TEXAS DEPARTMENT OF INSURANCE

Engineering Services Program / MC 103-3A 333 Guadalupe Street P.O. Box 149104 Austin, Texas 78714-9104
Phone No. (512) 322-2212 Fax No. (512) 463-6693

PRODUCT EVALUATION Effective February 1, 2012
FA-20

*The following product has been evaluated for compliance with the wind loads specified in the **International Residential Code (IRC)** and the **International Building Code (IBC)**. This product shall be subject to reevaluation **December 2015**.*

This product evaluation is not an endorsement of this product or a recommendation that this product be used. The Texas Department of Insurance has not authorized the use of any information contained in the product evaluation for advertising, or other commercial or promotional purpose.

This product evaluation is intended for use by those individuals who are following the design wind load criteria in Chapter 3 of the IRC and Section 1609 of the IBC. The design loads determined for the building or structure shall not exceed the design load rating specified for the products shown in the limitations section of this product evaluation. This product evaluation does not relieve a Texas licensed engineer of his responsibilities as outlined in the Texas Insurance Code, the Texas Administrative Code, and the Texas Engineering Practice Act.

Simpson Strong-Tie Uplift Rod System (URS), manufactured by

Simpson Strong-Tie Company, Inc.
2221 Country Lane
McKinney, TX 75069
Telephone: 800.999.5099
www.strongtie.com

will be accepted in designated catastrophe areas along the Texas Gulf Coast when installed in accordance with the manufacturer's installation instructions and this product evaluation.

PRODUCT DESCRIPTION

Simpson Strong-Tie continuous rod tie-down systems are used to anchor wood light frame walls against roof wind uplift delivered to the top of the wall by hurricane ties or similar devices. The continuous rod tie-down systems provide a continuous load path from one end at the top of the wall to the other end that terminates at the foundation or to other resisting elements. The URS consist of regularly spaced uplift rod runs with the spacing limited by the allowable load of either the framing or the components of the run. The uplift rod is a combination of fully or partially threaded rods, bearing plates, nuts, threaded rod couplers, and shrinkage compensators, when required, used to resist uplift tension forces (uplift). This evaluation report is limited to systems that resist roof wind uplift forces only. The URS system is comprised of the following components:

Steel Threaded Rods: The steel threaded rods used with the URS are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ inches in diameter. Standard carbon steel threaded rods are made of ASTM F1554, Grade 36 or ASTM A307, Grade A material with a minimum yield strength, F_y, of 36,000 psi and a minimum tensile strength, F_u of 58,000 psi. The rods are anchored at the bottom of the continuous tie-down run to the foundation through an approved cast-in-place anchor or post-installed concrete/masonry anchor or to a supporting wood framing member with bearing plates, nuts and an approved shrinkage compensating devices, when required by the design engineer. The threaded rods extend through all intermediate levels where they are connected by threaded rod couplers. Refer to Table 1 for threaded rod allowable loads.

Steel Bearing Plate Washers: The bearing plate washers used in the URS are 3 inch by 3 inch, 3 gauge (minimum 0.229 inch thick), available with two diameter holes, $\frac{9}{16}$ and $\frac{13}{16}$ inches. The bearing plate washers are manufactured from plain steel complying with ASTM A1011, Grade 33, with a minimum yield strength, F_y, of 33,000 psi, a minimum tensile strength, F_u of 52,000 psi. The bearing plate washers are used to transfer load into the rod system and are installed at the top of the wood double top plate system.

When the lower end of the rod terminates above the foundation, bearing plate washers are used to transfer load out of the rod system to the framing member. In this application, the bearing plate washers are used transfer load out of the rod system to the framing member. In this application, the bearing plate washers are installed at the bottom of the double top plates or wood beam at the terminating floor level. The allowable loads for the bearing plate washers are listed in Table 2. Refer to Figure 1 for the bearing plate washer details.

Nuts: UNC (unified threaded course) nuts are used with the URS system to terminate the threaded rod at the bearing plate. Steel heavy hex nuts are fabricated with ASTM A 563, Grade A and above, or ASTM A194, Grade 24 and above material.

Threaded Rod Couplers: The URS utilizes straight through and transitioning CNW coupling nuts. The CNW coupling nuts have witness holes for inspection purposes. The CNW coupling nuts are fabricated with ASTM A 563, Grade A and above, or ASTM A194, Grade 24 and above material. Straight through CNW couplers include a dimple on one face to provide a positive stop of the threaded rod at each end. Threading terminates in the middle section to provide a positive stop in transition couplers. CNW Coupler nuts are used to join appropriate threaded roads and are not limited to the URS product use. Refer to Figures 2 and 3 for the types of couplers. The dimensions and allowable loads for the coupler nuts are listed in Table 3.

Top-Plate-to-Stud Connectors: Top-plate-to-stud connectors or fasteners are required to be used to prevent top plate rotation due to eccentric loading from hurricane tie connectors installed on the side of the wall and rod restraint installed in the middle of the wall. Simpson-Strong-Tie top-plate-to-stud connectors or fasteners with an allowable load capable of resisting the connection forces listed in Table 4 and shown in Figure 4 shall be installed.

Simpson SDS Series Wood Screws: Simpson Strong-Tie Strong-Drive wood screws (SDS) are used as depicted in Figures 6 and 7 to reinforce top plate splices when utilizing the URS product as shown in Tables 7 and 8. Refer to ICC-ES evaluation report ESR 2236 for the description and allowable loads for the SDS screws.

Shrinkage Compensators: When shrinkage compensators are used with the URS, the compensators shall comply with ICC-ES evaluation report ESR 2320.

Uplift Rod Run: URS3, URS4, URS5 and URS6 are uplift rod runs consisting of required components, specified above, and shrinkage compensators, if required, to address wood shrinkage. The URS3 is comprised of the $\frac{3}{8}$ inch diameter threaded rod, couplers, BPRTUD3-4 bearing plate washer and nuts. The URS4 is comprised of the $\frac{1}{2}$ inch diameter threaded rod, couplers, BPRTUD3-4 bearing plate washer and nuts. The URS5 is comprised of the $\frac{5}{8}$ inch diameter threaded rod, couplers, BPRTUD5-6 bearing plate washer and nuts. The URS6 is comprised of the $\frac{3}{4}$ inch diameter threaded rod, couplers, BPRTUD5-6 bearing plate washer and nuts. These rod runs may terminate at the foundation or intermediate level where the dead load is sufficient to resist uplift forces. Refer to Figure 5 for typical elevation.

Uplift Rod Run: The URS consist of regularly spaced uplift rods (URS3, URS4, URS5 and URS6) designed to resist wind uplift loads delivered from the roof of the structure to the wall below through hurricane ties. Refer to Figure 5 for typical elevation. See Tables 5 through 8 for URS spacing, maximum rod length and maximum chord/drag allowable load.

Wood: Wood framing members must be sawn dimensioned lumber or engineered lumber. The maximum moisture content is 19 percent for sawn dimensional lumber and 16 percent for engineered lumber, except as noted in the design and installation section below. The specific gravity (G) shall be G≥0.50 for Douglas Fir-Larch, minimum No. 2 grade.

Product Identification: The Simpson Strong-Tie URS products described in this product evaluation report are identified with an adhesive or die-stamped label indicating the name of the manufacturer (**Simpson Strong-Tie**) and the model number of the component.

INSTALLATION REQUIREMENTS

General: The URS shall be fabricated, identified and installed in strict accordance with the manufacturer's published installation instructions, this report, design documents prepared by a Texas licensed engineer, and the current building code specifications adopted by the Texas Department of Insurance. In the event of a conflict between the manufacturer's published installation instructions and this report, this report shall govern. Design documents prepared by a Texas licensed engineer shall be available at all times on the jobsite during installation.

Structures built using the URS shall be designed and inspected by a Texas licensed professional engineer. Requirements for the design of the URS shall be based on the tables and details specified in this evaluation report along with the manufacturer's published installation instructions. This evaluation report is limited to systems that resist roof wind uplift forces only.

Design Documents: A Texas licensed engineer shall prepare calculations, design drawings and details for each URS installation. The design drawings shall include complete instructions for the connection and installation of the URS and other components as needed to provide a continuous load path and transfer of tension loads between portions of the structure. The design drawings shall be signed, sealed and dated by the engineer. The design drawings shall reference the appropriate edition of the wind load standard (ASCE 7) used based on the current building specifications adopted by the Texas Department of Insurance. The basic wind speed and the Exposure Category used for the design shall also be referenced.

A continuous load path from the peak of the roof to the foundation shall be provided. The URS is not used to replace anchor bolts or framing anchors that are required to resist lateral loads. The design of the wall framing anchorage system and associated connections is the responsibility of the engineer. The design shall be performed in accordance with the current building code specifications adopted by the Texas Department of Insurance.

Pre-engineered solutions are provided in Tables 4 through 8 of this report. Any alternate design shall consider appropriate load conditions, stress, deflection, wood shrinkage, bending and rotation of the plates and strength limit cases. The design of the wall top plates receiving uplift loads and distributing it to the URS shall consider both deflection and limit states, including combined axial and flexural stress for cases where the wood top plate(s) act as a drag strut or collector, and shall also consider geometric compatibility. A positive method to resist torsional rotation and cross-grain flexure of the top plates due to offsets between the point of load application (e.g., hurricane ties at the sides of the top plate) shall be provided where such conditions exist; and calculations in accordance with principles of mechanics shall be used to determine the demand connection used to resist top plate torsion.

Design Wind Loads: Design wind loads for the URS shall be determined using the wind load requirements for the structure as specified in the current building specifications adopted by the Texas Department of Insurance. All loads on the URS shall not exceed the allowable loads specified in this report.

Strength: The allowable loads shown in the tables of this product evaluation report are based on Allowable Stress Design (ASD). The allowable tension loads are shown for the different components of the URS. Tabulated allowable loads apply to URS products connected to wood used under dry conditions and where sustained temperatures are 100 degrees F or less. If installed in wood that has sustained exposure that exceeds these conditions, the allowable loads for components connector to or bearing on wood in this report must be adjusted by temperature factor, C_t, specified in the National Design Specification (NDS). When the URS products are installed to wood having moisture content greater than 19 percent for sawn dimensional lumber or 16 percent for engineered wood products, or

where wet service is expected, the allowable loads must be adjusted by the wet service factor, C_M, specified in the NDS.

Serviceability: The URS product load rating considers a serviceability limit. The spacing of the URS listed in Tables 5 through 8 are limited to the deflection limits in the ICC Evaluation Service AC391, Effective July 1, 2010, for the combined rod, lumber and bearing plate deflections.

Foundation: The foundation is considered to be part of the structure and shall be considered part of the design for the structure. A Texas licensed engineer shall prepare plans and calculations for the installation of the URS including anchorage into the foundation. The design drawings shall provide complete details on the installation and location of all components of the URS including the attachment to the foundation. Special inspections shall be provided as specified in Chapter 17 of the International Building Code.

Note: A set of sealed design drawings, Simpson Strong-Tie URS installation instructions, and this product evaluation report shall be available to the builder and inspector at the job site at all times. All fasteners shall be corrosion resistant as specified in the International Residential Code (IRC), the International Building Code (IBC), and the Texas Revisions.

Table 1 – Allowable Loads for Threaded Rods

Model Number	Gross Diam. (in.)	Area Gross (in^2)	Threads Per Inch	A_n (in^2)	Min. F_u (ksi)	Allowable Tension Based on Stress (lbs.)	Allowable Tension with 0.18" Elongation Limit (lbs) Uplift Rod Run maximum overall length (ft)					
							15	25	35	45	55	65
ATR 3/8	3/8	0.110	16	0.077	58	2485	2250	1350	960	750	610	520
ATR 1/2	1/2	0.196	13	0.142	58	4418	4120	2470	1760	1370	1120	950
ATR 5/8	5/8	0.307	11	0.226	58	6903	6550	3930	2810	2180	1790	1510
ATR 3/4	3/4	0.442	10	0.334	58	9940	9700	5820	4160	3230	2650	2240

1. Shaded area in allowable tension load of rod in table limited by maximum elongation limit of 0.18”.
2. Standard strength rod is ASTM F1554, Grade 36 steel or ASTM A36, Grade A steel.

Table 2 – Allowable Loads for Bearing Plate Washers

Bearing Plate Washer Model No.	**L (in.)**	**W (in)**	**T (in)**	**D_{hole} (in)**	**Allowable Bearing (lbs)**
					(160)
BPRTUD3-4	3	3	0.229	9/16	**6,100**
BPRTUD5-6	3	3	0.229	13/16	**5,910**

1. Allowable loads consider the load duration factor where applicable. No further increase allowed.
2. Allowable loads include reduced area based on take-up device alignment holes.

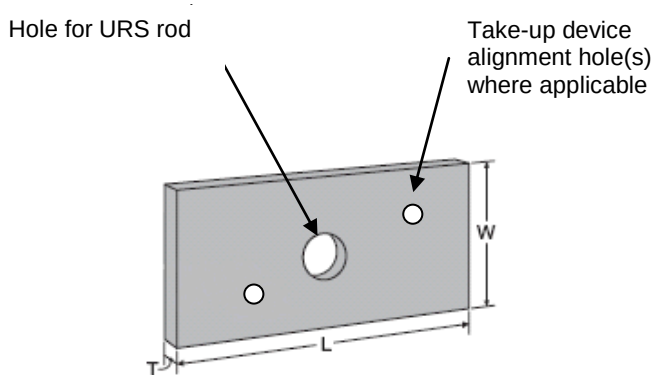


Figure 1 – Bearing Plate Washers

Table 3 – Allowable Loads for Coupler Nuts

Model No.	Rod Diameter (in)	H MIN (in)	Allowable Tension Capacity (lbs)
			(100)
CNW 3/8	0.375	1.125	2325
CNW 1/2	0.500	1.500	4265
CNW 5/8	0.625	1.875	6675
CNW 3/4	0.750	2.250	9610
CNW 5/8 - 1/2	0.625 to 0.500	1.500	4265
CNW 3/4 - 5/8	0.750 to 0.625	1.750	6675

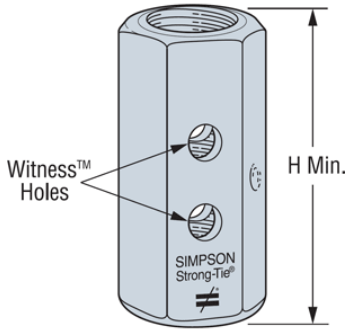


Figure 2 – Straight Through Coupler

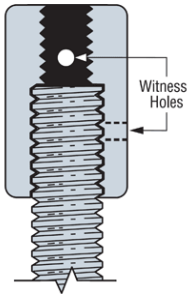
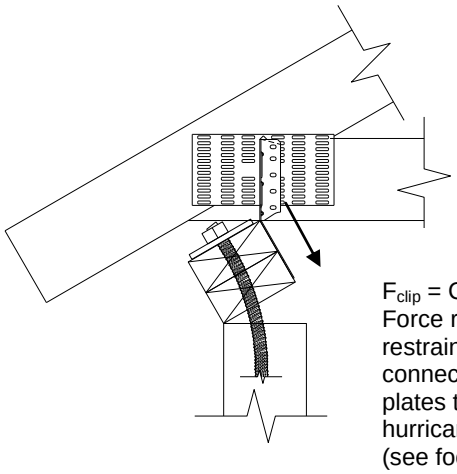


Figure 3 – Transition Coupler Nut

Table 4 – Required Top Plate Rotation Restraint Connection Force

Roof Uplift (plf)	Connection Force (lbs)		
	Connector Spacing		
	16 in.	24 in.	32 in.
100	67	100	133
150	100	150	200
200	133	200	267
300	200	300	400
400	267	400	533
500	333	500	667

1. The required connection force listed in the table is a function of the distance between the rod and hurricane tie.
2. The top plate to stud connection used to restrain top plate rotation shall be installed on the same side of the wall as the roof to top plate connection.



F_{clip} = Connection Force required to restrain rotation by connecting top plates to stud with hurricane tie (see footnote 2)

Figure 4 – Top Plate Rotation Restraint Connection Force

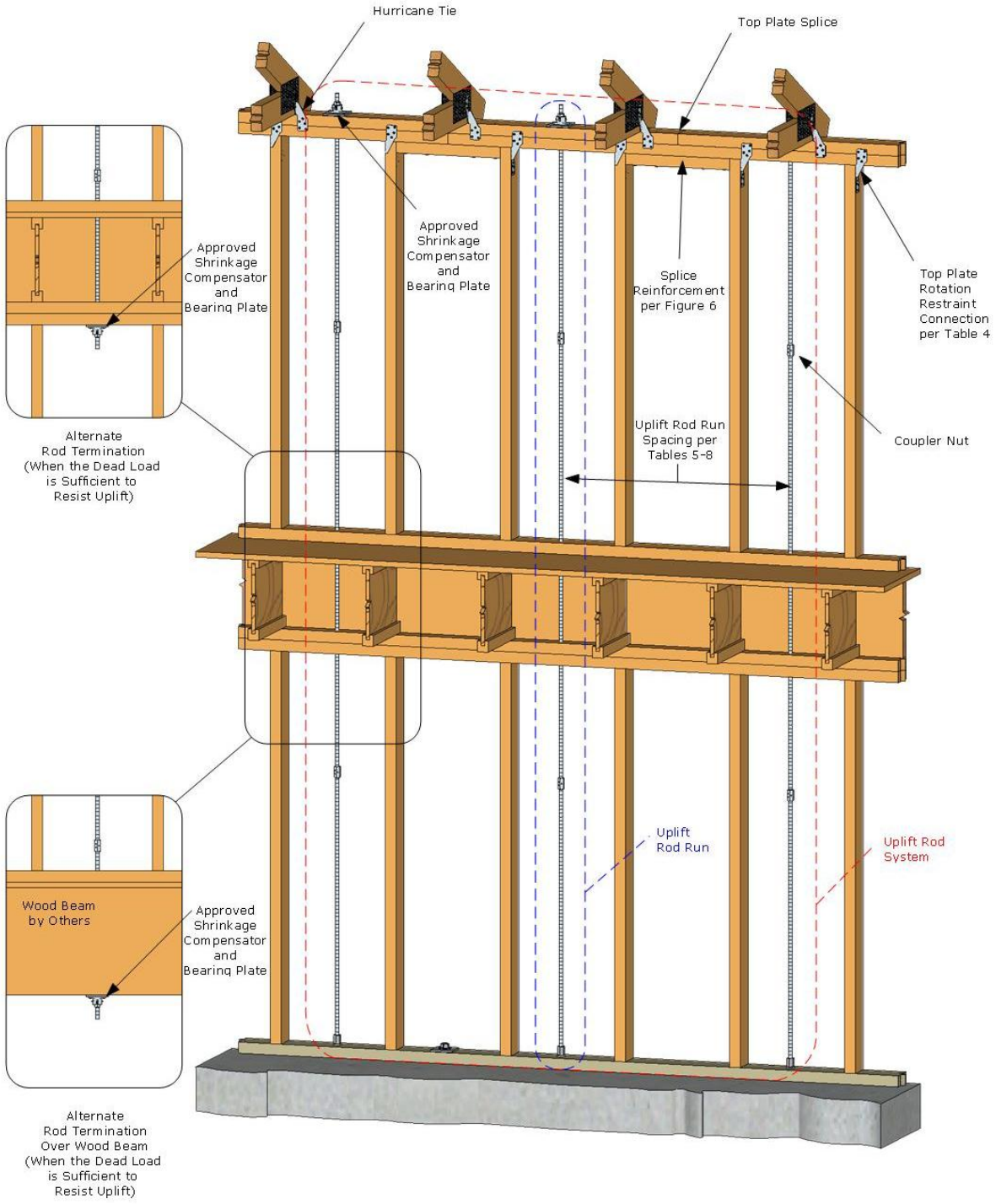


Figure 5 – Typical URS Elevation

TABLE 5: URS Spacing, Maximum Rod Length, and Maximum Chord/Drag Allowable Load Unreinforced Top Plate Splices: 2X4 Top Plates

Roof Uplift	URS Spacing (in.)	Uplift Rod System (URS) Model				Max. Chord/Drag Load[1,2] (lbs)
		URS3	URS4	URS5	URS6	
		Maximum URS Rod Length (ft)				
100 plf	24	65	65	65	65	5120
	30	65	65	65	65	4655
	36	65	65	65	65	4060
	40	65	65	65	65	3555
	42	65	65	65	65	3285
	48	23	43	65	65	2190
150 plf	24	65	65	65	65	4705
	30	65	65	65	65	3970
	36	63	65	65	65	2860
	40	38	65	65	65	2135
	42	26	47	65	65	1670
	48	NP	NP	NP	NP	-
200 plf	24	65	65	65	65	4295
	30	65	65	65	65	3220
	36	37	65	65	65	1830
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
300 plf	24	56	65	65	65	3205
	30	37	65	65	65	1585
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
400 plf	24	42	65	65	65	2285
	30	22	40	64	65	205
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
500 plf	24	33	60	65	65	1310
	30	NP	NP	NP	NP	-
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-

1. Allowable chord/drag tension load in single top plate remaining after uplift applied. Nailed top plate splice connection assumed. Consider adding strap(s) for additional chord/drag tension load as needed.
2. Largest URS diameter per spacing shown assumed for hole size in top plate, greater residual tension capacity will exist for smaller rod diameters.
3. NP Not Permitted.

TABLE 6: URS Spacing, Maximum Rod Length, and Maximum Chord/Drag Allowable Load Unreinforced Top Plate Splices: 2X6 Top Plates

Roof Uplift	URS Spacing (in.)	Uplift Rod System (URS) Model				Max. Chord/Drag Load[1,2] (lbs)
		URS3	URS4	URS5	URS6	
		Maximum URS Rod Length (ft)				
100 plf	30	65	65	65	65	7455
	36	65	65	65	65	6790
	40	65	65	65	65	6275
	42	65	65	65	65	6000
	48	57	65	65	65	4965
	60	NP	NP	NP	NP	-
150 plf	30	65	65	65	65	6695
	36	65	65	65	65	5695
	40	58	65	65	65	4805
	42	48	65	65	65	4405
	48	17	32	51	65	2915
	60	NP	NP	NP	NP	-
200 plf	30	65	65	65	65	5940
	36	51	65	65	65	4490
	40	34	62	65	65	3405
	42	25	47	65	65	2880
	48	NP	NP	NP	NP	-
300 plf	24	56	65	65	65	5910
	30	45	65	65	65	4315
	36	25	46	65	65	2305
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
400 plf	24	42	65	65	65	4965
	30	30	55	65	65	2765
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
500 plf	24	33	61	65	65	3915
	30	20	38	60	65	1290
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-

1. Allowable chord/drag tension load in single top plate remaining after uplift applied. Nailed top plate splice connection assumed. Consider adding strap(s) for additional chord/drag tension load as needed.
2. Largest URS diameter per spacing shown assumed for hole size in top plate, greater residual tension capacity will exist for smaller rod diameters.
3. NP Not Permitted.

TABLE 7: URS Spacing, Maximum Rod Length, and Maximum Chord/Drag Allowable Load Reinforced Top Plate Splices: 2X4 Top Plates [1]

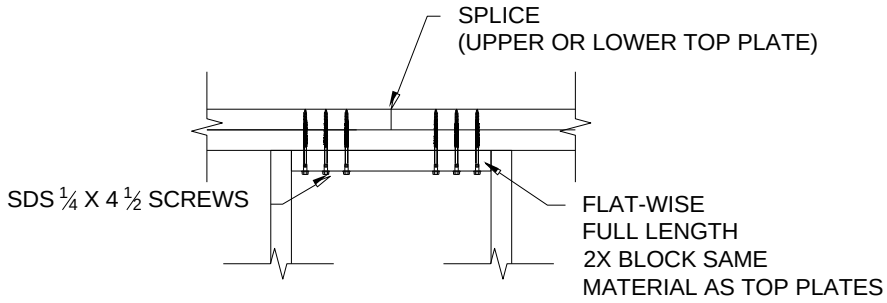
Roof Uplift	URS Spacing (in.)	Uplift Rod System (URS) Model				Max. Chord/Drag Load[2,3] (lbs)
		URS3	URS4	URS5	URS6	
		Maximum URS Rod Length (ft)				
100 plf	30	65	65	65	65	4715
	36	65	65	65	65	4060
	40	65	65	65	65	3555
	42	65	65	65	65	3285
	48	65	65	65	65	2285
	60	NP	NP	NP	15	205
150 plf	30	65	65	65	65	3970
	36	65	65	65	65	2985
	40	65	65	65	65	2225
	42	56	65	65	65	1745
	48	30	55	65	65	435
	60	NP	NP	NP	NP	-
200 plf	30	65	65	65	65	3220
	36	56	65	65	65	1910
	40	41	65	65	65	900
	42	34	62	65	65	325
	48	10	19	30	50	0
	60	NP	NP	NP	NP	-
300 plf	24	56	65	65	65	3205
	30	45	65	65	65	1655
	36	30	55	65	65	0
	40	18	33	52	65	0
	42	11	21	33	55	0
	48	NP	NP	NP	NP	-
400 plf	24	42	65	65	65	2285
	30	33	60	65	65	215
	36	17	31	50	65	0
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-
500 plf	24	33	61	65	65	1310
	30	24	43	65	65	0
	36	NP	NP	NP	NP	-
	40	NP	NP	NP	NP	-
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-

1. URS top plate splices shall be reinforced for bending in accordance with Figures 6 and 7.
2. Allowable tension load in single top plate remaining after uplift applied. Nailed top plate splice connection assumed and effect of bending reinforcement neglected. Consider adding strap(s) for additional chord/drag tension capacity as needed.
3. Largest URS diameter per spacing shown assumed for hole size in top plate, greater residual tension capacity will exist for smaller rod diameters.
4. NP Not Permitted.

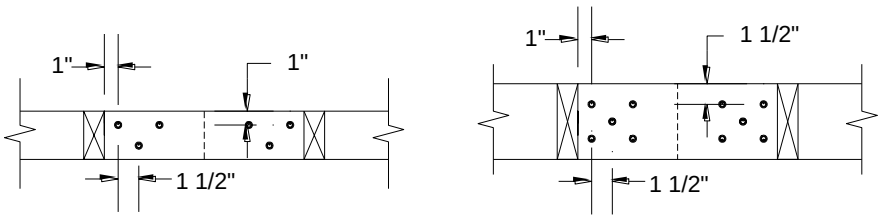
TABLE 8: URS Spacing, Maximum Rod Length, and Maximum Chord/Drag Allowable Load Reinforced Top Plate Splices: 2X6 Top Plates [1]

Roof Uplift	URS Spacing (in.)	Uplift Rod System (URS) Model				Max. Chord/Drag Load[2,3] (lbs)
		URS3	URS4	URS5	URS6	
		Maximum URS Rod Length (ft)				
100 plf	30	65	65	65	65	7455
	36	65	65	65	65	6790
	40	65	65	65	65	6275
	42	65	65	65	65	6000
	48	65	65	65	65	5090
	60	34	63	65	65	2765
150 plf	30	65	65	65	65	6695
	36	65	65	65	65	5695
	40	65	65	65	65	4930
	42	64	65	65	65	4405
	48	46	64	65	65	3075
	60	NP	NP	10	19	0
200 plf	30	65	65	65	65	5940
	36	56	65	65	65	4490
	40	50	65	65	65	3495
	42	45	65	65	65	2995
	48	27	49	65	65	1150
300 plf	24	56	65	65	65	5910
	30	45	65	65	65	4315
	36	37	65	65	65	2365
	40	27	50	65	65	845
	42	22	41	65	65	60
	48	NP	13	22	37	0
400 plf	24	42	65	65	65	4965
	30	33	61	65	65	2765
	36	24	44	65	65	230
	40	15	29	46	65	0
	42	11	21	33	54	0
	48	NP	NP	NP	NP	-
500 plf	24	33	61	65	65	3915
	30	27	49	65	65	1325
	36	16	30	48	65	0
	40	8	16	25	42	0
	42	NP	NP	NP	NP	-
	48	NP	NP	NP	NP	-

1. URS top plate splices shall be reinforced for bending in accordance with Figures 6 and 7.
2. Allowable tension load in single top plate remaining after uplift applied. Nailed top plate splice connection assumed and effect of bending reinforcement neglected. Consider adding strap(s) for additional chord/drag tension capacity as needed.
3. Largest URS diameter per spacing shown assumed for hole size in top plate, greater residual tension capacity will exist for smaller rod diameters.
4. NP – Not Permitted.

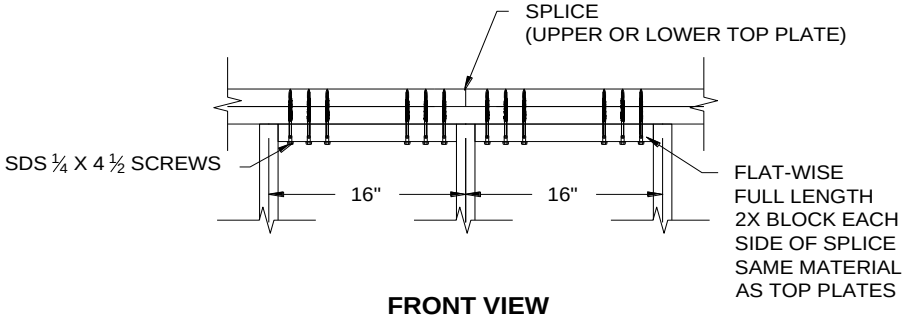


FRONT VIEW

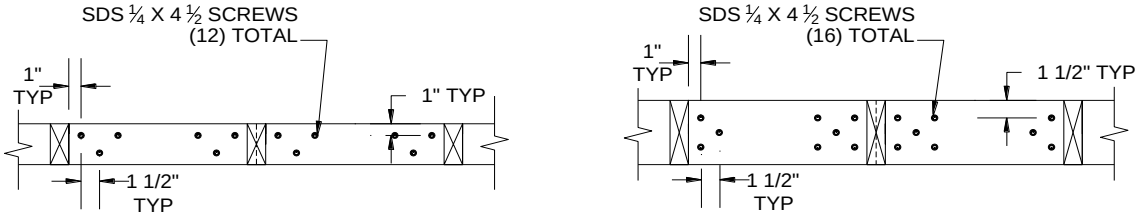


2x4 BOTTOM VIEW **2x6 BOTTOM VIEW**

Figure 6 – Top Plate Splice Reinforcement
(Splice Between Studs)



FRONT VIEW



2X4 BOTTOM VIEW **2X6 BOTTOM VIEW**

Figure 7 – Top Plate Splice
(Splice Centered Over Studs)