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# ICC-ES Evaluation Report

# ESR-3196

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**DIVISION: 04 00 00—MASONRY**  
**SECTION: 04 05 19.16—MASONRY ANCHORS**

**REPORT HOLDER:**

**DEWALT**

**701 EAST JOPPA ROAD  
TOWSON, MARYLAND 21286**

**EVALUATION SUBJECT:**

**TAPPER+® SCREW ANCHORS IN MASONRY (DEWALT / POWERS)**



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# ICC-ES Evaluation Report

**ESR-3196**

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

**REPORT HOLDER:**

**DEWALT**  
701 EAST JOPPA ROAD  
TOWSON, MARYLAND 21286  
(800) 524-3244  
[www.dewalt.com](http://www.dewalt.com)  
[anchors@dewalt.com](mailto:anchors@dewalt.com)

**ADDITIONAL LISTEES:**

**POWERS FASTENERS**  
701 EAST JOPPA ROAD  
TOWSON, MARYLAND 21286  
(800) 524-3244  
[www.powers.com](http://www.powers.com)  
[engineering@powers.com](mailto:engineering@powers.com)

**ALL POINTS SCREW, BOLT & SPECIALTY**  
1590 NW 27TH AVENUE, #9  
POMPANO BEACH, FLORIDA 33069  
[info@allpointsscrew.com](mailto:info@allpointsscrew.com)

**THE HILLMAN GROUP**  
10590 HAMILTON AVENUE  
CINCINNATI, OHIO 45231  
[info@hillmangroup.com](mailto:info@hillmangroup.com)

**EVALUATION SUBJECT:**

**TAPPER+® SCREW ANCHORS IN MASONRY**  
**(DEWALT / POWERS)**

**1.0 EVALUATION SCOPE**

**Compliance with the following codes:**

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

[For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety \(LADBS\), see ESR-3196 LABC and LARC Supplement.](#)

**Property evaluated:**

Structural

**2.0 USES**

The Tapper+ screw anchors including product names described in Section 3.1 of this report are used as anchorage to resist static, wind and seismic tension and shear loads in fully grout-filled concrete masonry units.

The Tapper+ screw anchors are alternatives to cast-in-place anchors described in Section 8.1.3 (2013 edition), or Section 2.1.4 (2011 or 2008 edition) of TMS 402/ACI 530/ASCE 5 as referenced in Section 2107.1 of the IBC.

The Tapper+ screw anchors are permitted to be used in structures regulated under the IRC, provided an engineered design is submitted in accordance with Section R301.1.3.

**3.0 DESCRIPTION**

**3.1 Tapper+ Screw Anchors:**

The screw anchors are comprised of a one-piece threaded anchor body with a hex head, a slotted hex head, a Phillips flat head or a trim flat head.

Product names for the report holder and the additional listees are presented in the following table of this report.

COMPANY NAME	PRODUCT NAME
DEWALT	Tapper+®
Powers Fasteners	Tapper+®
All Points Screw, Bolt & Specialty	AP Tapper+
The Hillman Group	Hillman Tapper+

Available nominal diameters are 3/16-inch and 1/4-inch. The anchors are manufactured from low-carbon steel that is case-hardened, and they have a Perma-Seal® coating available in various colors. The Tapper+ screw anchor and drill bits are illustrated in Figure 2 of this report.

The anchor body is formed with alternating high-low threads and a gimlet point tip. The anchors are installed in a predrilled hole with a powered tool during which the threads on the anchor body tap into the sides of the predrilled hole and interlock with the base material during installation. Installation specifications are given in Table 1 and Figures 1 and 3 of this report.

**3.2 Grout-filled Concrete Masonry:**

The specified compressive strength of masonry,  $f'_m$ , at 28 days must be a minimum of 1,500 psi (10.3 MPa). Fully grouted masonry walls must be constructed from the following materials:

**3.2.1 Concrete Masonry Units (CMUs):** Grout-filled concrete masonry walls must be constructed from

minimum 6-inch-wide (152 mm), Grade N, Type II, concrete masonry units (CMUs) conforming to ASTM C90.

**3.2.2 Grout:** Grout-filled concrete masonry units must be fully grouted with grout complying with Section 2103.3 (2015 IBC), 2103.13 of the 2012 IBC or Section 2103.12 of the 2009 IBC, or Section R606 (2015 IRC) and R609.1.1 of the IRC (2012 or 2009), as applicable. The grout must have a minimum compressive strength of 2,000 psi (13.8 MPa) at 28 days.

**3.2.3 Mortar:** Mortar must be Types M, S or N, prepared in accordance with Section 2103 of the IBC, or Section R606 (2015 IRC) or Section R607 of the (2012 or 2009) IRC, as applicable.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Allowable Stress Design:

The design load values for anchors described in this report are based on allowable stress design (ASD) under the codes described in Section 1.0 of this report.

Allowable tension and shear loads for installation in fully grout-filled masonry wall faces are noted in Table 3 of this report. The allowable tension and shear loads are for anchors installed in the grouted cells, the center web of the concrete masonry units and horizontal mortared bed joints of the fully grouted CMU construction. Allowable loads for anchors installed within  $1\frac{3}{8}$  inches (35 mm) of the vertical (head) joint, as depicted in Figure 4, are beyond the scope of this report.

Allowable tension and shear loads for installation in fully grout-filled masonry wall tops are noted in Table 4 of this report. The allowable tension and shear loads are for anchors installed at a minimum end distance of 3 inches (76 mm) and a minimum edge distance of  $1\frac{1}{2}$  inches (38 mm). Allowable loads for anchors installed within  $1\frac{1}{2}$  inches (38 mm) of the vertical (head) joint are beyond the scope of this report.

The allowable loads for anchors installed in fully grout-filled concrete masonry subjected to combined tension and shear forces must be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right) + \left(\frac{V_s}{V_t}\right) \leq 1$$

where:

- $P_s$  = Applied service tension load.
- $P_t$  = Allowable service tension load.
- $V_s$  = Applied service shear load.
- $V_t$  = Allowable service shear load.

### 4.2 Installation:

Anchors must be installed in accordance with this report (Figure 3) and the manufacturer's published installation instructions (MPII). Anchor locations must comply with the approved plans and specifications. The anchors must not be installed until the base material has reached its minimum designated compressive strength. The Tapper+ drill bit size, hole diameter, hole depth, embedment depth, spacing, edge distance and base material must comply with the requirements of this report. Installation procedures and locations must be in accordance with Tables 1, 3 and 4 as well as Figures 1, 3 and 4 of this report.

### 4.3 Special Inspections:

Anchors must be installed with special inspection. Special inspection must be in accordance with Section 1704 and 1705 of the IBC. For fasteners installed under special inspection, the following items must be inspected: fastener

type, fastener dimensions, masonry dimensions and compressive strength, grout and mortar compliance with Section 3.2 of this report, drill bit size, fastener spacing, edge distances and fastener embedment (as applicable). The special inspector must verify that anchor installation is in compliance with this report and in accordance with the manufacturer's published installation instructions.

## 5.0 CONDITIONS OF USE

The Tapper+® Screw Anchors described in this report are suitable alternatives to what is specified in the codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** The anchors must be identified and installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between the instructions in this report and the manufacturer's instructions, this report must govern.
- 5.2** Tapper+ screw anchor sizes, dimensions, and allowable loads must be as set forth in this report.
- 5.3** Anchors resisting static, seismic and wind tension and shear loads in concrete masonry must be designed in accordance with Section 4.1 of this report.
- 5.4** For installations in concrete masonry, anchors are recognized to static, seismic and wind tension and shear load applications. When using the basic load combinations in accordance with IBC Section 1605.3.1, allowable loads are not permitted to be increased for seismic or wind loading. When using the alternative basic load combinations in 2009 IBC Section 1605.3.2 that include seismic or wind loads, the allowable shear and tension loads for anchors are permitted to be increased by  $33\frac{1}{3}$  percent, or the alternative basic load combinations may be reduced by a factor of 0.75. For the 2015 or 2012 IBC, the allowable loads or load combinations must not be adjusted.
- 5.5** Grout and mortar shall have reached its minimum specified compressive strength prior to installation of the anchors.
- 5.6** Anchors must be installed in holes predrilled in substrates described in this report, using only Tapper+ carbide-tipped drill bits complying with the dimensions in Table 1 of this report.
- 5.7** 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 being constructed.
- 5.8** Since an ICC-ES acceptance criteria for evaluating data to determine the performance of screw anchors subjected to fatigue and shock loading is unavailable at this time, the use of these anchors under these conditions is beyond the scope of this report.
- 5.9** Where not otherwise prohibited by the code, anchors are permitted for installation in fire-resistance-rated construction provided at least one of the following conditions is fulfilled:
  - Anchors are used to resist wind or seismic forces only.
  - Anchors that support fire-resistance-rated construction or gravity load-bearing structural elements are within a fire-resistance-rated envelope or a fire-resistance-rated membrane,

are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.

- Anchors are used to support nonstructural elements.

**5.10** Since an ICC-ES acceptance criteria for evaluating data to determine the performance of screw anchors in cracked masonry is unavailable at this time, the use of screw anchors is limited to installation in uncracked masonry. Cracking occurs when  $f_t > f_r$  due to service loads or deformations.

**5.11** Special inspection, when required, must be provided in accordance with Section 4.3 of this report.

**5.12** Anchors are limited to dry, interior use.

**5.13** The Tapper+ screw anchors are manufactured under an approved quality control program with inspections by ICC-ES.

**6.0 EVIDENCE SUBMITTED**

Data in accordance with the ICC-ES Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry (AC106), dated November 2015.

**7.0 IDENTIFICATION**

The screw anchors and additional product names described in Section 3.1 of this report must be identified in the field by labels on the packaging bearing the company name (DEWALT), the product name (Tapper+), the anchor diameter and length, and the evaluation report number (ESR-3196). In addition, the anchor length code (see Table 2) is stamped on the head of each screw anchor.

**TABLE 1—TAPPER+ SCREW ANCHOR INSTALLATION SPECIFICATIONS<sup>1</sup>**

Anchor Property / Setting Information	Symbol	Units	Nominal Anchor Size, $d$ (inch)	
			$3/16$	$1/4$
Nominal outside anchor diameter	$d_o$	in.	0.145	0.185
Nominal drill bit diameter	$d_{bit}$	in.	$3/16$ Tapper+ bit	$1/4$ Tapper+ bit
Tapper+ bit tolerance range	-	in.	0.170 to 0.176	0.202 to 0.207
Hex head wrench / socket size	$d_h$	in.	$1/4$	$5/16$
Hex head Height	-	in.	$7/64$	$9/64$
Phillips flat head bit tip size	-	No.	2	3

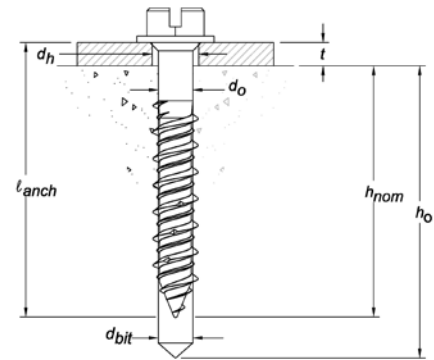
For SI: 1 inch = 25.4 mm, 1 ft-lb = 1.356 N-m.

**TABLE 2—FASTENER SPECIFICATIONS – TAPPER+ SCREW**

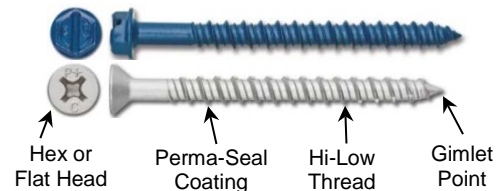
Length ID marking on head <sup>1</sup>	#	A	B	C	D	E	F	G	H	I	J
Overall anchor length, $l_{anch}$ (inches)	Up to but not including	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6

For SI: 1 inch = 25.4 mm; 1 psi = 6.9 kPa.

<sup>1</sup>For purposes of measuring overall fastener length, the hex head versions are measured from the underside of the head to the bottom of the tip; flat head versions of the Tapper+ are measured from the top of the head to the tip of the anchor.

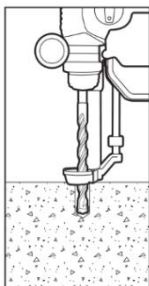


**FIGURE 1—TAPPER+ ANCHOR DETAIL** (slotted hex head version pictured)

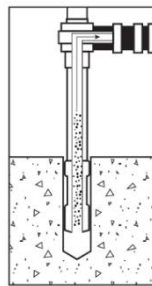


Tapper+ Drill Bits

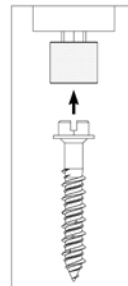
**FIGURE 2—TAPPER+ ANCHOR AND BITS** (slotted hex head and flat head versions pictured)



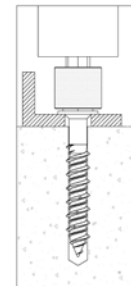
1.) Using the proper Tapper+ drill bit size, drill a hole into the base material to the required depth,  $h_o$ , which is a  $1/4$ -inch deeper than the minimum embedment depth,  $h_{nom}$ . The tolerances of the Tapper+ bit used must meet the tolerance range in Table 1.



2.) Remove dust and debris from hole during drilling (e.g. dust extractor) or following drilling (e.g. suction, forced air) to extract loose particles left from drilling.



3.) Attach a Tapper 1000 installation socket tool for the selected anchor size to a percussion drill and set the drill to rotary only mode. Mount the screw anchor head into the socket. For flat head versions a phillips bit tip must be used with the socket tool.



4.) Place the point of the Tapper+ anchor through the fixture into the predrilled hole and drive the anchor until it is fully seated at the proper embedment. The socket tool will automatically disengage from the head of the Tapper+.

**FIGURE 3—TAPPER+ INSTALLATION INSTRUCTIONS**  
**TABLE 3—ALLOWABLE TENSION AND SHEAR LOADS FOR TAPPER+ SCREW ANCHORS**  
**INSTALLED IN THE FACE OF GROUT-FILLED CONCRETE MASONRY<sup>1,2,3,4,5</sup>**

ANCHOR INSTALLED INTO GROUTED MASONRY WALL FACE								
NOMINAL ANCHOR SIZE <i>d</i> (inch)	MINIMUM EMBEDMENT <i>h<sub>nom</sub></i> (inches)	MINIMUM EDGE / END DISTANCE, <i>c<sub>min</sub></i> (inches)	MINIMUM SPACING, <i>s<sub>min</sub></i> (inches)	TENSION (pounds)		SHEAR (pounds)		
				Minimum Masonry Compressive Strength, <i>f' m</i>		Direction of Loading	Minimum Masonry Compressive Strength, <i>f' m</i>	
				1,500 psi	2,000 psi		1,500 psi	2,000 psi
3/16	1 1/2	3	1 1/2	80	95	Towards edge	115	135
						Towards end	130	150
1/4	1 1/2	3	2	130	150	Any	200	235

For **SI**: 1 inch = 25.4 mm; 1 lbs = 0.0044 kN.

<sup>1</sup>The tabulated allowable loads are for anchors installed in minimum 6-inch-wide (152 mm) grout-filled concrete masonry units described in Section 3.2 of this report and must have reached the minimum specified masonry compressive strength at the time of installation.

<sup>2</sup>The minimum embedment, *h<sub>nom</sub>*, is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor.

<sup>3</sup>Anchors may only be installed in the grouted cells and in cell webs and bed joints not closer than 1 3/8 inches from head joints. The minimum edge and end distances, *c<sub>min</sub>*, must be maintained.

<sup>4</sup>The tabulated minimum edge and end distances, *c<sub>min</sub>*, are equal to the critical edge distance, *c<sub>cr</sub>*, for the anchors. The tabulated minimum spacing *s<sub>min</sub>*, is also equal to the critical spacing, *s<sub>cr</sub>*, for the anchors.

<sup>5</sup>The tabulated allowable loads are based on a safety factor of 5.0.

**TABLE 4—ALLOWABLE TENSION AND SHEAR LOADS FOR TAPPER+ SCREW ANCHORS**  
**INSTALLED INTO THE TOP OF GROUT-FILLED CONCRETE MASONRY<sup>1,2,3,4,5</sup>**

ANCHOR INSTALLED INTO TOP OF GROUTED MASONRY WALLS									
NOMINAL ANCHOR SIZE <i>d</i> (inch)	MINIMUM EMBEDMENT <i>h<sub>nom</sub></i> (inches)	MINIMUM EDGE DISTANCE <i>c<sub>min,1</sub></i> (inches)	MINIMUM END DISTANCE <i>c<sub>min,2</sub></i> (inches)	MINIMUM SPACING <i>s<sub>min</sub></i> (inches)	TENSION (pounds)		SHEAR (pounds)		
					Minimum Masonry Compressive Strength, <i>f' m</i>		Direction of Loading	Minimum Masonry Compressive Strength, <i>f' m</i>	
					1,500 psi	2,000 psi		1,500 psi	2,000 psi
3/16	1 1/2	1 1/2	3	3	90	105	Any	100	115
1/4	1 1/2	1 1/2	3	2	165	190	Any	155	180

For **SI**: 1 inch = 25.4 mm; 1 lbs = 0.0044 kN.

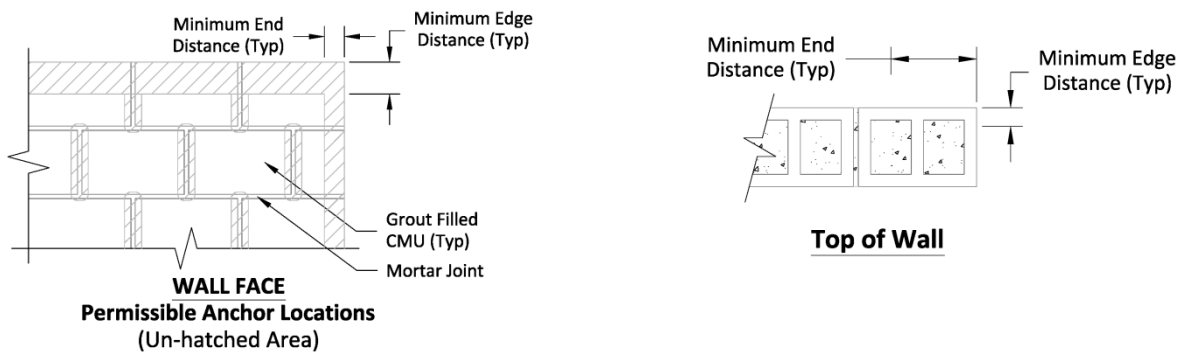
<sup>1</sup>The tabulated allowable loads are for anchors installed in minimum 6-inch-wide (152 mm) grout-filled concrete masonry units described in Section 3.2. of this report and must have reached the minimum specified masonry compressive strength at the time of installation.

<sup>2</sup>The minimum embedment, *h<sub>nom</sub>*, is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor.

<sup>3</sup>Anchors may only be installed in the grouted cells not closer than 1 1/2 inches from head joints. The minimum edge and end distances, *c<sub>min</sub>*, must be maintained.

<sup>4</sup>The tabulated minimum edge and end distances, *c<sub>min</sub>*, are equal to the critical edge distance, *c<sub>cr</sub>*, for the anchors. The tabulated minimum spacing *s<sub>min</sub>*, is also equal to the critical spacing, *s<sub>cr</sub>*, for the anchors.

<sup>5</sup>The tabulated allowable loads are based on a safety factor of 5.0.



**FIGURE 4—TAPPER+ SCREW ANCHORS INSTALLED INTO GROUT-FILLED CONCRETE MASONRY**

## ICC-ES Evaluation Report

## ESR-3196 LABC and LARC Supplement

Issued December 2017

This report is subject to renewal October 2018.

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[www.dewalt.com](http://www.dewalt.com)  
[anchors@dewalt.com](mailto:anchors@dewalt.com)

### EVALUATION SUBJECT:

**TAPPER+® SCREW ANCHORS IN MASONRY (DEWALT / POWERS)**

### 1.0 REPORT PURPOSE AND SCOPE

#### Purpose:

The purpose of this evaluation report supplement is to indicate that the Tapper+ Screw Anchors in masonry, described in ICC-ES master evaluation report [ESR-3196](#), 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:

- 2017 *City of Los Angeles Building Code* (LABC)
- 2017 *City of Los Angeles Residential Code* (LARC)

### 2.0 CONCLUSIONS

The Tapper+ Screw Anchors in masonry, described in Sections 2.0 through 7.0 of the master evaluation report [ESR-3196](#), comply with the LABC Chapter 21, and the LARC, and are subjected to the conditions of use described in this report.

### 3.0 CONDITIONS OF USE

The Tapper+ Screw Anchors described in this evaluation report must comply with all of the following conditions:

- All applicable sections in the master evaluation report [ESR-3196](#).
- The design, installation, conditions of use and identification of the anchors are in accordance with the 2015 *International Building Code*® (2015 IBC) provisions noted in the master evaluation report [ESR-3196](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, and Section 2114, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The allowable design values listed in the master evaluation report and tables are for the connection of the anchors to masonry substrate. The connection between the anchors and the connected members shall be checked for capacity (which may govern).

This supplement expires concurrently with the master report, reissued October 2017 and revised December 2017.

## ICC-ES Evaluation Report

## ESR-3196 FBC Supplement

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[www.dewalt.com](http://www.dewalt.com)  
[anchors@dewalt.com](mailto:anchors@dewalt.com)

### EVALUATION SUBJECT:

**TAPPER+® SCREW ANCHORS IN MASONRY (DEWALT / POWERS)**

### 1.0 REPORT PURPOSE AND SCOPE

#### Purpose:

The purpose of this evaluation report supplement is to indicate that Tapper+ screw anchors in masonry, recognized in ICC-ES master evaluation report ESR-3196, have also been evaluated for compliance with the codes noted below.

#### Applicable code editions:

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

### 2.0 CONCLUSIONS

The Tapper+ screw anchors in masonry, described in Sections 2.0 through 7.0 of the master evaluation report ESR-3196, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the master evaluation report.

Use of the Tapper+ screw anchors in masonry 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*, under the following additional condition:

- Design and installation must meet the requirements of Section 2122.7 of the *Florida Building Code—Building*.

For products falling under Florida Rule 9N-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 master report, reissued October 2017 and revised December 2017.