



SURE-FAST
INDUSTRIAL FASTENERS

Mechanical Testing

Roof-Fast Self Drilling screws were tested for determination of withdrawal properties in accordance with *AS 3566.1-2002 Self-Drilling Screws for the Building and Construction Industries – Part 1: General Requirements and Mechanical Properties*.

The test procedure included being driven into steel and radiata pine substrates.



- Screw Type 1:** Roof-Fast Self Drilling (SD) – M6-11 x 50mm long
Screw Type 2: Roof-Fast Self Drilling (SD) – M5.5-11 x 40mm long
Head Type: Hexagon Washer Head
Width (Nominal): 7.8mm (A/F)
Coating Type: Zinc

Screws were driven into substrates measuring thicknesses of 0.55mm, 0.75mm, 1.2mm x 1.5mm galvanized steel plate and 90 x 45mm radiata pine (15% moisture content and density of 380kg/m³).

For all testing into steel substrates, several full pitch threads were protruding from the underside of the test plate. Axial withdrawal force was then applied individually to the screw head until the screws achieved the peak tensile force and withdrew from the test plate.

For testing of screws into radiata pine, the embedment depth was 35mm for the 50mm long screws and 25mm for the 40mm long screws. The timber test assembly was secured into a testing machined allowing the protruding screw heads to be gripped for tensile loading. Withdrawal force was then applied until the screws achieved the peak tensile force and withdrew from the timber.

Table 1: Withdrawal Test Data for M5.5 x 11 TPI x 40mm Long; 1.5mm Thick Steel (Purlin)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|--|--------------|----------------------|---------------------------|---|
| M5.5 x 11 TPI x 40 mm long; 1.5mm Thick Steel (Purlin) | 1 | 5.2 | 2.8 | Withdrawal from the steel material, minor damage to the screw threads, PASS |
| | 2 | 5.3 | | " |
| | 3 | 5.2 | | " |
| | 4 | 5.3 | | " |
| | 5 | 5.2 | | " |
| | 6 | 5.3 | | " |
| | 7 | 5.4 | | " |
| | 8 | 5.3 | | " |
| | 9 | 5.1 | | " |
| | 10 | 5.0 | | " |
| Mean | | 5.2 | | |
| Min | | 5.0 | | |
| Max | | 5.4 | | |

Table 2: Withdrawal Test Data for M6 x 11 TPI x 50mm Long; 1.5mm Thick Steel (Purlin)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|--|--------------|----------------------|---------------------------|---|
| M6 x 11 TPI x 50 mm long; 1.5mm Thick Steel (Purlin) | 1 | 4.9 | 2.8 | Withdrawal from the steel material, minor damage to the screw threads, PASS |
| | 2 | 5.1 | | " |
| | 3 | 5.0 | | " |
| | 4 | 4.9 | | " |
| | 5 | 5.1 | | " |
| | 6 | 5.1 | | " |
| | 7 | 5.0 | | " |
| | 8 | 5.4 | | " |
| | 9 | 4.8 | | " |
| | 10 | 4.9 | | " |
| Mean | | 5.0 | | |
| Min | | 4.8 | | |
| Max | | 5.4 | | |

Table 3: Withdrawal Test Data for M5.5 x 11 TPI x 40mm Long; 1.2mm Thick Steel (Purlin)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M5.5 x 11 TPI x 40 mm long; 1.2mm Thick Steel (Purlin) | 1 | 4.3 | 2.8 | Withdrawal from the steel material, minor damage to the screw threads, PASS |
| | 2 | 4.1 | | " |
| | 3 | 4.2 | | " |
| | 4 | 4.1 | | " |
| | 5 | 4.2 | | " |
| | 6 | 4.2 | | " |
| | 7 | 4.2 | | " |
| | 8 | 4.2 | | " |
| | 9 | 4.2 | | " |
| | 10 | 4.1 | | " |

Mean 4.2
Min 4.1
Max 4.3

Table 4: Withdrawal Test Data for M6 x 11 TPI x 50mm Long; 1.2mm Thick Steel (Purlin)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M6 x 11 TPI x 50 mm long; 1.2mm Thick Steel (Purlin) | 1 | 3.5 | 2.8 | Withdrawal from the steel material, minor damage to the screw threads, PASS |
| | 2 | 3.4 | | " |
| | 3 | 3.8 | | " |
| | 4 | 3.8 | | " |
| | 5 | 3.5 | | " |
| | 6 | 3.6 | | " |
| | 7 | 3.5 | | " |
| | 8 | 3.8 | | " |
| | 9 | 3.3 | | " |
| | 10 | 3.1 | | " |

Mean 3.5
Min 3.1
Max 3.8

Table 5: Withdrawal Test Data for M5.5 x 11 TPI x 40mm Long; 0.75mm Thick Steel (Top Hat)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M5.5 x 11 TPI x 40 mm long; 0.75mm Thick Steel (Top Hat) | 1 | 2.1 | N/A | Withdrawal from the steel material, minor damage to the screw threads |
| | 2 | 2.2 | | " |
| | 3 | 2.2 | | " |
| | 4 | 2.1 | | " |
| | 5 | 2.2 | | " |
| | 6 | 2.1 | | " |
| | 7 | 2.2 | | " |
| | 8 | 2.1 | | " |
| | 9 | 2.2 | | " |
| | 10 | 2.1 | | " |

Mean 2.2
Min 2.1
Max 2.2

Table 6: Withdrawal Test Data for M6 x 11 TPI x 50mm Long; 0.75mm Thick Steel (Top Hat)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M6 x 11 TPI x 50 mm long; 0.75mm Thick Steel (Top Hat) | 1 | 2.0 | N/A | Withdrawal from the steel material, minor damage to the screw threads |
| | 2 | 2.2 | | " |
| | 3 | 2.1 | | " |
| | 4 | 2.3 | | " |
| | 5 | 2.3 | | " |
| | 6 | 2.1 | | " |
| | 7 | 2.4 | | " |
| | 8 | 2.0 | | " |
| | 9 | 2.0 | | " |
| | 10 | 1.8 | | " |

Mean 2.1
Min 1.8
Max 2.4

Table 7: Withdrawal Test Data for M5.5 x 11 TPI x 40mm Long; 0.55mm Thick Steel (Top Hat)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M5.5 x 11 TPI x 40 mm long; 0.55mm Thick Steel (Top Hat) | 1 | 1.1 | N/A | Withdrawal from the steel material, minor damage to the screw threads |
| | 2 | 1.2 | | " |
| | 3 | 1.2 | | " |
| | 4 | 1.2 | | " |
| | 5 | 1.1 | | " |
| | 6 | 1.2 | | " |
| | 7 | 1.2 | | " |
| | 8 | 1.2 | | " |
| | 9 | 1.2 | | " |
| | 10 | 1.2 | | " |
| Mean | | 1.2 | | |
| Min | | 1.1 | | |
| Max | | 1.2 | | |

Table 8: Withdrawal Test Data for M6 x 11 TPI x 50mm Long; 0.55mm Thick Steel (Top Hat)

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|---|--------------|----------------------|---------------------------|---|
| M6 x 11 TPI x 50 mm long; 0.55mm Thick Steel (Top Hat) | 1 | 1.3 | N/A | Withdrawal from the steel material, minor damage to the screw threads |
| | 2 | 1.2 | | " |
| | 3 | 1.2 | | " |
| | 4 | 1.2 | | " |
| | 5 | 1.2 | | " |
| | 6 | 1.2 | | " |
| | 7 | 1.3 | | " |
| | 8 | 1.3 | | " |
| | 9 | 1.2 | | " |
| | 10 | 1.4 | | " |
| Mean | | 1.3 | | |
| Min | | 1.2 | | |
| Max | | 1.4 | | |

Table 9: Withdrawal Test Data for M6 x 11 TPI x 50mm Long; 90 x 45mm Radiata Pine

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|--|--------------|----------------------|---------------------------|--|
| M6 x 11 TPI x 50 mm long; 90 x 45 mm Radiata Pine | 1 | 4.4 | 2.8 | Withdrawal from the timber material, no damage or failure of the screw, PASS |
| | 2 | 4.1 | | " |
| | 3 | 4.1 | | " |
| | 4 | 4.1 | | " |
| | 5 | 4.1 | | " |
| | 6 | 4.1 | | " |
| | 7 | 4.1 | | " |
| | 8 | 4.3 | | " |
| | 9 | 4.3 | | " |
| | 10 | 4.5 | | " |
| Mean | | 4.2 | | |
| Min | | 4.1 | | |
| Max | | 4.5 | | |

Table 10: Withdrawal Test Data for M5.5 x 11 TPI x 40mm Long; 90 x 45mm Radiata Pine

| Screw & Substrate Type | Specimen No. | Peak Test Force (kN) | AS 3566.1 Min. Force (kN) | Test Observations / Comments |
|--|--------------|----------------------|---------------------------|--|
| M5.5 x 11 TPI x 40 mm long; 90 x 45 mm Radiata Pine | 1 | 3.4 | 2.8 | Withdrawal from the timber material, no damage or failure of the screw, PASS |
| | 2 | 3.4 | | " |
| | 3 | 3.6 | | " |
| | 4 | 3.2 | | " |
| | 5 | 3.2 | | " |
| | 6 | 3.1 | | " |
| | 7 | 3.4 | | " |
| | 8 | 3.2 | | " |
| | 9 | 3.4 | | " |
| | 10 | 3.1 | | " |
| Mean | | 3.3 | | |
| Min | | 3.1 | | |
| Max | | 3.6 | | |