CALCULATION OF LOADS

The use of the dowel is a development of the evolution of the Omega profiles for concreting work joints. Due to the quick-detachable casing, adjacent to the dowel body, and the increase in the contact area of the dowel and concrete, it was possible to increase the load-bearing loads of the floor.

The dowels carry and transfer the load between two adjacent sections of the concrete floor, that is, the equipment with the "P" load moves along the finished floor without causing stress in the concrete slab.

A concrete slab usually has only about 50% of its bearing capacity at the edges, so the dowels support the slab at the edges and help to support and transfer weight from one slab to another, allowing the slabs to flex slightly, gently transferring the load along its surface.

The calculation of the bearing capacity of the dowels is given in the British methodological guide **TR34 ver.4 clause 6.5 and Appendix D.**

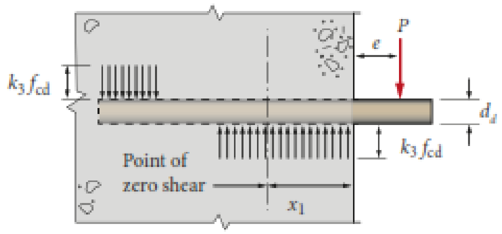


fig. nv.10 External and internal forces affecting the dowel

The shear force on the dowel is determined by the formula:

$P_{sh\ plate} = A \times 0.9 \times 0.6 \times P_y$

Bearing / bending load on the dowel:

$P_{max\ plate} = 0.5[(b_1^2 + c_1^2)^{0.5} - b_1]$

Where
A — cross-sectional area of the dowel
P_y — yield strength of steel
$b_1 = 2ek_3\ f_{cd}\ W$
$c_1 = 2k_3 f_{cd}\ W^2 T^2 f_{yd}$
e — distance of application of load from concrete surface; with a symmetrical arrangement, this is equivalent to half the opening of the joint (see. Fig.5)
k_3=3 (const)
f_{cd} — concrete strength (cylinder)= f_{ck} /y_c
W — dowel width
T — dowel thickness
f_{ye} — dowel steel strength

Standard dowels are made of steel S355 (yield strength σ0.2=355 MPa) and have the following dimensions:

Tab. nv.6

Type of dowel	Width, W (mm)	Length, L (mm)	Thickness T (mm)	Distance, c/c (mm)	Casing color
60/OP-5	150	120	5	600	Green
60/OP-8	150	130	8	600	Orange
60/OP-8XL	180	140	8	500	Red

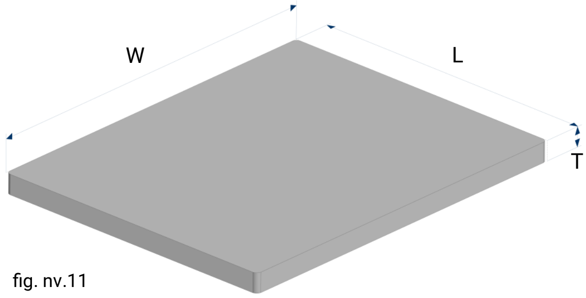


fig. nv.11

Destructive forces on the dowel

Design bending ($P_{max\ plate}$) and shear resistance ($P_{sh\ plate}$) of single dowels for concrete C30/35
in accordance with TR34 ver.4 clause 6.5

Tab. nv.7

Type of dowel	Joint opening, mm	Shear capacity, $P_{sh\ plate}$, kN	Bearing/bending $P_{max\ plate}$, kN
60/OP-5	10	125,02	40,05
	15		31,32
	20		25,37
60/OP-8	10	200,03	78,94
	15		66,26
	20		56,41
	25		48,72
	30		42,65
60/OP-8XL	10	240,04	94,73
	15		78,51
	20		67,69
	25		58,46
	30		51,18

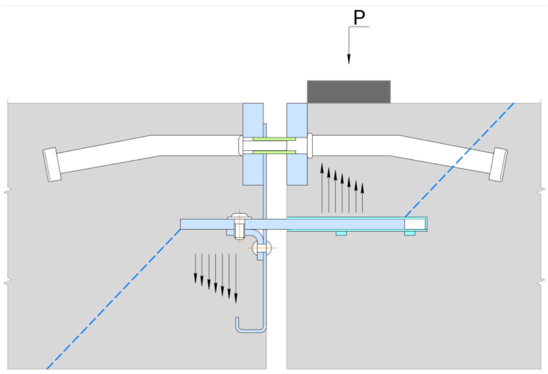


fig. nv.12

The number of dowels involved in the work and the total perceived load directly depends on:

- The base on which the floor slab is poured,
- floor slab thickness,
- concrete class.

Table nv.8 shows the most common measures of perceived stress.

Calculated ultimate loads at failure of dowel or concrete in accordance with TR34 ver.4 clause 6.5

Concrete 30/35 (Unforced Slab). Base: compacted sand.

Tab. nv.8

Joint opening, mm	Slab Depth, mm	60/OP-5 (S355)		60/OP-8 (S355)		60/OP-8XL (S355)	
		Dowel bending, кN/m	Concrete bursting, kN/m	Dowel bending, кN/m	Concrete bursting, kN/m	Dowel bending, кN/m	Concrete bursting, kN/m
10	100	46,49	9,54	91,62	9,11	131,93	9,67
	150	63,01	18,03	124,18	17,46	178,82	18,32
	200	78,18	28,92	154,08	28,20	221,88	29,37
	250	92,43	42,21	182,15	41,34	262,30	42,82
15	100	36,35	9,35	76,90	8,92	110,74	9,48
	150	49,27	17,74	104,24	17,17	150,10	18,03
	200	61,14	28,53	129,34	27,81	186,24	28,98
	250	72,27	41,71	152,90	40,85	220,17	42,33
20	100	29,44	9,15	65,47	8,73	94,28	9,29
	150	39,90	17,44	88,74	16,88	127,78	17,74
	200	49,51	28,13	110,11	27,42	158,55	28,59
	250	58,53	41,21	130,17	40,36	187,44	41,84
25	100	24,56	8,96	56,55	8,54	81,43	9,11
	150	33,29	17,15	76,64	16,59	110,36	17,46
	200	41,31	27,73	95,10	27,03	136,94	28,20
	250	48,83	40,71	112,42	39,87	161,89	41,34
30	100	20,99	8,77	49,50	8,36	71,29	8,92
	150	28,45	16,85	67,10	16,30	96,62	17,17
	200	35,30	27,34	83,26	26,64	119,89	27,81
	250	41,73	40,22	98,42	39,37	141,73	40,85

The table shows the load for unreinforced concrete slab C30/35 leading to bending of the dowel (failure) or to bursting of concrete (failure).
The data are calculated for various indicators of joint opening, provided that the dowel is in the middle of the slab.
For calculation of values for other data, please contact Dewmark.

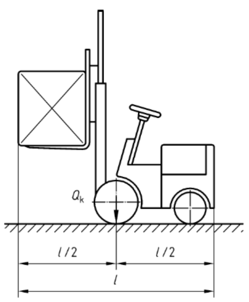
You can order a calculation for the selection of the type of dowel based on your values.
To do this, you need to give the following characteristics:

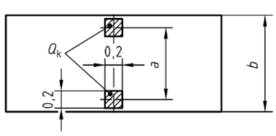
1. Concrete class.
2. Concrete slab thickness.
3. Detailed description of the base of the concrete slab (sand, compacted sand, crushed stone, etc.).
4. Approximate expansion joint opening (10, 15 mm, etc.).
5. Static load (per rack support/distance between two nearest supports).
6. Dynamic load (forklift type according to DIN 1055-3 (see. Tab. nv.9).

send your requests by e-mail: info@dewmark-joint.com

Type of Forklift in accordance with DIN

Tab. nv.9





Forklift type	Maximum weight, kN	Load capacity, kN	Axle load (without shock loads, $2xQ_k$ kN	Wheel load (without shock loads), Q_k kN
G1	31	10	26	12,5
G2	46	15	40	15
G3	69	25	63	31,5
G4	100	40	90	45
G5	150	60	140	70
G6	190	80	170	85