional information such as how the Base Flood Elevations (BFEs) and/or floodways have been determined and previously issued Letters of Map Change. Requests to revise flood information may be provided to the District during the community review period on preliminary maps, or through the appropriate process with FEMA Change Your Flood Zone Designation | FEMA.gov. Information about flood insurance may be obtained at (https://www.floodsmart.com)

Base Flood Elevation (BFE)

The elevation shown on the Flood Insurance Rate Map for Zones AE, AH, A1-A30, AR, AO, V1-V30, and VE that indicates the water surface elevation resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year.

A

Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.

AE, A1-A30

Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

AH

Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Usually areas of ponding with flood depths of 1 to 3 feet. Base Flood Elevations are determined.

AO

Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Usually areas of sheet flow on sloping terrain with flood depths of 1 to 3 feet.Base Flood Elevations are determined.

Supplemental Information:

10%-chance flood elevations (10-year flood-risk elevations) and 50%-chance flood elevations (2-year flood-risk elevations), are calculated during detailed flooding studies but are not shown on FEMA Digital Flood Insurance Rate Maps (FIRMs). They have been provided as supplemental information in the Flood Information section of this report.

AE FW (FLOODWAYS)

The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood (1% annual chance flood event). The floodway must be kept open so that flood water can proceed downstream and not be obstructed or diverted onto other properties.

Please note, if you develop within the regulatory floodway, you will need to contact your Local Government and the Suwannee River Water Management District prior to commencing with the activity. Please contact the District at 800.226.1066.

VE

Areas with a 1% annual chance of flooding over the life of a 30-year mortgage with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed analyses.

X 0.2 PCT (X Shaded, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD)

Same as Zone X; however, detailed studies have been performed, and the area has been determined to be within the 0.2 percent annual chance floodplain (also known as the 500-year flood zone). Insurance purchase is not required in this zone but is available at a reduced rate and is recommended.

X

All areas outside the 1-percent annual chance floodplain are Zone X. This includes areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone. Insurance purchase is not required in these zones.

LINKS
FEMA:

http://www.fema.gov

SRWMD:

http://www.srwmd.state.fl.us

CONTACT
SRWMD
9225 County Road 49
Live Oak, FL 32060

(386) 362-1001

Toll Free:
(800) 226-1066

GRACE ICE & WATER SHIELD® Data Sheet

The original, best-in-class, self-adhered roofing underlayment

Product Description

GRACE ICE & WATER SHIELD® self-adhered roofing underlayment is a premier membrane composed of two waterproofing materials—an aggressive rubberized asphalt adhesive backed by a layer of slip resistant coated high density cross laminated polyethylene film. The rubberized asphalt surface is backed with a foldless release paper that protects its adhesive quality. During application, the release paper is easily removed, allowing the rubberized asphalt to bond tightly to the roof deck. The Ripcord®embedded in the adhesive provides the applicator a "split release on demand" feature.

Find a GRACE ICE & WATER SHIELD® Distributor

GRACE ICE & WATER SHIELD® is a versatile underlayment material that may be used on sloped roofs, under mechanically attached roof coverings such as asphalt shingles, slate, tile, cedar, and standing seam metal in many climate and assembly conditions (see limitations for additional information).

GRACE ICE & WATER SHIELD® is supplied in 3 ft wide rolls of varying lengths. Membrane strips are also available in 75 ft (22.9 m) long rolls at widths of 6 in. (150 mm), 9 in. (225 mm), 12 in. (300 mm) and 18 in. (450 mm). See the Product Data chart for product information.

Features & Benefits

- Seals around fasteners — The rubberized asphalt layer in GRACE ICE & WATER SHIELD® membrane seals around fasteners, resisting leakage caused by water back-up behind ice dams, or from winddriven rain.
- Superior Adhesion to the Deck — The self-adhesive membrane bonds firmly to the roof deck without need for heat or special adhesives.
- Watertight Laps — Membrane easily forms water-tight overlaps without special treatment.
- Protects under all standard sloped roof coverings — GRACE ICE & WATER SHIELD® roofing underlayment protects under slate, tile, cedar shakes or metal, as well as under conventional asphalt shingles.
- Proven track record — GRACE ICE & WATER SHIELD® roofing underlayment is the name brand in roofing underlayments with a track record of more than 35 years protecting roofs from ice dams and wind-driven rain.
- Ripcord — Split Release on demand feature makes GRACE ICE & WATER SHIELD® underlayment easier to apply. Faster application of the membrane in the straight-aways, as well as ease of membrane positioning in detail areas (valleys, around dormers, etc.).
- Slip resistant surface — GRACE ICE & WATER SHIELD® self-adhered membrane has a slip resistant embossed surface to maximize traction and safety for applicators.

- Reroofable — Unlike granular surfaced membranes, GRACE ICE & WATER SHIELD® smooth surface underlayment will not adhere to the underside of the exposed roof covering. GRACE ICE & WATER SHIELD® membrane can be applied over the old GCP self-adhered underlayment in retrofit applications, making re-roofing easier, less costly (since there is no need to remove the existing underlayment), more durable and environmentally friendly (as the structural deck remains intact avoiding the need to purchase additional wood decking).
- Membrane will not crack, dry out or rot — GRACE ICE & WATER SHIELD® roofing underlayment resists attacks from fungus and bacteria; maintains its integrity for long lasting protection.
- Local technical support — GRACE ICE & WATER SHIELD® roofing underlayment is backed by local technical support personnel that help ensure every application goes smoothly.

Guidelines for Use

GRACE ICE & WATER SHIELD® roofing membrane is used as an underlayment for sloped roofs to resist water penetration due to water back-up behind ice dams or wind-driven rain. GRACE ICE & WATER SHIELD® underlayment also offers leak protection in trouble prone spots like valleys, skylights, protrusions and other flashing areas.

Ice Dams

GRACE ICE & WATER SHIELD® roofing underlayment should be used in conjunction with roof designs that minimize ice dam formation. In cold climates, it is particularly important to provide proper insulation and ventilation to reduce the size of ice dams and to avoid interior condensation. Cathedral ceilings must include ventilation between rafters to allow for air flow to a ridge vent. Well ventilated cold roof designs are particularly important in alpine regions to reduce the size of ice dams which could contribute to structural damage. Several variables will influence the height of ice dams and the membrane coverage required.

1. Climate — The annual snow fall will affect the amount of membrane needed.
2. Slope — On a low slope, ice dams will extend farther inward from the roof edge.
3. Overhang — A wide overhang will require more membrane to reach the appropriate point on the roof.
4. Insulation and ventilation — A very well insulated building with a cold, well ventilated attic will have smaller ice dams.
5. Valleys — Any valleys formed by projections such as dormers or roof direction changes are likely to trap more snow and cause larger ice dams.
6. Exposure — A northern exposure or shaded areas will generally contribute to larger ice dams. While gutters may make it easier for an ice dam to start, large dams can occur on roofs with no gutters. Removing snow from a roof edge or installing heat cables may not prevent ice dam formation, but may shift the location of the ice dam. Under certain conditions, a dam can form at the edge of the remaining snow. Local building codes should be consulted for specific requirements.

Installation Procedure

Surface Preparation

Install GRACE ICE & WATER SHIELD® roofing underlayment directly on a clean, dry, continuous structural deck. Some suitable deck materials include plywood, wood composition, metal, concrete, and gypsum sheathing. Prior to membrane application, remove dust, dirt, loose nails, and old roofing materials. Protrusions from the deck area must be removed. Decks shall have no voids, damaged, or unsupported areas. Repair deck areas as needed before installing the membrane.

Prime concrete, masonry surfaces and DensGlass Gold®with PERM-A-BARRIER®WB PRIMER. Prime wood composition and gypsum sheathing with PERM-A-BARRIER®WB PRIMER if adhesion is found to be marginal (refer to Technical Letter 12, Use on Oriented Strand Board (OSB) Roof Sheathing). Apply PERM-A-BARRIER®WB PRIMER at a rate of 250–350 ft^2/gal (6–8 m^2/L). Priming is not required for other suitable surfaces provided that they are clean and dry.

Membrane Installation

Apply GRACE ICE & WATER SHIELD® underlayment in fair weather when the air, roof deck, and membrane are at temperatures of 40°F (5°C) or higher. Apply roof covering material at temperatures of 40°F (5°C) or higher.

Cut the membrane into 10–15 ft (3–5 m) lengths and reroll loosely. Peel back 1–2 ft (300–600 mm) of release liner, align the membrane, and continue to peel the release liner from the membrane. Press the membrane in place with heavy hand pressure. Side laps must be a minimum of 3.5 in. (90 mm) and end laps a minimum of 6 in. (150 mm). For valley and ridge application, peel the release liner, center the sheet over the valley or ridge, drape, and press it in place. Work from the center of the valley or ridge outward in each direction and start at the low point and work up the roof.

Alternatively, starting with a full roll of membrane, unroll a 3–6 ft (1–2 m) piece of membrane leaving the release liner in place. Align the membrane and roll in the intended direction of membrane application. Carefully cut the release liner on top of the roll in the cross direction being careful not to cut the membrane. Peel back about 6 in. (150 mm) of the release liner in the opposite direction of the intended membrane application exposing the black adhesive. Hold the release liner with one hand and pull the roll along the deck with the release liner, leaving the applied membrane behind. Use the other hand to apply pressure on the top of the roll. Stop frequently to press the membrane in place with heavy hand pressure. When finished with the roll go back to the beginning, reroll and pull the remaining release paper from the material, finishing the installation.

For successive membrane courses, align the edge of the release liner with the dashed line provided on the surface of the membrane to achieve the 3.5 in. (90 mm) side lap.

Consistent with good roofing practice, install the membrane such that all laps shed water. Always work from the low point to the high point of the roof. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof.

Use smooth shank, electro-plated galvanized nails for fastening shingles to get the best seal. Hand nailing generally provides a better seal than power-activated nailing. If nailing of the membrane is necessary on steep slopes during hot or extreme cold weather, backnail and cover the nails by overlapping with the next sheet.

Extend the membrane on the roof deck above the highest expected level of water back-up from ice dams and above the highest expected level of snow and ice on the wall sheathing on vertical side walls (dormers) and vertical front walls for ice dam protection. Consider a double layer of membrane in critical areas, such as along the eaves or in valleys and in climates where severe ice dams are anticipated. Apply the membrane to the entire roof deck for wind-driven rain protection. Apply a new layer of GRACE ICE & WATER SHIELD® underlayment directly over the old GCP self-adhered underlayment (except GCP granular underlayments) in retrofit applications following the standard membrane application procedure.

Precautions & Limitations

- Slippery when wet or covered by frost.
- Consistent with good roofing practice, always wear fall protection when working on a roof deck.
- Release liners are slippery. Remove from work area immediately after membrane application.
- Do not leave permanently exposed to sunlight. Cover within 90 days.
- Place metal drip edges or wood starter shingles over the membrane.
- Do not fold over the roof edge unless the edge is protected by a drip edge, gutter or other flashing material.
- Do not install on the chamfered edges of wood plank.
- Do not install directly on old roof coverings.
- Certain product applications are prohibited in hot desert areas in the southwestern United States. Contact your GCP Applied Technologies sales representative for assistance choosing the best product for your application.
- Check with the manufacturer of the metal roofing system for any special requirements when used under metal roofing.
- Do not install under copper, COR-TEN®, or zinc metal roofing in high altitudes. These roofs can reach extremely high temperatures due to the low reflectivity, high absorption, and high conductivity of the metals. Use GRACE ULTRA™ underlayment for these roof types. Contact your GCP Applied Technologies sales representative for assistance choosing the best product for your application.
- Provide proper roof insulation and ventilation to help reduce ice dams and to minimize condensation. GRACE ICE & WATER SHIELD® membrane is an air and vapor barrier.
- Repair holes, fishmouths, tears, and damage to membrane with a round patch of membrane extending past the damaged area 6 in. (150 mm) in all directions. If fasteners are removed leaving holes in the membrane, they must be patched. The membrane may not self-seal open fastener penetrations.
- Do not install fasteners through the membrane over unsupported areas of the structural deck, such as over the joints between adjacent structural panels.
- Due to its slight asphaltic odor, do not apply where the membrane is exposed to interior living space. Refer to product literature for more complete information.
- Not compatible with EPDM or TPO; use GRACE ULTRA™ underlayment for tie-ins (refer to Technical Letter 5, *Chemical Compatibility*).
- Not compatible with polysulfides, flexible PVC, or high concentrations of resin (pitch) found in some wood plank decks. For more information, refer to Technical Letter 5.

Product Data

Roll length	75 ft (22.9 m)	66.6 ft (20.2 m)	36 ft (11.0 m)
Roll width	36 in (914 mm)	36 in (914 mm)	36 in (914 mm)
Roll size	225 ft2 (20.9 m^2)	200 ft^2 (18.6 m^2)	108 ft^2 (10.4 m^2)
Packaging	Corrugated cartons	Corrugated cartons	Corrugated cartons
Roll weight	61.4 lbs (27.9 kg)	55 lbs (24.9 kg)	33.6 lbs (15.3 kg)
Rolls per pallet	35	35	25

Code Compliance

GRACE ICE & WATER SHIELD®roofing underlayment meets the following standards:

- ICC ESR-1677 approval according to AC-48 Acceptance Criteria for Self-Adhered underlayments used as Ice Barriers
- Miami-Dade County Product Control Approved. NOA# can be found on Miami-Dade Product Control Search.
- Florida State Product Approval. Product Approval # can be found on FL Building Code Product Approval Search.
- Underwriters Laboratories Inc. Classified Sheathing Material Fire Resistance Classification with Roof Designs: P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P736, P742, P803, P814, P818, P824
- Underwriters Laboratories Inc. Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790)
- CCMC Approval No. 13670-L

Performance Properties

PROPERTY	VALUE	TEST METHOD
Color	Gray-black	
Thickness, membrane	40 mil (1.02 mm)	ASTM D3767 method A
Tensile strength, membrane	250 psi (1720 kN/m²)	ASTM D412 (Die C modified)
Elongation, membrane	250%	ASTM D412 (Die C modified)
Low temperature flexibility	Unaffected @ -20°F (-29°C)	ASTM D1970
Adhesion to plywood	3.0 lbs/in. width (525 N/m)	ASTM D903
Permeance (max)	0.05 Perms (2.9 ng/m²s Pa)	ASTM E96
Material weight installed (max)	0.3 lb/ft² (1.3 kg/m²)	ASTM D461

GCP Applied Technologies Inc., 2325 Lakeview Parkway, Suite 400, Alpharetta, GA 30009, USA

GCP Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6

Last Updated: 2023-05-17
gcpat.com/solutions/products/grace-ice-water-shield-roofing-underlayment/grace-ice-water-shield-data-sheet

SDWC 15600 & 15450 Flat Down Screws

EVALUATION REPORT Number: 262

Originally Issued: 06/28/2012 **Revised: 10/14/2020** **Valid Through: 06/30/2021**

EVALUATION SUBJECT:
SIMPSON STRONG-TIE STRONG DRIVE® SDWC WOOD SCREWS

REPORT HOLDER:
Simpson Strong-Tie Company Inc.
5956 West Las Positas Boulevard
Pleasanton, California 94588
(800) 999-5099
www.strongtie.com

CSI Division: 06 – WOOD, PLASTICS, AND COMPOSITES
CSI Section: 06 05 23 – Wood, Plastic and Composite Fastenings

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:
- 2018, 2015, 2012 and 2009 International Building Code® (IBC)
- 2018, 2015, 2012 and 2009 International Residential Code® (IRC)
- 2020 City of Los Angeles Building Code (LABC) – attached Supplement
- 2020 City of Los Angeles Residential Code (LARC) – attached Supplement

1.2 Evaluated in accordance with:
- ICC-ES AC233
- ICC-ES AC257

1.3 Properties assessed:
- Structural
- Corrosion Resistance

2.0 PRODUCT USE

The Simpson Strong-Tie Strong-Drive® SDWC fasteners described in this report are dowel-type threaded and self-drilling fasteners used for wood-to-wood connections. These fasteners comply with 2018 and 2015 IBC Section 2304.10 (2012 and 2009 IBC Section 2304.9). The fasteners are permitted when an engineered design is submitted in accordance with IRC Section R301.1.3.

The Simpson Strong-Tie Strong-Drive® SDWC15450 may be used where fasteners are required to exhibit corrosion resistance when exposed to adverse environmental conditions and/or in chemically treated wood, which are subject to limitations of Section 5.5 of this report, and are alternatives to hot-dipped-zinc-coated galvanized fasteners with a coating weight in compliance with ASTM A153, Class D. Fasteners with these proprietary corrosion-resistant coatings were evaluated for contact with wood chemically treated with waterborne alkaline copper quaternary, Type (D) (ACQ-D), to a maximum retention level of 0.4 pcf (6.4 kg/m^3), which was shown to be more corrosive than Chromated Copper Arsenate, Type C (CCA-C), Micronized Copper Azole (MCA), and Dispersed Copper Azole (μCA-C).

3.0 PRODUCT DESCRIPTION

3.1 General: The SDWC screws (Figure 1 of this report) are fully threaded with rolled threads spaced approximately at 7 threads per inch (0.28 threads/mm) and a type 17 point. The head is a cap-style head with a T-30 recess. The SDWC screws are available in two lengths: 4½ inches and 6 inches (114 mm and 152 mm). The SDWC15600 screws have a clear zinc coating and are acceptable for dry-service conditions, and the SDWC15450 screws have a proprietary black electrocoat applied over a clear zinc undercoating. Table 1 of this report describes the screws recognized in this report including the bending yield strength, tensile strength, and shear strength.

3.2 Materials

3.2.1 SDWC Wood Screws: The SDWC screws are manufactured from C1022 carbon steel complying with ASTM A510. The manufacturing process involves cold-forming followed by heat treatment.

3.2.2 Wood Members: Wood side and main members shall consist of solid-sawn lumber with a specific gravity of 0.42 to 0.55 or structural composite lumber (e.g., LVL, PSL, LSL etc.) shall have a minimum 0.8E for lateral and withdrawal loading. The structural composite lumber shall be recognized in an evaluation report and shall have an equivalent specific gravity of 0.50 minimum for lateral and 0.42 for withdrawal. The combined thickness of the main and side members shall be equal to or greater than the screw length. The side member thickness shall be at least 1.5 inches (38 mm).

Chemicals used to preservative treat wood are limited to the following:
1. Alkaline Copper Quaternary Type D (ACQ-D), with a maximum retention level of 0.4 pcf (6.4 kg/m^3).
2. Wood treatments that have been demonstrated to have lower levels of corrosivity compared to ACQ-D.

4.0 DESIGN AND INSTALLATION

4.1 Design

4.1.1 General: Reference lateral, withdrawal and pull-through design values in the report are for allowable stress design and shall be multiplied by all applicable adjustment factors specified in the ANSI/AWC NDS to determine adjusted design values, including wet service condition specified in Section 11.3.3 of the ANSI/AWC NDS – 2018 or 2015 (or Section 10.3.3 of the ANSI/AWC NDS – 2012 or

ANSI/AF&PA NDS – 2005). The fastener strength taken from Table 1 of this report shall not be multiplied by the ANSI/AWC NDS adjustment factors.

Local stresses in connections using multiple fasteners shall be checked in accordance with Section 11.1.2 of ANSI/AWC NDS – 2018 or 2015 (or Section 10.1.2 of the ANSI/AWC NDS – 2012 or ANSI/AF&PA NDS – 2005). Structural members forming the connection shall be designed in accordance with the IBC.

The following requirements shall be observed when designing with the fasteners:

1. The allowable load for a single-screw connection in which the screw is subject to tension is the least of: (a) the reference withdrawal design value given in Table 3 of this report, adjusted by all applicable adjustment factors; (b) the reference head pull-through design value given in Table 3 of this report, adjusted by all applicable adjustment factors; and (c) the allowable screw tension strength given in Table 1 of this report.
2. The allowable lateral load for a single-fastener connection is the lesser of: (a) the reference lateral design value given in Table 2 of this report, adjusted by all applicable adjustment factors, and (b) the allowable screw shear strength given in Table 1 of this report.
3. Connections containing multiple fasteners shall be designed in accordance with Sections 11.2.2 and 12.6 of ANSI/AWC NDS – 2018 or 2015 (or Sections 10.2.2 and 11.6 of ANSI/AWC NDS – 2012 or ANSI/AF&PA NDS – 2005).
4. Where the screws are subjected to combined lateral and withdrawal loads, connections shall be designed in accordance with Section 12.4.1 of ANSI/AWC NDS – 2018 or 2015 (or Section 11.4.1 of ANSI/AWC NDS – 2012 or ANSI/AF&PA NDS – 2005).
5. When designing a connection, the structural members shall be checked for load-carrying capacity in accordance with Section 11.1.2 of ANSI/AWC NDS – 2018 or 2015 (or Section 10.1.2 of the ANSI/AWC NDS – 2012 or ANSI/AF&PA NDS – 2005) and local stresses within the connection shall be checked against Appendix E in the ANSI/AWC NDS to ensure the capacity of the connection and fastener group.
6. When use is in structural composite lumber products, the minimum fastener end and edge distances and spacings shall be in accordance with Table 4 of this report or in accordance with the recommendations of the structural composite lumber manufacturer, whichever is more restrictive.

The SDWC15450 wood screws have corrosion-resistant coatings that are recognized for use in wood members with chemical treatments as set forth in Section 3.2.2 of this report. These fasteners shall be limited to use in applications and limitations defined in Table 5 of this report.

4.1.2 Lateral Design Values: Reference lateral (Z) design values for SDWC wood screws for single shear wood-to-wood connections loaded perpendicular to grain and parallel to grain are shown in Table 2 of this report.

4.1.3 Reference Withdrawal Design Values: Reference withdrawal (W) design values for SDWC wood screws are shown in Table 3 of this report and are given in pounds per inch of thread penetration into the main member.

4.1.4 Pull-through Design Values: Reference pull-through design values for SDWC wood screws are shown in Table 3 of this report and are given in pounds per inch of thread penetration into the side member.

4.2 Installation: The SDWC wood screws shall be installed in accordance with the manufacturer's installation instructions, the evaluation report and the codes listed in Section 1.1 of this report. Installation may be performed without pre-drilling wood members. Edge distances, end distances and spacing of the screws shall be sufficient to prevent splitting of the wood, or as required by Table 4 of this report, whichever is more restrictive. The top of the screw head shall be installed flush to the surface of the member being connected.

5.0 LIMITATIONS

The Simpson Strong-Tie Strong-Drive® SDWC described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following limitations:

5.1 The fasteners shall be manufactured, identified and installed in accordance with the manufacturer's published installation instructions, this report, and the applicable code. A copy of the instructions shall be available at the jobsite continuously during installation. If there is a conflict between this report and the manufacturer's published installation instructions, the more restrictive shall govern.

5.2 Calculations and details showing compliance with this report shall be submitted to the building official. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Design and installation shall conform to Section 4.0 of this report.

5.4 Calculations and details showing compliance with this report shall be submitted to the building official. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.5 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.

5.6 The SDWC wood screws are manufactured under a quality control program with inspections by IAPMO Uniform ES.

6.0 SUBSTANTIATING DATA

6.1 Data and test reports submitted are from laboratories in compliance with ISO/IEC 17025 and in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), approved October 2018.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Corrosion-Resistant Fasteners and Evaluation of Corrosion Effects of Wood Treatments (AC 257), approved October 2009 (editorially revised March 2018).

7.0 IDENTIFICATION

The packaging for the SDWC wood screws is labeled with designation "Simpson Strong-Drive® SDWC15450 or SDWC15600", the Simpson Strong-Tie Co. name and address, the fastener size, the IAPMO UES Mark of Conformity, and the IAPMO UES evaluation report number (ER-262). Each screw head is marked with the No-Equal to symbol (≠) and the numeric number "4.5 or 6" indicating screws length, as shown in Figure 1 of this report. A die-stamp label may also substitute for the label. Either Mark of Conformity may be used as follows:

IAPMO ES® or UES®

IAPMO UES ER-262

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

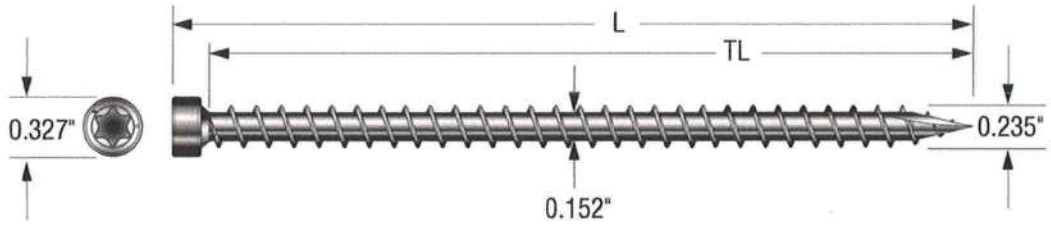
For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1 – SDWC WOOD SCREW SPECIFICATIONS, ALLOWABLE BENDING YIELD STRENGTH, AND FASTENER ALLOWABLE STEEL STRENGTH

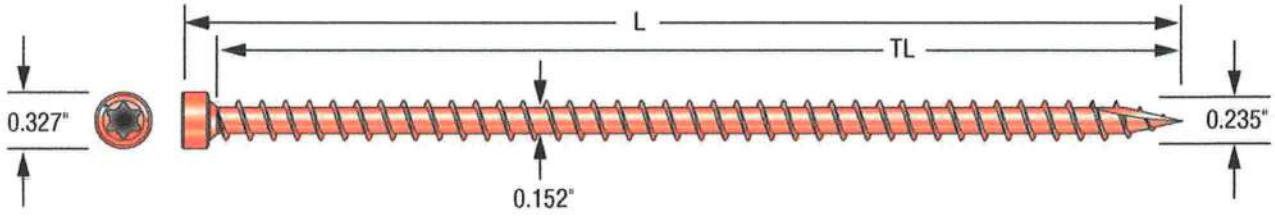
FASTENER DESIGNATION	HEAD MARKING	FASTENER LENGTH[1] L (in)	LENGTH OF THREAD[2] TL (in)	MAJOR THREAD DIAMETER (in)	MINOR THREAD (ROOT) DIAMETER (in)	FASTENER ALLOWABLE PROPERTIES[4]		
						Bending Yield Strength[3] (F_{yb}) (psi)	Tension (lbs)	Shear (lbs)
SDWC15450	≠, 4.5	4.5	4 ¼	0.235	0.152	195,000	1,160	815
SDWC15600	≠, 6	6.0	5 ¾					

For SI: 1 inch=25.4 mm, 1 psi=6.89 kPa, 1 lbf=4.45 N

1. For purposes of measuring overall fastener length, screw fasteners are measured from the top of head to bottom of tip.
2. Length of thread includes tip. Figure 1 of this report shows the location of dimensions.
3. Bending yield strength determined in accordance with methods specified in ASTM F1575 and based on the minor thread (root) diameter.
4. Allowable connection loads include consideration of fastener properties. Table 3 and 4 of this report provide allowable reference lateral (Z), withdrawal (W) and pull-through design values for the screws in wood-to-wood connections



SDWC15450



SDWC15600

FIGURE 1 – SDWC SCREWS

TABLE 2 – REFERENCE LATERAL (Z) DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS [1,2,3,4,5,8]

FASTENER DESIGNATION	FASTENER LENGTH (in)	THREAD LENGTH TL (in)	SIDE MEMBER	MAIN MEMBER	LATERAL DESIGN VALUE (Z) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS (lbs.)					
					Zpara[6]			Zperp[7]		
					SP	DF	SPF	SP	DF	SPF
SDWC15450	4 1/2	4 1/4	2x (Face)	2x (End Grain)	-	-	-	225	205	192
SDWC15600	6	5 3/4	(2)2x (Face)	2x (Edge)	245	240	180	240	240	240
			2x (Face)	2x (End Grain)	-	-	-	225	205	192
			(2)2x (Face)	2x (End Grain)	-	-	-	225	225	186

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N

1. The connection conditions of this table are for specific intended applications. Reference lateral design values for all other shear connections shall be calculated in accordance with the NDS. Minimum fastener penetration into the main member shall be 1.0 inch.
2. The main and side members shall be wood having a minimum NDS referenced specific gravity of 0.50 for DF, 0.55 for SP and 0.42 for SPF and HF. Lateral table values for sawn lumber are also applicable for fasteners installed into structural composite lumber described in Section 3.2.2 of this report.
3. Reference lateral design values (Z) shall be multiplied by all applicable adjustment factors, including the load duration factor, C_D, from the NDS as referenced in the IBC or IRC.
4. Screws shall be installed into the side grain of the wood main member with the screw axis at a 90-degree angle to the surface of the member.
5. DF is Douglas Fir-Larch. SP is Southern Pine. SPF is Spruce-Pine-Fir.
6. Parallel to grain loading in the side member and perpendicular to grain loading in the main member.
7. Perpendicular to grain loading in the side member and perpendicular to grain loading in the main member, except for 2x (edge) where main member is loaded parallel to grain.
8. Specific gravities for each species combination are based on values in 2018 and 2015 ANSI/AWC NDS Table 12.3.3A (2012 ANSI/AWC NDS Table 11.3.3A).

TABLE 3 – REFERENCE WITHDRAWAL (W) AND PULL-THROUGH DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS[1,2,3,4,8]

FASTENER DESIGNATION	FASTENER LENGTH (in)	THREAD LENGTH (in)	MAIN MEMBER	WITHDRAWAL DESIGN VALUE (W) (lbs./in)[5, 7]			PULL-THROUGH DESIGN VALUE (lbs./in)[6]		
				SP	DF	SPF	SP	DF	SPF
DWC15450 SDWC15600	4 1/2 6	4 1/4 5 3/4	2x (Edge)	250	230	149	-	-	-
			2x (End Grain)	200	140	103	208	179	175
			2x (Face)	210	177	118	255	195	159
			(2) 2x (Face)	220	199	163	240	225	188

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N

1. The reference withdrawal and pull-through values are in pounds per inch of the thread penetration into the main member and a minimum 1½ inch thick side member, respectively.
2. The reference withdrawal and pull- through design values shall be multiplied by all applicable adjustment factors in the ANSI/AWC NDS, including the load duration factor, C_D, as referenced in the IBC or IRC.
3. Screws shall be installed into the side grain of the main member with the screw axis at a 90-degree angle to the surface.
4. Specific gravities for each species combination are based on values in 2018 and 2015 ANSI/AWC NDS Table 12.3.3A (2012 ANSI/AWC NDS Table 11.3.3A).
5. The reference withdrawal values shall be multiplied by the length of thread penetration in the main member. The length includes the threaded tip.
6. The reference pull-through values shall be multiplied by the length of thread penetration in the side member.
7. The main members shall be wood having a minimum NDS referenced specific gravity of 0.50 for DF, 0.55 for SP, and 0.42 for SPF and HF. Withdrawal table values for sawn lumber are also applicable for fasteners installed into structural composite lumber described in Section 3.2.2 of this report.
8. DF is Douglas Fir-Larch. SP is Southern Pine. SPF is Spruce-Pine-Fir. HF is Hem-Fir.

TABLE 4 – CONNECTION GEOMETRY REQUIREMENTS[1,2,3]

CONDITION		MINIMUM DIMENSION (in.)
End Distance	Load toward end	2
	Load away from end	2
	Load perpendicular to grain	1
Edge Distance	Load any direction	½
Spacing Between Fasteners in a Row	Load parallel to grain	3½
	Load perpendicular to grain	2⅜
Spacing between rows	In-line rows	1
	Staggered rows	½

For SI: 1 inch = 25.4 mm

1. For fasteners installed in side grain.
2. Edge distances, end distances and spacing of the screws shall be sufficient to prevent splitting of the wood, or as required by this table, or when applicable, as recommended by the structural composite lumber manufacturer, whichever is the more restrictive.
3. Values for spacing between staggered rows apply where fasteners in adjacent rows are off-set by half of the spacing between fasteners in a row.

TABLE 5 – RECOGNIZED EXPOSURE CONDITIONS FOR SIMPSON STRONG-TIE SDWC15450 FASTENERS

EXPOSURE CONDITION	TYPICAL APPLICATIONS	RECOGNITION LIMITATIONS
1	Treated wood in dry use applications	Limited to use where equilibrium moisture content of the chemically treated wood meets the dry services condition as described in NDS
3	General Construction	Limited to freshwater and chemically treated wood exposure, e.g., no salt water exposure

CITY OF LOS ANGELES SUPPLEMENT

SIMPSON STRONG-TIE STRONG DRIVE® SDWC WOOD SCREWS

REPORT HOLDER:
Simpson Strong-Tie Company Inc.
5956 West Las Positas Boulevard
Pleasanton, California 94588
(800) 999-5099
www.strongtie.com

CSI Division: 06—Wood, Plastics and Composites
CSI Section: 06 05 23—Wood, Plastic, and Composite Fastenings

1.0 RECOGNITION

Simpson Strong-Tie Strong-Drive® SDWC wood screws described in ER-262 and this supplemental report have been evaluated for use as dowel-type threaded and self-drilling fasteners in wood-to-wood connections. Simpson Strong-Tie Strong-Drive® SDWC wood screws have been evaluated for structural and corrosion resistance performance properties, subject to the requirements in ER-262 and this supplemental report. Simpson Strong-Tie Strong-Drive® SDWC wood screws were evaluated for compliance with the following codes and regulations:

- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)

2.0 LIMITATIONS

Use of the Simpson Strong-Tie Strong-Drive® SDWC wood screws recognized in ER-262 and this report supplement are subject to the following limitations in addition to the limitations shown in the ER-262:

2.1 Simpson Strong-Tie Strong-Drive® SDWC wood screws shall be installed in accordance with the manufacturer's published installation instructions and ER-262.

2.2 Construction details and specifications verifying compliance with the Simpson Strong-Tie Strong-Drive® SDWC wood screws shall be indicated on the approved plans by the engineer of record. The details shall be approved by the structural plan check engineer at the time of application.

2.3 Reference lateral and withdrawal design values in ER-262 are for allowable stress design and shall be multiplied by all applicable adjustment factors specified in the ANSI/AWC NDS.

2.4 Structural members forming the connection shall be designed in accordance with the 2020 LABC.

2.5 When designing a connection, the structural members shall be checked for load-carrying capacity in accordance with Section 11.1.2 of ANSI/AWC NDS 2018 and 2015.

FLORIDA SUPPLEMENT

SIMPSON STRONG - TIE STRONG DRIVE® SDWC WOOD SCREWS

REPORT HOLDER:
Simpson Strong-Tie Company Inc.
5956 West Las Positas Boulevard
Pleasanton, California 94588
(800) 999-5099
www.strongtie.com

CSI Division: 06—Wood, Plastics and Composites
CSI Section: 06 05 23—Wood, Plastic, and Composite Fastenings

1.0 RECOGNITION

Simpson Strong-Tie Strong-Drive® SDWC wood screws have been evaluated for structural performance properties, subject to the requirements in ER-262 and this supplemental report for compliance with the following codes and regulations:

- 2020 and 2017 Florida Building Code, Building (FBC–Building)
- 2020 and 2017 Florida Building Code, Residential (FBC–Residential)

2.0 LIMITATIONS

Use of the Simpson Strong-Tie Strong-Drive® SDWC wood screws recognized in this supplement for complies with the 2020 and 2017 FBC–Building and the 2020 and 2017 FBC–Residential are subject to the following limitations in addition to the limitations shown in the ER-262:

1. The design and installation of Simpson Strong-Tie Strong-Drive® SDWC wood screws recognized in this supplement shall be in accordance with the 2018 or 2015 International Building Code and the 2018 or 2015 International Residential Code as noted in ER-262.

2. Load combinations shall be in accordance with Sections 1605.2 or 1605.3 of the FBC–Building, as applicable.

3. Design wind loads shall be in accordance with Section 1609.5 of the FBC–Building or Section R301.2.1.1 of the FBC–Residential, as applicable, and Section 1620 of the FBC–Building where used in High-velocity Hurricane Zones (HVHZ).

4. Use of Simpson Strong-Tie Strong-Drive® SDWC wood screws recognized in this supplement complies with the High-velocity Hurricane Zone (HVHZ) provisions set forth in Sections 2324.2 of the FBC–Building.

5. Simpson Strong-Tie Strong-Drive® SDWC wood screws shall be manufactured, identified, and installed in accordance with ER-262 and the manufacturer's published installation instructions. A copy of the installation instructions shall be available at the job site continuously during installation. If there is a conflict between this report and the manufacturer's published installation instructions, the more restrictive prevails.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission (or the building official when the report holder does not possess an approval by the Commission) is required to provide oversight and determine that the products are being manufactured as described in this evaluation report to establish continual product performance.

This supplement expires concurrently with ER-262

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

DTT2Z Hold down

ICC EVALUATION SERVICE

ICC-ES Evaluation Report

ESR-2330

Reissued May 2020
Revised July 2020
This report is subject to renewal May 2021.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® SCREW HOLD-DOWN CONNECTORS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2018, 2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-2330 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

Simpson Strong-Tie® screw hold-down connectors are used as wood framing anchorage, such as to connect wood posts to concrete foundations or to connect an upper-story wood post to a lower-story supporting wood post, in accordance with 2018 and 2015 IBC Sections 2304.10.3, 2305.1, 2305.3, 2308.6.5.1 and 2308.6.5.2; 2012, 2009 and 2006 IBC Sections 2304.9.3, 2305.1, 2305.3, 2308.9.3.1, and 2308.9.3.2; and 2015 AWC SDPWS Section 4.3.6.4.2; and 2008 AF&PA SDPWS Sections 4.3.6.4.2 and 4.3.6.1.2; and are used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls as required by IBC Section 1604.8. The hold-down connectors may also be used in structures regulated under the IRC, when an engineered design is submitted in accordance with IRC Section R301.1.3 ; or when used in accordance with the prescriptive provisions of 2018 IRC Section R507.9.2; 2015 IRC Section R507.2.4; 2012 IRC Section R507.2.3; 2018, 2015 and 2012 IRC Sections R602.10.2.2.1, R602.10.6.1, R602.10.6.2, R602.10.6.5 and R602.10.7; or 2009 IRC Sections R502.2.2.3, R602.10.1.4.1(2), R602.10.3.2, R602.10.3.3, R602.10.4.4 and R602.10.5.3.

3.0 DESCRIPTION

3.1 General:

3.1.1 HDU Hold-downs: HDU hold-downs consist of a main structural steel component with prepunched holes for installation of SDS wood screws used to connect the hold-down to the wood member, and a base plate component that provides a seat for an anchor rod/bolt nut, as shown in Figure 1. The body of the HDU2, HDU4 and HDU5 hold-downs is formed from No. 14 gage galvanized steel; the HDU8 and HDU11 bodies are formed from No. 10 gage galvanized steel; and the HDU14 body is formed from No. 7 gage galvanized steel. The base plate component for all HDU hold-downs is formed from No. 3 gage galvanized steel. See Table 1A for HDU hold-down dimensions and fastener requirements.

3.1.2 HDQ8 and HHDQ Hold-downs: The HDQ8 hold-down consists of a main structural steel component with prepunched holes for installation of SDS wood screws used to connect the HDQ8 hold-down to the wood member, and steel crossbars and a washer for an anchor rod/bolt nut, as shown in Figure 2A. The HHDQ11 and HHDQ14 hold-downs also have a main structural steel component with pre-drilled holes for SDS wood screws used to connect HHDQ hold-downs to the wood member, and have a factory-welded load transfer plate at its base for an anchor rod or bolt. The HDQ8 body is formed from No. 7 gage galvanized steel, and its crossbars are formed from $^3/_8$-inch-thick-by-1-inch-deep (9.5 mm by 25.4 mm) steel bar stock, and the washers are formed from $^3/_8$-inch-thick (9.5 mm) steel plate. The HHDQ bodies are formed from No. 7 gage steel, and the load transfer plates are $^1/_2$-inch-thick (12.7 mm) steel plate. See Table 2A for HDQ8 and HHDQ hold-down dimensions and fastener requirements. See Figure 2B for typical installations of the HDQ8 and HHDQ hold-downs.

3.1.3 DTT2 Hold-down: The DTT2 hold-down consists of a single-piece formed structural steel component with prepunched holes for installation of SDS wood screws used to connect the hold-down to the wood member as shown in Figure 3. The DTT2 is formed from No. 14 gage galvanized steel. One steel, plain (flat), standard plate (W) washer conforming to ASTM F844 and ASME B18.22.1, Type A, with a $1^3/_8$-inch (35 mm) outer diameter, is provided with the DTT2 hold-down, and must be installed between the nut and the seat of the hold-down. See Table 3 for product dimensions, required fasteners and allowable loads.

3.1.4 HDC10 Concentric Hold-downs: HDC10 concentric hold-downs consist of a main structural U-shaped steel component with prepunched holes for installation of SDS wood screws used to connect the

hold-down to the wood member, and an aluminum support base component with a hole for a $^7/_8$-inch-diameter (22.2 mm) anchor bolt used to connect the hold-down to the concrete as shown in Figure 4. The body of the HDC10 hold-downs is formed from No. 10 gage galvanized steel. The aluminum base is die cast from aluminum alloy. One steel, plain (flat), SAE narrow (N) washer conforming to ASTM F844 and ASME B18.22.1, Type A, with a $1^3/_4$-inch (44.5 mm) outer diameter, is provided with the HDC10 hold-down, and must be installed between the nut and the bottom of the U-shaped steel component of the hold-down. See Tables 4A and 4B for product dimensions, required fasteners and allowable loads.

3.2 Materials:

3.2.1 Steel: The bodies of the HDU, HDQ8, and HDC10 hold-downs are fabricated from ASTM A653, SS, Grade 33, galvanized steel, having a minimum yield strength, F_y, of 33,000 psi (227 MPa) and a minimum tensile strength, F_u, of 45,000 psi (310 MPa). The load transfer base plates of the HDU series hold-downs is fabricated from ASTM A1011, SS, Grade 33 steel, having a minimum yield strength, F_y, of 33,000 psi (227 MPa) and a minimum ultimate strength, F_u, of 52,000 psi (359 MPa). The crossbars and the load transfer washer for the HDQ8 hold-down are fabricated from No. 1018 carbon steel complying with SAE J403, and having a minimum yield strength, F_y, of 54,000 psi (371 MPa) and a minimum tensile strength, F_u, of 64,000 psi (440 MPa). The support base of the HDC10 hold-downs is die cast aluminum.

The bodies of the HHDQ hold-downs are fabricated from ASTM A1011, SS, Grade 33 steel, having a minimum yield strength, F_y, of 33,000 psi (227 MPa) and a minimum ultimate strength, F_u, of 52,000 psi (359 MPa). The load transfer plates for the HHDQ hold-downs are formed from ASTM A36 steel, having a minimum yield strength, F_y, of 36,000 psi (248 MPa) and a minimum tensile strength, F_u, of 58,000 psi (399 MPa). The DTT2 hold-down is formed from ASTM A653, SS designation, Grade 33 steel.

The galvanized bodies of the HDU, HDQ8, DTT2, and HDC10 hold-downs have a minimum G90 zinc coating in accordance with ASTM A653. Some models may also be available with either a G185 zinc coating (denoted by model numbers ending in the letter Z) or with a batch hot-dipped galvanized coating (denoted by model numbers ending with the letters HDG) with a minimum specified coating weight of 2.0 ounces of zinc per square foot of surface area (600 g/m^2), total for both sides in accordance with ASTM A123. Model numbers shown in this report do not list the -Z or -HDG suffix, but the information shown applies. The HHDQ hold-downs have a painted finish. HDU base plates and HDQ8 washers and crossbars have a minimum ASTM B633, SC 1, Type I electro galvanized coating.

The lumber treater or the report holder (Simpson Strong-Tie Company) should be contacted for recommendations on minimum corrosion resistance protection of steel hold-down connectors in contact with the specific proprietary preservative-treated or fire-retardant-treated lumber. The use of hold-downs in contact with preservative-treated or fire-retardant-treated lumber is outside the scope of this report, and is subject to the approval of the code official.

The steel components of the hold-downs described in this report have the following minimum base-metal thicknesses:

NOMINAL THICKNESS	MINIMUM BASE-METAL THICKNESS (in.)
$^1/_2$ inch	0.4845
$^3/_8$ inch	0.3600
No. 3 gage	0.2285
No. 7 gage (ASTM A653)	0.1715
No. 7 gage (ASTM A1011)	0.1705
No. 10 gage	0.1275
No. 12 gage	0.0975
No. 14 gage	0.0685

For **SI:** 1 inch = 25.4 mm.

3.2.2 Wood: Wood members with which the hold-downs are used must be either sawn lumber or engineered lumber having a minimum specific gravity of 0.50 (minimum equivalent specific gravity of 0.50 for engineered lumber). The required thickness (depth) of the wood members in the direction of the fastener penetration is specified in Table 1B for HDU hold-down assemblies, Tables 2B and 2D for HDQ8/HHDQ hold-down assemblies, Table 3 for DTT2 hold-down assemblies, and Table 4B for HDC10 hold-down assemblies. Unless noted otherwise, the minimum width of the wood members listed in Tables 1B, 2B, 2D, 3, and Table 4B is $3^1/_2$ inches (88.9 mm). Additionally, the wood members used with the HDC hold-downs must have a minimum F_c* of 1550 psi (10.7 MPa), where F_c* is the NDS-specified reference compression design value parallel-to-grain, multiplied by all applicable adjustment factors except C_P.

3.2.3 SDS Wood Screws: Fasteners used with the hold-down assemblies described in Tables 1B, 2B, 2D, 3, and 4B must be Simpson Strong-Tie SDS wood screws recognized in ESR-2236. Model numbers shown in this report do not include the SDS model number after the hold-down model number (e.g., HDU4-SDS2.5), but the information shown applies. SDS screws used in contact with preservative-treated or fire-retardant-treated lumber must, as a minimum, comply with ESR-2236. The lumber treater or Simpson Strong-Tie Company should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant-treated lumber.

3.2.4 Threaded Rods: As a minimum, threaded steel rods must comply with ASTM A307 A36 or F1554.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Hold-down Assembly: The allowable loads shown in Tables 1B, 2B, 2D, and 4B of this report are for hold-down assemblies consisting of the following components: (1) hold-down device; (2) an anchor bolt/rod attached to the seat of the device; (3) a wood member, having minimum specified dimensions and properties; (4) quantity and size of SDS wood screws used to attach the hold-down device to the wood member; and, in some cases as noted, (5) bearing plates or washers. The allowable loads for these assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D, corresponding with the applicable loads in accordance with the National Design Specification (NDS) for Wood Construction. The assembly must have an allowable strength equal to or exceeding the

required strength of the assembly under the action of the ASD (Allowable Stress Design) load combinations referenced in the applicable code.

Where design load combinations include earthquake loads or effects, story drifts of the structure must be determined in accordance with Section 12.8.6 of ASCE 7 by using strength-level seismic forces without reduction for ASD. The deflection of a shear wall restrained from overturning by hold-downs installed in accordance with this report is calculated using Equation 23-2 shown in Section 2305.3 of the IBC, or Equation 4.3-1 shown in Section 4.3.2 of AWC SDPWS-2015 (Special Design Provisions for Wind and Seismic) or ANSI AF&PA SDPWS-2008, as applicable. The total deflection values, Δ_{all} and Δ_s, at ASD-level and strength-level forces, respectively, for hold-down assemblies shown in Tables 1B, 2B, and 4B of this report, include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation where the unbraced length of the rod is a maximum of 6 inches (152 mm) for assemblies using HDU, HDQ, and HHDQ hold-downs; and a maximum of 4.5 inches (114 mm) for assemblies using DTT2 hold-downs. The contribution of the hold-down anchor rod elongation to the total elongation (deflection) of the hold-down assembly needs to be considered when the actual diameter, length, or ASTM steel specification of the anchor rod differs from that described in this report.

Please note: When seismic governs, the symbol Δ_s as used in this report for hold-down *assemblies* refers to the symbol d_a in IBC Section 2305.3 and to the symbol Δ_a in Section 4.3.2 of AWC SDPWS-2015 or ANSI/AF&PA SDPWS-2008, as applicable.

Tabulated allowable loads are for hold-downs connected to wood used under continuously dry interior conditions, and where sustained temperatures are 100°F (37.8°C) or less.

When hold-downs are fastened to wood having a moisture content greater than 19 percent (16 percent for engineered lumber), or where wet service is expected, the allowable loads shown in Tables 1B, 2B, 2D, and 3 of this report must be adjusted by the wet service factor, C_M, specified in the NDS.

When hold-downs are fastened to wood that will experience sustained exposure to temperatures exceeding 100°F (37.8°C), the allowable loads shown in Tables 1B, 2B, 2D, and 4B in this report must be adjusted by the temperature factor, C_t, specified in the NDS.

The design of wood members fastened to the hold-down devices must consider combined stresses due to axial tension or compression, and flexural bending induced by eccentricities in the connection about either or both axes, relative to the centroid of the wood member. Stresses must be evaluated at the critical net section for total combined stress in accordance with the NDS.

The design of hold-downs used in series must account for the cumulative deformation of all hold-downs within that series.

4.1.2 Hold-down Devices Used as Anchorage of Structural Walls: Allowable tensile strengths and strength-level displacements are specified in Table 1C for HDU hold-down devices. Allowable tensile and compressive strengths and corresponding displacements are specified in Table 2C for HDQ8/HHDQ hold-down devices. These values are for the steel anchorage device independent of the SDS screws and anchor rod, and are used when designing structural wall anchorage in accordance with Section 12.11.2.2.2 of ASCE 7. Allowable compression loads of a structural wall anchorage system consisting of HDQ8/HHDQ hold-down devices, wood members, SDS wood screws, and threaded anchor rod, are shown in Table 2D. Axial compression of the anchor rod must be calculated when the actual diameter, length, or ASTM steel specification of the anchor rod differs from that described in the footnotes to Table 2D. The effective length and slenderness ratio of anchor rods subject to axial compression loads must be determined using accepted engineering principles.

4.1.3 Anchorage to Concrete or Masonry: Adequate embedment length and anchorage details, including edge and end distances, must be determined by a registered design professional in accordance with Chapters 19 or 21 of the IBC, as applicable, for design of anchorage to concrete and masonry structural members.

Where design load combinations include earthquake loads or effects, the design strength of anchorage to concrete must be determined in accordance with 2018 or 2015 IBC Sections 1901.3 and 1905, 2012 IBC Section 1909 or 2009 or 2006 IBC Section 1912, except for detached one- and two-family dwellings assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, S_s, is less than 0.4g.

4.2 Installation:

Installation of the Simpson Strong-Tie hold-down connectors must be in accordance with this evaluation report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

4.3 Special Inspection:

4.3.1 IBC: For compliance with the 2018, 2015, 2012 or 2009 IBC, a statement of special inspection must be prepared by the registered design professional in responsible charge, and submitted to the code official for approval, where required by 2018, 2015 and 2012 IBC Section 1704.3 or 2009 IBC Section 1705. For compliance with the 2006 IBC, a quality assurance plan must be submitted to the code official for approval, where required by 2006 IBC Sections 1705 or 1706. Special inspections for seismic resistance must be conducted as required, and in accordance with the appropriate sections of Chapter 17 of the IBC. Special inspections for anchor bolts in concrete or masonry must be conducted in accordance with 2018, 2015, and 2012 IBC Sections 1705.3 or 1705.4; and 2009 and 2006 IBC Sections 1704.4 or 1704.5.

4.3.2 IRC: For installations under the IRC, special inspection is not normally required. However, for an engineered design where calculations are required to be signed by a registered design professional, periodic special inspection requirements and exemptions are as stated in Section 4.3.1, as applicable for installations under the IRC.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie hold-down connectors described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The connectors must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available at the jobsite

at all times during installation.

5.2 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Adjustment factors noted in Section 4.1 and the applicable codes must be considered, where applicable.

5.4 Connected wood members and fasteners must comply, respectively, with Sections 3.2.2 and 3.2.3 of this report.

5.5 Use of steel hold-down connectors with preservative- or fire-retardant-treated lumber must be in accordance with Section 3.2.1 of this report. Use of fasteners with preservative- or fire-retardant-treated lumber must be in accordance with Section 3.2.3 of this report.

5.6 Anchorage to concrete or masonry structural members must be designed in accordance with Section 4.1.3 of this report.

5.7 No further duration of load increase for wind or earthquake loading is allowed.

5.8 Welded hold-downs (models HHDQ11 and HHDQ14) are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Hold-downs (Tie-downs) Attached to Wood Members (AC155), dated May 2015 (editorially revised January 2018).

7.0 IDENTIFICATION

7.1 The hold-down devices described in this report are identified with a die-stamped label or an adhesive label indicating the name of the manufacturer (Simpson Strong-Tie), the model number, and the number of the index evaluation report (ESR-2523) which contains a summary of all the product model numbers in the ICC-ES evaluation reports listed in that report for this manufacturer. The SDS wood screws are identified as described in evaluation report ESR-2236.

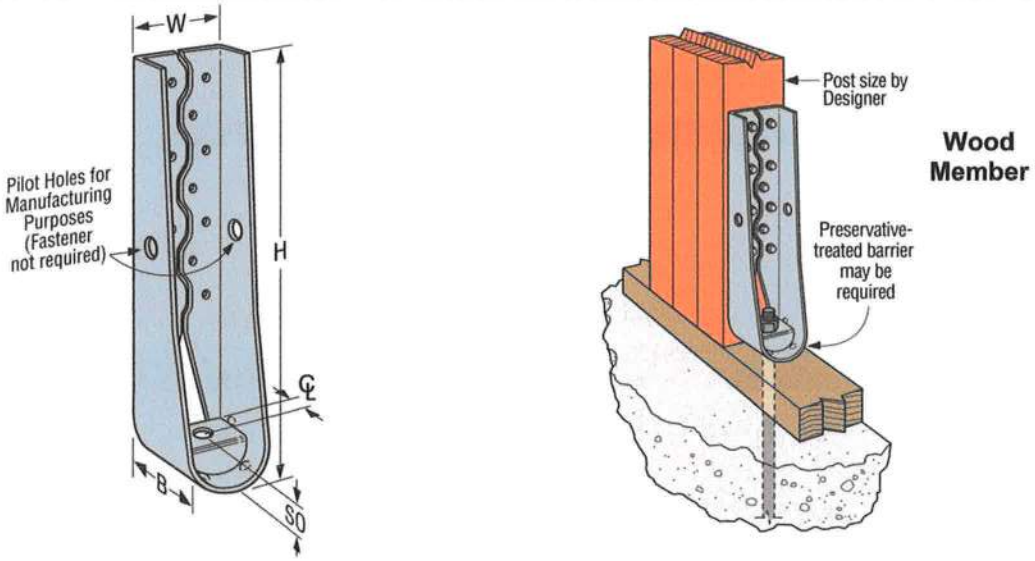
7.2 The report holder's contact information is the following:

SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 925-5099
www.strongtie.com

TABLE 1A—DIMENSIONS AND FASTENER REQUIREMENTS FOR HDU SERIES HOLD-DOWN CONNECTORS

HOLD-DOWN MODEL NO.	DIMENSIONS (in)					ANCHOR BOLT DIA. (in)	SDS SCREW QUANTITY
	H	W	B	CL	SO		
HDU2	$8^{11}/_{16}$	3	$3^{1}/_{4}$	$1^{1}/_{4}$	$1^{3}/_{8}$	$^{5}/_{8}$	6
HDU4	$10^{15}/_{16}$	3	$3^{1}/_{4}$	$1^{1}/_{4}$	$1^{3}/_{8}$	$^{5}/_{8}$	10
HDU5	$13^{3}/_{16}$	3	$3^{1}/_{4}$	$1^{1}/_{4}$	$1^{3}/_{8}$	$^{5}/_{8}$	14
HDU8	$16^{5}/_{8}$	3	$3^{1}/_{2}$	$1^{1}/_{4}$	$1^{1}/_{2}$	$^{7}/_{8}$	20
HDU11	$22^{1}/_{4}$	3	$3^{1}/_{2}$	$1^{1}/_{4}$	$1^{1}/_{2}$	1	30
HDU14	$25^{21}/_{32}$	3	$3^{1}/_{2}$	$1^{9}/_{16}$	$1^{9}/_{16}$	1	36

For **SI:** 1 inch = 25.4 mm.



HDU Hold-down

Vertical HDU Hold-down Installation

FIGURE 1—HDU SERIES HOLD-DOWNS

TABLE 1B—ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR HDU SERIES HOLD-DOWN ASSEMBLIES[1,2,3,4]

HOLD-DOWN MODEL NO.	SDS SCREW SIZE (in)	ALLOWABLE TENSION LOADS[5], P_{all} (lbs) C_D = 1.33 or C_D = 1.6 Wood Member Thickness[6] (in.)						DISPLACEMENT Δ AT MAXIMUM LOAD[8,9] (in.)	
		3	3.5	4.5	5.5	7.25	5.5[7]	Δ_{all}	Δ_s
HDU2	1/4 x 1.5	1,810	1,810	1,810	1,810	1,810	1,810	0.069	0.090
	¼ x 2.5	3,075	3,075	3,075	3,075	3,075	3,075	0.088	0.118
HDU4	¼ x 1.5	3,105	3,105	3,105	3,105	3,105	3,105	0.083	0.108
	¼ x 2.5	4,565	4,565	4,565	4,565	4,565	4,565	0.114	0.154
HDU5	¼ x 1.5	3,960	3,960	3,960	3,960	3,960	3,960	0.109	0.142
	¼ x 2.5	5,645	5,670	5,670	5,670	5,670	5,670	0.115	0.158
HDU8	¼ x 1.5	5,980	5,980	5,980	5,980	5,980	5,980	0.087	0.115
	¼ x 2.5	6,765	6,970	7,870	7,870	7,870	7,870	0.113	0.161
HDU11	¼ x 2.5	—	—	—	9,535	11,175[10]	11,175	0.137	0.182
HDU14	¼ x 2.5	—	—	—	—	14,390[10]	14,445	0.172	0.239

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a wood structural member with the size of SDS wood screws noted in the table. The quantity of SDS wood screws must comply with Table 1A.
[2]The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed.
[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down assembly must not be increased for wind of earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads that tabulated allowable loads for the hold-down assembly must not be increased by 33 1/3 percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]Anchorage to concrete or masonry must be determined in accordance with Section 4.1.3 of this report.
[5]The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_s deformations.
[6]The minimum thickness of the wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be 3 1/2 inches, except as noted.
[7]The minimum width of the wood members must be 5 1/2 inches (6x6 nominal).
[8]Tabulated displacement values, Δ_{all} and Δ_s, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation, at ASD-level and strength-level forces, respectively.
[9]Elongation of the hold-down anchor rod must be calculated when the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report, or the actual unbraced length is greater than 6 inches. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 6 inches to 18 inches above the concrete, an additional 0.010 inch may be added to the tabulated hold-down displacement at allowable load, Δ_{all}, and an additional 0.014 inch may be added to the tabulated hold-down displacement at strength-level load, Δ_s, to account for anchor rod elongation.
[10]Requires a heavy hex anchor nut to achieve tabulated tension loads.

TABLE 1C—ALLOWABLE TENSION LOADS AND DISPLACEMENTS OF HDU SERIES HOLD-DOWN CONNECTORS[2,3]

HOLD-DOWN MODEL NO.	ALLOWABLE TENSION LOAD, P_{all} (lbs)	DISPLACEMENT Δ AT MAX LOAD[4] (in)	
		Δ_{all}	Δ_s
HDU2	3,505	0.081	0.110
HDU4	4,990	0.089	0.117
HDU5	5,670	0.078	0.107
HDU8	9,950	0.131	0.164
HDU11	11,905	0.121	0.157
HDU14	15,905[5]	0.124	0.172

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]This table lists the allowable tensile strength of the steel hold-down connectors exclusive of fasteners and anchor rods when tested on a steel jig.
[2]Allowable tension loads are applicable for designs complying with Section 12.11.2.2.2 of ASCE 7.
[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down must not be increased for wind of earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads that tabulated allowable loads for the hold-down must not be increased by 33 1/3 percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]Δ_{all} is the displacement at the tabulated ASD load and Δ_S is displacement at the strength-level load. Tabulated displacement values in Table 1C consist only of deformation of the hold-down (tie-down) device when tested on a steel jig. Other variables contributing to total displacement, d_a, such as fastener slip, wood shrinkage, and anchor bolt/rod elongation, must be checked by the registered design professional. The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level loads associated with the tabulated strength-level deformations, Δ_S.
[5]Requires a heavy hex anchor nut to achieve tabulated tension loads.

TABLE 2A—DIMENSIONS AND FASTENER REQUIREMENTS FOR HDQ8/HHDQ HOLD-DOWN CONNECTORS

HOLD-DOWN MODEL NO.	DIMENSIONS (in)					ANCHOR BOLT DIA. (in)	SDS SCREW QUANTITY
	H	W	B	CL	SO		
HDQ8	14	$2^{7}/_{8}$	$2^{1}/_{2}$	$1^{1}/_{4}$	$2^{3}/_{8}$	$^{7}/_{8}$	20
HHDQ11	$15^{1}/_{8}$	3	$3^{1}/_{2}$	$1^{1}/_{2}$	$^{7}/_{8}$	1	24
HHDQ14	$18^{3}/_{4}$	3	$3^{1}/_{2}$	$1^{1}/_{2}$	$^{7}/_{8}$	1	30

For **SI:** 1 inch = 25.4 mm.

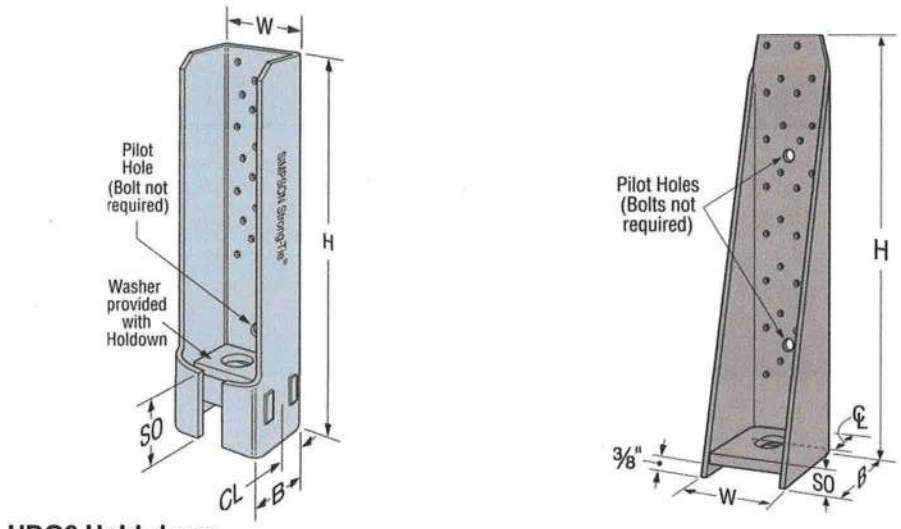


FIGURE 2A—HDQ8/HHDQ SERIES HOLD-DOWNS

TABLE 2B—ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR HDQ8/HHDQ SERIES HOLD-DOWN ASSEMBLIES[1,2,3,4]

HOLD-DOWN MODEL NO.	SDS SCREW SIZE (in)	ALLOWABLE TENSION LOADS[5], P_{all} (lbs) C_D = 1.33 or C_D = 1.6 Wood Member Thickness[6] (in.)						DISPLACEMENT[8,9] Δ AT MAX LOAD (in)	
		3	3.5	4.5	5.5	7.25	5.5[7]	Δ_{all}	Δ_s
HDQ8	¼ x 1.5	5,715	5,715	5,715	5,715	5,715	5,715	0.073	0.093
	¼ x 2.5	5,715	5,715	7,280	7,280	7,280	7,280	0.091	0.121
	¼ x 3	5,715	7,630	9,230	9,230	9,230	9,230	0.095	0.130
HHDQ11	¼ x 2.5	—	—	—	11,810	11,810	11,810[10]	0.131	0.168
HHDQ14	¼ x 2.5	—	—	—	—	13,015	13,710[10]	0.107	0.144

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a wood structural member with the size of SDS wood screws noted in the table above. The quantity of SDS wood screws must comply with Table 2A.
[2]The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed.
[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down assembly must not be increased for wind of earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads, that tabulated allowable loads for the hold-down assembly must not be increased by $33^{1}/_{3}$ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]Anchorage to concrete or masonry must be determined in accordance with Section 4.1.3 of this report.
[5]The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_S deformations.
[6]The minimum thickness of the wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be $3^{1}/_{2}$ inches, except as noted.
[7]The minimum width of the wood members must be $5^{1}/_{2}$ inches (6x6 nominal).
[8]Tabulated displacement values, Δ_{all} and Δ_S, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation, at ASD-level and strength-level forces, respectively.
[9]Elongation of the hold-down anchor rod must be calculated when the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report, or the actual unbraced length is greater than 6 inches. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 6 inches to 18 inches above the concrete, an additional 0.010 inch may be added to the tabulated hold-down displacement at allowable load, Δ_{all}, and an additional 0.014 inch may be added to the tabulated hold-down displacement at strength-level load, Δ_s, to account for anchor rod elongation.
[10]Requires a heavy hex anchor nut to achieve tabulated tension loads.

TABLE 2C—ALLOWABLE TENSION AND COMPRESSION LOADS AND DISPLACEMENTS FOR HDQ AND HHDQ SERIES HOLD-DOWN CONNECTORS[1,2,3]

MODEL NO.	ALLOWABLE LOAD[4], P_{all} (lbs)		DISPLACEMENT[5] Δ AT MAXIMUM LOAD (in.)			
			Tension		Compression	
	Tension	Compression	Δ_{all}	Δ_s	Δ_{all}	Δ_s
HDQ8	12,200	7,725	0.080	0.101	0.052	0.067
HHDQ11	12,290	9,745	0.053	0.068	0.086	0.120
HHDQ14	14,605[6]	11,010[6]	0.036	0.052	0.070	0.097

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]This table lists the allowable tensile and compressive strengths of the steel hold-down connectors exclusive of fasteners and anchor rods when tested on a steel jig.
[2]Allowable tension and compression loads are applicable for designs complying with Section 12.11.2.2.2 of ASCE 7.
[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down must not be increased for wind of earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads that tabulated allowable loads for the hold-down must not be increased by $33^1/_3$ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]The designer must verify that the hold-down anchor bolt is adequate to resist compression forces based on the unbraced length of the anchor bolt.
[5]Δ_{all} is the displacement at the tabulated ASD loads and Δ_S is displacement at strength-level loads. Tabulated displacement values in Table 2C consist only of deformation of the hold-down (tie-down) device when tested on a steel jig. Other variables contributing to total displacement, d_a, such as fastener slip, wood shrinkage, and anchor bolt/rod elongation, must be checked by the registered design professional. The tabulated allowable tension and compression (ASD) loads must be multiplied by 1.4 to obtain the strength-level loads associated with the tabulated strength-level deformations, Δ_S.
[6]A heavy hex anchor nut is required to achieve tabulated loads.

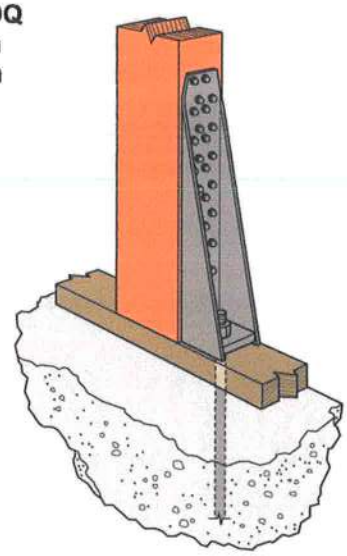
TABLE 2D—ALLOWABLE COMPRESSION LOADS AND DISPLACEMENTS FOR HDQ8/HHDQ SERIES HOLD-DOWN ASSEMBLIES[1,2,3]

MODEL NO.	SDS SCREW SIZE (in)	ALLOWABLE COMPRESSION LOADS[4], P_{all} (lbs) C_D = 1.33 or C_D = 1.6 Wood Member Thickness[7] (in.)						DISPLACEMENT[5,6] Δ AT MAX LOAD (in)	
		3	3.5	4.5	5.5	7.25	5.5[8]	Δ_{all}	Δ_s
HDQ8	¼ x 1.5	5,570	5,570	5,570	5,570	5,570	5,570	0.038	0.045
	¼ x 2.5	5,570	5,570	7,825	7,825	7,825	7,825	0.049	0.075
	¼ x 3	5,570	5,570	8,995	8,995	8,995	8,995	0.053	0.076
HHDQ11	¼ x 2.5	—	—	—	10,860	10,860	10,860[9]	0.109	0.143
HHDQ14	¼ x 2.5	—	—	—	—	12,035	12,035[9]	0.081	0.110

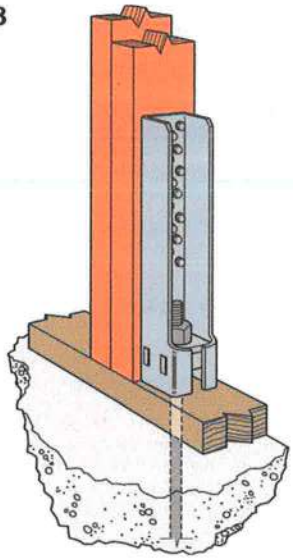
For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

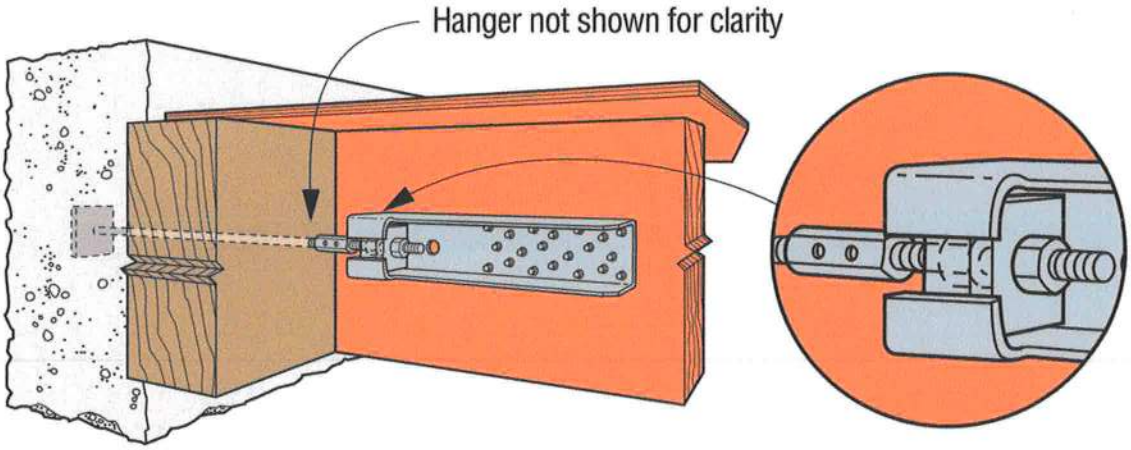
[1]Tabulated allowable compression loads are for a HDQ8 AND HHDQ Series hold-down assemblies consisting of the hold-down device attached to a wood structural member with the size of SDS wood screws noted in the table. The quantity of SDS wood screws must comply with Table 2A.
[2]Allowable compression loads are applicable for design of anchorage assemblies for structural walls in accordance with Section 12.11 of ASCE 7.
[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down assembly must not be increased for wind of earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads that tabulated allowable loads for the hold-down assemblies must not be increased by $33^1/_3$ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]The tabulated allowable compression load does not consider the end bearing capacity of the connected wood member.
[5]Δ_{all} is the displacement at the tabulated ASD loads and Δ_S is displacement at strength-level loads. The tabulated allowable tension and compression (ASD) loads must be multiplied by 1.4 to obtain the strength-level loads associated with the tabulated strength-level deformations, Δ_S.
[6]The registered design professional must verify that the hold-down anchor bolt is adequate to resist design compression forces based on the unbraced length of the anchor bolt.
[7]The minimum thickness of the wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be $3^1/_2$ inches, except as noted.
[8]The minimum width of the wood members must be $5^1/_2$ inches (6x6 nominal).
[9]A heavy hex anchor nut is required to achieve tabulated loads.

Vertical HHDQ Hold-down Installation



Vertical HDQ8 Hold-down Installation





Horizontal HDQ8 Hold-down Installation

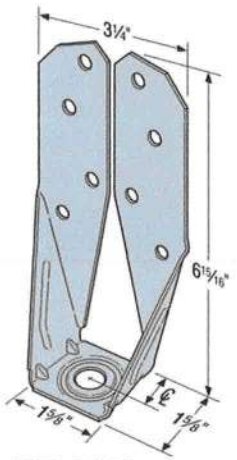
FIGURE 2B—TYPICAL INSTALLATIONS OF HDQ8/HHDQ SERIES HOLD-DOWNS

TABLE 3—DIMENSIONS, FASTENER REQUIREMENTS, ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR DTT2 SERIES HOLD-DOWN ASSEMBLIES[1,2,3,4,5]

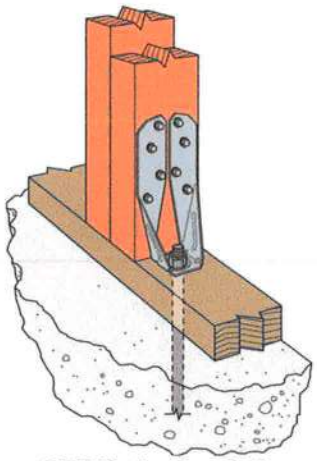
MODEL NO.	DIMENSIONS (inches)				REQUIRED FASTENERS			WOOD MEMBER THICKNESS[6] (inches)	ALLOWABLE TENSION LOADS[7], P_{all} (lbs)		DISPLACEMENT Δ AT MAXIMUM LOAD[8,9]	
					Anchor Bolt Dia.	SDS Screws						
	L	W	CL	B		Qty.	Size		C_D=1.0	C_D=1.6	Δ_{all}	Δ_s
DTT2	$6^{15}/_{16}$	$3^1/_4$	$^{13}/_{16}$	$1^5/_8$	$^1/_2$	8	SDS $^1/_4$ x $1^1/_2$	1.5	1,825	1,825	0.105	0.189
								3.0	2,000	2,145	0.128	0.241

For **SI:** 1 inch = 25.4 mm, 1 lb = 4.45 N.

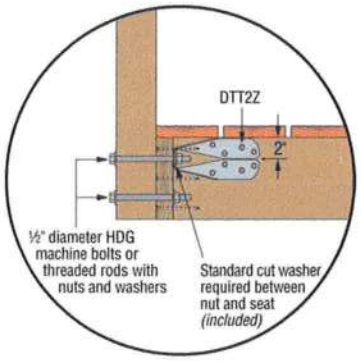
[1]One steel, plain (flat), standard plate (W) washer, as provided with the DTT2 hold-down, must be installed between the nut and the seat of the hold-down.
[2]Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a wood structural member with the fasteners noted in Table 3.
[3]The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factors, C_D, corresponding with a normal duration of load (C_D=1.0) and wind/earthquake loading (C_D=1.6) in accordance with the NDS. No further increase is allowed. Reduce where other load durations govern.
[4]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down assembly must not be increased for wind or earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads, the tabulated allowable loads for the hold-down assembly must not be increased by $33^1/_3$ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[5]Anchorage to concrete or masonry must be determined in accordance with Section 4.1.3 of this report.
[6]The minimum thickness of the wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be $3^1/_2$ inches.
[7]The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_S deformations.
[8]Tabulated displacement values, Δ_{all} and Δ_S, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation, at ASD-level and strength-level forces, respectively.
[9]Elongation of the hold-down anchor rod must be calculated when the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report, or the actual unbraced length is greater than 4.5 inches. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 4.5 inches to 18 inches above the concrete, an additional 0.010 inch may be added to the tabulated hold-down displacement at allowable load, Δ_{all}, and an additional 0.014 inch may be added to the tabulated hold-down displacement at strength-level load, Δ_s, to account for anchor rod elongation.



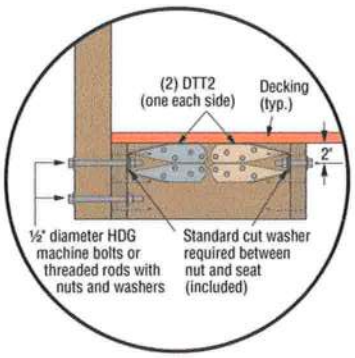
DTT2 Hold-Down



DTT2 Vertical Installation



DTT2 Horizontal Installation



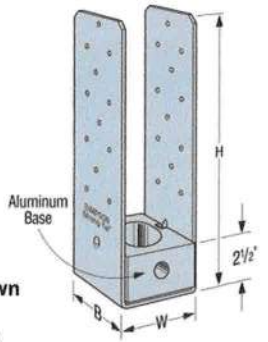
DTT2 Horizontal Installation

FIGURE 3—DTT2 HOLD-DOWN

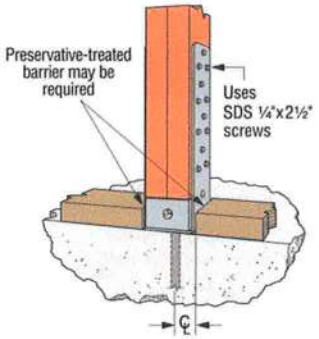
TABLE 4A—DIMENSIONS AND FASTENER REQUIREMENTS FOR HDC SERIES HOLD-DOWN CONNECTORS

MODEL NO.	DIMENSIONS (inches)				REQUIRED FASTENERS		
	H	W	B	CL	Anchor Bolt Dia. (in)	SDS Screws	
						Qty.	Size
HDC10/22	$14^{3}/_{8}$	$3^{1}/_{8}$	3	$1^{9}/_{16}$	$^{7}/_{8}$	24	SDS $^{1}/_{4}$ x 2.5
HDC10/4	$14^{1}/_{8}$	$3^{9}/_{16}$	3	$1^{13}/_{16}$	$^{7}/_{8}$	24	SDS $^{1}/_{4}$ x 2.5

For **SI:** 1 lbf = 4.45N, 1 inch = 25.4 mm.



HDC10 Hold-Down Patents: U.S. 6,513,290; Can. 2,364,585



HDC10/22 Installation

FIGURE 4—HDC10 HOLD-DOWN

TABLE 4B—ALLOWABLE TENSION/COMPRESSION LOADS AND DISPLACEMENTS FOR HDC SERIES HOLD-DOWN ASSEMBLES[1,2,3,4,12]

MODEL NO.	POST SIZE[7,9]	TENSION (Uplift)[5] C_D = 1.6			COMPRESSION (Download)[6,7] C_D = 1.0	COMPRESSION (Download)[6,7] C_D = 1.6[8]		
		Allowable Tension Load, P_{all}[10] (lbs)	Displacement, Δ, at maximum load (in)[11]		Allowable Compression Load, P_{all} (lbs)	Allowable Compression Load, P_{all}[10] (lbs)	Displacement, Δ, at maximum load (in)[11]	
			Δ_{all}	Δ_s			Δ_{all}	Δ_s
HDC10/22	2-2x4	9,135	0.054	0.073	7,070	9,255	0.027	0.034
HDC10/4	4x4	9,135	0.054	0.073	9,600	10,550	0.029	0.036

For **SI:** 1 lbf = 4.45N, 1 inch = 25.4 mm.

[1]One steel, plain (flat), SAE narrow (N) washer, as provided with the HDC10 hold-down, must be installed between the nut and the bottom of the U-shaped steel component of the hold-down.

[2]The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D, as shown in the table in accordance with the NDS. No further increase is allowed, except as noted in footnote 8, below.

[3]When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down assembly must not be increased for wind or earthquake loading. When using the alternate basic load combinations, in IBC Section 1605.3.2 that include wind or earthquake loads, the tabulated allowable loads for the hold-down assembly must not be increased by $33^{1}/_{3}$ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.

[4]Anchorage to concrete or masonry must be determined in accordance with Section 4.1.3 of this report.

[5]Allowable tension loads are for the hold-down assembly, consisting of the hold-down device attached to a wood structural member with the size and quantity of SDS wood screws noted in Table 4A.

[6]Allowable compression loads are based on the lesser of: a) the allowable compression load based on testing of the hold-down assembly, b) the calculated allowable concrete bearing strength, and c) the calculated bearing capacity of the wood members on the aluminum base.

[7]The wood member(s) must have a minimum F_c* of 1550 psi, where F_c* is the NDS-specified reference compression design value parallel-to-grain, multiplied by all applicable adjustment factors except C_P, and must be installed such that they bear directly upon the aluminum base. The bottom of the HDC10 hold-down must bear directly on concrete having a minimum compressive strength, f'_c, of 2,500 psi.

[8]Allowable compression loads corresponding to a load duration factor of C_D=1.6 are governed by the concrete bearing strength, based on an assumed f'_c of 2,500 psi and a gross bearing area of 9.38 in^2. The allowable compression loads, and the corresponding displacements may be linearly increased for higher concrete compressive strengths, up to maximum values as follows:

Model No.	P_{all} (lbs)	Δ_{all} (in)	Δ_s (in)
HDC10/22	11,315	0.031	0.038
HDC10/4	15,360	0.036	0.047

All other aspects of the foundation design, including but not limited to design for applicable shear and flexural stresses induced by the hold-down, must be considered by the designer.

[9]The cumulative thickness of the wood member(s) (i.e., the dimension parallel to the long axis of the SDS wood screws) must be 3 inches for the HDC10/22, and $3^{1}/_{2}$ inches for the HDC10/4. The minimum width of the wood members must be $3^{1}/_{2}$ inches.

[10]The tabulated allowable (ASD) loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_s deformations.

[11]Tabulated displacement values, Δ_{all} and Δ_s, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, and hold-down device extension or compression, at ASD-level and strength-level forces, respectively.

[12]Due to the possibility of galvanic action, the HDC10 must be limited to covered end-use installations with dry conditions of use.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY, INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® SCREW HOLD-DOWN CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Tie® Screw Hold-Down Connectors, described in ICC-ES evaluation report ESR-2330, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Simpson Strong-Tie® Screw Hold-Down Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2330, comply with the LABC Chapter 23, and the LARC and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Simpson Strong-Tie® Screw Hold-Down Connectors described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2330.
- The design, installation, conditions of use and identification of the screw hold-down connectors are in accordance with the 2018 *International Building Code®* (2018 IBC) provisions noted in the evaluation report ESR-2330.
- The design, installation and inspection are in accordance with additional requirements of the LABC Chapters 16 and 17, Sections 2305 and 2306, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- In accordance with LABC Section 2305.5, allowable seismic load values of Simpson Strong-tie® Screw Hold-Down Connectors used as hold-down connectors must be 75 percent of those in the evaluation report ESR-2330
- The seismic design provisions for hillside buildings referenced in LABC Section 2301.1 have not been considered and are outside of the scope of this supplement.
- For use in wall anchorage assemblies to flexible diaphragms, allowable loads for screw hold-down connectors shall be in accordance with Tables 1 through 4 of this supplement, calculated in accordance with City of Los Angeles Information Bulletin P/BC 2020-071.

This supplement expires concurrently with the evaluation report, reissued May 2020, revised July 2020.

TABLE 1—ALLOWABLE LOADS FOR HDU SERIES HOLD-DOWNS USED FOR WALL ANCHORAGE[1,2,3,4] IN THE CITY OF LOS ANGELES PER 2020 LABC CHAPTER 16

Hold-down Model No.	Fasteners			Allowable Tension Loads per Chapter 16 (lbs.) C_d = 1.6 and Governing Load Case (a, b, c)						
	Anchor Bolt Dia. (in.)	Wood MBR Fastener		Minimum Wood Member Thickness (in.)[5]						
		QTY	SDS Screw Size (in)	1.5	3	3.5	4.5	5.5	7.25	5.5[6]
DTT2Z	3/8	8	1/4x1.5	1560 a	1560 a	1560 a	1560 a	1560 a	1560 a	1560 a
HDU2	5/8	6	1/4x1.5	-	1810 c	1810 c	1810 c	1810 c	1810 c	1810 c
			1/4x2.5	-	2445 a	2445 a	2445 a	2445 a	2445 a	2445 a
HDU4	5/8	10	1/4x1.5	-	3105 a	3105 a	3105 a	3105 a	3105 a	3105 a
			1/4x2.5	-	3485 a	3485 a	3485 a	3485 a	3485 a	3485 a
HDU5	5/8	14	1/4x1.5	-	3960 a	3960 a	3960 a	3960 a	3960 a	3960 a
			1/4x2.5	-	3960 a	3960 a	3960 a	3960 a	3960 a	3960 a
HDU8	7/8	20	1/4x1.5	-	5980 a	5980 a	5980 a	5980 a	5980 a	5980 a
			1/4x2.5	-	6945 a	6945 a	6945 a	6945 a	6945 a	6945 a
HDU11[7]	1	30	1/4x2.5	-	-	-	-	8315 a	8315 a	8315 a
HDU14[7]	1	36	1/4x2.5	-	-	-	-	-	9850 b	9960 b

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N

[1]For hold-down dimensions, refer to ESR-2330 Table 1A for HDU or Table 3 for DTT2Z.
[2]The wood member must be sized for the load carrying capacity.
[3]Loads shall not be increased for short-term duration.
[4]Anchor bolt type, length, and embedment to be specified by the registered design professional.
[5]The minimum thickness of wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be 3 1/2 inches, except as noted.
[6]The minimum width of the wood members must be 5 1/2 inches (6x6 nominal).
[7]Requires heavy hex anchor nut for 4x8 nominal values.

Legend of Governing Criteria:

a = average ultimate load value on steel jig / (3 x 1.4).
b = average deflection on wood assembly at 3/8" / 3.
c = the fastener value in accordance with 2020 LABC.

TABLE 2—ALLOWABLE LOADS FOR HDU SERIES HOLD-DOWNS USED FOR WALL ANCHORAGE[1] IN CITY OF LOS ANGELES PER 2020 LABC CHAPTERS 91 AND 96

Hold-down Model No.	Fasteners			Allowable Tension Loads per Chapter 91 & 96 (lbs.) C_d = 1.0 and Governing Load Case (a, b, c)						
	Anchor Bolt Dia. (in.)	Wood MBR Fastener		Minimum Wood Member Thickness (in.)[5]						
		QTY	SDS Screw Size (in)	1.5	3	3.5	4.5	5.5	7.25	5.5[6]
DTT2Z	3/8	8	1/4x1.5	1310 a	1310 a	1310 a	1310 a	1310 a	1310 a	1310 a
HDU2	5/8	6	1/4x1.5	-	1500 c	1500 c	1500 c	1500 c	1500 c	1500 c
			1/4x2.5	-	2055 a	2055 a	2055 a	2055 a	2055 a	2055 a
HDU4	5/8	10	1/4x1.5	-	2500 c	2500 c	2500 c	2500 c	2500 c	2500 c
			1/4x2.5	-	2630 b	2630 b	2630 b	2630 b	2630 b	2630 b
HDU5	5/8	14	1/4x1.5	-	2440 b	2440 b	2440 b	2440 b	2440 b	2440 b
			1/4x2.5	-	3325 a	3325 a	3325 a	3325 a	3325 a	3325 a
HDU8	7/8	20	1/4x1.5	-	5000 b	5000 b	5000 b	5000 b	5000 b	5000 b
			1/4x2.5	-	5000 b	4215 b	5345 b	5345 b	5345 b	5345 b
HDU11[7]	1	30	1/4x2.5	-	-	-	-	4540 b	5500 b	5500 b
HDU14[7]	1	36	1/4x2.5	-	-	-	-	-	5550 b	5575 b

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N

[1]See footnotes to Table 1.

Legend of Governing Criteria:

a = average ultimate load value on steel jig / 5.
b = average deflection on wood assembly at 3/8" / 5.
c = the fastener value in accordance with 2020 LABC.

TABLE 3—ALLOWABLE LOADS FOR HDQ AND HHDQ SERIES HOLD-DOWNS USED FOR WALL ANCHORAGE[1,2,3,4] IN CITY OF LOS ANGELES PER 2020 LABC CHAPTER 16

Hold-down Model No.	Fasteners			Allowable Tension Loads per Chapter 16 (lbs.) C_d = 1.6 and Governing Load Case (a, b, c)					
	Anchor Bolt Dia. (in.)	Wood MBR Fastener		Minimum Wood Member Thickness (in.)[5]					
		QTY	SDS Screw Size (in)	3	3.5	4.5	5.5	7.25	5.5[6]
HDQ8	7/8	20	1/4x1.5	5715 a	5715 a	5715 a	5715 a	5715 a	5715 a
			1/4x2.5	5715 a	5715 a	7280 a	7280 a	7280 a	7280 a
			1/4x3.0	5715 a	7280 a	9060 a	9060 a	9060 a	9060 a
HHDQ11[7]	1	24	1/4x2.5	-	-	-	8550 a	8550 a	8550 a
HHDQ14[7]	1	30	1/4x1.5	-	-	-	-	10160 a	10160 a

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N

[1]For hold-down dimensions, refer to ESR-2330 Table 2A.
[2]The wood member must be sized for the load carrying capacity.
[3]Loads shall not be increased for short-term duration.
[4]Anchor bolt type, length, and embedment to be specified by the registered design professional.
[5]The minimum thickness of wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be 3 1/2 inches, except as noted.
[6]The minimum width of the wood members must be 5 1/2 inches (6x6 nominal).
[7]Requires heavy hex anchor nut for 6x6 nominal values.

Legend of Governing Criteria:

a = average ultimate load value on steel jig / (3 x 1.4).
b = average deflection on wood assembly at 3/8" / 3.
c = the fastener value in accordance with 2020 LABC.

TABLE 4—ALLOWABLE LOADS FOR HDQ AND HHDQ SERIES HOLD-DOWNS USED FOR WALL ANCHORAGE[1] IN CITY OF LOS ANGELES PER 2020 LABC CHAPTERS 91 AND 96

Hold-down Model No.	Fasteners			Allowable Tension Loads per Chapter 91 & 96 (lbs.) C_d = 1.0 and Governing Load Case (a, b, c)					
	Anchor Bolt Dia. (in.)	Wood MBR Fastener		Minimum Wood Member Thickness (in.)[5]					
		QTY	SDS Screw Size (in)	3	3.5	4.5	5.5	7.25	5.5[6]
HDQ8	7/8	20	1/4x1.5	5000 c	5000 c	5000 c	5000 c	5000 c	5000 c
			1/4x2.5	5000 c	5000 c	5665 b	5665 b	5665 b	5665 b
			1/4x3.0	5000 c	5665 b	6965 b	6965 b	6965 b	6965 b
HHDQ11[7]	1	24	1/4x2.5	-	-	-	5770 b	5770 b	5770 b
HHDQ14[7]	1	30	1/4x1.5	-	-	-	-	8535 a	8535 a

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N

[1]See footnotes to Table 3.

Legend of Governing Criteria:

a = average ultimate load value on steel jig / 5.
b = average deflection on wood assembly at 3/8" / 5.
c = the fastener value in accordance with 2020 LABC.

ICC-ES Evaluation Report

ESR-2330 FBC Supplement

Issued July 2020

This report is subject to renewal May 2021.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastics, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY, INC

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® SCREW HOLD-DOWN CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Tie® Screw Hold-Down Connectors, described in ICC-ES evaluation report ESR-2330, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 and 2017 *Florida Building Code—Building*
- 2020 and 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Simpson Strong-Tie® Screw Hold-Down Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2330, comply with the *Florida Building Code—Building*, and the *Florida Building Code—Residential*, provided the design requirements are determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-2330 for the 2018 and 2015 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable.

Use of the Simpson Strong-Tie® Screw Hold-Down Connectors has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building*, and the *Florida Building Code—Residential* with the following condition:

a. For connections subject to uplift, the connection must be designed for no less than 700 pounds (3,114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report ESR-2330, reissued May 2020, revised July 2020.

MSTA 18 Straps

ICC EVALUATION SERVICE

ICC-ES Evaluation Report

ESR-2105

Reissued January 2020
Revised July 2020
This report is subject to renewal January 2021.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE STRAPS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2018, 2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-2105 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

The Simpson Strong-Tie HST, LSTA, LSTI, MST, MSTA, MSTC, MSTI, and ST Series Straight Tie Straps; CMST and CS Series Coiled Tie Straps; MSTC16 Coiled Tie Strap; CTS218 Compression/Tension Straps; and the MSTCB3 Pre-bent Tie Straps are used to transfer between wood members wind or seismic loads resulting from the critical load combination in accordance with Section 1605.3 of the IBC where allowable stress equations are used. The straps may also be used in structures regulated by the IRC where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Straight Tie Straps:

The HST, LSTA, LSTI, MST, MSTA, MSTC, MSTI, and ST Series straight tie straps are supplied in manufacturer-designated lengths with prepunched holes for nails or bolts.

3.1.1 ST Series: The ST9, ST12, ST18, and ST 22 straps are 9 to $21\frac{5}{8}$ inches (229 to 549 mm) long and $1\frac{1}{4}$ inches (31.8 mm) wide. Each strap has unevenly spaced $\frac{11}{64}$-inch-diameter (4.3 mm) prepunched nail holes. See Figure 1 for a drawing of the ST9, ST12, ST18, and ST 22 tie straps.

The ST292, ST2122, ST2215, ST6215, ST6224, and ST6236 straps are $9\frac{5}{16}$ to $33\frac{13}{16}$ inches (236.5 to 858.8 mm) long, and have a constant width of $1\frac{13}{16}$ inches (46 mm). The total strap width between longitudinal edges is $2\frac{1}{16}$ inches (52.4 mm). Notches are $\frac{9}{32}$ inch (7.1 mm) deep and are spaced $1\frac{3}{4}$ inches (44.5 mm) on center. Each longitudinal edge of an ST strap has a row of $\frac{11}{64}$-inch-diameter (4.3 mm) prepunched nail holes, spaced $1\frac{3}{4}$ inches (44.5 mm) on center. See Figure 2 for a drawing of the ST292, ST2122, ST2215, ST6215, ST6224, and ST6236 tie straps.

The ST2115 strap is $16\frac{5}{16}$ inches (414.3 mm) long and $\frac{3}{4}$ inch (19.1 mm) wide, and has one row of $\frac{11}{64}$-inch-diameter (4.3 mm), prepunched nail holes, spaced $1\frac{5}{8}$ inches (41.3 mm) on center. See Figure 3 for a drawing of the ST2115 tie strap.

See Table 1 for ST Series tie strap dimensions, fastener schedules, and allowable tension loads.

3.1.2 HST Series: The HST Series tie straps are either $21\frac{1}{4}$ or $25\frac{1}{2}$ inches (540 or 648 mm) long and from $2\frac{1}{2}$ to 6 inches (63.5 to 152 mm) wide. Each end of an HST strap has either three or six prepunched holes to accommodate $\frac{5}{8}$-inch- or $\frac{3}{4}$-inch-diameter (15.9 and 19.1 mm) bolts. The spacing and the location of the bolt holes in the strap length comply with the code-required bolt spacing and end distances. See Figure 4 for a drawing of the HST Series tie straps. See Table 2 for strap dimensions, fastener schedules, and allowable tension loads.

3.1.3 MST Series: The MST Series tie straps are 27 to 72 inches (686 to 1829 mm) long and $2\frac{1}{16}$ inches (52.4 mm) wide. Each strap has two rows of $\frac{11}{64}$-inch-diameter (4.3 mm) prepunched nail holes spaced $1\frac{3}{4}$ inches (43.7 mm) on center. Additionally, the straps have $\frac{9}{16}$-inch-diameter (14.3 mm) prepunched bolt holes spaced $5\frac{1}{4}$ inches (133.4 mm) on center. See Figure 5 for a drawing of the MST Series tie straps. See Table 2 for strap dimensions, fastener schedules, and allowable tension loads.

3.1.4 LSTA and MSTA Series: The LSTA and MSTA Series tie straps are 9 to 49 inches (229 to 1245 mm) long and $1\frac{1}{4}$ inches (32 mm) wide. Each strap has one row of staggered $\frac{11}{64}$-inch-diameter (4.3 mm) prepunched nail holes. The MSTA49 has $\frac{5}{32}$-inch-diameter (4.0 mm) prepunched nail holes. Longitudinal spacing (pitch) of consecutive holes is $1\frac{1}{2}$ inches (38 mm), and the transverse distance (gage) between staggered holes is $\frac{9}{16}$ inch (14.3 mm). For the MSTA49, the longitudinal spacing (pitch) of consecutive holes is $1\frac{17}{32}$ inches (38.9 mm), and the transverse distance (gage) between staggered holes is $\frac{1}{2}$ inch (12.7 mm). Both ends of

every strap (except for the MSTA49) have one nail hole located between the last two staggered holes. See Figure 6 for a drawing of the LSTA and MSTA Series tie straps. See Table 3 for strap dimensions, fastener schedules, and allowable tension loads.

3.1.5 LSTI Series: The LSTI Series tie straps are either 49 or 73 inches (1244 or 1854 mm) long and 3 3/4 inches (95.3 mm) wide. Each strap has two rows of staggered 5/32-inch-diameter (4.0 mm) prepunched nail holes. Longitudinal spacing (pitch) of consecutive holes in a row is 3 inches (76 mm), and the transverse distance (gage) between staggered holes in a row is 3/8 inch (9.5 mm). See Figure 7 for a drawing of the LSTI Series tie straps. See Table 3 for strap dimensions, fastener schedules, and allowable tension loads.

3.1.6 MSTI Series: The MSTI Series tie straps are 2 1/16 inches (52.4 mm) wide and from 26 to 72 inches (660 to 1829 mm) long. Each strap has three rows of 5/32-inch-diameter (4.0 mm) prepunched nail holes spaced 3 inches (76 mm) on center. The holes in adjacent rows are offset by 1 inch (25.4 mm), resulting in one nail hole per inch of strap. See Figure 8 for a drawing of the MSTI Series tie straps. See Table 3 for strap dimensions, fastener schedules, and allowable tension loads.

3.1.7 MSTC Series: The MSTC Series tie straps are 28 1/4 to 77 3/4 inches (718 to 1975 mm) long and 3 inches (76.2 mm) wide. The straps have two rows of staggered prepunched holes spaced 1 1/2 inches (38.1 mm), measured from center-to-center of holes. On the nail head side of the strap, the holes are oblong and measure 3/64 inch wide by 9/32 inch long (5.1 mm by 7.1 mm), and are chamfered at 120 degrees. On the wood side of the strap, the holes are 11/64 inch wide by 1/4 inch long (4.4 mm by 6.4 mm). The long direction of the nail holes is perpendicular to the length of the strap. See Figure 9 for a drawing of the MSTC Series tie straps. See Table 3 for strap dimensions, fastener schedules, and allowable tension loads.

3.2 Coiled Tie Straps:

The CS Series, CSHP Series, CMST Series, and CMSTC16 tie straps are supplied in coils and are cut to a specified length at the jobsite for engineered applications where the connected wood members are not abutting each other.

3.2.1 CS Series: The CS14, CS16, CS18, CS20, and CS22 straps are supplied as 100-, 150-, 200-, 250-, and 300-foot-long (30.5, 45.7, 61.0, 76.2, and 91.4 m) coils, respectively. The coiled steel is 1 1/4 inches (32 mm) wide and has two rows of prepunched, 5/32-inch-diameter (4.0 mm) holes. The longitudinal spacing of the holes in each row is 2 1/16 inches (52.4 mm). See Figure 11 for a drawing of the CS Series tie straps and Figure 14 for a typical installation. See Table 4 for strap dimensions, fastener schedules, and allowable tension loads.

3.2.2 CMST Series: The CMST12 strap is supplied as a 40-foot-long (12.19 m) coil, and the CMST14 strap is supplied as a 52 1/2-foot-long (16.0 m) coil. The coiled steel is 3 inches (76 mm) wide and may have a crosswise weld. The coiled steel has two rows of prepunched round holes with 11/64-inch (4.3 mm) diameters, and two rows of equilateral triangular holes sized to circumscribe an 11/64-inch-diameter (4.3 mm) hole. The longitudinal spacing of the round and triangular holes in each row is 3.5 inches (88.9 mm). See Figure 12 for a drawing of the CMST14 tie strap, and Figure 14 for a typical installation. See Table 4 for strap dimensions, fastener schedules, and allowable tension loads.

3.2.3 CMSTC16: The CMSTC16 strap is supplied as a 54-foot-long (16.46 m) coil. The width of the coiled steel is 3 inches (76.2 mm) and may have a crosswise weld. The coiled steel has two rows of staggered prepunched holes spaced 1 1/2 inches (38.1 mm), measured from center-to-center of holes. On the nail head side of the strap, the holes are oblong and measure 1/4 inch wide by 21/64 inch long (6.4 mm by 8.3 mm), and are chamfered at 120 degrees. On the wood side of the strap, the holes are 11/64 inch wide by 1/4 inch long (4.4 mm by 6.4 mm). See Figure 13 for a drawing of the CMSTC16 tie strap Figure 14 for a typical installation. See Table 4 for strap dimensions, fastener schedules, and allowable tension loads.

3.2.4 CSHP Series: The CSHP18 and CSHP20 straps are supplied as 75-foot-long (22.9 m) coils. The coiled steel is 1 3/8 inches (35 mm) wide and has two rows of prepunched, 0.136-inch-diameter (3.5 mm) holes. The longitudinal spacing of the holes in each row is 1 15/16 inches (49.2 mm). See Figure 10 for a drawing of the CSHP Series tie straps and Figure 14 for a typical installation. See Table 4 for strap dimensions, fastener schedules, and allowable tension

3.3 Compression/Tension Straps:

The CTS Series compression/tension strap is supplied in manufacturer-designated lengths with pre-punched holes for nails or Simpson Strong-Tie SD screws (ESR-3046). The straps have unique rolled edges and embossments allowing the straps to span gaps to partially restore compression as well as tension capacity to the notched or cut wood lumber framing.

The CTS218 is 1 1/2 inches wide by 17 7/8 inches long (38 by 454 mm). The flat portion of the strap is 1 3/8 inches wide (35 mm) and the rolled edge is 3/8 inch deep (9.5 mm). The strap has one row of staggered 5/32-inch-diameter (4.0 mm) prepunched fastener holes. Longitudinal spacing of consecutive holes is 1/2 inch (12.7 mm), and the transverse distance between staggered holes is 3/8 inch (9.5 mm). There are 24 total prepunched holes, 12 holes on either side of a 6 5/16-inch-long gap (161 mm). A 5 3/4-inch-long-by-9/32-inch-deep (147 by 7.1 mm) embossment is centered in the gap and on the strap. See Figure 15 for a drawing of the CTS218 strap and Figure 16 for a typical installation. See Table 5 for strap quantities, fastener schedule, and allowable tensile and compressive loads.

3.4 Pre-Bent Straps:

The MSTC48B3 and MSTC66B3 are pre-bent straps designed to transfer tension load from an upper-story wood column or post to joists or a beam at the story below. The MSTC48B3 and MSTC66B3 pre-bent tie straps are 44 7/8 and 62 7/8 inches (1140 and 1597 mm) long, respectively, and 3 inches (76.2 mm) wide. The straps have two rows of staggered prepunched holes spaced 1 1/2 inches (38.1 mm), measured from center-to-center of holes. On the nail head side of the strap, the holes are oblong and measure 13/64 inch wide by 9/32 inch long (5.1 mm by 7.1 mm), and are chamfered at 120 degrees. On the wood side of the strap, the holes are 11/64 inch wide by 1/4 inch long (4.4 mm by 6.4 mm). The long direction of the nail holes is perpendicular to the length of the strap. See Figure 17 for drawings of the MSTCB3 Series pre-bent tie straps. See Table 6 for strap dimensions, fastener schedules, and allowable tension loads.

3.5 Materials:

3.5.1 Steel: The tie straps described in this report are manufactured from galvanized steel complying with ASTM A653 SS designation, and minimum G90 zinc coating specifications, except for the HST3 and HST6 tie straps, which are manufactured from galvanized steel complying

with ASTM A1011, and the MST48, MST60, and MST72 tie straps, which are manufactured from galvanized steel complying with Simpson Strong-Tie's published specification for steel. Refer to the tables in this report for the minimum specified yield and tensile strengths, F_y and F_u, respectively, of the steel for each strap described in this report. Some models are available with a G185 continuous sheet galvanization in accordance with ASTM A653. The model numbers of tie straps with a G185 zinc coating are followed by the letter Z. Some models are available with a batch hot-dip galvanized coating with a minimum specified coating weight of 2.0 ounces of zinc per square foot of surface area (600 g/m^2), total for both sides, in accordance with ASTM A123. The model numbers of tie straps with a batch hot-dipped zinc coating are followed by the letters HDG.

The galvanized steel tie straps have the following minimum base-metal thicknesses:

GAGE	BASE-METAL THICKNESS (inch)
No. 3	0.2285
No. 7	0.1715
No. 10	0.1275
No. 12	0.0975
No. 14	0.0685
No. 16	0.0555
No. 18	0.0445
No. 20	0.0334

3.5.2 Wood: Wood members with which the tie straps are used must be either sawn lumber or engineered lumber having a minimum specific gravity of 0.50 (minimum equivalent specific gravity of 0.50 for engineered lumber), and having a maximum moisture content of 19 percent (16 percent for engineered lumber). The thickness (depth) of the wood main member must be equal to or greater than the length of the fasteners specified in the tables in this report, unless the reduced penetration effect on the load calculation per the applicable *National Design Specification for Wood Construction*® (NDS) and its *Supplement* is taken into account, or as required by wood member design, whichever is greater.

3.5.3 Fasteners: Nails must comply with ASTM F1667 and have minimum bending yield strength, F_{yb}, of 90,000 psi (620.1 MPa). Bolts used with the MST and HST Series tie straps must as a minimum comply with ASTM F1554-07a Grade 36 and have a minimum bending yield strength of 45,000 psi (310.1 MPa).

Fasteners used in contact with preservative-treated or fire-retardant-treated lumber must, as a minimum, comply with 2018 and 2015 IBC Section 2304.10.5, 2012, 2009 and 2006 IBC Section 2304.9.5, 2018, 2015, 2012 and 2009 IRC Section R317.3 or 2006 IRC Section R319.3, as applicable. The lumber treater or report holder should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant-treated lumber.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Tabulated allowable tension loads in this evaluation report are based on allowable stress design and are the lesser of the tie strap steel strength or the connection strength. When connection strength governs, the tabulated allowable loads include the load duration factor, C_D, corresponding to design wind and seismic loads in accordance with the NDS.

Tabulated allowable loads are for tie straps connected to wood used under continuously dry interior conditions, and where sustained temperatures are 100°F (37.8°C) or less.

When tie straps are fastened to wood having a moisture content greater than 19 percent (16 percent for engineered wood products), or where wet service is expected, the allowable tension loads based on fastener lateral design values in this evaluation report must be adjusted by the wet service factor, C_M, specified in the NDS.

When tie straps are connected to wood that will experience sustained exposure to temperatures exceeding 100°F (37.7°C), the allowable loads in this evaluation report must be adjusted by the temperature factor, C_t, specified in the NDS.

Connected wood members must be analyzed for load-carrying capacity at the tie strap connection in accordance with the NDS.

4.2 Installation:

Installation of the tie straps must be in accordance with this evaluation report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie Straight and Coiled Tie Straps described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The tie straps must be manufactured, identified, and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available at the jobsite at all times during installation.

5.2 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statues of the jurisdiction in which the project is to be constructed.

5.3 Adjustment factors noted in Section 4.1 of this report and the applicable codes must be considered, where applicable.

5.4 Connected wood members and fasteners must comply, respectively, with Sections 3.5.2 and 3.5.3 of this report.

5.5 Use of tie straps with preservative-treated and fire-retardant-treated lumber is outside the scope of this report. Use of fasteners with treated lumber must comply with Section 3.5.3 of this report.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated March 2018.

6.2 Structural calculations.

6.3 Quality documentation.

7.0 IDENTIFICATION

7.1 Each tie strap described in this report is identified with a die-stamped label or an adhesive label, indicating the name of the manufacturer (Simpson Strong-Tie), the

model number, and the number of an index evaluation report (ESR-2523) which contains a summary of all the product model numbers in the ICC-ES evaluation reports issued to this manufacturer.

7.2 The report holder's contact information is the following:

SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 999-5099
www.strongtie.com
www.simpsonanchors.com

TABLE 1—ALLOWABLE TENSION LOADS FOR THE ST SERIES TIE STRAPS

MODEL SERIES	MODEL NO.	TIE STRAP PROPERTIES				COMMON NAILS[1] (Total Quantity–Size)	ALLOWABLE TENSION LOADS [2,3,4] (lbs)
		Thickness (Gage No.)	Length (inches)	Minimum F_y (ksi)	Minimum F_u (ksi)		C_D = 1.6
ST	ST292	20	$9^{5}/_{16}$	33	45	12–16d×$2^{1}/_{2}$	1,260[5]
	ST2122	20	$12^{13}/_{16}$	40	55	16–16d×$2^{1}/_{2}$	1,530[5]
	ST2115	20	$16^{5}/_{16}$	50	65	10–16d×$2^{1}/_{2}$	660[5]
	ST2215	20	$16^{5}/_{16}$	50	65	20–16d×$2^{1}/_{2}$	1,875[5]
	ST6215	16	$16^{5}/_{16}$	33	45	20–16d×$2^{1}/_{2}$	2,090[5]
	ST6224	16	$23^{5}/_{16}$	40	55	28–16d×$2^{1}/_{2}$	2,535[5]
	ST6236	14	$33^{13}/_{16}$	50	65	40–16d×$2^{1}/_{2}$	3,845[5]
	ST9	16	9	33	45	8–16d×$2^{1}/_{2}$	885
	ST12	16	$11^{5}/_{8}$	33	45	10–16d×$2^{1}/_{2}$	1,105
	ST18	16	$17^{3}/_{4}$	33	45	14–16d×$2^{1}/_{2}$	1,420[5]
	ST22	16	$21^{5}/_{8}$	33	45	18–16d×$2^{1}/_{2}$	1,420[5]

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N.

[1]Quantity of fasteners is the minimum number of common nails required to achieve the tabulated allowable loads. One half of the tabulated quantity must be installed in each wood member forming the connection. Fasteners must comply with Section 3.5.3 of this report.
[2]Allowable tension loads are based on the steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50.
[3]Allowable tension loads are the lesser of the tie strap steel strength or the connection strength.
[4]Tabulated allowable tension loads are governed by connection strength, unless noted otherwise. Connection strength is derived by multiplying the number of nails by the minimum value from the yield mode equations in Section 12.3.1 from the 2018 and 2015 NDS and Section 11.3.1 from the 2012 and 2005 NDS, where the side member (i.e., the steel tie strap) dowel bearing strength, F_{es}, is equal to $2.2F_u/C_D$, where C_D equals 1.6 as shown in the table, and where F_u equals the minimum specified tensile strength value of the steel shown in the table. The tabulated allowable tension loads governed by connection strength have been multiplied by the load duration factor, C_D, noted in the table, and are not permitted to be adjusted for other load durations.
[5]The tabulated allowable tension load is governed by steel strength, and does not include a one-third stress increase or the load duration factor, C_D. The steel strength is the least of yielding at the gross section of the strap, the fracture in the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of AISI S100-07 (2009 IBC) or AISI-NAS-01 (North American Specification for the Design of Cold-formed Steel Structural Members) (2006 IBC).

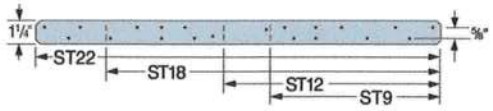


FIGURE 1—ST SERIES TIE STRAPS

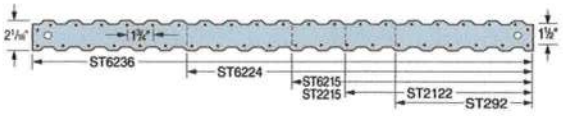


FIGURE 2—ST SERIES TIE STRAPS

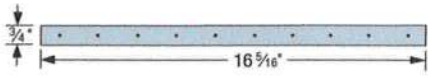


FIGURE 3—ST2115 TIE STRAP

TABLE 2—ALLOWABLE TENSION LOADS FOR THE HST AND MST SERIES TIE STRAPS

MODEL SERIES	MODE NO.	TIE STRAP PROPERTIES				FASTENERS[1] (Quantity–Size)		ALLOWABLE TENSION LOADS[2,3,4,5] (lbs) C_D = 1.6			
		Thick. (Gage No.)	Length (in.)	Min. F_y (ksi)	Min. F_u (ksi)	COMMON Nails	Bolts	Nails	Bolts Wood Member Thickness (in.) 3	$3^1/_2$	$5^1/_2$
HST	HST2	7	$21^1/_4$	33	45	—	$6–^5/_8$"	—	5,280	5,260	5,220
	HST5	7	$21^1/_4$	33	45	—	$12–^5/_8$"	—	10,680	10,650	10,595
	HST3	3	$25^1/_2$	33	52	—	$6–^3/_4$"	—	6,795	7,625	7,650
	HST6	3	$25^1/_2$	33	52	—	$12–^3/_4$"	—	13,760	15,395	15,425
MST	MST27	12	27	40	55	$30–16d×2^1/_2$	$4–^1/_2$"	3,700	2,180	2,175	2,165
	MST37	12	$37^1/_2$	40	55	$42–16d×2^1/_2$	$6–^1/_2$"	5.070	3,075	3,060	3,030
	MST48	12	48	42	56	$50–16dx2^1/_2$	$8–^1/_2$"	5,310[6]	3,695[6]	3,695[6]	3,675
	MST60	10	60	42	56	$68–16d×2^1/_2$	$10–^1/_2$"	6,730[6]	4,670	4,605	4,490
	MST72	10	72	42	56	$68–16d×2^1/_2$	$10–^1/_2$"	6,730[6]	4,670	4,605	4,490

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N.

[1]Quantity of fasteners is the total number of common nails or bolts, but not both, required to achieve the tabulated allowable loads. One half of the tabulated quantity must be installed in each wood member forming the connection. Fasteners must comply with Section 3.5.3 of this report.
[2]Allowable tension loads for nailed and bolted connections are not cumulative.
[3]Allowable tension loads are based on the steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50.
[4]Allowable tension loads are the lesser of the tie strap steel strength or the connection strength.
[5]Tabulated allowable tension loads are governed by connection strength, unless noted otherwise. Connection strength is derived by multiplying the number of fasteners by the minimum value from the yield mode equations in Section 12.3.1. from the 2018 and 2015 NDS and Section 11.3.1 from the 2012 and 2005 NDS, where the dowel bearing strength, F_{es}, of the side member (i.e., the steel tie strap) is equal to $2.2F_u/C_D$ for nailed and bolted connections, where the load duration factor, C_D, equals 1.6 as shown in the table, and where the minimum specified tensile strength, F_u of the steel strap is as shown in the table. For bolted connections, the tabulated allowable tension loads include the load duration factor, C_D, noted in the table, and the applicable group action factor, C_g.
[6]The tabulated allowable tension load is governed by steel strength, and does not include a one-third stress increase or the load duration factor, C_D. The steel strength is the least of yielding at the gross section of the strap, the fracture in the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of AISI S100-07 (2009 IBC) or AISI-NAS-01 (North American Specification for the Design of Cold-formed Steel Structural Members) (2006 IBC).

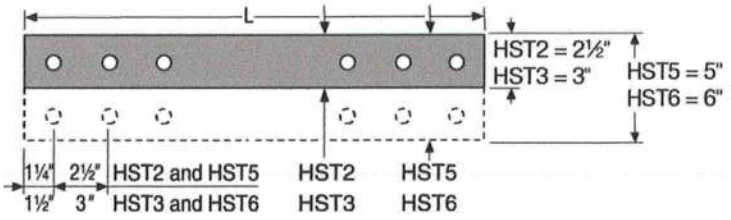


FIGURE 4—HST SERIES TIE STRAP

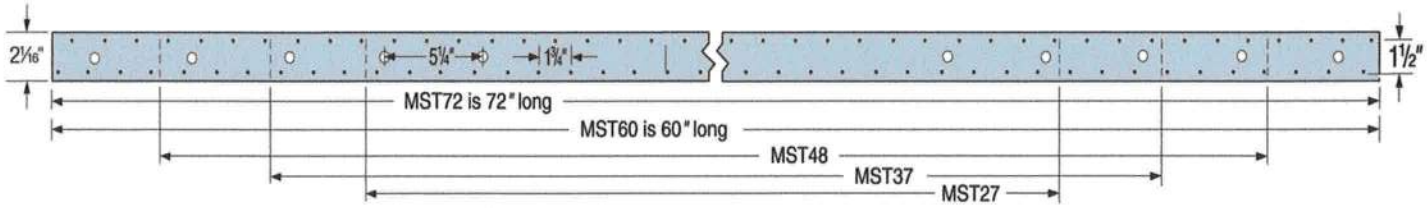


FIGURE 5—MST SERIES TIE STRAP

TABLE 3—ALLOWABLE TENSION LOADS FOR THE LSTA, MSTA, LSTI, AND MSTI SERIES TIE STRAPS

MODEL SERIES	MODEL NO.	TIE STRAP PROPERTIES				NAILS[1] (Total Quantity–Size)	ALLOWABLE TENSION LOADS[2,3,4] (lbs)
		Thickness (Gage No.)	Length (inches)	Min. F_y (ksi)	Min. F_u (ksi)		C_D = 1.6
LSTA	LSTA9	20	9	50	65	8–10d×2 1/2 common	740
	LSTA12	20	12	50	65	10–10d×2 1/2 common	925
	LSTA15	20	15	50	65	12–10d×2 1/2 common	1,110
	LSTA18	20	18	50	65	14–10d×2 1/2 common	1,235[5]
	LSTA21	20	21	50	65	16–10d×2 1/2 common	1,235[5]
	LSTA24	20	24	50	65	18–10d×2 1/2 common	1,235[5]
	LSTA30	18	30	50	65	22–10d×2 1/2 common	1,640[5]
	LSTA36	18	36	50	65	24–10d×2 1/2 common	1,640[5]
MSTA	MSTA9	18	9	50	65	8–10d×2 1/2 common	750
	MSTA12	18	12	50	65	10–10d×2 1/2 common	940
	MSTA15	18	15	50	65	12–10d×2 1/2 common	1,130
	MSTA18	18	18	50	65	14–10d×2 1/2 common	1,315
	MSTA21	18	21	50	65	16–10d×2 1/2 common	1,505
	MSTA24	18	24	50	65	18–10d×2 1/2 common	1,640[5]
	MSTA30	16	30	50	65	22–10d×2 1/2 common	2,050[5]
	MSTA36	16	36	50	65	26–10d×2 1/2 common	2,050[5]
	MSTA49	16	49	50	65	26–10d×2 1/2 common	2,020[5]
LSTI	LSTI49	18	49	40	55	32–10d×1 1/2 common	2,970
	LSTI73	18	73	40	55	48–10d×1 1/2 common	4,205[5]
MSTI	MSTI26	12	26	40	55	26–10d×1 1/2 common	2,745
	MSTI36	12	36	40	55	36–10d×1 1/2 common	3,800
	MSTI48	12	48	40	55	48–10d×1 1/2 common	5,070
	MSTI60	12	60	40	55	60–10d×1 1/2 common	5,070[5]
	MSTI72	12	72	40	55	72–10d×1 1/2 common	5,070[5]
MSTC	MSTC28	16	28 1/4	50	65	36–16d sinker	3,460
	MSTC40	16	40 1/4	50	65	52–16d sinker	4,735[5]
	MSTC52	16	52 1/4	50	65	62–16d sinker	4,735[5]
	MSTC66	14	65 3/4	50	65	76–16d sinker	5,850[5]
	MSTC78	14	77 3/4	50	65	76–16d sinker	5,850[5]

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N.

[1]Total fasteners are the minimum number of nails required to achieve the tabulated allowable loads. One half of the total must be installed in each wood member forming the connection. Fasteners must comply with Section 3.5.33 of this report.

[2]Allowable tension loads are based on the steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50.

[3]Allowable tension loads are the lesser of the tie strap steel strength or the connection strength.

[4]Tabulated allowable tension loads are governed by connection strength, unless noted otherwise. Connection strength is derived by multiplying the number of nails by the minimum value from the yield mode equations in Section 12.3.1 from the 2018 and 2015 NDS and Section 11.3.1 from the 2012 and 2005 NDS, where the side member (i.e., the steel tie strap) dowel bearing strength, F_{es}, is equal to $2.2F_u/C_D$, where the load duration factor, C_D, equals 1.6 as shown in the table, and where the minimum specified tensile strength, F_u of the steel strap is as shown in the table. The tabulated allowable tension loads governed by connection strength have been multiplied by the load duration factor, C_D, noted in the table.

[5]The tabulated allowable tension load is governed by steel strength, and does not include a one-third stress increase or the load duration factor, C_D. The steel strength is the least of yielding at the gross section of the strap, the fracture in the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of AISI S100-07 (2009 IBC) or AISI-NAS-01 (North American Specification for the Design of Cold-formed Steel Structural Members) (2006 IBC).

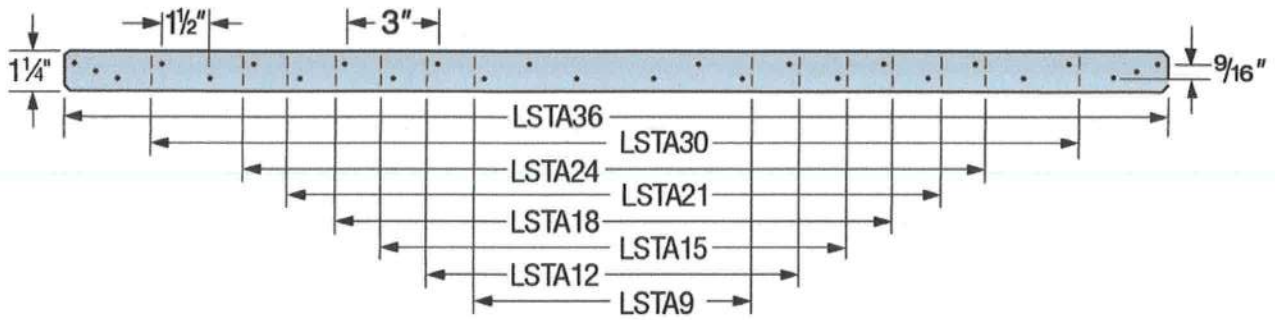


FIGURE 6—LSTA SERIES (MSTA SERIES SIMILAR) TIE STRAP

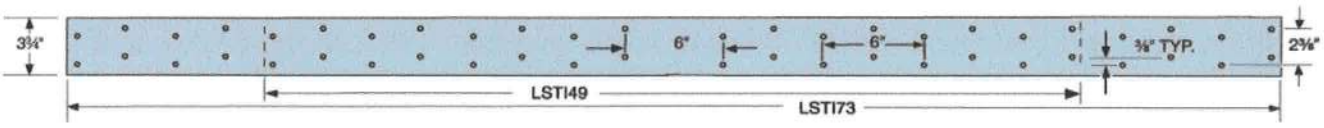


FIGURE 7—LSTI SERIES TIE STRAP

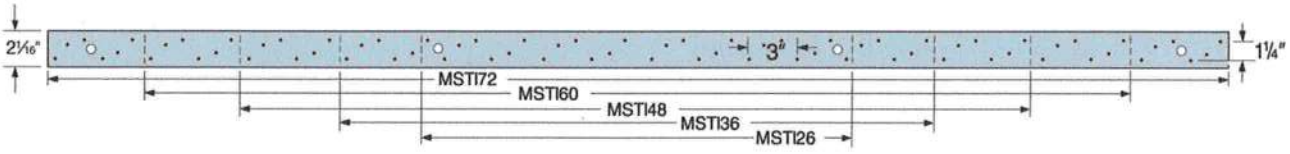


FIGURE 8—MSTI SERIES TIE STRAP

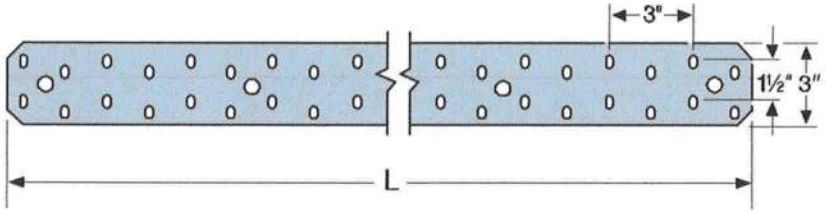


FIGURE 9—MSTC SERIES TIE STRAP

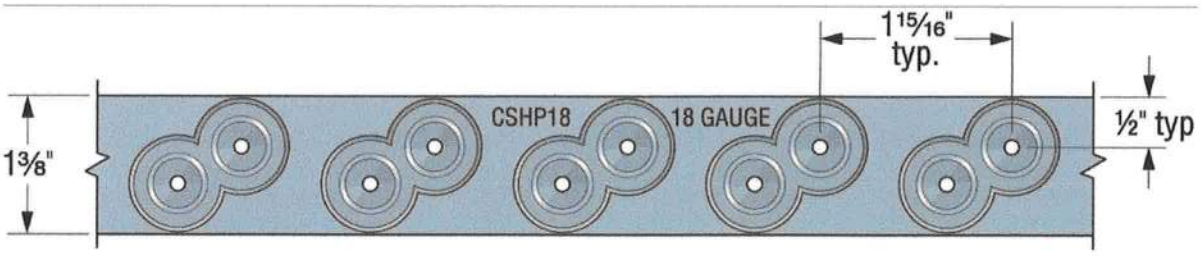


FIGURE 10—CSHP SERIES TIE STRAP
(SEE TABLE 4 NEXT PAGE)

TABLE 4—ALLOWABLE TENSION LOADS FOR THE CS AND CMST SERIES COIL STRAPS AND THE CMSTC16 COIL TIE STRAP

MODEL SERIES	MODEL NO.	TIE STRAP PROPERTIES				NAILS[1] (Quantity–Size)	ALLOWABLE TENSION LOADS[2,3] (lbs)	
		Thickness (Gage No.)	Length	Min. F_y (ksi)	Min. F_u (ksi)		C_D = 1.6	Based on Steel Strength[5]
CS	CS14	14	Cut to length	50	65	26–10d×2½ common	2,590	2,490
						30–8d common	2,505	2,490
	CS16	16	Cut to length	40	55	20–10d×2½ common	1,890	1,705
						22–8d common	1,725	1,705
	CS18	18	Cut to length	40	55	16–10d×2½ common	1,490	1,370
						18–8d common	1,385	1,370
	CS20	20	Cut to length	40	55	12–10d×2½ common	1,100	1,030
						14–8d common	1,065	1,030
	CS22	22	Cut to length	40	55	10–10d×2½ common	915	845
						12–8d common	905	845
CSHP	CSHP18	18	Cut to length	40	55	14–10d×2½ common	1680	1540
						16–8d common	1650	1540
	CSHP20	20	Cut to length	40	55	12–10d×2½ common	1380	1160
						12–8d common	1180	1160
CMST	CMST12	12	Cut to length	50	65	74–16d×2½ common	9,430	9,215
						86–10d×2½ common	9,430	9,215
	CMST14	14	Cut to length	50	65	56–16d×2½ common	6,550	6,475
						66–10d×2½ common	6,565	6,475
CMSTC	CMSTC16	16	Cut to length	50	65	50–16d sinker	4,805	4,690

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N.

[1]Total fasteners are the minimum number of nails required to achieve the tabulated allowable loads. One half of the total must be installed in each wood member forming the connection. Fasteners must comply with Section 3.5.3 of this report.
[2]Allowable tension loads are based on the steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50.
[3]Allowable tension loads must be the lesser of the tie strap steel strength or the connection strength.
[4]Allowable tension loads based on connection strength are derived by multiplying the number of nails by the minimum value from the yield mode equations in Section 12.3.1 from the 2018 and 2015 NDS and Section 11.3.1 from the 2012 and 2005 NDS, where the side member (i.e., the steel tie strap) dowel bearing strength, Fes, is equal to $2.2F_u/C_D$, where C_D equals 1.6 as shown in the table, and where the minimum specified tensile strength, F_u of the steel strap is as shown in the table. Allowable tension loads governed by connection strength have been multiplied by the load duration factor, C_D, noted in the table.
[5]The tabulated allowable tension loads based on steel strength do not include a one-third stress increase, and are the least of yielding at the gross section of the strap, the fracture in the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of AISI S100-07 (2009 IBC) or AISI-NAS-01 (North American Specification for the Design of Cold-formed Steel Structural Members) (2006 IBC).

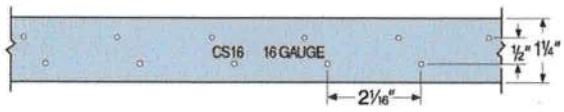


FIGURE 11—CS SERIES TIE STRAP

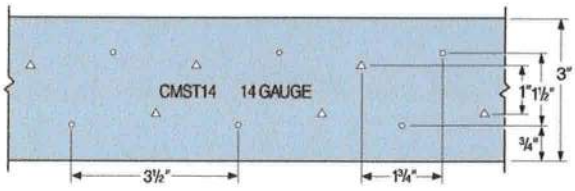


FIGURE 12—CMST14 TIE STRAP

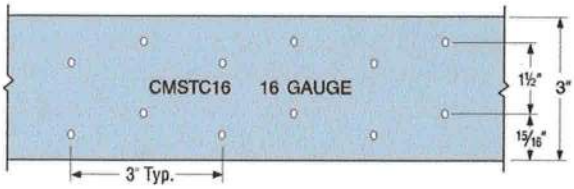


FIGURE 13—CMSTC16 TIE STRAP

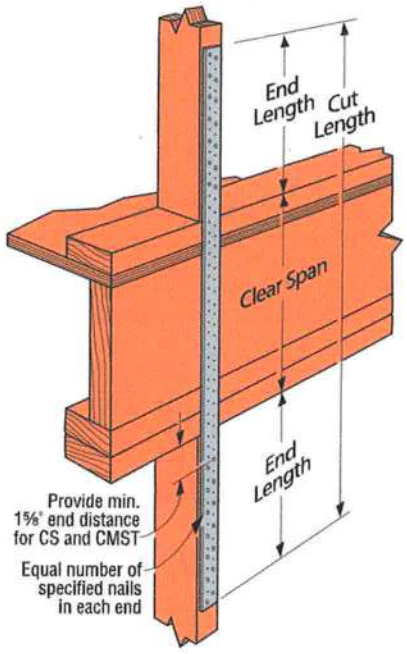


FIGURE 14—TYPICAL INSTALLATION OF CS,CMST,AND CMSTC16 TIE STRAP

TABLE 5—ALLOWABLE TENSION AND COMPRESION LOADS FOR CTS SERIES STRAP

MODLE NO.	STRAP QTY.	INSTALLATION	FASTENERS[2] (Quantity-Size)	ALLOWABLE LOADS[3] (lbs)	
				Compression (C_D = 1.60)[4,5]	Tension (C_D = 1.60)
CTS218[1]	1	One Side	24 – 10d x 1 1/2	1,125	2,270[6]
	2	One Side		2,2,50	4,535[6]
	2	Two Side		2,515	4,535[6]
	3	Two Side		3,310	6,805[6]
	4	Two Side		5,035	9.070[6]
	1	One Side	24 – SD#9 x 1 1/2	1,175	2,510[7]
	2	One Side		2,350	5,020[7]
	2	Two Side		2,735	5,020[7]
	3	Two Side		4,130	7,530[7]
	4	Two Side		5,470	10,040[7]

For **SI:** 1 inch = 25.4 mm, 1lbf = 4.45 N, 1 psi = 6.89 MPa.

[1]Strap properties: minimum F_y = 33, 000 pound per square inch (psi) and minimum F_u = 45, 000 psi. 14 gage steel.
[2]Fastener quantities are for a single strap.
[3]Allowable loads are based on steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50.
[4]The maximum gap between wood framing members is 4 1/2 inches (114 mm).
[5]The tabulated allowable compression capacity is controlled by steel buckling and is a tested load.
[6]The tabulated allowable tension loads are governed by the connection strength and have been multiplied by the load duration factor, C_D, of 1.60, as shown in the table. Connection strength is derived by multiplying half of the required number of nails by the minimum values in the yield mode equations in Section 12.3.1 of the 2018 and 2015 NDS and Section 11.3.1 of the 2012 and 2005 NDS, where the side member (i.e. steel strap) dowel bearing strength, F_{es}, is equal to $2.2F_u/C_D$, where F_u of steel strap equals to 45,000 psi.
[7]The tabulated allowable tension loads are governed by the steel strength, and does not include the 1/3 steel stress increase or the load duration factor, C_D. The steel strength is the least of the yielding at the gross section of the strap, the fracture at the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of the AISI S100-07 (2009 IBC), or AISI-NAS-01, North American Specification for Design of Cold-formed Steel Structural Members (2006 IBC).

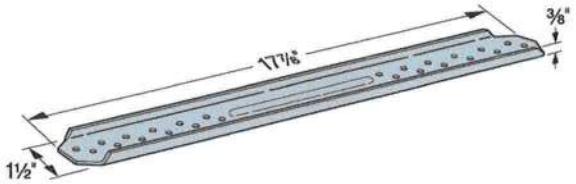


FIGURE 15—CTS218 COMPRESSION STRAP

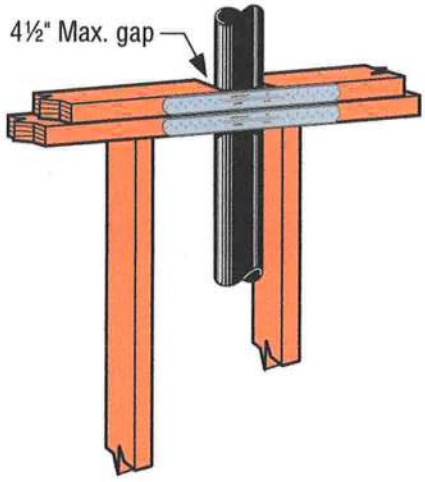


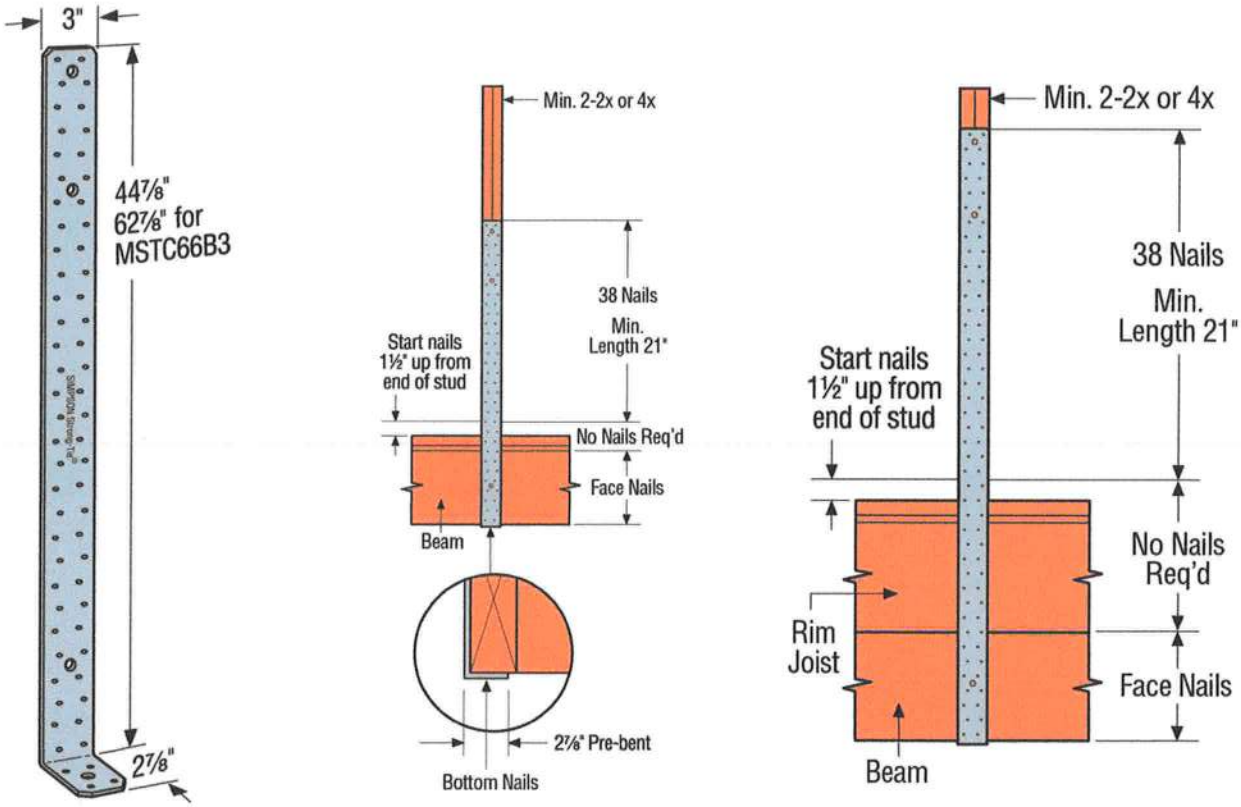
FIGURE 16—TYPICAL INSTALLATION OF CTS218 COMPRESSION/TENSION STRAP (TWO-STRAP,ONE-SIDED INSTALLATION SHOWN)

TABLE 6—ALLOWABLE TENSION LOADS FOR THE MSTCB3 SERIES PRE-BENT TIE STRAPS[1,2,3,4,5]

MODEL NO.	TIE STRAP PROPERTIES				MIN. WOOD BEAM DIMENSIONS		COMMON NAILS (Total Quantity-Size)			ALLOWABLE TENSION LOADS (lbs)
							Beam		Studs/ Post	
	Thickness (Gage No.)	Length (inches)	Min. F_y (ksi)	Mini. F_u (ksi)	Width (min)	Depth (min)	Face	Bottom		C_D = 1.6
MSTC48B3	14	44 7/8	50	65	3	9¼	12-10d	4-10d	38-10d	3,975
MSTC66B3	14	62 7/8	50	65	3½	11¼	14-10d			4,490

For **SI:** 1 inch = 25.4 mm, 1lbf = 4.45 N, 1 psi = 6.89 MPa.

[1] Nails in studs/post must be installed symmetrically. Nails may be installed over the entire length of the strap over the studs/post.
[2] Allowable tension loads are based on steel straps connected to wood members having an assigned or equivalent minimum specific gravity of 0.50. The beam must also have a reference compression design value perpendicular to grain, $F_{c\perp}$, of 625 psi (4,310 MPa) or greater.
[3] The tabulated allowable tension loads are based on the lowest value of the tested tension load at 0.125 inch deflection from static tests on wood members, the connection strength in accordance with Footnote 4, and the steel strength in accordance with Footnote 5. Further increase of the tabulated allowable tension loads is not permitted.
[4] Allowable tension loads based on connection strength are derived by multiplying the number of nails by the minimum value from the yield mode equations in Section 12.3.1 of the 2018 and 2015 NDS and Section 11.3.1 of the 2012 and 2005 NDS, where the side member (i.e., the steel tie strap) dowel bearing strength, F_{es}, is equal to $2.2F_u/C_D$, where C_D equals 1.6 as shown in the table, and where the minimum specified tensile strength, F_u of the steel strap is as shown in the table. Allowable tension loads governed by connection strength have been multiplied by the load duration factor, C_D, noted in the table.
[5] The tabulated allowable tension loads based on steel strength do not include a one-third stress increase, and are the least of yielding at the gross section of the strap, the fracture in the net section away from the connection, and fracture at the connection in accordance with Section C2 of AISI S100-16 (2018 IBC), AISI S100-12 (2015 IBC), Section C2 of AISI S100-07/S2-10 (2012 IBC), Section C2 of AISI S100-07 (2009 IBC) or AISI-NAS-01 (North American Specification for the Design of Cold-formed Steel Structural Members) (2006 IBC).



MSTC48B3 MSTC66B3 Installation with No Rim Jois MSTC66B3 Installation with Rim Joist

FIGURE 17—MSTCB3 SERIES PRE-BENT TIE STRAPS

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE STRAPS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Tie straps, described in ICC-ES evaluation report ESR-2105, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Simpson Strong-Tie straps, described in Sections 2.0 through 7.0 of the evaluation report ESR-2105, comply with the LABC Chapter 23, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Simpson Strong-Tie straps, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2105.
- The design, installation, conditions of use and labeling are in accordance with the 2018 *International Building Code®* (2018 IBC) provisions noted in the evaluation report ESR-2105.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 23 as applicable.
- In accordance with LABC Section 2305.5, allowable seismic load values of Simpson Strong-Tie straps and ties used as hold-down connectors must be 75 percent of those in the evaluation report ESR-2105.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The seismic design provisions for hillside buildings referenced in LABC Section 2301.1 have not been considered and are outside of the scope of this supplement.

This supplement expires concurrently with the evaluation report, reissued January 2020 and revised July 2020.

DIVISION: 06 00 00—WOOD, PLASTICS, AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE STRAPS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Simpson Strong-Tie straps, described in ICC-ES evaluation report ESR-2105, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 and 2017 *Florida Building Code—Building*
- 2020 and 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Simpson Strong-Tie straps, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-2105, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design requirements are determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-2105 for the 2018 and 2015 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable.

Use of the Simpson Strong-Tie straps has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* with the following condition:

a. For connections subject to uplift, the connection must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report ESR-2105, reissued January 2020 and revised July 2020.