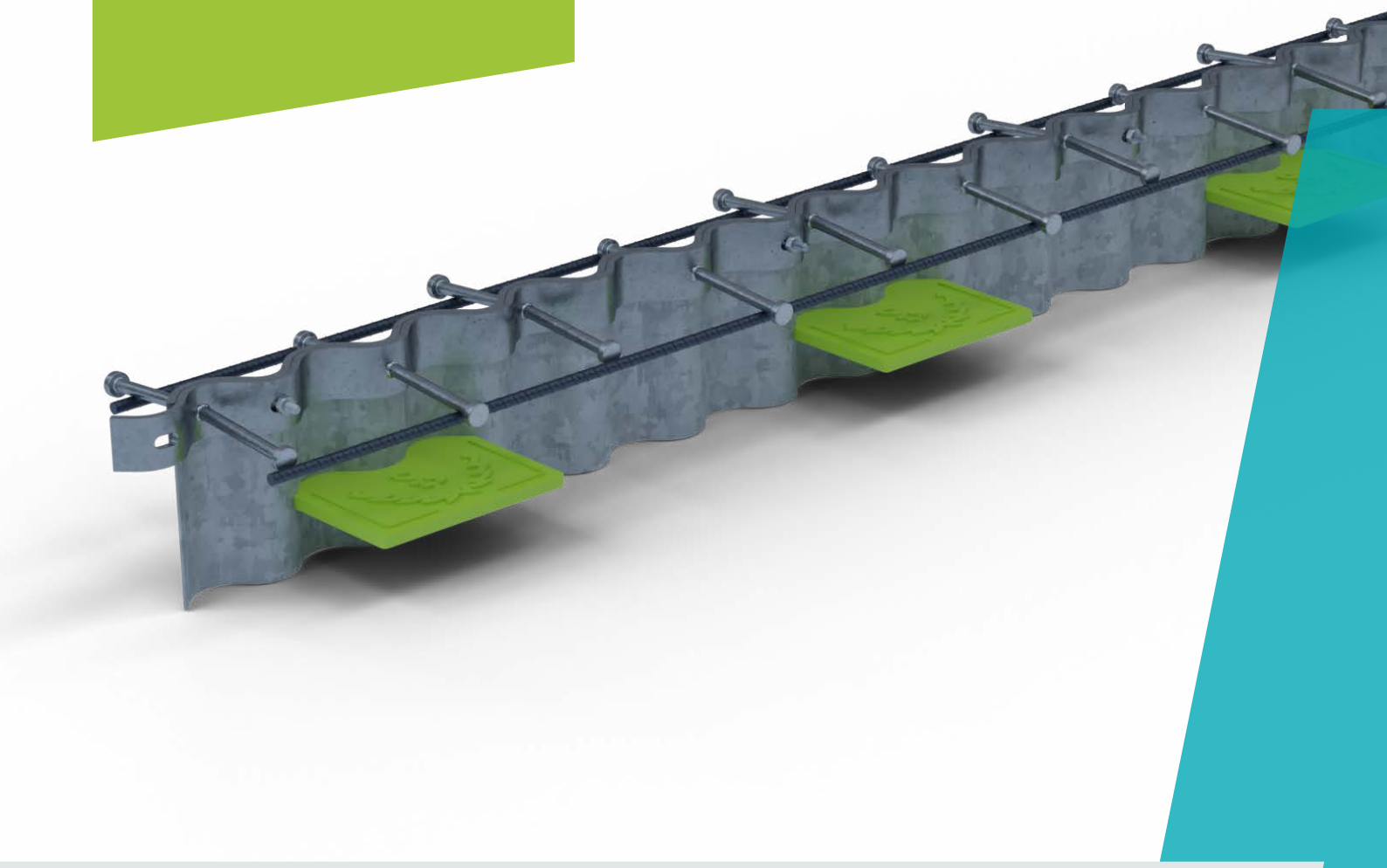
TECHNICAL MANUAL



WAWEJOINT® Free Movement Joint

Silent and Robust Free Movement Joint System

Version PEIKKO GROUP 02/2022

peikko®

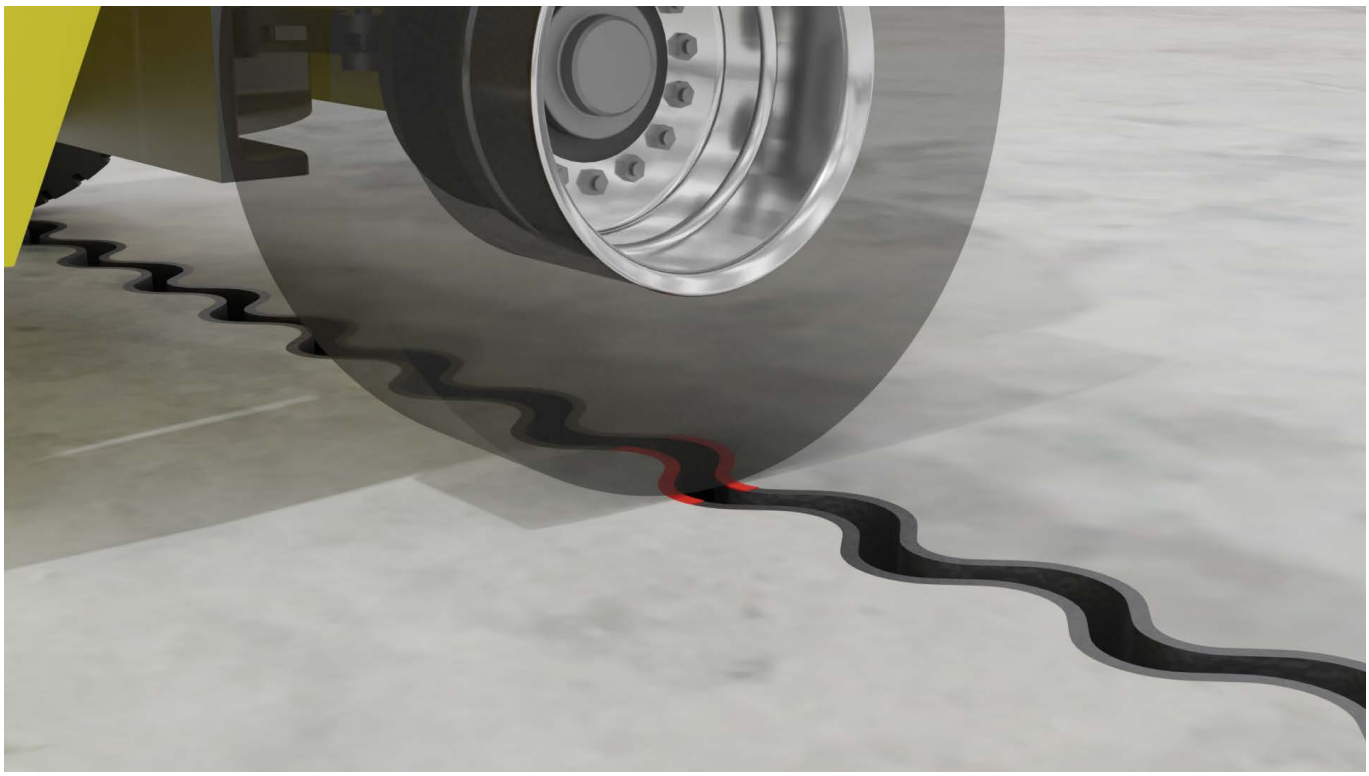
WAWEJOINT® Free Movement Joint

Silent and Robust Free Movement Joint System

- WAWEJOINT® is specially designed for smooth and silent transition across the joints
- Prefabricated leave-in-place free movement joint system with a variety of fixed load transfer mechanisms to suit all floor loadings.
- Excellent performance with 40mm x 6mm wavy steel flat bars for extreme armoring 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.
- Compatible with TERAJOINT® regarding slab thicknesses and loads.
- All materials used in this product are 100% recyclable.

WAWEJOINT® is prefabricated heavy-duty movement joint systems, suitable for all large area construction methods for ground and pile supported (or ground-bearing and pile-supported) concrete floors. The wavy steel rails provide extremely durable protection to the slab arises with silent crossing of joint, making it ideal for floors with highly intensive traffic environment.

The system ensures reliable load transfer in formed free movement joints with openings of up to 30 mm wide, and suitable for slab depths from 100 mm to 300 mm.



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About WAWEJOINT®

1. Product Properties

WAWEJOINT® is a prefabricated leave-in-place joint system designed to create (/construct) formed shrinkage free movement joints, consisting of heavy duty arris armoring, permanent formwork, and a load transfer system. WAWEJOINT® allows the wheels to roll smoothly over the joint. The arris armoring is provided by 40 × 6 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 × 100 mm welded anchors. One of the profiles is welded onto the steel divider plate, which has the dowels (load transfer system) positioned. Two rebars, one to each side, has welded to anchors provide additional stiffness to joint.

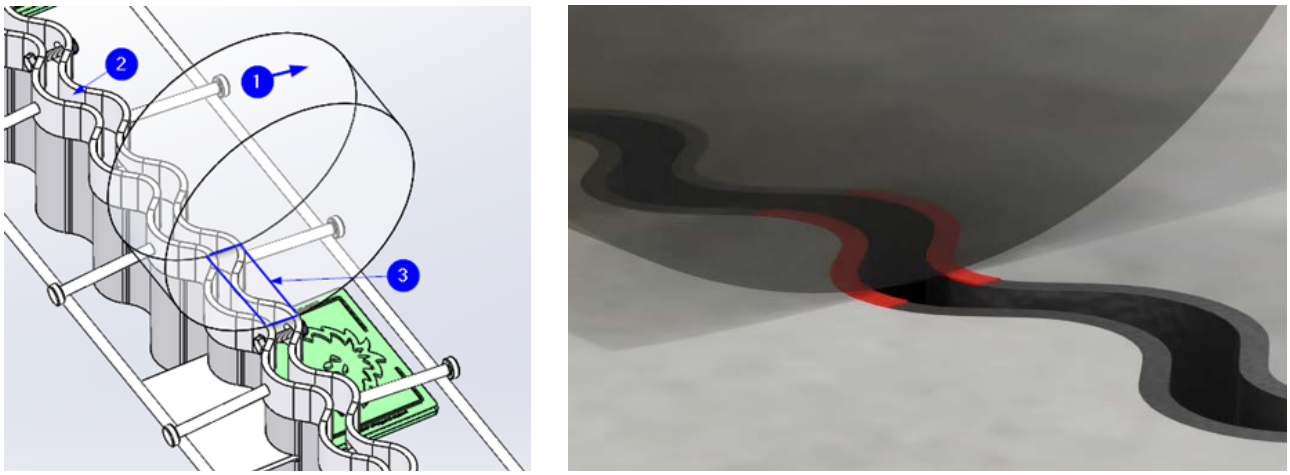


Figure 1. Example: Ø250 × 100 wheel ① is crossing WAWEJOINT®, joint opening 20 mm ②, pressure area of wheel 30 × 100 mm² ③. When crossing the WAWEJOINT®, the wheel carries on/from both sides of slab at the same time.

WAWEJOINT® can be used even in the highest floor class FM1[(1)], where very high standards of flatness and levelness are required. Floor class FM1 allows reach trucks operating at above 13 m without side-shift.
[(1)] See: TR34 Concrete Industrial Ground Floors 4th Ed. Table 3.1

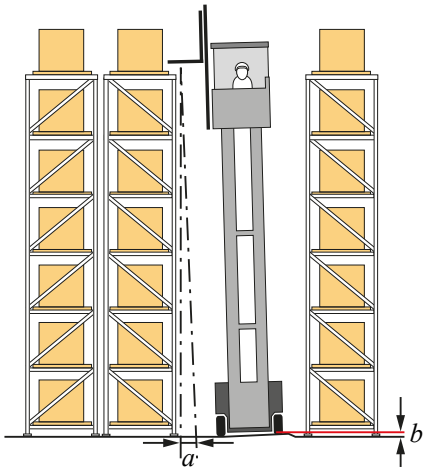


Figure 2. Static lean (a) because of variation in floor level (b).

WAWEJOINT® is installed into position on the sub-base at the correct height, before the slab is cast. Once the concrete is cast, the shrinkage forces generated by the drying concrete slabs cut the plastic bolts connecting the two steel profiles together, which causes the joint to open.

WAWEJOINT® transfers vertical loads between adjacent slabs and minimizes vertical displacement of the slabs. The load transfer system is accomplished by utilizing high strength steel discrete plate dowels, moving within rigid plastic release sleeves.

WAWEJOINT® with rectangular WDR 6 dowels is free movement joint solution for maximum 30 mm openings.

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 and the slab itself should be designed to carry the rest of the load.

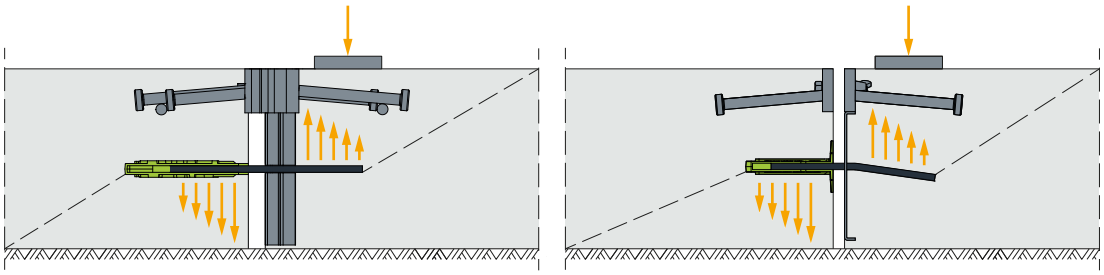
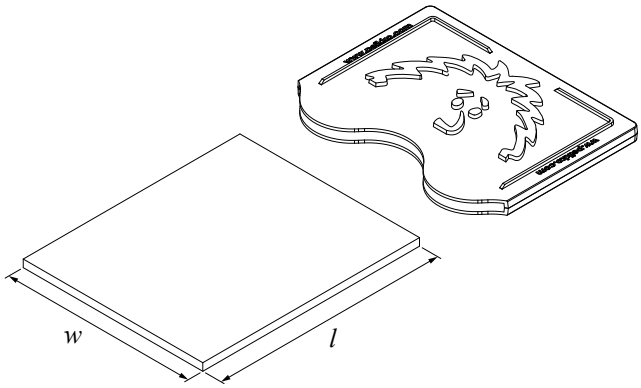


Figure 3. WAWEJOINT® and TERAJOINT® dowels have similar Load Transfer.

Table 1. WAWEJOINT® Dowel Type.



Dowel Type	WAWEDOWEL Rectangular 6 mm WDR-6
Thickness	6 mm
Dimensions $w \times l$	145 mm × 175 mm
Sleeve Color	Green
Joint Opening	0 ~ 20 mm recommended 0 ~ 30 mm maximum

1.1 Materials and Dimensions

1.1.1 Materials

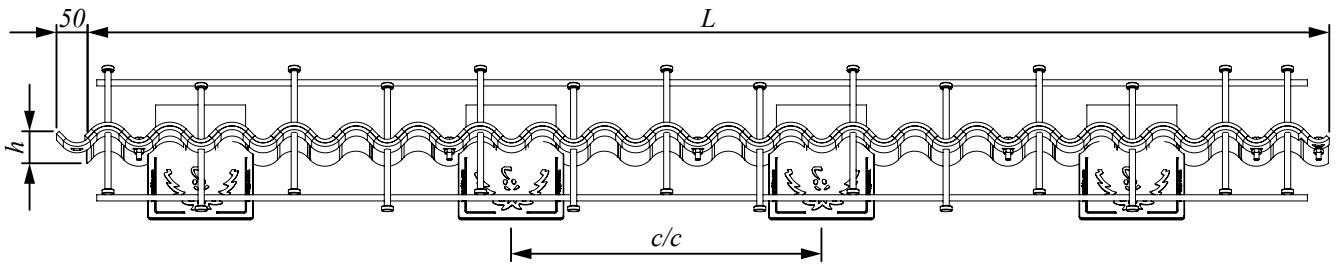
Table 2. Materials and standards of WAWEJOINT® WJ6.

Version	Top Rails	Divider Plate	Plate Dowels	Anchors	Sleeves
WAWEJOINT®	Q235B	DC01	S355J2 + N	S235J2 + C450	ABS/HDPS

WAWEJOINT® is suitable for dry internal conditions.

1.1.2 Dimensions

Table 3. Dimensions [mm] of WAWEJOINT® WJ6



Type	Height *h*	Dowel Type	Dowel Centers *c/c*	Length *L*	Weight [kg]	Slab Depth	Sleeve Color
WJ6-90-2000	90 mm	WDR-6	500 mm	2000 mm	20.3	100 ~ 120 mm	Green
WJ6-115-2000	115 mm				21.2	125 ~ 145 mm	
WJ6-135-2000	135 mm				22.0	145 ~ 170 mm	
WJ6-160-2000	160 mm				22.9	170 ~ 195 mm	
WJ6-185-2000	185 mm				23.8	195 ~ 225 mm	
WJ6-215-2000	215 mm				24.9	225 ~ 250 mm	
WJ6-230-2000	230 mm				25.4	245 ~ 270 mm	
WJ6-245-2000	245 mm				25.9	260 ~ 300 mm	

If the height requirements are different from those indicated in *Table 3*, Peikko Technical Support will design WAWEJOINT® with a custom height for clients.

1.2 Quality

Peikko Group's production units are externally controlled and periodically audited on the basis of production certifications and product approvals by various independent organizations.

2. Resistances.

Resistances of the WAWEJOINT® dowels are determined according to UK Concrete Society TR34.4 published August 2013.

Table 4. Load transfer and required verifications for single plate dowels.

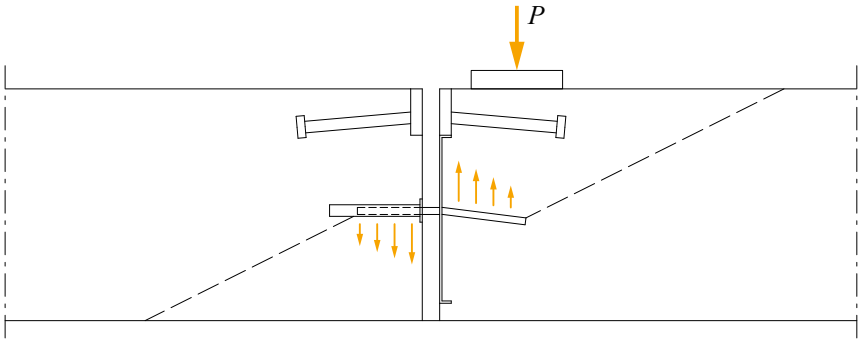
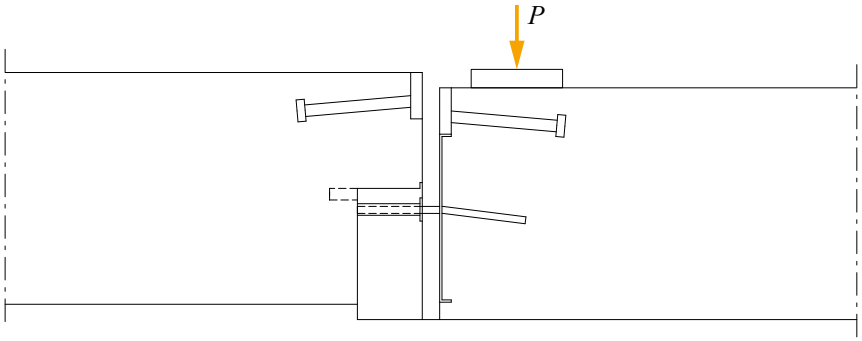
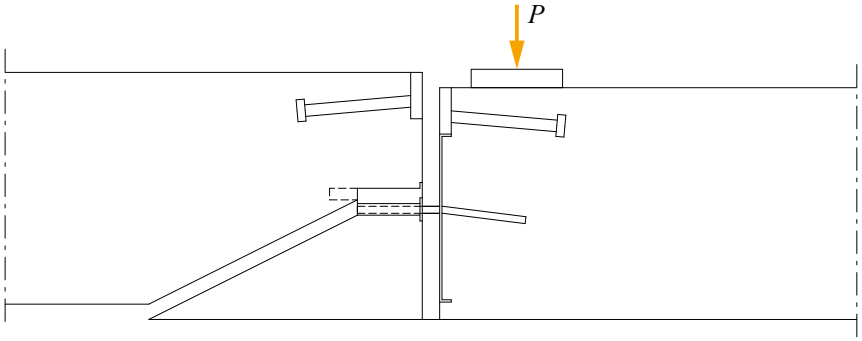
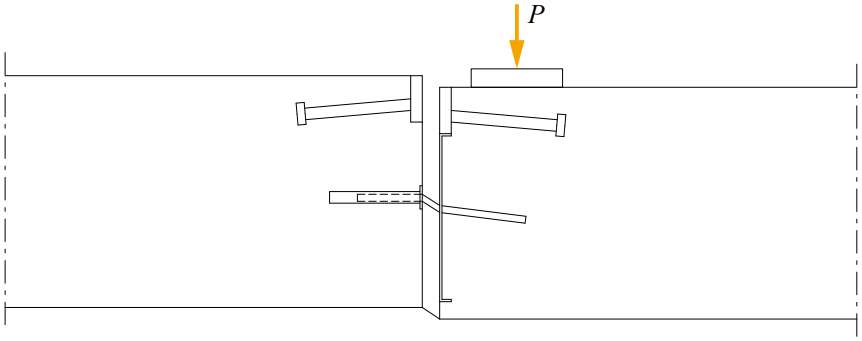
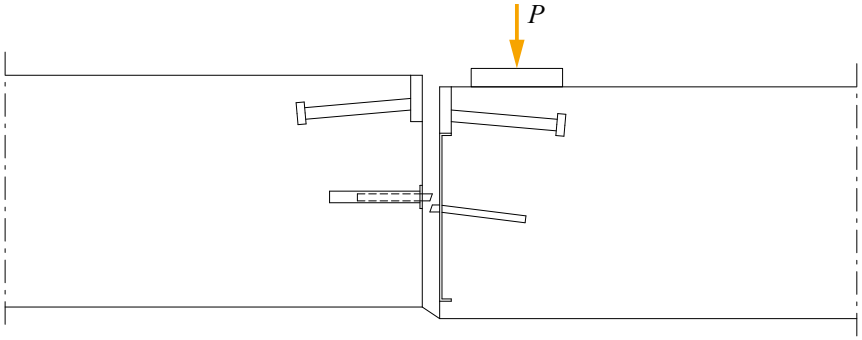
Load transfer	
Punching shear at the face of the loaded area	
Punching shear on the critical perimeter	
Bearing/bending capacity of dowel	
Shear capacity of dowel	

Table 5. Design resistance of single dowel in shear P_{sh} and bearing/bending $P_{max,plate}$ [kN] according TR34.4 for C32/40.

Dowel Type	Joint Opening x	Shear P_{sh}	$P_{max,plate}$
WDR 6	20 mm	145.0	34.0
WDR 6	30 mm	145.0	24.7

Table 6. Design resistance [kN/m] for WAWEJOINT® WJ6 according TR34.4 for 20 mm joint opening.

Slab Thickness	C25/30	C28/35	C30/37	C32/40	C35/45
100 mm	21.7	23.0	23.8	24.6	25.7
150 mm	37.8	40.0	41.4	42.8	44.7
200 mm	51.8	54.8	56.7	58.6	61.3
250 mm	65.7	66.8	67.5	68.1	68.9

Table 7. Design resistance [kN/m] for WAWEJOINT® WJ6 according TR34.4 for 30 mm joint opening.

Slab Thickness	C25/30	C28/35	C30/37	C32/40	C35/45
100 mm	21.1	22.4	23.1	23.9	25.0
150 mm	37.0	39.1	40.5	41.8	43.7
200 mm	48.3	48.8	49.1	49.3	49.7
250 mm	48.3	48.8	49.1	49.3	49.7

Design resistance [kN/m] covers all required verifications listed in *Table 4*.

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

The resistances for other joint openings, concrete grades, or slabs thicknesses can be calculated with the free web-based Peikko Designer® FLOOR JOINT online tool. The calculated resistances can be compared to the given loads.

Peikko Designer® FLOOR JOINT can be found in the Peikko Designer® main menu or from address:
https://floorjoint.peikkodesigner.com/

Selecting WAWEJOINT®

WAWEJOINT® is selected according to following criteria:

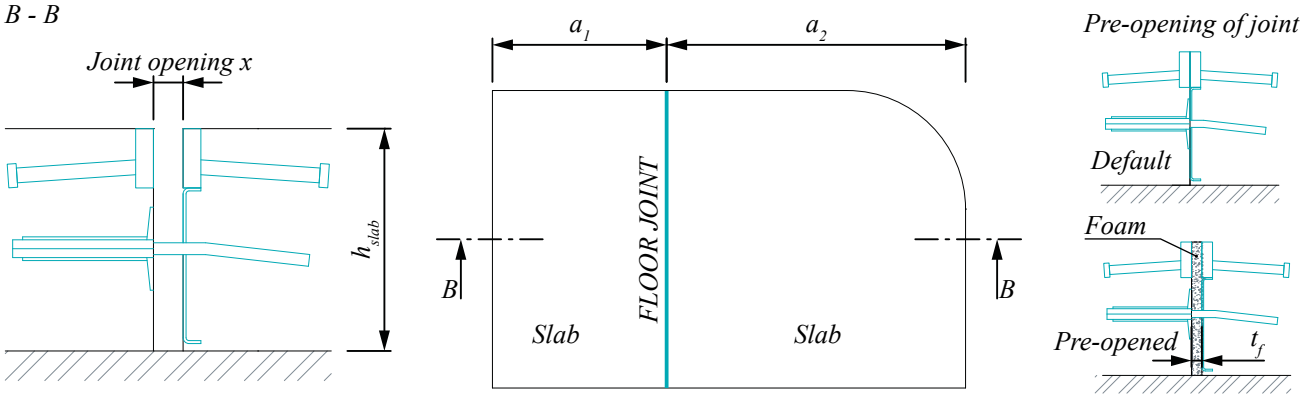
- **Slab depth.** It is recommended that the joint depth, WAWEJOINT® height, is at least 10 mm shallower than the slab depth. Advisable slab depths are stated in *Table 3*.
- **Designed joint opening.** WAWEJOINT® WJ6 is recommended for joint openings of up to 20 mm wide. Load transfer and resistances are guaranteed for joint openings of up to 30 mm wide.
- **Environment.** For internal floors, we would suggest the plain steel WAWEJOINT® version.
- **20 mm designed joint opening.** This refers generally to 50 × 50 m slab size limiting dimensions of jointed floors, and a 35 × 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 dynamic impact during joint transition. If there is a design requirement for wider joint openings, Peikko can offer a 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.

A further recommendation is to separate 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.

Annex A – WAWEJOINT® Design form

Basic dimensions

Thickness of the slab h_{slab} =		mm	
Joint opening x =		mm	(recommended value 0 ~ 20 mm, maximum allowed value 30 mm)
Pre-opening of joint: Thickness of foam t_f =		mm	(default value 0 mm, available 5/10/15 mm)
Type of Peikko flooring product =			**WAWEJOINT®** for joint opening ≤ 30 mm
Maximum length of slab A_{max} =		m	(maximum length of slab perpendicular to WAWEJOINT® connection) - maximum A_1 or A_2
Difference of temperatures of slab Δt =		°C	Example 1: +10°C to -15°C ⇨ t = -25°C Example 2: +10°C to 40°C ⇨ t = 30°C



Material options

Concrete grade of slab =			C20/25 ~ C40/50
Partial safety factor for concrete γ_c =			recommended value = 1.50
Version of WAWEJOINT® =			Standard, HDG, Stainless or Acid proof
Partial safety factor for steel γ_s =			recommended value = 1.15
Modulus of subgrade reaction k =		N/mm³	(based on soil type)

Soil type	k value [N/mm³]	
	Lower value	Upper value
Fine or slightly compacted sand	0.015	0.030
Well compacted sand	0.050	0.100
Very well compacted sand	0.100	0.150
Loam or clay (moist)	0.030	0.060
Loam or clay (dry)	0.080	0.100
Clay with sand	0.080	0.100
Crushed stone with sand	0.100	0.150
Coarse crushed stone	0.200	0.250
Well compacted crushed stone	0.200	0.300

Loads

Permanent loads

Characteristic permanent load g_k =		kN/m^2	
Partial safety factor for permanent load γ_g =			Recommended value = 1.35

Imposed loads

Characteristic imposed load q_k =		kN/m^2	
Partial safety factor for imposed load γ_q =			recommended value = 1.50

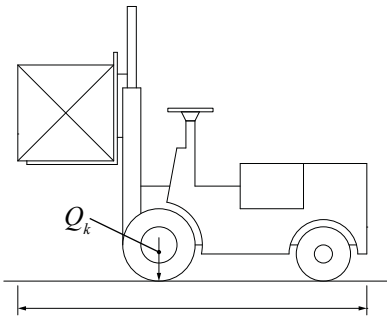
Point load

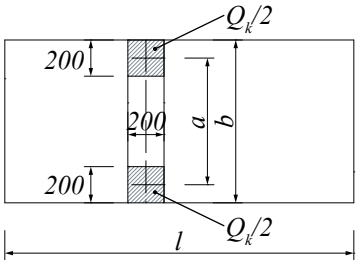
Characteristic value of point load Q_p =		kN	
Partial safety factor for point load γ_{Qp} =			recommended value = 1.50

Dynamic loads (forklift)

Partial safety factor for dynamic load γ_{Qk} =			recommended value = 1.60
Dynamic magnification factor φ =			value 1.4 for pneumatic tires and value 2.0 for solid tires
Characteristic axle load of forklift Q_k =		kN	based on type of forklift (FL 1~6)
Width of contact area =		mm	recommended value 200 mm
Distance between middle of contact areas a =		mm	based on type of forklift (FL 1~6)

Class of forklifts	Axle load Q_k [kN]	Net weight [kN]	Hoisting load [kN]	Width of axle a [mm]	Overall width b [mm]	Overall length l [mm]
FL 1	26	21	10	850	1000	2600
FL 2	40	31	15	950	1100	3000
FL 3	63	44	25	1000	1200	3300
FL 4	90	60	40	1200	1400	4000
FL 5	140	90	60	1500	1900	4600
FL 6	170	110	80	1800	2300	5100





Installing WAWEJOINT® Free Movement Joint

General

The handling of WAWEJOINT® Free Movement Joins must be done by following safety instructions. The free movement joints on site must be protected from weather, damage during handling and possible damage during removal on the packing. Joints should be stored in dry and sheltered conditions.

Before use, the free movement joints are inspected visually for completeness and any signs of damage that might have occurred during transport or storage.

The assessment of the products is based on the assumption that during the estimated working life no maintenance is required, though regular check should be carried out on the slab surface to ensure that any damage is detected and repaired as soon as possible. In case of a repair, it is necessary to perform an assessment for mechanical resistance.

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

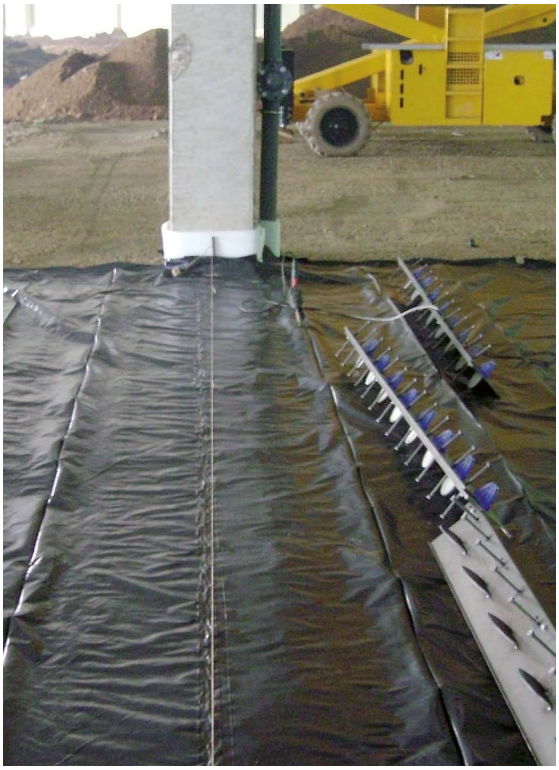
The sub-base must be made as accurate and level as possible to the requirements on the slab drawing. The tolerance of the level must be considered when ordering joints. Typically, the joint height will be 10 mm to 35 mm less than the slab depth.

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. String lines can be aside of WAWEJOINT® if center line is hard to see.

Step 3. Joint Installation

1. Joints are placed sequentially away from vertical column/ wall. The first joint is placed adjacent to column or wall allowing for isolation material.

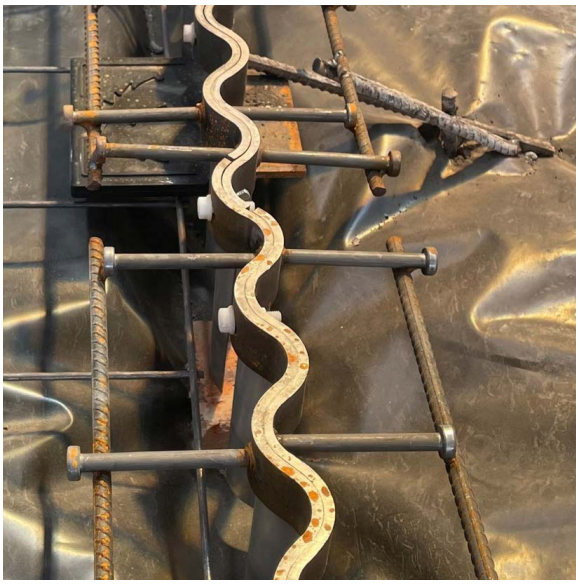


2. The joints are placed in the correct position according to the string line, and the height is adjusted. The height should be verified by laser level or similar at both ends, and the joint should be set vertical using a spirit level which can be placed across the top edges.

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 × 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.

   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. As an alternative and if pins are not available, then the joints can be positioned and held in place by concrete ‘dabs’. The joints must be positioned accurately and supported. The dabs should be placed at 1 m spacing along the joint lengths. 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 the 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.

Revision History

Version: PEIKKO GROUP 02/2022. Revision: 001

- First publication.

Resources

DESIGN TOOLS

Use our powerful software every day to make your work faster, easier, and more reliable. Peikko design tools include design software, 3D components for modeling programs, installation instructions, technical manuals, and product approvals of Peikko's products.

peikko.com/design-tools

TECHNICAL SUPPORT

Our technical support teams around the world are available to assist you with all of your questions regarding design, installation etc.

peikko.com/technical-support

APPROVALS

Approvals, certificates, and documents related to CE-marking (DoP, DoC) can be found on our websites under each products' product page.

peikko.com/products

EPDS AND MANAGEMENT SYSTEM CERTIFICATES

Environmental Product Declarations and management system certificates can be found at the quality section of our websites.

peikko.com/qehs