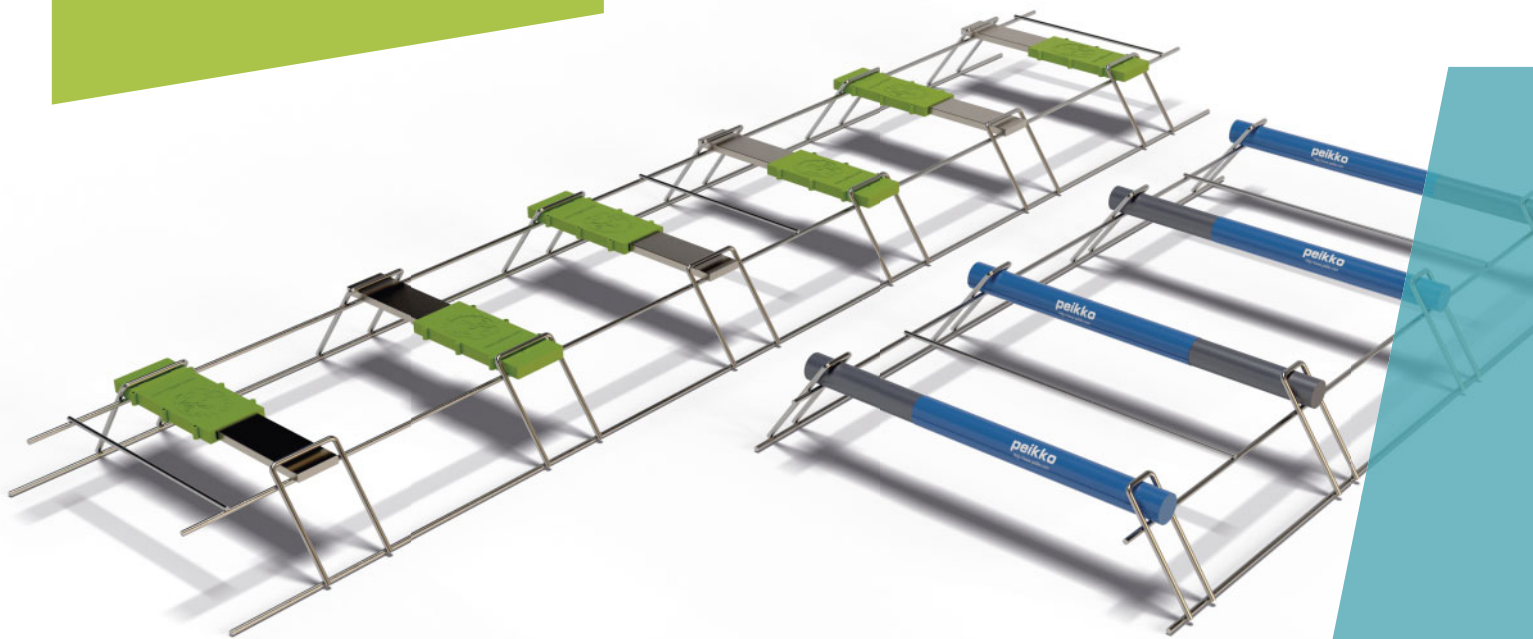


# TECHNICAL MANUAL



## DOWELCRADLE Load Transfer System

Dowel System for Saw Cut or Induced Concrete Floors

Version: PEIKKO GROUP 06/2014

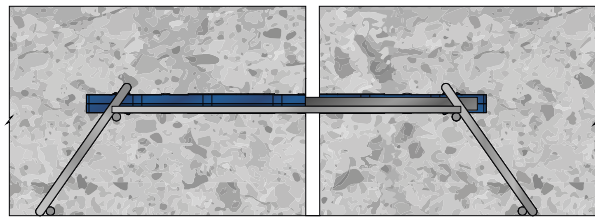
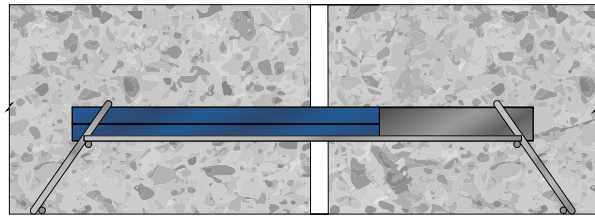
# DOWELCRADLE

## Load Transfer System

Load Transfer System for Contraction Free Movement Saw Cut Joints in Concrete Floors

### System benefits

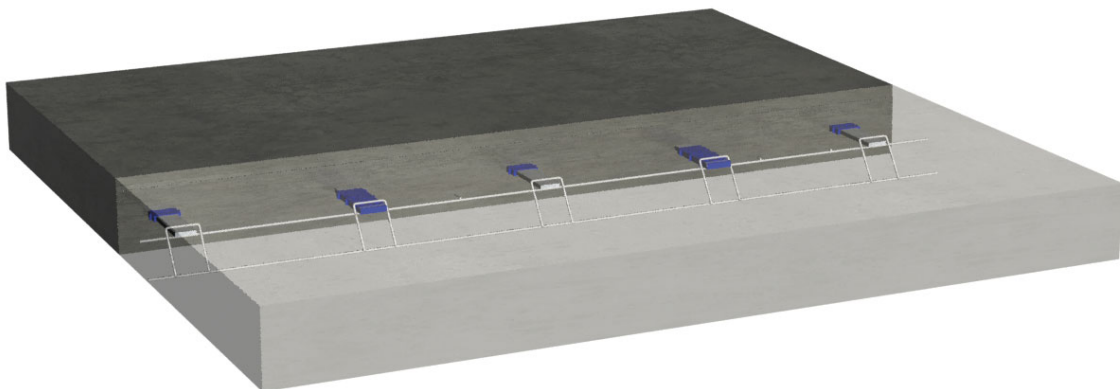
- Prefabricated leave-in-place cages, for positioning dowels at the correct height and spacing in the slab
- Available with round bar and flat plate dowels and sleeves
- Flat plate dowel cradle provides free movement in all horizontal directions of the slab
- Light, quick and easy installation
- Dowel spacing is correctly maintained without the need of additional measurement or adjustment
- Available in Black and Hot Dip Galvanized for external application



DOWELCRADLES are designed for use in concrete slabs or pavements where a sawn or other induced free movement contraction joints are required to be created.

Dowels and sleeves are held by the cradle, aligned and suspended in position, in the middle of the slab at required dowel spacing, thereby ensuring correct positioning and alignment of the individual dowels and sleeves. This prevents slab interlock and cracks forming and ensures maximal level of load transfer through the joint.

DOWELCRADLES are suitable for internal and external applications on slab depths from 125 mm to 250 mm. It is extremely quick and simple to install the system.



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## 1. Product Properties

DOWELCRADLE is a universal prefabricated leave-in-place load transfer system dedicated to the construction of saw cut or induced contraction joints. The system consists of a positioning wire cradle and load transfer system, which can be either a round bar dowel combined with a shrink wrap release sleeve or a flat plate dowel combined with plastic release sleeve. The wire cradle pre-sets the height of the dowel in the slab and distance between the centers of the dowels. The length of the DOWELCRADLEs is optimized for easy handling and installation by one person.

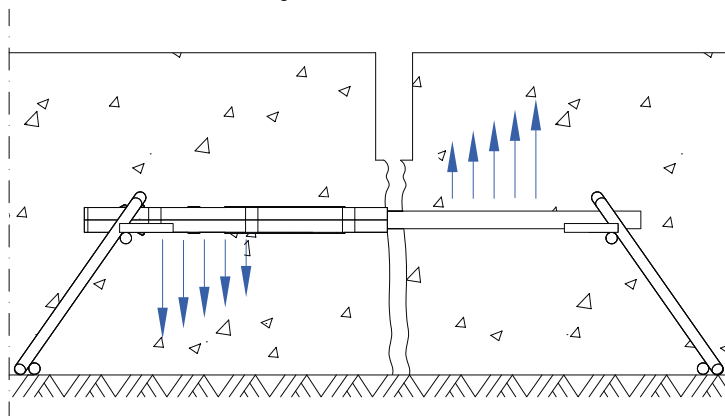
DOWELCRADLE is installed into position on the sub-base in the position where the saw cut joint is planned to be made, before the slab is cast. Once the concrete is placed and has cured, a saw cut is made above the centre of the dowels, this will induce a full depth crack through the slab. The shrinkage forces generated by the drying concrete slabs, during the curing process, will cause the saw cut joint to open.

A crack inducer can be used below the DOWELCRADLE if specified.

DOWELCRADLE with round bar dowels permits one directional slab movement. DOWELCRADLE with flat plate dowels permits two directional slab movement and ensures free movement of the slab, caused by drying shrinkage and thermal variations in both longitudinal and perpendicular directions of the slab plane as required and thereby eliminating the principle cause of shrinkage cracks at the joint, and minimising vertical displacement of the slabs. The flat plate sleeves permit 7 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

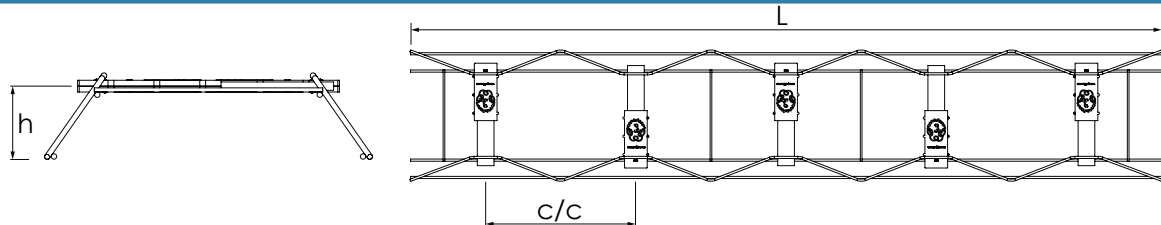
Table 1. Materials of DOWELCRADLE.

| Version             | Cradle | Dowels    | Sleeves          |
|---------------------|--------|-----------|------------------|
| DOWELCRADLE FDC     | Q195   | Q345D     | ABS, Green, Blue |
| DOWELCRADLE FDC HDG | Q295   | Q345D HDG | ABS, Green, Blue |
| DOWELCRADLE RDC HDG | Q395   | Q345D HDG | PE, blue         |

HDG = hot dip galvanized.

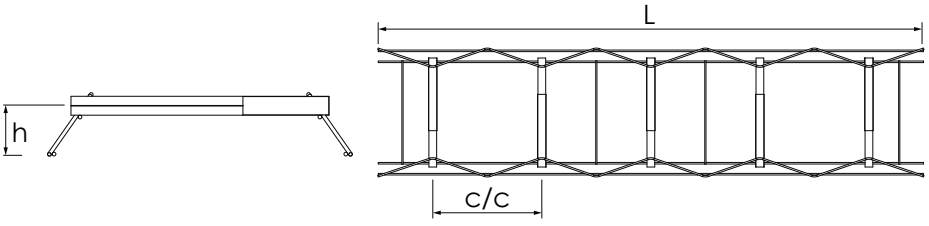
### 1.1.2 Dimensions

Table 2. Dimensions [mm] of DOWELCRADLE FDC.



| Type           | Height h | Dowel type                              | Dowel centres c/c | Length L | Weight [kg] | Advisable slab depth |
|----------------|----------|---|-------------------|----------|-------------|----------------------|
| FDC 6-450-63   | 63 mm    | Flat plate<br>dowel 6 x 50 x<br>500 mm  | 450 mm            | 1800 mm  | 5.2         | 125 mm               |
| FDC 6-450-75   | 75 mm    |   |                   |          | 5.3         | 150 mm               |
| FDC 10-450-63  | 63 mm    | 6.9                                     |                   |          | 125 mm      |                      |
| FDC 10-450-75  | 75 mm    | 7.0                                     |                   |          | 150 mm      |                      |
| FDC 10-450-88  | 88 mm    | Flat plate<br>dowel 10 x 50 x<br>500 mm |                   |          | 7.0         | 175 mm               |
| FDC 10-450-100 | 100 mm   |   |                   |          | 7.1         | 200 mm               |
| FDC 10-450-113 | 113 mm   |   |                   |          | 7.1         | 225 mm               |
| FDC 10-450-125 | 125 mm   |   |                   |          | 7.2         | 250 mm               |

Table 3. Dimensions [mm] of DOWELCRADLE RDC.



| Type          | Height h | Dowel type                         | Dowel centres c/c | Length L | Weight [kg] | Advisable slab depth |
|---------------|----------|------------------------------------|-------------------|----------|-------------|----------------------|
| RDC32-450-63  | 63 mm    | Round bar<br>dowel D32 x<br>450 mm | 450 mm            | 1000 mm  | 10          | 125 mm               |
| RDC32-450-75  | 75 mm    |                                    |                   |          | 10          | 150 mm               |
| RDC32-450-88  | 88 mm    |                                    |                   |          | 10          | 175 mm               |
| RDC32-450-100 | 100 mm   |                                    |                   |          | 10          | 200 mm               |
| RDC32-450-113 | 113 mm   |                                    |                   |          | 10          | 225 mm               |
| RDC32-450-125 | 125 mm   |                                    |                   |          | 10          | 250 mm               |

If the height requirements or dowel spacing are different from those indicated in Table 2. and Table 3., Peikko technical support will design DOWELCRADLE according to requirements of the client.

## 2. Resistances

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

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

| Dowel type                        | Join opening x | Shear Psh | P max plate |
|-----------------------------------|----------------|-----------|-------------|
| Flat plate dowel 6 x 50 x 300 mm  | 5 mm           | 50.0      | 25.9        |
| Flat plate dowel 10 x 50 x 300 mm | 5 mm           | 83.3      | 48.3        |

Table 5. Design punching shear resistance [kN] of Flat plate dowels according TR34.4 for 5 mm joint opening

| Slab thickness | Punching Pp<br>C25/30 | Punching Pp<br>C28/35 | Punching Pp<br>C30/37 | Punching Pp<br>C32/40 | Punching Pp<br>C35/45 |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 125 mm         | 17.7                  | 18.7                  | 19.4                  | 20.0                  | 20.9                  |
| 150 mm         | 21.7                  | 23.0                  | 23.8                  | 24.6                  | 25.7                  |
| 175 mm         | 26.3                  | 27.9                  | 28.9                  | 29.8                  | 31.2                  |
| 200 mm         | 31.1                  | 32.9                  | 34.0                  | 35.1                  | 36.8                  |
| 225 mm         | 36.1                  | 38.2                  | 39.6                  | 40.9                  | 42.7                  |
| 250 mm         | 41.5                  | 43.9                  | 45.5                  | 47.0                  | 49.1                  |

Table 6. Design resistances of Round bar dowels in shear and bearing / bending [kN] according TR34.4 for C32/40

| Dowel type                   | Join opening x | Shear Psh | P max plate |
|------------------------------|----------------|-----------|-------------|
| Round bar dowel D32 x 450 mm | 10 mm          | 134.0     | 74.1        |

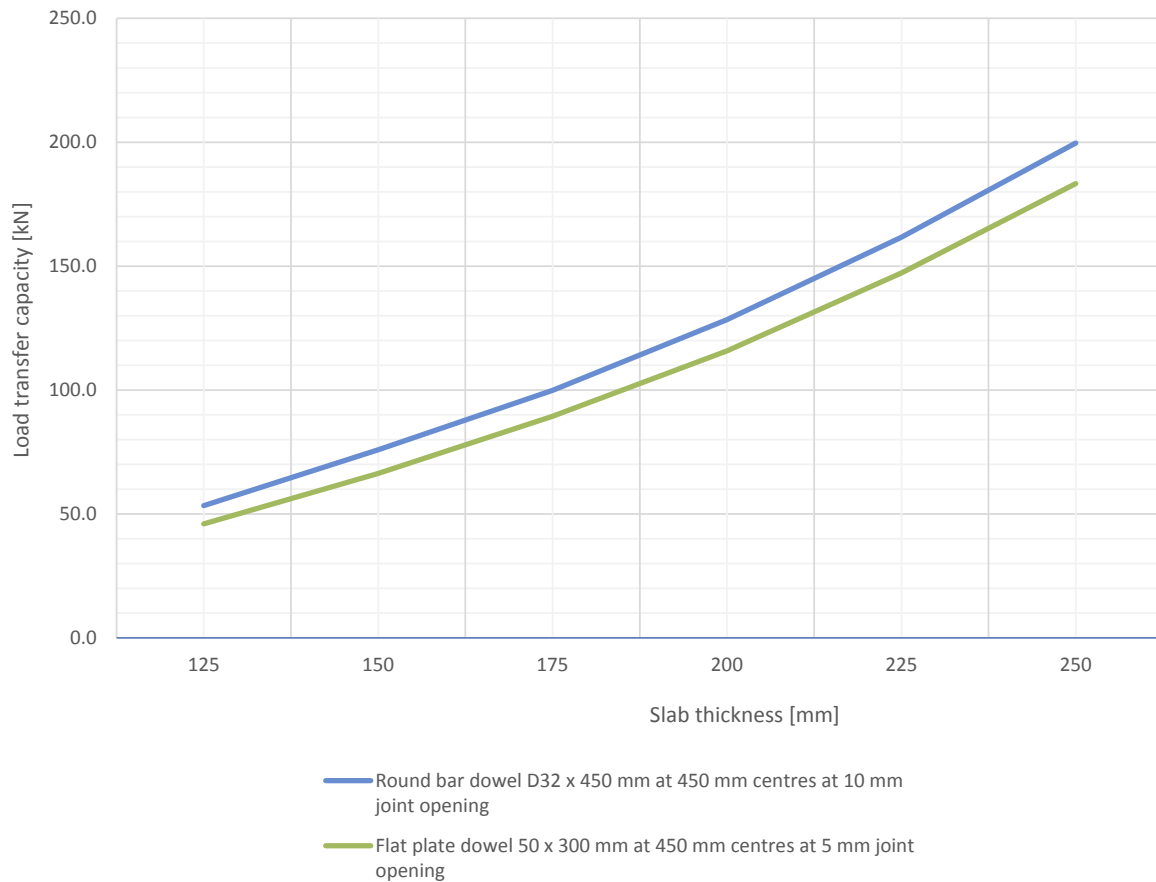
Table 7. Design punching shear resistance [kN] of Round bar dowels according TR34.4 for 10 mm joint opening

| Slab thickness | Punching Pp<br>C25/30 | Punching Pp<br>C28/35 | Punching Pp<br>C30/37 | Punching Pp<br>C32/40 | Punching Pp<br>C35/45 |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 125 mm         | 20.5                  | 21.7                  | 22.4                  | 23.2                  | 24.2                  |
| 150 mm         | 24.8                  | 26.3                  | 27.2                  | 28.1                  | 29.3                  |
| 175 mm         | 29.4                  | 31.2                  | 32.2                  | 33.3                  | 34.8                  |
| 200 mm         | 34.4                  | 36.4                  | 37.7                  | 38.9                  | 40.7                  |
| 225 mm         | 39.7                  | 42.0                  | 43.5                  | 44.9                  | 46.9                  |
| 250 mm         | 45.3                  | 47.9                  | 49.6                  | 51.2                  | 53.6                  |

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.

Table 8. Load transfer capacity [kN] of DOWELCRADLE according TR34.4 in C32/40 concrete



A modulus of subgrade reaction  $k = 0,05 \text{ N/mm}^2$  has been used for load transfer calculation.

The load transfer capacity represents only the capacity of the load transfer system. If the load transfer capacity of the whole joint should be checked, the capacity of the slab should be calculated.

If load transfer capacities for other concrete grades or conditions are needed, please contact Peikko Technical Support.



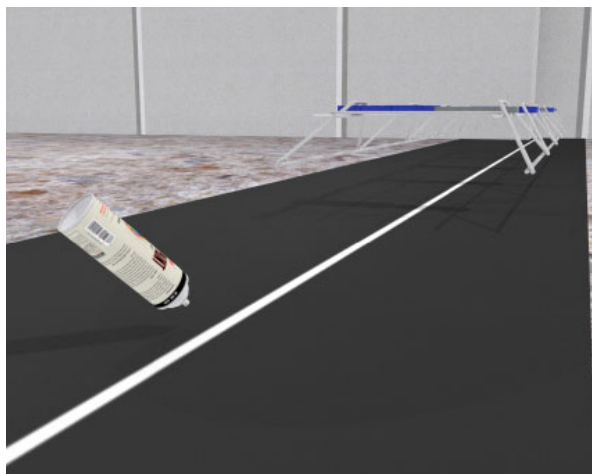
**DOWELCRADLEs are selected according to following criteria:**

- **Slab Depth.** Is required to determine the type of the DOWELCRADLE as the dowels have to be positioned always in the centre of the slab. Advisable slab depths are stated in table 2 and 3.
- **Environment.** For internal floors we would suggest the basic plain steel DOWELCRADLEs. For external applications and where corrosion resistance is required, it is recommended to use HDG (Hot Dipped Galvanized) DOWELCRADLEs.
- **Maximal designed joint opening.** The saw cut joint should not be wider than 5 mm + the cutting disk thickness when DOWELCRADLE with flat plate dowel is used. This limitation should be taken to account during the layout design. A wider joint opening is can be achieved with round bar DOWELCRADLE.

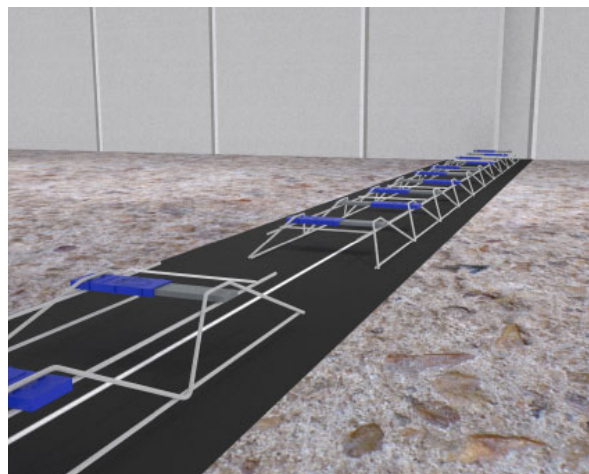
## Installing DOWELCRADLE

1. Mark the position of sawn contraction joint with a string line, or a paint line on the sub-grade or on top of membrane if used.
2. Place the first DOWELCRADLE centrally over the marked line, there is 30 mm tolerance on the center position of the DOWELCRADLE ensured by the sleeve overlap. Place the second DOWELCRADLE over the marked line at the end of the first cradle, the cradles can be positioned end-to-end without the need to make additional measurements or adjustments. Place subsequent cradles similarly. Place crack inducer under the DOWELCRADLEs if necessary. If necessary fix the correct position of the cradles by wire pins to avoid position change during the concrete pouring.
3. Install the slab reinforcement mesh (if specified) as directed by the slab designer.
4. Once the cradle is correctly positioned, cut the cross wires to allow independent movement of the two cradle halves. It is recommended to cut the cross wires just before the concrete pouring.
5. Pour the concrete ensuring that concrete placement and minimum reinforcement coverage is achieved as per slab design. Pour concrete around the DOWELCRADLE paying particular attention to the fill around the DOWELCRADLE. All plate type dowels require adequate compaction with a Poker Vibrator around them, to eliminate the possibility of air entrapment below the sleeve.
6. Saw cut the slab over the centerline by diamond saw to a depth of 25 ~ 30% total slab thickness, as soon as it is possible to cut without damaging the arrises (within 24 hours). Control the depth of the cut to make sure the dowels are not cut through.

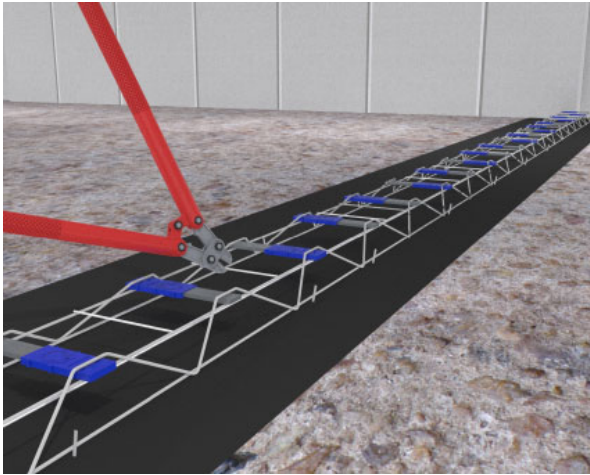
Mark the position of the sawn contraction joint



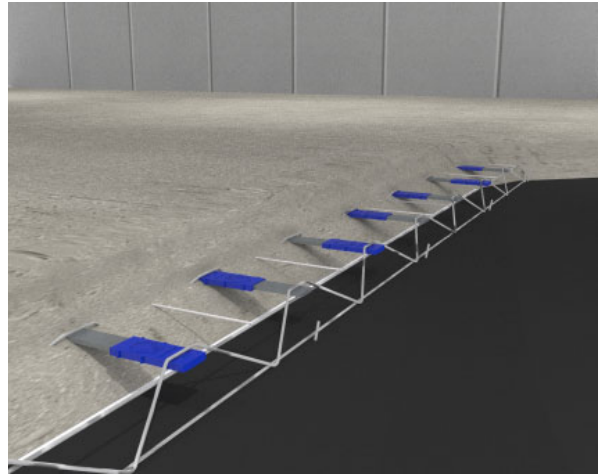
Placing of the DOWELCRADLEs



Cut the cross wires



Pour the concrete



Saw cut the slab to create the contraction joint









## Technical Manual Revisions

**Version: PEIKKO GROUP 06/2014 Revision:001\***

- New cover design for 2018 added.

# 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.

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## **TECHNICAL SUPPORT**

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

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

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## **EPDS AND MANAGEMENT SYSTEM CERTIFICATES**

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[peikko.com/qehs](https://peikko.com/qehs)