TECHNICAL MANUAL

TERAJOINT® Free Movement Joint

Robust Free Movement Joint System

Version: APAC 12/2018

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TERAJOINT® Free Movement Joint

Robust Free Movement Joint System

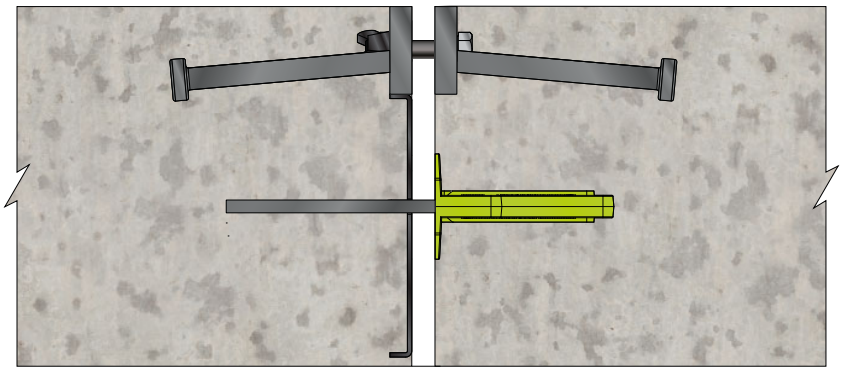
- Prefabricated leave-in-place free movement joint system with a variety of integral
- load transfer mechanisms to suit all floor loadings
- Heavy Duty performance with 40 mm x 10 mm cold drawn steel for extreme armouring of joint arrises.
- Suitable for the high flatness category floor and superflat floor construction.
- Fast track installation with a selection of fixing methods and accessories.
- All materials used in the construction of this product are 100% recyclable.

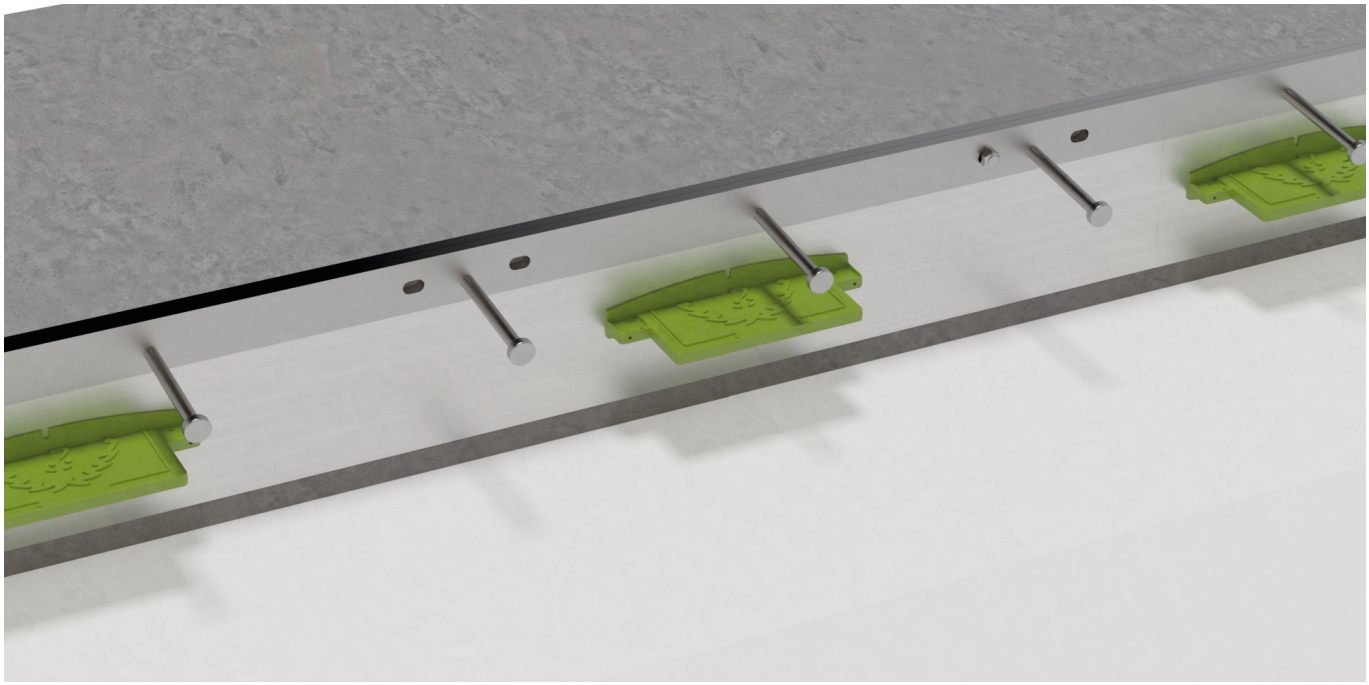
TERAJOINT® is the industry standard in the range of prefabricated heavy duty movement joint systems, suitable for all large area construction methods for ground bearing and pile supported concrete floors. The cold drawn steel rails provide extremely durable protection to the slab arrises, making it ideal for floors in a heavy duty traffic environment.

The system ensures reliable load transfer in formed free movement joints with openings of up to 20 mm wide, and suitable for slab depths from 100 mm to 300 mm.

Available in Plain Steel, Hot Dip Galvanized finish or Stainless-Steel versions, which means that the TERAJOINT® system offers a solution for all operational environments.

The TERAJOINT® system range includes a selection of prefabricated intersections, including “T” sections, “X” sections and rounded sections.





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About TERAJOINT® Free Movement Joint

1. Product Properties

TERAJOINT® is a prefabricated leave in place joint system designed to construct formed contraction free movement joints, consisting of heavy duty arris armouring, permanent formwork, and a load transfer system. The arris armouring is provided by 10x40 mm cold drawn steel profiles, which are connected by yieldable plastic bolts. The profiles are anchored into the slab by means of a number of 10 x 100 mm welded shear connectors, and one of the profiles is welded onto the steel divider plate, which has the load transfer system positioned and attached to it.

TERAJOINT® are installed into position on the sub base by a variety of methods, at the correct height, before the slab is cast. Once the concrete is placed, the shrinkage forces generated by the drying concrete slabs, during the cure process, shears the plastic bolts connecting the two steel profiles together, which cause the joint to open.

TERAJOINT® permits the minor free slab movements, caused by drying shrinkage and thermal variations in both longitudinal and perpendicular directions of the slab plane as required. TERAJOINT® transfers vertical loads between adjacent slabs and minimize vertical displacement of the slabs. The load transfer system utilizes high strength steel discrete plate dowels, moving within rigid plastic release sleeves. TERAJOINT® can be supplied with three different types of plate dowel systems, TDR-6, TDR-8 and TDR-12 for contraction free movement joints. 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.

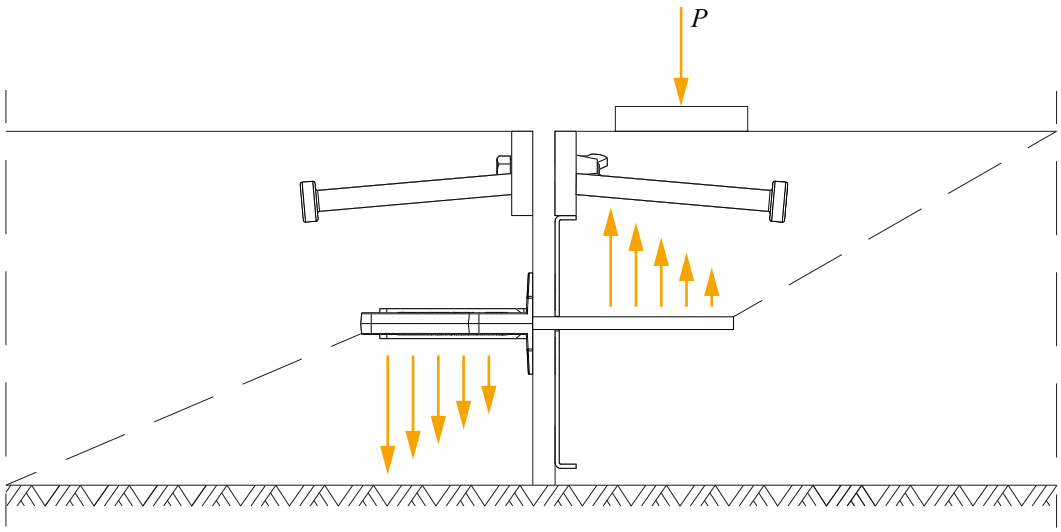
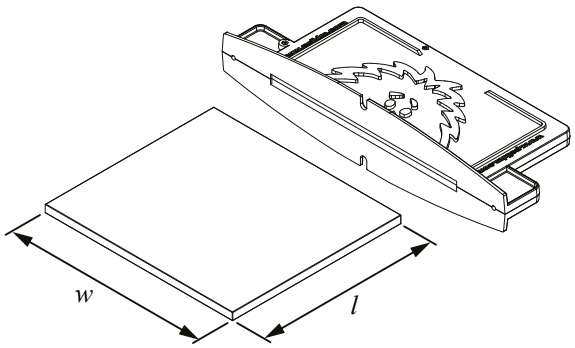
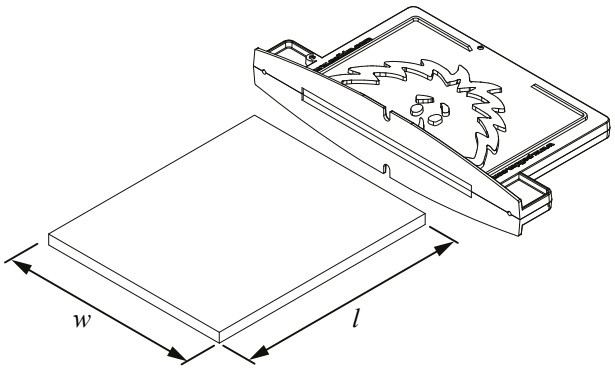


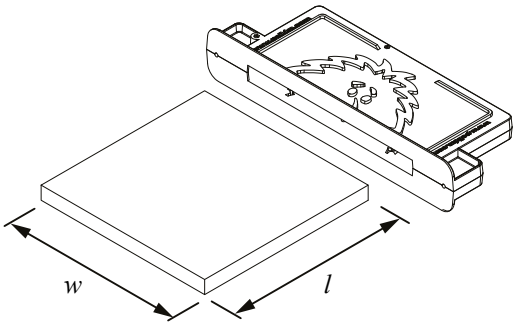
Table 1. TERAJOINT® Dowel Types.



Dowel Type	TERADOWEL Rectangular 6 mm TDR-6
Thickness	6 mm
Dimensions $w \times l$	150 mm x 135 mm
Sleeve Color	Green
Adjustable Joint Opening	0 ~ 15 mm



Dowel Type	TERADOWEL Rectangular 6 mm TDR-8
Thickness	8 mm
Dimensions $w \times l$	145 mm x 175 mm
Sleeve Color	Gray
Adjustable Joint Opening	15 ~ 20 mm



Dowel Type	TERADOWEL Rectangular 6 mm TDR-12
Thickness	12 mm
Dimensions $w \times l$	150 mm x 150 mm
Sleeve Color	Blue
Adjustable Joint Opening	15 ~ 20 mm

1.1 Materials and Dimensions

1.1.1 Materials

Table 2. Materials and standards of TERAJOINT® TJ6 RD.

Version	Top Rails + Anchors	Divider Plate	Plate Dowels	Shear Connectors	Sleeves
TERAJOINT®	S235JRC + C	DC01	Q345	S235J2 + C450	ABS, Green
TERAJOINT® HDG	S235JRC + C HDG	DC01 HDG	Q345 HDG	S235J2 + C450 HDG	ABS, Green
TERAJOINT® Stainless	1.4301	DC01 HDG	Q345 HDG	S235J2 + C450	ABS, Green
TERAJOINT® Acid Proof	1.4401	1.4401	1.4401	1.4301	ABS, Green
HDG = Hot dip galvanized. Standard for black steel EN 10025 and EN 10088 for stainless.					

Table 3. Materials and standards of TERAJOINT® TJ8 RD.

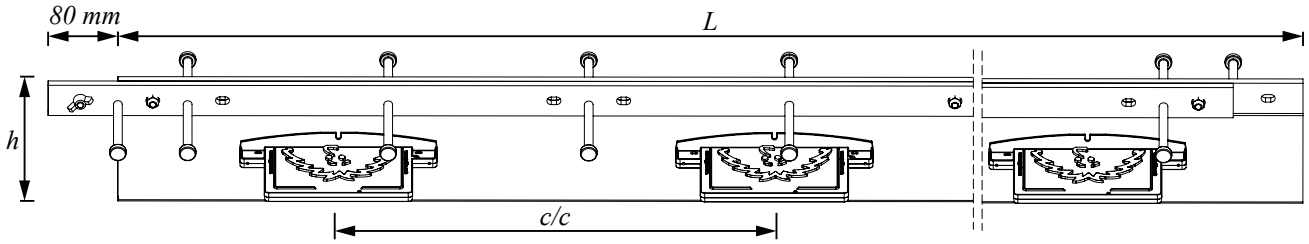
Version	Top Rails + Anchors	Divider Plate	Plate Dowels	Shear Connectors	Sleeves
TERAJOINT®	S235JRC + C	DC01	Q345	S235J2 + C450	ABS, Gray
TERAJOINT® HDG	S235JRC + C HDG	DC01 HDG	Q345 HDG	S235J2 + C450 HDG	ABS, Gray
TERAJOINT® Stainless	1.4301	DC01 HDG	Q345 HDG	S235J2 + C450	ABS, Gray
TERAJOINT® Acid Proof	1.4401	1.4401	1.4401	1.4301	ABS, Gray
HDG = Hot dip galvanized. Standard for black steel EN 10025 and EN 10088 for stainless.					

Table 4. Materials and standards of TERAJOINT® TJ12 RD.

Version	Top Rails + Anchors	Divider Plate	Plate Dowels	Shear Connectors	Sleeves
TERAJOINT®	S235JRC + C	DC01	Q345	S235J2 + C450	ABS, Blue
TERAJOINT® HDG	S235JRC + C HDG	DC01 HDG	Q345 HDG	S235J2 + C450 HDG	ABS, Blue
TERAJOINT® Stainless	1.4301	DC01 HDG	Q345 HDG	S235J2 + C450	ABS, Blue
TERAJOINT® Acid Proof	1.4401	1.4401	1.4401	1.4301	ABS, Blue
HDG = Hot dip galvanized. Standard for black steel EN 10025 and EN 10088 for stainless.					

1.1.2 Dimensions

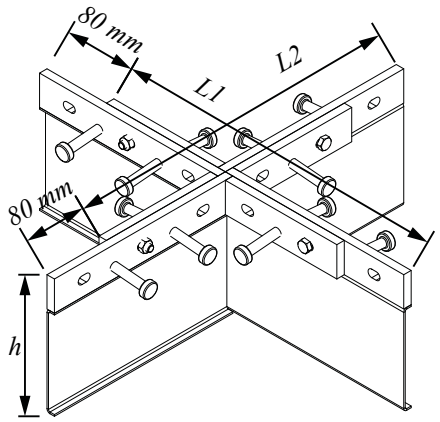
Table 5. Dimensions [mm] of TERAJOINT TJ6 RD, TJ8 RD and TJ12 RD.



Type	Height *h*	Dowel Type	Dowel Centers *c/c*	Length *L*	Weight [kg]	Adjustable Slab Depth *	Sleeve Color
TJ6-90-3000 RD	90 mm	TDR-6	500 mm	3000 mm	29.4	100 ~ 120 mm	Green
TJ6-115-3000 RD	115 mm				30.5	125 ~ 145 mm	
TJ6-135-3000 RD	135 mm				31.5	145 ~ 155 mm	
TJ6-145-3000 RD	145 mm				32.2	155 ~ 170 mm	
TJ6-160-3000 RD	160 mm				32.6	170 ~ 195 mm	
TJ6-185-3000 RD	185 mm				33.8	195 ~ 225 mm	
TJ6-215-3000 RD	215 mm				35.2	225 ~ 250 mm	
TJ6-230-3000 RD	230 mm				35.9	245 ~ 270 mm	
TJ6-245-3000 RD	245 mm				36.6	260 ~ 300 mm	
TJ8-135-3000 RD	135 mm	TDR-8	500 mm	3000 mm	36.1	145 ~ 170 mm	Gray
TJ8-145-3000 RD	145 mm				36.3	150 ~ 170 mm	
TJ8-160-3000 RD	160 mm				37.2	170 ~ 195 mm	
TJ8-185-3000 RD	185 mm				38.4	195 ~ 225 mm	
TJ8-215-3000 RD	215 mm				39.8	225 ~ 250 mm	
TJ8-230-3000 RD	230 mm				40.5	245 ~ 270 mm	
TJ8-245-3000 RD	245 mm				41.2	260 ~ 300 mm	
TJ12-135-3000 RD	135 mm	TDR-12	500 mm	3000 mm	37.7	145 ~ 170 mm	Blue
TJ12-145-3000 RD	145 mm				38.1	155 ~ 170 mm	
TJ12-160-3000 RD	160 mm				38.9	170 ~ 195 mm	
TJ12-185-3000 RD	185 mm				40.1	195 ~ 225 mm	
TJ12-215-3000 RD	215 mm				41.5	225 ~ 250 mm	
TJ12-230-3000 RD	230 mm				42.1	245 ~ 270 mm	
TJ12-245-3000 RD	245 mm				42.9	260 ~ 300 mm	

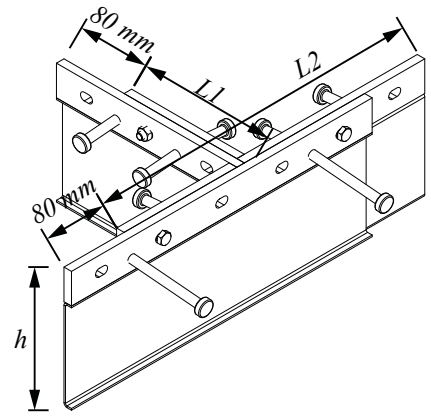
If the height requirements are different from those indicated in *Table 5*. Peikko technical support will design TERAJOINT® with a custom height for clients.

Table 6. Dimensions [mm] of TERAJOINT® X-Junction.



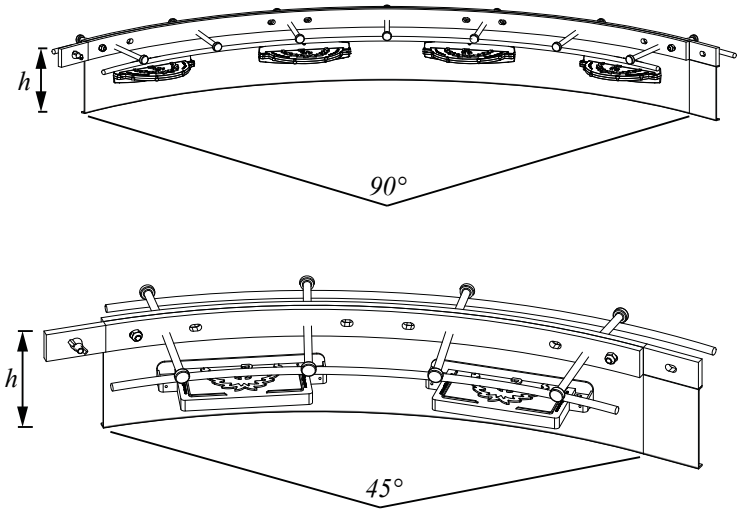
Type	Height *h*	Width *L1*	Width *L2*	Weight [kg]
TJX-90	90 mm	400 mm	400 mm	6.3
TJX-115	115 mm			6.7
TJX-135	135 mm			7.0
TJX-145	145 mm			7.2
TJX-160	160 mm			7.4
TJX-185	185 mm			7.8
TJX-215	215 mm			8.2
TJX-230	230 mm			8.5
TJX-245	245 mm			8.7

Table 7. Dimensions [mm] of TERAJOINT® T-Junction.



Type	Height *h*	Width *L1*	Width *L2*	Weight [kg]
TJT-90	90 mm	160 mm	400 mm	4.9
TJT-115	115 mm			5.3
TJT-135	135 mm			5.6
TJT-145	145 mm			5.8
TJT-160	160 mm			5.9
TJT-185	185 mm			6.3
TJT-215	215 mm			6.7
TJT-230	230 mm			6.9
TJT-245	245 mm			7.1

Table 8. Dimensions [mm] of TERAJOINT® R-Section.



Type	Angle	Radius
TJR6-90 RD	45°, 90°	600 mm, 900 mm or more
TJR6-115 RD		
TJR6-135 RD		
TJR6-145 RD		
TJR6-160 RD		
TJR6-185 RD		
TJR6-215 RD		
TJR6-230 RD		
TJR6-245 RD		
TJR8-135 RD		
TJR8-145 RD		
TJR8-160 RD		
TJR8-185 RD		
TJR8-215 RD		
TJR8-230 RD		
TJR8-245 RD		
TJR12-135 RD		
TJR12-145 RD		
TJR12-160 RD		
TJR12-185 RD		
TJR12-215 RD		
TJR12-230 RD		
TJR12-245 RD		

TERAJOINT® rounded sections are available also in different angles and radii. Peikko technical support will design TERAJOINT® rounded sections according project requirements.

2. Resistances

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

Table 9. 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
TDR-6	15 mm	150.1	42.8
TDR-8	20 mm	193.4	55.4
TDR-12	20 mm	300.1	107.0

Table 10. Design punching shear resistance [kN] of TDR-6 according TR34.4 for 15 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
100 mm	11.2	11.8	12.2	12.6	13.2
150 mm	17.3	18.3	19.0	19.6	20.5
200 mm	24.5	25.9	26.8	27.7	29.0
250 mm	32.7	34.6	35.8	37.0	38.7

Table 11. Design punching shear resistance [kN] of TDR-8 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	17.9	18.9	19.6	20.2	21.2
200 mm	25.2	26.6	27.6	28.5	29.8
250 mm	33.5	35.4	36.7	37.9	39.6

Table 12. Design punching shear resistance [kN] of TDR-12 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	17.1	18.1	18.7	19.3	20.2
200 mm	24.2	25.6	26.5	27.4	28.6
250 mm	32.4	34.3	35.5	36.6	38.3

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

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

Selecting TERAJOINT® Free Movement Joint

TERAJOINT® is selected according to following criteria:

- **Slab depth.** It is recommended that the joint depth is at least 10 mm shallower than the slab depth. Advisable slab depths are stated in *Table 5*.
- **Designed joint opening.** For joint openings of up to 15 mm wide, we recommend TERAJOINT® TJ6 RD. For joint openings from 15 to 20 mm wide TERAJOINT® TJ8 RD is recommended. Whereas for pile supported slabs, we would only recommend the use of TERAJOINT® TJ12 RD.
- **Environment.** For internal floors we would suggest the basic steel plain TERAJOINT® version. When corrosion resistance is required, TERAJOINT® HDG (Hot Dipped Galvanised) version is recommended, and for a more aggressive external environment or high hygienic requirement, TERAJOINT® in Stainless Steel is recommended. For an extremely corrosive environment such as coastal salty or acidic, TERAJOINT® Acid Proof is recommended, this is manufactured from a high corrosion resistance grade of Stainless Steel (1.4401).
- **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 must be reduced accordingly, however, this is not practical due to the increase of dynamical impact during joint transition. If there is a design requirement for wider joint openings, Peikko can offer suitable solution from its extensive flooring product range.
- **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.
- **Use of TERAJOINT® rounded sections.** These are recommended to avoid sharp corners in the floor slab where cracking would normally be expected.

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 TERAJOINT® Free Movement Joint

Installation tolerances

Joints should be installed as precisely vertical as possible and checked with a spirit level to ensure proper function of the dowels during slab movement. The levelness and straightness of the joint installation should be according to the relevant requirements of the floor slab design, and again checked using a standard laser level device or optical sight level.

Installation

Step 1. Sub-base level

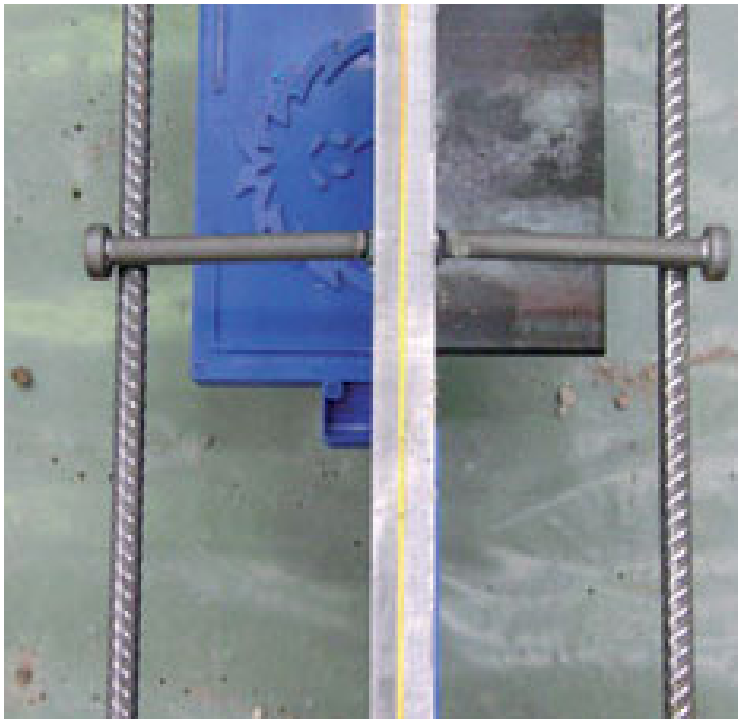
The sub-base must be made as accurate and level as possible to the requirements on the slab drawing. The tolerance of the level must be considered when ordering joints. Typically, the Joint height will be 10 mm to 35 mm less than the slab depth.

Step 2. Joint location

The required layout, position and height of the joints will be specified on the floor slab drawing which must be followed closely. String lines are placed to identify the position of joints according to the slab layout dimensioned drawings.

Step 3. Joint Installation

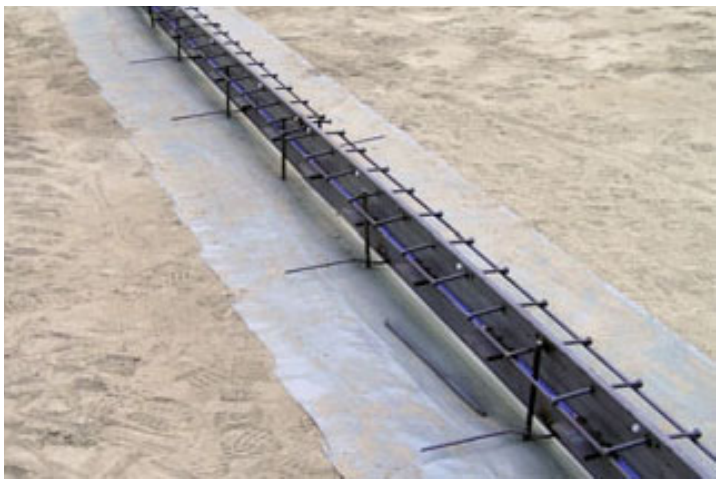
1. Joints are placed sequentially away from junction pieces or from vertical column/wall.
   a. If Junction pieces are used the first joint is connected to the junction piece at the overlap section using a dowel bush, plastic bolt and steel nut.
   b. If junction pieces are not used the first joint is placed adjacent to column or wall allowing for isolation material, the connection overlap is cut away.
2. The joints are placed in the correct position according to the string line, and the height is adjusted. The height should be verified by laser level or similar at both ends, and the joint should be set vertical using a spirit level which can be placed across the top edges.



3. The joint can then be fixed in position using pins. Fixing pins should be 14 mm – 16 mm diameter and at least 300 mm longer than the joint height. A good practice is to use 14 x 600 mm fixing pins.

   For slabs up to 200 mm deep 4 pins per joint are required, (up to 300 mm 6 pins per joint). The pins should be spaced equally along one side of the joint, on the opposite side to the first pour.

   Alternate pins should be placed vertically and fixed approximately half-way along the length of the studs, and at an angle of approximately 30 degrees to the vertical, away from the joint and fixed at the end of the studs. This ensures excellent stability, and if it is possible to do the first pour on the opposite side to the pins, then it will allow them to be sawn through before pouring the second side reducing any resistance to joint opening. Pins should always be placed so that they finish level with the stud, and if necessary any excess pin above the level of the stud should be removed prior to pouring. Pins can be simply driven into place with a suitable impact gun or hammer.



4. Subsequent joints are aligned, fixed at the overlap using dowel bushes, plastic bolts and nuts, adjusted and fixed in the same manner. The joints should be fixed so that the ends of adjacent top strips are not touching but have a clearance gap of between 1 mm and 2 mm to allow for longitudinal movement.

5. The final joint in any run will usually require being cut to length. The gap between the column/wall and the penultimate joint is measured taking account of suitable isolation material. The final joint is cut to length and installed in the same manner as previous joints.

6. If the joint layout requires a run of joints between two junction pieces and the distance between them is not a full multiple of 3 metres, then there will need to be a cut joint in the run. Joints should be placed running from the junction pieces, to some point approximately equidistant from both when the gap is less than 3 m.

   The gap should be measured accurately between the top strips. The final joint should have a section cut from the center equal to the distance between the joints, keeping both overlap sections at the ends intact. The two pieces are then installed in the usual manner to each side of the gap and simply butt-welded together at the joint.

7. If required by the design ‘X’ or ‘T’ junctions should be placed according to the required layout and set to the correct height using a laser level or equivalent.

   The junction pieces are placed in the correct position and the height is adjusted. The height should be verified by laser level and the junction should be set horizontal using a spirit level in two perpendicular directions. The junction pieces can then be fixed in position using pins as described in section 3. ‘X’ junctions require 4 pins and ‘T’ junctions 3 pins.

8. As an alternative and if pins are not available then the joints and junction pieces can be positioned and held in place by concrete ‘dabs’. The joints and intersections must be positioned accurately and supported. The dabs should be placed at 1 m spacing along the joint lengths or at the center of the intersection pieces. Dabs should be sufficient to support the rails during pouring and levelling of the concrete ideally conical in shape and poured up to at least half the depth of the rail. Dabs should be allowed to harden sufficiently before removing support.

Step 4. Pouring concrete

Once rails are correctly positioned pouring of concrete can commence. Concrete should be poured to the level of the rails with attention to consolidation around the dowels and sleeves. All plate type dowels require close attention to filling around the dowels to eliminate the possibility of air entrapment. This should be done with a suitable vibrating poker. Both sides of joints can be poured at the same time if so required.

Technical Manual Revisions

Version: APAC 12/2018. Revision: 002

- Dowel Resistance tables updated
- Illustration updates for clarity
- Updated layout to latest branding

Version: APAC 08/2017. Revision: 001*

- New cover design for 2018 added

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