

ICC-ES Evaluation Report

ESR-2811

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Fastenings

REPORT HOLDER:

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EVALUATION SUBJECT:

SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS AND ASSEMBLIES

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Property evaluated:

Structural

2.0 USES

The Simpson Strong-Tie® Gas-Actuated Fasteners described in this report are used to fasten building components, such as cold-formed steel framing members, to base materials of normalweight concrete, sand-lightweight concrete, steel decks filled with sand-lightweight concrete, concrete masonry units (CMUs) and structural steel. The fasteners are alternatives to the cast-in-place anchors described in 2015 IBC Section [1901.3](#) (2012 IBC Section [1908](#); 2009 and 2006 IBC Section [1911](#)) for placement in concrete; the embedded anchors described in Section 8.1.3 of TMS 402-13, referenced in Section [2107](#) of the 2015 IBC (Section 2.1.4 of TMS 402-11, -08 and -05, referenced in Section [2107](#) of the 2012, 2009 and 2006 IBC, respectively) for placement in masonry; and the welds and bolts used to attach materials to steel, described in IBC Sections [2204.1](#) and [2204.2](#), respectively.

~~The Simpson Strong Tie Rod Hanger Assemblies are used to attach threaded steel rod to concrete, and the Simpson Strong Tie Angle Clip Assemblies are used to attach wire to concrete.~~ *

~~For structures regulated under the IRC, the fasteners and assemblies may be used where an engineered design is submitted in accordance with IRC Section [R301.1.3](#).~~ *

3.0 DESCRIPTION

3.1 Gas-Actuated Fasteners:

3.1.1 Materials: Simpson Strong-Tie® GDP and GDPS Gas-Actuated Fasteners are power-actuated fasteners (PAFs) manufactured from steel complying with [ASTM A510](#), Grade 1060 or 10B60, and austempered to a Rockwell “C” core hardness of 53 to 56.

~~Simpson Strong Tie® GDPM, GW, and GTH Gas-Actuated Fasteners are PAFs manufactured from steel complying with ASTM A510 Grades 1060 to 1065 or 10B60 to 10B65, austempered to a Rockwell “C” core hardness of 53 to 56.~~ *

See [Table 1](#) for coating information.

3.1.2 Shank Type and Dimensions: The fasteners have straight or stepped smooth shanks. See [Table 1](#) for shank type and fastener dimensions. Maximum point length is the maximum specified length from the tip of the fastener to the location where the diameter of the shank becomes constant. Minimum effective length is the minimum specified length from the underside of the fastener head to the tip of the fastener, except for fasteners with premounted washers, where the minimum effective shank length is the minimum specified length from the underside of the washer, in its installed condition, to the tip of the fastener.

3.2 Gas Actuated Assemblies:

~~**3.2.1 Rod Hanger Assemblies:** The Simpson Strong-Tie® GRH Rod Hanger Assemblies consist of a GTH smooth shank fastener described in Section 3-1, with a premounted cold formed steel bracket. The brackets for the GRH25 and GRH37 assemblies have an internally threaded hole which will accept, respectively, a 1/4 20 or 3/8 16 threaded steel rod. The brackets are formed from carbon steel complying with the report holder's specifications. The brackets have a minimum base steel thickness of 0.063 inch (1.6 mm). See [Table 1](#) for additional details.~~ *

~~**3.2.2 Angle Clip Assemblies:** The Simpson Strong Tie® GAC Angle Clip Assemblies consist of a GTH smooth~~ *

- * ~~shank fastener described in Section 3.1, with a premounted cold formed steel 90-degree clip angle. The outstanding leg of the clip angle has a 0.315-inch diameter (8.0 mm) hole for the attachment of ceiling wire. The clips are formed from carbon steel complying with the report holder's specifications. The clips have a minimum base steel thickness of 0.071 inch (1.8 mm). See Table 1 for additional details.~~

3.3 Substrate Materials:

3.3.1 Concrete: Normalweight and sand-lightweight concrete must comply with IBC [Chapter 19](#) or IRC Section [R402.2](#), as applicable. The minimum concrete compressive strength at the time of fastener installation must be as noted in [Tables 2](#) and [3](#), as applicable.

3.3.2 Concrete Masonry Units (CMUs): CMUs must be minimum 8-inch-thick (203 mm) lightweight blocks complying with [ASTM C90](#) for the GDP fastener. ~~CMUs must be minimum 8 inch thick (203 mm) mediumweight blocks complying with ASTM C90 for the GDPM, GW, and GTH fasteners.~~

3.3.3 Steel: Structural steel must comply with the minimum requirements of [ASTM A36](#), [ASTM A572](#) Grade 50 or [ASTM A992](#), and have the minimum thicknesses as noted in [Table 5](#).

3.3.4 Steel Deck: Steel deck panels must conform to [ASTM A653](#) SS Grade 33 (minimum) with a minimum yield strength of 38,000 psi and a minimum tensile strength of 45,000 psi. Steel deck configurations must be as described in [Table 3](#) and [Figures 1A](#), [1B](#), [2A](#) and [2B](#).

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Selection of fasteners must take into consideration the applicable base material and the length of the fastener. The minimum fastener length must be determined as follows:

- For installation into concrete, concrete-filled steel deck panels, concrete masonry units and steel base materials, the minimum effective shank length shown in [Table 1](#) must equal or exceed the sum of the thickness of the attached material and the minimum embedment depth (penetration) shown in the applicable tables in this report.
- For installation through steel base materials, the minimum effective shank length shown in [Table 1](#) must equal or exceed the sum of the following: the thickness of the attached material, the thickness of the base material and the required point penetration shown in the applicable tables in this report.

4.1.2 Allowable Loads: The applicable allowable load tables for Simpson Strong-Tie® Gas-Actuated Fasteners and assemblies driven into different base materials may be determined by referencing [Table 1](#).

The most critical applied loads, excluding seismic load effects, resulting from the load combinations in IBC Section [1605.3.1](#) or [1605.3.2](#) must not exceed the allowable loads. For fasteners which are subjected to seismic loads, see Section 4.1.5 for additional information. The stress increases and load reductions described in IBC Section [1605.3](#) are not allowed.

The allowable tension (pullout) loads, shear loads and oblique loads (applied at a 45-degree angle with respect to the fastener axis), listed in this report apply only to the connection of the fasteners to the base materials and to the connection of premounted accessories to the fastener.

Other limit states applicable to the design of a connection, such as fastener pull-through (pull-over) and lateral bearing on the attached material, which are governed by the properties of attached material, are outside the scope of this report. Design of the connection to the attached material must comply with the applicable requirements of the IBC. When designing the connection of wood members to the base material, the bending yield strength of the PAFs can be assumed to be the same as that of a nail with the same shank diameter as the PAF.

4.1.3 Combined Loading: For fasteners subjected to both tension and shear loads, compliance with the following interaction equation must be verified:

$$(p/P_a) + (v/V_a) \leq 1$$

where:

- p = Actual applied tension load on fastener, lbf (N).
- P_a = Allowable tension load on fastener, lbf (N).
- v = Actual applied shear load on fastener, lbf (N).
- V_a = Allowable shear load on fastener, lbf (N).

4.1.4 Steel-to-steel Connections: When the Simpson Strong-Tie® fasteners listed in [Table 5](#) are used in connections of two steel elements in accordance with Section E5 of [AISI S100-12](#), connection capacity must be determined in accordance with Sections 4.1.4.1 and 4.1.4.2, as applicable.

4.1.4.1 Connection Strength - Tension: To determine tensile connection strength in accordance with Section E5.2 of AISI S100-12, the fastener tension strength, pull-out strength and pull-over strength must be known. These characteristics must be determined as follows:

- **PAF Tensile Strength:** The available tension strengths must be calculated in accordance with Section E5.2.1 of AISI S100-12 using a value of 260,000 psi for F_{uh} .
- **Pull-out Strength:** See [Table 5](#) for available pull-out strength.
- **Pull-over Strength:** The available pull-over strengths must be calculated in accordance with Section E5.2.3 of AISI S100-12.

4.1.4.2 Connection Strength - Shear: To determine shear connection strength in accordance with Section E5.3 of AISI S100-12, the fastener shear strength, bearing and tilting strength, pull-out strength in shear, net section rupture strength and shear strength limited by edge distance must be known. These characteristics must be determined as follows:

- **PAF Shear Strength:** The available shear strengths must be calculated in accordance with Section E5.3.1 of AISI S100-12 using a value of 260,000 psi for F_{uh} .
- **Bearing and Tilting Strength:** The available bearing and tilting strengths must be calculated in accordance with Section E5.3.2 of AISI S100-12.
- **Pull-out Strength in Shear:** The available pull-out strength in shear must be the applicable allowable shear strength from [Table 5](#), or must be calculated in accordance with Section E5.3.3 of AISI S100-12.
- **Net Section Rupture Strength and Shear Strength Limited by Edge Distance:** The net section rupture strength must be determined in accordance with Section E5.3.4 of AISI S100-12 and the shear strength limited by edge distance must be determined in accordance with Section E5.3.5 of AISI S100-12.

4.1.5 Seismic Considerations: The Simpson Strong-Tie fasteners and assemblies are recognized for use when subjected to seismic loads as follows:

1. The fasteners and assemblies may be used for attachment of nonstructural components listed in Section 13.1.4 of [ASCE 7](#), which are exempt from the requirements of ASCE 7.
2. Concrete base materials: The fasteners and assemblies installed in concrete may be used to support acoustical tile or lay-in panel suspended ceiling systems, distributed systems and distribution systems where the service load on any individual fastener or assembly does not exceed the lesser of 90 lbf (400 N) or the published allowable load in [Tables 2A, 2B](#) and [3](#), as applicable.
3. Steel base materials: The fasteners installed in steel may be used where the service load on any individual fastener or assembly does not exceed the lesser of 250 lbf (1112 N) or the published allowable load shown in [Table 5](#).
4. For interior, nonstructural walls that are not subject to sustained tension loads and that are not a bracing application, the power-driven fasteners may be used to attach steel track to concrete or steel in all Seismic Design Categories. In Seismic Design Categories D, E, and F, the allowable shear load due to transverse pressure shall be no more than 90 pounds (400 N) when attaching to concrete; or 250 pounds (1,112 N) when attaching to steel. Substantiating calculations must be submitted addressing the fastener-to-base-material capacity and the fastener-to-attached-material capacity. Interior nonstructural walls are limited to locations where bearing walls, shear walls or braced walls are not required by the approved plans. The design load on the fastener must not exceed the allowable load established in this report for the concrete or steel base material.

4.2 Installation:

The fasteners and assemblies must be installed with a power fastening tool in accordance with Simpson Strong-Tie® recommendations. The fastening procedures must comply with the manufacturer's published installation instructions. These instructions must be available on the jobsite at all times during fastener installation.

The fasteners size, minimum embedment or penetration, minimum spacing and edge distances must comply with [Tables 2](#) through 5, as applicable. For fasteners installed into concrete, the fasteners must not be installed into concrete until the concrete has reached the designated compressive strength.

5.0 CONDITIONS OF USE

* The Simpson Strong-Tie® Gas-Actuated Fasteners ~~and Assemblies~~ 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 fasteners and assemblies must be manufactured and identified in accordance with this report.
- 5.2 Fastener installation complies with this report and the Simpson Strong-Tie® published installation instructions. In the event of conflict between this report and the Simpson Strong-Tie® published installation instructions, the more restrictive requirements govern.
- 5.3 Calculations demonstrating that the applied loads are less than the allowable loads described in this report must be submitted to the code official for approval. 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.
- 5.4 For steel-to-steel connections that meet the applicability requirements of Section E5 of AISI S100-12, calculations demonstrating that the available connection strength has been determined in accordance with Section E5 of AISI S100-12 and Section 4.1.4 of this report, and equals or exceeds the applied load, 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.
- 5.5 The minimum concrete thickness must be three times the fastener penetration depth. Face shell thickness of CMUs must be a minimum of 1¹/₄ inches (32 mm).
- 5.6 Refer to Section 4.1.5 for seismic considerations.
- 5.7 The use of fasteners in concrete or masonry is limited to installation in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.
- 5.8 Use of fasteners is limited to dry, interior locations, which include exterior walls which are protected by an exterior wall envelope.
- 5.9 Use of fasteners in contact with preservative-treated or fire-retardant-treated wood is not permitted.
- 5.10 The Simpson Strong-Tie products addressed in this report 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 Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements (AC70), dated February 2016.

7.0 IDENTIFICATION

Containers of fasteners ~~and assemblies~~ are identified with the report holder's name (Simpson Strong-Tie®), the product name, the fastener catalog number, the length, the quantity, the manufacturing date and the evaluation report number (ESR-2811). In addition, each fastener is identified by ≠ (the "no equal" sign) stamped on the fastener head. *

TABLE 1—SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS AND ASSEMBLIES

FASTENERS (see Figures 5 and 6)									
FASTENER MODEL NUMBER	SHANK TYPE	SHANK DIAMETER ² (inch)	NOMINAL HEAD DIAMETER (inch)	MAXIMUM POINT LENGTH (inch)	MINIMUM EFFECTIVE SHANK LENGTH ⁴ (inch)	FASTENER GALVANIZATION	APPLICABLE BASE MATERIAL	APPLICATION TABLES	
GDP-XX(X) ³	Smooth, straight	0.106	0.240	0.22	XX(X)/100 - 0.02	ASTM B695, CLASS 5, TYPE I	Concrete Conc.-filled deck Masonry Steel	2A, 3, 4, 5	
GDPS-XX(X) ³	Smooth, stepped	0.118/0.102	0.240	0.22	XX(X)/100 - 0.02	ASTM B633, SC1, TYPE 1	Steel	5	
GDPM-75	Smooth, straight	0.126	0.252	0.25	0.73	ASTM B695, CLASS 5, TYPE I	Concrete Conc.-filled deck Masonry	2A, 3, 4	
GDPM-100					0.98				
GDPM-50	Smooth, stepped	0.128/0.110	0.252	0.21	0.48	ASTM B695, CLASS 5, TYPE I	Steel	5	
FASTENERS WITH PREMOUNTED WASHERS (see Figures 7 and 8)									
ASSEMBLY MODEL NUMBER	SHANK TYPE	SHANK DIAMETER ² (inch)	NOMINAL HEAD DIAMETER (inch)	MAXIMUM POINT LENGTH (inch)	MINIMUM EFFECTIVE SHANK LENGTH (inch)	WASHER DESCRIPTION	WASHER MATERIAL & GALVANIZATION	APPLICABLE BASE MATERIAL	APPLICATION TABLES
GW-75	Smooth, straight	0.126	0.283	0.25	0.654	⁵ / ₈ -inch diameter, dimpled	Carbon steel ASTM B633, SC1, TYPE 1	Concrete Conc.-filled deck Masonry	2A, 3, 4
GW-100					0.905				
GW-50	Smooth, stepped	0.128/0.110	0.283	0.21	0.425	⁵ / ₈ -inch diameter, dimpled	Carbon steel ASTM B633, SC1, TYPE 1	Steel	5
GTH ¹	Smooth, straight	0.126	0.283	0.25	0.959	Tophat	Aluminum	Concrete Conc.-filled deck Masonry	2A, 3, 4
THREADED ROD HANGER ASSEMBLIES (see Figure 9)									
ASSEMBLY MODEL NUMBER	FASTENER W/WASHER	CLIP DESCRIPTION				CLIP MATERIAL & GALVANIZATION	APPLICABLE BASE MATERIAL	APPLICATION TABLES	
GRH25	GTH	0.063 inch thick with ¹ / ₄ -20 threaded eyelet				Carbon steel ASTM B633, SC1, TYPE 1	Concrete Conc.-filled deck	2B, 3	
GRH37	GTH	0.063 inch thick with ³ / ₈ -16 threaded eyelet				Carbon steel ASTM B633, SC1, TYPE 1	Concrete Conc.-filled deck	2B, 3	
CEILING CLIP ASSEMBLIES (see Figure 10)									
ASSEMBLY MODEL NUMBER	FASTENER W/WASHER	CLIP DESCRIPTION				CLIP MATERIAL & GALVANIZATION	APPLICABLE BASE MATERIAL	APPLICATION TABLES	
GAC	GTH	0.071 inch thick, 90° clip angle				Carbon steel ASTM B633, SC1, TYPE 1	Concrete Conc.-filled deck	2B, 3	

For SI: 1 inch = 25.4 mm.

¹The tophat is manufactured from aluminum complying with the manufacturer's specifications in the approved quality documentation.

²For step shank fasteners: (Diameter of shank above the step)/(Diameter of shank below the step).

³The XX(X) designation in the model number represents the length of the fastener expressed in inches multiplied by 100.

⁴When multiple lengths of a fastener are addressed, the minimum effective shank length is expressed in terms of the designated length, XX(X), in inches.

TABLE 2A—ALLOWABLE LOADS FOR SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS DRIVEN INTO NORMALWEIGHT CONCRETE^{1,3}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)									
					Concrete Compressive Strength:					2,000 psi	2,500 psi	3,000 psi	4,000 psi	5,000 psi
					Load Direction:					Tension	Shear	Tension	Shear	Tension
GDP-XX(X)	0.106	5/8	4	3	25	25	25	25	30	25	45	25	45	25
	0.106	3/4	4	3	30	45	30	50	30	55	30	75	30	75
GDPM-75	0.126	5/8	4	3	60	55	65	60	70	65	95	95	-	-
GDPM-100		3/4	4	3	85	120	95	135	105	145	190	215	-	-
GW-75 GW-100 GTH														

*

TABLE 2B—ALLOWABLE LOADS FOR SIMPSON STRONG-TIE® GAS-ACTUATED ASSEMBLIES DRIVEN INTO NORMALWEIGHT CONCRETE^{1,2,3}

ASSEMBLY MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)									
					Concrete Compressive Strength:					2,500 psi	3,000 psi	4,000 psi	5,000 psi	6,000 psi
					Load Direction:					Tension	Oblique	Tension	Oblique	Tension
GRH25 GRH37	0.126	3/4	4	3	85	-	115	-	160	-	165	-	165	-
GAC	0.126	3/4	4	3	105	130	120	135	150	145	170	155	195	175

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

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength, or the minimum compressive strength specified in the applicable code, whichever is greater.

²Oblique load direction is 45° from the concrete member surface.

³The fasteners and assemblies listed in the tables above may be used for static load conditions and for the seismic load conditions described in Section 4.1.5, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.5, Items 2 and 4, as applicable.

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TABLE 3—ALLOWABLE LOADS FOR SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS AND ASSEMBLIES DRIVEN INTO SAND-LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK^{1,7,8}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE ³ (inches)	ALLOWABLE LOADS (lbf)							
					Fastener Location:		Fasteners Installed through Lower Flute of Steel Deck into Concrete ^{3,4}					
					Fastener Location:		Fasteners Installed Directly into Concrete ²		1.5-inch “B” Deck ⁵			3-inch “W” Deck ⁶
Load Direction:				Tension	Shear	Tension	Shear	Oblique	Tension	Shear	Oblique	
GDP-XX(X)	0.106	5/8	4	3	75	35	65	195	-	60	180	-
	0.106	3/4	4	3	105	140	130	270	-	60	180	-
GDPM-75	0.126	3/4	4	3	60	110	-	-	-	35	215	-
GDPM-100					115	130	-	-	55	235	-	
GW-75					-	-	95	-	-	-		
GW-100					-	-	95	-	-	-		
GTH	-	-	90	-	90	105	-	120				
GRH25	0.126	3/4	4	-	-	-	-	-	95	-	-	
GRH37				-	-	-	-	-	-	-	-	
GAC	0.126	3/4	4	-	-	-	90	-	90	105	-	120

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

¹The fasteners must not be driven until the concrete has reached a minimum compressive strength of 3,000 psi.

²For fasteners installed in concrete (not through metal deck), the fastener must be installed with a minimum edge distance of 3 inches from the edge of the concrete.

³For fasteners installed through metal deck, the fastener must be installed through the lower flutes of the deck with minimum edge distances as shown in [Figures 1A, 1B, 2A and 2B](#), and a minimum of 3 inches from the end of the deck.

⁴The allowable load values are applicable to fasteners installed through the underside of a steel deck at the ribs and into sand-lightweight concrete with a minimum compressive strength, f_c , of 3,000 psi. The steel deck must have a minimum base-metal thickness of 20 gage (0.0359 inch).

⁵See [Figures 1A and 1B](#) for installation parameters for the GDP fasteners. See [Figure 1A](#) for installation parameters for the GRH and GAC assemblies.

⁶See [Figure 2A](#) for installation parameters for the GDP fasteners and the GRH and GAC assemblies. See [Figure 2B](#) for installation parameters for GDPM, GW and GTH fasteners.

⁷Oblique load direction is 45° from the concrete member surface.

⁸The fasteners and assemblies listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.5, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.5, Items 2 and 4, as applicable.

TABLE 4—ALLOWABLE LOADS FOR SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS DRIVEN INTO THE FACE SHELL OF HOLLOW CONCRETE MASONRY UNITS (CMUs)^{1,3,4}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE ² (inches)	ALLOWABLE LOADS (lbf)	
					Tension	Shear
GDP-XX(X)	0.106	5/8	8	3	35	60
GDPM-75	0.126	5/8	8	3	75	90
GDPM-100						
GW-75						
GW-100						
GTH	-	-	-	-	-	-

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

¹The tabulated allowable load values are for fasteners installed in a hollow CMU conforming to [ASTM C90](#). The minimum allowable nominal size of the CMU must be 8 inches high by 8 inches wide by 16 inches long, with a minimum, 1 1/4-inch-thick face shell thickness. See Section 3.3.2 for additional information.

²Distance from center of PAF to edge of individual blocks.

³The tabulated allowable load values are for fasteners installed in the center of a hollow CMU face shell. See [Figure 4](#) for a depiction of the recognized placement zone. Only one PAF may be installed at each cell. Allowable loads for fasteners installed in mortar head and bed joints, or into the web of the CMU, are outside the scope of this report.

⁴The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Item 1 of Section 4.1.5.

TABLE 5—ALLOWABLE LOADS FOR SIMPSON STRONG-TIE® GAS-ACTUATED FASTENERS DRIVEN INTO STEEL^{1,2}

FASTENER MODEL NUMBER	SHANK DIAMETER ³ (inch)	MINIMUM SPACING (inch)	MINIMUM EDGE DISTANCE (inch)	MINIMUM STEEL STRENGTH	ALLOWABLE LOADS (lbf)											
					Steel Thickness (inch):		¹ / ₈		³ / ₁₆		¹ / ₄		³ / ₈		¹ / ₂	
					Load Direction:		Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
GDP-XX(X)	0.106	1	1/2	ASTM A36	125 ⁶	285	210 ⁶	225	220 ⁶	205	—	—	—	—		
GDP-XX(X)	0.106	1	1/2	ASTM A572, Grade 50 or ASTM A992	—	—	225 ⁶	250	185 ⁶	145	—	—	—	—		
GDP-XX(X)	0.118/0.102	1	1/2	ASTM A36	—	—	95⁶	180	170⁶	265	165⁴	225⁴	145⁴	225⁴		
GDP-XX(X)	0.118/0.102	1	1/2	ASTM A572, Grade 50 or ASTM A992	—	—	110⁶	205	170⁶	305	155⁴	205⁴	—	—		
GDPM-50 GW-50	0.128/0.110	1	1/2	ASTM A36	-	-	225⁶	400	275⁶	345	245⁵	310⁵	-	-		
GDPM-50 GW-50	0.128/0.110	1	1/2	ASTM A572 Grade 50 or ASTM A992	-	-	240⁶	380	215⁵	325⁵	280⁵	350⁵	-	-		

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N, 1 ksi = 6.895 MPa.

¹The entire pointed portion of the fastener must penetrate through the steel to obtain the tabulated values (see [Figure 3](#)), unless otherwise noted.

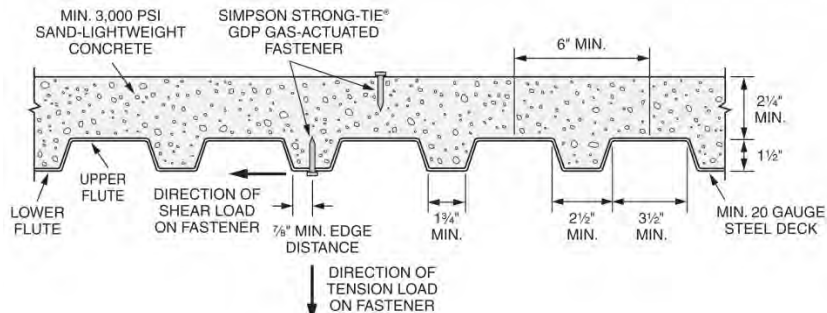
²The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.5, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.5, Items 3 and 4, as applicable.

³For stepped shank fasteners: (Diameter of shank above the step)/(Diameter of shank below the step).

⁴Tabulated values are based on minimum penetration of the fastener point into the steel of 0.35 inch (8.9 mm).

⁵Tabulated values are based on minimum penetration of the fastener point into the steel of 0.25 inch (6.4 mm).

⁶For steel-to-steel connections designed in accordance with Section 4.1.4, the tabulated allowable load may be increased by a factor of 1.25, and the design strength may be taken as the tabulated allowable load multiplied by a factor of 2.0.



*** FIGURE 1A—GDP GAS-ACTUATED FASTENER AND GRH AND GAG ASSEMBLIES INSTALLED INTO CONCRETE FILLED 1/2-INCH-DEEP COMPOSITE FLOOR “B” DECK**

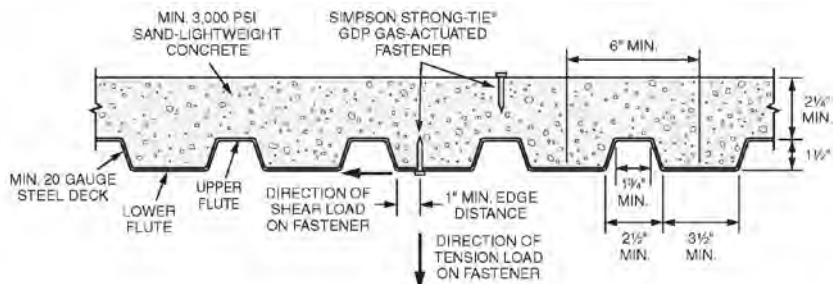


FIGURE 1B—GDP GAS-ACTUATED FASTENER INSTALLED INTO CONCRETE FILLED INVERTED 1/2-INCH-DEEP COMPOSITE FLOOR “B” DECK

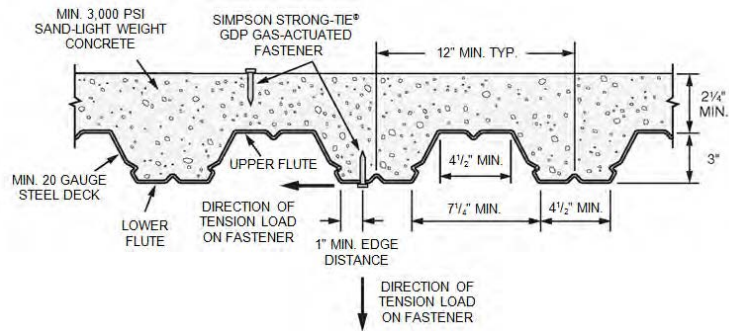


FIGURE 2A—GDP GAS-ACTUATED FASTENER AND GRH AND GAC ASSEMBLIES INSTALLED IN CONCRETE FILLED 3-INCH-DEEP COMPOSITE FLOOR “W” DECK

*

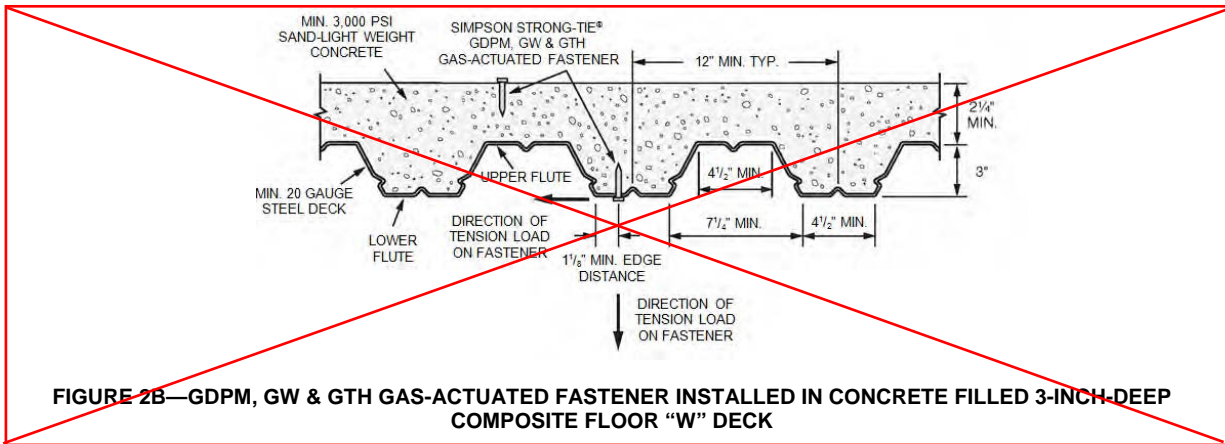


FIGURE 2B—GDPM, GW & GTH GAS-ACTUATED FASTENER INSTALLED IN CONCRETE FILLED 3-INCH-DEEP COMPOSITE FLOOR “W” DECK

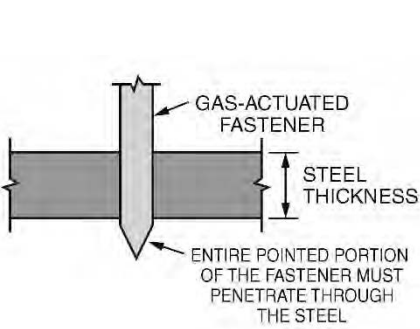


FIGURE 3—FASTENER PENETRATION THROUGH STEEL WHERE REQUIRED

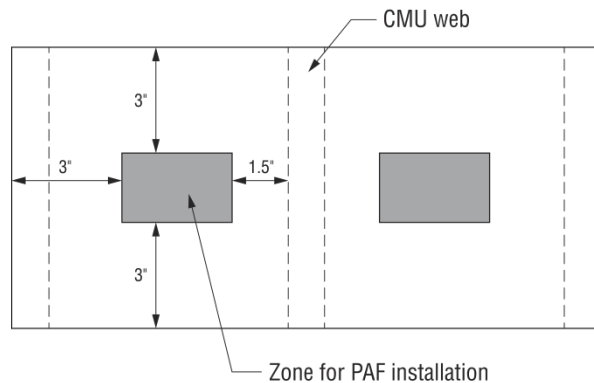


FIGURE 4—ZONE FOR FASTENER INSTALLATION IN FACE SHELL OF CMU



U.S. PATENT 605,016
FIGURE 5—COLLATED GDP GAS-ACTUATED SMOOTH SHANK FASTENER



FIGURE 6—COLLATED GDPS GAS-ACTUATED STEP SHANK FASTENER

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**FIGURE 7—GW GAS-ACTUATED
SMOOTH OR STEP SHANK FASTENER**



**FIGURE 8—GTH GAS-ACTUATED
SMOOTH SHANK FASTENER**



FIGURE 9—GRH ROD HANGER ASSEMBLY



FIGURE 10—GAC ANGLE CLIP ASSEMBLY