

LICENCE

for

AS 3566.1-2002 Self-drilling screws for the building and construction industries - General requirements and mechanical properties

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Australian Standard™

**Self-drilling screws for the building and
construction industries**

**Part 1: General requirements and
mechanical properties**

This Australian Standard was prepared by Committee ME-029, Fasteners. It was approved on behalf of the Council of Standards Australia on 28 February 2002 and published on 19 March 2002.

The following interests are represented on Committee ME-029:

- Australian Building Codes Board
- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Bureau of Steel Manufacturers of Australia
- Electricity Supply Association of Australia
- Federal Chamber of Automotive Industries
- Institute of Materials Engineering Australasia
- Metal Building Products Manufacturers Association

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Australian Standard™

Self-drilling screws for the building and construction industries

Part 1: General requirements and mechanical properties

Originated as AS 3566—1998.

Revised and redesignated in part as AS 3566.1—2002.

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-029, Fasteners to supersede (in part) AS 3566—1988, *Screws—Self-drilling—For the building and construction industries*.

The objective of this Standard is to provide manufacturers and users with the general requirements and mechanical properties for self-drilling screws used in the building and construction industries.

This Standard is Part 1 of a two-part series dealing with self-drilling screws for the building and construction industries. Part 2 specifies the corrosion resistance requirements for self-drilling screws.

The size designations given in AS/NZS 4411:1996, *Tapping screws thread* have been adopted in this Standard. The equivalent screw number designations used in the 1988 edition are given in parenthesis.

Statements expressed in mandatory terms in notes to tables in figures are deemed to be requirements of this Standard.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

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STANDARDS AUSTRALIA

Australian Standard

Self-drilling screws for the building and construction industries

Part 1: General requirements and mechanical properties

SECTION 1 SCOPE AND GENERAL
REQUIREMENTS**1.1 SCOPE**

This Standard specifies the general requirements and mechanical properties for the following types of self-drilling screws used in the building and construction industries:

- (a) Screws for drilling and tapping into layered or unlayered steel of 0.9 mm minimum total thickness.
- (b) Screws for drilling and tapping into timber.
- (c) Screws for fixing plasterboard to steel with a maximum thickness of 0.8 mm.

1.2 APPLICATION

Self-drilling screws shall comply with Section 1 and with the relevant requirements of Sections 2, 3 and 4 and AS 3566.2.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|----------|--|
| 1397 | Steel sheet and strip—Hot-dipped zinc-coated or aluminium/zinc-coated |
| 4291 | Mechanical properties of fasteners made of carbon steel and alloy steel |
| 4291.1 | Part 1: Bolts, screws and studs |
| 3566 | Self-drilling screws for the building and construction industries |
| 3566.2 | Part 2: Corrosion resistance requirements |
| HB 18 | Guidelines for third-party certification and accreditation |
| HB 18.22 | Guide 22: Information on manufacturers' declaration of conformity with Standards or other technical specifications |

AS/NZS

- | | |
|--------|---|
| 1080 | Timber—Methods of test |
| 1080.1 | Method 1: Moisture content |
| 1080.3 | Method 3: Density |
| 4406 | Cross recessed pan head tapping screws |
| 4407 | Cross recessed countersunk (flat) head tapping screws (common head style) |

ISO

- | | |
|------|--|
| 272 | Fasteners—Hexagon products—Widths across flats |
| 4757 | Cross recesses for screws |

ISO	
4759	Tolerances for fasteners
4759-1	Part 1: Bolts, screws, studs and nuts—Product grades A, B and C
15330	Fasteners—Preloading test for the detection of hydrogen embrittlement—Parallel bearing surface method
SAE	
J423	Methods of measuring case depth

1.4 CLASSIFICATION AND DESIGNATION

Self-drilling screws shall be classified by type and size and the designation shall be comprised of the following information:

- General product description.
- The number of this Australian, i.e. AS 3566.1.
- Size.
- Type.
- The nominal length, in millimetres.
- Head type and drive.
- Coating or material if inherently corrosion resistant and corrosion resistance class in accordance with AS 3566.2.

1.5 MATERIALS

Self-drilling screws shall be manufactured from case hardening steel or heat treatable steel.

1.6 METHOD OF MANUFACTURE

Self-drilling screws shall be manufactured by cold forging and the threads shall be formed by rolling.

Self-drilling screws shall be heat treated and tempered to achieve the mechanical properties specified.

1.7 HEADS

1.7.1 Types of heads

The shape and dimensions of heads for self-drilling screws shall be suitable for the application intended by the manufacturer. The shape and dimensions of hexagon washer heads, cross recessed wafer heads, cross recessed and hexagon socket bugle heads, and cross recessed pan heads shall be as follows:

- Hexagon washer headsas shown in Figure 1.1.
- Cross recessed wafer headsas shown in Figure 1.2.
- Cross recessed and hexagon socket bugle headsas shown in Figure 1.3
NOTE: Bugle heads type 17 are used only for fixing to timber.
- Cross recessed pan headin accordance with
AS/NZS 4406 with type
H (Phillips) cross recess.
- Cross recessed counter-sunk flat headsin accordance with
AS/NZS 4407 with type
H (Phillips) cross recess.

1.7.2 Driving features

The driving features shall be suitable for use with hand-held machine-operated driving equipment and shall be within the concentricity, symmetry and run-out tolerances given in ISO 4759-1 for products grades A and B.

Cross recesses shall be type H (Phillips) in accordance with ISO 4757.

The across flats dimensions of external hexagon driving features except hexagon washer heads in accordance with Item 1.7(a) shall be selected from ISO 272 and shall be within the tolerances given in ISO 4759-1 for products grade A and B. The wrenching height shall not be less than 0.7 times the height of the hexagon.

The across flats dimensions of internal hexagon driving features shall be selected from Table 1.1 and shall be within the tolerance given in ISO 4759-1 for products grade A and B. The depth of key engagement shall be not less than the value given in Table 1.1.

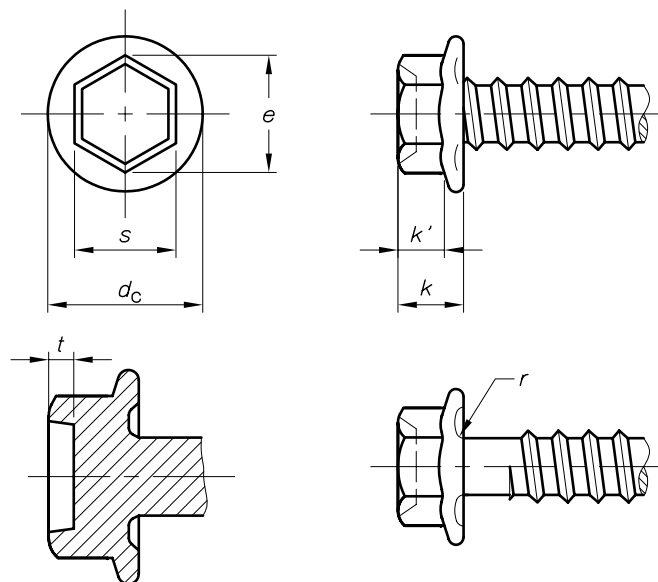
Where proprietary driving features are used, manufacturers shall ensure that suitable driving tools are available.

1.7.3 Self-embedding features

Heads of self-drilling screws for fixing timber to steel or timber to timber may be provided with self-embedding features where appropriate.

TABLE 1.1
NOMINAL DIMENSION OF INTERNAL
HEXAGON DRIVE FEATURES

millimetres	
Across flats	Depth of key engagement
3	2
4	3
5	4
6	4.5

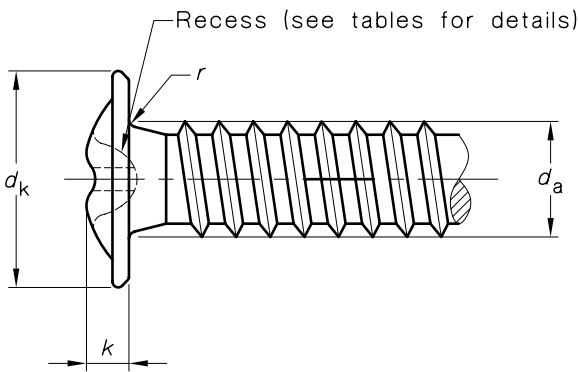


Size designation	millimetres										
	Width across flats (s)		Washer dia. (d _c)		Across corners (min.) (e)	Wrenching height (k')		Head height (k)		Indent depth (max.) (t)	Fillet radius (min.) (r)
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.		
ST 3.5 (No. 6)	6.20	6.35	8.38	9.14	6.91	1.90	2.29	3.05	3.43	1.14	0.25
ST 4.2 (No. 8)	6.20	6.35	9.40	10.29	6.91	2.41	2.79	3.68	4.32	1.14	0.38
ST 4.8 (No. 10)	7.78	7.92	10.67	11.43	8.64	2.79	3.30	4.32	4.83	1.40	0.38
ST 5.5 (No. 12)	7.78	7.92	13.97	14.78	8.64	3.61	3.94	5.08	5.92	1.65	0.51
ST 6.3 (No. 14)	9.32	9.52	13.97	15.49	10.39	4.06	4.70	5.84	6.60	1.91	0.76

NOTES:

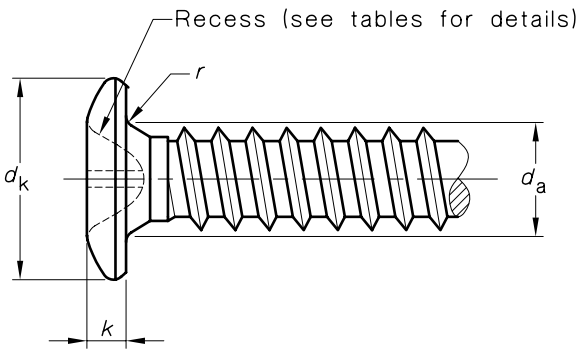
- 1 Screws with hexagon washer head are used for fixing roofing profiles through the crest and fixing wall cladding through the valley. Other designs of heads may be used, provided that dimension d_c is as shown.
- 2 Hexagon head with separate washer is also permitted, provided that the hexagon head conforms to the dimensions shown and the washer outside diameter conforms to dimension d_c .

FIGURE 1.1 HEXAGON WASHER HEAD



millimetres											
Size designation	Head dia. (d_k)		Taper dia. (d_a)		Head height (k)		Cross recess No.	Cross recess penetration value		Radius (r)	
	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
ST 3.5 (No. 6)	6.73	6.86	4.06	4.32	1.39	1.65	Type H No. 2	1.27	1.88	0.25	0.51
ST 4.2 (No. 8)	7.77	8.18	4.57	4.83	1.65	1.90	Type H No. 2	1.27	1.90	0.25	0.51
ST 4.8 (No. 10)	8.94	9.53	4.83	5.21	1.52	2.03	Type H No. 2	1.90	2.67	0.38	0.89

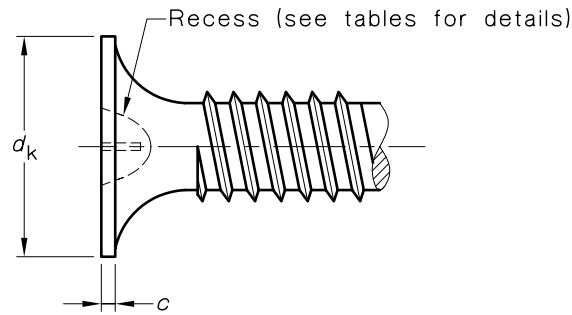
(a) Wafer head—Style 1



millimetres											
Size designation	Head dia. (dk)		Taper dia. (da)		Head height (k)		Cross recess No.	Cross recess penetration value		Radius (r)	
	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
ST 4.8 (No. 10)	9.07	9.47	4.83	5.26	1.65	1.91	Type H No. 2	2.13	2.74	0.38	0.89

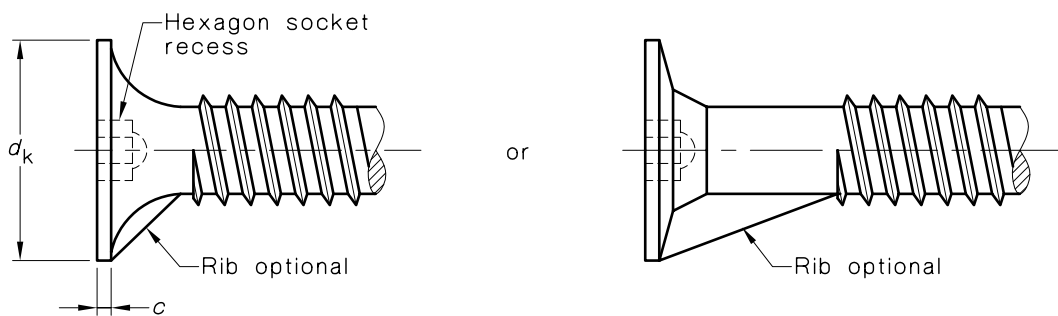
(b) Wafer head—Style 2

FIGURE 1.2 CROSS RECESSED WAFER HEAD



millimetres						
Size designation	Head diameter (min.) (dk)	Head edge thickness (c)		Cross recess No.	Cross recess penetration value	
		Min.	Max.		Min.	Max.
ST 3.5 (No. 6)	7.90	0.46	0.81	Type H No. 2	2.59	3.17
ST 3.9 (No. 7)	7.90	0.46	0.81	Type H No. 2	2.59	3.17
ST 4.2 (No. 8)	7.90	0.46	0.81	Type H No. 2	2.26	3.17

(a) Cross recessed bugle head



Size designation	millimetres	
	Head diameter (d _k)	
	Min.	Max.
ST 6.3 (No. 14)	13.59	14.61

(b) Hexagon socket bugle head (Type 17)

FIGURE 1.3 CROSS RECESSED AND HEXAGON SOCKET BUGLE HEADS

1.8 LENGTH

The nominal length of self-drilling screws shall be the distance from the extreme point to the largest diameter of the bearing surface of the head measured parallel to the axis of the screw.

1.9 CONCENTRICITY AND SYMMETRY

The heads and driving features of self-drilling screws shall be concentric or symmetric to the shank or screw thread within the tolerances given in ISO 4759-1 for products grade A or B as appropriate.

1.10 SQUARENESS

The heads of self-drilling screws shall be square to the shank or screw thread within the tolerances given in ISO 4359-1 for products grade A and B as appropriate.

1.11 MECHANICAL PROPERTIES

1.11.1 Hardness

1.11.1.1 Surface hardness

When determined in accordance with AS 4291.1 the surface hardness of self-drilling screws shall be as follows:

- (a) For self-drilling screws for fixing to steelnot less than 530 HV.
- (b) For self-drilling screws for fixing to timbernot less than 450 HV.
- (c) For self-drilling screws for fixing plasterboard to steelnot less than 450 HV

1.11.1.2 Core hardness

When determined in accordance with AS 4291.1 the core hardness of case-hardened self-drilling screws shall be as follows:

- (a) For self-drilling screws for fixing to steel—
 - (i) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 5; and
 - (ii) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 10.
- (b) For self-drilling screws for fixing to timber—
 - (i) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 5; and
 - (ii) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 10.
- (c) For self-drilling screws for fixing plasterboard to steel—
 - (i) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 5; and
 - (ii) for screws $\leq$ ST 4.2 (No. 8)not greater than 400 HV 10.

The recommended minimum tempering shall be 330°C. The tempering temperature range 275°C to 315°C shall be avoided to minimize the risk of tempered martensite embrittlement.

1.11.1.3 Case depth

When determined in accordance with SAE J423 the case depth of case-hardened screws shall be as given in Table 1.2.

TABLE 1.2
CASE DEPTH OF CASE-HARDENED SCREWS

Size	Case depth, mm			
	For fixing to steel		For fixing to timber and fixing plasterboard to steel	
	Min.	Max.	Min.	Max.
ST 35 (No. 6)	0.05	0.18	0.05	0.18
ST 4.2–5.5 (No. 8–12)	0.10	0.23	0.08	0.23
ST 6.3 (No. 14)	0.15	0.28	0.10	0.28

1.11.2 Microstructure

The microstructure of self-drilling screws shall not exhibit any ferrite streaks between the surface zone and the core.

1.11.3 Hydrogen embrittlement

Manufacturing processes shall be controlled to reduce the risk of hydrogen embrittlement. The efficacy of the controls shall be maintained by in-process testing in accordance with ISO 15330 and records of the results of these tests shall be maintained.

NOTE: The sensitivity of the preloading test specified in ISO 15330 depends on the time of starting the test after the step in the manufacturing process under investigation. The test should be started as soon as possible, preferably within 24 h after that step in the manufacturing process.

1.11.4 Ductility

When self-drilling screws are tested for head soundness in accordance with Appendix A there shall be no cracking or fracture at the head/shank junction.

When self-drilling screws equal to longer than the length given in Table 1.3 are bent in accordance with Appendix A there shall be no cracking evident into the core of the fastener or fracture of the shank.

TABLE 1.3
SCREWS SUBJECT TO BEND TEST

Size	millimetres
	Nominal length
ST 3.5 (No. 6)	≥16
ST 4.2 (No. 8)	≥16
ST 4.8 (No. 10)	≥20
ST 5.5 (No. 12)	≥25
ST 6.3 (No. 14)	≥30

1.12 MARKING

The manufacturer's identification mark, or trademark or both shall be embossed or indented on the heads of the following screws:

- (a) Hexagon headed screwsST 4.8 (No. 10) and larger.
- (b) Bugle head screwsType 17 ST 4.8 (No. 10) and larger.
- (c) Class 3 or Class 4 corrosion resistant screwsST 4.8 (No. 10) and larger.

The marking of screws of other sizes and head configurations shall be at the manufacturer's option.

For the purposes of this Standard a distributor who marks screws with a unique identification mark shall be considered as the manufacturer.

NOTES:

- 1 Manufacturers making a statement of compliance with this Australian Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.
- 2 Guidance on the manufacturer's decision of conformity with this Standard is given in HB 18.22.

SECTION 2 SELF-DRILLING SCREWS FOR
FIXING TO STEEL

2.1 TYPES

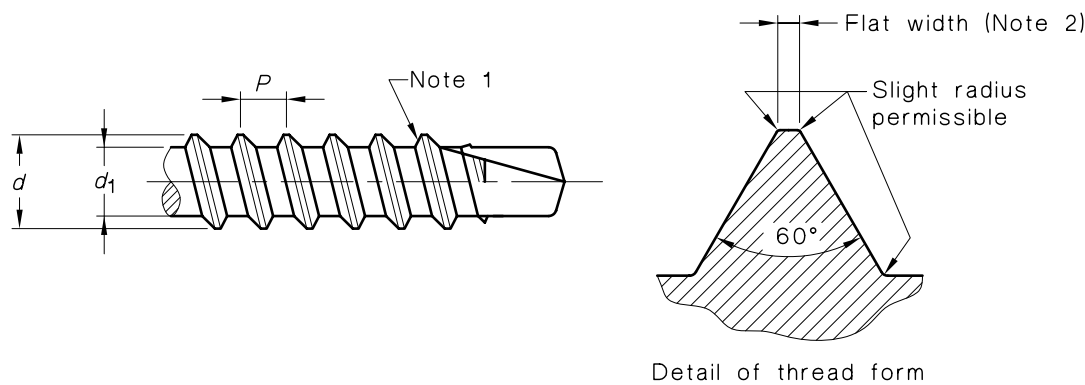
Self-drilling screws intended for drilling and tapping into layered or unlayered steel with a minimum total thickness of 0.9 mm shall be type ASD, BSD or CSD.

Type ASD and BSD screws have spaced threads and type CSD screws have threads of UNC machine screw diameter-pitch combinations with a 60 degree basic thread form.

The drill points for ASD, BSD and CSD shall be No. 2, No. 3 and No. 4 designed to accommodate different panel thicknesses.

2.2 THREADS

The preferred form and dimensions of the threads for type ASD, BSD and CSD self-drilling screws are shown in Figure 2.1. Other thread forms are acceptable provided the requirements specified in Clauses 2.7 and 2.8 can be achieved.



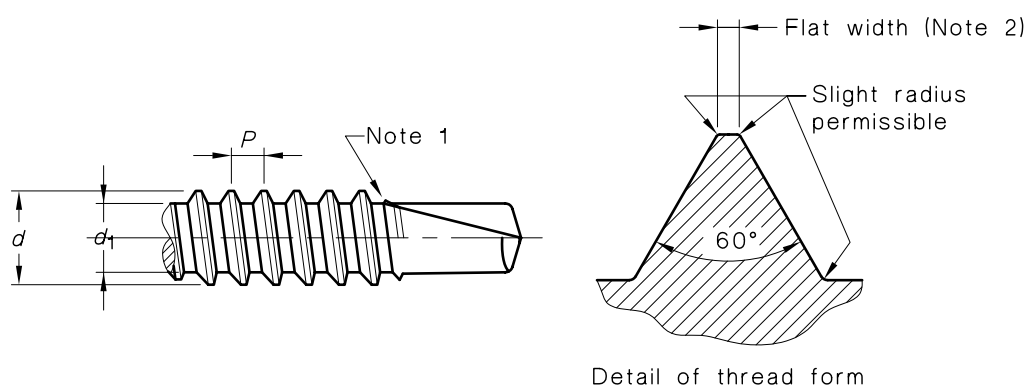
millimetres					
Size	Pitch (nom.) (p)	Major dia. (d)		Minor dia. (d ₁)	
		Min.	Max.	Min.	Max.
ST 5.5 (No. 12)	2.31	5.46	5.79	3.94	4.19
ST 6.3 (No. 14)	2.54	6.30	6.45	4.52	4.70

NOTES:

- 1 Tapered threads may have unfinished crests.
- 2 The width of flat at the crest of the thread shall not exceed 0.1 mm for sizes up to and including ST 4.2 (No. 8) or 0.15 mm for larger sizes.

(a) Type ASD

FIGURE 2.1 (in part) THREADS FOR SELF-DRILLING SCREWS FOR
FIXING TO STEEL

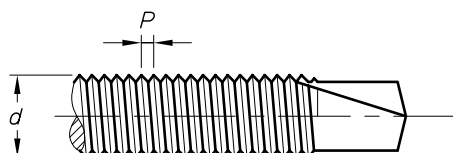


Size	Pitch (nom.) (p)	millimetres			
		Major dia. (d)		Minor dia. (d ₁)	
		Min.	Max.	Min.	Max.
ST 3.5 (No. 6)	1.27	3.43	3.53	2.51	2.64
ST 4.2 (No. 8)	1.41	4.09	4.22	2.95	3.10
ST 4.8 (No. 10)	1.59	4.65	4.80	3.43	3.58
ST 5.5 (No. 12)	1.80	5.31	5.46	3.99	4.17
ST 6.3 (No. 14)	1.80	6.10	6.25	4.70	4.88

NOTES:

- 1 Tapered threads may have unfinished crests.
- 2 The width of flat at the crest of the thread shall not exceed 0.1 mm for sizes up to and including ST 4.2 (No. 8) or 0.15 mm for larger sizes.

(b) Type BSD



Size	Pitch (nom.) (p)	millimetres	
		Major dia. (d)	
		Min.	Max.
3.5 (No. 6)	0.79	3.37	3.51
4.2 (No. 8)	0.79	4.03	4.17
4.8 (No. 10)	1.06	4.66	4.83
5.5 (No. 12)	1.06	5.32	5.49
6.3 (No. 14)	1.27	6.17	6.35

NOTE: Tapered threads may have unfinished crests.

(c) Type CSD

FIGURE 2.1 (in part) THREADS FOR SELF-DRILLING SCREWS FOR FIXING TO STEEL

2.3 LENGTH OF THREAD

2.3.1 Type ASD and BSD screws

For ASD and BSD screws of nominal lengths equal to or shorter than 35 mm, the full form threads shall extend close to the head such that the minor diameter limits are maintained to within one pitch of the shank/head junction.

For screws of nominal lengths longer than 35 mm, the length of full form thread shall be at the discretion of the manufacturer.

2.3.2 Type CSD screws

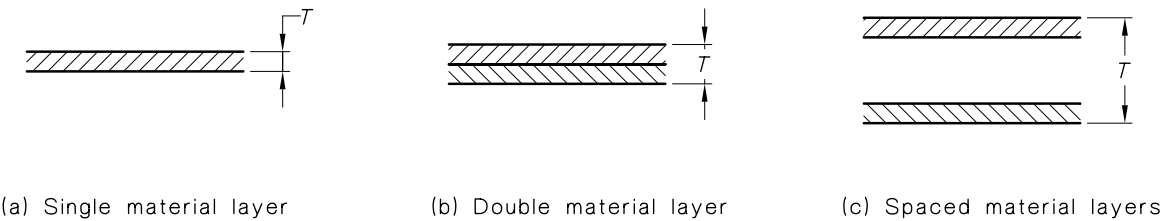
For CSD screws of nominal lengths equal or shorter than 35 mm, the full form threads shall extend close to the head such that the major diameter limits are maintained to within two pitches of the shank/head junction.

For screws of nominal length longer than 35 mm, the length of full form thread shall be at the discretion of the manufacturers.

2.4 DRILL POINTS

The drill points for type ASD, BSD and CSD shall be No. 2, No. 3, or No. 4 designed to accommodate the different panel thickness conditions shown in Figure 2.2.

The drill portion of the screw shall be milled or cold-formed and details of point taper and flute design are optional, provided that the screws comply with the performance requirements specified in this Standard and are capable of drilling the maximum material thicknesses as shown in Figure 2.2 prior to thread pick-up.

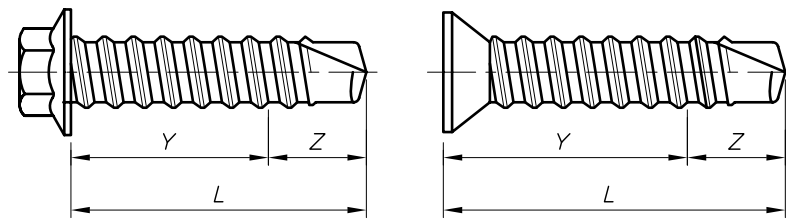


Size designation	millimetres				
	Dimension <i>T</i> (max.)				
	Type ASD (Point No. 2)	Type BSD		Type CSD	
		Point No. 2	Point No. 3	Point No. 2	Points No. 3 and No. 4
3.5 (No. 6)	—	2.3	2.8	2.3	2.8
4.2 (No. 8)	—	2.5	3.6	2.5	3.6
4.8 (No. 10)	—	2.5	4.5	4.5	4.5
5.5 (No. 12)	3.0	3.6	4.5	3.6	5.3
6.3 (No. 14)	3.0	4.4	6.3	4.4	6.3

FIGURE 2.2 DRILLING AND THREADING CAPACITY

2.5 PROTRUSION ALLOWANCE

The maximum distance, measured parallel to the axis of the screw, from the extreme point to the first full form thread beyond the point and including the length of the drill point and the tapered incomplete threads shall be as shown in Figure 2.3.



LEGEND:

L = Normal length of screw

Z = protrusion allowance

Y = Effective screw length

Size designation	millimetres	
	Protrusion allowance (Z)	
	Types ASD and BSD (Points No. 2 and No. 3)	Type CSD (Points No. 2 and No. 3)
3.5 (No. 6)	7	7
4.3 (No. 8)	8	8
4.8 (No. 10)	10	10
5.5 (No. 12)	11	11
6.3 (No. 14)	12	13

FIGURE 2.3 PROTRUSION ALLOWANCE

2.6 LENGTH OF SCREWS

2.6.1 Preferred size/length/type combinations

The preferred size/length/type combinations of self-drilling screws for fixing to steel are as given in Table 2.1.

TABLE 2.1
SIZE/LENGTH/TYPE COMBINATIONS

Size designation	Screw type															
	Length, mm															
	10	12	13	16	20	22	25	30	35	40	42	45	50	55	65	95
ST 3.5 (No. 6)	BSD	BSD	—	—	—	—	BSD	BSD	BSD	—	—	BSD	BSD	—	BSD	—
ST 4.2 (No. 8)	—	BSD	BSD	BSD CSD	BSD	BSD	BSD	BSD	BSD	—	—	BSD	—	—	—	—
ST 4.8 (No. 10)	—	BSD	—	BSD CSD	BSD CSD	BSD CSD	BSD CSD	BSD CSD	—	BSD CSD	—	CSD	CSD	—	CSD	—
ST 5.5 (No. 12)	—	—	—	—	ASD BSD CSD	—	—	—	ASD BSD CSD	ASD	—	ASD BSD CSD	—	ASD BSD CSD	ASD BSD CSD	—
ST 6.3 (No. 14)	—	—	—	—	BSD	ASD CSD	—	CSD	—	CSD	ASD	ASD CSD	ASD CSD	—	ASD CSD	CSD

NOTE: Some combinations shown may not be generally available.

2.6.2 Tolerances on screw lengths

The tolerances on screw lengths shall be as given in Table 2.2.

TABLE 2.2
TOLERANCES ON SCREW LENGTH

		millimetres
Screw length		Tolerance
≤20		+0,−0.8
>20	≤40	+0,−1.2
	≥40	+0,−1.5

2.7 TORSIONAL STRENGTH

When self-drilling screws intended for fixing to steel are tested in accordance with Appendix B the ultimate torsional load shall be not less than the values given in Table 2.3.

TABLE 2.3
MINIMUM TORQUE FOR
TORSIONAL STRENGTH

Size designation	newton metres		
	Torque		
	Type ASD	Type BSD	Type CSD
ST 3.5 (No. 6)	2.7	2.7	2.7
ST 4.2 (No. 8)	4.4	4.7	5.4
ST 4.8 (No. 10)	5.4	6.9	7.3
ST 5.5 (No. 12)	9.4	10.9	11.3
ST 6.3 (No. 14)	14.1	16.9	17.6

2.8 PERFORMANCE REQUIREMENTS

2.8.1 Drilling and thread forming

When self-drilling screws intended for fixing to steel are tested in accordance with Appendix C the screws shall form a screw thread in the test plate without damage to the thread of the screw.

2.8.2 Holding strength

When self-drilling screws intended for fixing to steel are tested in accordance with Appendix D the force required to withdraw the screw from the test plate shall be not less than the values given in Table 2.4.

TABLE 2.4
MINIMUM AXIAL FORCE
FOR WITHDRAWAL

kilonewtons	
Size designation	Minimum axial withdrawal force
ST 4.8 (No. 10)	2.5
ST 5.5 (No. 12)	2.8
ST 6.3 (No. 14)	3.1

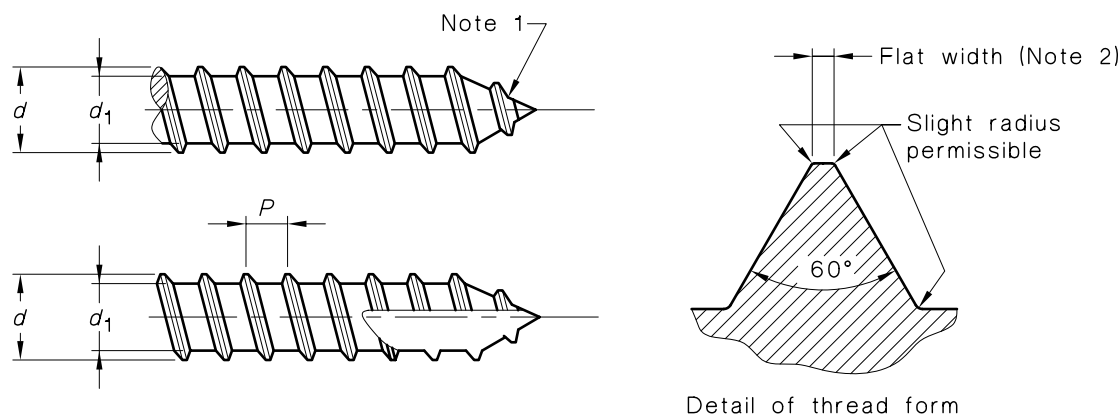
SECTION 3 SELF-DRILLING SCREWS FOR
FIXING TO TIMBER

3.1 TYPE

Self-drilling screws intended for drilling into Type G 550 steel in accordance with AS 1397 with a maximum thickness of 0.48 mm and hold into timber shall be type 17.

3.2 THREAD

The preferred form and dimensions of the thread for type 17 screws are shown in Figure 3.1. Other thread forms are acceptable provided the requirements specified in Clauses 3.5 and 3.6 can be achieved.



millimetres					
Size designation	Pitch (nom.) (p)	Major dia. (d)		Minor dia. (d ₁)	
		Min.	Max.	Min.	Max.
ST 3.5 (No. 6)	1.41	3.45	3.58	2.44	2.59
ST 4.2 (No. 8)	1.69	4.11	4.27	2.95	3.12
ST 4.8 (No. 10)	2.12	4.78	4.93	3.20	3.38
ST 5.5 (No. 12)	2.31	5.46	5.74	3.94	4.19
ST 6.3 (No. 14)	2.54	6.30	6.45	4.52	4.70

NOTES:

- 1 No extrusion of excess metal beyond the apex of the point resulting from thread rolling shall be permissible.
- 2 The width of flat at the crest of the thread shall not exceed 0.1 mm for sizes up to and including ST 4.2 (No. 8) or 0.15 mm for larger sizes.

FIGURE 3.1 THREAD FOR SELF-DRILLING SCREWS FOR FIXING TO TIMBER

3.3 LENGTH OF THREAD

For screws of nominal length equal to or shorter than 35 mm, the full form threads shall extend close to the head such that the minor diameter limits are maintained to within one pitch of the shank/head junction.

For screws of nominal lengths longer than 35 mm, the length of full form thread shall be at the discretion of the manufacturer.

3.4 LENGTH OF SCREWS

3.4.1 Preferred size/length combinations

The preferred size/length combinations of self-drilling screws for fixing to timber are as given in Table 3.1.

TABLE 3.1
SIZE/LENGTH COMBINATIONS

Size designation	Length, mm													
	12	13	20	25	30	35	40	45	50	60	65	75	90	100
ST 3.5 (No. 6)	—	—	X	—	—	—	—	—	—	—	—	—	—	—
ST 4.2 (No. 8)	X	X	X	X	—	—	—	—	—	—	—	—	—	—
ST 4.8 (No. 10)	—	—	—	X	X	X	X	X	X	—	—	X	—	—
ST 5.5 (No. 12)	—	—	—	X	X	—	X	X	X	X	X	—	—	—
ST 6.3 (No. 14)	—	—	—	X	X	—	X	X	X	—	X	X	X	X

X indicates that combination is available.

3.4.2 Tolerances on screw lengths

The tolerances on screw length shall be as given in Table 3.2.

TABLE 3.2
TOLERANCES ON
SCREW LENGTH

millimetres	
Screw length	Tolerance
≤25	±0.8
>25	±1.5

3.5 TORSIONAL STRENGTH

When self-drilling screws intended for fixing to timber are tested in accordance with Appendix B the minimum torque at failure load shall be not less than the values given for type ASD screws in Table 2.3.

3.6 PERFORMANCE REQUIREMENTS

3.6.1 Drill and drive capacity

Self-drilling screws for fixing to timber with hexagon washer heads shall be able to penetrate steel of 0.48 mm thickness and grade G550 to AS 1397.

3.6.2 Holding strength

When ST 4.8, ST 5.5 and ST 6.3, self-drilling screws for fixing to timber are tested in accordance with Appendix E, the axial force required to remove each screw shall be not less than the values given in Table 3.3.

TABLE 3.3
MINIMUM AXIAL FORCE FOR WITHDRAWAL

kilonewtons	
Size designation	Minimum axial withdrawal force
ST 4.8 (No. 10)	2.5
ST 5.5 (No. 12)	2.8
ST 6.3 (No. 14)	3.1

SECTION 4 SELF-DRILLING SCREWS FOR FIXING PLASTERBOARD TO STEEL

4.1 TYPES

Self-drilling screws intended for fixing plasterboard to steel with a maximum thickness of 0.8 mm shall be type 1 or type 2. Type 1 screws shall have two threads with the same major diameters and type 2 screws shall have two threads with different major diameters.

4.2 THREAD

The preferred form and dimensions of the threads for type 1 and type 2 screws shall be as shown in Figure 4.1. Other thread forms are acceptable provided the requirements in Clauses 4.5 and 4.6 can be achieved.

4.3 LENGTH OF THREAD

For screws of nominal length equal to or shorter than 40 mm, the full form threads shall extend close to the head such that the minor diameter limits are maintained to within one pitch of the head/shank junction.

For screws of nominal length longer than 40 mm, the length of full form thread shall be at the discretion of the manufacturer.

4.4 LENGTH OF SCREWS

4.4.1 Preferred size/length of combinations

The preferred size/length combinations of self-drilling screws for fixing plasterboard to steel are as given in Table 4.1

TABLE 4.1
SIZE/PREFERRED LENGTH
COMBINATIONS

Size designation	Preferred length, mm					
	20	25	30	45	50	60
ST 3.5 (No. 6)	—	X	—	—	—	—
ST 3.9 (No. 7)	X	X	X	X	X	—
ST 4.2 (No. 8)	—	—	—	X	X	X

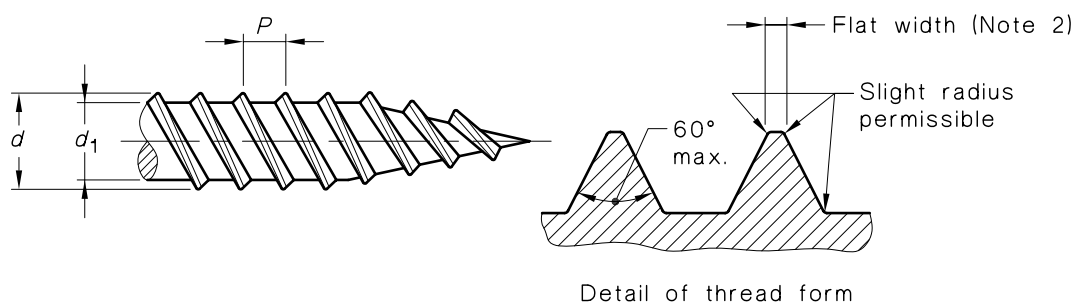
NOTE: Some combinations may not be available.

4.4.2 Tolerances on screw lengths

The tolerances on screw lengths shall be as given in Table 4.2.

TABLE 4.2
TOLERANCES ON
SCREW LENGTHS

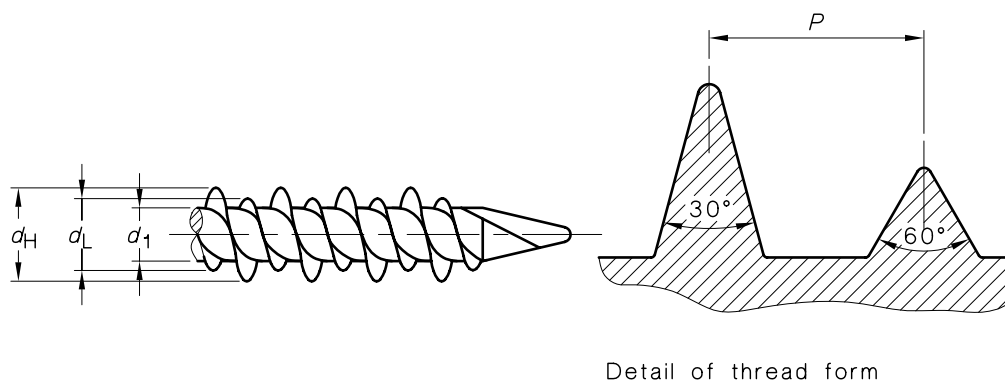
millimetres	
Screw length	Tolerance
≤25	±0.8
>25	±1.5



millimetres				
Size designation	Pitch (nom) (<i>p</i>)	Major dia. (<i>d</i>)		Minor dia. (min.) (<i>d</i> ₁)
		Min.	Max.	
ST 3.5 (No. 6)	1.27	3.43	3.61	2.29
ST 3.9 (No. 7)	1.34	3.78	3.96	2.29
ST 4.2 (No. 8)	1.41	4.09	3.34	2.95

NOTES: The width of flat at the crest of the thread shall not exceed 0.1 mm.

(a) Type 1



millimetres					
Size designation	Pitch (nom) (p)	High major dia. (d _H)		Low major dia. (d _L)	Minor dia. (d ₁)
		Min.	Max.		
ST 3.5 (No. 6)	1.34	3.43	3.68	2.74	2.03
ST 3.9 (No. 7)	1.34	3.76	4.01	3.30	2.46
ST 4.2 (No. 8)	1.41	4.06	4.32	3.30	2.41

(b) Type 2

FIGURE 4.1 THREADS FOR SELF-DRILLING SCREWS FOR FIXING PLASTERBOARD TO STEEL

4.5 TORSIONAL STRENGTH

When self-drilling screws intended for fixing plaster board to steel are tested in accordance with Appendix B the minimum torque at failure shall be not less than the values given in Table 4.3.

TABLE 4.3
MINIMUM TORQUE FOR
TORSIONAL STRENGTH

Size designation	newton metres	
	Torque	
	Type 1	Type 2
ST 3.5 (No. 6)	2.5	1.4
ST 3.9 (No. 7)	2.8	2.4
ST 4.2 (No. 8)	4.4	2.9

4.6 PERFORMANCE REQUIREMENTS

4.6.1 Drilling and thread forming

When self-drilling screws intended for fixing plasterboard to steel are tested in accordance with Appendix C the screws shall form a screw thread in the test plate without damage to the thread of the screw.

4.6.2 Holding strength

When self-drilling screws intended for fixing plasterboard to steel are tested in accordance with Appendix D the axial force required to remove a screw shall be not less than 750 N.

APPENDIX A

DUCTILITY TEST

(Normative)

A1 SCOPE

This Appendix specifies a method for determining a degree of ductility of self-drilling screws.

A2 PRINCIPLE

Axial and radial loads are separately applied to the head of the screw until the head or shank, depending on the subject of the test, is permanently bent to a predetermined degree.

A3 APPARATUS

The following apparatus is required:

- (a) A hardened steel wedge block with a drilled hole with 1 mm clearance.
- (b) A hardened steel shank clamping device.
- (c) A hammer or a similar device.

A4 PROCEDURE

A4.1 Head soundness testing

The procedure shall be as follows:

- (a) Insert screw into the drilled clearance hole in a hardened steel wedge block or other suitable locating device.
- (b) Apply an axial impact force against the top of the screw head until the plane of the underhead bearing surface of the screw is bent permanently to 12 degrees in relation to the axis of the screw.
- (c) Inspect the screw for cracking or fractures at the head/shank junction.

A4.2 Shank bend testing

The procedure shall be as follows:

- (a) Clamp screw in a suitable clamping device, with a length of shank of not less than four thread pitches threads projecting above the top of the clamping device.
- (b) Apply a radial impact force to the head of the screw until the shank is bent permanently to 12 degrees in relation to the axis of the screw.
- (c) Inspect the screw shank for cracking or fracture.

A5 REPORT

The following shall be reported:

- (a) Whether the plane of the underhead bearing surface of the screw became bent permanently to the specified angle in relation to the axis of the screw or whether it fractured before achieving this position.
- (b) Whether the free part of the shank became bent to the specified angle in relation to the axis of the screw or whether it fractured before achieving this position.

APPENDIX B
TEST FOR TORSIONAL STRENGTH
(Normative)

B1 SCOPE

This Appendix specifies a method for determining the torsional strength of self-drilling screws.

B2 PRINCIPLE

A self-drilling screw is clamped by its shank and a gradually increasing torque is applied to the head until the screw fails. The torque at failure is measured.

B3 APPARATUS

The following apparatus is required:

- (a) An appropriate clamping device (see Figure B1).
- (b) A device to determine the torque applied to the screw.

B4 PROCEDURE

The procedure shall be as follows:

- (a) Clamp the screw securely in a mating, split, blind hole die or by other means. Take care not to damage the clamped portion of the threads. Ensure that at least two full threads project above the clamping device.
- (b) Apply torque through a driving tool, corresponding to the driving feature of the screw, until the screw fails, i.e. breaks completely.

B5 REPORT

Torque at which failure occurred, in newton metres shall be reported.

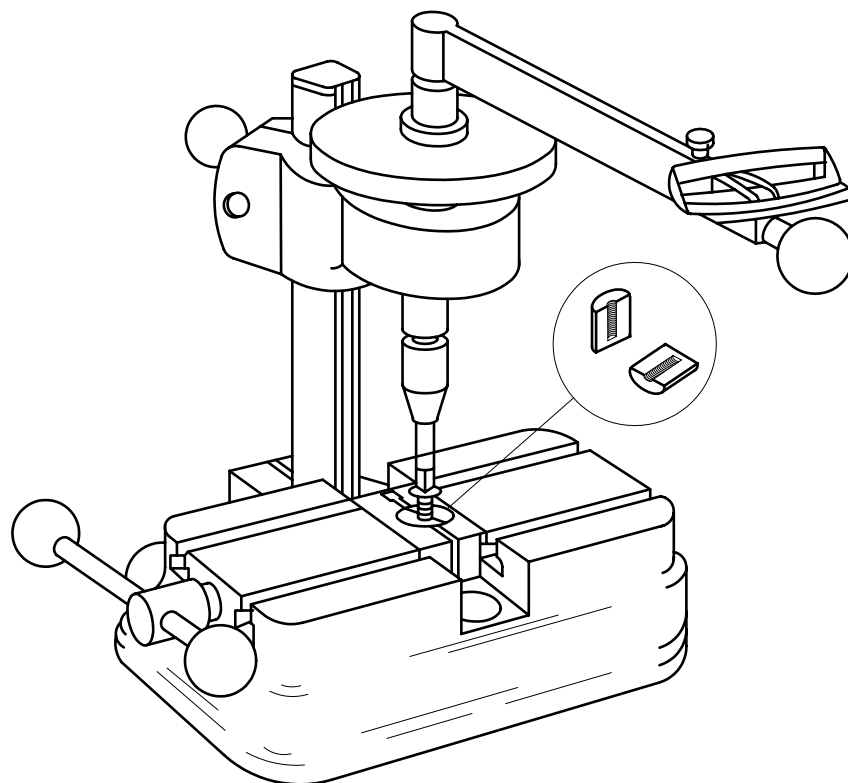


FIGURE B1 FIXTURE FOR DETERMINING TORSIONAL STRENGTH

APPENDIX C

DRILLING AND DRIVING TEST FOR SELF-DRILLING SCREWS
FOR STEEL AND FOR FIXING PLASTERBOARD TO STEEL

(Normative)

C1 SCOPE

This Appendix specifies a method for determining the drilling and driving capacity of self-drilling screws for steel and for fixing plasterboard to steel.

C2 PRINCIPLE

Under a predetermined load, the screw is driven into a test plate. The screw should drill a hole and form a thread.

C3 APPARATUS

The following apparatus is required (see Figure C1):

- (a) A drill stand, capable of accepting weights to feed the drill in an axial direction.
- (b) Weights to provide the specified axial feed (see Table C1).
- (c) A steel test plate as specified in Paragraph C4 and accompanying support fixture.
- (d) Limit switch.
- (e) Timer.

C4 SPECIFICATIONS FOR DRILL DRIVE TEST PLATES**C4.1 Drill drive test plate for self-drilling screws for steel****C4.1.1 Material**

The material shall be one or more thicknesses of zinc-coated steel Type G300-Z275, Type G350-Z275, or Type G450-Z350 in accordance with AS 1397.

C4.1.2 Thickness

The thickness shall be as shown in Table C2.

C4.2 Drill drive test plate for self-drilling screws for fixing plasterboard to steel**C4.2.1 Material**

The material shall be zinc-coated steel Type G200-Z275 in accordance with AS 1397.

C4.2.2 Thickness

The plate shall be of 0.55 mm minimum base thickness.

C5 PROCEDURE

The procedure shall be as follows:

- (a) Secure an appropriate test plate in the fixture.
- (b) Load the required amount of weights onto the drill (see Table C1).
- (c) Secure a driving bit, corresponding to the driving recess of the screw, in the chuck of the drill.

- (d) Locate the screw head in the driver bit and then lower the driver while holding the screw engaged in the driver until the point of the screw rests on the test plate.
- (e) Switch on the drill.
- (f) Establish whether a hole was drilled and thread was cut into the test plate. (A limit switch on the drill will switch it off once this has happened.)

C6 REPORT

Whether a thread was formed in the test plate shall be reported.

TABLE C1
MAXIMUM MASS FOR DRILL DRIVE TEST

Size designation	Mass (max.), kg
ST 3.5, ST 3.9 and ST 4.2 (No. 6, No. 7, and No. 8)	20
ST 4.9 and ST 5.5 (No. 10 and No. 12)	27
ST 6.3 (No. 14)	32

TABLE C2
TEST PLATE THICKNESS FOR DRILL DRIVE TEST FOR
SELF-DRILLING SCREWS FOR STEEL

Size designation	Thickness of test plate				
	Type ASD	Type BSD		Type CSD	
	No. 2 point	No. 2 point	No. 3 point	No. 2 point	No. 3 and No. 4 points
ST 3.5 (No. 6)	—	2.3	2.8	2.3	2.8
ST 4.2 (No. 8)	—	2.5	3.5	2.5	3.5
ST 4.9 (No. 10)	—	2.5	4.5	2.5	4.5
ST 5.5 (No. 12)	3.0	3.6	4.5	3.6	5.3
ST 6.3 (No. 14)	3.0	4.4	6.3	4.4	6.3

millimetres

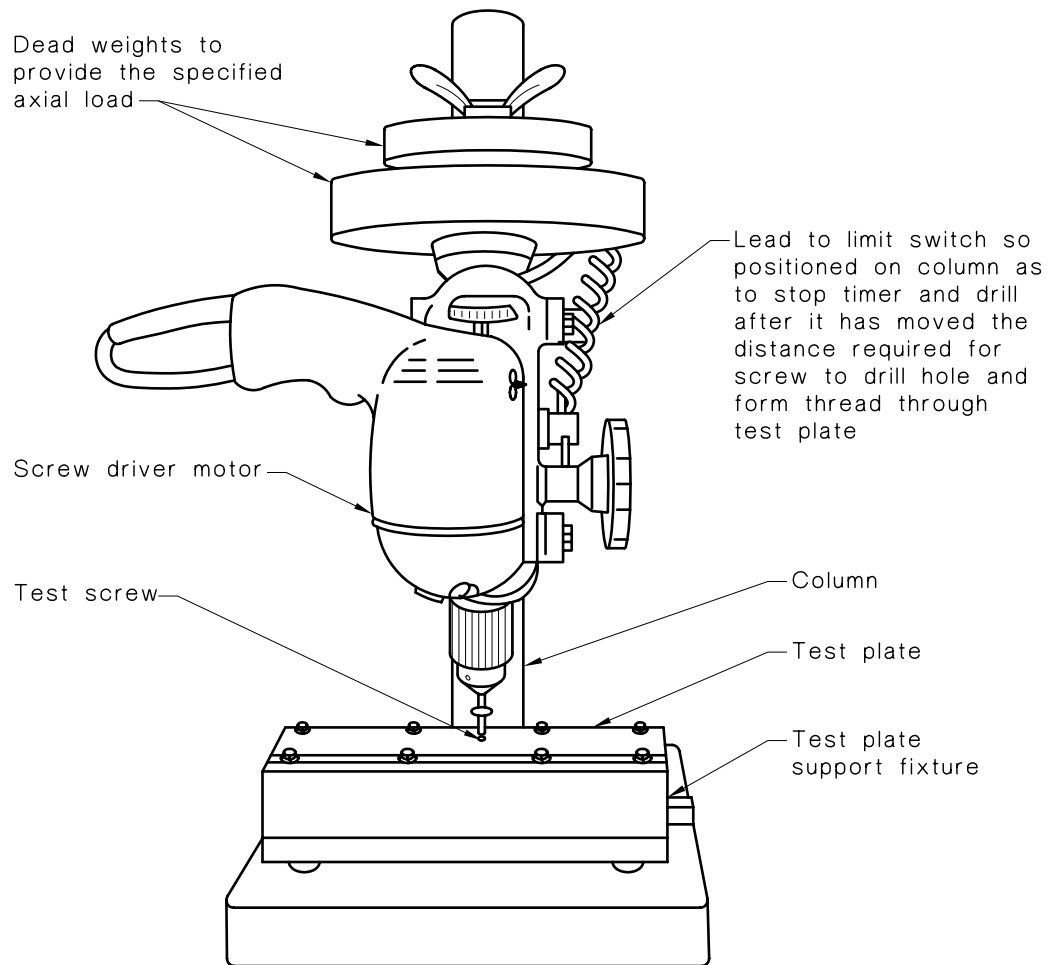


FIGURE C1 TYPICAL DRILL DRIVE TEST FIXTURE

APPENDIX D

WITHDRAWAL TEST FOR SELF-DRILLING SCREWS FOR
STEEL AND FOR FIXING PLASTERBOARD TO STEEL

(Normative)

D1 SCOPE

This Appendix specifies a method for determining the force required to withdraw from a test plate a self-drilling screw for steel or for fixing plasterboard to steel.

D2 PRINCIPLE

A screw is secured in a test plate. The screw is then withdrawn from the test plate by the application of an axial tensile force, which is measured.

D3 APPARATUS

The following apparatus is required:

- (a) A steel test plate as specified in Paragraph E4 and accompanying support fixture.
- (b) A device for applying an axial tensile force to the head of the screw. This force may be achieved by mechanical, pneumatic, or hydraulic means. The force shall be measurable. The force should be continuous and applied with a speed not greater than 3 mm/min.
- (c) An electric drill and driving bit suitable for the screw being tested.
- (d) An adaptor suitable for the screw head and the device for applying the force (see Figure D1).

D4 SPECIFICATIONS FOR TEST PLATES**D4.1 Test plate for self-drilling screws for steel****D4.1.1 Material**

The material shall be zinc-coated steel, Type G450-Z350 in accordance with AS 1397.

D4.1.2 Thickness

The thickness shall be 1.5 mm base metal thickness.

D4.2 Test plate for self-drilling screws for fixing plasterboard to steel**D4.2.1 Material**

The material shall be zinc-coated steel Type G200-Z275 in accordance with AS 1397.

D4.2.2 Thickness

The plate shall be of 0.55 mm base metal thickness.

D5 PROCEDURE

The procedure shall be as follows:

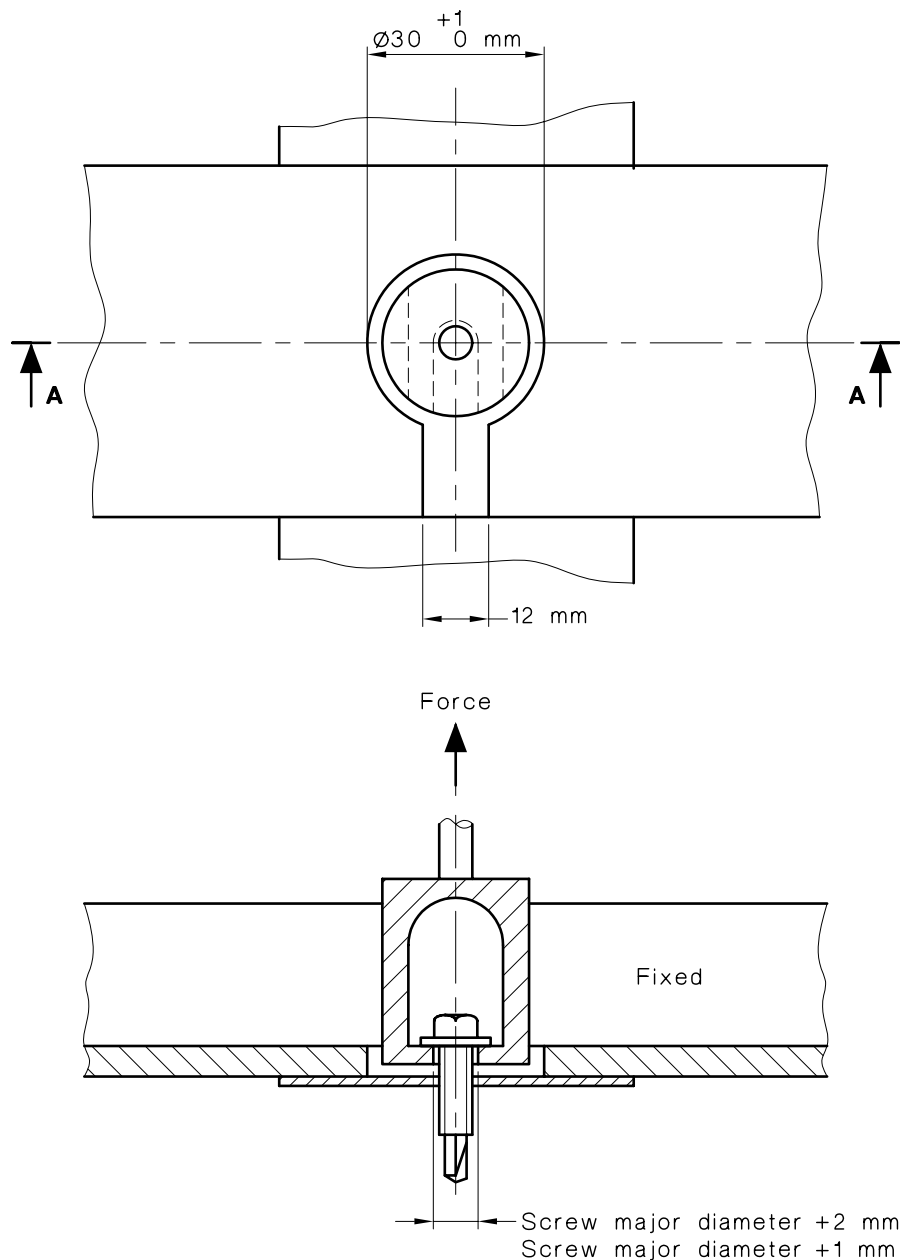
- (a) Drive a screw into the test plate, with at least one full pitch protruding from the opposite side of the plate.
- (b) Position the test plate and screw assembly in the fixture (see Figure D1).

NOTE: If a test plate is used for a number of tests, screws are not placed closer than 50 mm to each other or closer than 25 mm to the edge of the test plate.

- (c) Locate the head of the screw in an adaptor.
- (d) Apply the withdrawing force until the screw is withdrawn from the test plate.
- (e) Record the value of the force at withdrawal.

D6 REPORT

The force registered by the device when the screw was withdrawn from the test plate, in kilonewtons shall be reported.



SECTION A-A

FIGURE D1 TYPICAL WITHDRAWAL TEST FIXTURE

APPENDIX E

WITHDRAWAL TEST FOR SELF-DRILLING SCREWS FOR TIMBER

(Normative)

E1 SCOPE

This Appendix specifies a method for determining the force required to withdraw a screw from a timber test piece.

E2 PRINCIPLE

A screw is secured into a timber test piece. The screw is then withdrawn from the test piece by the application of an axial tensile force, which is measured.

E3 APPARATUS

The following apparatus is required:

- (a) A timber test piece as specified in Paragraph E4 and accompanying support fixture.
- (b) A device for applying a tensile force to the head of the screw. This force may be achieved by mechanical, pneumatic, or hydraulic means. The force shall be measurable. The force shall be continuous and applied with a speed less than 2.5 mm/min.
- (c) A hand-held electric screwdriver fitted with a clutch stop and driving bit, suitable for the screw being tested.
- (d) An adaptor suitable for the screw head and the device for applying the force (see Figure E1, Appendix E).

E4 SPECIFICATION FOR TIMBER TEST PIECE

The timber test piece shall be of E5 seasoned radiata pine with a maximum moisture content of 15 percent and a minimum density of 380 kg/m³, determined in accordance with AS/NZS 1080.1 and AS/NZS 1080.3 respectively.

E5 PROCEDURE

The procedure for each of the test specimens shall be as follows:

- (a) Drive a screw into the test timber to the depth stated in Table E1.
- (b) Locate the test assembly into the test fixture.
NOTE: Figure E1, shows a typical withdrawal test figure for steel.
- (c) Locate the head of the screw into the head withdrawal adaptor.
- (d) Apply the withdrawing force until the screw is withdrawn from the timber.
- (e) Record the value of the force at withdrawal.

TABLE E1
DEPTH OF PENETRATION OF
SCREW IN TEST PIECE

Size designation	Penetration depth, mm
ST 4.8 (No. 10)	25 ±1
ST 5.5 (No. 12)	30 ±1
ST 6.3 (No. 14)	35 ±1

E6 REPORT

The force registered by the device when the screw was withdrawn from the test timber, in kilonewtons shall be reported.

NOTES

NOTES

NOTES

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