Vedlegg

Innholdsfortegnelse

www.permaban.com
Permaban Limited
Mill Close, Lee Mill Industrial Estate, Ivybridge, Devon, PL21 9GL
t: +44 1752 895288 | f: +44 1752 690535 | e: info@permaban.com

Vedlegg A

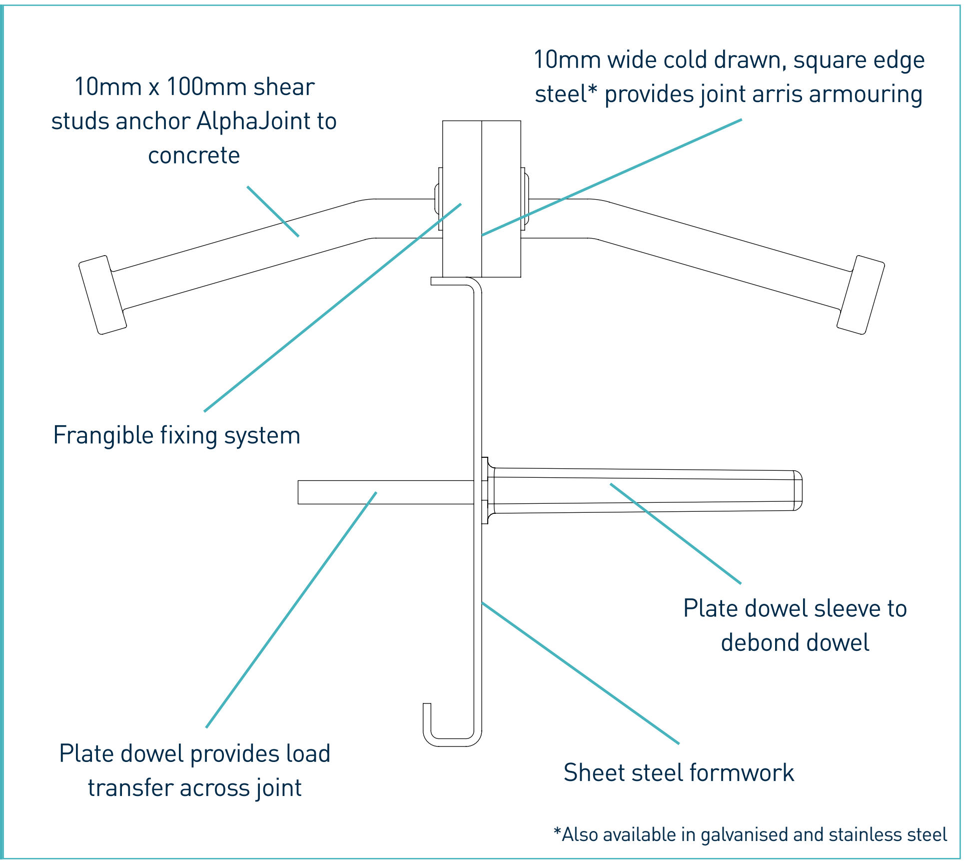
permaban®
protecting concrete floors worldwide

alphajoint® classic 4010

Specification Sheet
Issue 3.2
18/02/2016

alphajoint® classic 4010

alphajoint® classic 4010



www.permaban.com
Permaban Limited
Mill Close, Lee Mill Industrial Estate, Ivybridge, Devon, PL21 9GL
t: +44 1752 895288 | f: +44 1752 690535 | e: info@permaban.com

Vedlegg A

permaban®
protecting concrete floors worldwide

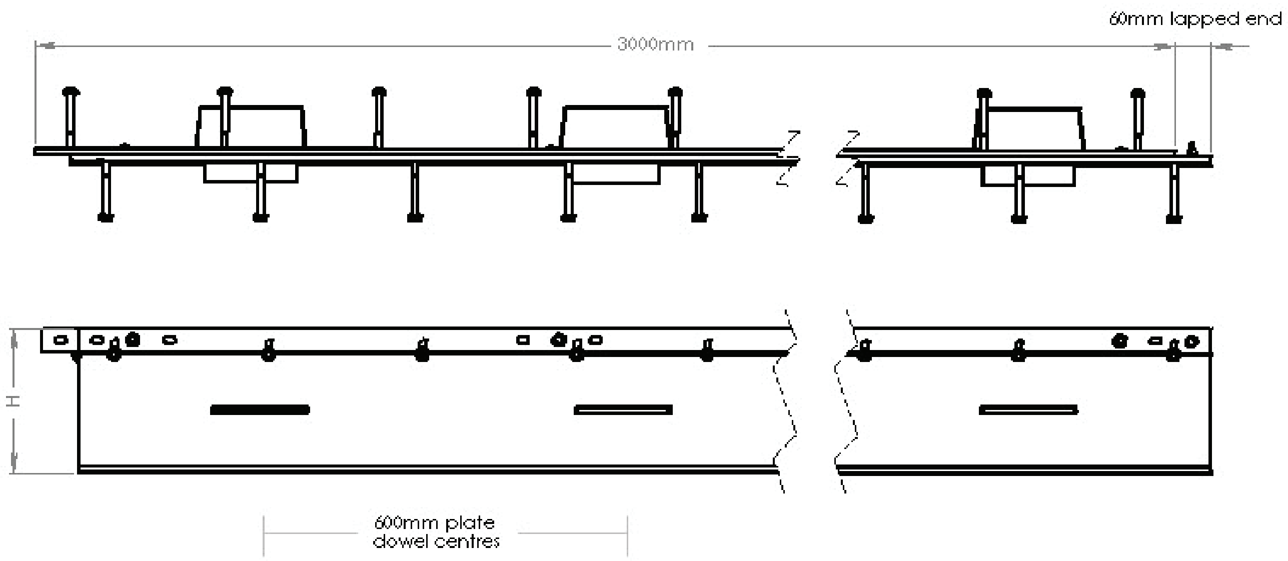
alphajoint® classic 4010

Specification Sheet Issue 3.2
18/02/2016

manufacturing tolerances

Length	±2.0mm	Height	±1mm	Straightness	±0.5mm/600mm

dimensions of alphajoint® classic 4010



dimensions and weight of alphajoint® classic 4010

Nominal Slab Depth (mm)	Joint Height, h (mm)	Dowel Size (mm)	Dowel Centres (mm)	Length (mm)	Single Joint Weight (kg)	Number Per Bundle	Weight per bundle incl packaging @ 148 kg
150	130	151 x 120 x 8	600	3000	29.1	45	1458 kg
170	150				30.3	42	1421 kg
190	175				32.0	42	1492 kg
210	200				33.0	35	1303 kg

Typical height and length values shown only. Weight values shown are based on Alphajoint® Classic 4010 including TD6 dowels and are approximate.

materials

Component	Material
Joint arris armouring (4010)	BS 070M20
Sheet steel formwork	BS EN 1030:1999 DC01
Shear stud	S275JR or equivalent
Plate dowel	BS EN 10025-2:2004 S275JRG2 min 410 N/mm^2 tensile strength
Plate dowel sleeve	HDPP

www.permaban.com
Permaban Limited
Mill Close, Lee Mill Industrial Estate, Ivybridge, Devon, PL21 9GL
t: +44 1752 895288 | f: +44 1752 690535 | e: info@permaban.com

permaban® protecting concrete floors worldwide

alphajoint® classic 4010

Specification Sheet Issue 3.2
18/02/2016

theoretical calculated ultimate loads at failure of dowel or concrete

(For typical slabs, 40N/mm² concrete and **20mm** joint opening)

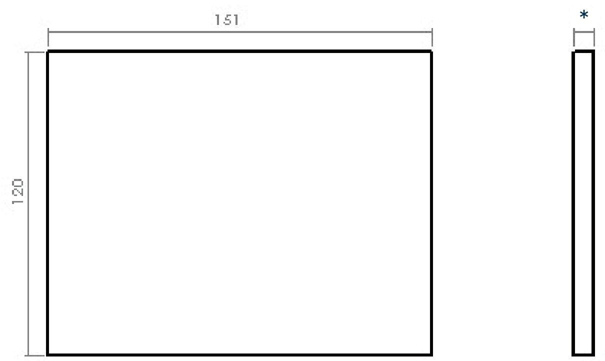
		Unreinforced Slab	
Slab Depth (mm)	**Dowel Type**	**Bursting (kN/m)**	**Bending (kN/m)**
150	TD6	31.2	53.4
	TD8	31.2	87.2
	TD10	31.2	124.7
175	TD6	40.0	53.4
	TD8	40.0	87.2
	TD10	40.0	124.7
200	TD6	49.9	53.4
	TD8	49.9	87.2
	TD10	49.9	124.7
225	TD6	60.7	53.4
	TD8	60.7	87.2
	TD10	60.7	124.7
250	TD6	72.4	53.4
	TD8	72.4	87.2
	TD10	72.4	124.7
275	TD6	85.6	53.4
	TD8	85.6	87.2
	TD10	85.6	124.7
300	TD6	86.9	53.4
	TD8	86.9	87.2
	TD10	86.9	124.7

Ultimate load (kN/m)

This table shows the load at failure in bursting (failure of the concrete) and bending (failure of the dowel) for a joint opening of **20mm** - larger joint openings can be accommodated. The ultimate load has been calculated in accordance with TR34 4th Edition. Dowel position taken at mid depth of slab. For more detailed analysis please contact Permaban.

*All design calculations should be verified by a suitably qualified structural engineer.

compatible dowel systems



Dimensions in mm

*Available in 6, 8, 10mm

DD is not available in the following territories: Mexico, Canada, USA, Australia and New Zealand.

Primekss

Primeteh AS
Reg. Nr. 40003997182
Gustava Zemgala gatve 76, Riga LV-1039, Latvia
Phone. +371 67801120, Fax +371 67801123
design@primekss.com

BETTER CONCRETE THROUGH RESEARCH

Statical calculations
plastic design of industrial floors
using steel fibers HE 75/50
including PrīmXComposite shrinkage reducing technology

design based on Yield Line Theory according to K.W.Johansen

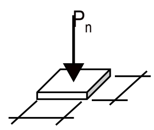
v1.2

Project name: BOS Berger
Customer: Skanska
Country: Norway
Date: 29.11.2017
Design executed at Primekss SIA by: MS

Customers data

Strength characteristics for concrete:			
- concrete grade:	C30/37	*w/c<0.55* **B30- M60**	EN 206
- characteristic cylinder strength f_{ck}:	30 MPa		
- Young's modulus E_{cm}:	32837 MPa	$E_{cm}=22[(f_{ck}+8)/10]^{0,3}$	EN 1992-1-1, tab 3.1
- mean tensile strength f_{ctm}:	2.90 MPa	$f_{ctm}=0,3f_{ck}^{2/3} \leq C50/60$	EN 1992-1-1, tab 3.1
- characteristic axial tensile strength $f_{ctk,0.05}$:	2.03 MPa	$f_{ctk,0.05}=0,7f_{ctm}$	EN 1992-1-1, tab 3.1
- flexural tensile strength of concrete $f_{ctk,fl}$:	4.06 N/mm²	$f_{ctk,fl}=[1+(200/h)^{0,5}]f_{ctk,0.05} \leq 2f_{ctk,0.05}$	TR34 3rd, Eqn. 9.1
Fibers:			
- fibre type:	HE 75/50		
- fibre diameter:	0.75 mm		
- fibre length:	50 mm		
- current fiber material safety factor:	1		
- fibre tensile strength:	1100 MPa		
- fibre dosage rate:	40 kg/m³		
Slab data:	PrīmXComposite		
- slab thickness **h**:	170 mm		
- placement of slab:	Inside		
- slab weight $G_{k,slab}$:	4.1 kN/m²		
- Poisson's ratio of the slab υ:	0.15		
Safety coefficients:			
- self weight of slab γ_G:	1.35	*2.03 overall safety factor*	
- material safety factor γ_c:	1.50		
- for racking γ_{Q1}:	1.35	*2.16 overall safety factor*	
- for dynamic loads γ_{Q2}:	1.60		
Yield line moments:			
- Plastic tensile stress σ_{pl}:	2.70 N/mm²	*obtained from full scale round indetermined plate tests*	
- design moment resistance M_{Rd}:	23.4 kNm/m	$M_{Rd}=0,45 \times \sigma_{pl} \times h^2/\gamma_c$	

Loading data

Rack load (PL):		*For back-to-back situation*	
- single rack leg load P_k:	180 kN	360 kN	
- baseplate dimensions **a × b**:	150 # 150 mm		
- contact pressure:	8.00 N/mm²		
- distance between pointloads **z**:	350 mm		
Uniformly Distributed Load (UDL):			
- unfactored UDL $Q_{k,udl}$:	30 kN/m²		
Line load (LL)			
- unfactored LL $P_{lin,k}$:			
Industrial floor load class:	FL4		
- capacity:	10.0 tons		
- wheel load $Q_{k,FL}$:	45 kN/wheel		
- contact pressure **p**:	1.4 N/mm²		

Truck load

- capacity:			
- wheel load $\mathbf{Q_{k,FL}}$:			
- type of wheel	Twin wheel		
- contact pressure **p**:			

Soil data:

- modulus of subgrade reaction **k**:			
- EV2 and EV1-values:	Ev2=100 MPa		
	Ev2/Ev1=2.2		
- modify subgrade with granular subbase:	No		
- resulting modulus of subgrade reaction $\mathbf{k_{sub}}$:	**0.083 N/mm³**		

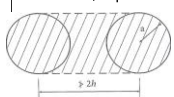
Insulation:

	No		
- type of insulation:			
- thickness $\mathbf{h_{ins}}$:			
- long-term compressive strength $\sigma_{insul.}$ at 2%:			
- long-term modulus of elasticity $\mathbf{E_{ins}}$:			
- subgrade reaction k-value of insulation $\mathbf{k_{ins}}$:		$k_{ins} = E_{ins}/h_{ins}$	
- resulting subgrade reaction of system $\mathbf{k_{res}}$:	**0.083 N/mm³**	$k_{res} = k_{sub} \times k_{ins}/(k_{sub} + k_{ins})$	

Stiffness:

- radius of relative stiffness of concrete slab $\mathbf{l_r}$:	639 mm	$l_r = [E_{cm} \times h^3/12(1 - v^2) \times k_{res}]^{0,25}$	TR34 3rd, Eqn. 9.4

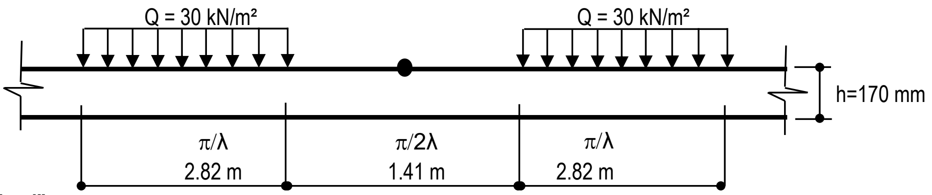
Load Case "Point load"



- equivalent radius of contact area of load $\mathbf{a_r}$:	84.6 mm		
- ultimate design load $\mathbf{P_d}$:	243.00 kN	$P_d = \gamma_{Q1} \times P_k$	
- failure load check if $\mathbf{a_r/l_r=0}$:	147.08 kN		TR34 3rd, Eqn. 9.10/9.13
- failure load check if $\mathbf{a_r/l_r>0,2}$:	307.76 kN		
- failure load check $\mathbf{P_{Rd}}$ for $\mathbf{a_r/l_r}$ = **0.13**	253.53 kN		
- design check:	$\mathbf{P_d < P_{Rd}}$	design condition is ok!	

Load Case "Uniform distributed load"

- moment at first crack **M:**	25.3 kNm/m'	$M=(f_{ctk,fl}+1,2) \times (h^2/6)$	TR34 3rd, Eqn. 9.6
- the critical width **λ**:	1.11 m	$\lambda = [3 \times k_{res}/E_{cm} \times h^3]^{0,25}$	TR34 3rd, Eqn. 9.15
- for a critical width **π/2λ** resulting max moment $\mathbf{M_c}$:	4.62 kNm/m'	$M_c=0,168 \times (Q_{k,UDL} + G_{k,slab}) \times [E_{cm} \times h^3/3 \times k_{res}]^{0,5}$	
- coresponding stress σ:	0.96 N/mm²	$\sigma=6M_c/h^2$	
- the load capacity per unit area $\mathbf{Q_{Rd}}$:	186.7 kN/m²	$Q_{Rd} = 5,95 \times \lambda^2 \times M$	TR34 3rd, Eqn. 9.19
- design check:	$\mathbf{Q_k < Q_{Rd}}$	design condition is ok!	



Load Case "Wheel load"

Forklift:

- equivalent radius of contact area of load $\mathbf{a_r}$:	101.6 mm	$a_r = Q_{k,FL}/(\pi \times p)^{0,5}$	
- ultimate design load $\mathbf{Q_{d,FL}}$:	72.0 kN	$Q_{d,FL} = \gamma_{Q2} \times Q_{k,FL}$	
- width of axle **z**:	1200 mm	if $z > 2h$, dual point load case	
- failure load check if $\mathbf{a_r/l_r=0}$:	226.25 kN		TR34 3rd, Eqn. 9.10/9.13
- failure load check if $\mathbf{a_r/l_r>0,2}$:	317.91 kN		
- failure load check $\mathbf{P_{Rd}}$ for $\mathbf{a_r/l_r}$ = **0.16**	299.12 kN	by interpolation	
- design check:	$\mathbf{Q_{d,FL} < Q_{Rd}}$	design condition is ok!	

Truck:

- equivalent radius of contact area of load $\mathbf{a_r}$:		$a_r = Q_{k,FL}/(\pi \times p)^{0,5}$	
- ultimate design load $\mathbf{Q_{d,truck}}$:		$Q_{d,truck} = \gamma_{Q2} \times Q_{k,truck}$	
- width of axle **z**:	2000 mm	if $z > 2h$, dual point load case	
- failure load check if $\mathbf{a_r/l_r=0}$:	279.03 kN		
- failure load check if $\mathbf{a_r/l_r>0,2}$:	294.17 kN		
- failure load check $\mathrm{Q_{Rd}}$ for $\mathbf{a_r/l_r}$ =	279.03 kN		
- design check:	$\mathbf{Q_{d,truck} < Q_{Rd}}$	design condition is ok!	

Load Case "Line load"

- moment at first crack **M**:	25.3 kNm/m'	$M=(f_{ctk,fl}+1,2) \times (h^2/6)$	TR34 3rd, Eqn. 9.6
- the critical width **ʎ**:	1.11 m	$\lambda = [3 \times k_{res}/E_{cm} \times h^3]^{0,25}$	TR34 3rd, Eqn. 9.15
- positive moment line load capacity $\mathbf{P_{R,lin,p}}$	113 kN/m	$P_{R,lin,p}=4 \lambda M_p$	TR34 3rd, Eqn. 9.16
- design check:	$\mathbf{P_{lin,d} < P_{R,lin,d}}$	design condition is ok!	

the calculations are ok!

PrimekssLabs solution

including PrīmXComposite shrinkage reducing technology

Concrete grade:	**C30/37**
Type of fibre:	**HE 75/50**
Fibre dosage rate:	**40 kg/m³**
Slab thickness h:	**170 mm**
Distance between joints:	∞

Notes: