



## Characteristic Capacities for the design of structural connections with Ecko T – REX17® Construction Screws

Ecko T – REX17® construction screws are partially threaded, which work by clamping two timber members together. They come in two head types, Washer head, to provide a high clamping force and Counter sunk which is used for flush fixings.

Ecko T – REX17® construction screws are coated with XGuard galvanising for use in outdoor conditions as per NZS3604 corrosion zone Table 4.3 Nail and Screw use.

Ecko T - REX17® Screw Range					
	Counter Sunk Head, TCC		Washer Head, TCW		
d1	8	10	6	8	10
dk	14.9	18.7	15.3	21	24.7
Bit driver	T-40	T-50	T-30	T-40	T-50
Point	Type 17	Type 17	Type 17	Type 17	Type 17
Ls	lgT	lgT	lgT	lgT	lgT
80	50	50	50	50	50
100	60	60	60	60	60
120	60	60	60	60	60
140	80	80	80	80	80
160	80	80	80	80	80
180	80	80	80	80	80
200	80	80	80	80	80
220	80	80	80	80	80
240	80	80	80	80	80
260	80	80	80	80	80
280	80	80	80	80	80
300	80	80	80	80	80
320	80	80		80	80
340	80	80		80	80
360	80	80		80	80
400	80	80		80	80
d1= Thread diameter			Ls = Screw length		
dk = Head diameter			lgT = Thread length		

## Connection Design using Ecko T – REX17® Screws

### Introduction

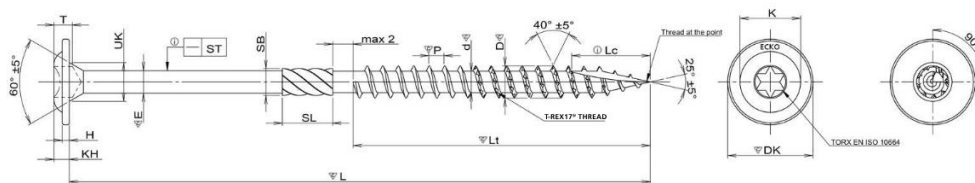
This guide has been developed from testing according to AS1649 – Methods of test for mechanical fasteners and connectors and EN1382/3 Timber structures test methods, to determine limit state design parameters. It is intended for use in conjunction by a design professional, for engineering designs in accordance with NZS3603 – Timber Structures, AS1720.1 – Timber Structures, NZS AS1720.1 – Timber Structures and Eurocode 5 - Timber.

### Description of Testing

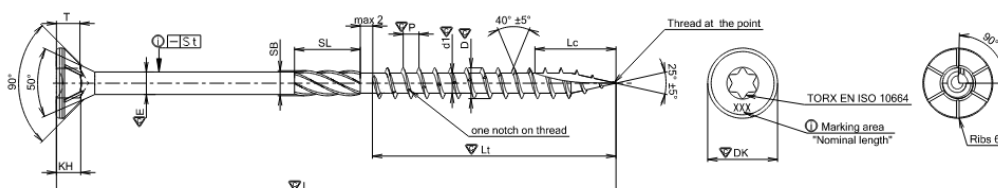
Sets of screw tests were performed in a matrix of withdrawal and lateral shear orientations to provide design data on SG8 (also GL8) Radiata Pine and LVL11 (face and edge) Radiata Pine timber material types. Temperature, humidity, moisture content and densities were recorded to ensure the material was within test parameters. Tests were performed without predrilling holes.

Ecko T - REX17® Mechanical Properties							
Head Type			Counter Sunk Head, TCC		Washer Head, TCW		
Nominal Diameter	D1	(mm)	8	10	6	8	10
Head Diameter	dk	(mm)	14.9	18.7	15.3	21.0	24.7
Thread Diameter	d1	(mm)	8.0	10.0	6.0	8.0	10.0
Shank Diameter	ds	(mm)	5.8	7.0	4.2	5.8	7.0
Yield Moment	$M_{y,k}$	(Nm)	20.4	34.5	7.6	20.4	34.5
Tensile Capacity	$f_{tens,k}$	(kN)	27.8	37.6	12.9	27.8	37.6
Charactertistic Withdrawal Parameter (Associated Density - 480kg/m3 LVL)	$f_{ax,k}$	(N/mm <sup>2</sup> )	17.2	17.2	17.2	17.2	17.2
Charactertistic Withdrawal Parameter (Associated Density - 375kg/m3 SG8)	$f_{ax,k}$	(N/mm <sup>2</sup> )	14.1	14.1	14.1	14.1	14.1
Charactertistic Head Pull Through Parameter (Associated Density - 480kg/m3 LVL)	$f_{head,k}$	(N/mm <sup>2</sup> )	14.6	14.6	14.6	14.6	14.6
Charactertistic Head Pull Through Parameter (Associated Density - 375kg/m3 SG8)	$f_{head,k}$	(N/mm <sup>2</sup> )	10.7	10.7	10.7	10.7	10.7

### Washer Head



### Countersunk Head



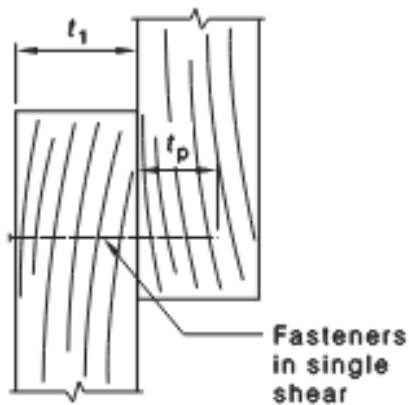
**Characteristic Capacity for a Ecco T-REX17® single screw in side grain loaded in single shear**

SG8 (Radiata Pine)	Fixing type	Shank Diameter (mm)	Characteristic Capacity for a single screw in side grain laterally loaded in single shear (N) <sub>1,2</sub>
	M8x140 TCC	5.8	1940
	M10x140 TCC	7.0	2890
	M6 x140 TCW	4.2	1260
	M8x140 TCW	5.8	1940
	M10x140 TCW	7.0	2890
LVL11 Face <sup>3</sup> (Radiata Pine)	Fixing type	Shank Diameter (mm)	Characteristic Capacity for a single screw in side grain laterally loaded in single shear (N) <sub>1,2</sub>
	M8x140 TCC	5.8	3430
	M10x140 TCC	7.0	3870
	M6 x140 TCW	4.2	1440
	M8x140 TCW	5.8	3430
	M10x140 TCW	7.0	3870

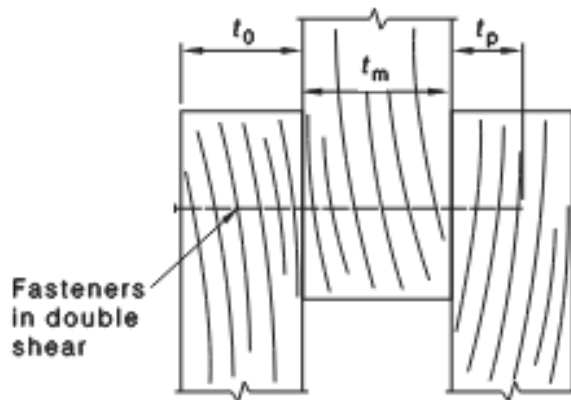
1 - Based on tests performed in double shear using 3/45mm dry timber members. Results are calculated for single shear.

2 - The lateral loads for screws in side grain is assumed to be the same for load direction parallel and perpendicular to grain (verified by testing).

3 - For LVL8 and LVL11 Edge orientation assume SG8 values. For LVL13 use LVL11 values.



(a) Two-member Type 1 joint



(b) Three-member Type 1 joint

Characteristic Capacity for a Ecko T-REX17® single screw in side grain loaded in withdrawal

SG8 (Radiata Pine)	Fixing type	Withdrawal (kN) 80mm thread penetration	Characteristic Withdrawal (N/mm)	Head Pull Through (kN)
	M8x140 TCC	8.0	102	3.3
	M10x140 TCC	9.1	114	4.3
	M6 x140 TCW	6.5	81	2.9
	M8x140 TCW	8.0	102	4.6
	M10x140 TCW	9.1	114	8.0

LVL11 Face (Radiata Pine)	Fixing type	Withdrawal (kN) 80mm thread penetration	Characteristic Withdrawal (N/mm)	Head Pull Through (kN)
	M8x140 TCC	9.1	114	4.0
	M10x140 TCC	10.6	133	5.3
	M6 x140 TCW	7.1	89	3.7
	M8x140 TCW	9.1	114	6.7
	M10x140 TCW	10.6	133	7.8

LVL11 Edge (Radiata Pine)	Fixing type	Withdrawal (kN) 80mm thread penetration	Characteristic Withdrawal (N/mm)	Head Pull Through (kN)
	M8x140 TCC	8.0	100	3.7
	M10x140 TCC	10.3	129	5.7
	M6 x140 TCW	6.6	83	3.4
	M8x140 TCW	8.0	100	5.7
	M10x140 TCW	10.3	129	8.7

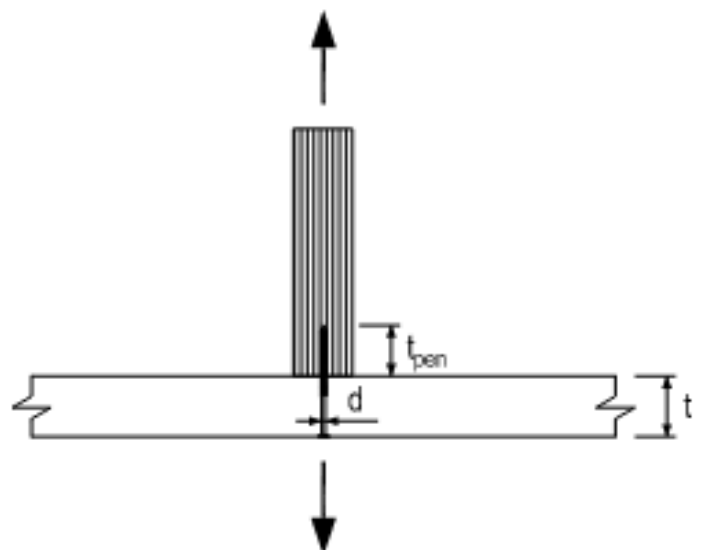
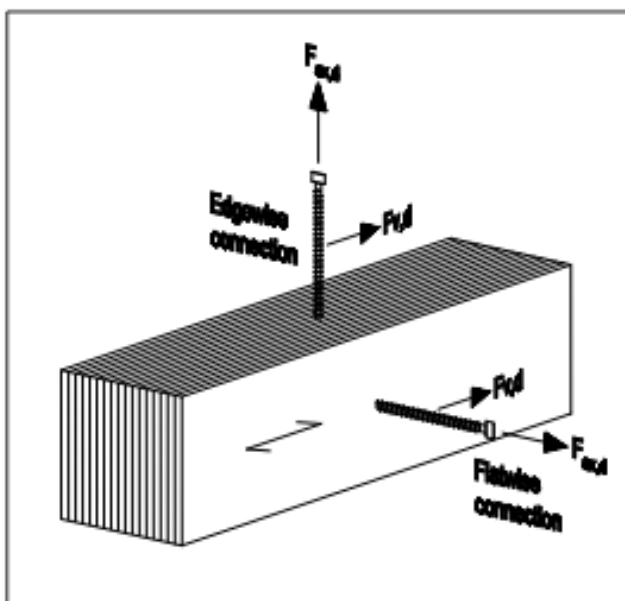
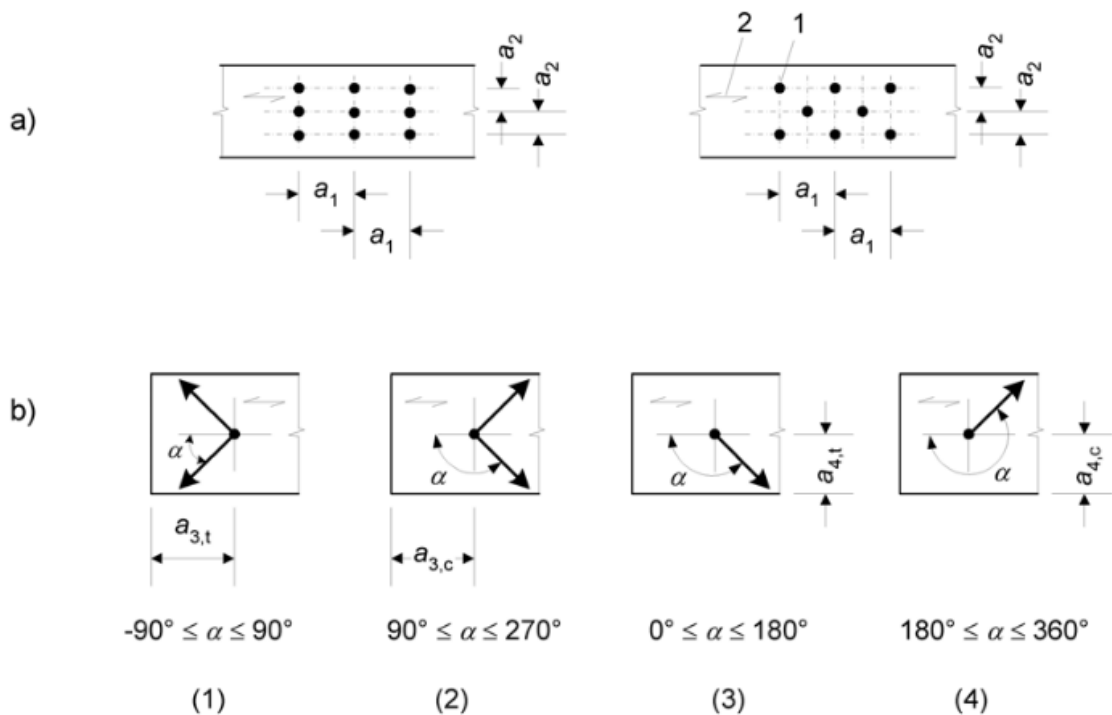


Figure 5.2. Edgewise (edge face) and flatwise (wide face) orientations and loading types of connections.  $F_{ax,d}$  are forces of axially loaded and  $F_{x,d}$  are forces of laterally loaded connections <sup>34</sup>.

Minimum Recommended Spacing of screws (mm) <sup>1</sup>				
		M6	M8	M10
Thread Diameter, d1		6	8	10
Spacing along grain	a1	60	80	100
Spacing across grain	a2	30	40	50
Loaded end distance	a3,t	90	120	150
Unloaded end distance	a3,c	50	60	80
Loaded edge distance	a4,t	30	40	45
Unloaded edge distance	a4,c	15	20	22.5

1- Without predrilled holes. For LVL edge orientation, increase spacing along, a1, by 20mm



Key:

- (1) Loaded end
- (2) Unloaded end
- (3) Loaded edge
- (4) Unloaded edge
- 1 Fastener
- 2 Grain direction

# Producer Statement

## Ecko T-REX17® Construction Screws.

Potius Building Systems Ltd has been engaged by Ecko Fastening Systems to test and develop design parameters for the Ecko T-REX17® M6, M8 & M10 range of screws.

Testing has been generally carried out in accordance with AS1684 and EN1382/83 and adapted where necessary to provide useable results.

We believe on reasonable grounds that the characteristic values contained in this Design Guide will meet the requirements of clauses B1/VM1 of the New Zealand Building Code documents.



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December 2022 (validity of producer statement 2 years from this date)



### Reference Standards:

AS1649 – Methods of test for mechanical fasteners and connectors

AS1720.1 – Timber Structures

BRANZ EM1 Structural Joint Strength and Stiffness Evaluation

NZS3603 – Timber Structures

NZS AS1720.1 – Timber Structures

EN 1382 – Withdrawal Capacity of Timber Fasteners

EN 1383 – Fastener Head Pull Through

EN 14358 – Calculation and Verification of Characteristic Values