peikko group

TERADOWEL

Load Transfer System

Load Transfer System for Contraction Free Movement Joints in Concrete Floors

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THE CONSTRUCTION STORE

MANAGEMENT SYSTEM CERTIFICATION ISO 9001 ISO 14001 OHSAS 18001 ISO 3834-2 DNV

Version: **AU 04/2015**

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Technical Manual

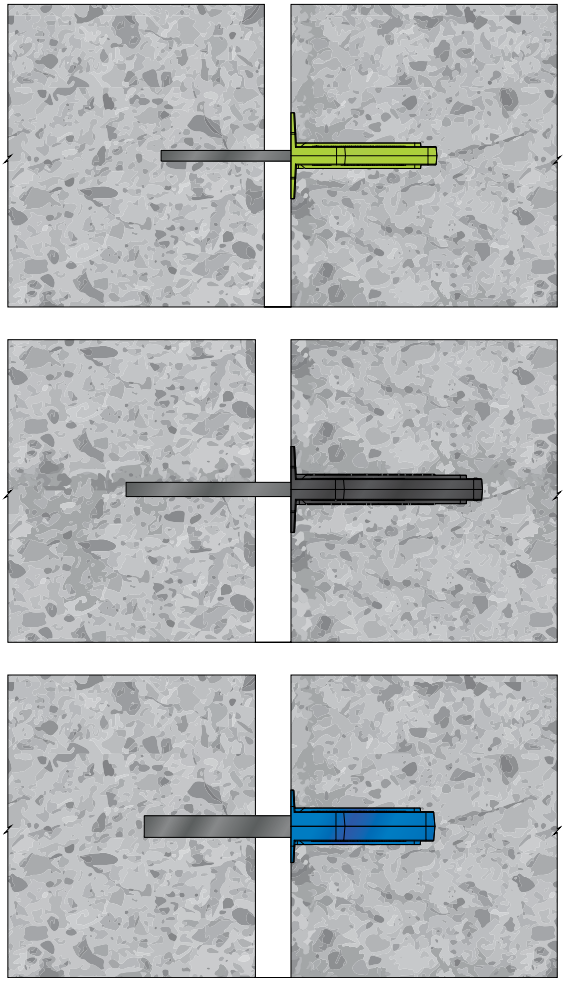
TERADOWEL

Load Transfer System

Load Transfer System for Contraction Free Movement Joints in Concrete Floors

System benefits

- Dowels manufactured from high strength carbon structural steel.
- Combined with rigid high density thin wall plastic release sleeves.
- Optimized shape of dowels for maximal bearing, bending and punching shear resistance.
- Allows all directional movement in the horizontal slab plane, minimizes vertical deflection of the slab edges.
- Easy and fast installation.



A range of efficient plate dowel load transfer systems for contraction free movement joints designed for use with traditional methods of formed joint construction with timber formwork (construction joint). Available in Plain Steel, Electro Zinc Plated or Hot Dip Galvanized finish, for use in interior and exterior applications.

A highly economical system with class leading load transfer capabilities. It eliminates completely the risk of slab interlock, as often seen with conventional bar dowel load transfer system applications.

TERADOWEL is recommended to be used for joint openings up to 20 mm wide, and are suitable for construction of all types of ground level floor slabs such as jointed or jointless, ground bearing and pile supported concrete floors.

Contents

1. Product Properties

TERADOWEL is a discontinuous plate dowel load transfer system, dedicated to provide load transfer during the construction of formed free movement contraction joints. The system comprising of discrete steel plate dowel and plastic release sleeves. The sleeve contains nails for fixing to the timber formwork, and the dowel slot is covered by tape to prevent cement paste entering during pouring of the concrete. The inner bracings in the sleeve prevent deformation or collapse of the horizontal sleeve walls caused by the concrete pressure in deep slabs, and allow problem free inserting of the dowel into the sleeve after formwork stripping.

A focus has been taken, during the design of the systems, on the dowel shape optimization, in order to minimize significant cross section reduction at higher joint openings, and to optimize bearing surface. In addition, to ensure high bending resistance, the use of high strength carbon steel in three different thicknesses has been adopted, to minimize capacity loss at wide joint openings.

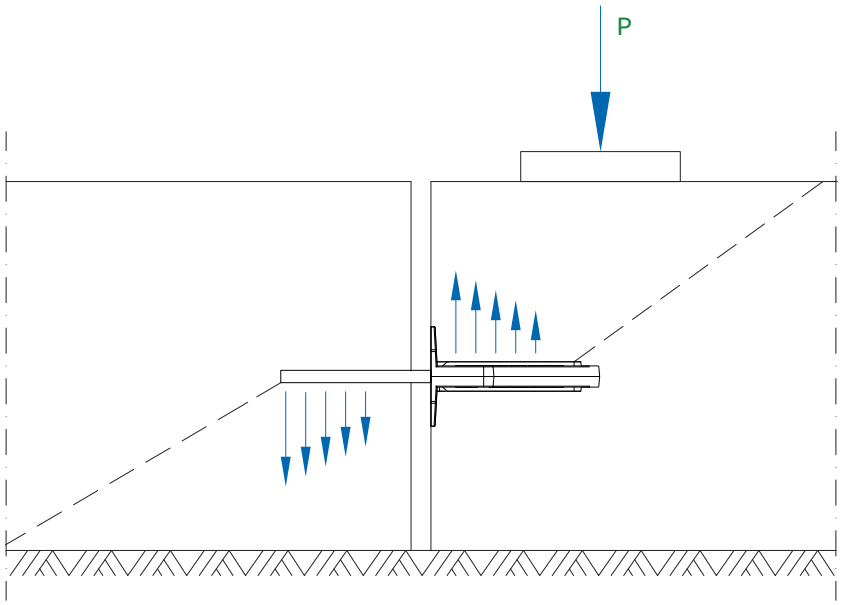
TERADOWEL load transfer system is integrated into all Peikko prefabricated free movement joints.

When used separately, TERA Sleeves are installed into position on the timber formwork at a specified distance apart, at a height of half of the slab depth, before the formwork is installed and the slab is cast. The slab containing the sleeves is poured, and after the concrete has hardened sufficiently, the timber formwork is stripped. TERADOWELs are then inserted to the slots of the cast in sleeves, and the second pour is performed.

TERADOWEL permit the free slab movements, caused by drying shrinkage and thermal variations in both longitudinal and perpendicular directions of the slab plane, thereby eliminating the principle cause of shrinkage cracks at the joint, and minimizing vertical displacement of the slabs. The sleeves permit 10 mm longitudinal movement of the dowels in either direction.

The limiting factor of load transfer in most cases, is the punching shear resistance of the concrete, these resistances can be found in section 2. It is recommended that no more than 50% of the applied load should be transferred by the load transfer system, the slab itself should be designed to carry the rest of the load.

Figure 1. Load Transfer



1.1 Materials and Dimensions

1.1.1 Materials

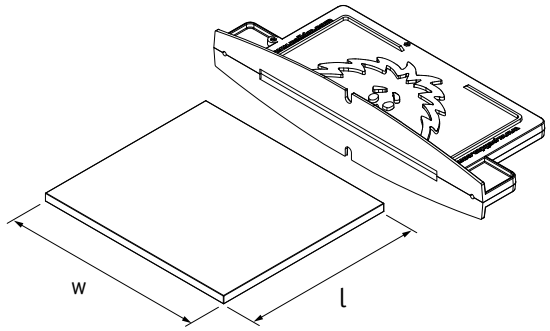
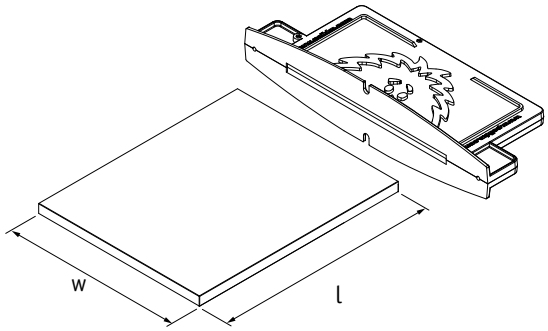
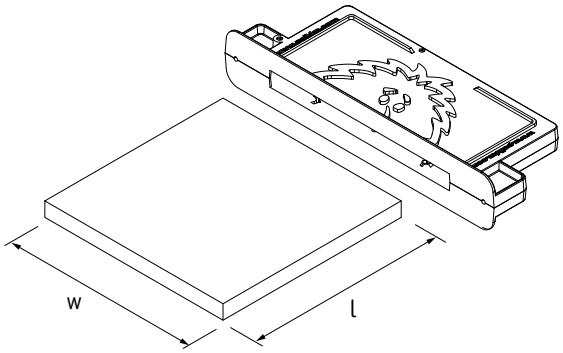
Table 1. Materials of TERADOWEL.

Dowels		Sleeves	
Version	Material	Version	Material
TERADOWEL Rectangular TJD-R6	S355J2+N	TERA Sleeve Rectangular TJS-R6	ABS, Green
TERADOWEL Rectangular TJD-R6 EZP	S355J2+N EZP	TERA Sleeve Rectangular TJS-R6	ABS, Green
TERADOWEL Rectangular TJD-R8	S355J2+N	TERA Sleeve Rectangular TJS-R8	ABS, Black
TERADOWEL Rectangular TJD-R8 EZP	S355J2+N EZP	TERA Sleeve Rectangular TJS-R8	ABS, Black
TERADOWEL Rectangular TJD-R12	S355J2+N	TERA Sleeve Rectangular TJS-R12	ABS, Blue
TERADOWEL Rectangular TJD-R12 EZP	S355J2+N EZP	TERA Sleeve Rectangular TJS-R12	ABS, Blue

EZP = galvanized.

1.1.2 Dimensions

Table 2. Dimensions [mm] of TERADOWEL

	Dowel Type	TERADOWEL Rectangular TJD-R6
	Thickness	6 mm
	Dimensions w x l	150 mm x 135 mm
	Sleeve Colour	Green
	Advisable Joint Opening	0~15 mm
	Dowel Type	TERADOWEL Rectangular TJD-R8
	Thickness	8 mm
	Dimensions w x l	145 mm x 175 mm
	Sleeve Colour	Black
	Advisable Joint Opening	15~20 mm
	Dowel Type	TERADOWEL Rectangular TJD-R12
	Thickness	12 mm
	Dimensions w x l	150 mm x 150 mm
	Sleeve Colour	Blue
	Advisable Joint Opening	15~20 mm

2. Resistances

Resistances of the TERADOWEL are determined according to UK Concrete Society TR34.4 published August 2013. All calculated design resistances are for single plate dowels.

Table 3. Design resistances of dowels in shear and bearing / bending [kN] according TR34.4 for C32/40.

Dowel Type	Joint Opening x	Shear Psh	P Max Plate
TJD-R6	15 mm	150,1	42,8
TJD-R8	20 mm	193,4	55,4
TJD-R12	20 mm	300,1	107,0

Table 4. Design punching shear resistance [kN] of TJD-R6 according TR34.4 for 15 mm joint.

Slab Thickness	Punching Pp C25/30	Punching Pp C28/35	Punching Pp C30/37	Punching Pp C32/40	Punching Pp C35/45
100 mm	12,8	13,6	14,0	14,5	15,2
150 mm	20,3	21,5	22,3	23,0	24,0
200 mm	29,2	30,9	31,9	33,0	34,5
250 mm	39,3	41,6	43,1	44,5	46,5

Table 5. Design punching shear resistance [kN] of TJD-R8 according TR34.4 for 20 mm joint opening.

Slab Thickness	Punching Pp C25/30	Punching Pp C28/35	Punching Pp C30/37	Punching Pp C32/40	Punching Pp C35/45
150 mm	20,9	22,1	22,9	23,6	24,7
200 mm	29,8	31,6	32,7	33,8	35,3
250 mm	40,1	42,4	43,9	45,4	47,5

Table 6. Design punching shear resistance [kN] of TJD-R12 according TR34.4 for 20 mm joint opening.

Slab Thickness	Punching Pp C25/30	Punching Pp C28/35	Punching Pp C30/37	Punching Pp C32/40	Punching Pp C35/45
150 mm	20,1	21,3	22,0	22,7	23,8
200 mm	28,9	30,6	31,6	32,7	34,2
250 mm	39,0	41,3	42,7	44,2	46,2

The punching shear resistances are calculated for plain concrete without any kind of additional reinforcement, and according to TR34.4, should also be used for steel and macro-synthetic fiber reinforced concrete.

If resistances for other joint openings or concrete grades are needed, please contact Peikko Technical Support.

TERADOWEL is selected according to following criteria:

- **Designed joint openings**. For joint openings of up to 15 mm wide, we recommend TERADOWEL TJD-R6. For joint openings from 15 to 20 mm wide TERADOWEL TJD-R8 is recommended. Whereas for pile supported slabs, we would only recommend the use of TERADOWEL TJD-R12.
- **Dowel spacing c/c.** The center to center dowel spacing should be as determined by the structural engineer for specific load conditions. For general conditions is recommended to use 500 ~ 600 mm spacing. Spacing can be reduced if necessary, but it is not recommended to use smaller spacing than listed in table 6, otherwise punching shear resistance of the dowels may be reduced.

Table 7. Minimal recommended dowel centre to centre spacing [mm].

Slab Depth [mm]	100 mm	150 mm	200 mm	250 mm	300 mm	350 mm	400 mm
Minimal dowel c/c spacing [mm]	300 mm	375 mm	450 mm	525 mm	600 mm	675 mm	750 mm

- **Environment.** For internal floors we would suggest the basic plain steel dowels. For external applications and where corrosion resistance is required, it is recommended to use EZP (Electro Zinc Plated) or HDG (Hot Dipped Galvanised) dowels.
- **20 mm designed joint opening.** This refers generally to 50 x 50 m slab size limiting dimensions of jointed floors, and a 35 x 35 m of jointless floors. A wider joint opening is possible, but resistances have to be reduced accordingly. The UDR8 dowel works reliably up to joint openings of 30 mm wide, however it is not recommended to use such wide joint openings with non-armored formed joints.
- **Joint aspect ratio**. Individual slabs should ideally have an aspect ratio of 1:1, this may not always be possible, but the ratio should never exceed 1:1.5.

A further recommendation is to assist prevention of restraint, by separation of the fixed elements from the slab, with the use of flexible compressible foam filler, with a thickness of at least 20 mm, also by avoiding re-entrant corners and avoiding point loads at joints.

Installing TERADOWEL:

1. Mark a horizontal line on the formwork at the level of half slab thickness (h/2) and mark the required centre to centre spacing of the sleeves along this line.

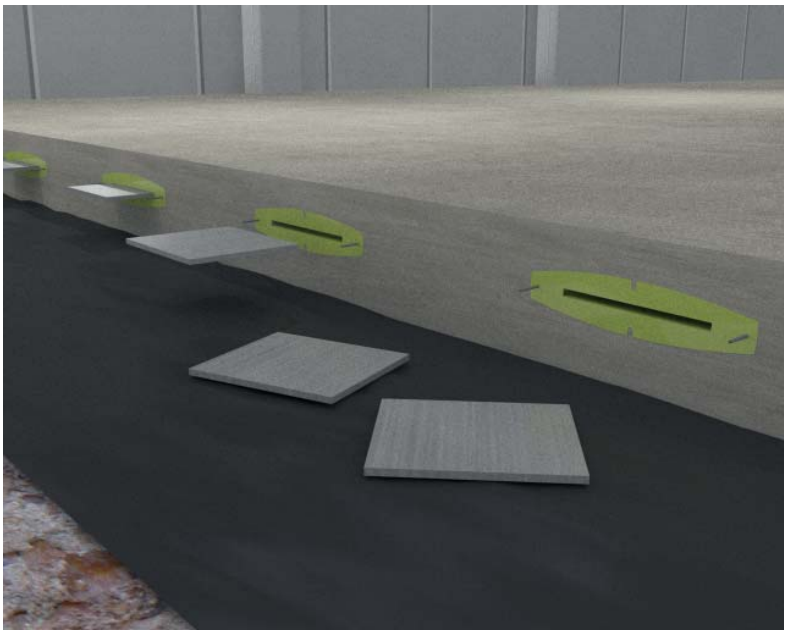
2. Nail the sleeves firmly through the nail holes at the marked locations on the formwork.

3. Pour concrete as normal around dowel sleeves paying particular attention to the fill around the sleeves. All plate type dowels require adequate compaction with a Poker Vibrator around them, to eliminate the possibility of air entrapment below the sleeve.

4. After concrete has hardened adequately and the formwork removed, the nails should be flattened and the dowels inserted into the sleeve pockets. The dowels should be inserted fully into the sleeves. The second slab can be then be poured, against the face of the first, and the exposed portion of the steel dowels.

Install the sleeves to the formwork.

Insert the dowels to the sleeves.



PEIKKO GROUP CORPORATION

Peikko Group Corporation is a leading global supplier of concrete connections and composite structures. Peikko's innovative solutions make the customers' building process faster, easier and more reliable. Peikko has subsidiaries in over 30 countries in Asia-Pacific, Europe, the Middle East, and North America, with manufacturing operations in 10 countries. Our aim is to serve our customers locally with leading solutions in the field in terms of quality, safety, and innovation.

Peikko is a family-owned and run company with over 1000 professionals. Peikko was founded in 1965 and is headquartered in Lahti, Finland.

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