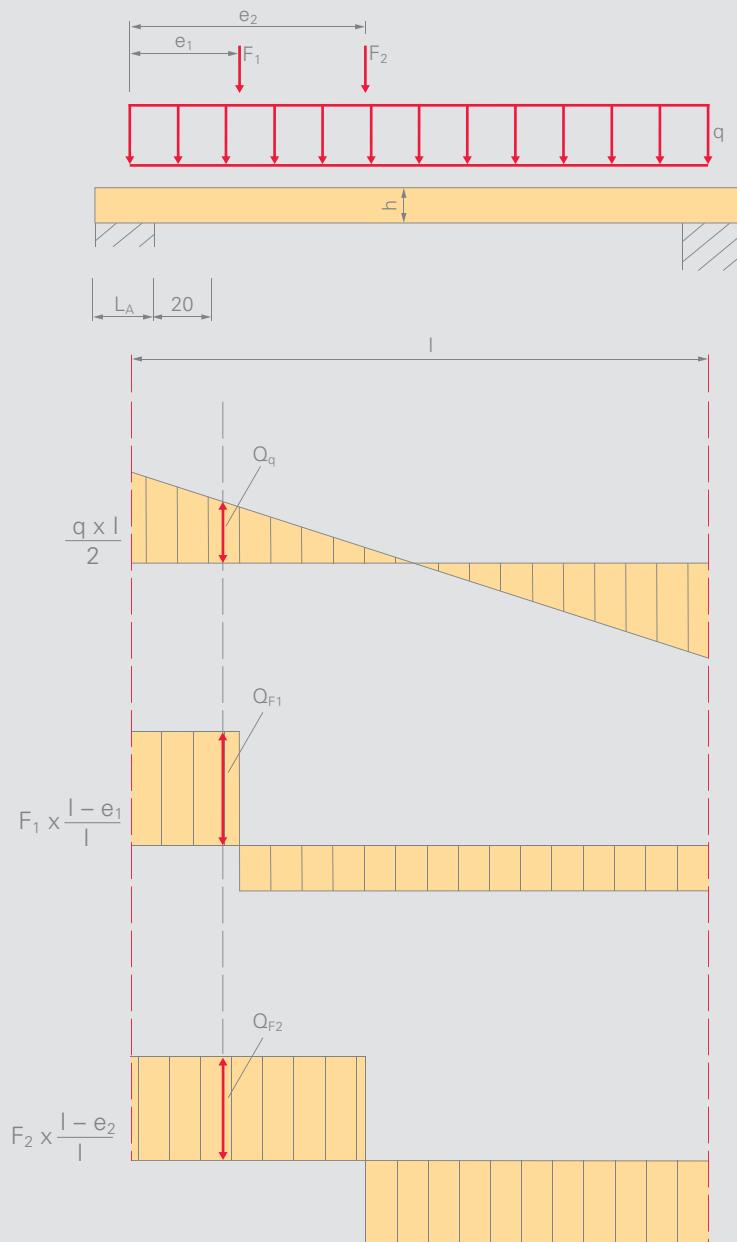


Design Tables 2015

Formwork and Shoring



Edition 09 | 2015

PERI

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Important notes

Without exception, all current safety regulations and guidelines must be observed in those countries where our products are used. The systems or items shown might not be available in every country.

Details of systematic and safety-related installation that have been correctly implemented can be found in the relevant Instructions for Assembly and Use.

Specific information as well as technical data must be strictly observed. Any deviations require separate static proof; incorrect use also presents a safety risk.

The information contained herein is subject to technical changes in the interests of progress. Errors and typographical mistakes reserved.

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* Reproduced here courtesy of the German Standardisation Institute (DIN Deutsches Institut für Normung e. V.). V.
Decisive for the application of the DIN standard is the version with the latest date of issue which is available from Beuth Verlag GmbH, Burggraf 6, 10787 Berlin, Germany.

Conversion Tables

Metric System vis-à-vis the Anglo-American System

Length

	Yard	Foot	Inch	Meter/cm
1 Meile	1760 yd	5280 ft	63360 in	1609.3 m
1 Yard	—	3 ft	36 in	0.9144 m
1 Foot	0.3333 yd	—	12 in	0.3048 m
1 Inch	0.0278 yd	0.0833 ft	—	2.54 cm
1 Meter	1.0936 yd	3.281 ft	39.37 in	—

	mm	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"
1/16"	1.587	26.99	52.39	77.79	103.19	128.59	153.99	179.39	204.79	230.19	255.59	280.99
1/8"	3.175	28.58	53.98	79.38	104.78	130.18	155.58	180.98	206.38	231.78	257.18	282.58
3/16"	4.761	30.16	55.56	80.96	106.36	131.76	157.16	182.56	207.96	233.36	258.76	284.16
1/4"	6.350	31.75	57.15	82.55	107.95	133.35	158.75	184.15	209.58	234.95	260.35	285.75
3/8"	9.525	34.93	60.33	85.73	111.13	136.53	161.93	187.33	212.73	238.13	263.53	288.93
1/2"	12.700	38.10	63.50	88.90	114.30	139.70	165.10	190.50	215.90	241.30	266.70	292.10
5/8"	15.875	41.28	66.68	92.08	117.48	142.88	168.29	193.68	219.08	244.48	269.88	295.28
3/4"	19.050	44.45	69.85	95.25	120.65	146.05	171.45	196.85	222.25	247.65	273.05	298.45
7/8"	22.225	47.63	73.03	98.43	123.83	149.23	174.63	200.03	225.43	250.83	276.23	301.63

Area

	Yard²	Foot²	Inch²	Meter²/cm²
1 Meile²	3097600 yd ²	27878400 ft ²	4014489600 in ²	2588881 m ²
1 Yard²	—	9 ft ²	1296 in ²	0.8361 m ²
1 Foot²	0.1111 yd ²	—	144 in ²	0.0929 m ²
1 Inch²	0.0008 yd ²	0.0069 ft ²	—	6.4516 cm ²
1 Meter²	1.196 yd ²	10.76 ft ²	1550 in ²	—
1 Acre	4840 yd ²	43546 ft ²	6272850 in ²	4047 m ²

Volume

	Yard³	Foot³	Inch³	Meter³/Liter
1 Yard³	—	27 ft ³	46656 in ³	0.7646 m ³
1 Foot³	0.037 yd ³	—	1728 in ³	0.02832 m ³
1 Inch³	0.0000215 yd ³	0.0006 ft ³	—	0.0000164 m ³
1 Meter³	1.307 yd ³	35.32 ft ³	61023 in ³	—
1 Gallone UK	0.00595 yd ³	0.1605 ft ³	277.4 in ³	4.546 Liter
1 Gallone US	0.00495 yd ³	0.1337 ft ³	231 in ³	3.785 Liter

Weight

	Pounds	Kilogramm
1 Pound	—	0.4536 kg
1 Kilogramm	2.2046 lbs	—
1 US-Tonne	2000 lbs	907.2 kg
1 UK-Tonne	2240 lbs	1016 kg
1 Metric Tonne	2204.6 lbs	1000 kg
1 Ounce	0.0624 lbs	0.0283 kg

Temperature

	° Celsius	° Fahrenheit
x ° Celsius	—	x 9/5 +32
x ° Fahrenheit	(x·32) 5/9	—

Force, Load, Stress

	Newton	Pounds
1 lbs	4.4482 N	—
1 kip	4448 N	1000 lbs
1 N	—	0.2248 lbs
1 kN	—	224.8 lbs = 0.2248 kips
1 lbs/ft	0.0146 kN/m	—
1 kN/m	—	68.6 lbs/ft
1 ksi (kips/in²)	6.89 MN/m ²	1000 psi
1 psi (lbs/in²)	6.89 kN/m ²	—
1 psf (lbs/ft²)	0.0479 kN/m ²	—
1 kN/m²	—	20.9 lbs/ft ²
1 lbs/ft³	0.1571 kN/m ³	—
1 kN/m³	—	6.3647 lbs/ft ³

Design Concept with Partial Safety Factors

Static calculations according to state-of-the-art technology

In Germany and Europe, the design concept with partial safety factors has been considered as standard practice for some time now. Here, the design values of the actions (loads) are com-

pared to the resistances (load-bearing capacities) of the static system. This is done on the design level (Index d for "design") and achieved through the increase of the characteristic actions and

reduction of the characteristic resistances (Index k) with corresponding partial safety factors. The safety level remains the same.

Method of proof: $E_d \leq R_d$

with $E_d = E(\sum F_d)$, $F_d = \gamma_F \cdot F_k$ and $R_d = \frac{R_k}{\gamma_M}$

Resistance side

R_k	Characteristic value of the resistance (maximum load-bearing capacity to be applied; for steel, e.g. the yield strength).
R_d	Design value of the resistance.
γ_M	Partial safety factor for resistances depending on the type of material Steel: $\gamma_M = 1.10$ Timber: $\gamma_M = 1.30$

In addition, the following applies for timber:

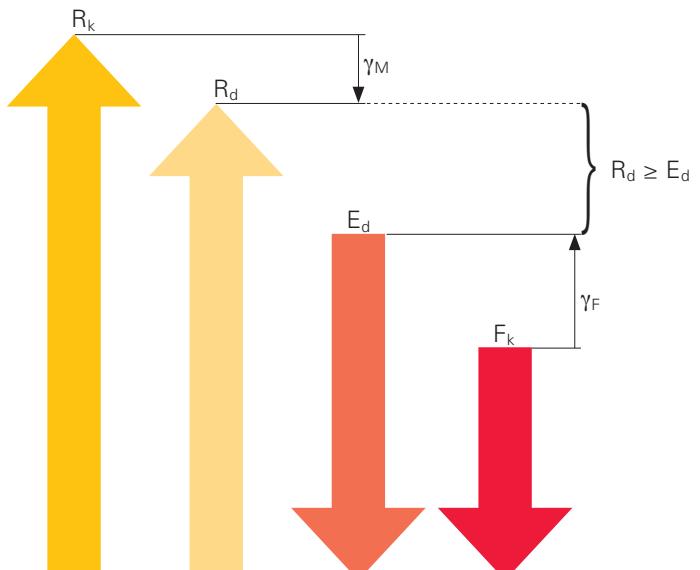
$$R_d = k_{mod} \cdot \frac{R_k}{\gamma_M}$$

k_{mod} Modification factor to consider regarding the moisture content of the timber and load duration.

Load side

F_k	Characteristic value of an action (e.g. actual dead weight, assumed live load, assumed wind load).
E_d	Design value of an effect (e.g. internal forces or stresses) due to the sum of all actions $\sum F_d$ from a load combination.
γ_F	Partial safety factor for actions depending on the type of action and according to the load combination (e.g. $\gamma_F = 1.35$ for dead weight or $\gamma_F = 1.50$ for live loads and wind loads).

Principle of the design method with partial safety factors



Background:

Characteristic resistance values are generally determined by means of calculations of known limit stresses or through tests. In this respect, the 95%-fractile principle generally applies. This means that in statistical terms, 95% of all failure values are higher than the characteristic resistance.

Warning:

The characteristic (actual) values of the actions are always to be increased with the partial safety factor γ_F in order to be able to compare them with the design values of the resistance.

Note:

Separate tables with design values R_d , which are to be used for the new concept with partial safety factors, are expressly indicated by PERI. The design values can, after division by $\gamma_F = 1.5$, also be used as a permissible load for the procedure with an absolute safety factor.

The Old Design Concept with Absolute Safety Factor

Achieving the result faster

For carrying out quick and rough calculations on the construction site, calculations done according to the old design concept with an absolute safety factor are common and generally produce faster results.

Method of proof: $F_{\text{vorh.}} \leq F_{\text{perm.}}$ with $F_{\text{perm.}} = \frac{F_{\text{limit}}}{\gamma_{\text{tot}}} (= \frac{R_k}{\gamma_M \gamma_F})$

Resistance side

F_{limit}	Load-bearing capacity limit (maximum load-bearing capacity to be applied; for steel, e.g. the yield strength) corresponds to the characteristic value of the resistance R_k .
$F_{\text{perm.}}$	Permissible load-bearing capacity.
γ_{tot}	Absolute safety factor depending on the type of material Steel: $\gamma_{\text{tot}} = 1.65$ Timber: $\gamma_{\text{tot}} = 2.17$

Load side

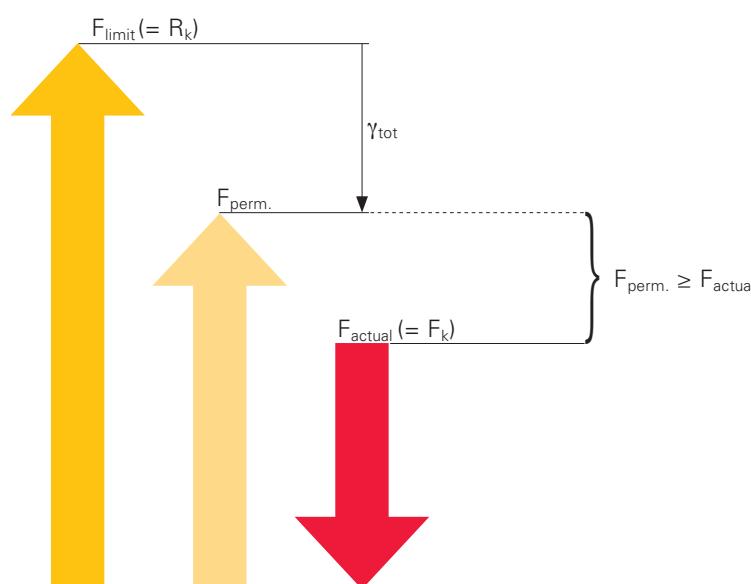
F_{actual}	Actual action (e.g. actual dead load, assumed live load, assumed wind load) corresponds to the characteristic value of the action F_k .
---------------------	---

Effective safety against failure is given for both design methods. The only important thing is that it is clear to the user which value is to be used.

Note:

This design method corresponds to DIN 4421. Through the assumption of a determined safety factor for actions of $\gamma_F = 1.5$, this proof is on the safe side.

Principle of the design method with absolute safety factor



Note:

All tables in the PERI design tables or in the PERI brochures which are not separately marked, feature permissible load-bearing capacities in accordance with this design method. After multiplication using $\gamma_F = 1.5$, the maximum load-bearing capacity can also be converted into a design value of the resistance R_d for the method with partial safety factors.

1. Important terms

$\sigma_{hk,max}$ = maximum value of the fresh concrete pressure to be applied

$\sigma_{hk,S}$ = max. horizontal fresh concrete pressure of the formwork

t_E = time from the first addition of water until complete setting of the concrete

SVB = self-compacting concrete

$T_{c,plac in}$ = temperature of the fresh concrete directly after placing

$T_{c,Ref}$ = reference temperature of the fresh concrete for determining the t_E

T_c = fresh concrete temperature

v = rate of rise m/h

γ_c = bulk density of the fresh concrete

2. Consistency classes according to DIN 1045-2:2008-08, Table 6

Class	Flow diameter	Consistency range
F 1	$\leq 34 \text{ cm}$	stiff
F 2	$35 - 41 \text{ cm}$	plastic
F 3	$42 - 48 \text{ cm}$	soft
F 4	$49 - 55 \text{ cm}$	very soft
F 5	$56 - 62 \text{ cm}$	flowable
F 6	$63 - 70 \text{ cm}$	highly flowable
SVB	$> 70 \text{ cm}$	self-compacting

3. Charts for determining the fresh concrete pressure

The fresh concrete pressure $\sigma_{hk,max}$ is dependent on the rate or rise v , consistency class and end of setting t_E , see Charts 1 – 5.

Boundary conditions according to DIN 18218:2010-01, Section 4.4

- bulk density of the fresh concrete $\gamma_c = 25 \text{ kN/m}^3$.
- vertical formwork.
(max. inclination $+/- 5^\circ$).
- formwork must be tightly closed.
- concrete is placed from above.
use internal vibrator for F1 – F6.
- no vibrator is to be used with self-compacting concrete.
- end of setting does not exceed t_E .
- the average rate of rise v is maximum 7.0 m/h at all points with F1; F2; F3; F4.
- $T_{c,plac in} = T_{c,Ref}$
- $T_c \geq T_{c,plac in}$

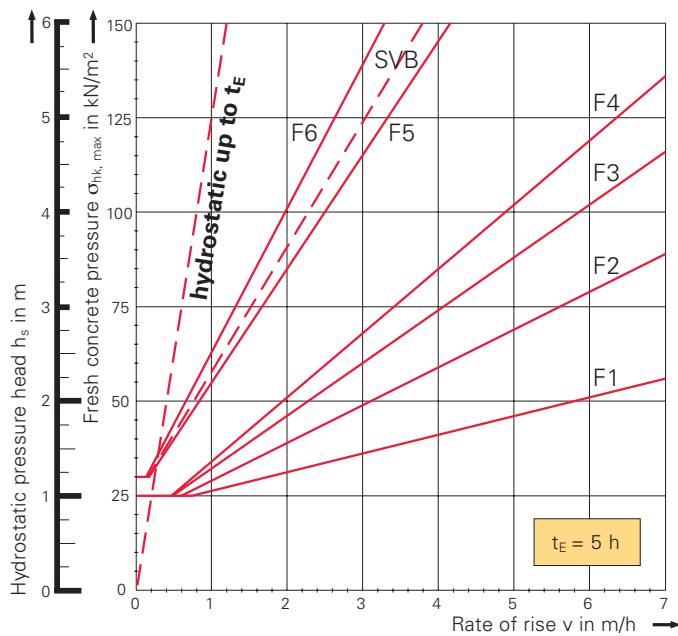
When complying with the boundary conditions, the following applies:

$$\sigma_{hk,S} = \sigma_{hk,max}$$

Otherwise $\sigma_{hk,max}$ is to be determined separately. DIN 18218 applies; alternatively, the PERI Formwork Load Monitor can be used.

The maximum fresh concrete pressure or the permissible rate of rise can be determined with the help of the PERI Formwork Load Monitor available at www.peri.de (Apps and Tools).

Chart 1
according to DIN 18218:2010-01, Fig. B.1



Pressure of fresh concrete on vertical formwork

Chart 2
according to DIN 18218:2010-01, Fig. B.2

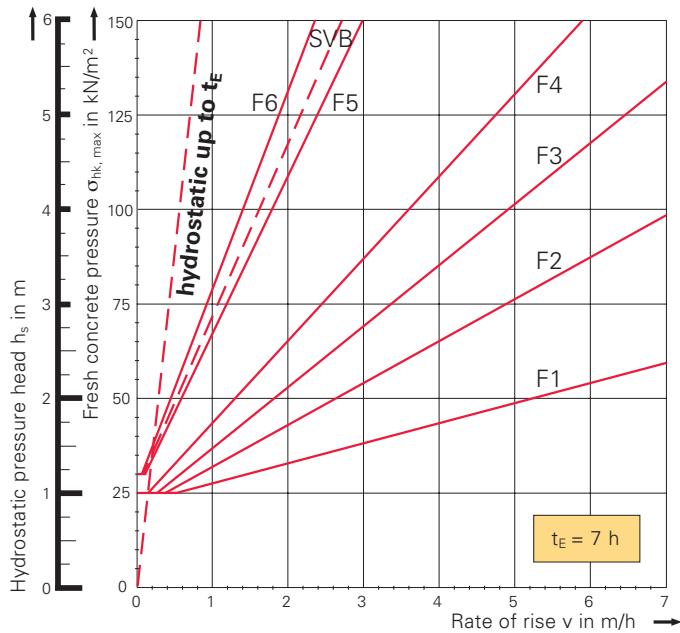


Chart 3
according to DIN 18218:2010-01, Fig. B.3

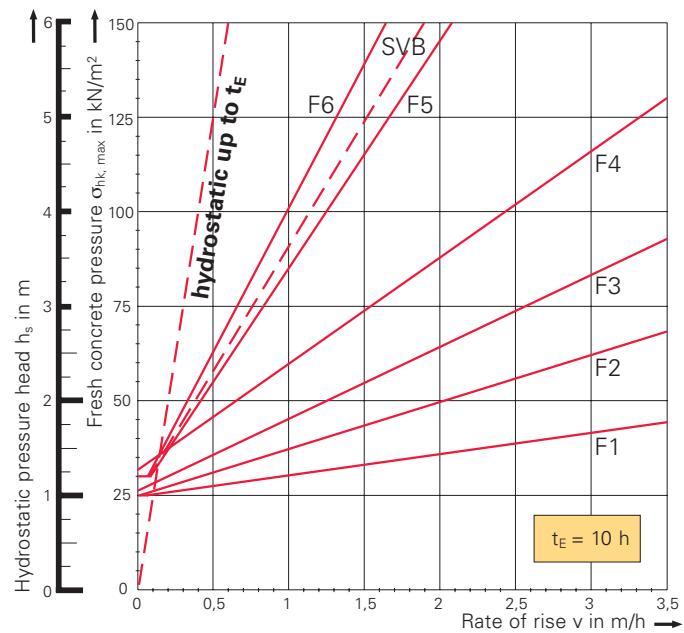


Chart 4
according to DIN 18218:2010-01, Fig. B.4

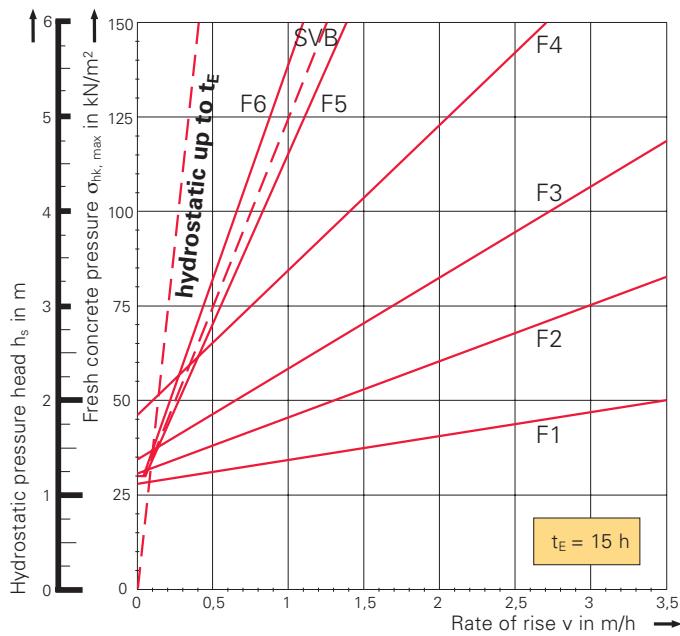
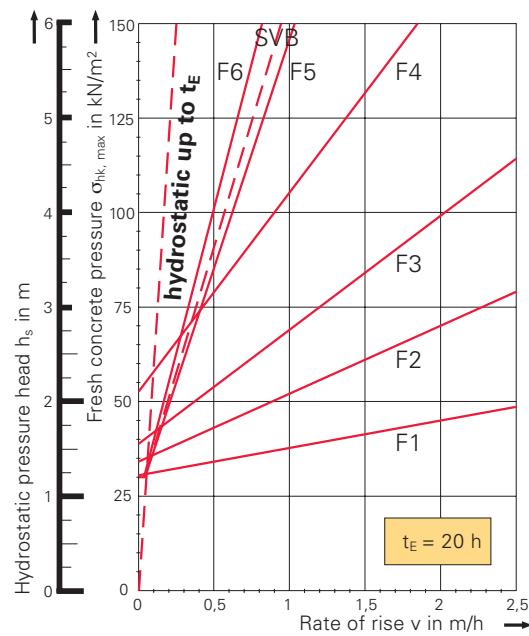


Chart 5
according to DIN 18218:2010-01, Fig. B.5



DIN 18202

Tolerances in Building Construction

Extract from DIN 18202, Tolerances in Building Construction, Edition April 2013

Table 3. Deflection tolerances

Column	1	2	3	4	5	6
	Position deviations (limit values), in mm, for distance of measuring points in m, up to					
	0.1	1 ¹⁾	4 ¹⁾	10 ¹⁾	15 ^{1) 2)}	
1	Unfinished surfaces of slabs, concrete bases and subfloors	10	15	20	25	30
2a	Unfinished slabs or bottom slabs for accommodating floor structures, e.g. bonded screeds or unbonded screeds, floating screeds, industrial floors, tiles or composite plate flooring on a bed of mortar	5	8	12	15	20
2b	Slabs with finished surfaces or composite plate flooring for secondary purposes, e.g. in stores, cellars, monolithic concrete floors					
3	Floors with finished surfaces, e.g. screeds as wearing surfaces, screeds to take flooring, tiles, trowelled finishes and glued flooring	2	4	10	12	15
4	Floors with finished surfaces to more stringent specifications, e.g. with self-levelling screeds	1	3	9	12	15
5	Wall surfaces and soffits of structural slabs that are unfinished	5	10	15	25	30
6	Wall surfaces and soffits of slabs that are finished, e.g. plastered walls, wall claddings, suspended ceilings	3	5	10	20	25
7	As in Line 6, but with more stringent specifications	2	3	8	15	20

1) Intermediate values are to be taken from Fig. 5 and 6 and rounded up to full mm.

2) The limit values for deflection deviations of Column 6 shall also apply for check point intervals over 15 m.

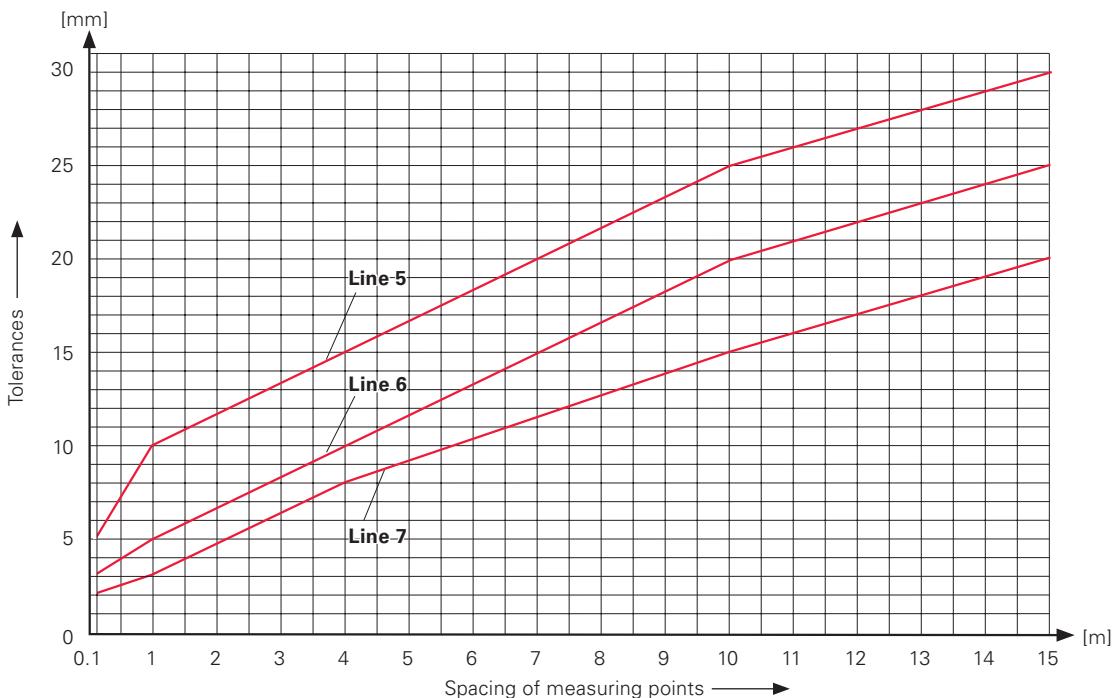


Fig. 6

Deflection tolerances of wall surfaces and slab soffits (according to lines in Table 3).

Tolerances in Building Construction

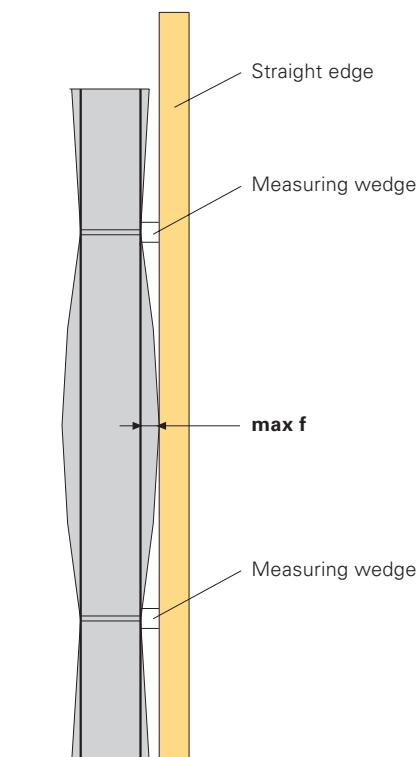
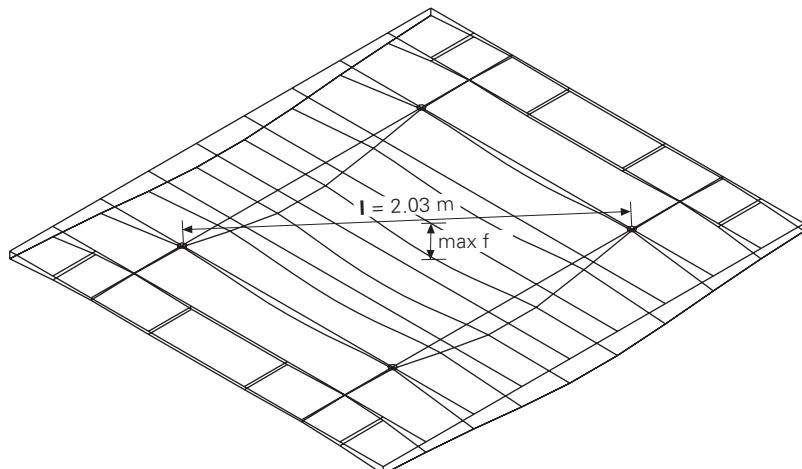
Measurement of deflection

With our large panels, the tie points can normally be taken as reference or check points. In accordance with the diagram below, a straight edge is applied in such a way that it touches the stripped concrete wall, with the two measuring wedges showing the same deflection. This deflection is to be compared to the permissible deflection.

Example:

TRIO panel 270 x 240: maximum deformation is measured in the middle of the panel.

According to DIN 18202, Fig. 2, with a check point interval of about 2.0 m and complying with Line 7, a maximum deflection of approx. 4.8 mm is permissible.



The permissible deflection is always determined from the check point interval (here, the tie point interval).

Formlining

Overview, Static Values

Plywood

Type of plywood	Thickness [mm]	Veneers	E-Modulus [N/mm ²] parallel/cross	Perm. σ [N/mm ²] parallel/cross
Fin-Ply	21	Birch	8560/6610	15.0/12.4
Fin-Ply, Maxi	20	Birch	7500/5760	13.0/10.5
Fin-Ply, USA	19 / ¾"	Birch	6180/6880	12.0/11.5
Fin-Ply	18	Birch	8730/6440	15.3/12.2
PERI Birch	21	Birch	8560/6610	15.0/12.4
PERI Birch, USA	19 / ¾"	Birch	9170/7060	15.7/13.6
PERI Spruce 400	21	Conifer Timber	7000/4130	8.3/6.3
3-Ply Plywood	27	Spruce	8000/1070	4.9/1.5
3-Ply Plywood	21	Spruce	8000/1070	5.9/1.3
FinNa-Ply	21	Conifer Timber	7910/3710	8.0/5.0

The statical/mechanical values given in the table refer to a moisture content of 15% according to the information from the manufacturers.

However, according to the GSV, the values should take into consideration a wood moisture content of 20%. The values for the E-Modulus are therefore to be reduced by a factor of 0.9167 and the values for the permissible stress by a factor of 0.875.

The fibres of the face veneer span in the direction of the first length shown for the plywood size.

Solid Timber

	E-Modul [N/mm ²] parallel	Perm. σ [N/mm ²] parallel
Conifer Timber, Sorting Class C24	11000	11

The permissible value according to DIN 1052 results in a short duration of load for Application Class 2.

Formlining

Plywood 18 mm

PERI

The E-Modulus and the permissible stress are based on the grade and moisture content of the plywood.
(See "Overview, Static Values")

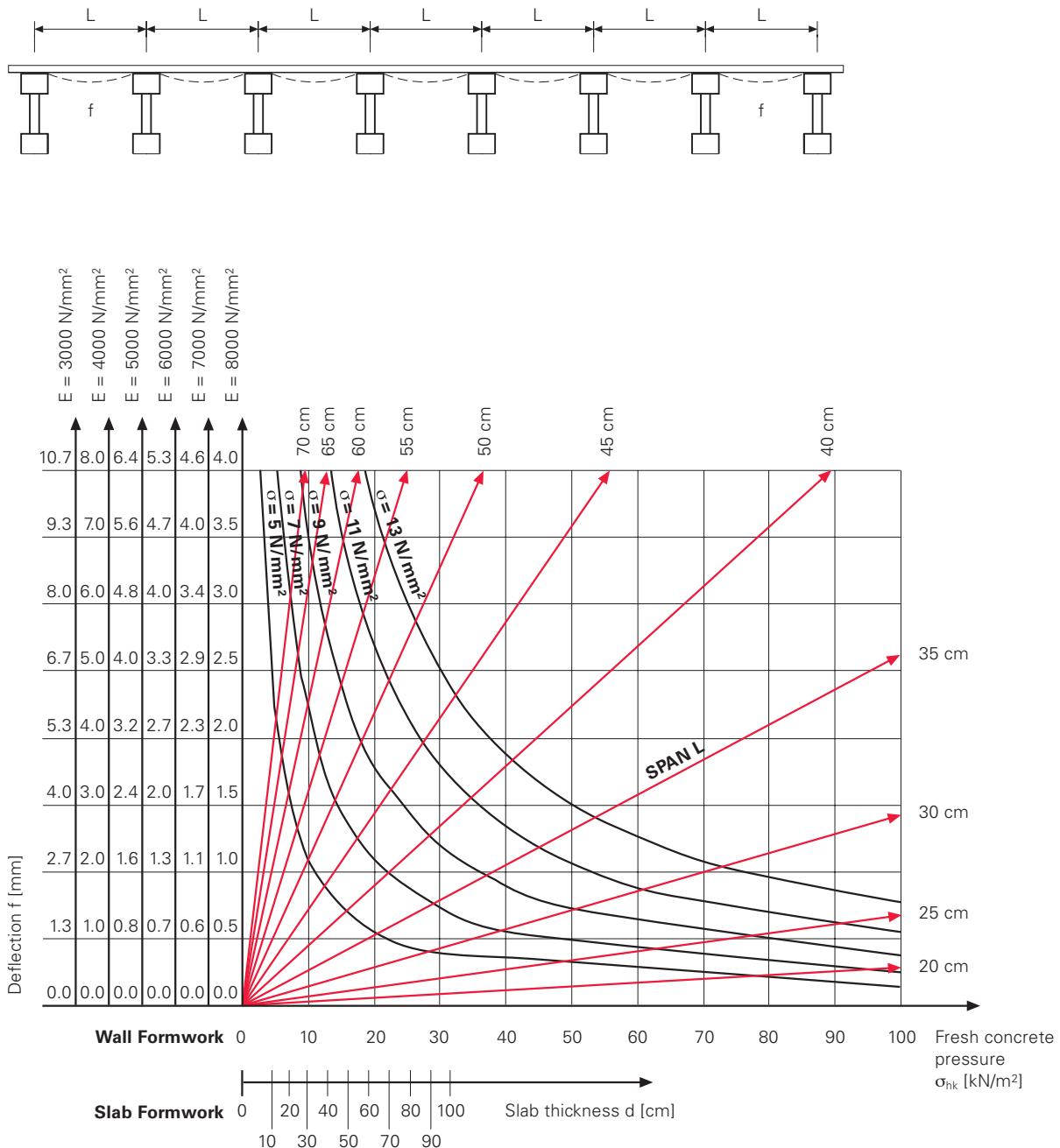
max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$

(valid for min. 3 spans)



Formlining

Plywood 19 mm / 3/4"

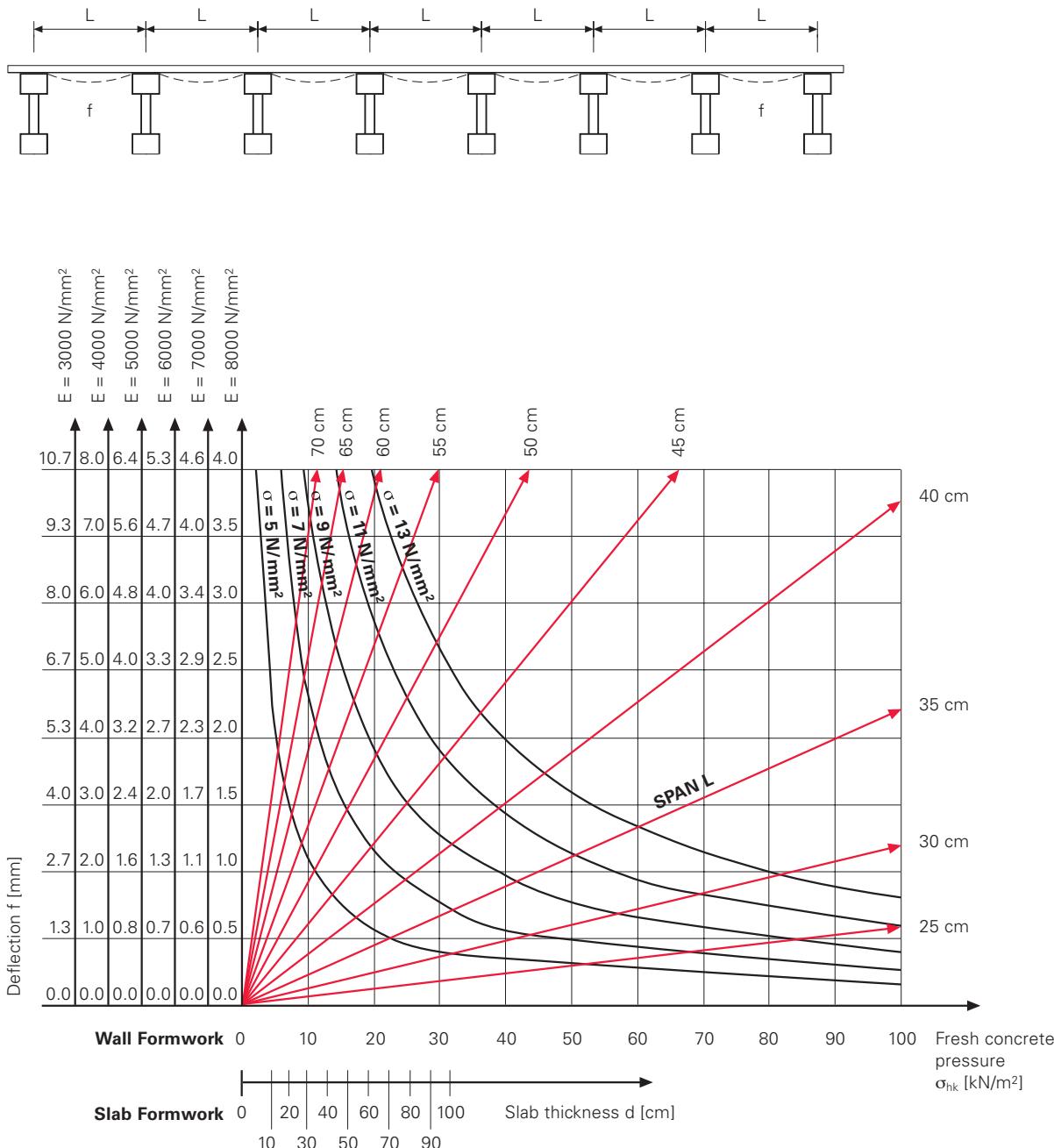
The E-Modulus and the permissible stress are based on the grade and moisture content of the plywood.
(See "Overview, Static Values")

max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment
(valid for min. 3 spans)

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$



Formlining

Plywood 21 mm

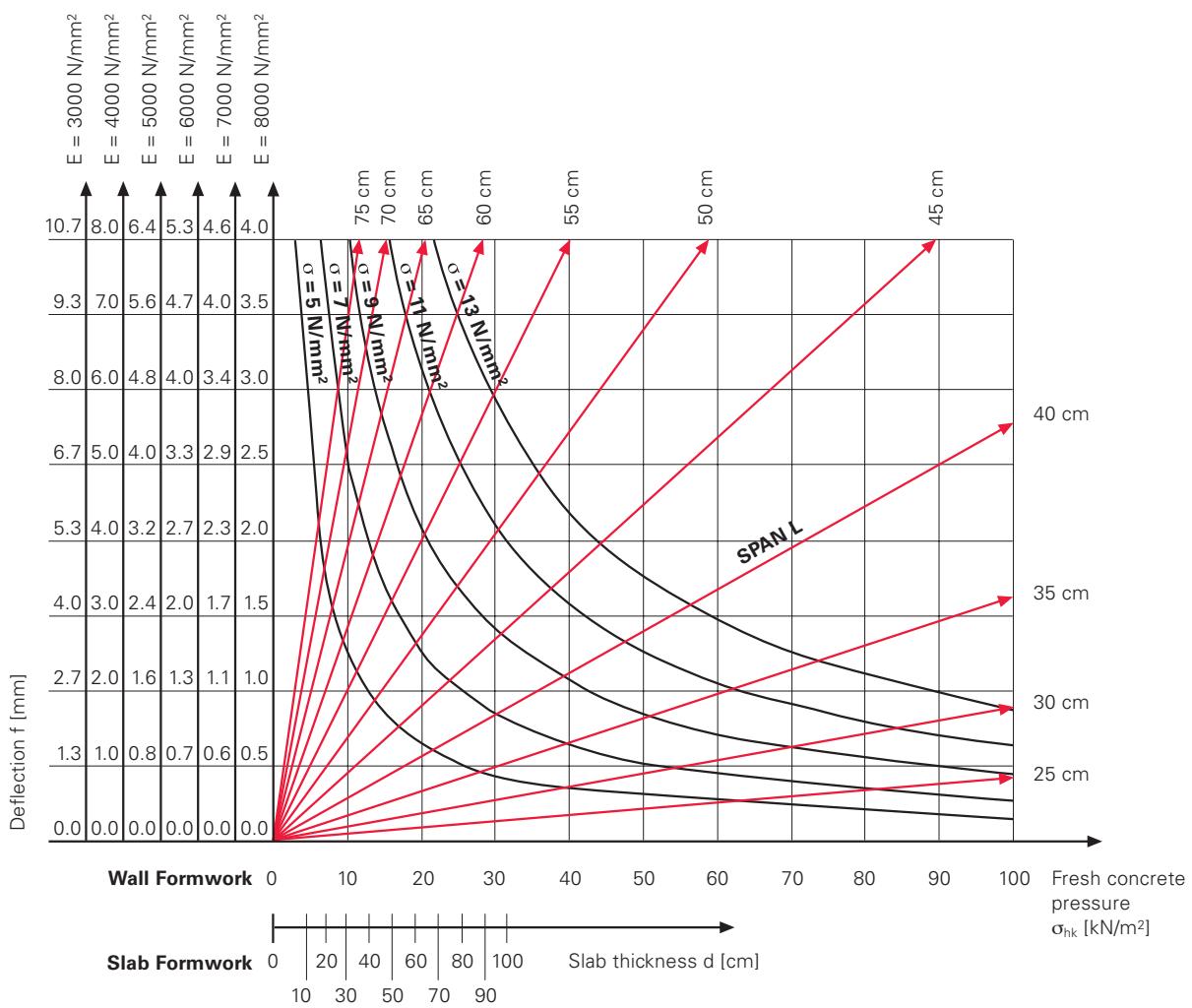
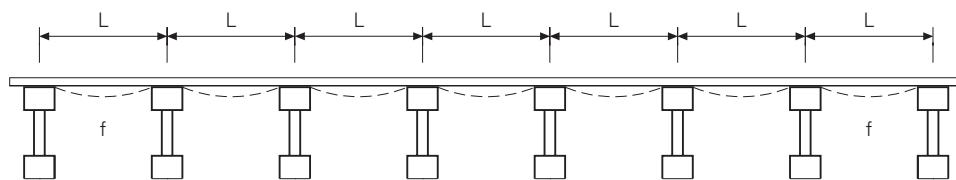
The E-Modulus and the permissible stress are based on the grade and moisture content of the plywood.
 (See "Overview, Static Values")

max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment
 (valid for min. 3 spans)

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$



Formlining

Plywood 27 mm

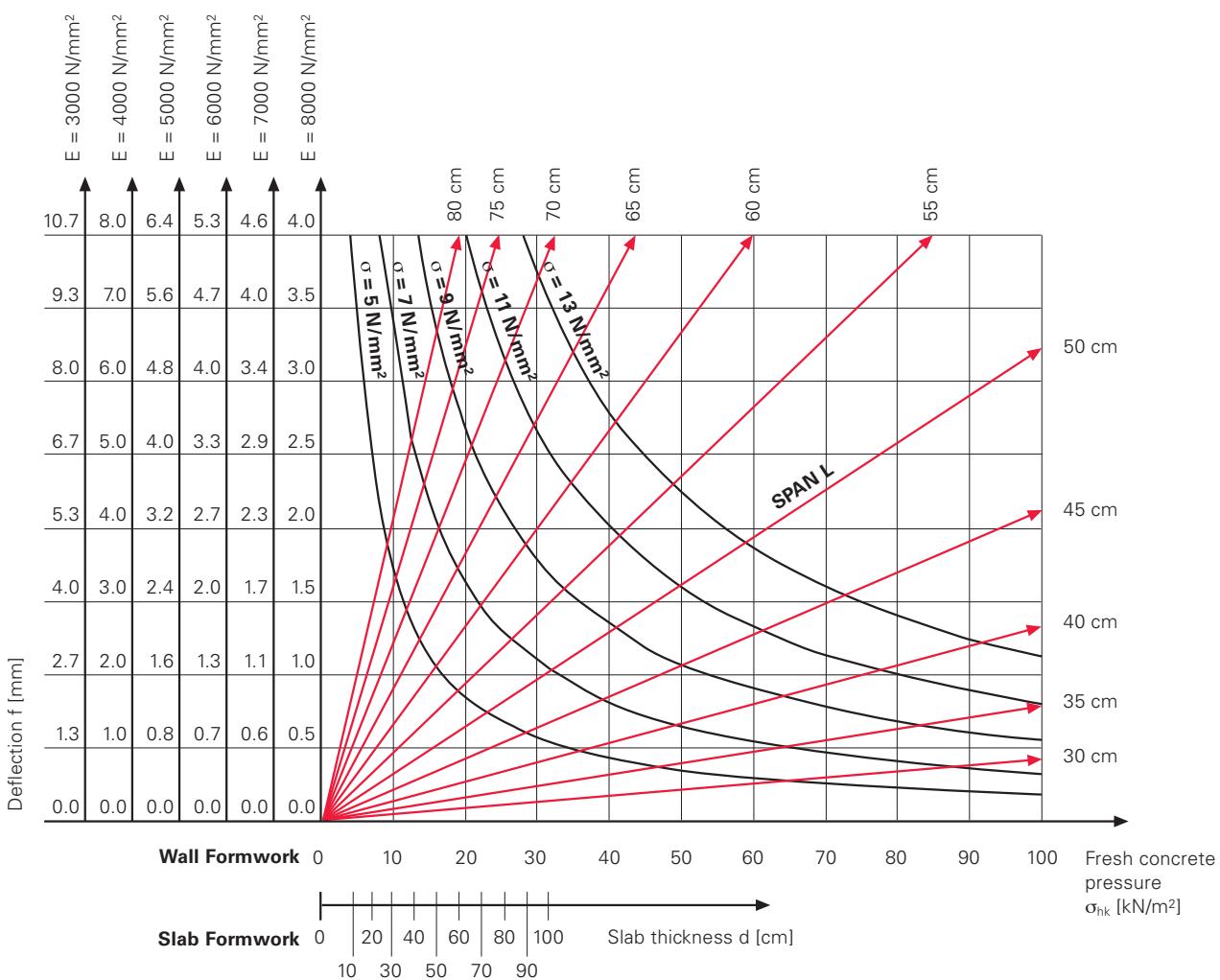
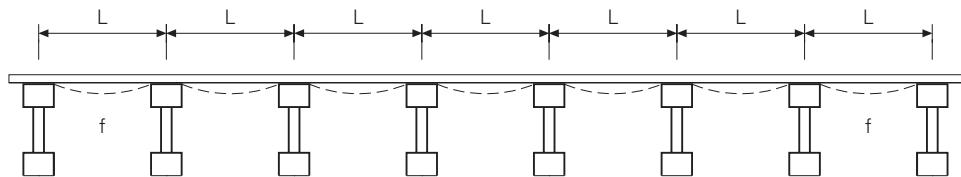
The E-Modulus and the permissible stress are based on the grade and moisture content of the plywood.
(See "Overview, Static Values")

max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment
(valid for min. 3 spans)

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$



Formlining

Timber Boarding 21 mm

$E = 11000 \text{ N/mm}^2$

$\sigma = 11 \text{ N/mm}^2$

Formlining: tongue and groove boards

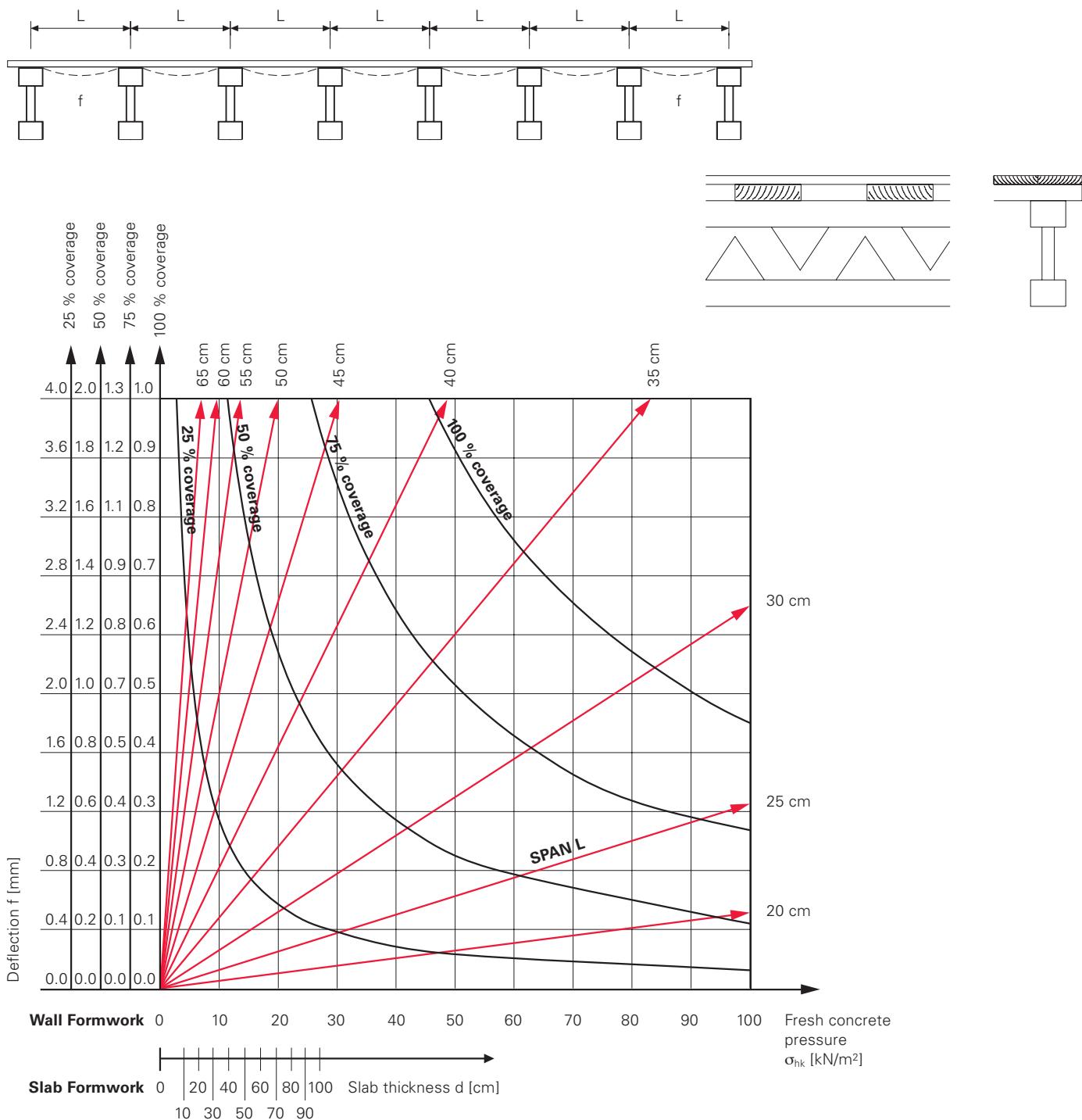
max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$

(valid for min. 3 spans)



Formlining

Timber Boarding 27 mm

$E = 11000 \text{ N/mm}^2$

$\sigma = 11 \text{ N/mm}^2$

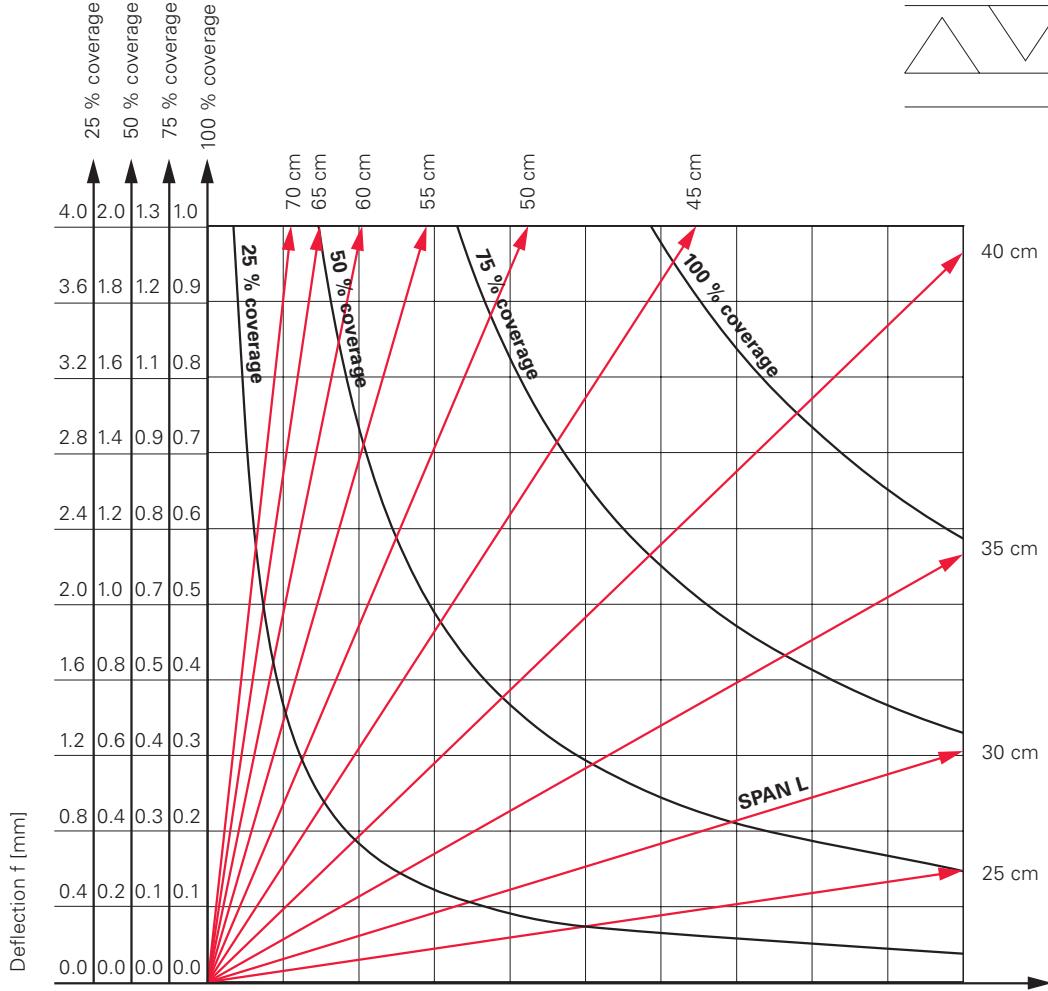
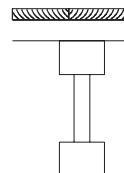
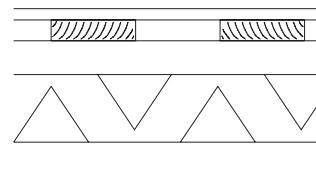
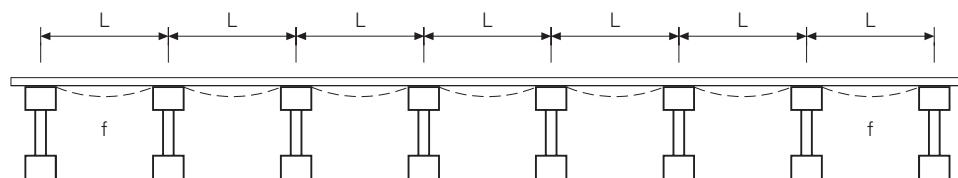
Formlining: tongue and groove boards

max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment
(valid for min. 3 spans)

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$



Wall Formwork 0 10 20 30 40 50 60 70 80 90 100 Fresh concrete pressure σ_{hk} [kN/m^2]

Slab Formwork 0 20 40 60 80 100 Slab thickness d [cm]

Formlining

Timber Boarding 37 mm

$E = 11000 \text{ N/mm}^2$

$\sigma = 11 \text{ N/mm}^2$

Formlining: tongue and groove boards

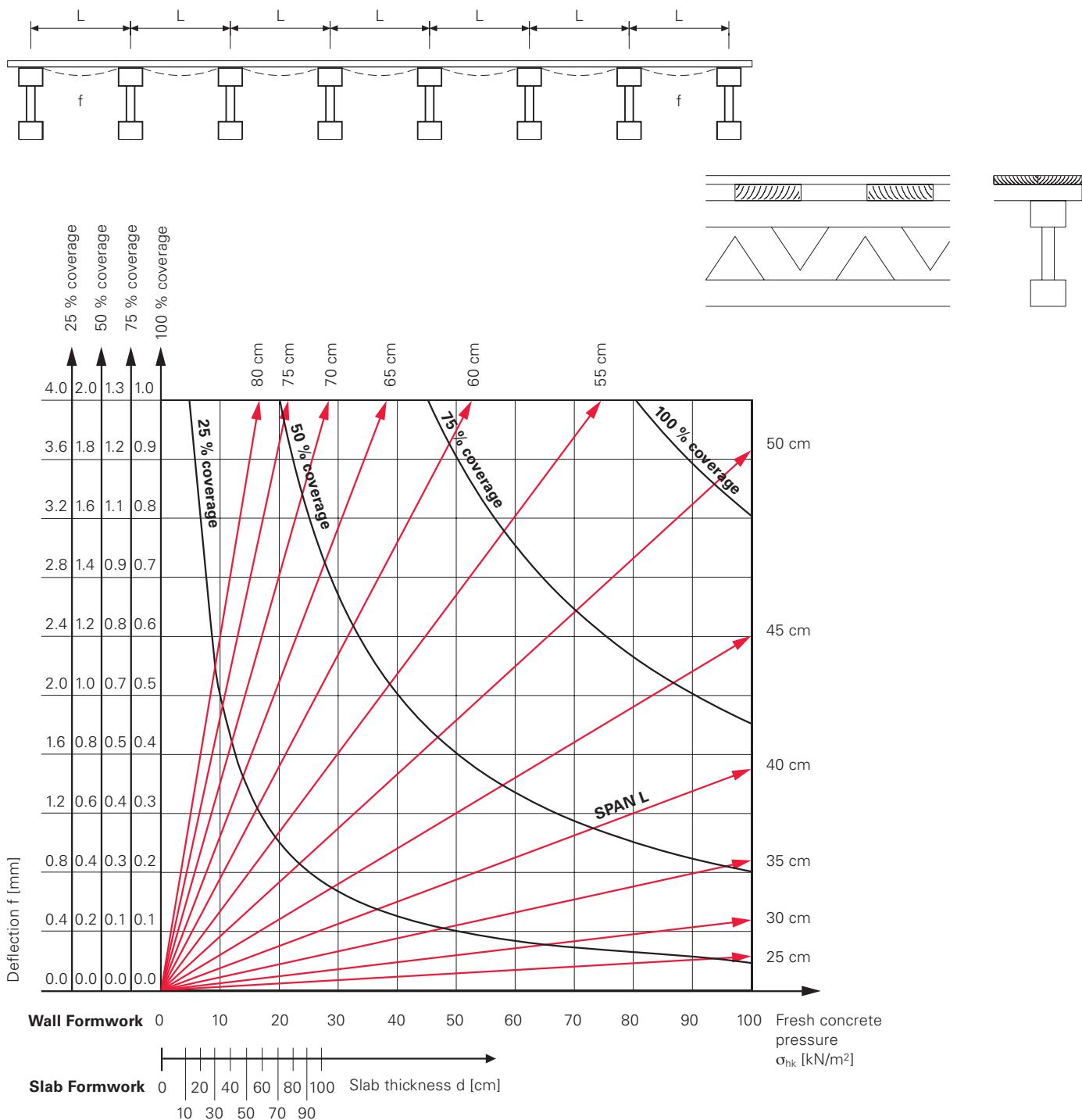
max. deflection

$$f = \frac{0.0068 \cdot \sigma_{hk} \cdot L^4}{E \cdot I}$$

max. moment

$$M = 0.1071 \cdot \sigma_{hk} \cdot L^2$$

(valid for min. 3 spans)



Formwork Girders

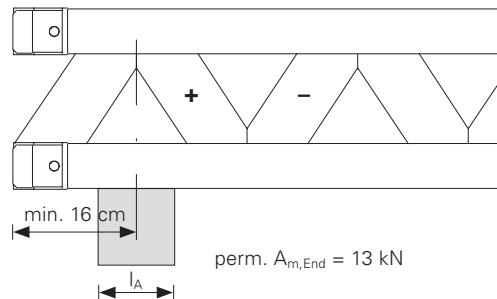
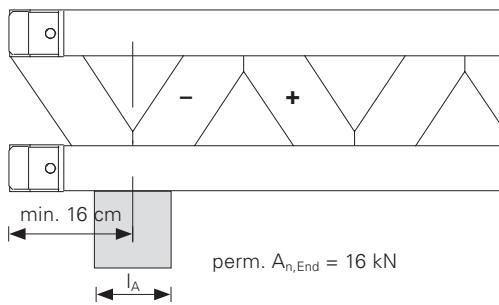
GT 24 Girder

Permissible internal forces and bearing forces

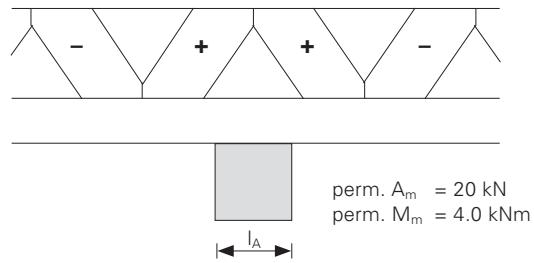
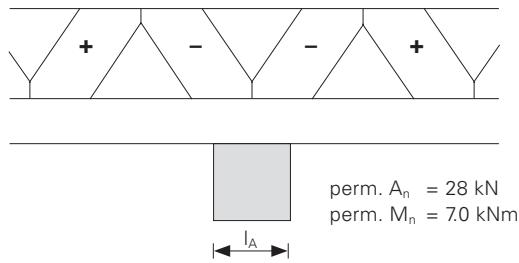
Permissible shear force	perm. Q = 13.0 kN
Permissible bearing force in the nodes (+/- 2 cm)	perm. A _n = 28.0 kN
Permissible bearing force between the nodes	perm. A _m = 20.0 kN
Permissible bending moment	perm. M = 7.0 kNm
Permissible support moment (for support directly under the nodes)	perm. M _n = 7.0 kNm
Permissible support moment (support between the nodes)	perm. M _m = 4.0 kNm

Bending stiffness EI = 887 kNm²

End supports for single spans and continuous girders



Supports for continuous and cantilevered girders



For carrying the maximum bearing force into the GT 24 girder, the support lengths l_A must have the following minimum dimensions:

l_A = 13.5 cm for support directly under the nodes
l_A = 14.5 cm for support between the nodes

Formwork Girders

GT 24 Girder

Bearing pressure:

Reaction force perm. $A = b \times L_{\text{eff}} \times k_c \times \text{perm. } \sigma_{D\perp}$

b = support width

L_{eff} = effective support length

= $L_A + 2 \times 3 \text{ cm}$, but

$\leq 2 \times L_A$

Design-typical lateral pressure coefficient for

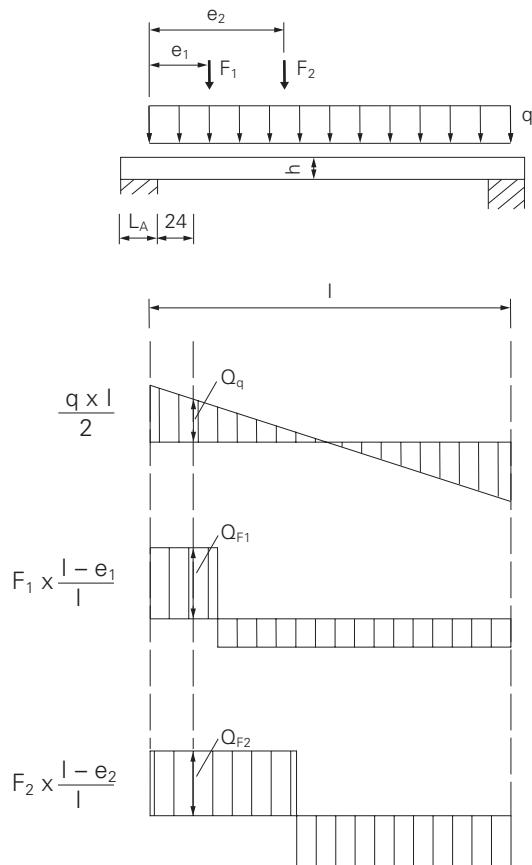
support directly under the nodes $k_{c,90,n} = 1.45$

support between the nodes $k_{c,90,m} = 1.0$

bearing pressure $\text{perm. } \sigma_{D\perp} = 1.24 \text{ N/mm}^2$

Specified shear forces

For the design, the shear forces (external loads) may be reduced as follows:



$$Q_{q,\text{red}} = \frac{q \times l}{2} \times \left(1 - \frac{L_A}{l} - \frac{48 \text{ cm}}{l}\right)$$

$$e_1 < 60 \text{ cm}: Q_{F1,\text{red}} = F_1 \times \frac{l - e_1}{l} \times \frac{e_1}{60 \text{ cm}}$$

$$e_2 > 60 \text{ cm}: Q_{F2} = F_2 \times \frac{l - e_2}{l}$$

$$Q_{\text{red}} = Q_{q,\text{red}} + Q_{F1,\text{red}} + Q_{F2}$$

$$\boxed{Q_{\text{red}} \leq \text{perm. } Q = 13 \text{ kN}}$$

In addition, the shear force

$$Q = Q_q + Q_{F1} + Q_{F2}$$

must be verified directly over the support.

$$\boxed{Q \leq \text{perm. } Q_n = 16 \text{ kN}}$$

The following applies for cantilever beams: $l = 2 \times l_k$.

Formwork Girders

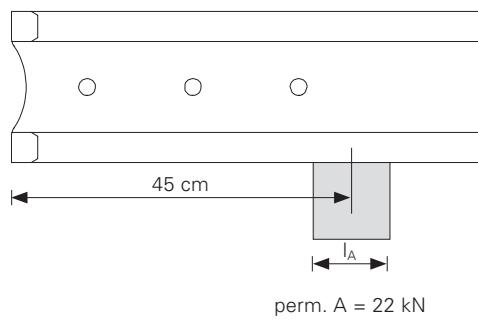
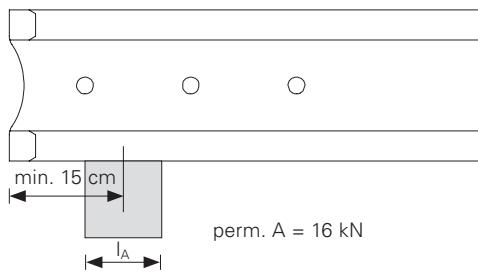
VT 20 Girder

Permissible internal forces and reaction forces:

Permissible shear force perm. $Q = 11.0 \text{ kN}$
 Permissible reaction force perm. $A = 22.0 \text{ kN}$
 Permissible bending moment perm. $M = 5.0 \text{ kNm}$

Bending stiffness $EI = 460 \text{ kNm}^2$

End supports for single spans and continuous girders



The projecting length of the girder must be at least 15 cm.

Depending on the projecting length of the girder between the two values $A = 16 \text{ kN}$ and max. perm. $A = 22 \text{ kN}$, the permissible bearing load can be linearly interpolated.

For transferring the maximum reaction force into the VT 20 girder, the support length l_A must be at least 13.5 cm.

Bearing pressure:

Reaction force perm. $A = b \times L_{\text{eff}} \times k_c \times \text{zul. } \sigma_{D\perp}$

b = support width

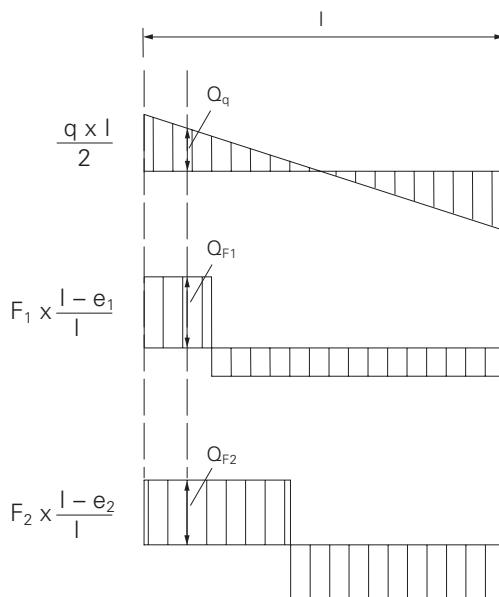
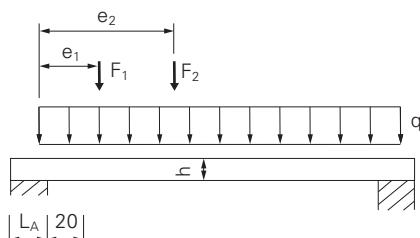
L_{eff} = effective support length

= $l_A + 2 \times 3 \text{ cm}$, but $\leq 2 \times l_A$

Design-typical lateral pressure coefficient with $k_{c,90,n} = 1.15$

Bearing pressure perm. $\sigma_{D\perp} = 1.24 \text{ N/mm}^2$

Specified shear forces



For the design, the shear forces (external loads) may be reduced as follows:

$$Q_{q,\text{red}} = \frac{q \times l}{2} \times \left(1 - \frac{l_A}{l} - \frac{40 \text{ cm}}{l} \right)$$

$$e_1 < 50 \text{ cm}: Q_{F1,\text{red}} = F_1 \times \frac{l - e_1}{l} \times \frac{e_1}{50 \text{ cm}}$$

$$e_2 > 50 \text{ cm}: Q_{F2,\text{red}} = F_2 \times \frac{l - e_2}{l}$$

$$Q_{\text{red}} = Q_{q,\text{red}} + Q_{F1,\text{red}} + Q_{F2,\text{red}}$$

$$Q_{\text{red}} \leq \text{perm. } Q = 11 \text{ kN}$$

In addition, the shear force

$$Q = Q_q + Q_{F1} + Q_{F2}$$

must be verified directly over the support.

$$Q \leq \text{perm. } Q_n = 16 \text{ kN}$$

The following applies for cantilever beams: $l = 2 \times l_k$.

Formwork Girders

MPB 24 Girder

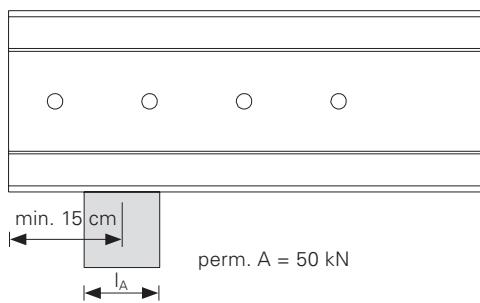
Permissible internal forces and reaction forces:

Permissible shear force* perm. Q = 50 kN
Permissible reaction force perm. A = 80 kN
Permissible bending moment perm. M = 15 kNm

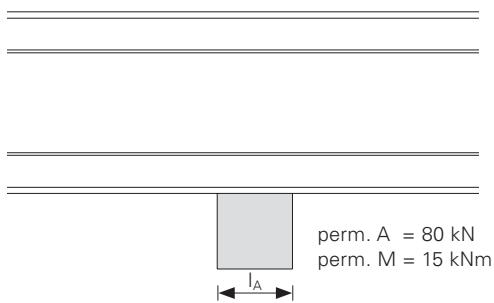
Bending stiffness EI = 1600 kNm²

* for end support = permissible bearing load

End supports for single spans and continuous girders



Supports for continuous and cantilevered girders



For transferring the maximum reaction force into the MPB 24 girder, the support length l_A must be at least 15 cm.

VARIO GT 24

Tips and Examples

Reaction forces on the GT 24 girder

The reaction forces are calculated as the waler load A or B multiplied by the actual girder spacing a_{actual} .

$$F_A = A \cdot a_{actual}$$
$$F_B = B \cdot a_{actual}$$
$$\text{etc.}$$

Formula for calculating the bearing load.

Example:

- girder 2.69 m
- System 1
- fresh concrete pressure 50 kN/m²
- actual girder spacing $a_{actual} = 40$ cm

Deflection calculations for the GT 24

$$f_{actual} = \frac{f_{K/F} \cdot a_{actual}}{a_{perm}}$$

Formula for calculating if girder is not used to full capacity.

Example:

- girder 2.69 m
- System 1
- fresh concrete pressure 50 kN/m²
- actual girder spacing $a_{actual} = 40$ cm

From the table:

- perm. girder spacing $a_{perm.} = 50$ cm
- deflection $f_K = 1.0$ mm on the cantilever section

Maximum deflection of the girder

$$f_{Kactual} = \frac{1.0 \cdot 40}{50} = 0.8 \text{ mm}$$

Effect of the moisture content on the deflection of the GT 24 girder

The PERI GT 24 girder consists of a lattice work of members that are all stressed in the direction of the longitudinal fibres of the timber. The timber is dimensionally stable in this direction when the moisture content changes.

The deflection of the GT 24 is only slightly dependent on the moisture content. Tests have shown that a change in the moisture content from 12% to 25% increases the deflection by approx. 10%.

VARIO GT 24

Girder GT 24, l = 2.69 m

PERI

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler load [kN/m]				
			f_k	f_F	A	B	C	D	E

f_k = cantilever deflection
 f_F = span deflection

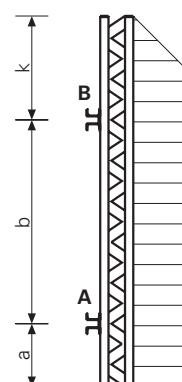
System 1									
a = 0.46 b = 1.48 k = 0.75	30	0.76	-1.3	1.0	37	25			
	40	0.58	-1.2	0.9	48	27			
	50	0.50	-1.0	0.8	56	27			
	60	0.45	-0.8	0.6	62	27			
	70								
	80								

Calculated example

System 2			Waler position for Brace Frame SB-1						
a = 0.46 b = 1.78 k = 0.46	30	0.68	-1.8	2.3	41	22			
	40	0.54	-1.6	2.0	52	23			
	50	0.46	-1.3	1.7	61	23			
	60	0.42	-1.1	1.4	66	22			
	70								
	80								

System 3									
a = 0.46 b = 2.07 k = 0.16	30	0.58	-2.1	3.4	44	18			
	40	0.50	-2.0	3.2	56	19			
	50	0.44	-1.6	2.8	64	19			
	60	0.41	-1.3	2.4	69	19			
	70								
	80								

System 4									
a = 0.46 b = 1.18 k = 1.05	30	0.88	1.5	0.1	30	32			
	40	0.68	1.0	0.1	41	34			
	50	0.56	0.8	0.1	50	34			
	60	0.51	0.9	0.1	55	33			
	70								
	80								



*See "Tips and Examples" for explanation

VARIO GT 24

Girder GT 24, $l = 2.99 \text{ m}$

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				f_k	f_F	A	B	C

f_k = cantilever deflection
 f_F = span deflection

System 1

$a = 0.46$ $b = 1.48$ $k = 1.05$	30	0.78	-0.4	0.7	35	36		
	40	0.60	-0.5	0.8	47	40		
	50	0.48	-0.6	0.7	58	41		
	60	0.42	-0.4	0.6	66	40		
	70	0.41	-0.3	0.5	69	40		
	80							

System 2

Waler position for Brace Frame SB-1

$a = 0.46$ $b = 1.78$ $k = 0.75$	30	0.68	-2.7	2.2	41	30		
	40	0.52	-2.5	2.1	54	33		
	50	0.43	-2.2	1.9	65	34		
	60	0.39	-1.9	1.6	72	34		
	70	0.37	-1.8	1.4	76	33		
	80							

System 3

$a = 0.46$ $b = 2.22$ $k = 0.31$	30	0.47	-2.4	4.0	47	24		
	40	0.39	-2.3	3.9	60	27		
	50	0.37	-2.2	3.8	71	27		
	60	0.35	-2.1	3.6	79	27		
	70	0.34	-1.8	3.3	83	26		
	80							

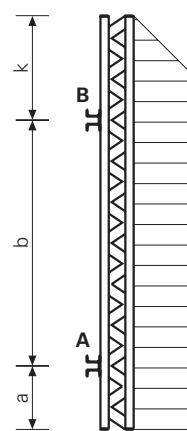
System 4

$a = 0.46$ $b = 2.07$ $k = 0.46$	30	0.54	-2.4	3.5	45	26		
	40	0.44	-2.3	3.4	58	29		
	50	0.41	-2.2	3.2	69	29		
	60	0.36	-2.0	2.8	77	29		
	70	0.35	-1.8	2.6	81	28		
	80							

System 5

$a = 0.46$ $b = 2.37$ $k = 0.16$	30	0.41	-2.6	4.5	49	23		
	40	0.35	-2.5	4.4	62	25		
	50	0.35	-2.6	4.6	73	25		
	60	0.35	-2.5	4.4	81	25		
	70	0.33	-2.2	4.1	84	25		
	80							

*See "Tips and Examples" for explanation



Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler load [kN/m]				
			f_k	f_F	A	B	C	D	E

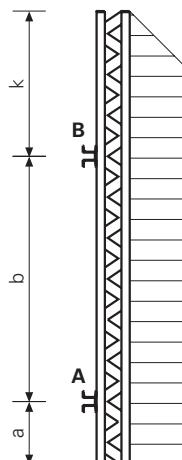
f_k = cantilever deflection
 f_F = span deflection

System 1		
a = 0.46	30	0.57
	40	0.51
	50	0.48
	60	0.42
	70	0.38
	80	0.37

System 2		
a = 0.46	30	0.59
	40	0.53
	50	0.42
	60	0.37
	70	0.34
	80	0.33

System 3		
a = 0.46	30	0.50
	40	0.41
	50	0.37
	60	0.34
	70	0.31
	80	0.30

System 4		
a = 0.46	30	0.74
	40	0.61
	50	0.54
	60	0.45
	70	0.41
	80	0.39



*See "Tips and Examples" for explanation

VARIO GT 24

Girder GT 24, $l = 3.58 \text{ m}$

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				f_k	f_F	A	B	C

f_k = cantilever deflection
 f_F = span deflection

System 1

$a = 0.46$	30	0.58	-0.2	0.4	34	48	8		
$b = 1.48$	40	0.48	-0.2	0.5	46	58	7		
$c = 1.48$	50	0.44	-0.3	0.6	58	64	6		
$k = 0.16$	60	0.41	-0.3	0.6	69	67	6		
	70	0.36	-0.2	0.5	78	67	6		
	80	0.33	-0.1	0.5	84	66	6		

System 2

$a = 0.46$	30	0.57	-3.8	3.2	44	45			
$b = 2.07$	40	0.41	-4.2	3.2	59	51			
$k = 1.05$	50	0.35	-4.4	3.3	73	55			
	60	0.33	-4.4	3.3	85	56			
	70	0.30	-4.0	3.0	94	56			
	80	0.28	-3.7	2.7	100	56			

System 3

Waler position for Brace Frame SB-1

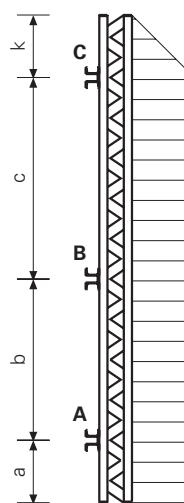
$a = 0.46$	30	0.53	2.1	0.8	36	53			
$b = 1.78$	40	0.47	-0.8	1.3	50	60			
$k = 1.35$	50	0.42	-1.0	1.6	64	64			
	60	0.37	-1.0	1.5	76	66			
	70	0.33	-0.9	1.4	85	66			
	80	0.31	-0.7	1.2	90	65			

System 4

$a = 0.46$	30	0.64	-0.3	0.2	29	44	15		
$b = 1.18$	40	0.51	-0.2	0.2	40	55	16		
$c = 1.48$	50	0.45	-0.4	0.4	51	62	15		
$k = 0.46$	60	0.43	-0.4	0.3	61	65	15		
	70	0.39	-0.4	0.3	71	65	15		
	80	0.36	-0.3	0.3	77	64	15		

System 5

$a = 0.46$	30	0.76	0.2	0.2	31	37	20		
$b = 1.18$	40	0.58	0.1	0.2	41	48	21		
$c = 1.18$	50	0.51	0.1	0.2	52	55	20		
$k = 0.75$	60	0.44	0.1	0.2	63	58	20		
	70	0.39	0.1	0.2	72	58	20		
	80	0.36	0.2	0.1	78	57	20		



*See "Tips and Examples" for explanation

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler Load [kN/m]				
			f_k	f_F	A	B	C	D	E

f_k = cantilever deflection

f_F = span deflection

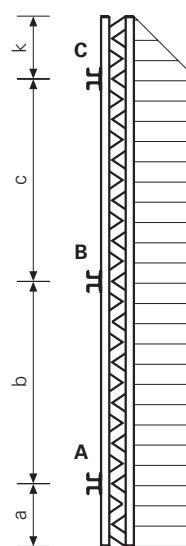
System 1		
$a = 0.46$	30	0.56
	40	0.44
	50	0.39
	60	0.36
	70	0.35
	80	0.32

System 2		
$a = 0.46$	30	0.49
	40	0.39
	50	0.34
	60	0.32
	70	0.29
	80	0.27

System 3			Waler position for Brace Frame SB-2					
$a = 0.46$	30	0.54	-1.0	1.2	27	52	19	
	40	0.43	-0.9	1.1	37	65	20	
	50	0.37	-0.8	0.9	48	75	20	
	60	0.35	-0.7	0.8	59	81	20	
	70	0.34	-0.7	0.8	69	83	19	
	80	0.34	-0.7	0.8	78	82	19	

System 4		
$a = 0.46$	30	0.64
	40	0.49
	50	0.42
	60	0.38
	70	0.37
	80	0.35

System 5		
$a = 0.46$	30	0.82
	40	0.60
	50	0.50
	60	0.44
	70	0.38
	80	0.34



*See "Tips and Examples" for explanation

VARIO GT 24

Girder GT 24, $l = 4.17 \text{ m}$

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				f_k	f_F	A	B	C

f_k = cantilever deflection
 f_F = span deflection

System 1

$a = 0.46$ $b = 1.48$ $c = 1.48$ $k = 0.75$	30	0.56	-0.5	0.4	33	50	23		
	40	0.43	-0.5	0.3	45	65	24		
	50	0.36	-0.4	0.4	57	77	24		
	60	0.33	-0.2	0.5	69	85	23		
	70	0.31	-0.3	0.6	80	89	22		
	80	0.31	-0.3	0.6	90	90	22		

System 2

Waler position for Brace Frame SB-2

$a = 0.46$ $b = 1.18$ $c = 1.78$ $k = 0.75$	30	0.54	-1.5	1.2	27	52	28		
	40	0.42	-1.4	1.1	37	67	30		
	50	0.35	-1.3	1.0	47	80	30		
	60	0.31	-1.1	0.9	58	89	30		
	70	0.30	-1.0	0.8	79	94	30		
	80	0.30	-1.0	0.8	79	94	30		

System 3

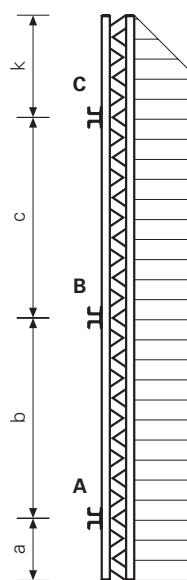
$a = 0.46$ $b = 1.18$ $c = 1.48$ $k = 1.05$	30	0.68	0.4	0.4	30	41	35		
	40	0.50	0.2	0.5	40	56	38		
	50	0.41	0.2	0.4	50	68	39		
	60	0.36	0.1	0.4	61	77	39		
	70	0.34	0.1	0.3	72	82	38		
	80	0.34	0.2	0.3	78	82	19		

System 4

$a = 0.46$ $b = 1.18$ $c = 1.18$ $d = 1.18$ $k = 0.17$	30	0.78	0.1	0.2	31	36	34	6	
	40	0.57	0.1	0.2	41	49	39	5	
	50	0.47	0.1	0.1	52	60	40	5	
	60	0.41	0.1	0.2	63	69	40	5	
	70	0.38	0.1	0.2	73	74	39	5	
	80	0.34	0.1	0.2	83	75	39	5	

System 5

$a = 0.46$ $b = 1.48$ $c = 1.78$ $k = 0.45$	30	0.49	-0.8	1.0	32	57	18		
	40	0.39	-0.7	0.8	43	72	19		
	50	0.33	-0.6	0.7	55	84	19		
	60	0.31	-0.6	0.6	67	91	18		
	70	0.29	-0.4	0.5	79	95	18		
	80	0.29	-0.4	0.5	89	96	17		



*See "Tips and Examples" for explanation

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler load [kN/m]				
			f_k	f_F	A	B	C	D	E

f_k = cantilever deflection

f_F = span deflection

System 1

$a = 0.46$ $b = 1.48$ $c = 1.48$ $k = 1.05$	30	0.60	0.6	0.4	34	47	34		
	40	0.44	-0.2	0.4	45	64	37		
	50	0.35	-0.2	0.4	57	79	37		
	60	0.31	-0.2	0.5	68	89	37		
	70	0.29	-0.3	0.5	80	96	36		
	80	0.28	-0.3	0.6	92	100	36		

System 2

$a = 0.46$ $b = 1.18$ $c = 1.78$ $k = 1.05$	30	0.57	-0.7	1.0	28	49	39		
	40	0.42	-1.1	1.1	37	66	43		
	50	0.35	-1.2	1.0	47	81	44		
	60	0.30	-1.1	0.9	57	93	45		
	70	0.28	-1.0	0.8	68	100	44		
	80	0.27	-0.9	0.8	79	104	44		

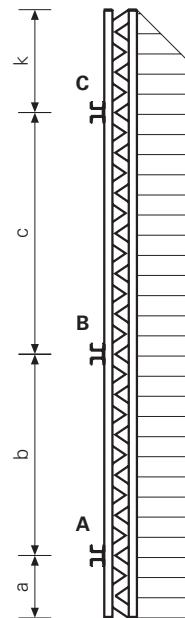
System 3

$a = 0.46$ $b = 1.48$ $c = 1.78$ $k = 0.75$	30	0.49	-1.2	1.0	32	57	27		
	40	0.38	-1.2	0.9	43	74	29		
	50	0.31	-1.0	0.8	55	89	29		
	60	0.28	-0.8	0.7	66	99	29		
	70	0.26	-0.7	0.6	78	106	28		
	80	0.26	-0.7	0.5	90	109	28		

System 4

$a = 0.46$ $b = 1.18$ $c = 1.18$ $d = 1.18$ $k = 0.46$	30	0.76	-0.3	0.2	31	35	37	12	
	40	0.58	-0.2	0.2	42	48	45	11	
	50	0.47	-0.1	0.1	52	60	49	11	
	60	0.39	0.1	0.2	62	71	49	11	
	70	0.35	0.1	0.2	73	79	49	11	
	80	0.33	0.1	0.2	84	83	48	11	

*See "Tips and Examples" for explanation



VARIO GT 24

Girder GT 24, $l = 4.77 \text{ m}$

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				f_k	f_F	A	B	C

f_k = cantilever deflection
 f_F = span deflection

System 1

$a = 0.46$	30	0.58	4.3	0.5	35	42	48		
$b = 1.48$	40	0.47	3.0	0.5	46	59	53		
$c = 1.48$	50	0.37	2.1	0.4	57	76	55		
$k = 1.35$	60	0.31	1.8	0.5	69	89	55		
	70	0.28	1.7	0.5	81	99	54		
	80	0.27	1.7	0.6	92	105	53		

System 2

Waler position for Brace Frame SB-2

$a = 0.46$	30	0.60	0.2	0.9	29	47	46	3	
$b = 1.18$	40	0.44	0.3	0.9	38	64	55	1	
$c = 1.78$	50	0.35	0.3	0.9	48	79	60	0	
$d = 1.18$	60	0.30	0.2	0.8	58	93	62	0	
$k = 0.16$	70	0.27	0.2	0.8	68	103	62	0	
	80	0.26	0.2	0.7	79	109	61	0	

System 3

$a = 0.46$	30	0.64	-0.6	0.6	32	33	44	15	
$b = 1.18$	40	0.51	-0.5	0.5	42	45	55	16	
$c = 1.18$	50	0.45	-0.4	0.4	52	58	62	15	
$d = 1.48$	60	0.40	-0.4	0.4	63	70	64	15	
$k = 0.46$	70	0.35	-0.3	0.3	73	80	64	15	
	80	0.32	-0.3	0.3	84	87	64	15	

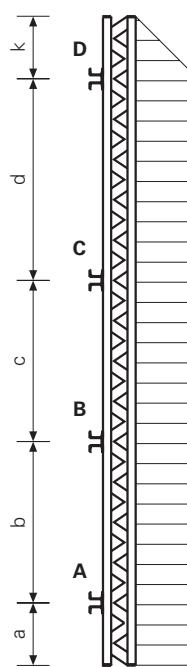
System 4

$a = 0.46$	30	0.68	-0.9	0.7	32	24	41	24	
$b = 1.18$	40	0.54	-0.9	0.6	43	37	52	26	
$c = 0.89$	50	0.47	-0.7	0.6	54	47	60	26	
$d = 1.48$	60	0.44	-0.7	0.5	64	59	64	26	
$k = 0.75$	70	0.37	-0.6	0.4	75	69	64	26	
	80	0.33	-0.5	0.4	85	76	63	26	

System 5

$a = 0.46$	30	0.76	-0.2	0.2	32	35	37	20	
$b = 1.18$	40	0.58	0.1	0.2	42	48	47	21	
$c = 1.18$	50	0.47	0.1	0.1	52	60	54	20	
$d = 1.18$	60	0.39	0.1	0.2	63	72	57	20	
$k = 0.75$	70	0.34	0.1	0.2	73	83	57	20	
	80	0.31	0.1	0.2	84	89	56	20	

*See "Tips and Examples" for explanation



Girder GT 24, l = 5.06 m

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler load [kN/m]				
			f_k	f_F	A	B	C	D	E

f_k = cantilever deflection

f_F = span deflection

System 1

$a = 0.46$ $b = 1.48$ $c = 1.48$ $d = 1.48$ $k = 0.16$	30	0.60	-0.2	0.4	34	47	45	8	
	40	0.44	-0.2	0.4	45	63	54	8	
	50	0.35	-0.2	0.4	56	79	59	7	
	60	0.29	-0.2	0.4	68	95	60	7	
	70	0.26	-0.2	0.4	80	107	60	7	
	80	0.24	-0.2	0.5	91	116	59	7	

System 2

$a = 0.46$ $b = 1.18$ $c = 1.78$ $d = 1.18$ $k = 0.46$	30	0.57	0.2	0.8	29	47	49	9	
	40	0.44	0.3	0.9	38	63	61	8	
	50	0.35	0.3	0.9	48	79	68	7	
	60	0.29	0.3	0.9	57	95	73	6	
	70	0.26	0.3	0.8	67	107	74	5	
	80	0.24	0.2	0.7	78	117	74	5	

System 3

$a = 0.46$ $b = 1.18$ $c = 1.48$ $d = 1.48$ $k = 0.46$	30	0.57	-0.5	0.5	31	39	49	15	
	40	0.46	-0.4	0.4	40	53	61	15	
	50	0.40	-0.3	0.4	50	68	70	14	
	60	0.34	-0.2	0.4	60	82	74	14	
	70	0.30	-0.2	0.4	71	94	76	13	
	80	0.27	-0.2	0.4	81	104	76	13	

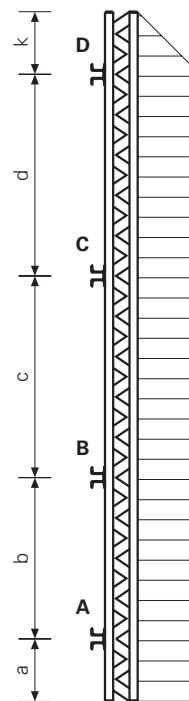
System 4

$a = 0.46$ $b = 1.18$ $c = 1.18$ $d = 1.48$ $k = 0.75$	30	0.64	-0.8	0.6	32	33	44	24	
	40	0.49	-0.7	0.5	42	45	57	25	
	50	0.42	-0.6	0.5	52	57	67	25	
	60	0.39	-0.5	0.4	63	70	72	25	
	70	0.34	-0.4	0.3	73	82	74	25	
	80	0.31	-0.4	0.3	84	91	74	25	

System 5

$a = 0.46$ $b = 1.18$ $c = 1.18$ $d = 1.18$ $k = 1.05$	30	0.78	1.3	0.2	31	36	34	32	
	40	0.58	0.8	0.2	42	48	46	34	
	50	0.47	0.7	0.1	52	60	55	34	
	60	0.38	0.6	0.2	62	73	61	33	
	70	0.33	0.5	0.2	72	85	63	33	
	80	0.30	0.5	0.1	83	94	62	33	

*See "Tips and Examples" for explanation



VARIO GT 24

Girder GT 24, $l = 5.36 \text{ m}$

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				f_k	f_F	A	B	C

f_k = cantilever deflection
 f_F = span deflection

System 1

$a = 0.46$	30	0.60	-0.5	0.5	34	46	47	15	
$b = 1.48$	40	0.45	-0.4	0.4	45	62	59	15	
$c = 1.48$	50	0.35	-0.3	0.4	57	79	67	14	
$d = 1.48$	60	0.29	-0.2	0.4	68	95	71	14	
$k = 0.46$	70	0.25	-0.2	0.4	79	110	72	14	
	80	0.23	-0.2	0.4	91	121	71	14	

System 2

Waler position for Brace Frame SB-2

$a = 0.46$	30	0.57	0.1	0.8	29	47	49	18	
$b = 1.18$	40	0.44	0.1	0.9	38	63	63	17	
$c = 1.78$	50	0.35	0.1	0.9	48	79	74	16	
$d = 1.18$	60	0.29	0.1	0.9	57	95	81	15	
$k = 0.75$	70	0.25	0.2	0.9	67	110	84	14	
	80	0.23	0.1	0.8	77	122	84	14	

System 3

$a = 0.46$	30	0.57	-0.5	0.6	31	39	49	23	
$b = 1.18$	40	0.44	-0.5	0.4	41	53	64	24	
$c = 1.48$	50	0.37	-0.4	0.3	51	67	75	24	
$d = 1.48$	60	0.34	-0.3	0.4	60	82	82	23	
$k = 0.75$	70	0.29	-0.2	0.4	70	95	86	23	
	80	0.26	-0.2	0.4	81	107	86	23	

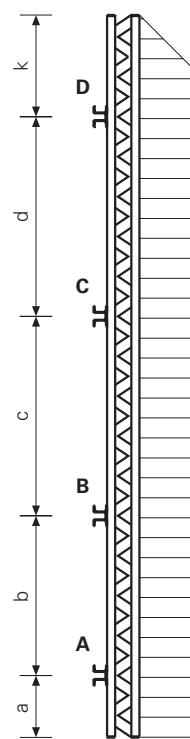
System 4

$a = 0.46$	30	0.68	0.1	0.4	31	34	41	35	
$b = 1.18$	40	0.50	-0.1	0.3	42	45	56	38	
$c = 1.18$	50	0.41	-0.1	0.5	52	57	68	39	
$d = 1.48$	60	0.36	-0.1	0.4	63	69	77	39	
$k = 1.05$	70	0.34	-0.1	0.3	73	82	81	38	
	80	0.30	-0.1	0.3	83	93	82	38	

System 5

$a = 0.46$	30	0.78	0.1	0.2	31	36	35	34	5
$b = 1.18$	40	0.58	0.1	0.2	42	48	48	39	5
$c = 1.18$	50	0.47	0.0	0.1	52	60	59	40	5
$d = 1.18$	60	0.39	0.0	0.2	62	72	68	40	5
$e = 1.18$	70	0.33	0.0	0.1	73	85	72	39	5
$k = 0.16$	80	0.29	0.0	0.1	83	96	73	39	5

*See "Tips and Examples" for explanation



Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]		Waler load [kN/m]				
			f_k	f_F	A	B	C	D	E

f_k = cantilever deflection

f_F = span deflection

System 1

$a = 0.46$ $b = 1.48$ $c = 1.48$ $d = 1.48$ $k = 0.75$	30	0.60	-0.7	0.5	34	46	47	24	
	40	0.45	-0.6	0.5	46	62	62	25	
	50	0.36	-0.4	0.4	57	78	72	24	
	60	0.29	-0.3	0.4	68	95	79	24	
	70	0.25	-0.2	0.4	79	111	82	24	
	80	0.23	-0.2	0.4	91	124	82	24	

System 2

$a = 0.46$ $b = 1.18$ $c = 1.78$ $d = 1.18$ $k = 1.05$	30	0.58	1.4	0.9	29	48	45	30	
	40	0.44	1.1	0.9	38	63	62	30	
	50	0.35	0.9	0.9	48	79	75	30	
	60	0.29	0.9	0.9	57	96	85	28	
	70	0.25	0.8	0.9	66	111	91	27	
	80	0.22	0.8	0.9	76	125	93	26	

System 3

$a = 0.46$ $b = 1.18$ $c = 1.18$ $d = 1.18$ $e = 1.18$ $k = 0.46$	30	0.76	-0.3	0.2	31	36	35	37	12
	40	0.60	-0.2	0.2	42	48	47	45	11
	50	0.47	-0.1	0.1	52	60	60	49	11
	60	0.39	-0.1	0.2	62	72	70	50	11
	70	0.33	-0.1	0.1	73	84	78	49	11
	80	0.29	-0.1	0.1	83	97	81	48	11

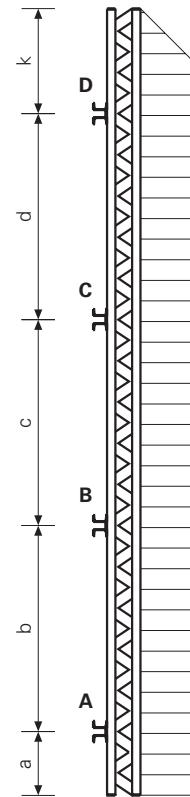
System 4

$a = 0.46$ $b = 1.18$ $c = 1.48$ $d = 1.48$ $k = 1.05$	30	0.61	0.5	0.3	30	40	46	35	
	40	0.45	0.1	0.3	41	53	62	37	
	50	0.37	0.1	0.3	51	67	76	38	
	60	0.33	0.2	0.4	60	81	86	37	
	70	0.29	0.2	0.4	70	96	93	37	
	80	0.26	0.2	0.4	80	109	95	36	

System 5

$a = 0.46$ $b = 1.18$ $c = 1.48$ $d = 1.78$ $k = 0.75$	30	0.50	-1.3	1.0	31	37	56	27	
	40	0.38	-1.2	1.0	41	50	73	29	
	50	0.32	-1.0	0.8	51	63	87	30	
	60	0.29	-0.9	0.7	61	78	97	29	
	70	0.27	-0.8	0.6	71	92	103	29	
	80	0.26	-0.7	0.6	81	106	106	29	

*See "Tips and Examples" for explanation



VARIO GT 24

Girder GT 24, l = 5.95 m

Waler spacing [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Girder spacing $a_{perm.}$ [m]	Deflection* [mm]	Waler load [kN/m]				
				A	B	C	D	E
			f_k	f_F				

f_k = cantilever deflection
 f_F = span deflection

System 1

a = 0.46	30	0.60	0.5	0.4	34	47	45	35	
b = 1.48	40	0.45	-0.2	0.4	45	62	60	38	
c = 1.48	50	0.36	-0.2	0.4	57	78	74	38	
d = 1.48	60	0.30	-0.2	0.4	68	94	83	38	
k = 1.05	70	0.25	-0.2	0.4	79	111	89	37	
	80	0.22	-0.2	0.4	91	126	91	37	

System 2

Waler position for Brace Frame SB-2

a = 0.46	30	0.57	4.9	1.0	28	49	39	44	
b = 1.18	40	0.44	3.6	1.0	38	64	56	47	
c = 1.78	50	0.35	2.9	0.9	47	80	72	47	
d = 1.18	60								
k = 1.35	70								
	80								

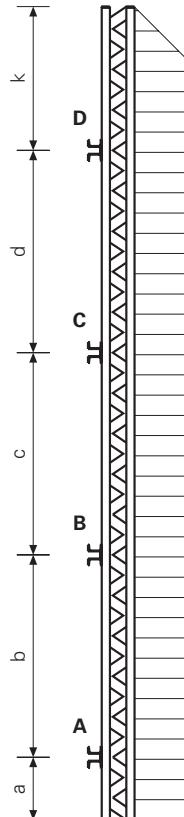
System 3

a = 0.46	30	0.76	-0.2	0.2	31	36	35	37	20
b = 1.18	40	0.58	-0.1	0.2	42	48	47	48	21
c = 1.18	50	0.47	-0.1	0.1	52	60	59	54	20
d = 1.18	60	0.39	0.1	0.2	62	71	71	57	20
e = 1.18	70	0.33	0.1	0.1	73	84	81	57	20
k = 0.75	80	0.29	0.1	0.1	83	96	88	57	20

System 4

a = 0.46	30	0.53	-0.5	0.8	31	38	53	38	
b = 1.18	40	0.39	-0.9	0.9	41	50	72	42	
c = 1.48	50	0.31	-0.9	0.8	51	62	89	43	
d = 1.78	60	0.27	-0.9	0.7	61	77	102	44	
k = 1.05	70	0.25	-0.7	0.6	71	92	111	43	
	80	0.24	-0.6	0.6	81	106	115	43	

*See "Tips and Examples" for explanation



VARIO GT 24

Stopend Formwork

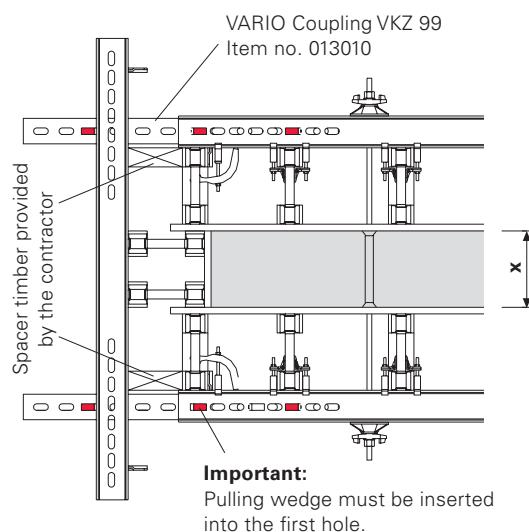
Permissible wall thickness x [m] for stopend formwork with VARIO

*Number of girders must be separately verified.

Waler Load	Steel Waler Profile		U100		U120		U140	
	with VKZ	with Stopend Tie	with VKZ	with Stopend Tie	with VKZ	with Stopend Tie	with VKZ	with Stopend Tie
50 kN/m	1.00	1.00	1.31	1.20	1.65	1.20		
60 kN/m	0.88	0.88	1.16	1.00	1.46	1.00		
70 kN/m	0.79	0.79	1.04	0.85	1.32	0.85		
80 kN/m	0.72	0.72	0.95	0.75	1.21	0.75		
90 kN/m	0.66	0.66	0.88	0.67	1.11	0.67		
100 kN/m	0.61	0.60	0.81	0.60	1.00	0.60		
110 kN/m	0.56	0.54	0.76	0.54	0.91	0.54		
120 kN/m	0.53	0.50	0.71	0.50	0.83	0.50		

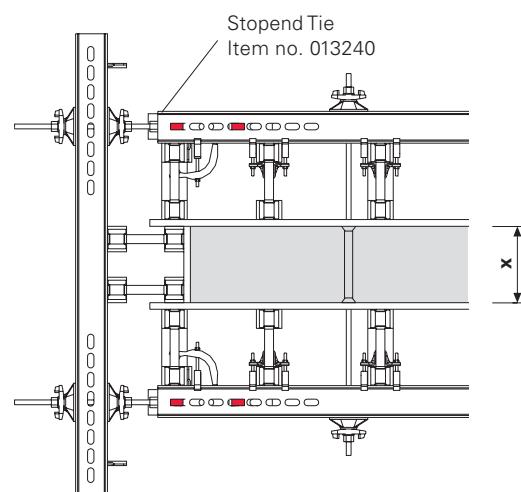
1. With VARIO Coupling VKZ

perm. tension force 50 kN



2. With Stopend Tie

perm. tension force 30 kN



VARIO GT 24

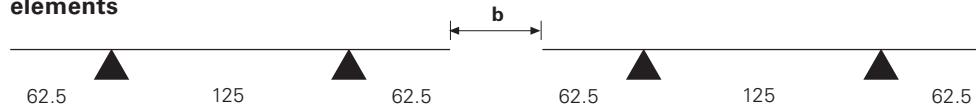
Compensations

PERI

Permissible compensation widths [m]
with VARIO Coupling VKZ 99, 147, 211

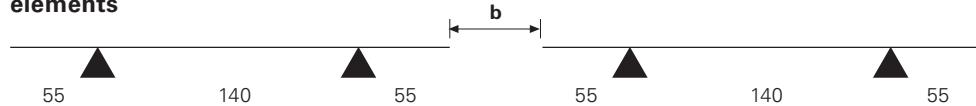
b = compensation width
f = deflection in the filler area

Tie positions of the adjacent elements



Actual Waler Load	Without tie		With 1 tie		With 2 ties	
	b [m]	f [mm]	b [m]	f [mm]	b [m]	f [mm]
U100	50 kN/m	0.27	5.5	0.76	1.8	1.24
	60 kN/m	0.16	5.1	0.64	1.6	1.11
	70 kN/m	0.04	3.3	0.55	1.1	0.93
	80 kN/m			Not possible		
U120	50 kN/m	0.47	6.3	0.82	1.7	1.24
	60 kN/m	0.35	5.5	0.68	1.5	1.24
	70 kN/m	0.26	5.0	0.58	1.0	0.99
	80 kN/m	0.18	4.4	0.50	1.0	0.80
U140	50 kN/m	0.62	6.2	0.90	1.5	1.24
	60 kN/m	0.50	5.5	0.75	1.4	1.24
	70 kN/m	0.41	5.1	0.63	1.3	1.24
	80 kN/m	0.33	4.7	0.54	1.3	0.96

Tie positions of the adjacent elements



Actual Waler Load	Without tie		With 1 tie		With 2 ties	
	b [m]	f [mm]	b [m]	f [mm]	b [m]	f [mm]
U100	50 kN/m	0.44	5.1	0.99	1.6	1.24
	60 kN/m	0.29	3.4	0.88	1.5	1.24
	70 kN/m	0.15	1.8	0.79	1.1	1.20
	80 kN/m	0.03	0.6	0.55	0.6	0.82
U120	50 kN/m	0.60	5.8	1.04	1.4	1.24
	60 kN/m	0.49	5.0	0.92	1.3	1.24
	70 kN/m	0.42	4.6	0.82	1.3	1.24
	80 kN/m	0.33	3.7	0.75	1.2	1.24
U140	50 kN/m	0.70	5.4	1.11	1.2	1.24
	60 kN/m	0.59	4.8	0.97	1.1	1.24
	70 kN/m	0.51	4.3	0.86	1.1	1.24
	80 kN/m	0.45	4.0	0.78	1.1	1.24

Note:

Standard elements are used if the filler width is more than 1.25 m.

VARIO GT 24

Height Extensions

Version 1

**Height maximum 8.00 m
with Extension Splice 24**

Extensions up to 5.00 m

4 Extension Splices 24 for an element width of 2.50 m.

Extensions up to 8.00 m

8 Extension Splices 24 for an element width of 2.50 m.

Static values for Extension Splice 24

perm. M = 1.73 kNm

perm. Q = 0

or

perm. M = 0

perm. Q = 5 kN

$$\frac{M + 0.07 Q}{0.28} + Q \leq 6.2$$

M in kNm

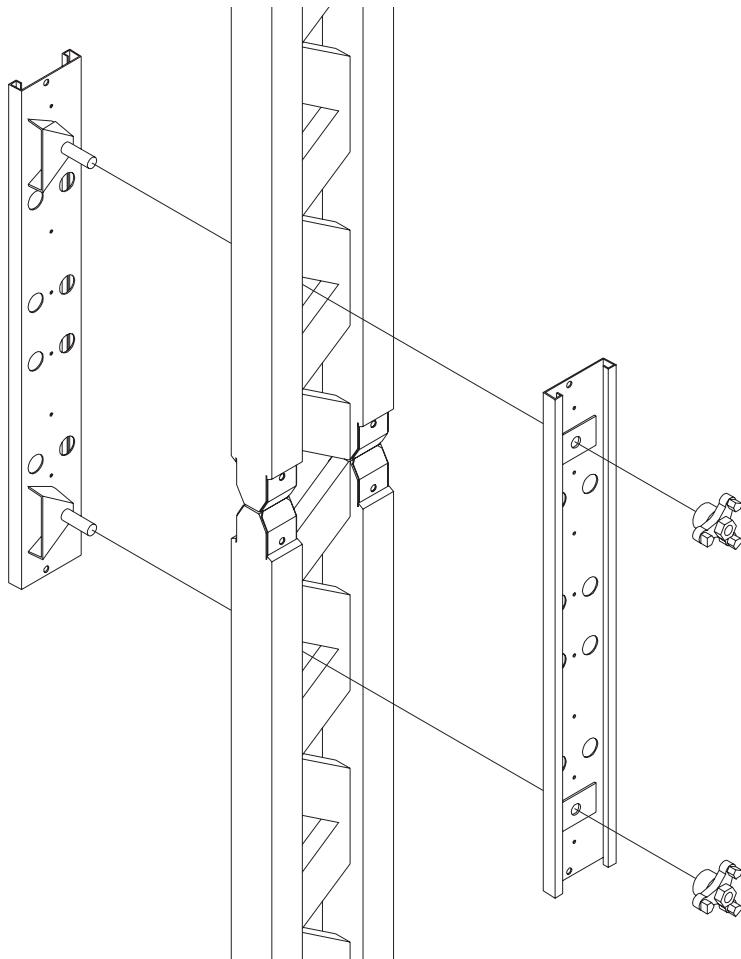
Q in kN

Static values for Extension Splice 24 for moving VARIO GT 24 elements

perm. Z = 5.7 kN

M = 0

Q = 0

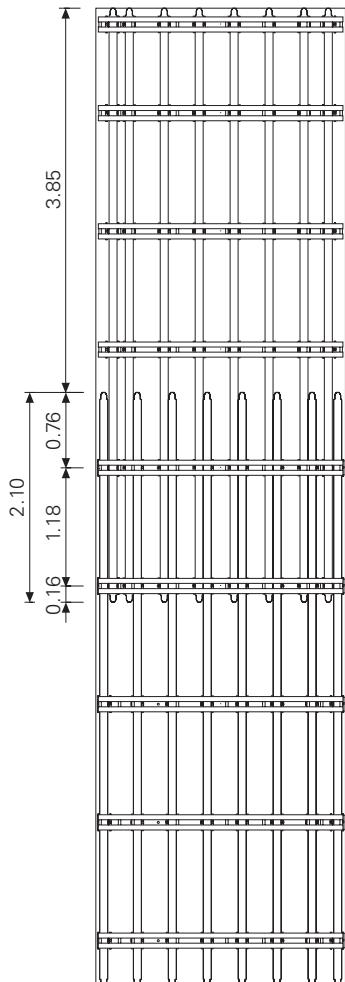


VARIO GT 24

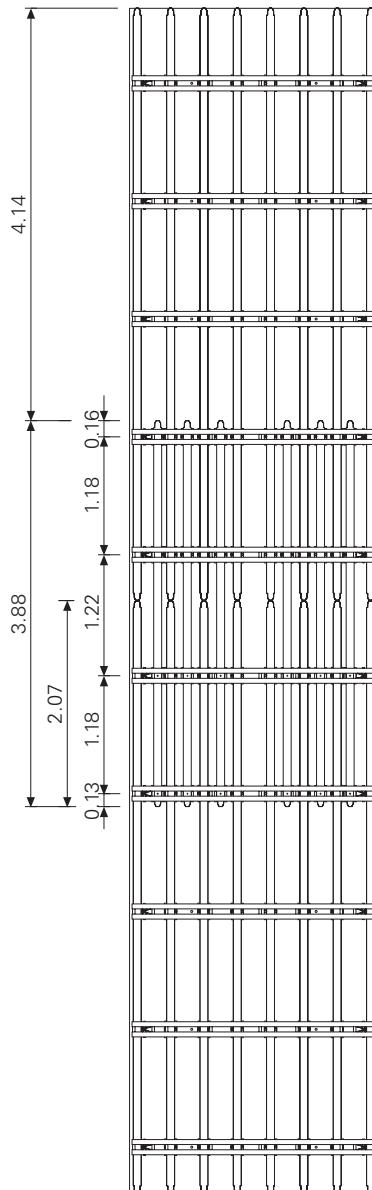
Height Extensions

PERI

Version 2
Height maximum 9.80 m
with overlapping girders



Version 3
Height maximum 11.90 m
with additional splicing girders



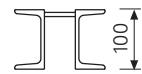
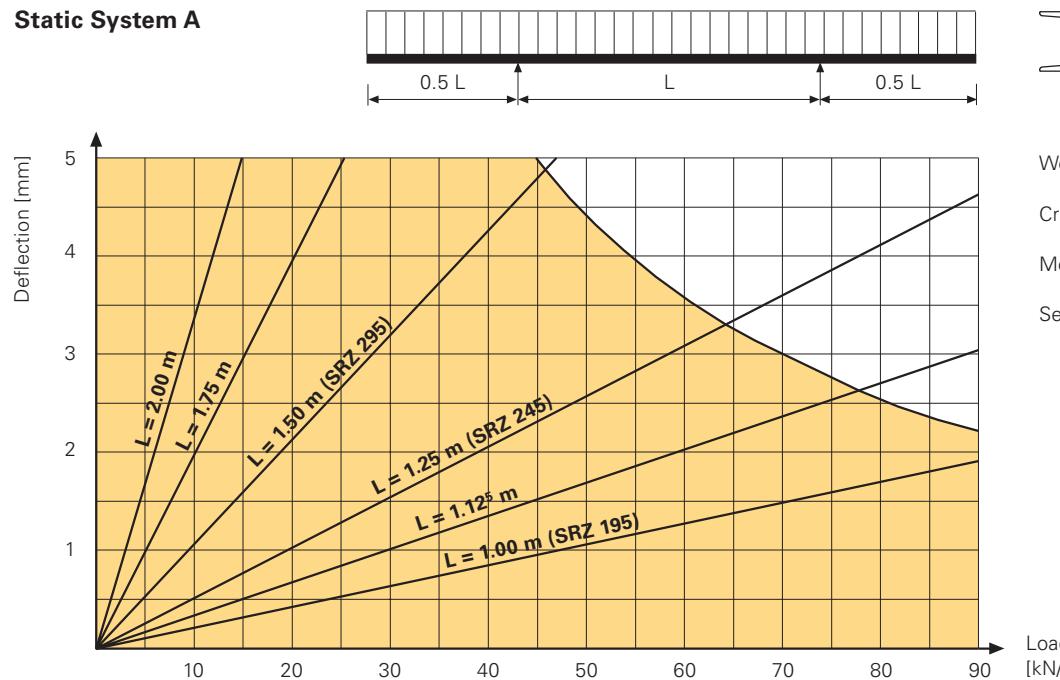
**Number of required splicing girders
for Version 3**

Element Width [m]	Element Height [m]									
	11.90	11.30	10.71	10.12	9.53	8.94	8.34	7.75	7.16	6.57
2.50	6	6	4	4	4	3	3	3	2	2
1.875	4	4	3	3	3	3	2	2	2	2
1.25	3	3	2	2	2	2	2	2	2	2

VARIO GT 24

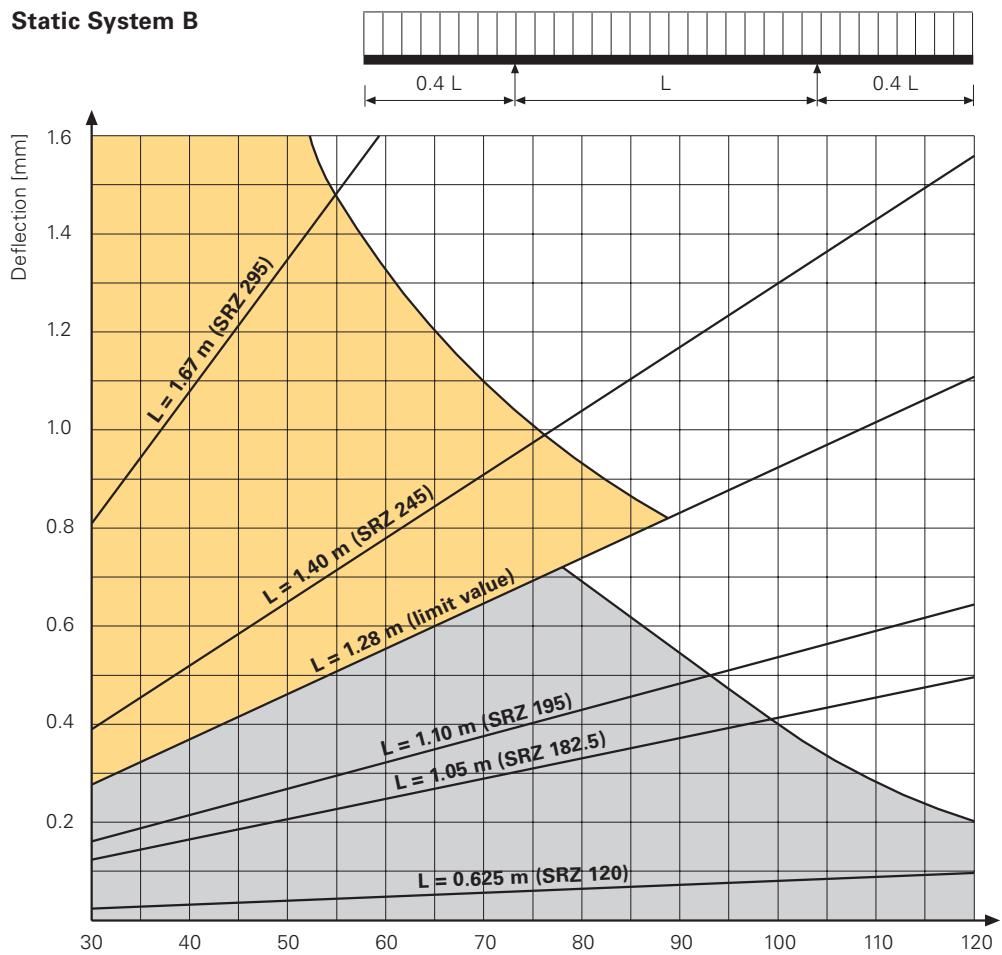
Steel Waler SRZ Profile U100

Static System A



Weight/m	$G = 21.2 \text{ kg/m}$
Cross-Sectional Area	$A = 27.0 \text{ cm}^2$
Moment of Inertia	$I_y = 412 \text{ cm}^4$
Section Modulus	$W_y = 82.4 \text{ cm}^3$

Static System B



Tie position outside the oblong holes



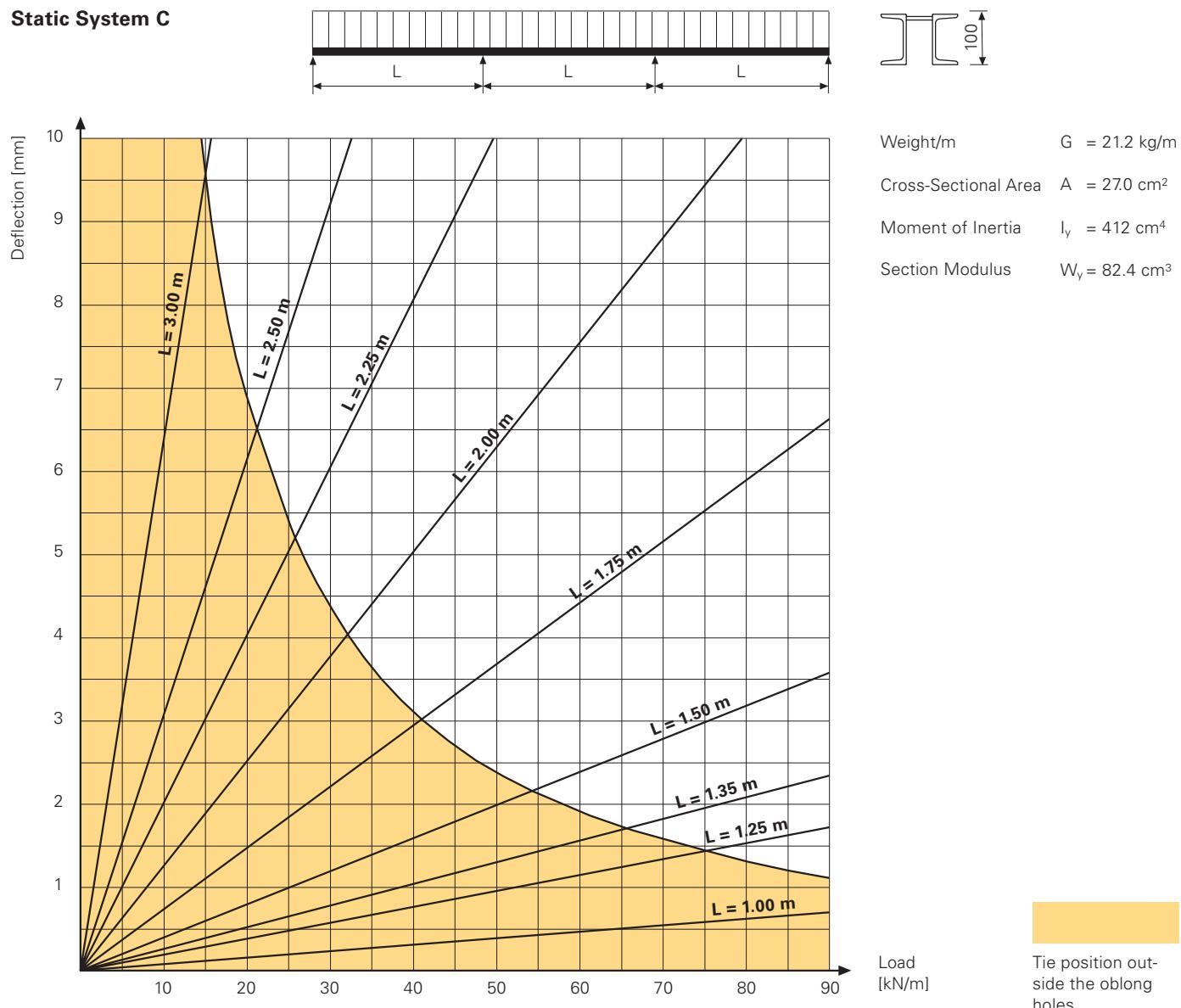
Tie position inside the oblong holes

VARIO GT 24

Steel Waler SRZ Profile U100

PERI

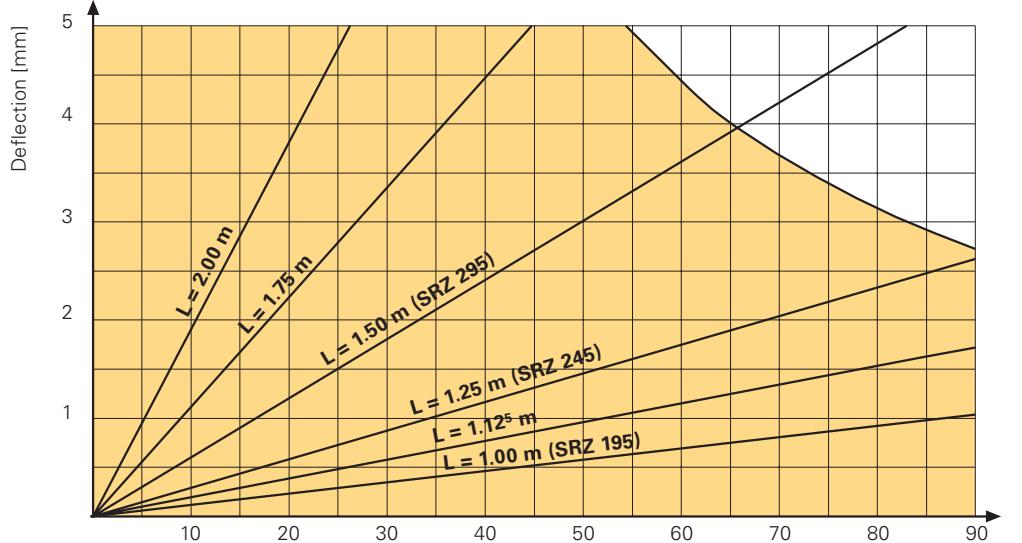
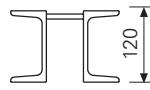
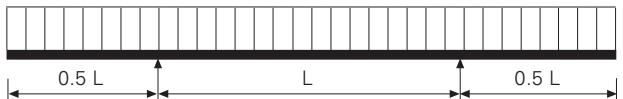
Static System C



VARIO GT 24

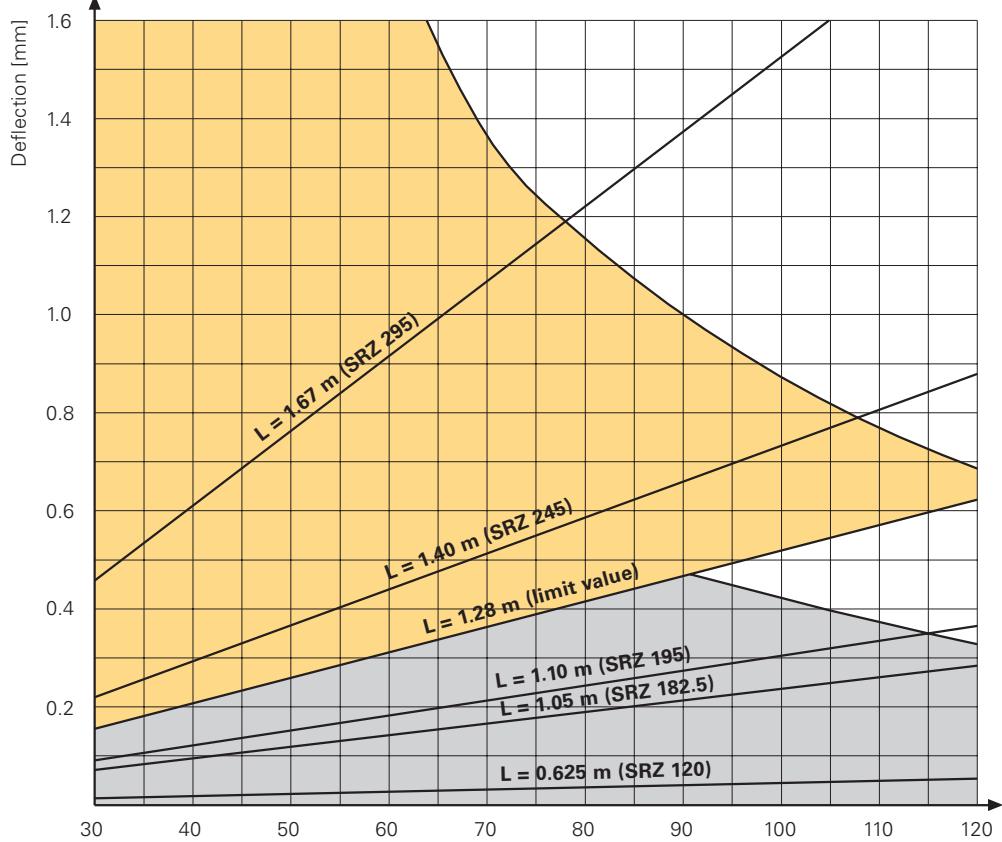
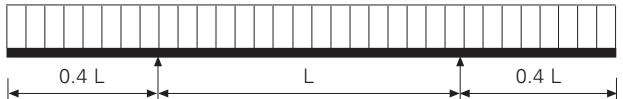
Steel Waler SRZ, SRU Profile U120

Static System A



Weight/m	$G = 26.8 \text{ kg/m}$
Cross-Sectional Area	$A = 34.0 \text{ cm}^2$
Moment of Inertia	$I_y = 728 \text{ cm}^4$
Section Modulus	$W_y = 121.4 \text{ cm}^3$

Static System B



Tie position outside the oblong holes

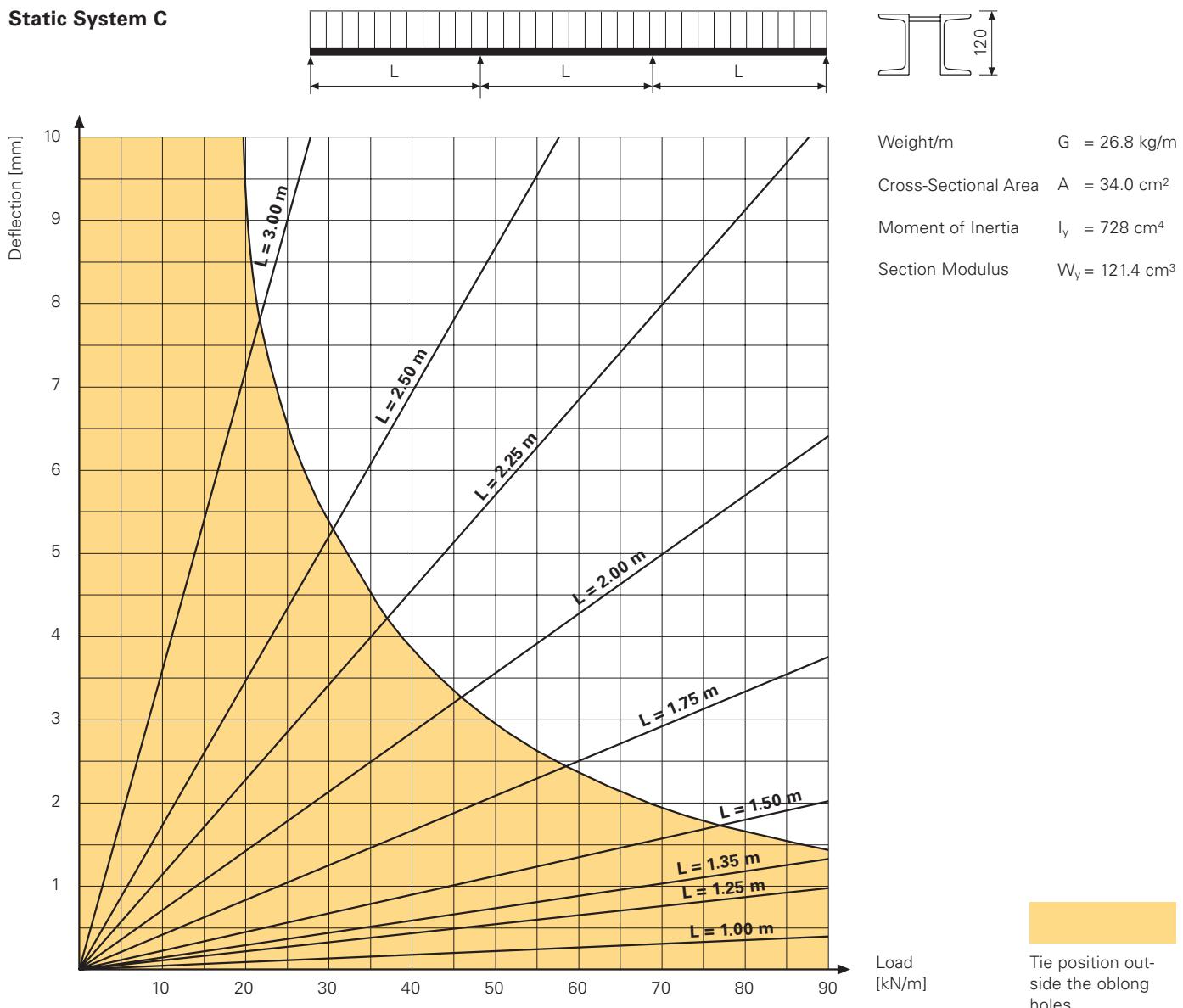
Tie position inside the oblong holes

VARIO GT 24

Steel Waler SRZ, SRU Profile U120

PERI

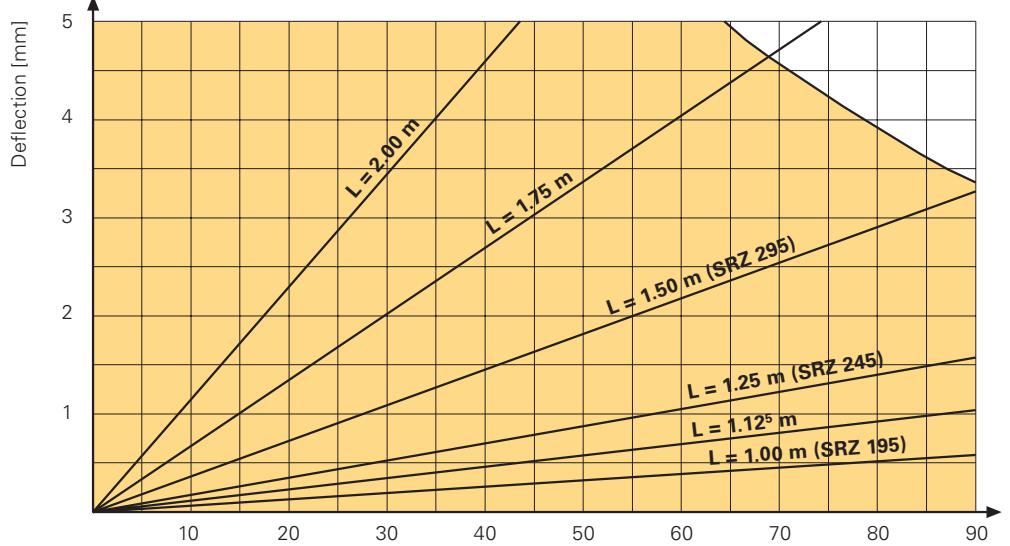
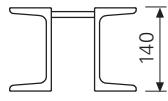
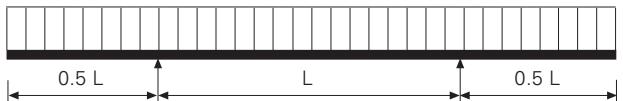
Static System C



VARIO GT 24

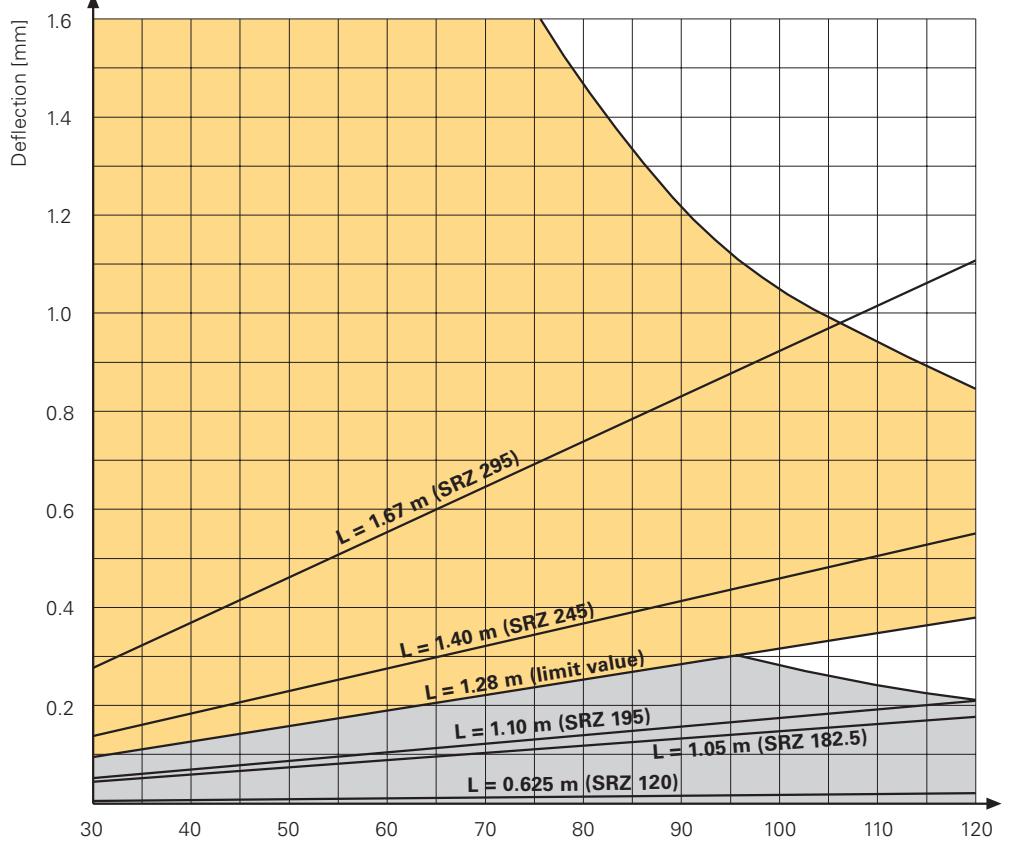
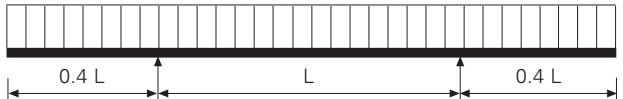
Steel Waler SRZ, SRU Profile U140

Static System A



Weight/m $G = 32.0 \text{ kg/m}$
 Cross-Sectional Area $A = 40.8 \text{ cm}^2$
 Moment of Inertia $I_y = 1210 \text{ cm}^4$
 Section Modulus $W_y = 172.8 \text{ cm}^3$

Static System B



Tie position outside the oblong holes

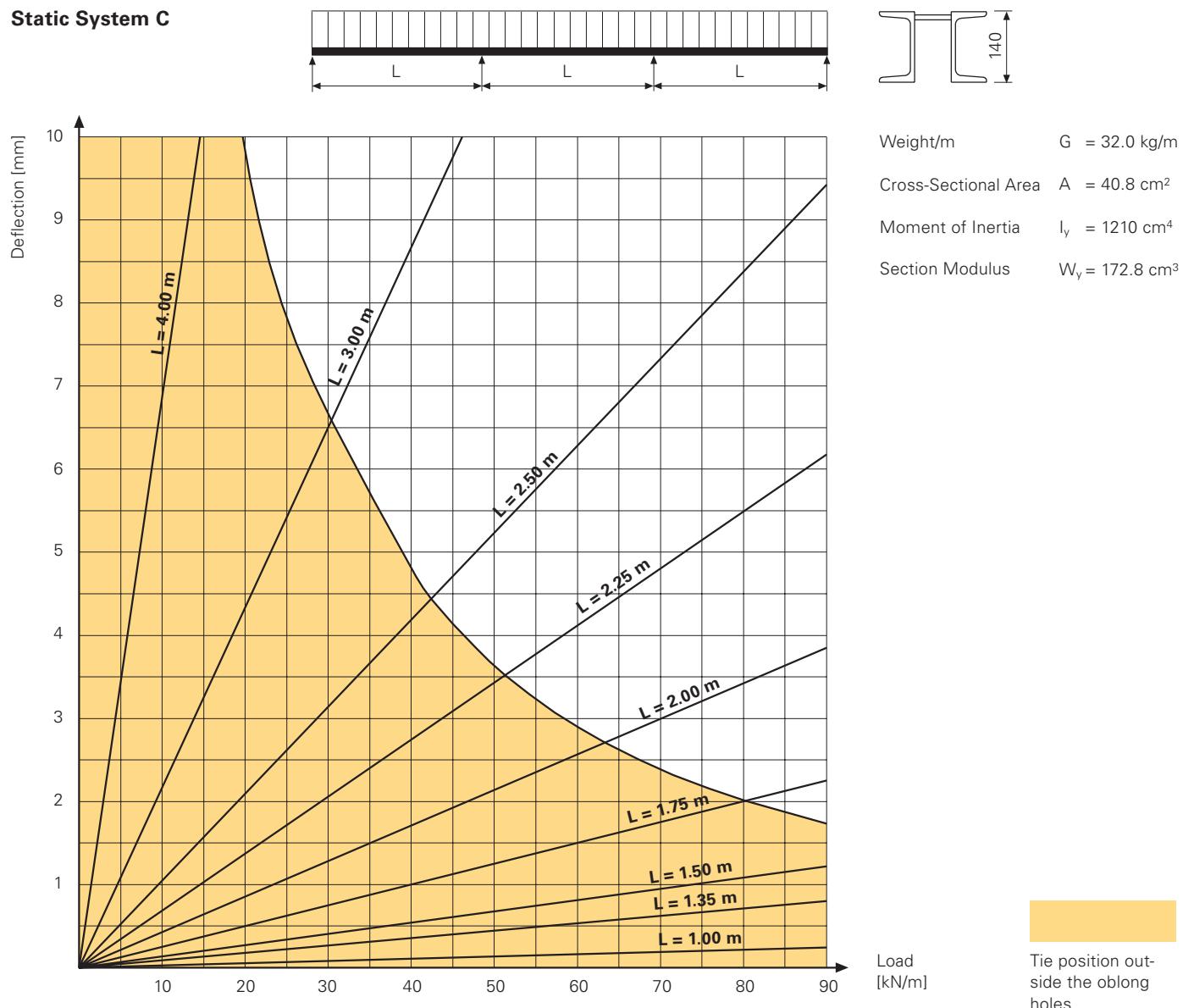
Tie position inside the oblong holes

VARIO GT 24

Steel Waler SRZ, SRU Profile U140

PERI

Static System C



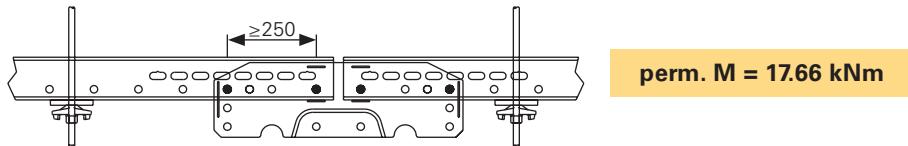
Weight/m	$G = 32.0 \text{ kg/m}$
Cross-Sectional Area	$A = 40.8 \text{ cm}^2$
Moment of Inertia	$I_y = 1210 \text{ cm}^4$
Section Modulus	$W_y = 172.8 \text{ cm}^3$

Universal Coupling UK 70

Perm. Moments, Concentrated Loads and Normal Forces

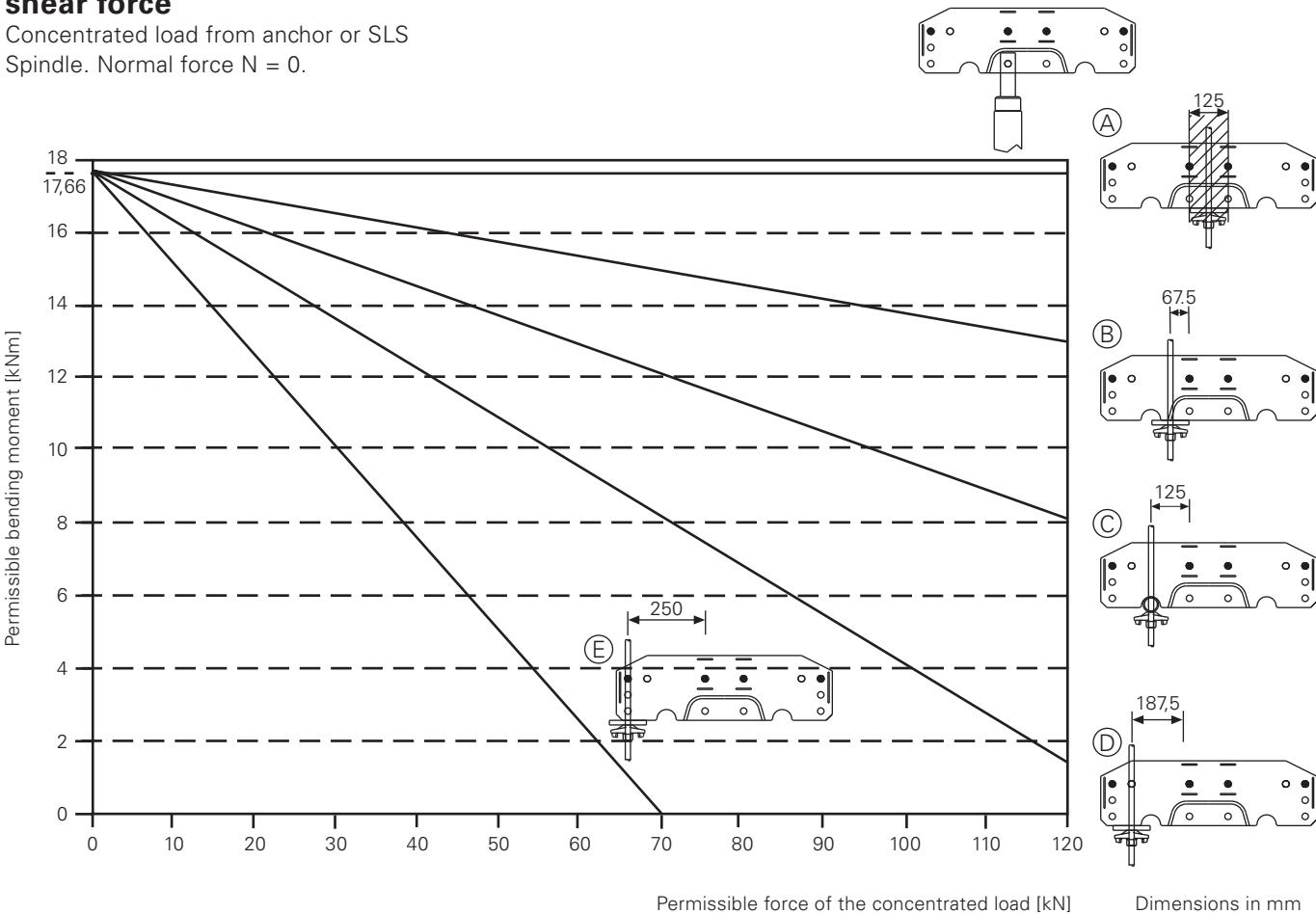
UK 70 as Bending Coupling

If the anchor is outside the area of the coupling, the full bending moment of the Universal Steel Waler SRU U120 can be taken!

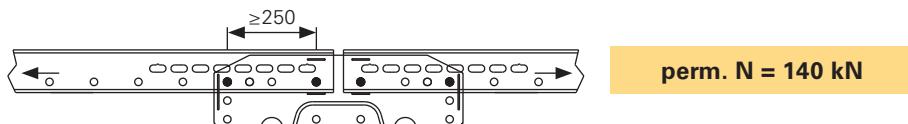


UK 70 as Bending Coupling with concentrated load as shear force

Concentrated load from anchor or SLS Spindle. Normal force N = 0.



UK 70 as Coupling for Tension and Compression Struts



Note:

The distance between two pins in a Universal Steel Waler SRU U120 has to be at least 250 mm.

VARIO GT 24

Column Formwork

PERI

Permissible waler spacing [m] with a fresh concrete pressure of 100 kN/m²

Formwork Height H [m]	Waler Spacing [m]				
	A	B	C	D	E
2.70	0.46	1.48			
3.00	0.46	1.48			
3.30	0.46	1.18	1.18		
3.60	0.46	1.18	1.48		
3.90	0.46	1.18	1.48		
4.20	0.46	1.18	1.78		
4.50	0.46	1.18	1.78		
4.80	0.31	0.89	1.18	1.48	
5.10	0.31	0.89	1.18	1.78	
5.40	0.31	0.89	0.89	1.18	1.48
5.70	0.31	0.89	0.89	1.18	1.48
6.00	0.31	0.89	0.89	1.18	1.78

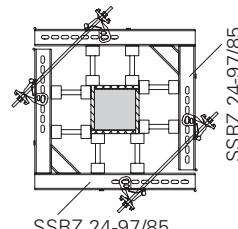
Required GT 24 Girders depending on the column width

Column Width [m]	0.20	0.30	0.40	0.50	0.60	0.70	0.76	0.80	0.90	1.00	1.10	1.20
Girders GT 24 per side	2	2	2	3	4	4	4	4	5	5	5	6

With Column Waler SSRZ 24-97/85,

Item no. 012150,

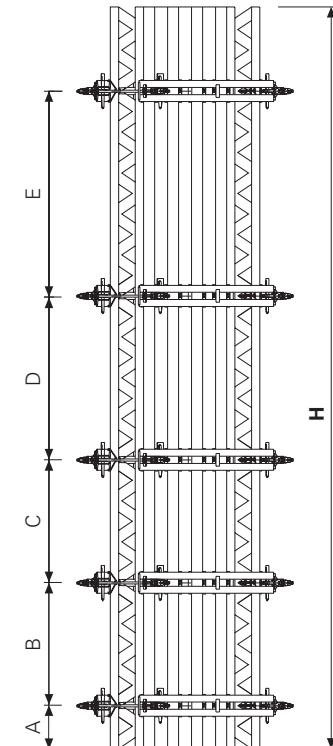
for column cross-sections from 24 x 24 cm to 48 x 60 cm.



With Column Waler SSRZ 24-113/101,

Item no. 012160,

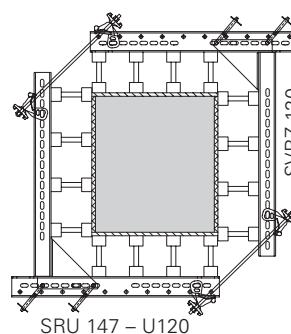
for column cross-sections from 40 x 40 cm to 64 x 76 cm.



With Column Vario Waler SVRZ 120,

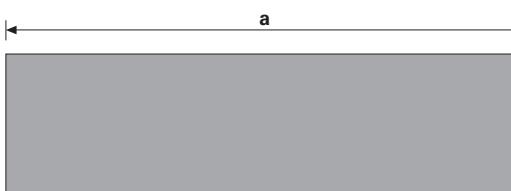
Item no. 012050 and Steel Waler SRU

Column Cross-Sections [m] from - to			
0.20 x 0.20	0.40 x 0.80	0.70 x 0.80	0.90 x 0.80
0.40 x 0.80	0.70 x 0.80	0.90 x 0.80	1.20 x 0.80
SRU 97 Item no. 103871	SRU 122 Item no. 103874	SRU 147 Item no. 103877	SRU 172 Item no. 103886



Note:

To prevent "bleeding" at the corners, we recommend pre-stressing the tie rod, not only by tightening the tie nut but also by hammering in the KZ Wedge of the Tie Yoke!



Note:

If $a \geq 3 \times b$, Column Waler SSRZ and Column Waler SVRZ must not be used. The column / shear wall must then be formed like a wall with two sets of stopend formwork.

Brace Frame SB-A0, A, B, C

Example, Calculating Magnitude of Reactions

Example

Application: Concreting height $h = 5.50 \text{ m}$

Fresh concrete pressure: $\sigma_{hk} = 60 \text{ kN/m}^2$

Combination: Brace Frame A+B

Element width: $b = 2.70 \text{ m}$

Width of influence: $e = 2.70 : 2 = 1.35 \text{ m}$

According to design tables
perm. $e = 1.39 \text{ m} > \text{act. } e = 1.35 \text{ m}$

Diagonal bracing with A and B.

Diagonal bracing C must also be mounted if the formwork unit is to be moved horizontally.

Calculating Magnitude of Reactions

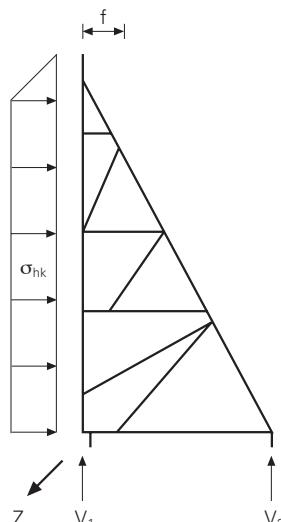
	Width of influence e	Values from table	
actual	$Z = 1.35 \text{ m} \cdot 365 \text{ kN/m} = 493 \text{ kN}$		
	$V_1 = 1.35 \text{ m} \cdot 105 \text{ kN/m} = 142 \text{ kN}$		
	$V_2 = 1.35 \text{ m} \cdot 178 \text{ kN/m} = 240 \text{ kN}$		
	$f = 1.35 \text{ m} \cdot 9 \text{ mm/m} = 12 \text{ mm}$		

Note:

Any arrangement of the Steel Waler SRZ may be adapted when using VARIO Formwork with Brace Frame SB-A, B, C.

We recommend pre-inclining the Brace Frame by 2/3 of the calculated deflection.

All values refer to a width of influence of 1.00 m.



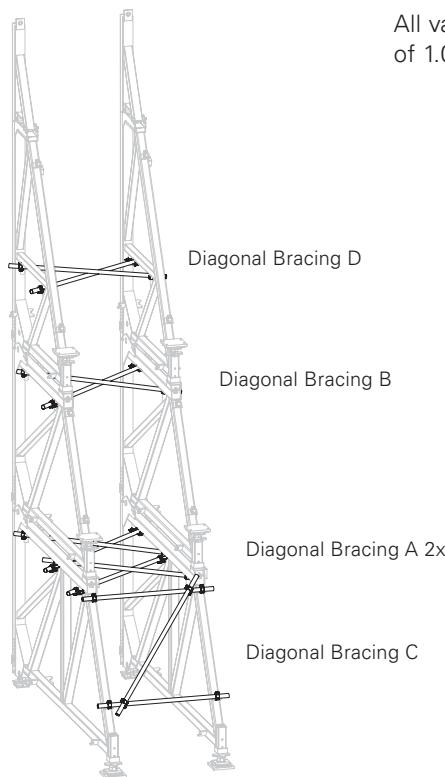
Brace Frame SB-A0, A, B, C

SB-A0+A+B+C; h = 6.75 – 8.75 m

Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
				V ₁ [kN/m]	V ₂ [kN/m]	
6.75	30	1.91	261	69	135	10
	40	1.48	337	92	167	13
	50	1.22	407	114	197	15
	60	1.06	471	136	221	17
7.00	30	1.83	272	69	147	12
	40	1.42	351	92	184	13
	50	1.17	425	114	215	17
	60	1.01	492	136	242	19
7.25	30	1.70	283	69	159	13
	40	1.35	365	92	200	16
	50	1.13	442	114	234	19
	60	0.97	514	136	264	21
7.50	30	1.56	293	69	172	14
	40	1.25	379	92	216	18
	50	1.06	460	114	254	21
7.75	30	1.45	304	69	186	16
	40	1.15	394	92	233	20
	50	0.98	478	114	274	23
8.00	30	1.36	314	69	198	18
	40	1.08	408	92	250	22
	50	0.90	495	114	296	26
8.25	30	1.25	328	69	216	20
	40	1.01	422	92	267	25
8.50	30	1.18	336	69	227	22
	40	0.94	436	92	287	27
8.75	30	1.12	347	69	241	24
	40	0.88	450	92	306	30

Required diagonal bracing for concreting, horizontally moving and lifting the formwork unit with the crane.

All values refer to a width of influence of 1.00 m.



Brace Frame SB-A0, A, B, C

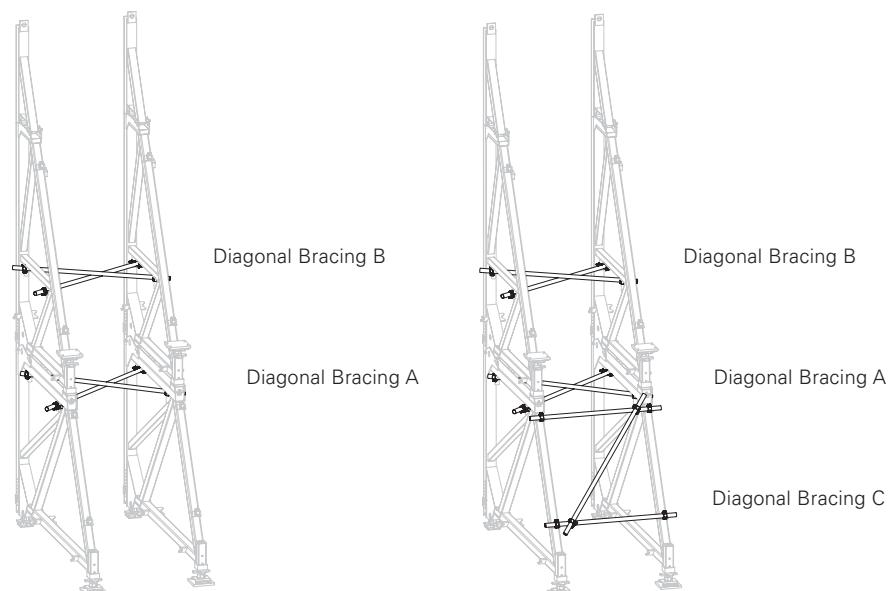
SB-A+B+C; h = 5.50 – 6.75 m

Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
				V ₁ [kN/m]	V ₂ [kN/m]	
5.50	40	1.90	266	72	140	7
	50	1.59	318	89	160	9
	60	1.39	365	105	177	9
5.75	40	1.71	280	72	156	9
	50	1.49	336	89	180	10
	60	1.31	386	105	199	11
6.00	40	1.54	294	72	172	10
	50	1.33	354	89	200	11
	60	1.20	407	105	222	12
6.25	40	1.39	308	72	190	11
	50	1.20	371	89	221	13
	60	1.08	429	105	246	14
6.50	30	1.53	251	50	170	10
	40	1.26	322	72	208	13
	50	1.08	389	89	243	15
	60	0.97	450	105	272	17
6.75	30	1.41	261	50	185	14
	40	1.17	337	72	229	16
	50	1.00	407	89	267	18
	60	0.87	471	105	300	21

Required diagonal bracing for concreting.

Required diagonal bracing for horizontally moving and lifting the formwork unit with the crane.

All values refer to a width of influence of 1.00 m.



Brace Frame SB-A0, A, B, C

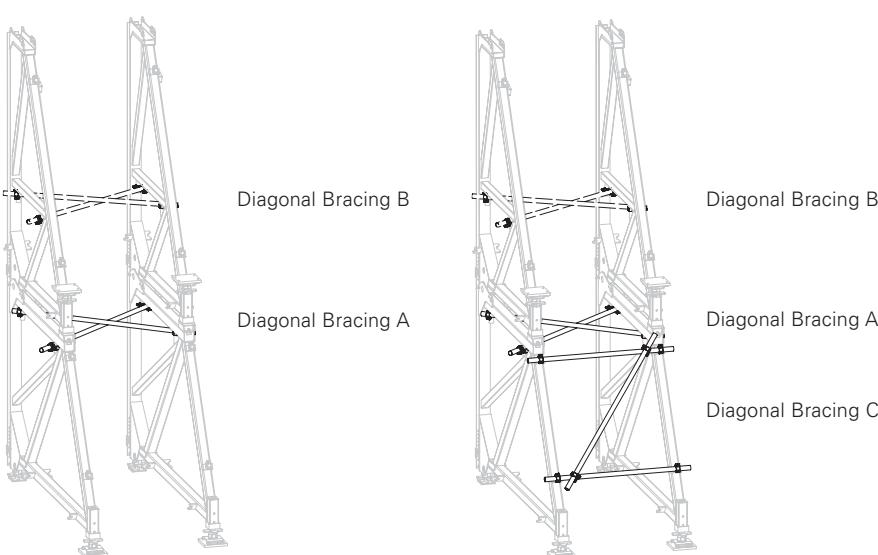
SB-A+B; h = 3.75 – 6.00 m

Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]	If e ≤ 1.35 m, the diagonal bracing B can be left out during concreting in those cases indicated with an "x".
				V ₁ [kN/m]	V ₂ [kN/m]		
3.75	40	2.60	167	71	53	2	x
	50	1.95	194	86	58	2	x
	60	1.75	216	100	61	3	x
4.00	40	2.50	181	72	63	3	x
	50	1.90	212	88	69	3	x
	60	1.70	238	103	74	4	x
4.25	40	2.40	195	72	73	4	x
	50	1.85	230	89	82	4	x
	60	1.65	259	104	88	5	x
4.50	40	2.30	209	72	85	4	x
	50	1.80	247	89	96	5	x
	60	1.60	280	105	103	6	x
4.75	40	2.20	223	72	98	5	x
	50	1.75	265	89	110	7	x
	60	1.55	301	105	120	7	x
5.00	40	2.10	238	72	111	5	x
	50	1.70	283	89	126	7	x
	60	1.50	322	105	138	8	x
5.25	40	2.00	252	72	125	7	x
	50	1.65	301	89	143	8	x
	60	1.45	344	105	157	9	x
5.50	40	1.90	266	72	140	7	
	50	1.59	318	89	161	9	
	60	1.39	365	105	178	9	
5.75	40	1.71	280	72	156	9	
	50	1.49	336	89	180	10	
	60	1.31	386	105	199	11	
6.00	40	1.54	294	72	173	10	
	50	1.33	354	89	200	11	
	60	1.20	407	105	223	12	

Required diagonal bracing for concreting.

Required diagonal bracing for moving and lifting the formwork unit with the crane.

All values refer to a width of influence of 1.00 m.

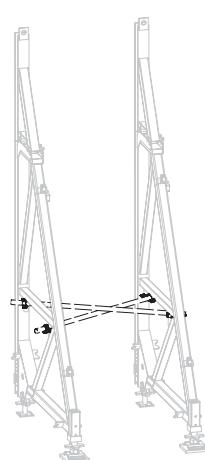


Brace Frame SB-A0, A, B, C

SB-B+C; h = 3.75 – 5.00 m

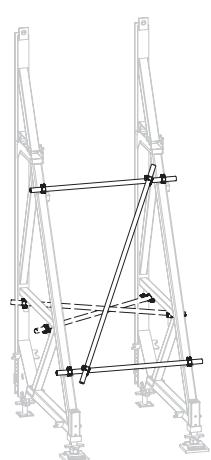
Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]	If e ≤ 1.35 m, the diagonal bracing B can be left out during concrete in those cases indicated with an "x" *
				V ₁ [kN/m]	V ₂ [kN/m]		
3.75	40	2.42	167	51	82	3	x
	50	2.11	195	63	90	3	x
	60	1.95	216	73	94	4	x
4.00	40	2.25	181	51	97	4	x
	50	1.93	212	63	107	4	x
	60	1.75	238	73	114	5	x
4.25	40	2.01	195	51	114	4	x
	50	1.77	230	63	127	5	x
	60	1.60	259	73	136	6	x
4.50	40	1.77	209	51	131	6	x
	50	1.56	248	63	148	6	
	60	1.43	280	73	160	7	
4.75	40	1.58	223	51	151	7	
	50	1.38	265	63	171	8	
	60	1.26	301	73	185	8	
5.00	40	1.40	243	51	172	9	
	50	1.20	283	63	195	9	
	60	1.10	322	73	213	10	

Required diagonal bracing for concreting.



Diagonal Bracing B

Required diagonal bracing for moving and lifting the formwork unit with the crane.



Diagonal Bracing B

Diagonal Bracing D

* If the brace frames are lifted with the crane, Diagonal Bracing B or Diagonal Bracing D is to be fitted.

All values refer to a width of influence of 1.00 m.

Brace Frame SB-A0, A, B, C

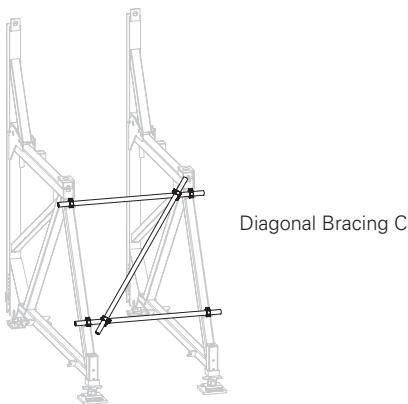
SB-A+C; h = 2.75 – 4.00 m

Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
				V ₁ [kN/m]	V ₂ [kN/m]	
2.75	40	3.00	110	60	22	1
	50	2.60	124	69	22	1
	60	2.40	132	75	22	1
3.00	40	2.81	125	64	28	1
	50	2.40	141	75	30	1
	60	2.17	153	83	30	1
3.25	40	2.69	139	67	35	2
	50	2.26	159	80	38	2
	60	2.01	174	90	39	2
3.50	40	2.62	153	70	43	3
	50	2.17	177	84	47	3
	60	1.90	195	95	49	3
3.75	40	2.28	167	71	52	5
	50	2.12	195	86	57	5
	60	1.83	216	100	60	5
4.00	40	1.60	181	72	63	7
	50	1.60	212	88	69	7
	60	1.60	238	103	74	7

Required diagonal bracing for moving and lifting the formwork unit with the crane.

The A+C combination does not require any diagonal bracing when used for concreting.

All values refer to a width of influence of 1.00 m.



Brace Frame SB-A0, A, B, C

SB-B; h = 2.50 – 4.00 m

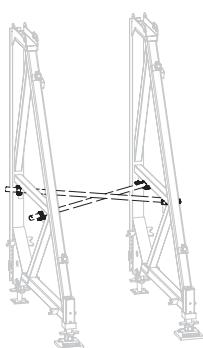
Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]	if e > 1.35 m, the diagonal bracing B must be installed during concreting in the cases indicated with an x
				V ₁ [kN/m]	V ₂ [kN/m]		
2.50	40	3.00	96	48	26	1	
	50	2.60	106	55	26	1	
	60	2.40	110	59	26	1	
2.75	40	3.00	110	50	34	1	
	50	2.60	124	59	36	1	
	60	2.40	132	65	36	1	
3.00	40	2.80	124	51	44	1	
	50	2.40	141	62	47	1	
	60	2.20	153	70	48	1	
3.25	40	2.60	139	51	56	1	
	50	2.30	159	63	60	1	
	60	2.10	174	72	61	2	
3.50	40	2.55	153	51	68	2	
	50	2.25	177	63	74	2	
	60	2.05	195	73	77	3	
3.75	40	2.42	167	51	82	3	x
	50	2.11	194	63	90	3	x
	60	1.95	216	73	95	4	x
4.00	40	2.25	181	51	97	4	x
	50	1.93	212	63	108	4	x
	60	1.75	238	73	115	5	x

Required diagonal bracing for
concreting.

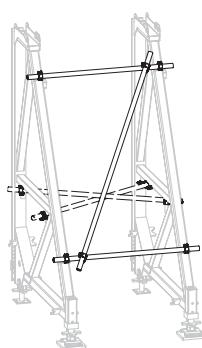
Required diagonal bracing for
moving and lifting the
formwork unit with the crane.

The SB-B brace frame does not require
any diagonal bracing when used for
concreting until the height reaches
3.75 m (see table).

All values refer to a width of influence
of 1.00 m.



Diagonal Bracing B



Diagonal Bracing D

Brace Frame SB-A0, A, B, C

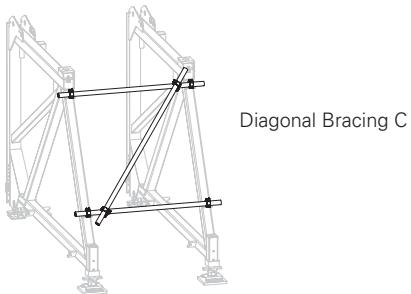
SB-A; h = 2.50 – 3.00 m

Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Perm. width of influence per SB e [m]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
				V ₁ [kN/m]	V ₂ [kN/m]	
2.50	40	3.00	96	55	16	1
	50	2.60	106	62	17	1
	60	2.40	110	65	17	1
2.75	40	3.00	110	60	22	1
	50	2.60	124	69	22	1
	60	2.40	132	75	22	1
3.00	40	2.81	125	64	28	1
	50	2.40	141	75	30	1
	60	2.17	153	83	30	1

Required diagonal bracing for moving and lifting the formwork unit with the crane.

The Brace Frame SB-A does not require any diagonal bracing for concreting.

All values refer to a width of influence of 1.00 m.



Brace Frame SB-1

Concreting Heights 2.50 – 3.75 m

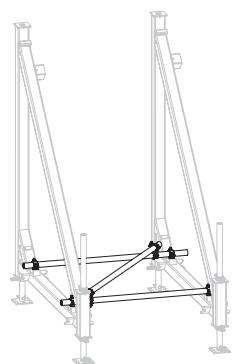
Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
			V ₁ [kN/m]	V ₂ [kN/m]	
2.50	30	81	37	21	2
	40	96	46	22	2
	50	106	53	22	2
2.75	30	91	38	27	2
	40	110	49	30	2
	50	124	57	31	2
3.00	30	102	38	35	2
	40	125	50	40	3
	50	142	59	42	3
3.25	30	113	38	44	2
	40	138	50	50	3
3.50	30	123	38	54	3
3.75	30	134	38	64	4

Required diagonal bracing for moving and lifting the formwork unit with the crane.

All values refer to a width of influence of 1.00 m.

If the Brace Frame SB-1 is used during concreting, no diagonal bracing is required.

Max. width of influence = 1.25 m.



Brace Frame SB-2

Concreting Heights 3.50 – 6.00 m

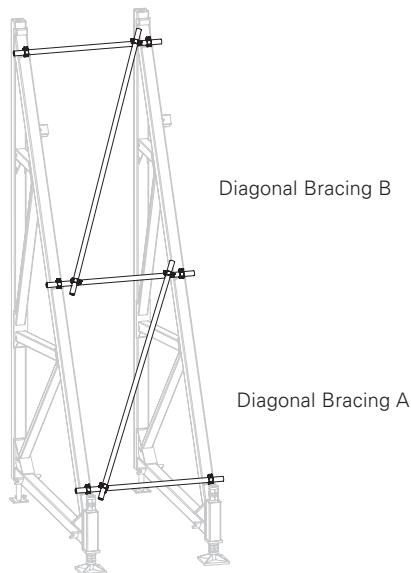
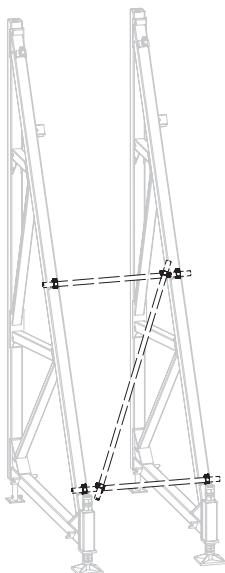
Concreting height h [m]	Fresh concrete pressure σ_{hk} [kN/m ²]	Anchor tension force Z [kN/m]	Spindle forces		Deflection f SB top [mm/m]
			V ₁ [kN/m]	V ₂ [kN/m]	
3.50	30	123	48	40	2
	40	153	63	46	2
	50	177	77	50	2
3.75	30	134	48	47	2
	40	167	63	55	2
	50	194	78	61	3
4.00	30	144	48	56	2
	40	181	63	66	3
	50	212	78	74	3
4.25	30	155	48	66	3
	40	195	63	78	3
	50	230	78	87	4
4.50	30	166	48	76	3
	40	210	63	91	4
	50	247	78	102	5
4.75	30	176	48	87	4
	40	223	63	105	5
	50	265	78	118	5
5.00	30	186	48	98	4
	40	238	63	120	6
	50	283	78	136	6
5.25	30	198	48	111	5
	40	252	63	135	6
	50	301	78	154	6
5.50	30	208	48	124	6
	40	266	63	152	7
	50	318	78	174	8
5.75	30	218	48	138	6
	40	280	63	170	8
	50	336	78	195	9
6.00	30	229	48	153	7
	40	294	63	189	9
	50	354	78	218	10

Required diagonal bracing for concreting height ≥ 5.00 m.

Required diagonal bracing for moving and lifting the formwork unit with the crane.

All values refer to a width of influence of 1.00 m.

Max. width of influence = 1.25 m.



Push-Pull Props, Kickers

Load-Bearing Capacities

General Notes

- The load-bearing capacity information refers to the use with symmetrical extensions.
- The connections are to be pin-jointed and made structurally adequate by calculations in each individual case.

Push-Pull Prop RS 210 L = 1.30 – 2.10 m

Extension Length [m]	1.30–2.00	2.10
Perm. Compressive Force F [kN]	25.0	23.6
Perm. Tension Force F [kN]		25.0

Push-Pull Prop RS 260 L = 2.30 – 2.60 m

Extension Length [m]	2.30	2.60
Perm. Compressive Force F [kN]	25.0	22.1
Perm. Tension Force F [kN]		25.0

Push-Pull Prop RS 300 L = 1.90 – 3.00 m

Extension Length [m]	1.90–2.30	2.50	3.00
Perm. Compressive Force F [kN]	25.0	21.6	14.2
Perm. Tension Force F [kN]		25.0	

Push-Pull Prop RS 450 L = 2.80 – 4.50 m

Extension Length [m]	2.80–3.60	4.00	4.50
Perm. Compressive Force F [kN]	25.0	17.2	11.8
Perm. Tension Force F [kN]		25.0	

Push-Pull Prop RS 650 L = 4.30 – 6.50 m

Extension Length [m]	4.30–4.90	5.00	5.50	6.00	6.50
Perm. Compressive Force F [kN]	25.0	24.4	18.5	15.9	13.2
Perm. Tension Force F [kN]			25.0		

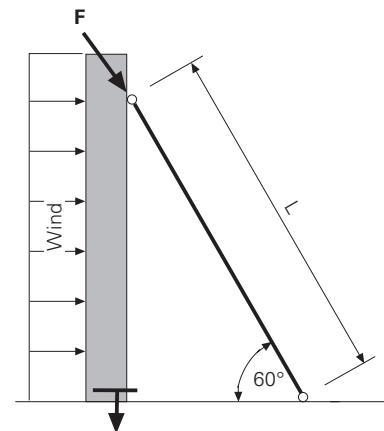
Push-Pull Prop RS 1000 L = 6.40 – 10.00 m

Extension Length [m]	6.40–6.64	7.64	8.44	9.24	10.00
Perm. Compressive Force F [kN]	34.2	25.9	20.3	16.0	12.8
Perm. Tension Force F [kN]			29.0		

Push-Pull Prop RS 1400 L = 6.40 – 14.00 m

Extension Length [m]	6.40–10.46	12.00	13.00	14.00
Perm. Compressive Force F [kN]	28.8	26.8	22.2	18.1
Perm. Tension Force F [kN]			27.7	

Static System for Push-Pull Props



Push-Pull Props, Kickers

Load-Bearing Capacities

Push-Pull Prop RS I L = 1.84 – 2.94 m

Extension Length [m]	1.84–2.45	2.75	2.94
Perm. Compressive Force F [kN]	16.3	14.6	12.5
Perm. Tension Force F [kN]		12.7	

Push-Pull Prop RS II L = 2.56 – 4.06 m

Extension Length [m]	2.56–2.97	3.37	3.77	4.06
Perm. Compressive Force F [kN]	16.3	11.7	8.5	7.0
Perm. Tension Force F [kN]		12.7		

Push-Pull Prop RSS I L = 2.05 – 2.94 m

Extension Length [m]	2.03	2.30	2.60	2.94
Perm. Compressive Force F [kN]	34.2	33.2	22.7	14.2
Perm. Tension Force F [kN]		26.3		

Push-Pull Prop RSS II L = 2.91 – 3.80 m

Extension Length [m]	2.91	3.21	3.50	3.80
Perm. Compressive Force F [kN]	31.7	26.4	17.1	11.6
Perm. Tension Force F [kN]		26.3		

Push-Pull Prop RSS III L = 4.60 – 6.00 m

Extension Length [m]	4.60	4.95	5.30	5.65	6.00
Perm. Compressive Force F [kN]	27.8	22.8	18.6	14.7	11.1
Perm. Tension Force F [kN]		20.0			

Kicker AV 82 / 111 / 140

L = 0.50 – 0.82 m

L = 0.79 – 1.11 m

L = 1.08 – 1.40 m

Extension Length [m]	0.50	0.66	0.82	0.79	0.95	1.11	1.08	1.24	1.40
Perm. Compressive Force F [kN]	34.1	28.9	23.2	30.9	24.9	19.7	25.7	20.0	15.7
Perm. Tension Force F [kN]		26.3			26.3		26.3		

Kicker AV 190 L = 1.08 – 1.90 m

Extension Length [m]	1.08	1.25	1.50	1.75	1.90
Perm. Compressive Force F [kN]	39.2	38.5	37.4	34.6	31.3
Perm. Tension Force F [kN]		21.1			

Kicker AV 210 L = 1.28 – 2.10 m

Extension Length [m]	1.28	1.69	1.90	2.10
Perm. Compressive Force F [kN]	34.2	34.2	25.5	19.0
Perm. Tension Force F [kN]		26.3		

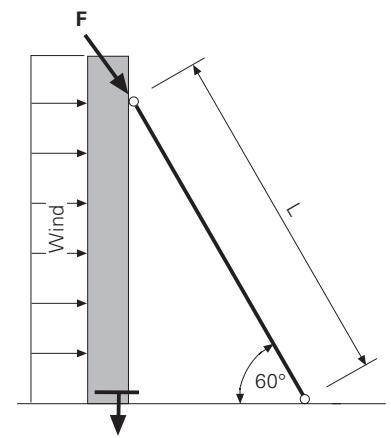
Kicker AV for RSS III L = 2.03 – 2.92 m

Extension Length [m]	2.03	2.30	2.60	2.94
Perm. Compressive Force F [kN]	34.2	33.2	22.7	14.2
Perm. Tension Force F [kN]		26.3		

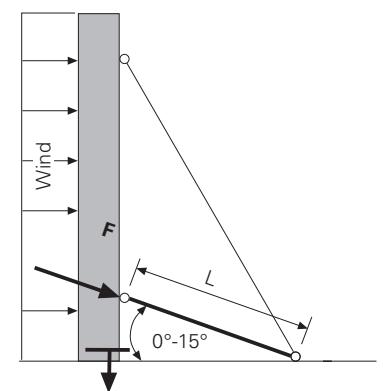
General Notes

- The load-bearing capacity information refers to the use with symmetrical extensions.
- The connections are to be pin-jointed and made structurally adequate by calculations in each individual case.

Static System for Push-Pull Props



Static System for Kickers



Push-Pull Props, Kickers

Maximum widths of influence for push-pull props and kickers

Standard application

		Formwork height h [m] System 1						Formwork height h [m] System 2			
		3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
Permissible width of influence [m]	EB_{ref}	5.20	4.04	2.74	2.26	2.05	1.74	2.45	2.04	1.80	1.50
Actual push-pull prop load [kN]	F_{RS1}	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.0	11.5	11.5
	F_{RS2}								10.9	11.5	11.2
Actual kicker load [kN]	F_{AV}	2.7	2.9	2.8	2.7	3.2	3.5	4.2	3.6	3.4	3.1
Base plate Resulting force [kN]	(1)	13.7	13.7	13.5	13.4	13.7	13.9	11.5	11.0	11.5	11.5
	(2)							14.2	14.3	13.7	12.8
Base plate Resulting angle of application [°]	(1)	52.4	51.1	51.1	51.1	49.4	48.2	60.0	60.0	60.0	60.0
	(2)							47.9	49.8	49.9	49.8
Lifting force VWind [kN/m]		2.1	2.6	3.8	4.6	5.1	5.9	8.4	10.0	11.4	13.2
x = Distance of base plate from rear edge of formwork [m]	x₁	1.2	1.6	2.0	2.4	3.0	3.6	4.2	4.7	5.1	5.5
	x₂							2.6	2.6	2.8	3.0
y = Top connection point from top of formwork [m]	y₁	1.0	1.2	1.5	1.8	1.8	1.8	1.5	1.8	2.1	2.4
	y₂							4.5	5.5	6.2	6.9
q(z=h) = q _h [kN/m ²]		0.50	0.50	0.58	0.58	0.58	0.61	0.64	0.66	0.69	0.71

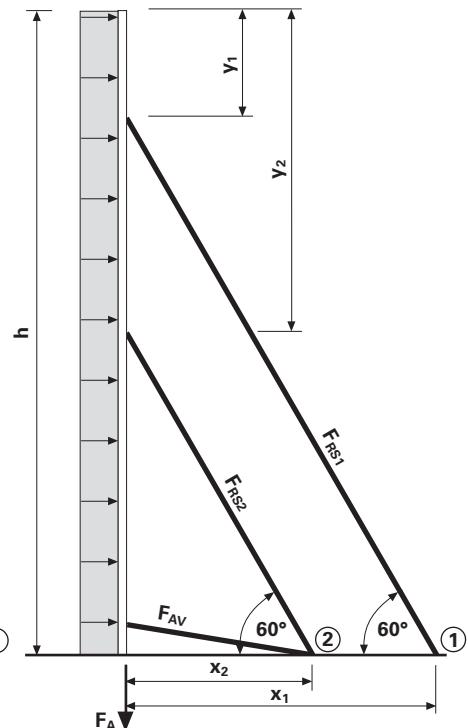
Assumptions:

- Wind loads according to DIN EN 1991-1-4 $w = q(z) \times c_p \times \kappa$ [kN/m²]
- Wind Zone 2, Terrain Category III
- Applied pressure coefficient $c_p = 1.8$ (see Graphic, below)
- Formwork in vertical position on ground
- Service life factor $\kappa = 0.6$
- $q(z)$ = peak velocity pressure
- Inclination of the push-pull prop to the horizontal 60°
- Values are characteristic values

Note:

Lift-off protection is provided if the lifting force $F_{A,d} = 1.5 \times V_{Wind} - 0.9 \times G \times h > 0$ G = surface area weight of the formwork including platforms.

System 2



In the end area L_E, the following c_p -values or wind loads are assumed:

$L/h \leq 3$: $c_{p,End} = 2.3^*$

$L/h = 5$: $c_{p,End} = 2.9^*$

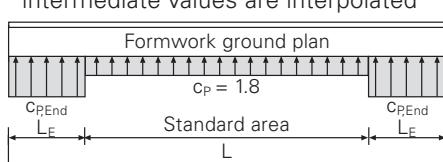
$L/h \geq 10$: $c_{p,End} = 3.4^*$

L_E = length of end area ($0.3 \times h$)

h = formwork height

L = formwork length

*intermediate values are interpolated



Push-Pull Props, Kickers

Maximum widths of influence for push-pull props and kickers

Wind loads $q(z) = q$ [kN/m²] for use when deviating from the standard application

Reference height z [m]	q(z) [kN/m ²]	Terrain Category III				Terrain Category II				Terrain Category I			
		Wind load zone											
		1	2	3	4	1	2	3	4	1	2	3	4
0 - 4	0.41	0.50	0.61	0.72	0.57	0.70	0.85	1.01	0.71	0.88	1.07	1.26	
7	0.47	0.58	0.70	0.83	0.67	0.83	1.00	1.20	0.81	1.00	1.22	1.44	
10	0.54	0.67	0.81	0.96	0.74	0.92	1.12	1.32	0.88	10.8	1.32	1.56	
15	0.63	0.77	0.94	1.11	0.83	1.02	1.23	1.47	0.95	1.18	1.43	1.70	
30	0.78	0.97	1.17	1.40	0.98	1.22	1.47	1.74	1.10	1.35	1.63	1.95	
50	0.91	1.12	1.36	1.62	1.10	1.35	1.63	1.95	1.21	1.48	1.80	2.14	

Note:

Values are valid for Germany.

In other countries, different values may be valid.

Formulae for usage deviating from the standard application

	max. width of influence EB	resulting lifting force F _{A,d}
Standard area	EB _{ref} × q _h / q	1.5 × V _{Wind} × q / q _h - G × h
End area	EB _{ref} × q _h / q × 1.8 / c _{P,End}	1.5 × V _{Wind} × q / q _h × c _{P,End} / 1.8 - G × h

Anchor Bolts

Anchor Bolt PERI 14/20 x 130

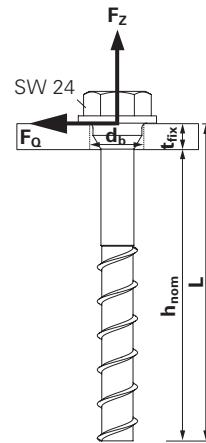
Anchor Bolt PERI 14 x 150

Anchor Bolt PERI 14/20 x 130

Technical data

Anchor length	L	130 mm
Fixing thickness	t_{fix}	6–12 mm
Anchoring depth	h_{nom}	L – t _{fix}
Depth of drilled hole	h₁	h _{nom} +10 mm
Drill Ø (Hammer Drill DIN 8035)	d₀	14 mm
Tightening torque	MD	50 Nm
Spanner size	SW	24 mm
Minimum axis spacing	s	≥ 500 mm
Minimum distance to edge	c₁, c₂	≥ 500 mm
Minimum thickness of structural member	d	≥ 225 mm
Hole in part to be fixed	d_b	21–22 mm
Concrete strength class ≥ C20/25 ≤ C50/60		
Cracked/non-cracked concrete	perm. F _Z	perm. F _O
f _{ck} = 10 N/mm ² , f _{ck,cube} = 12 N/mm ²	12.0 kN	35.0 kN
f _{ck} = 12 N/mm ² , f _{ck,cube} = 15 N/mm ²	14.7 kN	35.0 kN
f _{ck} = 16 N/mm ² , f _{ck,cube} = 20 N/mm ²	16.7 kN	35.0 kN
f _{ck} = 20 N/mm ² , f _{ck,cube} = 25 N/mm ²	18.6 kN	35.0 kN

Intermediate values to be interpolated.



Interaction equation

$$\frac{F_Z}{\text{perm. } F_Z} \leq 1.0$$

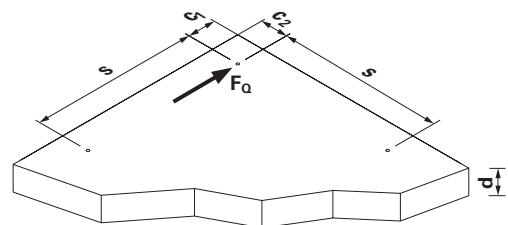
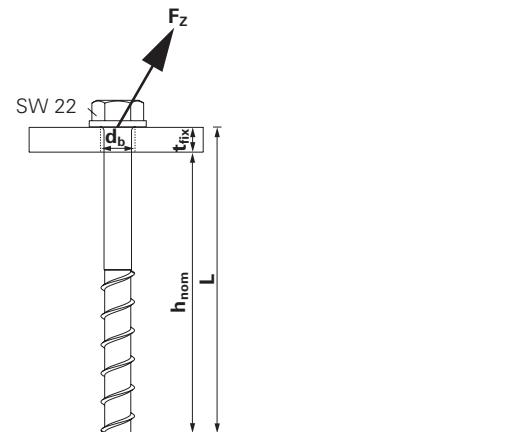
$$\frac{F_O}{\text{perm. } F_O} \leq 1.0 \quad \frac{F_Z}{\text{perm. } F_Z} + \frac{F_O}{\text{perm. } F_O} \leq 1.2$$

Anchor Bolt PERI 14 x 150

Technical data

Anchor length	L	150 mm
Fixing thickness	t_{fix}	≤ 35 mm
Anchoring depth	h_{nom}	L – t _{fix}
Depth of drilled hole	h₁	h _{nom} +10 mm
Drill Ø (Hammer Drill DIN 8035)	d₀	14 mm
Tightening torque	MD	50 Nm
Spanner size	SW	22 mm
Hole in part to be fixed	d_b	17–18 mm
Minimum axis spacing	s	≥ 400mmn ≥ 450 mm
Minimum thickness of structural member	d	≥ 200 mm ≥ 225 mm
Minimum distance to the edge in the direction of the load	c₁	≥ 135 mm ≥ 150 mm
Minimum distance to the edge transverse to the direction of the load	c₂	≥ 200 mm* ≥ 225 mm
Concrete strength class ≥ C20/25 ≤ C50/60	applies for every direction	
Cracked/non-cracked concrete	perm. F _Z	
f _{ck} = 10 N/mm ² , f _{ck,cube} = 12 N/mm ²	10.0 kN	12.0 kN
f _{ck} = 12 N/mm ² , f _{ck,cube} = 15 N/mm ²	12.0 kN	14.7 kN
f _{ck} = 16 N/mm ² , f _{ck,cube} = 20 N/mm ²	13.3 kN	16.7 kN

Intermediate values to be interpolated.



Drawing is valid for
Anchor Bolt PERI 14/20 x 130
Anchor Bolt PERI 14 x 150

*When using the Slab Foot PDF, c₂ may be reduced to 135 mm.

Compression Spindles

SKS, CB, VARIOKIT

Permissible load-bearing capacity with a symmetrical extension

Compression Brace SKS 2 L = 1.35 – 1.93 m

Extension Length [m]	1.35	1.50	1.65	1.80	1.93
Perm. Compressive Force [kN]	196.2	191.2	186.1	175.6	149.4
Perm. Tension Force [kN]	63.8				

Compression Brace SKS 3 L = 1.75 – 2.33 m

Extension Length [m]	1.75	1.90	2.05	2.20	2.33
Perm. Compressive Force [kN]	189.5	185.2	178.4	166.4	141.6
Perm. Tension Force [kN]	63.8				

Compression Brace SKS 4 L = 2.55 – 3.13 m

Extension Length [m]	2.55	2.70	2.85	3.00	3.13
Perm. Compressive Force [kN]	171.4	164.4	154.7	143.0	123.3
Perm. Tension Force [kN]	63.8				

Adjustable Brace CB 164 – 224* L = 1.64 – 2.24 m

Extension Length [m]	1.64	1.79	1.94	2.09	2.24
Perm. Compressive Force [kN]	137.1	121.4	105.6	101.9	97.0
Perm. Tension Force [kN]	102.0				

*The table corresponds to the type test.
Test Certificate No. S-A110157. It may only
be used in accordance with this type test.

Strut VARIOKIT L = 2.75 – 4.50 m

Extension Length [m]	2.75–4.50
Perm. Compressive Force [kN]	160.0
Perm. Tension Force [kN]	160.0

Strut VARIOKIT L = 4.00 – 7.00 m

Extension Length [m]	4.00–7.00
Perm. Compressive Force [kN]	160.0
Perm. Tension Force [kN]	160.0

Strut VARIOKIT L = 6.00 – 9.00 m

Extension Length [m]	6.00	7.00	8.00	9.00
Perm. Compressive Force [kN]	160.0	160.0	146.5	122.9
Perm. Tension Force [kN]	159.7			

Additional information for Compression Brace SKS:

When used with V-Strongback SKS and Brackets SKS 180 or SKSF 240, the maximum compression force is 135 kN. (Bolt bending Ø 25 x 180, a = 70 mm)

When used with V-Strongback SKS and H-Waler SKS, the maximum compression force is 116 kN. (Bolt bending Ø 25 x 180, a = 76 mm) Bearing stress and bolt bending of the connection are to be verified separately.

Additional information for the VARIOKIT Strut:

Permissible loads for the application with Pin Ø 26 x 120 (Item no. 111567)

- the boundary conditions of the connector parts are to be checked individually.
- dead load and wind load on the props considered.
- intermediate values may be linearly interpolated.
- bearing stress and bolt bending of the connection are to be verified separately.

Heavy-Duty Spindles

SLS and SCS

Permissible load-bearing capacity with a symmetrical extension

SLS 40/80 L = 0.40 – 0.80 m

Extension Length [m]	0.40–0.80
Perm. Compressive Force [kN]	88.0
Perm. Tension Force [kN]	70.8

SLS 80/140 L = 0.80 – 1.40 m

Extension Length L [m]	0.80–1.40
Perm. Compressive Force [kN]	107.1
Perm. Tension Force [kN]	81.6

SLS 100/180 L = 1.00 – 1.80 m

Extension Length L [m]	1.00–1.50	1.60	1.80
Perm. Compressive Force [kN]	107.1	105.5	90.4
Perm. Tension Force [kN]		81.6	

SLS 140/240 L = 1.40 – 2.40 m

Extension Length L [m]	1.40	1.50	1.70	1.90	2.00	2.10	2.20	2.30	2.40
Perm. Compressive Force [kN]	138.4	134.7	122.6	109.6	102.5	95.2	87.8	80.5	73.4
Perm. Tension Force [kN]					105.4				

SLS 200/300 L = 2.00 – 3.00 m

Extension Length L [m]	2.00	2.20	2.40	2.50	2.60	2.70	2.80	2.90	3.00
Perm. Compressive Force [kN]	136.6	123.6	109.3	101.9	94.4	87.2	79.8	72.9	66.4
Perm. Tension Force [kN]					105.4				

SLS 260/360 L = 2.60 – 3.60 m

Extension Length L [m]	2.60	2.80	3.00	3.10	3.20	3.30	3.40	3.50	3.60
Perm. Compressive Force [kN]	133.4	116.2	99.9	91.9	84.3	77.3	70.6	64.6	59.0
Perm. Tension Force [kN]					105.4				

SLS 320/420 L = 3.20 – 4.20 m

Extension Length L [m]	3.20	3.40	3.50	3.60	3.70	3.80	3.90	4.00	4.10	4.20
Perm. Compressive Force [kN]	117.1	101.2	92.8	85.5	78.6	72.1	66.1	60.2	55.8	51.2
Perm. Tension Force [kN]					105.4					

SLS 380/480 L = 3.80 – 4.80 m

Extension Length L [m]	3.80	3.90	4.00	4.10	4.20	4.30	4.40	4.50	4.60	4.70	4.80
Perm. Compressive Force [kN]	85.5	80.6	76.1	71.8	67.6	63.7	59.9	55.4	51.3	47.5	43.9
Perm. Tension Force [kN]					105.4						

SCS 198/250 L = 1.98 – 2.50 m

Extension Length L [m]	1.98	2.10	2.20	2.30	2.40	2.50
Perm. Compressive Force [kN]	264	247	233	217	197	175
Perm. Tension Force [kN]			211			

Additional information for SLS Spindles:

When using the SLS Spindle with Pin Ø 21 x 120 (Item no. 104031) or Hex. Bolt M20x100-8.8 on the SRU Steel Waler, a maximum load of 70 kN applies.

- values according to Type Test S-N-050528!
- horizontal to vertical applications.
- dead load and wind load on the props considered.
- intermediate values are to be linearly interpolated.
- bearing stress and bolt bending of the connection are to be verified separately.

Additional information for SCS Spindles:

- values according to Type Test!
- horizontal to vertical applications.
- dead load and wind load on the props considered.
- intermediate values are to be linearly interpolated.
- bearing stress and bolt bending of the connection are to be verified separately.

Heavy-Duty Spindles

SLS with Adapter

Permissible load-bearing capacity with a symmetrical extension

SLS 40/80 + Adapter L = 0.48 – 0.80 m

Extension Length L [m]	0.48–0.80
Perm. Compressive Force [kN]	88.0
Perm. Tension Force [kN]	70.8

SLS 80/140 + Adapter L = 0.99 – 1.50 m

Extension Length L [m]	0.99–1.20	1.40	1.50
Perm. Compressive Force [kN]	107.1	94.9	87.0
Perm. Tension Force [kN]		81.6	

SLS 100/180 + Adapter L = 1.19 – 1.91 m

Extension Length L [m]	1.19–1.30	1.50	1.80	1.91
Perm. Compressive Force [kN]	107.1	99.9	78.4	69.5
Perm. Tension Force [kN]		81.6		

SLS 140/240 + Adapter L = 1.59 – 2.51 m

Extension Length L [m]	1.59	1.70	1.90	2.10	2.30	2.51
Perm. Compressive Force [kN]	117.2	110.4	97.2	83.7	70.1	58.1
Perm. Tension Force [kN]			105.4			

SLS 200/300 + Adapter L = 2.19 – 3.11 m

Extension Length L [m]	2.19	2.30	2.50	2.70	2.90	3.11
Perm. Compressive Force [kN]	111.6	103.9	89.9	76.2	63.9	52.9
Perm. Tension Force [kN]			105.4			

SLS 260/360 + Adapter L = 2.79 – 3.71 m

Extension Length L [m]	2.79	2.90	3.10	3.30	3.50	3.71
Perm. Compressive Force [kN]	104.0	95.2	80.8	67.6	57.0	47.5
Perm. Tension Force [kN]			105.4			

SLS 320/420 + Adapter L = 3.39 – 4.31 m

Extension Length L [m]	3.39	3.50	3.70	3.90	4.10	4.31
Perm. Compressive Force [kN]	91.0	82.5	69.9	59.1	50.0	41.8
Perm. Tension Force [kN]			105.4			

SLS 380/480 + Adapter L = 3.99 – 4.91 m

Extension Length L [m]	3.99	4.10	4.30	4.50	4.70	4.91
Perm. Compressive Force [kN]	71.0	66.4	58.6	50.3	43.2	36.4
Perm. Tension Force [kN]			105.4			

Additional information for SLS Spindles:

When using the SLS Spindle with Pin Ø 21 x 120 (Item no. 104031) or Hex. Bolt M20x100-8.8 on the SRU Steel Waler, a maximum load of 70 kN applies.

- values according to Type Test S-N-050528!
- horizontal to vertical applications.
- dead load and wind load on the props considered.
- intermediate values are to be linearly interpolated.
- bearing stress and bolt bending of the connection are to be verified separately.

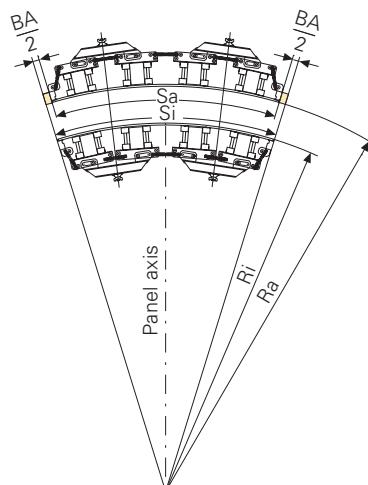
RUNDFLEX

Compensation Timber Widths

Panels A 250 outside / I 240 inside

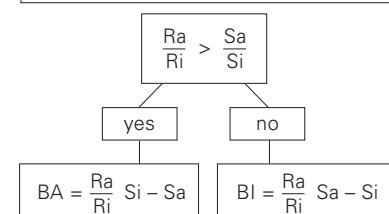
Inside radius [m]	Wall thickness d [m]				
	0.20	0.25	0.30	0.35	0.40
4.00	33	63	93		
4.20	27	55	84		
4.40	21	48	76		
4.60	16	42	68	94	
4.80	11	36	61	86	
5.00	6	30	54	78	
5.20	2	25	48	72	95
5.40	2	21	43	65	87
5.60	5	16	38	59	81
5.80	8	12	33	54	75
6.00	11	9	29	49	69
6.20	14	5	24	44	63
6.40	16	2	21	39	58
6.60	19	1	17	35	53
6.80	21	4	13	31	49
7.00	23	7	10	27	45
7.20	25	9	7	24	41
7.40	27	12	4	20	37
7.60	29	14	2	17	33
7.80	31	16	1	14	30
8.00	33	18	3	11	26
8.20	34	20	6	9	23
8.40	36	22	8	6	20
8.60	37	24	10	4	18
8.80	39	25	12	1	15
9.00	40	27	14	1	12
9.20	41	28	16	3	10
9.40	43	30	17	5	8
9.60	44	31	19	7	5
9.80	45	33	21	9	3
10.00	46	34	22	10	1
10.50	48	37	26	15	4
11.00	51	40	29	18	8

Inside radius [m]	Wall thickness d [m]				
	0.20	0.25	0.30	0.35	0.40
11.50	53	42	32	22	12
12.00	55	45	35	25	15
12.50	57	47	37	28	18
13.00	58	49	40	31	22
13.50	60	51	42	33	24
14.00	61	52	44	35	27
14.50	62	54	46	38	29
15.00	64	56	48	40	32
15.50	65	57	49	42	34
16.00	66	58	51	43	36
16.50	67	60	52	45	38
17.00	68	61	54	47	40
17.50	69	62	55	48	41
18.00	70	63	56	49	43
18.50	70	64	57	51	44
19.00	71	65	58	52	46
19.50	72	66	59	53	47
20.00	73	67	60	54	48



for $\frac{R_o}{R_i} = \frac{S_o}{S_i}$

no compensation required



BA = Compensation timber width outside [mm]

BI = Compensation timber width inside [mm]

Compensation Timber Widths Panels A 128 outside / I 123 inside

Inside radius [m]	Wall thickness d [m]				
	0.20	0.25	0.30	0.35	0.40
2.50	60	85			
2.60	56	79			
2.70	52	75	98		
2.80	48	70	92		
2.90	45	66	88		
3.00	42	62	83		
3.20	36	55	75	94	
3.40	31	49	68	86	
3.60	27	44	61	78	95
3.80	23	39	55	72	88
4.00	19	35	50	66	81
4.20	16	31	45	60	75
4.40	13	27	41	55	69
4.60	11	24	37	51	64
4.80	8	21	34	47	59
5.00	6	18	30	43	55
5.20	4	16	27	39	51
5.40	2	13	25	36	48
5.60	0	11	22	33	44
5.80	2	9	20	30	41
6.00	3	7	17	28	38
6.20	4	5	15	25	35
6.40	6	4	13	23	33
6.60	7	2	11	21	30
6.80	8	1	10	19	28
7.00	9	1	8	17	26
7.20	10	2	6	15	24
7.40	11	3	5	13	22
7.60	12	4	4	12	20
7.80	13	5	2	10	18
8.00	14	6	1	9	16
8.20	15	7	0	7	15
8.40	16	8	1	6	13



BA = Compensation timber width outside [mm]



BI = Compensation timber width inside [mm]

Inside radius [m]	Wall thickness d [m]				
	0.20	0.25	0.30	0.35	0.40
8.60	16	9	2	5	12
8.80	17	10	3	4	11
9.00	18	11	4	2	9
9.20	18	12	5	1	8
9.40	19	12	6	0	7
9.60	20	13	7	1	6
9.80	20	14	8	2	5
10.00	21	15	9	3	4
10.50	22	16	10	5	1
11.00	23	18	12	7	1
11.50	24	19	14	8	3
12.00	25	20	15	10	5
12.50	26	21	16	11	7
13.00	27	22	17	13	8
13.50	28	23	19	14	10
14.00	28	24	20	15	11
14.50	29	25	21	16	12
15.00	30	26	21	17	13
15.50	30	26	22	18	14
16.00	31	27	23	19	15
16.50	31	28	24	20	16
17.00	32	28	24	21	17
17.50	32	29	25	22	18
18.00	33	29	26	22	19
18.50	33	30	26	23	20
19.00	33	30	27	24	20
19.50	34	31	27	24	21
20.00	34	31	28	25	22

RUNDFLEX

Compensation Timber Widths Panels A 85 outside / I 72 inside

Inside radius Ri [m]	Wall thickness d [m]						
	0.20	0.25	0.30	0.35	0.40		
1.00	BAi BAA	Adjustable Spindle 210 inside	21	57 63	93 102		
1.10	BAi BAA		7	40 44	73 79		
1.20	Bli Bla		4	26	56 60	86 93	
1.30	Bli Bla		12	14	42 45	69 74	97 104
1.40	Bli Bla		19	4	29	55 59	81 86
1.50	Bli Bla		26	5	19	43	67 71
1.60	Bli Bla		32	11	9	32	54 58
1.70	Bli Bla		37	17	1	22	44
1.80	Bli Bla		41	23	5	14	34
1.90	Bli Bla		46	28	11	6	25
2.00	Bli Bla		50	32	16	0	18
2.10	Bli Bla		53 50	37	21	6	11
2.20	Bli Bla		56 53	40	25	11	4
2.30	Bli Bla		59 56	44	29	15	1
2.40	Bli Bla		62 59	47	33	19	6
2.50	Bli Bla		64 61	50	36	23	10
2.60	Bli Bla		67 64	53	40	27	14
2.70	Bli Bla		69 66	56	43	30	18
2.80	Bli Bla		71 68	58	45	33	22
2.90	Bli Bla		73 70	60	48	36	25
3.00	Bli Bla		75	62	51	39	28
3.10	Bli Bla		76	64	53	42	31
3.20	Bli Bla		78	66	55	44	34

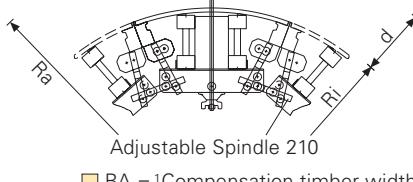
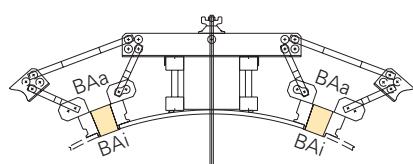


BA = Compensation timber width outside [mm]

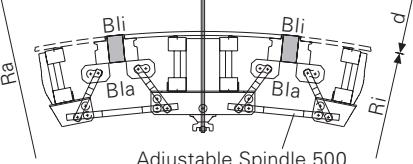
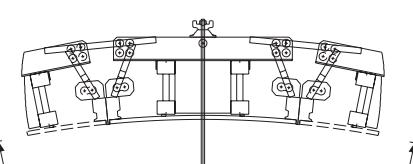


BI = Compensation timber width inside [mm]

Inside radius Ri [m]	Wall thickness d [m]						
	0.20	0.25	0.30	0.35	0.40		
3.30	BAi BAA	Adjustable Spindle 500 inside	79	68	57	47	36
3.40	BAi BAA		81	70	59	49	39
3.50	Bli Bla		82	71	61	51	41
3.60	Bli Bla		83	73	63	53	43
3.70	Bli Bla		85	74	64	55	45
3.80	Bli Bla		86	76	66	57	47
3.90	Bli Bla		87	77	68	58	49
4.00	Bli Bla		88	78	69	60	51
4.10	Bli Bla		89	80	70	62	53
4.20	Bli Bla		90	81	72	63	55
4.30	Bli Bla		91	82	73	65	56
4.40	Bli Bla		92	83	74	66	58
4.50	Bli Bla		92	84	75	67	59



BA = Compensation timber width on the outside panel [mm]



Bl = Compensation timber width on the inside panel [mm]

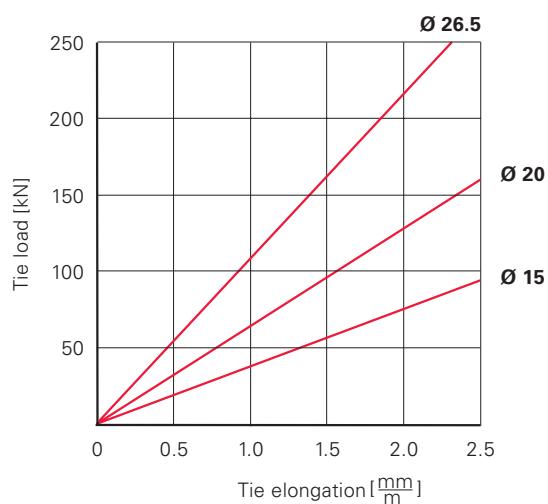
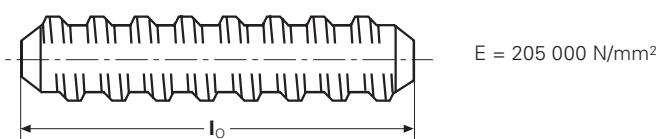
¹If the width of the compensation timber varies less than 3 mm between inside and outside, the cut is then rectangular.

Tie Rods

DW 15, DW 20, DW 26.5

	Rod diameter \varnothing [mm]		
	15	20	26.5
Nominal cross-section [mm ²]	177	314	551
Load group according to DIN 18216 [kN]	90	150	250

Elongation of Dywidag threaded tie rod



MULTIFLEX

GT 24 used as Slab Girder

Slab thickness d [m]	0.10			0.12			0.14			0.16			0.18			0.20				
Load q* [kN/m ²]	4.4			4.8			5.3			5.8			6.3			6.8				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50		
Cantilever e [m]	0.30	0.60	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			10.9	11.6	12.5	11.6	12.3	13.2	12.2	12.9	13.9	12.8	13.5	14.6	13.3	14.2	15.3	13.9	14.8	15.9
	0.45	0.90	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			16.4	17.4	18.8	17.3	18.4	19.8	18.2	19.4	20.9	19.1	20.3	21.9	20.0	21.3	22.9	20.9	22.2	23.9
	0.45	1.20	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.82	3.36	3.52	3.52	3.25	3.27	3.27
			21.9	23.3	25.1	23.1	24.6	26.4	24.3	25.8	27.8	25.5	27.1	28.0	26.7	28.0	28.0	27.8	28.0	28.0
	0.45	1.50	3.99	4.09	4.09	3.67	3.67	3.67	3.34	3.34	3.34	3.05	3.05	3.05	2.82	2.82	2.82	2.61	2.61	2.61
			27.4	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.80	3.41	3.41	3.41	3.06	3.06	3.06	2.78	2.78	2.78	2.55	2.55	2.55	2.35	2.35	2.35	2.18	2.18	2.18
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	2.10	2.92	2.92	2.92	2.62	2.62	2.62	2.38	2.38	2.38	2.18	2.18	2.18	2.01	2.01	2.01	1.87	1.87	1.87
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0

Slab thickness d [m]	0.22			0.24			0.25			0.26			0.28			0.30				
Load q* [kN/m ²]	7.3			7.8			8.0			8.3			8.8			9.3				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40		
Cantilever e [m]	0.30	0.60	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.74	3.18	3.43	3.69	3.11	3.35	3.61	3.04	3.28	3.53
			14.5	15.4	16.6	16.0	17.2	18.6	16.3	17.5	18.9	16.6	17.9	19.2	17.2	18.5	19.9	17.7	19.1	20.6
	0.45	0.90	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.69	3.18	3.43	3.58	3.11	3.35	3.38	3.04	3.20	3.20
			21.7	23.1	24.9	24.0	25.8	27.8	24.4	26.3	28.0	24.9	26.8	28.0	25.7	27.7	28.0	26.6	28.0	28.0
	0.45	1.20	3.05	3.05	3.05	2.86	2.86	2.86	2.77	2.77	2.77	2.69	2.69	2.69	2.54	2.54	2.54	2.40	2.40	2.40
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.50	2.44	2.44	2.44	2.29	2.29	2.29	2.22	2.22	2.22	2.15	2.15	2.03	2.03	2.03	1.92	1.92	1.92	1.92
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.80	2.03	2.03	2.03	1.90	1.90	1.90	1.85	1.85	1.85	1.79	1.79	1.79	1.69	1.69	1.69	1.60	1.60	1.60
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	2.10	1.74	1.74	1.74	1.63	1.63	1.63	1.58	1.58	1.58	1.54	1.54	1.54	1.45	1.45	1.45	1.37	1.37	1.37
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0

MULTIFLEX

GT 24 used as Slab Girder

Slab thickness d [m]	0.35		0.40		0.45		0.50		0.60		0.70		0.80		0.90		1.00	
Load q* [kN/m²]	10.6		11.9		13.3		14.6		17.3		20.0		22.5		25.0		27.4	
Sec. girder spacing a [m]	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40
Cantilever e [m]	0.30	0.60	3.12	3.36	2.99	3.22	2.88	3.10	2.77	3.00	2.54	2.57	2.22	2.22	1.98	1.98	1.78	1.62
			20.8	22.4	22.5	24.2	24.1	25.9	25.5	27.6	27.7	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	0.90	2.80	2.80	2.48	2.48	2.23	2.23	2.03	2.03	1.71	1.71	1.48	1.48	1.32	1.32	1.19	1.08
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.20	2.10	2.10	1.86	1.86	1.67	1.67	1.52	1.52	1.28	1.28	1.11	1.11	0.99	0.99	0.89	0.89
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.50	1.68	1.68	1.49	1.49	1.34	1.34	1.22	1.22	1.03	1.03	0.89	0.89	0.79	0.79	0.71	0.65
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	1.80	1.40	1.40	1.24	1.24	1.12	1.12	1.01	1.01	0.86	0.86	0.74	0.74	0.66	0.66	0.59	0.59
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
	0.45	2.10	1.20	1.20	1.06	1.06	0.96	0.96	0.87	0.87	0.73	0.73	0.63	0.63	0.56	0.56	0.51	0.46
			28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0

Calculation basis:

* Load according to EN 12812

Dead load

$$Q_1 = 0.40 \text{ kN/m}^2$$

Concrete load

$$Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$$

Equivalent load: concreting

$$Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

Equivalent load: working conditions

$$Q_{2,p} = 0.75 \text{ kN/m}^2$$

Total load

$$\mathbf{Q} = Q_1 + Q_{2,b} + Q_{2,p} + Q_4$$

– Deflection has been limited to l/500

– Main girder support at centre of girder nodes

– Secondary girder assumed as single span

For cantilevers:

c < 90 cm; e = 30 cm

c ≥ 90 cm; e = 45 cm

c: width of main beam interior span or prop spacing

e: length of cantilever

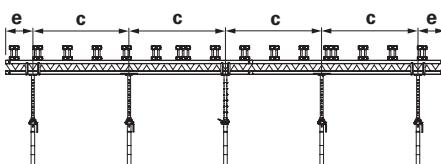
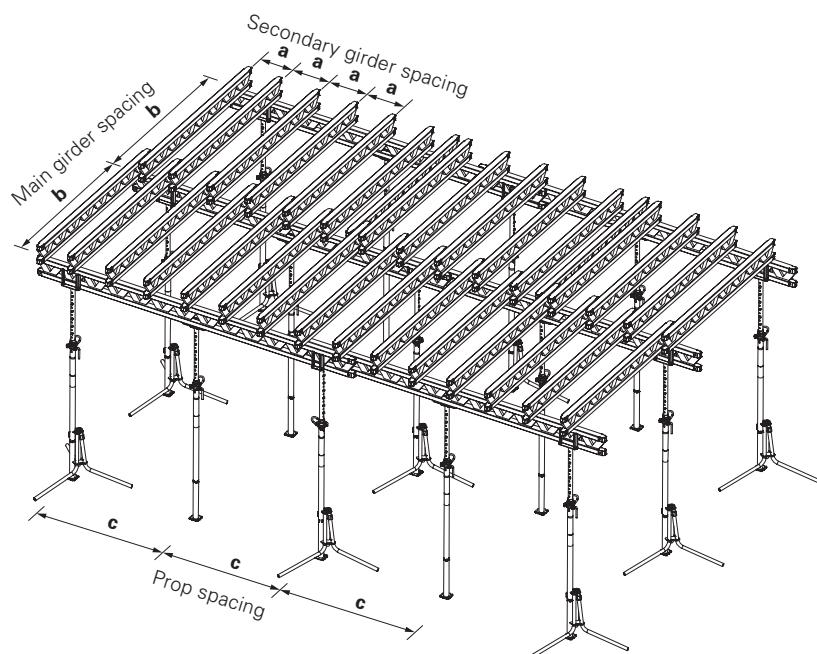


Table values mean the following:

2.77 perm. main girder spacing b [m]

28.0 actual prop load [kN]



MULTIFLEX

VT 20 used as Slab Girder

Slab thickness d [m]	0.10			0.12			0.14			0.16			0.18			0.20				
Load q* [kN/m ²]	4.4			4.8			5.3			5.8			6.3			6.8				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50		
Cantilever e [m]	0.25	0.50	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			7.3	7.8	8.4	7.7	8.2	8.9	8.1	8.6	9.3	8.5	9.1	9.8	8.9	9.5	10.2	9.3	9.9	10.7
	0.375	0.75	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			11.0	11.7	12.6	11.6	12.3	13.3	12.2	13.0	14.0	12.8	13.6	14.7	13.4	14.2	15.3	14.0	14.9	16.0
	0.50	1.00	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			14.7	15.6	16.8	15.5	16.4	17.7	16.3	17.3	18.6	17.1	18.1	19.5	17.9	19.0	20.4	18.6	19.8	21.3
	0.50	1.25	3.21	3.41	3.67	3.04	3.23	3.46	2.91	3.09	3.14	2.79	2.88	2.88	2.66	2.66	2.46	2.46	2.46	2.46
			18.3	19.5	21.0	19.3	20.5	22.0	20.3	21.6	22.0	21.3	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.50	3.21	3.21	3.21	2.89	2.89	2.89	2.62	2.62	2.62	2.40	2.40	2.40	2.21	2.21	2.21	2.05	2.05	2.05
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.75	3.21	3.21	3.21	2.47	2.47	2.47	2.25	2.25	2.25	2.06	2.06	2.06	1.90	1.90	1.90	1.76	1.76	1.76
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	2.00	2.75	2.75	2.75	2.47	2.47	2.47	2.25	2.25	2.25	2.06	2.06	2.06	1.90	1.90	1.90	1.76	1.76	1.76
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0

Slab thickness d [m]	0.22			0.24			0.25			0.26			0.28			0.30				
Load q* [kN/m ²]	7.3			7.8			8.0			8.3			8.8			9.3				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40		
Cantilever e [m]	0.25	0.50	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			9.7	10.3	11.1	10.7	11.5	12.4	10.9	11.7	12.6	11.1	12.0	12.9	11.5	12.4	13.3	11.9	12.8	13.8
	0.375	0.75	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			14.5	15.5	16.7	16.1	17.3	18.6	16.4	17.6	19.0	16.6	17.9	19.3	17.2	18.6	20.0	17.8	19.2	20.7
	0.50	1.00	2.53	2.69	2.87	2.62	2.69	2.69	2.59	2.61	2.61	2.53	2.53	2.53	2.39	2.39	2.39	2.27	2.27	2.27
			19.4	20.6	22.0	21.4	22.0	22.0	21.8	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.25	2.30	2.30	2.30	2.15	2.15	2.15	2.09	2.09	2.09	2.03	2.03	2.03	1.91	1.91	1.91	1.81	1.81	1.81
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.50	1.92	1.92	1.92	1.80	1.80	1.80	1.74	1.74	1.74	1.69	1.69	1.69	1.59	1.59	1.59	1.51	1.51	1.51
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.75	1.64	1.64	1.64	1.54	1.54	1.54	1.49	1.49	1.49	1.45	1.45	1.45	1.37	1.37	1.37	1.29	1.29	1.29
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	2.00	1.44	1.44	1.44	1.35	1.35	1.35	1.31	1.31	1.31	1.27	1.27	1.27	1.20	1.20	1.20	1.13	1.13	1.13
			22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0

VT 20 used as Slab Girder

Slab thickness d [m]	0.35		0.40		0.45		0.50		0.60		0.70		0.80		0.90		1.00	
Load q* [kN/m²]	10.6		11.9		13.3		14.6		17.3		20.0		22.5		25.0		27.4	
Sec. girder spacing a [m]	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40
Cantilever e [m]	0.25	0.50	2.51	2.70	2.40	2.59	2.31	2.49	2.24	2.41	2.11	2.27	2.00	2.09	1.86	1.86	1.68	1.68
		0.50	13.9	15.0	15.0	16.2	16.1	17.4	17.2	18.5	19.2	20.6	21.0	22.0	22.0	22.0	22.0	22.0
	0.375	0.75	2.51	2.64	2.34	2.34	2.10	2.10	1.91	1.91	1.61	1.61	1.40	1.40	1.24	1.24	1.12	1.02
		0.75	20.9	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.00	1.98	1.98	1.76	1.76	1.58	1.58	1.43	1.43	1.21	1.21	1.05	1.05	0.93	0.93	0.84	0.84
		1.00	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.25	1.58	1.58	1.41	1.41	1.26	1.26	1.15	1.15	0.97	0.97	0.84	0.84	0.74	0.74	0.67	0.67
		1.25	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.50	1.32	1.32	1.17	1.17	1.05	1.05	0.96	0.96	0.81	0.81	0.70	0.70	0.62	0.62	0.56	0.56
		1.50	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	1.75	1.13	1.13	1.00	1.00	0.90	0.90	0.82	0.82	0.69	0.69	0.60	0.60	0.53	0.53	0.48	0.48
		1.75	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	0.50	2.00	0.99	0.99	0.88	0.88	0.79	0.79	0.72	0.72	0.60	0.60	0.52	0.52	0.47	0.47	0.42	0.42
		2.00	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0

Calculation basis:

*Load according to EN 12812

Dead load

$$Q_1 = 0.40 \text{ kN/m}^2$$

Concrete load

$$Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$$

Equivalent load: concreting

$$Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

Equivalent load: working conditions

$$Q_{2,p} = 0.75 \text{ kN/m}^2$$

Total load

$$\mathbf{Q = Q_1 + Q_{2,b} + Q_{2,p} + Q_4}$$

– Deflection has been limited to l/500

– Secondary girder assumed as single span

For cantilevers:

c < 75 cm; e = c/2

c ≥ 75 cm; e = 50 cm

c: width of main beam interior span or prop spacing

e: length of cantilever

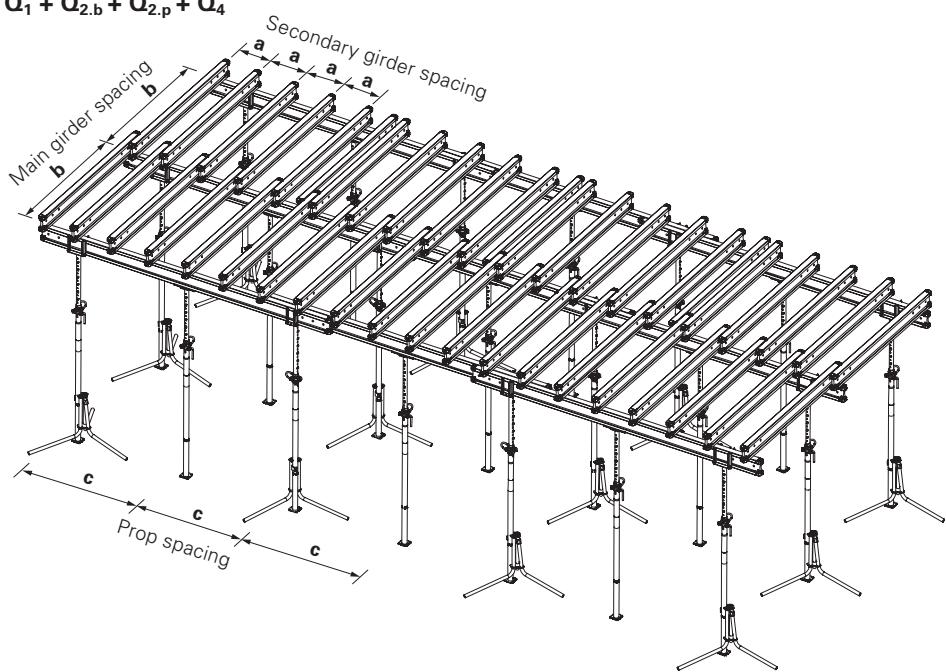
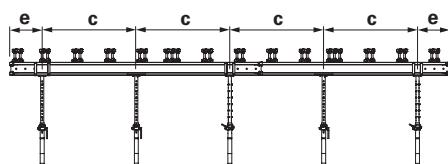


Table values mean the following:

2.61 perm. main girder spacing b [m]

22.0 actual prop load [kN]

MULTIFLEX

Secondary Girder: GT 24

Main Girder: 2 x GT 24

Slab thickness d [m]	0.10			0.12			0.14			0.16			0.18			0.20				
Load q* [kN/m ²]	4.4			4.8			5.3			5.8			6.3			6.8				
Sec. Girder Spacing a [m]	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50		
Cantilever e [m]	0.30	0.60	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			10.9	11.6	12.5	11.6	12.3	13.2	12.2	12.9	13.9	12.8	13.5	14.6	13.3	14.2	15.3	13.9	14.8	15.9
	0.45	0.90	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			16.4	17.4	18.8	17.3	18.4	19.8	18.2	19.4	20.9	19.1	20.3	21.9	20.0	21.3	22.9	20.9	22.2	23.9
	0.45	1.20	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			21.9	23.3	25.1	23.1	24.6	26.4	24.3	25.8	27.8	25.5	27.1	29.2	26.7	28.3	30.5	27.8	29.6	31.9
	0.45	1.50	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			27.4	29.1	31.3	28.9	30.7	33.1	30.4	32.3	34.8	31.9	33.9	36.5	33.3	35.4	38.2	34.8	37.0	39.8
	0.45	1.80	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			32.8	34.9	37.6	34.7	36.8	39.7	36.5	38.8	41.7	38.3	40.6	43.8	40.0	42.5	45.8	41.7	44.4	47.8
	0.45	2.10	3.99	4.24	4.57	3.79	4.03	4.34	3.62	3.85	4.14	3.48	3.70	3.98	3.36	3.57	3.84	3.25	3.45	3.72
			38.3	40.7	43.9	40.4	43.0	46.3	42.5	45.2	48.7	44.6	47.4	51.1	46.7	49.6	53.4	48.7	51.8	55.8

Slab thickness d [m]	0.22			0.24			0.25			0.26			0.28			0.30				
Load q* [kN/m ²]	7.3			7.8			8.0			8.3			8.8			9.3				
Sec. Girder Spacing a [m]	0.75	0.625	0.50	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40		
Cantilever e [m]	0.30	0.60	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.74	3.18	3.43	3.69	3.11	3.35	3.61	3.04	3.28	3.53
			14.5	15.4	16.6	16.0	17.2	18.6	16.3	17.5	18.9	16.6	17.9	19.2	17.2	18.5	19.9	17.7	19.1	20.6
	0.45	0.90	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.74	3.18	3.43	3.69	3.11	3.35	3.61	3.04	3.28	3.53
			21.7	23.1	24.9	24.0	25.8	27.8	24.4	26.3	28.3	24.9	26.8	28.9	25.7	27.7	29.9	26.6	28.6	30.8
	0.45	1.20	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.74	3.18	3.43	3.69	3.11	3.35	3.61	3.04	3.28	3.53
			29.0	30.8	33.2	32.0	34.4	37.1	32.6	35.1	37.8	33.2	35.7	38.5	34.3	37.0	39.8	35.4	38.2	41.1
	0.45	1.50	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.74	3.18	3.43	3.69	3.11	3.35	3.61	3.04	3.28	3.53
			36.2	38.5	41.5	40.0	43.1	46.4	40.7	43.9	47.2	41.4	44.6	48.1	42.9	46.2	49.8	44.3	47.7	51.4
	0.45	1.80	3.15	3.35	3.61	3.26	3.51	3.79	3.22	3.47	3.69	3.18	3.43	3.58	3.11	3.35	3.38	3.04	3.20	3.20
			43.5	46.2	49.7	48.0	51.7	55.7	48.9	52.6	56.0	49.7	53.6	56.0	51.5	55.4	56.0	53.2	56.0	56.0
	0.45	2.10	3.15	3.35	3.48	3.26	3.26	3.26	3.16	3.16	3.16	3.07	3.07	3.07	2.90	2.90	2.75	2.75	2.75	2.75
			50.7	53.9	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0

Secondary Girder: GT 24

Main Girder: 2 x GT 24

Slab thickness d [m]	0.35		0.40		0.45		0.50		0.60		0.70		0.80		0.90		1.00			
Load q* [kN/m ²]	10.6		11.9		13.3		14.6		17.3		20.0		22.5		25.0		27.4			
Sec. girder spacing a [m]	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40		
Cantilever e [m]	0.30	0.60	3.12	3.36	2.99	3.22	2.88	3.10	2.77	3.00	2.54	2.83	2.37	2.64	2.23	2.49	2.08	2.37	1.90	2.26
			20.8	22.4	22.5	24.2	24.1	25.9	25.5	27.6	27.7	30.8	29.8	33.3	31.6	35.4	32.8	37.2	32.8	39.0
	0.45	0.90	3.12	3.36	2.99	3.22	2.88	3.10	2.77	3.00	2.54	2.83	2.37	2.64	2.23	2.49	2.08	2.37	1.90	2.16
			31.2	33.6	33.7	36.3	36.1	38.9	38.2	41.4	41.6	46.2	44.7	50.0	47.4	53.0	49.1	55.9	49.1	56.0
	0.45	1.20	3.12	3.36	2.99	3.22	2.88	3.10	2.77	3.00	2.54	2.57	2.22	2.22	1.98	1.98	1.78	1.78	1.62	1.62
			41.6	44.8	44.9	48.4	48.2	51.9	51.0	55.2	55.5	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
	0.45	1.50	3.12	3.36	2.98	2.98	2.68	2.68	2.43	2.43	2.05	2.05	1.78	1.78	1.58	1.58	1.43	1.43	1.30	1.30
			52.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
	0.45	1.80	2.80	2.80	2.48	2.48	2.23	2.23	2.03	2.03	1.71	1.71	1.48	1.48	1.32	1.32	1.19	1.19	1.08	1.08
			56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
	0.45	2.10	2.40	2.40	2.13	2.13	1.91	1.91	1.74	1.74	1.47	1.47	1.27	1.27	1.13	1.13	1.02	1.02	0.93	0.93
			56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0

Calculation basis:

*Load according to EN 12812

Dead load

$$Q_1 = 0.40 \text{ kN/m}^2$$

Concrete load

$$Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$$

Equivalent load: concreting

$$Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

Equivalent load: working conditions

$$Q_{2,p} = 0.75 \text{ kN/m}^2$$

Total load

$$\mathbf{Q} = Q_1 + Q_{2,b} + Q_{2,p} + Q_4$$

– Deflection has been limited to l/500

– Main girder support at centre of girder nodes

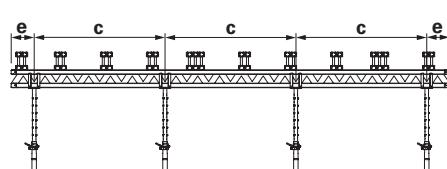
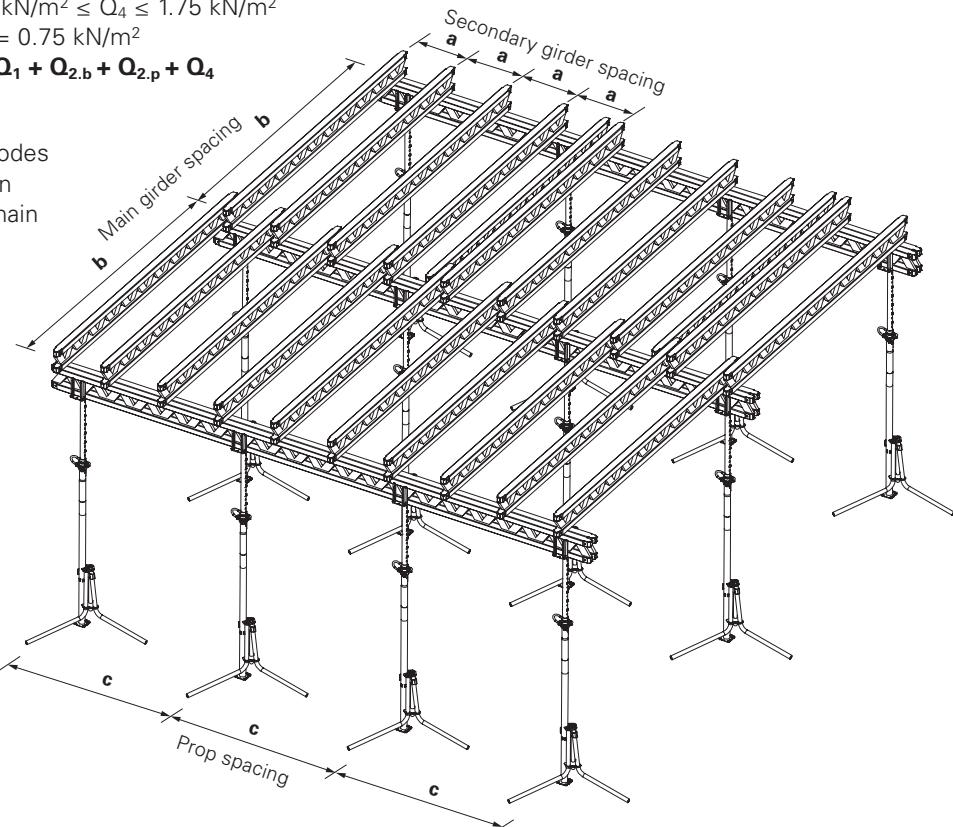
– Secondary girder assumed as single span

– For prop loads < 28.0 kN, 1 x GT 24 as main beam is sufficient.

Table values mean the following:

3.16 perm. main girder spacing b [m]

56.0 actual prop load [kN]



MULTIFLEX

Secondary Girder: VT 20

Main Girder: 2 x VT 20

Slab thickness d [m]	0.10			0.12			0.14			0.16			0.18			0.20				
Load q* [kN/m ²]	4.4			4.8			5.3			5.8			6.3			6.8				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50	0.75	0.625	0.50		
Cantilever e [m]	0.25	0.50	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			7.3	7.8	8.4	7.7	8.2	8.9	8.1	8.6	9.3	8.5	9.1	9.8	8.9	9.5	10.2	9.3	9.9	10.7
	0.375	0.75	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			11.0	11.7	12.6	11.6	12.3	13.3	12.2	13.0	14.0	12.8	13.6	14.7	13.4	14.2	15.3	14.0	14.9	16.0
	0.50	1.00	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			14.7	15.6	16.8	15.5	16.4	17.7	16.3	17.3	18.6	17.1	18.1	19.5	17.9	19.0	20.4	18.6	19.8	21.3
	0.50	1.25	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			18.3	19.5	21.0	19.3	20.5	22.1	20.3	21.6	23.3	21.3	22.7	24.4	22.3	23.7	25.6	23.3	24.8	26.7
Prop spacing c [m]	0.50	1.50	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			22.0	23.4	25.2	23.2	24.7	26.6	24.4	25.9	27.9	25.6	27.2	29.3	26.8	28.5	30.7	27.9	29.7	32.0
	0.50	1.75	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			25.7	27.3	29.4	27.1	28.8	31.0	28.5	30.3	32.6	29.9	31.7	34.2	31.3	33.2	35.8	32.6	34.7	37.3
	0.50	2.00	3.21	3.41	3.67	3.04	3.23	3.48	2.91	3.09	3.33	2.79	2.97	3.20	2.70	2.86	3.09	2.61	2.77	2.99
			29.3	31.2	33.6	30.9	32.9	35.4	32.5	34.6	37.3	34.1	36.3	39.1	35.7	38.0	40.9	37.3	39.6	42.7

Slab thickness d [m]	0.22			0.24			0.25			0.26			0.28			0.30				
Load q* [kN/m ²]	7.3			7.8			8.0			8.3			8.8			9.3				
Sec. girder spacing a [m]	0.75	0.625	0.50	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40	0.625	0.50	0.40		
Cantilever e [m]	0.25	0.50	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			9.7	10.3	11.1	10.7	11.5	12.4	10.9	11.7	12.6	11.1	12.0	12.9	11.5	12.4	13.3	11.9	12.8	13.8
	0.375	0.75	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			14.5	15.5	16.7	16.1	17.3	18.6	16.4	17.6	19.0	16.6	17.9	19.3	17.2	18.6	20.0	17.8	19.2	20.7
	0.50	1.00	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			19.4	20.6	22.2	21.4	23.1	24.8	21.8	23.5	25.3	22.2	23.9	25.8	23.0	24.7	26.7	23.7	25.6	27.5
	0.50	1.25	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			24.2	25.8	27.8	26.8	28.8	31.1	27.3	29.4	31.6	27.7	29.9	32.2	28.7	30.9	33.3	29.7	32.0	34.4
Prop spacing c [m]	0.50	1.50	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	3.00	2.56	2.75	2.97	2.50	2.69	2.90	2.44	2.63	2.84
			29.1	30.9	33.3	32.1	34.6	37.3	32.7	35.2	37.9	33.3	35.9	38.6	34.5	37.1	40.0	35.6	38.3	41.3
	0.50	1.75	2.53	2.69	2.90	2.62	2.82	3.04	2.59	2.79	2.98	2.56	2.75	2.90	2.50	2.69	2.73	2.44	2.59	2.59
			33.9	36.1	38.9	37.5	40.4	43.5	38.2	41.1	44.0	38.8	41.8	44.0	40.2	43.3	44.0	41.5	44.0	44.0
	0.50	2.00	2.53	2.69	2.87	2.62	2.69	2.69	2.59	2.61	2.61	2.53	2.53	2.53	2.39	2.39	2.39	2.27	2.27	2.27
			38.8	41.2	44.0	42.8	44.0	44.0	43.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0

Secondary Girder: VT 20

Main Girder: 2 x VT 20

Slab thickness d [m]	0.35		0.40		0.45		0.50		0.60		0.70		0.80		0.90		1.00	
Load q* [kN/m ²]	10.6		11.9		13.3		14.6		17.3		20.0		22.5		25.0		27.4	
Sec. girder spacing a [m]	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40	0.50	0.40
Cantilever e [m]	0.25	0.50	2.51	2.70	2.40	2.59	2.31	2.49	2.24	2.41	2.11	2.27	2.00	2.16	1.89	2.07	1.76	1.99
		0.50	13.9	15.0	15.0	16.2	16.1	17.4	17.2	18.5	19.2	20.6	21.0	22.7	22.3	24.4	23.1	26.1
	0.375	0.75	2.51	2.70	2.40	2.59	2.31	2.49	2.24	2.41	2.11	2.27	2.00	2.16	1.89	2.07	1.76	1.99
		0.75	20.9	22.5	22.6	24.3	24.2	26.0	25.7	27.7	28.7	31.0	31.5	34.0	33.4	36.6	34.7	39.1
	0.50	1.00	2.51	2.70	2.40	2.59	2.31	2.49	2.24	2.41	2.11	2.27	2.00	2.09	1.86	1.86	1.68	1.68
		1.00	27.8	30.0	30.1	32.4	32.2	34.7	34.3	37.0	38.3	41.3	42.0	44.0	44.0	44.0	44.0	44.0
	0.50	1.25	2.51	2.70	2.40	2.59	2.31	2.49	2.24	2.29	1.94	1.94	1.67	1.67	1.49	1.49	1.34	1.34
		1.25	34.8	37.5	37.6	40.5	40.3	43.4	42.9	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
	0.50	1.50	2.51	2.64	2.34	2.34	2.10	2.10	1.91	1.91	1.61	1.61	1.40	1.40	1.24	1.24	1.12	1.12
		1.50	41.8	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
	0.50	1.75	2.26	2.26	2.01	2.01	1.80	1.80	1.64	1.64	1.38	1.38	1.20	1.20	1.06	1.06	0.96	0.96
		1.75	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
	0.50	2.00	1.98	1.98	1.76	1.76	1.58	1.58	1.43	1.43	1.21	1.21	1.05	1.05	0.93	0.93	0.84	0.84
		2.00	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0

Calculation basis:

*Load according to EN 12812

Dead load

$$Q_1 = 0.40 \text{ kN/m}^2$$

Concrete load

$$Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$$

Equivalent load: concreting

$$Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

Equivalent load: working conditions

$$Q_{2,p} = 0.75 \text{ kN/m}^2$$

Total load

$$\mathbf{Q = Q_1 + Q_{2,b} + Q_{2,p} + Q_4}$$

– Deflection has been limited to l/500

– Secondary girder assumed as single span

– For prop loads < 22.0 kN, 1 x VT 20 as main beam is sufficient.

For cantilevers:

c < 75 cm; e = c/2

c ≥ 75 cm; e = 50 cm

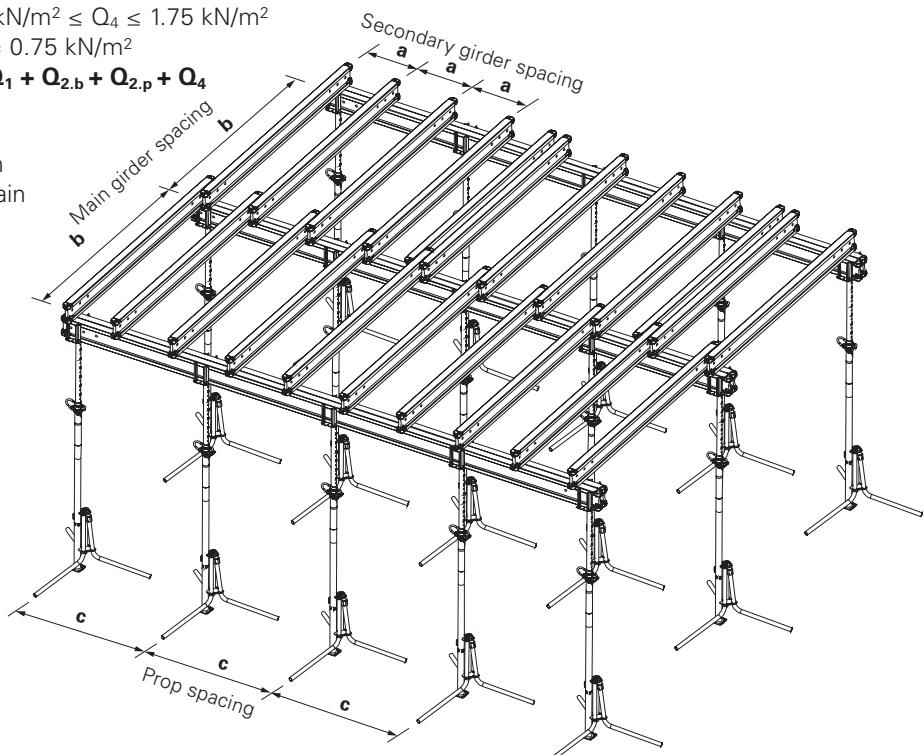
c: width of main beam interior span or prop spacing

e: length of cantilever

Table values mean the following:

2.61 perm. main girder spacing b [m]

44.0 actual prop load [kN]



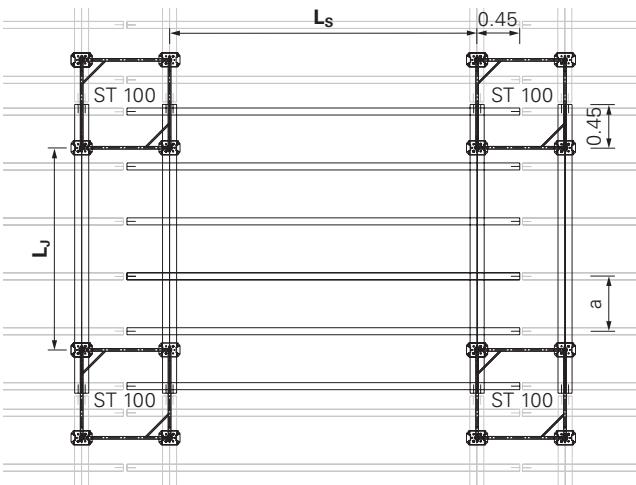
MULTIFLEX

2 x GT 24 as Main Girder on ST 100 Stacking Tower

a = Spacing of the formlining beams
(see table: **GT 24 used as Slab Girder**)

L_s = Span of GT 24 as formlining beam

L_j = Span of GT 24 as twin main girder



Perm. span L_j [m] for 2 x GT 24 as main girder

Slab thickness d [m]	Load q* [kN/m ²]	Span LS [m] for Secondary Girder GT 24											
		1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75
0.10	4.35	4.66	4.49	4.34	4.21	4.09	3.99	3.90	3.82	3.72	3.62	3.53	3.44
0.12	4.84	4.43	4.27	4.13	4.00	3.89	3.80	3.71	3.63	3.55	3.45	3.36	3.28
0.14	5.33	4.24	4.08	3.95	3.83	3.73	3.64	3.55	3.48	3.39	3.30	3.22	3.14
0.16	5.82	4.08	3.93	3.80	3.69	3.59	3.50	3.42	3.35	3.26	3.17	3.09	3.02
0.18	6.31	3.94	3.80	3.68	3.57	3.47	3.39	3.31	3.24	3.14	3.06	2.98	2.91
0.20	6.80	3.83	3.69	3.57	3.46	3.37	3.29	3.22	3.13	3.04	2.96	2.88	2.82
0.22	7.29	3.72	3.59	3.47	3.37	3.28	3.20	3.13	3.03	2.95	2.87	2.80	2.73
0.24	7.78	3.63	3.50	3.38	3.29	3.20	3.12	3.04	2.95	2.86	2.79	2.72	2.66
0.25	8.03	3.58	3.46	3.34	3.25	3.16	3.09	3.00	2.91	2.82	2.75	2.68	2.62
0.26	8.27	3.54	3.42	3.31	3.21	3.13	3.05	2.96	2.87	2.79	2.72	2.65	2.59
0.28	8.76	3.47	3.34	3.24	3.14	3.06	2.98	2.88	2.80	2.72	2.65	2.59	2.53
0.30	9.25	3.40	3.28	3.17	3.08	3.00	2.91	2.81	2.73	2.66	2.59	2.53	2.47
0.40	11.93	3.12	3.01	2.92	2.80	2.69	2.60	2.52	2.45	2.35	2.16	1.98	1.82
0.50	14.63	2.93	2.71	2.63	2.56	2.47	2.37	2.13	1.92	1.74	1.57	1.43	1.30
0.60	17.32	2.73	2.60	2.48	2.36	2.08	1.84	1.64	1.46	1.31	1.17	1.05	0.94
0.70	20.02	2.57	2.44	2.34	2.25	2.08	1.84	1.64	1.46	1.31	1.17	1.05	0.94
0.80	22.50	2.44	2.16	1.84	1.59	1.37	1.19	1.03	0.90	0.78	0.67	0.58	
0.90	24.95	2.21	1.85	1.57	1.33	1.14	0.97	0.83	0.71	0.60			
1.00	27.40	1.92	1.60	1.34	1.12	0.95	0.80	0.67	0.56				
1.10	29.85	1.68	1.38	1.14	0.95	0.79	0.65						

Calculation basis:

*Load according to EN 12812

Dead load

$$Q_1 = 0.40 \text{ kN/m}^2$$

Concrete load

$$Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$$

Equivalent load: concreting

$$Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

Equivalent load: working conditions

$$Q_{2,p} = 0.75 \text{ kN/m}^2$$

Total load

$$\mathbf{Q} = Q_1 + Q_{2,b} + Q_{2,p} + Q_4$$

Deflection has been limited to l/500

Stopend Formwork

Formwork Bracket-2, Slab Stopend Bar 105, Stopend Sleeve 15

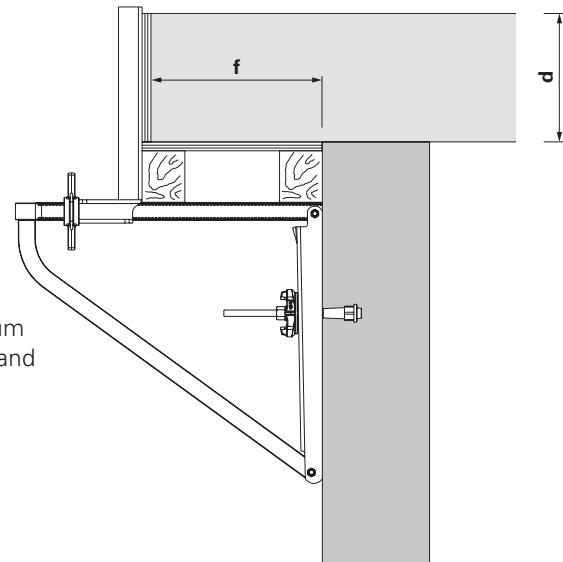
Formwork Bracket-2

Permissible spacings [m] depending on the slab thickness and cantilever

Slab thickness d [m]	Cantilever f [m]				
	0.10	0.20	0.30	0.40	0.45
0.20	2.50	2.50	2.50	1.85	1.60
0.30	1.00	1.00	1.00	1.00	1.00

The above-mentioned values refer to the load-bearing capacity of the formwork bracket. Depending on the formlining used, smaller spacings

might be required. The maximum anchor tension force is 6.5 kN and the shear force is 5.3 kN.



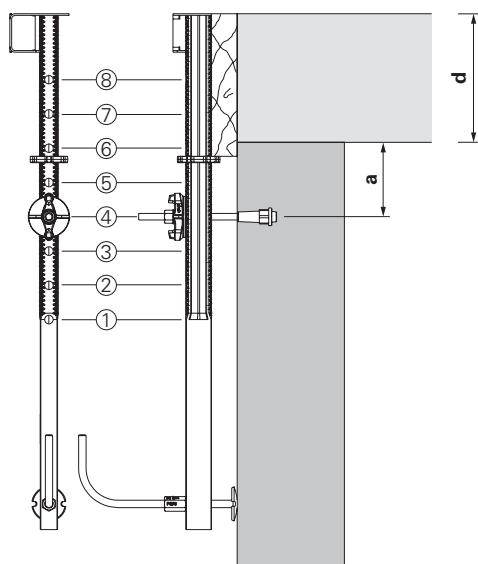
Slab Stopend Bar 105

Permissible spacings [m] depending on the slab thickness

Slab thickness d [m]	0.20	0.30	0.40	0.50	Hole
with side protection (handrail boards or Side Mesh Barrier PMB)	1.20	1.12	0.80	0.66	①
	1.20	1.12	0.93	0.76	②
	1.30	1.24	1.14	0.99	③
	1.43	1.37	1.34	–	④
	1.58	1.53	–	–	⑤
	1.77	–	–	–	⑥
without side protection	1.75	1.15	0.80	0.66	①
	2.22	1.56	1.12	0.89	②
	2.90	2.07	1.45	1.21	③
	3.00	1.67	2.00	–	④
	3.00	3.00	–	–	⑤
	3.00	–	–	–	⑥

Used in connection with HSGP-2 and boards 15/3. Connecting to the structure takes place, for example, with Stopend Sleeve 15*.

The maximum anchor tension force is 6.3 kN.



Stopend Sleeve 15

**Permissible anchor tension force Z [kN]
depending on the concrete strength.
Concrete strength class C20/25 to C50/60**

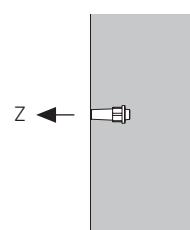
Required concrete strength $f_{ck,cube}$ [N/mm ²]	10	15	20	25	30
Anchor tension force Z [kN]	6.3	8.6	10.1	10.4	10.7

Boundary conditions:

Centre distance \geq 300 mm.

Edge distance \geq 150 mm (parallel and transverse to the direction of the load).

Component thickness \geq 200 mm.



Slab Table

Table Swivel Head with 2 x GT 24 as Main Girder

Type of Table and Prop Load [kN]

Slab Thickness d = 0.20 m; q = 6.71 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20	0.70 / 3.6	
Table Width B [m]	1.60	4 / 10.5	4 / 12.6	4 / 14.7	4 / 16.8	4 / 18.9	4 / 21.0	6 / 19.4
	2.00	4 / 12.6	4 / 15.1	4 / 17.6	4 / 20.1	4 / 22.6	6 / 18.5	6 / 23.3
	2.40	4 / 14.7	4 / 17.6	4 / 20.5	4 / 23.5	4 / 26.4	6 / 21.6	6 / 27.1
	2.80	4 / 16.8	4 / 20.1	4 / 23.5	4 / 26.8	6 / 21.5	6 / 24.7	6 / 31.0
	3.20	4 / 18.9	4 / 22.6	4 / 26.4	4 / 30.2	6 / 24.2	6 / 27.8	6 / 34.9
	3.60	4 / 20.0	4 / 25.1	4 / 29.3	4 / 33.5	6 / 26.9	6 / 30.9	6 / 38.8

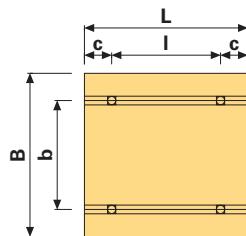
Slab Thickness d = 0.25 m; q = 7.93 kN/m²

Slab Thickness d = 0.25 m; q = 7.93 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20	0.70 / 3.6	
Table Width B [m]	1.60	4 / 12.4	4 / 14.9	4 / 17.3	4 / 19.8	4 / 22.3	6 / 18.3	6 / 22.9
	2.00	4 / 14.9	4 / 17.8	4 / 20.8	4 / 23.8	4 / 26.8	6 / 21.9	6 / 27.5
	2.40	4 / 17.3	4 / 20.8	4 / 24.3	4 / 27.8	6 / 22.3	6 / 25.6	6 / 32.1
	2.80	4 / 19.8	4 / 23.8	4 / 27.8	4 / 31.7	6 / 25.4	6 / 29.2	6 / 36.7
	3.20	4 / 22.3	4 / 26.8	4 / 31.2	6 / 24.4	6 / 28.6	6 / 32.9	6 / 41.3
	3.60	4 / 24.8	4 / 29.7	6 / 23.6	6 / 27.1	6 / 31.8	6 / 36.5	6 / 45.9

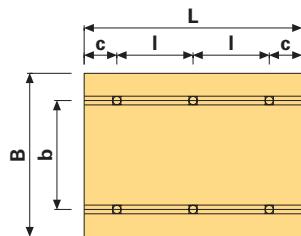
Slab Thickness d = 0.30 m; q = 9.16 kN/m²

Slab Thickness d = 0.30 m; q = 9.16 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20		
Type 6 c [m] / l [m]		0.40 / 0.85	0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.22
Type 8 c [m] / l [m]							0.70 / 1.53	
Table Width B [m]	1.60	4 / 14.3	4 / 17.2	4 / 20.0	4 / 22.9	4 / 25.8	6 / 21.1	6 / 26.5
	2.00	4 / 17.2	4 / 20.6	4 / 24.0	4 / 27.5	6 / 22.0	6 / 25.3	6 / 31.8
	2.40	4 / 20.0	4 / 24.0	4 / 28.0	4 / 32.1	6 / 25.7	6 / 29.5	6 / 37.1
	2.80	4 / 22.9	4 / 27.5	4 / 32.1	6 / 25.0	6 / 29.4	6 / 33.7	6 / 42.4
	3.20	4 / 25.8	4 / 30.9	4 / 36.1	6 / 28.1	6 / 33.0	6 / 37.7	6 / 47.7
	3.60	4 / 28.6	4 / 34.3	6 / 27.2	6 / 31.2	6 / 36.7	6 / 42.2	6 / 53.0

Type 4



Type 6



Type 8

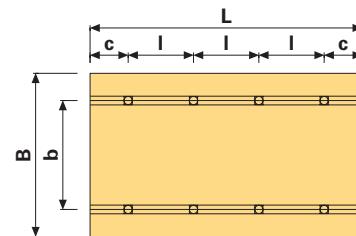


Table Swivel Head with 2 x GT 24 as Main Girder

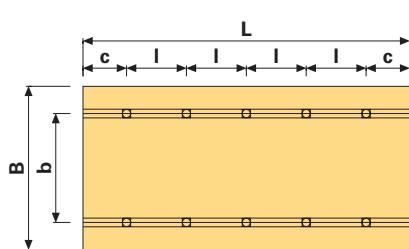
Type of Table and Prop Load [kN]

Slab Thickness d = 0.35 m; q = 10.49 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]				0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.20
Type 8 c [m] / l [m]								0.70 / 1.53
Table Width B [m]	2.50	Main Girder Spacing b [m]	1.60	4 / 16.4	4 / 19.7	4 / 23.0	4 / 26.2	6 / 21.0
	3.00		2.00	4 / 19.7	4 / 23.6	4 / 27.5	4 / 31.5	6 / 25.3
	3.50		2.40	4 / 23.0	4 / 27.5	4 / 32.1	4 / 36.7	6 / 29.5
	4.00		2.80	4 / 26.2	4 / 31.5	4 / 36.7	6 / 28.6	6 / 33.7
	4.50		3.20	4 / 29.5	4 / 35.4	6 / 28.1	6 / 32.2	6 / 37.9
	5.00		3.60	4 / 32.8	4 / 39.3	6 / 31.2	6 / 35.8	6 / 42.1

Slab Thickness d = 0.40 m; q = 11.84 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]				0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80
Type 8 c [m] / l [m]								0.70 / 1.53
Table Width B [m]	2.50	Main Girder Spacing b [m]	1.60	4 / 18.5	4 / 22.2	4 / 25.9	4 / 29.6	6 / 23.7
	3.00		2.00	4 / 22.2	4 / 26.6	4 / 31.1	6 / 24.2	6 / 28.5
	3.50		2.40	4 / 25.9	4 / 31.1	4 / 36.3	6 / 28.3	6 / 33.2
	4.00		2.80	4 / 29.6	4 / 35.5	6 / 28.2	6 / 32.3	6 / 38.0
	4.50		3.20	4 / 33.3	6 / 27.3	6 / 31.7	6 / 36.3	6 / 42.7
	5.00		3.60	4 / 37.0	6 / 30.3	6 / 35.2	6 / 40.4	6 / 47.5

Slab Thickness d = 0.50 m; q = 14.54 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]		0.40 / 0.85	0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.20
Type 8 c [m] / l [m]				0.55 / 1.20	0.45 / 1.03	0.50 / 1.17	0.55 / 1.30	0.70 / 1.53
Type 10 c [m] / l [m]								0.55 / 1.23
Table Width B [m]	2.50	Main Girder Spacing b [m]	1.60	4 / 22.7	4 / 27.3	4 / 31.8	6 / 24.8	6 / 29.1
	3.00		2.00	4 / 27.3	4 / 32.7	6 / 25.9	6 / 29.8	6 / 35.0
	3.50		2.40	4 / 31.8	4 / 38.2	6 / 30.3	6 / 34.7	6 / 40.8
	4.00		2.80	4 / 36.3	6 / 29.8	6 / 34.6	6 / 39.7	6 / 46.6
	4.50		3.20	6 / 28.1	6 / 33.5	6 / 38.9	6 / 44.6	6 / 52.5
	5.00		3.60	6 / 31.3	6 / 37.2	6 / 43.2	6 / 49.6	8 / 42.1

Type 10



Twin Main Girder GT 24

perm. M = 2 x 7 kNm
perm. Q = 2 x 14 kN
perm. A = 2 x 28 kN

Load according to DIN EN 12812

Deflection is f > l / 500

Dead load Q₁ = 0.30 kN/m²

Concrete load Q_{2.b} = 24.5 kN/m³ x d [m]

Equivalent load:
concreting Q₄ = 0.10 x Q_{2.b}
0.75 ≤ Q₄ ≤ 1.75 kN/m²

Equivalent load:
working conditions Q_{2.p} = 0.75 kN/m²

Total load Q = Q₁ + Q_{2.b} + Q_{2.p} + Q₄

Slab Table

Table Swivel Head with 2 x VT 20 as Main Girder

Type of Table and Prop Load [kN]

Slab Thickness d = 0.20 m; q = 6.71 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20		
Table Width B [m]	2.50	1.60	4 / 10.5	4 / 12.6	4 / 14.7	4 / 16.8	4 / 18.9	6 / 15.4
	3.00	2.00	4 / 12.6	4 / 15.1	4 / 17.6	4 / 20.1	6 / 16.1	6 / 18.5
	3.50	2.40	4 / 14.7	4 / 17.6	4 / 20.5	4 / 23.5	6 / 18.8	6 / 21.6
	4.00	2.80	4 / 16.8	4 / 20.1	4 / 23.5	6 / 18.3	6 / 21.5	6 / 24.7
	4.50	3.20	4 / 18.9	4 / 22.6	4 / 26.4	6 / 20.6	6 / 24.2	6 / 27.8
	5.00	3.60	4 / 21.0	4 / 25.1	4 / 29.3	6 / 22.9	6 / 26.9	6 / 30.9

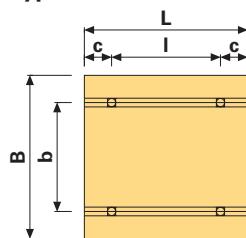
Slab Thickness d = 0.25 m; q = 7.93 kN/m²

Slab Thickness d = 0.25 m; q = 7.93 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20	0.70 / 3.6	
Table Width B [m]	2.50	1.60	4 / 12.4	4 / 14.9	4 / 17.3	4 / 19.8	6 / 15.9	6 / 18.3
	3.00	2.00	4 / 14.9	4 / 17.8	4 / 20.8	4 / 23.8	6 / 19.1	6 / 21.9
	3.50	2.40	4 / 17.3	4 / 20.8	4 / 24.3	6 / 18.9	6 / 22.3	6 / 25.6
	4.00	2.80	4 / 19.8	4 / 23.8	4 / 27.8	6 / 21.6	6 / 25.4	6 / 29.2
	4.50	3.20	4 / 22.3	4 / 26.8	6 / 31.2	6 / 24.4	6 / 28.6	6 / 32.9
	5.00	3.60	4 / 24.8	4 / 29.7	6 / 23.6	6 / 27.1	6 / 31.8	8 / 29.6

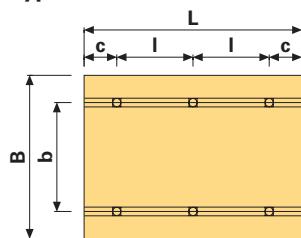
Slab Thickness d = 0.30 m; q = 9.16 kN/m²

Slab Thickness d = 0.30 m; q = 9.16 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80	0.65 / 3.20		
Table Width B [m]	2.50	1.60	4 / 14.3	4 / 17.2	4 / 20.0	4 / 18.4	6 / 25.8	6 / 21.1
	3.00	2.00	4 / 17.2	4 / 20.6	4 / 24.0	6 / 27.5	6 / 22.0	6 / 25.3
	3.50	2.40	4 / 20.0	4 / 24.0	4 / 28.0	6 / 32.1	6 / 25.7	6 / 29.5
	4.00	2.80	4 / 22.9	4 / 27.5	6 / 21.8	6 / 25.0	6 / 29.4	6 / 33.7
	4.50	3.20	4 / 25.8	4 / 30.9	6 / 24.5	6 / 28.1	6 / 33.0	6 / 37.7
	5.00	3.60	4 / 28.6	4 / 34.3	6 / 27.2	6 / 31.2	6 / 36.7	8 / 31.7

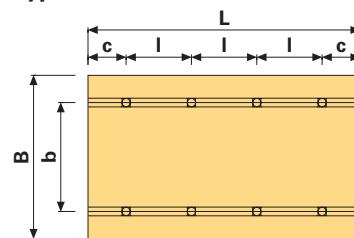
Type 4



Type 6



Type 8



Slab Table

PERI

Table Swivel Head with 2 x VT 20 as Main Girder

Type of Table and Prop Load [kN]

Slab Thickness d = 0.35 m; q = 10.49 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]		0.40 / 0.85	0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.20
Type 8 c [m] / l [m]							0.55 / 1.30	0.70 / 1.53
Table Width B [m]	Main Girder Spacing b [m]	2.50 1.60	4 / 16.4	4 / 19.7	4 / 23.0	6 / 17.9	6 / 21.0	6 / 24.2
3.00 2.00	4 / 19.7	4 / 23.6	4 / 27.5	6 / 21.5	6 / 25.3	6 / 29.0	6 / 36.4	
3.50 2.40	4 / 23.0	4 / 27.5	6 / 21.8	6 / 25.1	6 / 29.5	6 / 33.8	6 / 42.5	
4.00 2.80	4 / 26.2	6 / 21.5	6 / 25.0	6 / 28.6	6 / 33.7	6 / 38.6	8 / 31.6	
4.50 3.20	4 / 29.5	6 / 24.2	6 / 28.1	6 / 32.2	6 / 37.9	6 / 43.5	8 / 35.5	
5.00 3.60	6 / 22.6	6 / 26.8	6 / 31.2	6 / 35.8	6 / 42.1	8 / 33.9	8 / 39.5	

Slab Thickness d = 0.40 m; q = 11.84 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]		0.40 / 0.85	0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.20
Type 8 c [m] / l [m]					0.45 / 1.03	0.50 / 1.17	0.55 / 1.30	0.70 / 1.53
Type 10 c [m] / l [m]								0.55 / 1.23
Table Width B [m]	Main Girder Spacing b [m]	2.50 1.60	4 / 18.5	4 / 22.2	4 / 25.9	6 / 20.2	6 / 23.7	6 / 34.2
3.00 2.00	4 / 22.2	4 / 26.6	6 / 21.1	6 / 24.2	6 / 28.5	6 / 32.7	6 / 41.1	
3.50 2.40	4 / 25.9	6 / 21.2	6 / 24.6	6 / 28.3	6 / 33.2	6 / 38.2	8 / 31.2	
4.00 2.80	4 / 29.6	6 / 24.2	6 / 28.2	6 / 32.3	6 / 38.0	8 / 30.6	8 / 35.6	
4.50 3.20	6 / 22.9	6 / 27.3	6 / 31.7	6 / 36.3	6 / 42.7	8 / 34.4	8 / 40.1	
5.00 3.60	6 / 25.5	6 / 30.3	6 / 35.2	6 / 40.4	8 / 34.3	8 / 38.2	10 / 37.0	

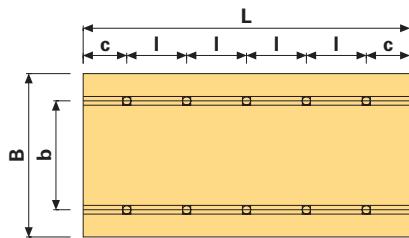
Slab Thickness d = 0.50 m; q = 14.54 kN/m ²		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Table Length L [m]		2.50	3.00	3.50	4.00	4.50	5.00	6.00
Type 4 c [m] / l [m]		0.45 / 1.60	0.50 / 2.00	0.55 / 2.40	0.60 / 2.80			
Type 6 c [m] / l [m]		0.40 / 0.85	0.45 / 1.05	0.55 / 1.20	0.60 / 1.40	0.65 / 1.60	0.70 / 1.80	0.80 / 2.20
Type 8 c [m] / l [m]				0.40 / 0.90	0.45 / 1.03	0.50 / 1.17	0.55 / 1.30	0.70 / 1.53
Type 10 c [m] / l [m]						0.40 / 0.93	0.45 / 1.03	0.55 / 1.23
Table Width B [m]	Main Girder Spacing b [m]	2.50 1.60	4 / 22.7	4 / 27.3	6 / 21.6	6 / 24.8	6 / 29.1	8 / 27.3
3.00 2.00	4 / 27.3	4 / 32.7	6 / 25.9	6 / 29.8	6 / 35.0	6 / 40.2	8 / 32.8	
3.50 2.40	6 / 21.9	6 / 26.0	6 / 30.3	6 / 34.7	6 / 40.8	8 / 32.8	8 / 38.3	
4.00 2.80	6 / 25.0	6 / 29.8	6 / 34.6	6 / 39.7	8 / 33.7	8 / 37.5	10 / 36.3	
4.50 3.20	6 / 28.1	6 / 33.5	6 / 38.9	8 / 33.2	8 / 37.9	8 / 42.2	10 / 40.8	
5.00 3.60	6 / 31.3	6 / 37.2	8 / 32.1	8 / 36.9	8 / 42.1	10 / 37.8		

Twin Main Girder VT 20

Load according to DIN EN 12812

Deflection is f > l/500

Type 10



perm. M = 2 x 5 kNm
perm. Q = 2 x 11 kN
perm. A = 2 x 22 kN

Dead load Q₁ = 0.30 kN/m²

Concrete load Q_{2.b} = 24.5 kN/m³ x d [m]

Equivalent load:
concreting Q₄ = 0.10 x Q_{2.b}
0.75 ≤ Q₄ ≤ 1.75 kN/m²

Equivalent load:
working conditions Q_{2.p} = 0.75 kN/m²

Total load Q = Q₁ + Q_{2.b} + Q_{2.p} + Q₄

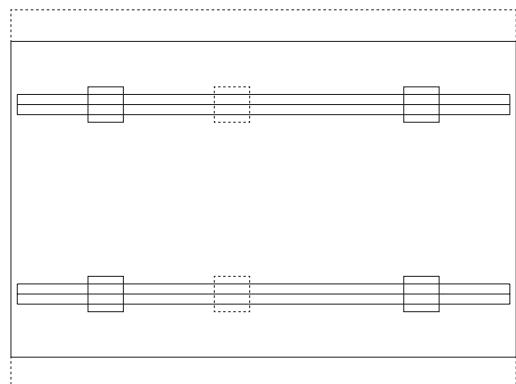
Slab Table

VT Table Module, L = 4.00 m

Table Module L = 4.00 m		VT 200/215 x 400	VT 250/265 x 400
Width of Influence EB [m]		2.20	2.70
Ver- sion 1	Perm. Slab Thickness d [m]	0.50	0.40*
	Actual Leg Load [kN]	34.6	35.2
Ver- sion 2	Perm. Slab Thickness d [m]	0.60	0.60*
	Actual Leg Load [kN]	33.7	41.3

Note:

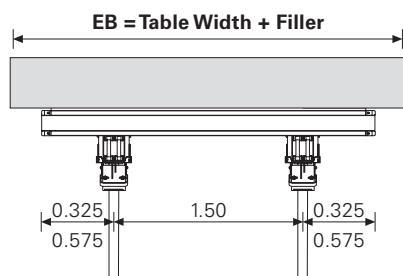
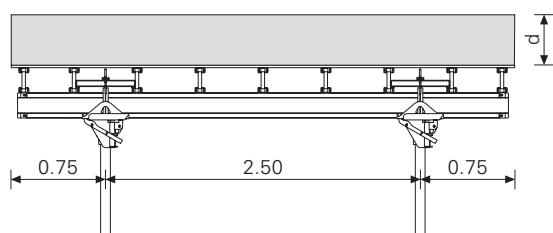
Intermediate values of the permissible loads and resultant leg loads can be linearly interpolated.



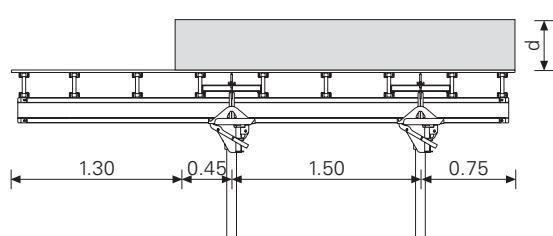
Safety instructions:

*Stability is no longer given in case of slabs thicker than *0.30 m, **0.15 m. Concreting must therefore be carried out in several pours or layers, or additional supports at the table edges are to be provided.

Version 1



Version 2



Slab Table

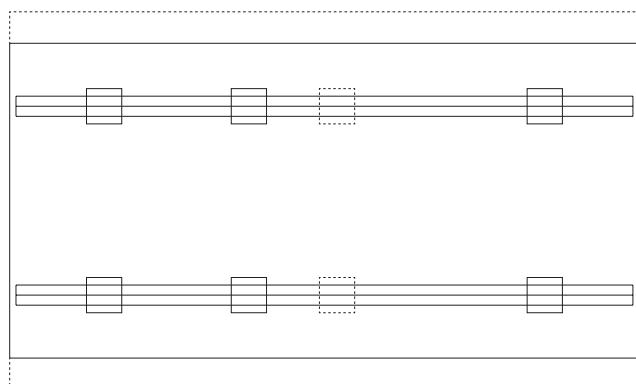
VT Table Module, L = 5.00 m

Table Module L = 5.00 m		VT 200/215 x 500	VT 250/265 x 500
Width of Influence EB [m]		2.20	2.70
Version 1	Perm. Slab Thickness d [m]	0.50	0.40*
	Actual Leg Load [kN]	34.6	35.2
Version 2	Perm. Slab Thickness d [m]	0.50	0.40*
	Actual Leg Load [kN]	34.6	35.2
Version 3	Perm. Slab Thickness d [m]	0.60	0.55*
	Actual Leg Load [kN]	36.0	39.9

Note:

Intermediate values of the permissible loads and resultant leg loads can be linearly interpolated.

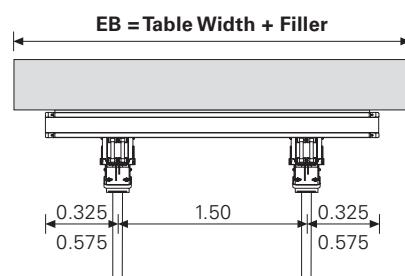
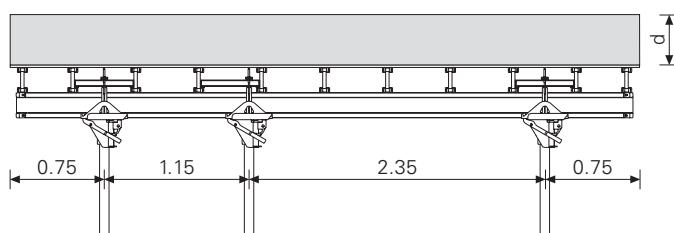
For Version 3, the Table Swivel Head must be repositioned.



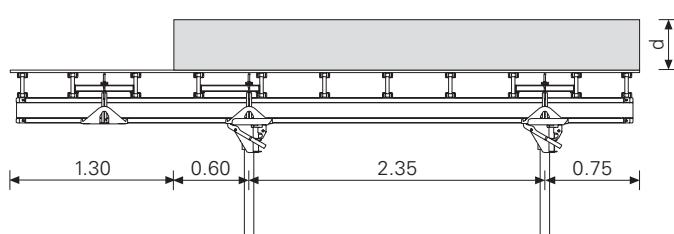
Safety instructions:

*Stability is no longer given in case of slabs thicker than *0.30 m, **0.15 m. Concreting must therefore be carried out in several pours or layers, or additional supports at the table edges are to be provided.

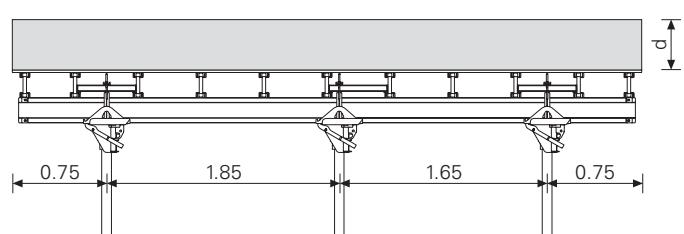
Version 1



Version 2



Version 3



Slab Table

VARIODECK

PERI

Leg Load [kN]

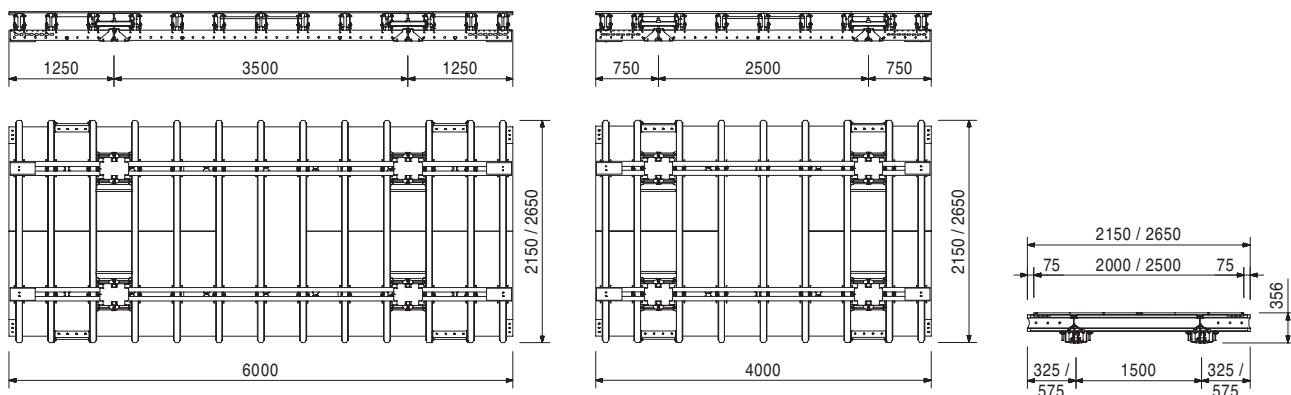
Slab Table 4-legged	200 x 400	250 x 400	200 x 600	250 x 600	Width of Influence EB [m]			
	2.20	2.70	2.70	3.15	2.20	2.70	2.70	3.15
	Slab Thickness [m]							
0.20	15.6	19.1	18.9	22.0	23.2	28.5	28.2	32.9
0.25	18.3	22.4	22.2	25.9	27.3	33.4	33.1	38.7
0.30	21.0	25.7	25.5	29.8	31.3	38.4	38.1	44.5
0.35	23.9	29.4	29.2	34.0	35.8	43.9	43.6	50.8
0.40	26.9	33.0	32.8	38.3	40.2	49.4	49.1	57.2
0.45	29.9	36.7	36.5	42.5	44.7	54.8	54.5	63.6
0.50	32.9	40.3	40.1	46.8	49.1	60.3	60.0	70.0

Slab Table 6-legged	200 x 600	250 x 600	Width of Influence EB [m]				Leg Load			
	2.20	2.70	2.70	3.15						
	Slab Thickness [m]									
0.20	17.7	21.7	21.5	25.1						
0.25	20.8	25.5	25.3	29.5						
0.30	23.9	29.3	29.1	33.9						
0.35	27.3	33.5	33.3	38.8						
0.40	30.7	37.7	37.4	43.7						
0.45	34.1	41.9	41.6	48.6						
0.50	37.5	46.0	45.8	53.4						

Note:

Intermediate values of the permissible loads and resultant leg loads can be linearly interpolated.
Maximum deflection in accordance with DIN 18218, Table 3, Line 7.

Deflection in accordance with DIN 18202, Table 3, Line 6.



Slab Table Compensations

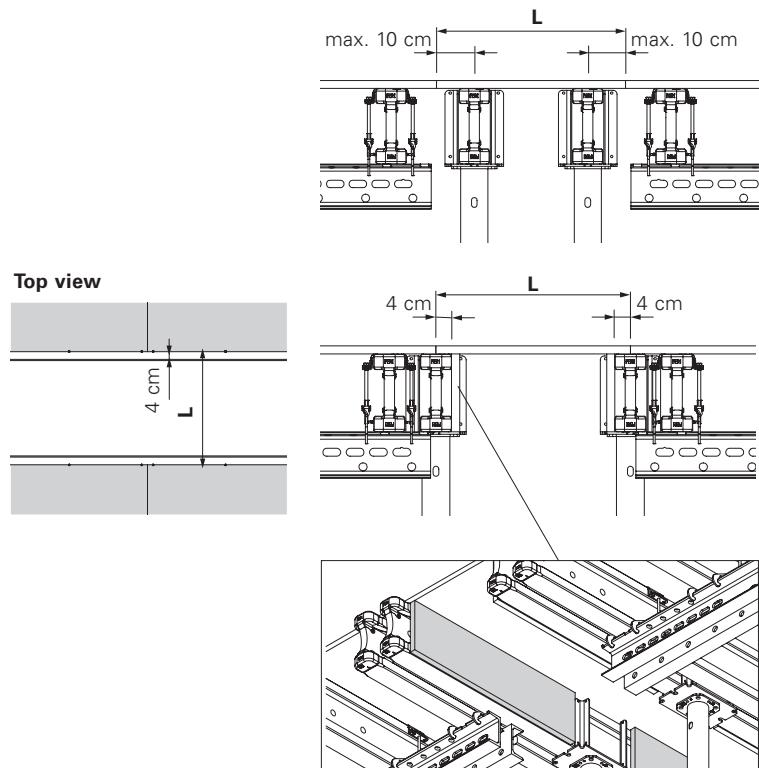
VARIODECK, Table Module VT

PERI

Permissible span L [m] for infill areas

Deflection max. l/300

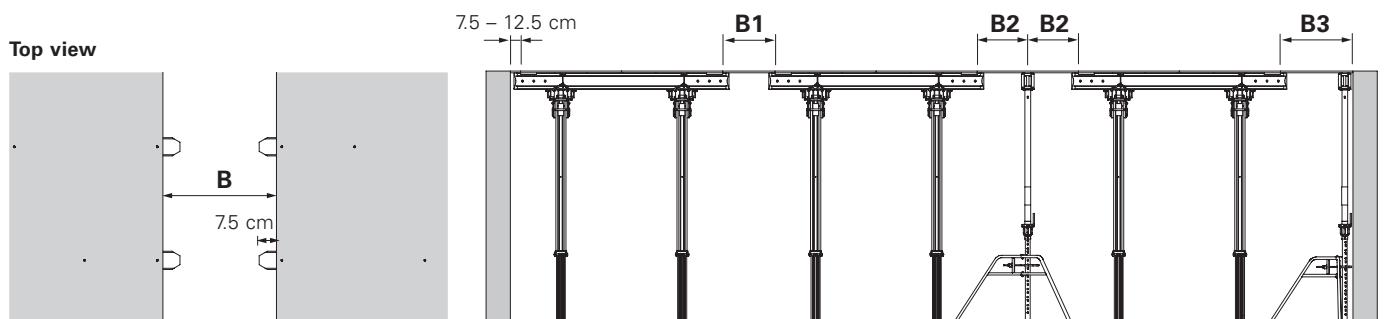
Slab Thickness [m]	Longitudinal infill L		
	FinPly 19 mm	Birch 19 mm	Birch / Finply 21 mm
0.20	0.56	0.59	0.63
0.25	0.52	0.55	0.59
0.30	0.49	0.52	0.56
0.35	0.47	0.49	0.53
0.40	0.45	0.47	0.51
0.45	0.43	0.45	0.49
0.50	0.42	0.44	0.47



Permissible span B [m] for infill areas

Deflection if necessary greater than l/300

Slab Thickness [m]	Transverse infill B							
	B1		B2		B3		Birch / FinPly 21 mm	Birch / FinPly 21 mm
FinPly 19 mm	Birch 19 mm	FinPly 19 mm	Birch / FinPly 21 mm	FinPly 19 mm	Birch / FinPly 21 mm	FinPly 19 mm	Birch / FinPly 21 mm	Birch / FinPly 21 mm
0.20	0.45	0.51	0.57	0.63	0.63	0.58	0.63	0.63
0.25	0.36	0.41	0.52	0.63	0.63	0.54	0.59	0.59
0.30	0.25	0.35	0.44	0.63	0.63	0.51	0.56	0.56
0.35	0.25	0.25	0.38	0.63	0.63	0.49	0.53	0.53
0.40	0.25	0.25	0.32	0.63	0.63	0.46	0.51	0.51
0.45	0.25	0.25	0.25	0.60	0.63	0.45	0.49	0.49
0.50	0.25	0.25	0.25	0.58	0.63	0.43	0.47	0.47



SKYDECK

With Drophead SFK

Slab Thickness d [m]	Load q* [kN/m ²]	Main Beam SLT 225								Main Beam SLT 150							
		Panel Span c 1.50 m				Panel Span c 0.75 m				Panel Span c 1.50 m				Panel Span c 0.75 m			
		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**	
			with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK
0.14	5.13	17.7		7		8.8		7		11.9		7					
0.16	5.62	19.4		7		9.7		7		13.1		7					
0.18	6.11	21.1		7		10.5		7		14.2		7					
0.20	6.60	22.8		7		11.4		7		15.3		7					
0.22	7.09	24.5		7		12.2		7		16.5		7					
0.24	7.58	26.2		7		13.1		7		17.6		7					
0.25	7.83	27.0		7		13.5		7		18.2		7					
0.26	8.07	27.8		7		13.9		7		18.8		7					
0.28	8.56	29.5	16.2	7	7	14.8		7		19.9		7					
0.30	9.05	31.2	17.2	7	7	15.6		7		21.0		7					
0.35	10.38	35.8	19.7	7	7	17.9		7		24.1		7					
0.40	11.73	40.5	22.3	6	7	20.2		7		273		7					
0.43	12.54	43.3	23.6	6	6	21.4		7		29.2		6					
0.45	13.08		24.8		6	22.6		7		30.4		6					
0.50	14.43		27.4		6	24.9		7		33.5		6					
0.52	14.96		28.4		6	25.8		7	7	34.8		6		17.4		7	
0.55	15.77					27.2		7	7					18.3		7	
0.60	17.12					29.5	17.7	7	7					19.9		7	
0.65	18.47					31.9	19.1	7	7					21.5		7	
0.70	19.82					34.2	20.5	6	7					23.0		7	
0.75	21.08					36.4	21.8	6	7					24.5		7	
0.80	22.30					38.5	23.1	6	7					25.9		7	
0.85	23.53					40.6	24.3	6	7					27.3		7	
0.90	24.75					42.7	25.6	6	7					28.8		6	
0.95	25.98						26.9		7					30.2		6	
1.00	27.20						28.2		6					31.6		6	
1.05	28.43						29.4		6					33.0		6	
1.09	29.35						30.4		6					34.1		6	

*Load according to DIN EN 12812:

$$\text{Dead load } Q_1 = 0.20 \text{ kN/m}^2$$

$$\text{Concrete load } Q_{2,b} = 24.5 \text{ kN/m}^3 \times d [\text{m}]$$

$$\text{Equivalent load: concreting } Q_4 = 0.10 \times Q_{2,b}$$

$$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$$

$$\text{Equivalent load: working conditions } Q_{2,p} = 0.75 \text{ kN/m}^2$$

$$\text{Total load } \mathbf{Q = Q_1 + Q_{2,b} + Q_{2,p} + Q_4}$$

**Deflection according to DIN 18202, assuming perfect levelling.

When calculating the prop load, the actual extension length may be used. The exact extension length of the prop when using the SKYDECK drophead is: Clear room height minus 0.41 m.

Prop loads over 33.3 kN:
Bolting on of Drophead for use with PEP Slab Props using 2 Bolts DIN EN ISO 4016 M12 x 40-4.6 galv. nut.

SKYDECK

With Prophead SSK

Slab Thickness <i>d</i> [m]	Load <i>q</i> * [kN/m ²]	Main Beam SLT 225								Main Beam SLT 150							
		Panel Span c 1.50 m				Panel Span c 0.75 m				Panel Span c 1.50 m				Panel Span c 0.75 m			
		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**		Prop Load [kN]		Deflection Line**	
			with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK		with centre support SSK
0.14	5.13	17.3		7		8.7		7		11.5		7					
0.16	5.62	19.0		7		9.5		7		12.6		7					
0.18	6.11	20.6		7		10.3		7		13.7		7					
0.20	6.60	22.3		7		11.1		7		14.9		7					
0.22	7.09	23.9		7		12.0		7		16.0		7					
0.24	7.58	25.6		7		12.8		7		17.1		7					
0.25	7.83	26.4		7		13.2		7		17.6		7					
0.26	8.07	27.2		7		13.6		7		18.2		7					
0.28	8.56	28.9	16.2	7	7	14.4		7		19.3		7					
0.30	9.05	30.5	17.1	7	7	15.3		7		20.4		7					
0.35	10.38	35.0	19.6	7	7	17.5		7		23.4		7					
0.40	11.73	39.6	22.2	6	7	19.8		7		26.4		7					
0.43	12.54	42.3	23.7	6	6	21.2		7		28.2		6					
0.45	13.08		24.7		6	22.1		7		29.4		6					
0.50	14.43		27.3		6	24.3		7		32.5		6					
0.55	15.77		29.8		6	26.6		7		35.5		6		17.7		7	
0.60	17.12					28.9		7					19.3		7		
0.65	18.47					31.2	19.0	7	7				20.8		7		
0.70	19.82					33.4	20.4	7	7				22.3		7		
0.75	21.08					35.6	21.7	6	7				23.7		7		
0.80	22.30					37.6	23.0	6	7				25.1		7		
0.85	23.53					39.7	24.2	6	7				26.5		7		
0.90	24.75					41.8	25.5	6	7				27.8		6		
0.95	25.98					26.7		7					29.2		6		
1.00	27.20					28.0		6					30.6		6		
1.05	28.43					29.3		6					32.0		6		
1.09	29.35					30.2		6					33.0		6		

***Load according to DIN EN 12812:**

Dead load $Q_1 = 0.20 \text{ kN/m}^2$

Concrete load $Q_{2,b} = 24.5 \text{ kN/m}^3 \times d \text{ [m]}$

Equivalent load: concreting $Q_4 = 0.10 \times Q_{2,b}$
 $0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$

Equivalent load: working conditions $Q_{2,p} = 0.75 \text{ kN/m}^2$

Total load $\mathbf{Q = Q_1 + Q_{2,b} + Q_{2,p} + Q_4}$

**Deflection according to DIN 18202, assuming perfect levelling.

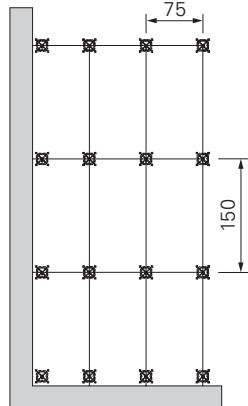
When calculating the prop load, the actual extension length may be used. The exact extension length of the prop when using the SKYDECK Prophead is: clear room height minus 0.33 m.

SKYDECK

Panel System, Striking Guide Values

Panel System

Slab Thickness d [m]	Load q* [kN/m ²]	Prop Load [kN]	** Deflection to DIN 18202, Line
0.14	5.13	5.78	7
0.16	5.62	6.33	7
0.18	6.11	6.88	7
0.20	6.61	7.43	7
0.22	7.10	7.98	7
0.24	7.59	8.53	7
0.25	7.83	8.81	7
0.26	8.08	9.09	7
0.28	8.57	9.64	7
0.30	9.06	10.19	7
0.35	10.39	11.69	7
0.40	11.74	13.21	7
0.42	12.28	13.82	6
0.45	13.09	14.73	6
0.50	14.44	16.24	6
0.55	15.79	17.76	6



** Deflection according to
DIN 18202. Assuming
perfect levelling.

Calculation basis:

*Load according to EN 12812

Dead load $Q_1 = 0.20 \text{ kN/m}^2$

Concrete load $Q_{2,b} = 24.5 \text{ kN/m}^3 \times d [\text{m}]$

Equivalent load: concreting $Q_4 = 0.10 \times Q_{2,b}$

$0.75 \text{ kN/m}^2 \leq Q_4 \leq 1.75 \text{ kN/m}^2$

Equivalent load: working conditions $Q_{2,p} = 0.75 \text{ kN/m}^2$

Total load $\mathbf{Q = Q_1 + Q_{2,b} + Q_{2,p} + Q_4}$

Striking Time Guidelines* [Days] for Drophead System

Slab Thickness d [m]	Required concrete strength $f_{ck,cube} [\text{N/mm}^2]$	*Guide values for striking time [days] for panels and main beams at average curing temperature [°C] of		
		5°	10°	20°
0.14	15	10	6	5
0.16	13	8	5	4
0.18	11	6	4	3
0.20	9	5	3	2
0.22	8	4	3	2
0.25	7	4	2	2
0.30	6	3	2	2
0.35	5	3	2	1
0.40–1.09	5	2	1	1

The required concrete strength at the time of striking is decisive. It is to be calculated using suitable methods.

Guidelines according to DIN 1045 must also be taken into account, e.g. curing. At least 1.88 cm²/m (Q 188) is necessary for the bottom reinforcement layer.

For systems without any middle support of the main beams, a live load of 1 kN/m² on the slab which has struck early, is to be considered.

* Guide values according to Leonhard for cement Z 35, CEM I 32.5 R.

Infill Areas, Forming Around Columns

Perm. width B [m] of the infill area

Slab Thickness d [m]	Case 1		Case 2	
	Fin Ply 21 mm Spruce 400 parallel/cross			
0.14	0.65	0.71		
0.16	0.62	0.69		
0.18	0.60	0.68		
0.20	0.58	0.65		
0.22	0.57	0.64		
0.24	0.55	0.63		
0.25	0.55	0.61		
0.26	0.54	0.61		
0.28	0.53	0.60		
0.30	0.52	0.59		
0.35	0.49	0.58		
0.40	0.47	0.56		
0.43	0.46	0.54		
0.45	0.46	0.53		
0.50	0.44	0.52		
0.52	0.44	0.51		
0.55	0.43	0.51		
0.60	0.42	0.50		
0.65	0.41	0.49		
0.70	0.40	0.48		
0.75	0.39	0.47		
0.80	0.39	0.46		
0.85	0.38	0.46		
0.90	0.37	0.45		
0.95	0.37	0.45		
1.00	0.36	0.44		
1.05	0.36	0.44		
1.09	0.35	0.43		

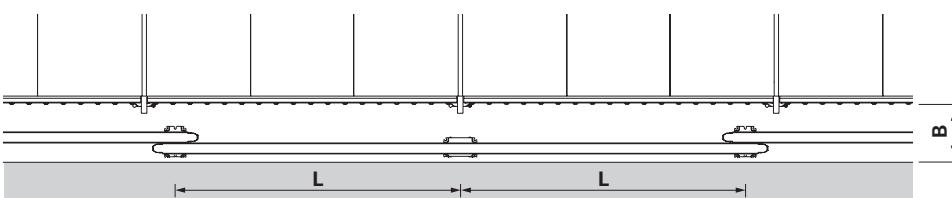
Note:

Deflection single span beam B/300.

Perm. span L [m] of the edge main beams

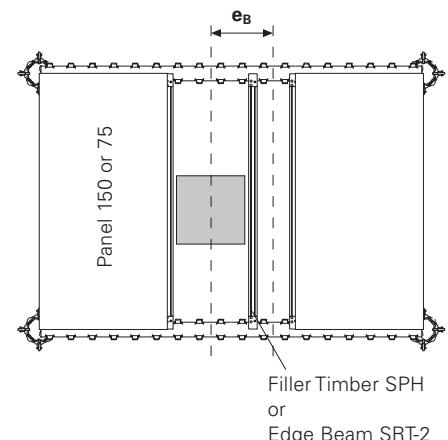
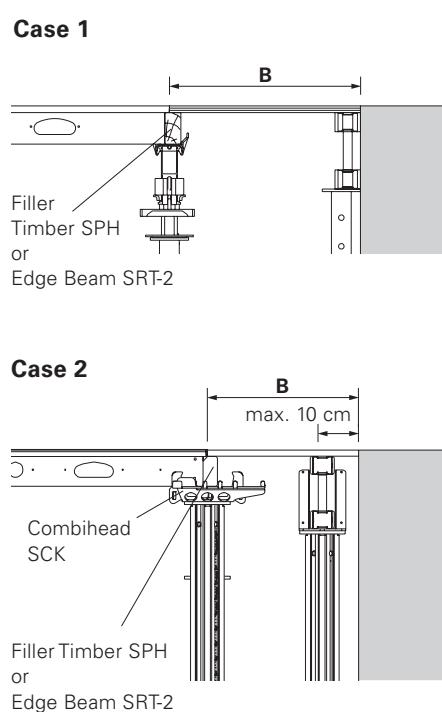
Girder used	Slab Thickness [m]										
	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.05	1.09
GT 24	4.61	3.93	3.45	3.12	2.86	2.66	2.51	2.26	2.06	1.97	1.91
VT 20	3.89	3.32	2.92	2.63	2.42	2.22	1.97	1.78	1.62	1.55	1.50
KH 10/16	3.79	3.23	2.84	2.56	2.35	2.10	1.86	1.68	1.53	1.46	1.42

Perm. width B [m] of the infill area max. 0.40 m



Perm. width of influence e_B [m] for shuttering columns

Slab Thickness d [m]	Panel 150		Panel 75	
	L/500 = 3 mm SRT-2	SPH	L/500 = 1.5 mm SRT-2	SPH
0.14	1.14	0.49		
0.16	1.01	0.43		
0.18	0.90	0.38		
0.20	0.81	0.35		
0.22	0.74	0.32		
0.24	0.68	0.29		
0.25	0.65	0.28		
0.26	0.63	0.27		
0.28	0.59	0.25		
0.30	0.55	0.23		
0.35	0.47	0.20		
0.40	0.41	0.18		
0.43	0.39	0.16	1.70	0.72
0.45	0.37	0.16	1.63	0.69
0.50	0.33	0.14	1.48	0.63
0.52	0.32	0.14	1.43	0.61
0.55			1.35	0.57
0.60			1.25	0.53
0.65			1.16	0.49
0.70			1.08	0.46
0.75			1.01	0.43
0.80			0.96	0.41
0.85			0.91	0.38
0.90			0.86	0.37
0.95			0.82	0.35
1.00			0.78	0.33
1.05			0.75	0.32
1.09			0.73	0.31



Beams

Beam Formwork UZ

Permissible width of influence EB [m]
for UZ Beam Bracket 40 depending on
the beam depth and slab thickness

	Beam depth h [m]											
	0.30		0.40		0.50		0.60		0.70		0.80	
Slab thickness d [m]	Version		Version		Version		Version		Version		Version	
	1	2	1	2	1	2	1	2	1	2	1	2
0	2.01	4.21	1.74	3.59	1.57	3.14	1.45	2.80	1.36	2.60	*1.29	*1.85
0.20	2.05	4.56	1.91	3.30	1.77	2.69	1.64	1.95	*1.35	*1.42	*1.02	*1.07
0.25	1.83	4.00	1.71	2.51	1.62	2.36	1.55	1.77	*1.23	*1.29	*0.94	*0.98
0.30	1.77	3.58	1.66	2.34	1.58	2.10	1.51	1.61	*1.13	*1.19	*0.86	*0.90
0.35	1.71	3.30	1.62	2.06	1.54	1.88	1.40	1.45	*1.04	*1.09	*0.77	*0.83

The above values relate to the load-bearing capacity of the UZ Beam Bracket 40, the vertical 8 x 8 cm timber and the secondary beams as they are shown on the drawings.

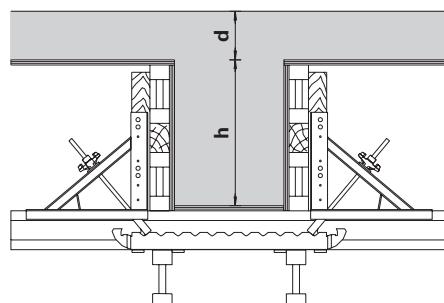
Depending on the formlining used, additional secondary beams may be needed.

Separate structural calculations must be provided to show that the sub-structure can carry all resulting loads.

The equivalent load (V/100) acting horizontally and the pressures arising on one side (e.g. the edge beam) are to be accommodated by suitable means provided by the contractor.

Version 1:

Side form with 1 or 2 GT 24 girders (vertical).

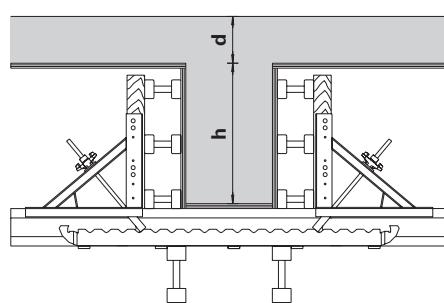


The max. deflection is l/500

*) vertical timber in the UZ 40
Bracket 10 x 8 cm! (instead of 8 x 8 cm)

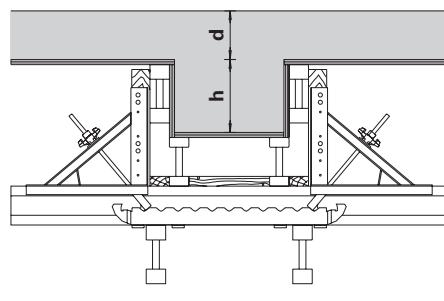
Version 2:

Side form with 2 or 3 VT 20 girders (horizontal).



Version 3:

Packing of the beam soffit form.



d = slab thickness
h = beam depth

Beam Waler UZR 190/150

Slab thickness d [cm]	Cross Beam		Main Beam: 2 x GT 24		Beam	Legs
	L ₁ / l ₁ / C ₁ [m]	Spacing a GT 24 [m]	L ₂ / l ₂ / C ₂ [m]	Spindle load F _{spi} [kN]	Beam load F _{uz} [kN]*	Leg load F _{leg} [kN] = F _{spi} + F _{uz}
23	6.0/5.1/0.45	0.25	3.6/2.38/0.61	44.7	17.1	61.8
23	6.0/4.8/0.60	0.31	3.6/2.38/0.61	44.7	17.1	61.8
20	6.0/5.1/0.45	0.29	3.3/2.38/0.46	37.4	15.7	53.1
20	6.0/4.8/0.60	0.34	3.6/2.38/0.61	40.8	17.1	57.9
18	6.0/5.1/0.45	0.31	3.3/2.38/0.46	35.1	15.7	50.8
18	6.0/4.8/0.60	0.37	3.3/2.38/0.46	35.1	15.7	50.8
15	6.0/5.1/0.45	0.35	3.9/2.66/0.62	37.3	18.5	55.8
15	6.0/4.8/0.60	0.41	4.2/2.66/0.77	40.2	20.0	60.1
13	6.0/5.1/0.45	0.38	3.6/2.66/0.47	31.9	17.1	49.0
13	6.0/4.8/0.60	0.44	4.6/2.96/0.82	40.8	21.9	62.6

*The beam load of 19.0 kN/linear metre is based on a beam size of b = 61 cm, and h = 91 cm.

System: restrained at the top

Load assumptions:

Concrete load: 24.0 kN/m³

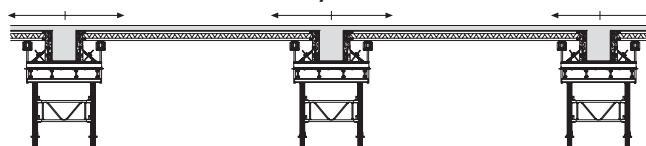
Live load: 2.45 kN/m²

Dead load: Slab Formwork 0.4 kN/m
Beam Formwork 1.0 kN/linear metre

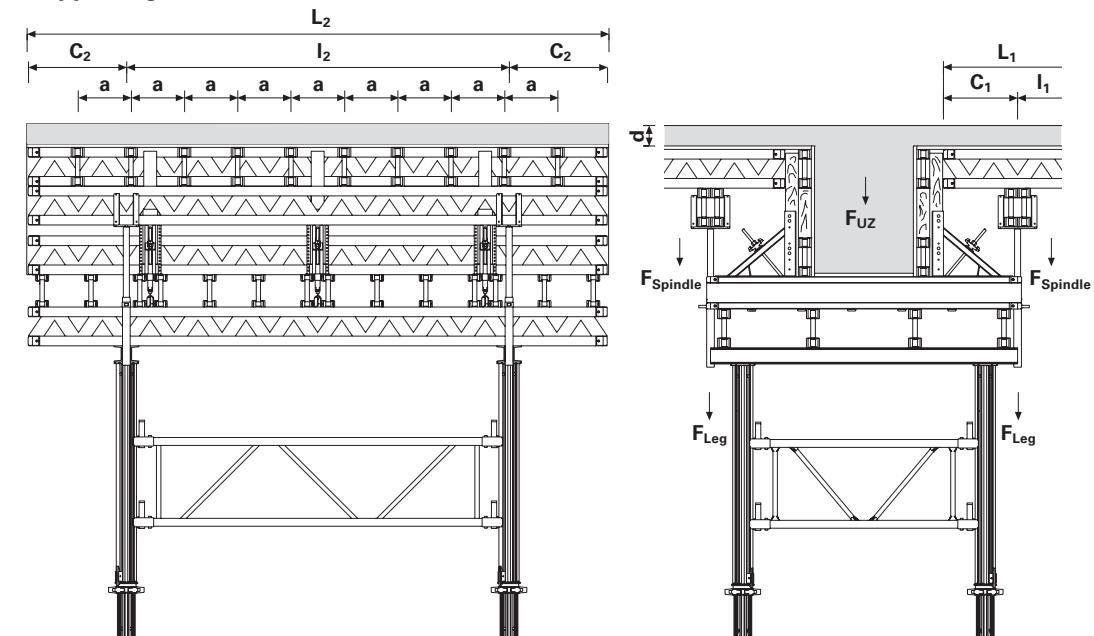
Note:

The deflection has been limited to l/360.

Concreting is carried out simultaneously from the centre



Supporting with MULTIPROP



Beams

Stopend Angle AW

Permissible width of influence EB [m]

for Stopend Angle AW depending on
the slab thickness, beam depth and
type of fixing

		Height of side formwork h [m]															
		0.20			0.25			0.30			0.35						
Sub-structure	nailed to			clamping			nailed to			clamping			nailed to				
	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	
Slab thickness d [m]	0	3.27	3.27	3.27	3.27	2.82	2.86	2.86	2.86	1.63	2.60	2.60	2.60	0.97	2.21	1.69	1.90
	0.20	1.19	2.75	2.05	1.88	0.71	1.64	1.24	1.32	0.45	1.02	0.79	0.99	—	0.69	0.54	0.76
	0.25	1.07	2.46	1.84	1.63	0.61	1.39	1.06	1.16	0.39	0.88	0.68	0.87	—	0.60	0.47	0.67
	0.30	0.93	2.15	1.61	1.43	0.54	1.23	0.94	1.03	—	0.77	0.60	0.78	—	0.53	0.41	0.60
	0.35	0.82	1.89	1.41	1.28	0.47	1.08	0.83	0.92	—	0.69	0.53	0.69	—	0.47	—	0.54
	0.40	0.73	1.69	1.26	1.14	0.42	0.96	0.73	0.83	—	0.62	0.48	0.63	—	0.42	—	0.49

		Height of side formwork h [m]														
		0.40			0.50			0.60								
Sub-Structure	nailed to			clamping			nailed to			clamping			nailed to		clamping	
	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	SKYDECK*	Formlining 21 mm	Timber Girder	Timber Girder	—	—	—	—
Slab thickness d [m]	0	0.62	1.41	1.09	1.40	—	0.68	0.53	0.83	—	—	—	—	0.54	—	—
	0.20	—	0.49	—	0.60	—	—	—	0.40	—	—	—	—	—	—	—
	0.25	—	0.43	—	0.53	—	—	—	—	—	—	—	—	—	—	—
	0.30	—	—	—	0.48	—	—	—	—	—	—	—	—	—	—	—
	0.35	—	—	—	0.44	—	—	—	—	—	—	—	—	—	—	—
	0.40	—	—	—	0.40	—	—	—	—	—	—	—	—	—	—	—

– nail with 8 nails Ø 3.1 mm (6 at the front and 2 at the back).

* Using the Guardrail Post AW on SKYDECK panels is not permissible.

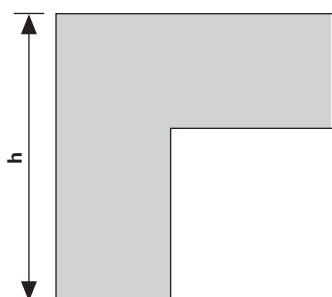
Separate structural calculations must be provided to show that the sub-structure can carry all resulting loads.

The equivalent load (V/100) acting horizontally and the pressures arising on one side (e.g. the edge beam) are to be accommodated by suitable means provided by the contractor.

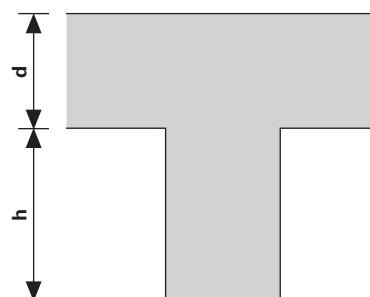
1. Stopend for Slab Formwork



2. Slab with Edge Beam



3. Slab with T-Beam



Slab Props

According to DIN 4424

Steel props with extension mechanism according to DIN 4424.

The usable resistance, i.e. the normal loading capacities for props are:

For N-Props (normal type):

$$\text{perm. } F_N = 40 \cdot \frac{\max I}{l^2} \text{ in kN}$$

but

$$\text{perm. } F_N \leq 30 \text{ kN}$$

For G-Props (heavy type):

$$\text{perm. } F_G = 60 \cdot \frac{\max I}{l^2} \text{ in kN}$$

but

$$\text{perm. } F_G \leq 35 \text{ kN}$$

Where:

l = actual extension length [m]

$\max I$ = maximum extension length [m] according to prop size (see DIN 4424)

**Permissible prop load [kN]
according to DIN 4424**

Perm. prop load [kN]

Extension length l [m]	DS 260N 1.51 – 2.60	DS 300N 1.71 – 3.00	DS 350N 1.96 – 3.50	DS 410G 2.31 – 4.10	DS 490G 2.71 – 4.90	DS 550G 3.04 – 5.50	HL 300 1.71 – 3.00	HL 410 2.31 – 4.10	HL 500 2.81 – 4.95
1.60	30.0								
1.70	30.0	30.0							
1.80	30.0	30.0							
1.90	28.8	30.0							
2.00	26.0	30.0	30.0						
2.10	23.6	27.2	30.0						
2.20	21.5	24.8	28.9						
2.30	19.7	22.7	26.5	35.0					
2.40	18.1	20.8	24.3	35.0					
2.50	16.6	19.2	22.4	35.0					
2.60	15.4	17.8	20.7	35.0					
2.70		16.5	19.2	33.7	35.0				
2.80		15.3	17.9	31.4	35.0				
2.90		14.3	16.6	29.3	35.0				
3.00		13.3	15.6	27.3	32.7	35.0			
3.10			14.6	25.6	30.6	34.3			
3.20			13.7	24.0	28.7	32.2			
3.30			12.9	22.6	27.0	30.3			
3.40			12.1	21.3	25.4	28.5			
3.50			11.4	20.1	24.0	26.9			
3.60				19.0	22.7	25.5			
3.70				18.0	21.5	24.1			
3.80				17.0	20.4	22.9			
3.90				16.2	19.3	21.7			
4.00				15.4	18.4	20.6			
4.10				14.6	17.5	19.6			
4.20					16.7	18.7			
4.30					15.9	17.8			
4.40					15.2	17.0			
4.50					14.5	16.3			
4.60					13.9	15.6			
4.70					13.3	14.9			
4.80					12.8	14.3			
4.90					12.2	13.7			
5.00						13.2			
5.10						12.7			
5.20						12.2			
5.30						11.7			
5.40						11.3			
5.50						10.9			

The given adjusting lengths are approximate values according to the manufacturer.

Slab Props

PEP Ergo B

Permissible prop load [kN]

Extension length [m]	PEP Ergo B-300		PEP Ergo B-350	
	L = 1.97 – 3.00 m		L = 2.25 – 3.50 m	
	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
2.00	30.8	30.8		
2.10	29.8	30.8		
2.20	27.0	30.8		
2.30	24.6	30.8	30.8	28.6
2.40	23.0	30.8	28.6	28.6
2.50	21.5	30.8	25.5	28.6
2.60	20.3	29.5	23.1	28.4
2.70	19.3	27.5	21.3	28.0
2.80	18.3	24.8	19.8	27.4
2.90	16.9	22.3	18.6	26.1
3.00	15.6	20.2	17.5	24.4
3.10			16.3	22.8
3.20			15.2	20.8
3.30			14.3	19.0
3.40			13.2	17.4
3.50			12.4	15.7

Note:

- PERI PEP Ergo B-300 and PEP Ergo B-350 Props meet the load-bearing capacity requirements of Prop Class B as stipulated in DIN EN 1065.
- General Building Inspectorate Approval Z-8.311-934 issued by the German Institute for Building Technology (DIBt).

Slab Props

PEP Ergo B with Base MP 50

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	PEP Ergo B-300		PEP Ergo B-350	
	L = 1.97 – 3.00 m	L = 2.25 – 3.50 m	Outer tube bottom	Inner tube bottom
2.50	30.8	30.8		
2.60	29.3	30.8		
2.70	26.3	30.8		
2.80	23.8	30.8	30.8	30.5
2.90	21.8	30.8	28.1	30.2
3.00	20.4	28.3	25.0	29.6
3.10	19.2	25.1	22.4	28.9
3.20	18.1	22.5	20.6	27.5
3.30	16.9	20.4	19.0	25.0
3.40	15.6	18.6	17.7	22.6
3.50	14.3	16.9	16.5	20.5
3.60			15.2	18.7
3.70			14.1	16.9
3.80			13.1	15.0
3.90			12.2	13.4
4.00			11.2	11.9

Slab Props

PEP Ergo D

Permissible prop load [kN]

Extension length [m]	PEP Ergo D-150		PEP Ergo D-250		PEP Ergo D-350		PEP Ergo D-400		PEP Ergo D-500	
	L = 0.98 – 1.50 m		L = 1.47 – 2.50 m		L = 2.26 – 3.50 m		L = 2.51 – 4.00 m		L = 3.26 – 5.00 m	
	Outer tube bottom	Inner tube bottom								
1.00	30.8	30.8								
1.10	30.8	30.8								
1.20	30.8	30.8								
1.30	30.8	30.8								
1.40	28.5	30.8								
1.50	26.4	30.8	35.0	35.0						
1.60			35.0	35.0						
1.70			32.9	35.0						
1.80			30.7	35.0						
1.90			29.1	35.0						
2.00			28.1	35.0						
2.10			27.3	35.0						
2.20			26.5	34.1						
2.30			25.7	32.3	40.0	40.0				
2.40			24.3	29.4	40.0	40.0				
2.50			22.4	26.3	40.0	40.0				
2.60					38.0	40.0	40.0	40.0		
2.70					35.2	40.0	40.0	40.0		
2.80					33.1	40.0	40.0	40.0		
2.90					31.3	40.0	40.0	40.0		
3.00					29.9	40.0	40.0	40.0		
3.10					28.5	39.0	37.7	40.0		
3.20					27.2	35.3	35.7	40.0		
3.30					25.3	32.1	33.9	40.0	40.0	40.0
3.40					23.5	29.2	32.5	40.0	40.0	40.0
3.50					21.7	26.5	31.0	39.7	40.0	40.0
3.60							29.0	36.4	40.0	40.0
3.70							27.0	33.3	40.0	40.0
3.80							25.2	30.7	40.0	40.0
3.90							23.5	28.2	40.0	40.0
4.00							21.8	26.0	40.0	40.0
4.10									39.3	40.0
4.20									36.5	40.0
4.30									34.0	39.2
4.40									31.8	37.0
4.50									29.9	34.6
4.60									28.1	32.4
4.70									26.4	30.4
4.80									24.8	28.5
4.90									23.4	26.8
5.00									21.8	25.3

Note:

- PERI PEP Ergo D-150, PEP Ergo D-250, PEP Ergo D-350, PEP Ergo D-400 and PEP Ergo D-500 Props fulfil Prop Class D load-bearing capacity requirements of DIN EN 1065.
- In addition, the PEP Ergo D-250 Prop fulfils Prop Class B requirements as stipulated in DIN EN 1065.
- General Building Inspectorate Approval Z-8.311-934 for PERI PEP Ergo D-150 and PEP Ergo D-250.
- General Building Inspectorate Approval Z-8.311-941 for PERI PEP Ergo D-350, PEP Ergo D-400 and PEP Ergo D-500.

Slab Props

PEP Ergo D with Base MP 50

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	PEP Ergo D-250		PEP Ergo D-350		PEP Ergo D-400		PEP Ergo D-500	
	L = 1.47 – 2.50 m		L = 2.26 – 3.50 m		L = 2.51 – 4.00 m		L = 3.26 – 5.00 m	
	Outer tube bottom	Inner tube bottom						
2.00	36.4	37.9						
2.10	35.2	37.9						
2.20	31.9	37.9						
2.30	29.3	37.9						
2.40	27.6	37.9						
2.50	26.2	36.0						
2.60	25.1	33.8						
2.70	24.2	30.3						
2.80	23.3	27.0	40.0	40.0				
2.90	21.7	24.3	40.0	40.0				
3.00	19.8	21.9	39.5	40.0				
3.10			36.1	40.0	40.0	40.0		
3.20			33.2	40.0	40.0	40.0		
3.30			30.9	40.0	40.0	40.0		
3.40			29.2	36.6	40.0	40.0		
3.50			27.6	33.0	38.8	40.0		
3.60			26.0	30.0	36.0	40.0		
3.70			24.1	27.4	34.0	40.0		
3.80			22.3	25.2	32.0	36.9	40.0	40.0
3.90			20.6	23.2	30.1	33.6	40.0	40.0
4.00			19.0	21.3	27.9	30.9	40.0	40.0
4.10					25.9	28.7	40.0	40.0
4.20					24.1	26.6	40.0	40.0
4.30					22.5	24.7	40.0	40.0
4.40					21.0	22.9	39.8	40.0
4.50					19.5	21.3	36.9	38.7
4.60							34.4	36.0
4.70							32.1	33.7
4.80							30.0	31.6
4.90							28.1	29.7
5.00							26.5	28.0
5.10							24.9	26.4
5.20							23.4	24.9
5.30							22.1	23.5
5.40							20.8	22.6
5.50							19.5	21.0

Slab Props

PEP Ergo E

PEP Ergo E with Base MP 50

Permissible prop load [kN]

Extension length [m]	PEP Ergo E-300		PEP Ergo E-400	
	L = 1.96 – 3.00 m		L = 2.51 – 4.00 m	
	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
2.0	50.4	50.4		
2.1	50.4	50.4		
2.2	50.4	50.4		
2.3	50.4	50.4		
2.4	50.4	50.4		
2.5	48.9	50.4		
2.6	46.7	50.4	50.4	50.4
2.7	44.7	50.4	50.4	50.4
2.8	43.0	50.4	50.4	50.4
2.9	41.2	50.4	50.4	50.4
3.0	39.1	46.3	50.4	50.4
3.1			50.4	50.4
3.2			50.4	50.4
3.3			50.4	50.4
3.4			50.4	50.4
3.5			48.5	50.4
3.6			46.0	50.4
3.7			42.7	48.4
3.8			39.7	44.7
3.9			36.9	41.1
4.0			34.1	37.7

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	PEP Ergo E-300		PEP Ergo E-400	
	L = 1.96 – 3.00 m		L = 2.51 – 4.00 m	
	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
2.5	50.4	50.4		
2.6	50.4	50.4		
2.7	50.4	50.4		
2.8	50.4	50.4		
2.9	49.0	50.4		
3.0	46.2	50.4		
3.1	43.5	50.4	50.4	50.4
3.2	41.2	50.1	50.4	50.4
3.3	39.2	44.6	50.4	50.4
3.4	37.1	40.0	50.4	50.4
3.5	33.7	35.8	50.4	50.4
3.6			50.4	50.4
3.7			50.4	50.4
3.8			49.3	50.4
3.9			46.2	48.4
4.0			42.7	44.6
4.1			39.6	41.2
4.2			36.8	38.2
4.3			34.3	35.5
4.4			31.8	33.0
4.5			29.5	30.5

Note:

- PERI PEP Ergo E-300 and PEP Ergo E-400 Props fulfil Prop Class E load-bearing capacity requirements of DIN EN 1065.
- General Building Inspectorate Approval Z-8.311-941 of the German Institute for Building Technology (DIBt).

Slab Props

PEP 10

Permissible prop load [kN]

Extension length [m] L = 1.47 – 2.50 m	PEP 10-250 A	PEP 10-300 A L = 1.72 – 3.00 m	PEP 10-350 A L = 1.97 – 3.50 m	PEP 10-400 A L = 2.22 – 4.00 m
1.50	25.0			
1.60	25.0			
1.70	25.0			
1.80	23.1	25.0		
1.90	20.8	24.9		
2.00	18.8	22.5	25.0	
2.10	17.0	20.4	23.8	
2.20	15.5	18.6	21.7	
2.30	14.2	17.0	19.8	22.7
2.40	13.0	15.6	18.2	20.8
2.50	12.0	14.4	16.8	19.2
2.60		13.3	15.5	17.8
2.70		12.3	14.4	16.5
2.80		11.5	13.4	15.3
2.90		10.7	12.5	14.3
3.00		10.0	11.7	13.3
3.10			10.9	12.5
3.20			10.3	11.7
3.30			9.6	11.0
3.40			9.1	10.4
3.50			8.6	9.8
3.60				9.3
3.70				8.8
3.80				8.3
3.90				7.9
4.00				7.5

Note:

- PERI PEP 10-250 A, PEP 10-300 A, PEP 10-350 A and PEP 10-400 A Props fulfil Prop Class A load-bearing capacity requirements of DIN EN 1065.
- The permissible values are valid when using the bottom outer and inner tubes.

Slab Props

PEP 20

Permissible prop load [kN]

Extension length [m]	PEP 20 N 260*		PEP 20-300		PEP 20-350		PEP 20-400		PEP 20-500	
	L = 1.51 – 2.60 m	L = 1.71 – 3.00 m	L = 1.96 – 3.50 m	L = 2.21 – 4.00 m	L = 2.71 – 5.00 m					
	Outer tube bottom	Inner tube bottom								
1.60	35.0	35.0								
1.70	35.0	35.0								
1.80	35.0	35.0	36.4	36.4						
1.90	35.0	35.0	36.4	36.4						
2.00	33.5	35.0	36.1	36.4	36.4	36.4				
2.10	31.9	35.0	33.2	36.4	36.4	36.4				
2.20	30.9	35.0	31.4	36.4	36.4	36.4				
2.30	29.8	35.0	29.9	36.4	36.4	36.4	36.4	36.4		
2.40	28.6	35.0	28.7	36.4	36.4	36.4	36.4	36.4		
2.50	27.1	32.9	27.7	36.4	36.4	36.4	36.4	36.4		
2.60	24.8	29.4	26.9	36.3	34.8	36.4	36.4	36.4		
2.70			25.7	32.7	33.4	36.4	36.4	36.4		
2.80			24.0	29.3	32.1	36.4	36.4	36.4	36.4	36.4
2.90			22.3	26.5	31.1	36.4	36.4	36.4	36.4	36.4
3.00			20.5	23.9	30.1	36.4	36.4	36.4	36.4	36.4
3.10					28.3	35.7	34.6	36.4	36.4	36.4
3.20					26.5	32.5	33.5	36.4	36.4	36.4
3.30					24.8	29.7	32.1	36.4	36.4	36.4
3.40					23.1	27.2	30.5	36.4	36.4	36.4
3.50					21.3	24.8	28.7	34.9	36.4	36.4
3.60							26.9	32.1	36.4	36.4
3.70							25.3	29.8	36.4	36.4
3.80							23.7	27.6	36.4	36.4
3.90							22.3	25.5	36.4	36.4
4.00							20.7	23.5	35.3	36.4
4.10									33.3	36.4
4.20									31.5	36.4
4.30									29.8	35.0
4.40									28.2	32.9
4.50									26.8	30.8
4.60									25.3	28.9
4.70									24.1	27.2
4.80									22.8	25.7
4.90									21.5	24.1
5.00									20.3	22.1

All PEP 20 Props correspond to Class D of DIN EN 1065, i. e. the permissible load for all extension lengths is a minimum of 20 kN.

When using PERI Slab Tables, the permissible load for all PEP 20 Props is a minimum of 30 kN over the entire extension lengths due to the clamping in the Table Swivel Head or UNIPORTAL Head.

*For the N Props, a use of the inner tube at the bottom is only possible in connection with PERI Slab Tables or SKYDECK (bolted head).

Slab Props

PEP 20 with Base MP 50

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	PEP 20 N 260* L = 1.51 – 2.60 m		PEP 20-300 L = 1.71 – 3.00 m		PEP 20-350 L = 1.96 – 3.50 m		PEP 20-400 L = 2.21 – 4.00 m		PEP 20-500 L = 2.71 – 5.00 m	
	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
2.10	36.4	36.4								
2.20	36.4	36.4								
2.30	36.4	36.4	36.4	36.4						
2.40	34.2	36.4	36.4	36.4						
2.50	31.9	36.4	34.9	36.4	36.4	36.4				
2.60	30.4	36.4	31.8	36.4	36.4	36.4				
2.70	28.7	36.4	29.6	36.4	36.4	36.4				
2.80	27.3	34.7	27.8	36.4	36.4	36.4	36.4	36.4		
2.90	26.3	30.7	26.4	35.8	36.4	36.4	36.4	36.4		
3.00	24.5	27.5	25.2	32.1	35.0	36.4	36.4	36.4		
3.10	22.2	24.7	24.2	28.8	32.9	36.4	36.4	36.4		
3.20			23.1	26.3	31.1	36.4	36.4	36.4		
3.30			21.4	23.9	29.7	36.4	36.4	36.4	36.4	36.4
3.40			19.9	21.8	28.4	34.2	35.7	36.4	36.4	36.4
3.50			18.1	19.8	27.0	30.7	33.9	36.4	36.4	36.4
3.60					25.3	28.6	32.3	36.4	36.4	36.4
3.70					23.6	26.1	30.8	35.3	36.4	36.4
3.80					22.0	24.2	29.1	32.7	36.4	36.4
3.90					20.4	22.5	27.3	30.0	36.4	36.4
4.00					18.9	20.7	25.5	27.8	36.4	36.4
4.10							23.9	26.1	36.4	36.4
4.20							22.4	24.2	36.4	36.4
4.30							21.0	22.8	35.6	36.4
4.40							19.7	21.2	33.6	36.4
4.50							18.3	19.7	31.6	34.2
4.60									29.3	32.1
4.70									28.0	30.0
4.80									26.5	28.4
4.90									25.1	26.8
5.00									23.8	25.4
5.10									22.6	24.0
5.20									21.4	22.7
5.30									20.3	21.6
5.40									19.1	20.4
5.50									18.1	19.1

*For the N Props, a use of the inner tube at the bottom is only possible in connection with PERI Slab Tables or SKYDECK (bolted head).

Slab Props

PEP 30

Permissible prop load [kN]

Extension length [m]	PEP 30-150		PEP 30-250		PEP 30-300		PEP 30-350		PEP 30-400	
	L = 0.96 – 1.50 m		L = 1.46 – 2.50 m		L = 1.71 – 3.00 m		L = 1.96 – 3.50 m		L = 2.21 – 4.00 m	
	Outer tube bottom	Inner tube bottom								
1.00	36.4	36.4								
1.10	36.4	36.4								
1.20	36.4	36.4								
1.30	35.9	36.4								
1.40	35.3	36.4								
1.50	34.5	36.4	42.9	42.9						
1.60			42.9	42.9						
1.70			42.9	42.9						
1.80			42.1	42.9	42.9	42.9				
1.90			39.7	42.9	42.9	42.9				
2.00			37.9	42.9	42.9	42.9	45.5	45.5		
2.10			36.4	42.9	42.9	42.9	45.5	45.5		
2.20			35.5	42.9	42.9	42.9	45.5	45.5		
2.30			34.3	41.5	42.9	42.9	45.5	45.5	41.5	41.5
2.40			33.1	38.7	42.7	42.9	45.5	45.5	41.5	41.5
2.50			31.0	35.9	41.1	42.9	45.5	45.5	41.5	41.5
2.60					40.0	42.9	45.5	45.5	41.5	41.5
2.70					38.5	42.9	45.5	45.5	41.5	41.5
2.80					36.9	41.6	45.5	45.5	41.5	41.5
2.90					34.2	38.3	45.0	45.5	41.5	41.5
3.00					31.3	34.8	43.6	45.5	41.5	41.5
3.10							41.4	44.2	41.5	41.5
3.20							38.7	42.1	41.5	41.5
3.30							36.1	38.7	41.5	41.5
3.40							33.3	35.7	41.5	41.5
3.50							30.7	32.5	41.5	41.5
3.60									41.5	41.5
3.70									41.3	41.5
3.80									38.5	41.3
3.90									35.9	38.1
4.00									33.2	34.9

All PEP 30 Props correspond to Class E of DIN EN 1065, i. e. the permissible load for all extension lengths is a minimum of 30 kN.

When using PERI Slab Tables, the permissible load for all PEP 30 Props is a minimum of 40 kN (PEP 30-150 = 35 kN) over the entire extension lengths due to the clamping in the Table Swivel Head or UNIPORTAL Head.

Slab Props

PEP 30 with Base MP 50

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	PEP 30-250		PEP 30-300		PEP 30-350		PEP 30-400	
	L = 1.46 – 2.50 m	L = 1.71 – 3.00 m	L = 1.96 – 3.50 m	L = 2.21 – 4.00 m	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
2.00	42.9	42.9						
2.10	42.9	42.9						
2.20	42.9	42.9						
2.30	40.1	42.9	42.9					
2.40	37.2	42.9	42.9	42.9				
2.50	35.0	42.9	42.9	42.9	45.4	45.4		
2.60	33.2	42.3	42.9	42.9	45.4	45.4		
2.70	31.8	39.8	42.9	42.9	45.4	45.4		
2.80	30.6	36.4	41.6	42.9	45.4	45.4	41.5	41.5
2.90	28.4	32.3	39.5	42.9	45.4	45.4	41.5	41.5
3.00	26.7	28.5	37.6	42.5	45.4	45.4	41.5	41.5
3.10			36.2	41.2	45.4	45.4	41.5	41.5
3.20			33.9	37.9	45.1	45.4	41.5	41.5
3.30			32.1	34.2	43.0	45.4	41.5	41.5
3.40			29.4	31.2	40.0	43.0	41.5	41.5
3.50			26.9	27.9	38.2	40.9	41.5	41.5
3.60					35.8	37.6	41.5	41.5
3.70					33.4	34.5	41.5	41.5
3.80					30.9	31.8	41.5	41.5
3.90					28.6	29.6	43.1	41.5
4.00					26.3	27.1	40.6	42.1
4.10							37.8	39.1
4.20							35.3	36.2
4.30							33.0	33.9
4.40							30.8	31.4
4.50							28.4	29.0

Slab Props

MULTIPROP 250, 350, 480, 625

Permissible prop load [kN]

Extension length [m]	MP 250 L = 1.45 – 2.50 m		MP 350 L = 1.95 – 3.50 m		MP 480 L = 2.60 – 4.80 m		MP 625 L = 4.30 – 6.25 m	
	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom	Outer tube bottom	Inner tube bottom
1.45	75.5	78.5						
1.50	75.5	78.5						
1.60	75.5	78.5						
1.70	75.5	78.5						
1.80	73.8	78.5						
1.90	70.6	78.5						
1.95	68.0	78.5	91.0	90.1				
2.00	67.3	78.5	91.0	90.1				
2.10	65.7	76.8	86.0	90.1				
2.20	64.1	75.1	80.6	90.1				
2.30	62.5	72.6	75.1	89.8				
2.40	60.8	69.1	70.7	87.9				
2.50	59.2	65.6	66.4	86.1				
2.60			63.7	83.1	88.5	73.6		
2.70			61.1	80.1	83.7	73.3		
2.80			59.2	77.1	78.8	72.9		
2.90			57.4	74.1	74.0	72.6		
3.00			56.0	70.3	69.1	72.2		
3.10			54.5	66.6	64.9	71.4		
3.20			52.9	61.8	60.7	70.7		
3.30			51.3	57.1	56.5	70.0		
3.40			47.7	51.7	54.1	68.2		
3.50			44.2	46.4	51.8	66.5		
3.60					49.4	64.7		
3.70					47.5	60.4		
3.80					45.7	56.1		
3.90					43.8	51.8		
4.00					41.8	48.4		
4.10					39.7	45.0		
4.20					37.7	41.6		
4.30					35.8	39.3	57.9	45.7
4.40					33.9	37.0	56.3	45.7
4.50					32.0	34.8	54.7	45.7
4.60					30.2	32.5	52.5	45.1
4.70					28.3	30.2	50.3	44.4
4.80					26.4	27.9	47.9	43.5
4.90							45.2	42.4
5.00							42.5	41.3
5.10							39.9	39.9
5.20	MULTIPROPs are classified according to official approval as follows:						37.2	38.5
5.30	MP 250 = Class T 25		MP 480 = Class D 45				34.9	37.1
5.40	MP 350 = Class R 35		MP 625 = Class D 60				32.8	35.6
5.50							30.8	34.1
5.60							29.3	32.6
5.70	To release the loads > 60 kN, we recommend using the HD Wingnut Spanner, Item no. 022027.						27.8	31.2
5.80							26.4	29.6
5.90							25.1	27.9
6.00							23.8	26.2
6.10							22.7	24.8
6.20							21.6	23.4
6.25							21.0	22.7

Slab Props

MULTIPROP 250, 350, 480, 625

With Base MP 50

Permissible prop load [kN]

Overall height [m] (prop extension + 50 cm)	MP 250 + MP 50 L = 1.95 – 3.00 m		MP 350 + MP 50 L = 2.45 – 4.00 m		MP 480 + MP 50 L = 3.10 – 5.30 m		MP 625 + MP 50 L = 4.80 – 6.75 m	
	Outer tube bottom	Inner tube bottom						
2.25	76.6	73.6						
2.30	74.5	72.9						
2.40	72.4	72.1						
2.50	66.1	69.8	87.6	84.2				
2.60	63.3	67.7	83.8	82.9				
2.70	60.5	65.6	79.9	81.7				
2.80	57.7	63.1	76.1	80.5				
2.90	55.1	60.1	70.0	77.0				
3.00	52.4	57.1	63.9	73.5				
3.10			60.8	70.6	76.8	73.3		
3.20			57.6	67.6	74.4	72.8		
3.30			55.2	64.7	71.9	72.3		
3.40			52.7	61.8	69.4	71.8		
3.50			50.8	59.1	67.0	71.3		
3.60			48.8	56.4	62.6	70.0		
3.70			46.9	52.2	58.2	68.7		
3.80			45.0	48.0	53.9	67.4		
3.90			41.8	43.9	51.2	62.9		
4.00			38.5	39.8	48.6	58.4		
4.10					45.9	53.9		
4.20					43.9	50.1		
4.30					41.9	46.3		
4.40					39.8	42.5		
4.50					37.7	40.0		
4.60					35.5	37.5		
4.70					33.3	35.0		
4.80					31.7	33.2	48.7	44.5
4.90					30.0	31.4	47.5	44.4
5.00					28.4	29.6	46.2	44.3
5.10					26.7	27.8	44.5	43.1
5.20					25.1	26.0	42.8	41.8
5.30					23.4	24.2	41.1	40.4
5.40							40.1	39.6
5.50							37.3	37.2
5.60							35.3	35.6
5.70							33.3	34.0
5.80							31.5	32.5
5.90							30.6	31.7
6.00							28.1	29.5
6.10							26.7	28.1
6.20							25.3	26.7
6.30							24.1	25.4
6.40							23.5	24.8
6.50							21.8	22.9
6.60							20.8	21.7
6.70							19.8	20.6
6.75							19.3	20.0

Note:

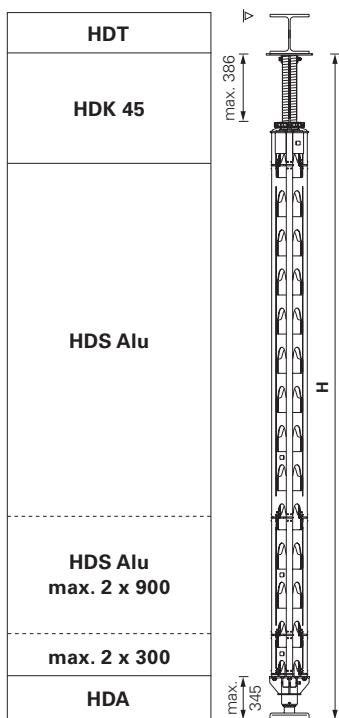
To release the loads > 60 kN, we recommend using the HD Wingnut Spanner, Item no. 022027.

HD 200 Heavy-Duty Prop

Restrained at the Top

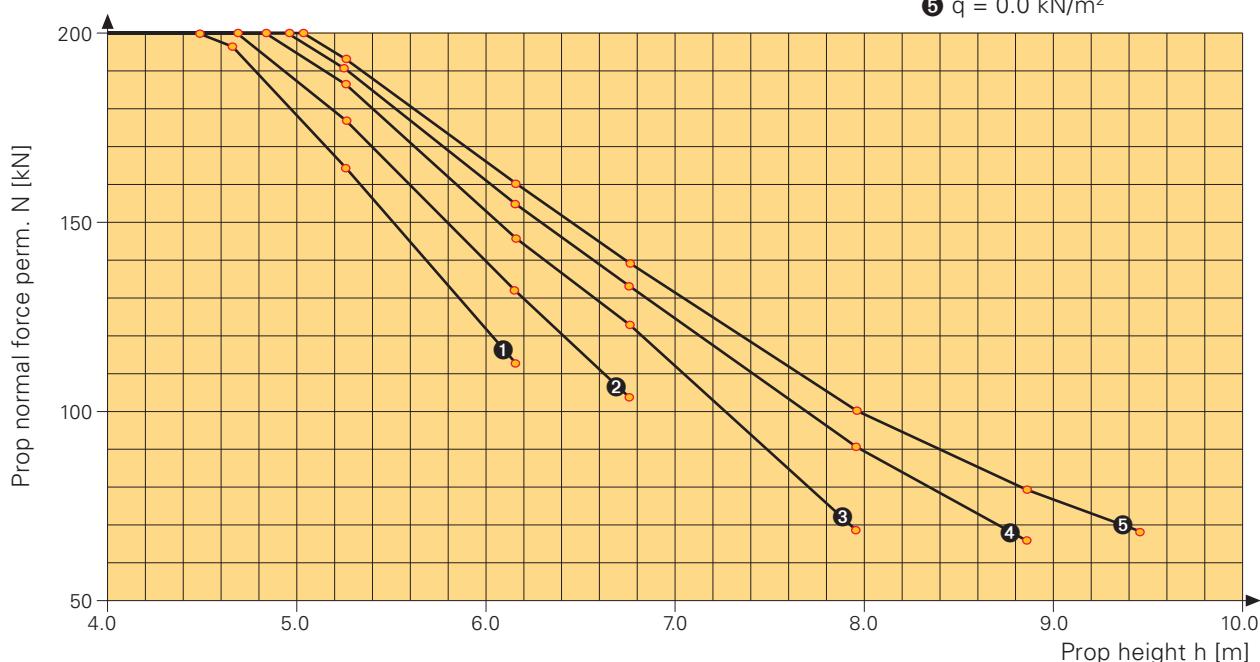
Prop Sections HDS Alu

Permissible prop load [kN] according to the type test.



Wind load with dynamic pressure q

- ① $q = 1.3 \text{ kN/m}^2$
- ② $q = 0.9 \text{ kN/m}^2$
- ③ $q = 0.5 \text{ kN/m}^2$
- ④ $q = 0.2 \text{ kN/m}^2$
- ⑤ $q = 0.0 \text{ kN/m}^2$

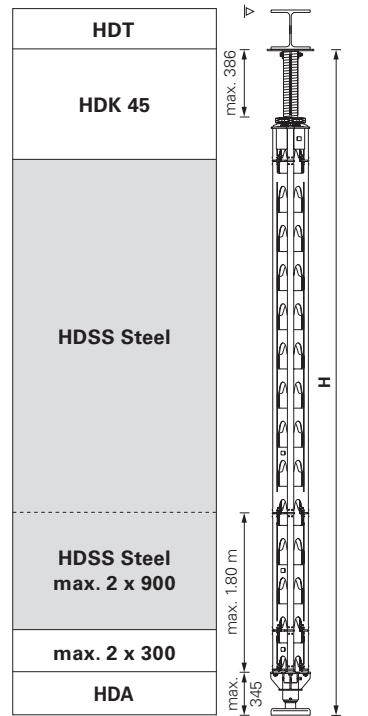


Intermediate values as a result of other wind loads may be determined by linear interpolation between the carrying capacity curves.

HD 200 Heavy-Duty Prop Restrained at the Top

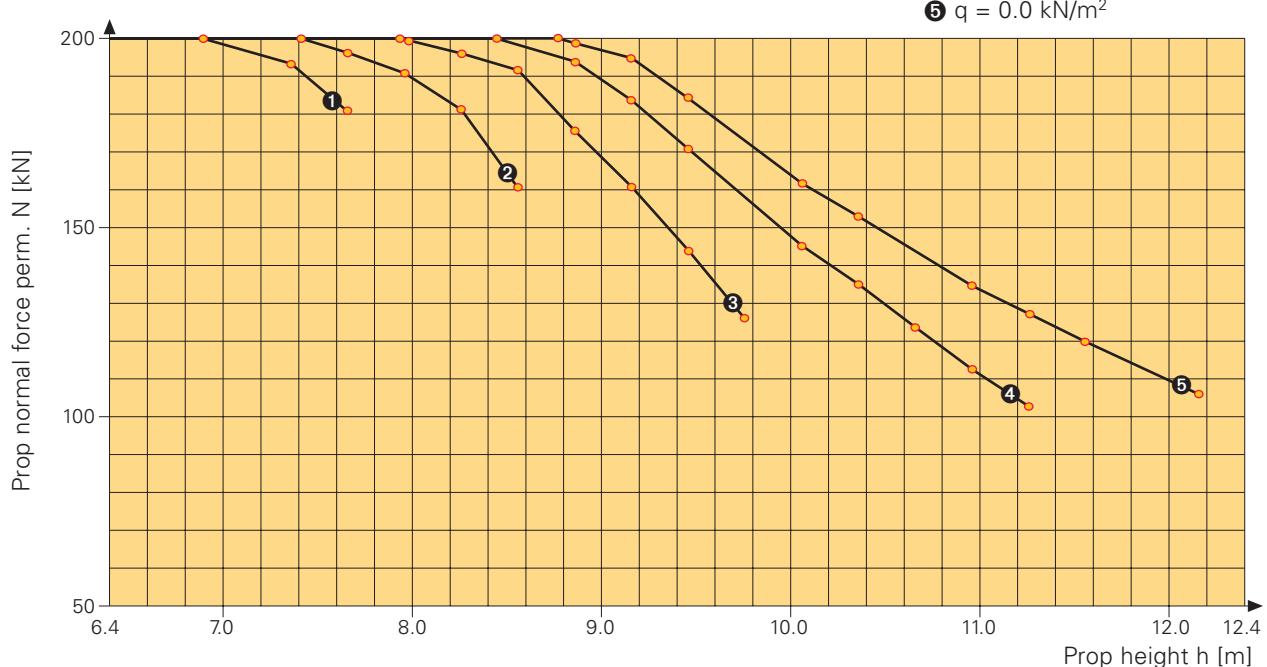
Prop Sections HDSS Steel

Permissible prop load [kN] according to the type test.



Wind load with dynamic pressure q

- ① $q = 1.3 \text{ kN/m}^2$
- ② $q = 0.9 \text{ kN/m}^2$
- ③ $q = 0.5 \text{ kN/m}^2$
- ④ $q = 0.2 \text{ kN/m}^2$
- ⑤ $q = 0.0 \text{ kN/m}^2$



Intermediate values as a result of other wind loads may be determined by linear interpolation between the carrying capacity curves.

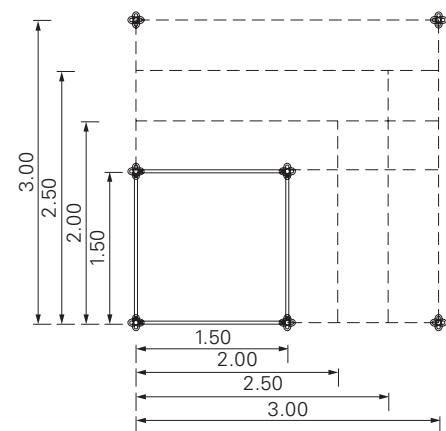
PERI UP Rosett Shoring Tower

Restrained at the Top, $h \leq 21.89$ m

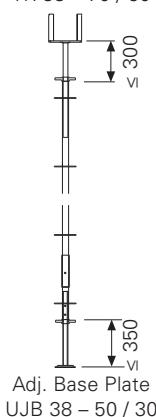
Application conditions

- restrained at the top
- **without additional ledgers** in the top and bottom units
- horizontal cross strut min. every 9 m
- Head Spindle or Cross Forkhead
- $h \leq 21.89$ m

Ground plan



Head Spindle or
Cross Forkhead
TR 38 - 70 / 50



Perm. leg load

h [m]	F _V [kN]									
	Ground plan [m]									
	1.5 x				2.0 x			2.5 x		3.0 x
	1.5	2.0	2.5	3.0	2.0	2.5	3.0	2.5	3.0	3.0
q = 0.5										
1.83 - 8.39	35.7	34.4								
8.33 - 8.89	33.9	33.1	32.4	31.6	33.7	33.1	32.4	33.8	33.2	34.0
8.83 - 9.39	33.6	32.8	32.0	31.2	33.4	32.7	32.0	33.3	32.8	33.5
9.33 - 9.89	33.2	32.4	31.6	30.7	33.0	32.2	31.5	32.9	32.3	33.1
9.83 - 10.39	32.9	32.0	31.1	30.3	32.6	31.8	31.0	32.5	31.8	32.6
10.33 - 10.89	32.6	31.7	30.7	29.8	32.2	31.4	30.6	32.1	31.3	32.1
10.83 - 11.39	32.3	31.3	30.3	29.3	31.9	31.0	30.1	31.6	30.9	31.6
11.33 - 11.89	32.0	30.9	29.9	28.9	31.5	30.6	29.6	31.2	30.4	31.1
11.83 - 12.39	31.6	30.6	29.5	28.4	31.1	30.1	29.2	30.8	29.9	30.7
12.33 - 12.89	31.3	30.2	29.1	28.0	30.7	29.7	28.7	30.4	29.4	30.2
12.83 - 13.39	31.0	29.8	28.7	27.5	30.4	29.3	28.2	29.9	29.0	29.7
13.33 - 13.89	30.7	29.5	28.3	27.0	30.0	28.9	27.8	29.5	28.5	29.2
13.83 - 14.39	30.4	29.1	27.8	26.6	29.6	28.5	27.3	29.1	28.0	28.7
14.33 - 14.89	30.0	28.7	27.4	26.1	29.2	28.0	26.8	28.7	27.5	28.3
14.83 - 15.39	29.7	28.4	27.0	25.7	28.9	27.6	26.4	28.2	27.1	27.8
15.33 - 15.89	29.4	28.0	26.6	25.2	28.5	27.2	25.9	27.8	26.6	27.3
15.83 - 16.39	29.2									
16.33 - 16.89	28.9									
16.83 - 17.39	28.7									
17.33 - 17.89	28.4									
17.83 - 18.39	28.2									
18.33 - 18.89	27.9									
18.83 - 19.39	27.7									
19.33 - 19.89	27.4									
19.83 - 20.39	27.2									
20.33 - 20.89	27.0									
20.83 - 21.39	26.7									
21.33 - 21.89	26.5									

Impact Pressure [kN/m²] q = 0.8

For this area please refer to
Attachments T1 + T2 of the type test.

F _V [kN]
all ground plans
38.0
37.9
37.8
37.7
37.6
37.5
37.4
37.3
37.2
37.1
37.0
36.9
36.8
36.7
36.6
36.5
36.5
36.4
36.4
36.4
36.3
36.3
36.3
36.2
36.2
36.2
36.1
36.1

without wind, q = 0

PERI UP Rosett Shoring Tower

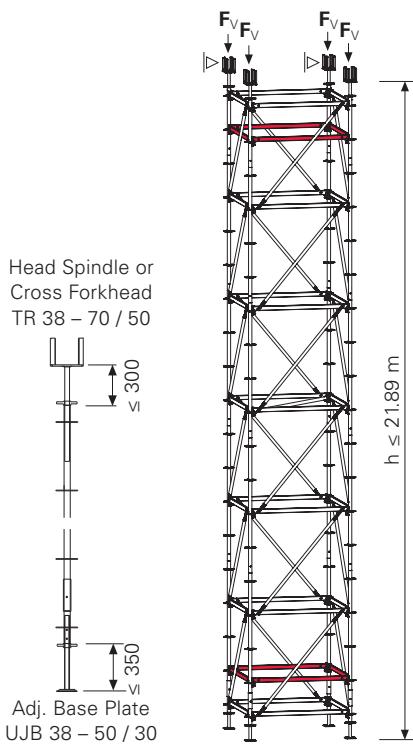
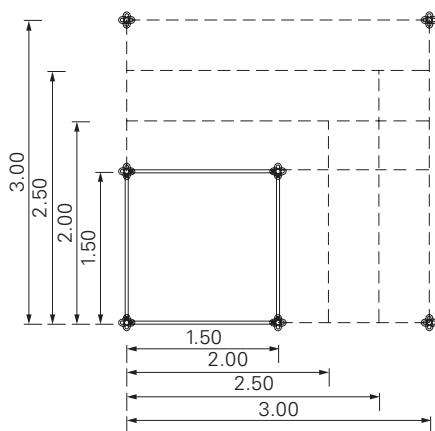
Restrained at the Top, $h \leq 21.89$ m, with Additional Ledgers

PERI

Application conditions

- restrained at the top
- **with additional ledgers** in the top and bottom units
- horizontal cross strut min. every 9 m
- Head Spindle or Cross Forkhead
- $h \leq 21.89$ m

Ground plan



Perm. leg load

h [m]	F _v [kN]									
	Ground plan [m]									
	1.5 x	2.0 x	2.5 x	3.0 x	2.0	2.5	3.0	2.5	3.0	3.0
q = 0.5 1.83 - 8.39	39.9									
8.33 - 8.89	38.5	37.7	37.0	36.2	37.9	37.3	36.6	37.6	37.1	37.5
8.83 - 9.39	38.1	37.3	36.5	35.7	37.5	36.9	36.2	37.2	36.6	37.0
9.33 - 9.89	37.8	36.9	36.1	35.3	37.2	36.4	35.7	36.8	36.2	36.6
9.83 - 10.39	37.4	36.6	35.7	34.8	36.8	36.0	35.2	36.4	35.7	36.2
10.33 - 10.89	37.1	36.2	35.2	34.3	36.4	35.6	34.8	36.0	35.3	35.7
10.83 - 11.39	36.8	35.8	34.8	33.8	36.0	35.2	34.3	35.6	34.8	35.3
11.33 - 11.89	36.4	35.4	34.4	33.3	35.6	34.8	33.8	35.2	34.4	34.9
11.83 - 12.39	36.1	35.0	33.9	32.9	35.3	34.3	33.4	34.7	33.9	34.4
12.33 - 12.89	35.7	34.6	33.5	32.4	34.9	33.9	32.9	34.3	33.5	34.0
12.83 - 13.39	35.4	34.2	33.1	31.9	34.5	33.5	32.4	33.9	33.0	33.6
13.33 - 13.89	35.1	33.8	32.6	31.4	34.1	33.1	32.0	33.5	32.6	33.1
13.83 - 14.39	34.7	33.5	32.2	30.9	33.7	32.7	31.5	33.1	32.1	32.7
14.33 - 14.89	34.4	33.1	31.8	30.5	33.4	32.2	31.0	32.7	31.7	32.3
14.83 - 15.39	34.0	32.7	31.3	30.0	33.0	31.8	30.6	32.3	31.2	31.8
15.33 - 15.89	33.7	32.3	30.9	29.5	32.6	31.4	30.1	31.9	30.8	31.4
15.83 - 16.39	33.4									
16.33 - 16.89	33.2									
16.83 - 17.39	32.9									
17.33 - 17.89	32.6									
17.83 - 18.39	32.4									
18.33 - 18.89	32.1									
18.83 - 19.39	31.8									
19.33 - 19.89	31.6									
19.83 - 20.39	31.3									
20.33 - 20.89	31.0									
20.83 - 21.39	30.8									
21.33 - 21.89	30.5									

For this area please refer to
Attachments T3 + T4 of the type test.

without wind, q = 0

F _v [kN]
all ground plans
41.6
41.5
41.4
41.3
41.2
41.1
41.0
40.9
40.8
40.7
40.6
40.5
40.4
40.3
40.2
40.1
40.1
40.1
40.0
40.0
40.0
40.0
39.9
39.9
39.9
39.8
39.8

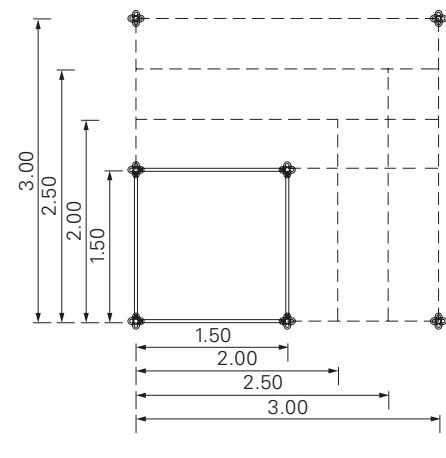
PERI UP Rosett Shoring Tower

Restrained at the Top, $h \leq 22.34$ m, with Spindle Section

Application conditions

- restrained at the top
- **with additional ledgers** in the top and bottom units and above the spindle section
- horizontal cross strut min. every 9 m and directly below the spindle section
- Head Spindle or Cross Forkhead
- $h \leq 22.34$ m

Ground plan

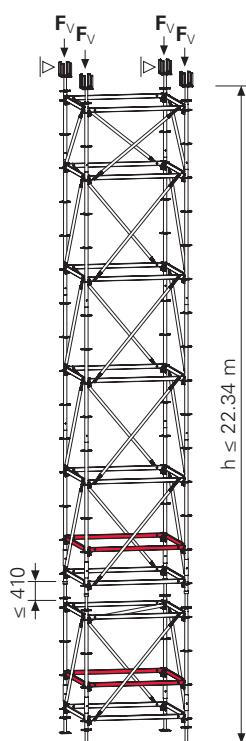


Head Spindle or
Cross Forkhead
TR 38 - 70 / 50

$\Delta h = 200$

$\Delta h = 250$

Adj. Base Plate
UJB 38 - 50 / 30



Perm. leg load

h [m]	F _v [kN]									
	Ground plan [m]									
	1.5 x				2.0 x			2.5 x		3.0 x
	1.5	2.0	2.5	3.0	2.0	2.5	3.0	2.5	3.0	3.0
q = 0.5	44.9 43.5									
2.64 - 8.34	44.9									
8.14 - 8.84	43.4	42.9	42.4	41.9	42.8	42.2	41.7	42.2	41.6	41.5
8.64 - 9.34	43.2	42.7	42.1	41.6	42.6	42.0	41.5	41.9	41.3	41.3
9.14 - 9.84	43.0	42.4	41.9	41.3	42.4	41.7	41.2	41.7	41.1	41.0
9.64 - 10.34	42.8	42.2	41.6	41.0	42.1	41.5	40.9	41.4	40.8	40.7
10.14 - 10.84	42.6	42.0	41.3	40.7	41.9	41.2	40.6	41.2	40.5	40.5
10.64 - 11.34	42.3	41.7	41.1	40.4	41.7	41.0	40.3	40.9	40.3	40.2
11.14 - 11.84	42.1	41.5	40.8	40.1	41.5	40.7	40.0	40.7	40.0	40.0
11.64 - 12.34	41.9	41.3	40.5	39.8	41.2	40.5	39.7	40.4	39.7	39.7
12.14 - 12.84	41.7	41.0	40.3	39.5	41.0	40.2	39.4	40.2	39.5	39.4
12.64 - 13.34	41.5	40.8	40.0	39.2	40.8	40.0	39.2	39.9	39.2	39.2
13.14 - 13.84	41.3	40.6	39.7	38.9	40.6	39.7	38.9	39.7	38.9	38.9
13.64 - 14.34	41.1	40.3	39.5	38.6	40.3	39.5	38.6	39.4	38.7	38.7
14.14 - 14.84	40.9	40.1	39.2	38.3	40.1	39.2	38.3	39.2	38.4	38.4
14.64 - 15.34	40.7	39.8	38.9	38.0	39.8	38.9	38.0	38.9	38.1	38.1
15.14 - 15.84	40.4	39.5	38.6	37.7	39.6	38.6	37.7	38.6	37.8	37.8
15.64 - 16.34	40.2	39.3	38.3	37.4	39.3	38.3	37.4	38.3	37.5	37.5
16.14 - 16.84	39.9	39.0	38.0	37.1	39.0	38.0	37.1	38.0	37.2	37.2
16.64 - 17.34	39.7	38.7	37.8	36.7	38.8	37.8	36.7	37.8	36.8	36.8
17.14 - 17.84	39.4	38.4	37.5	36.4	38.5	37.5	36.4	37.5	36.5	36.5
17.64 - 18.34	39.2	38.2	37.2	36.1	38.2	37.2	36.1	37.2	36.2	36.2
18.14 - 18.84	38.9	37.9	36.9	35.8	38.0	36.9	35.8	36.9	35.9	35.9
18.64 - 19.34	38.7	37.6	36.6	35.5	37.7	36.6	35.5	36.6	35.6	35.6
19.14 - 19.84	38.5	37.4	36.3	35.2	37.4	36.3	35.2	36.3	35.3	35.3
19.64 - 20.34	38.2	37.1	36.0	34.8	37.2	36.0	34.9	36.0	35.0	35.0
20.14 - 20.84	38.0	36.9	35.7	34.5	36.9	35.8	34.6	35.8	34.7	34.7
20.64 - 21.34	37.8	36.6	35.4	34.2	36.6	35.5	34.2	35.5	34.3	34.3
21.14 - 21.84	37.5	36.4	35.1	33.8	36.4	35.2	33.9	35.2	34.0	34.0
21.64 - 22.34	37.3	36.1	34.8	33.5	36.1	34.9	33.6	34.9	33.7	33.7

without wind, q = 0	all ground plans
	46.3
	46.3
	46.3
	46.3
	46.3
	46.3
	46.3
	46.3
	46.3
	46.3
	46.2
	46.2
	46.1
	46.0
	46.0
	45.9
	45.8
	45.8
	45.7
	45.6
	45.5
	45.4
	45.3
	45.2
	45.1

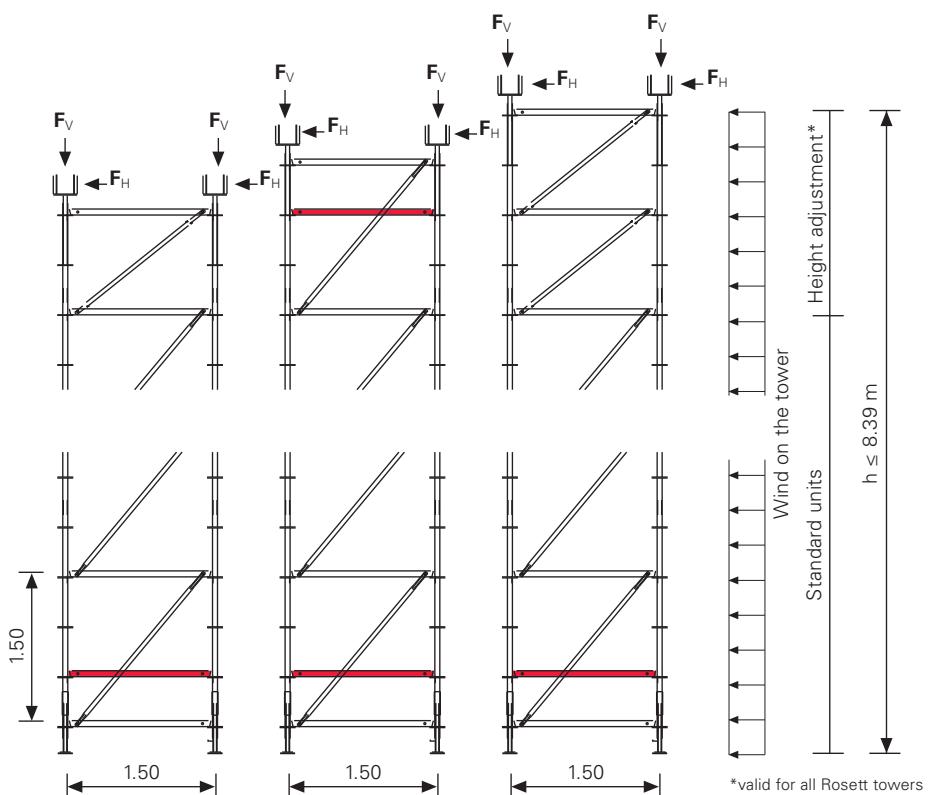
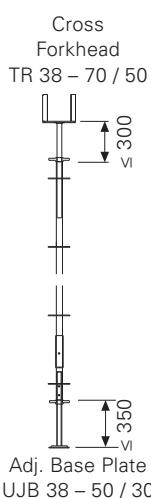
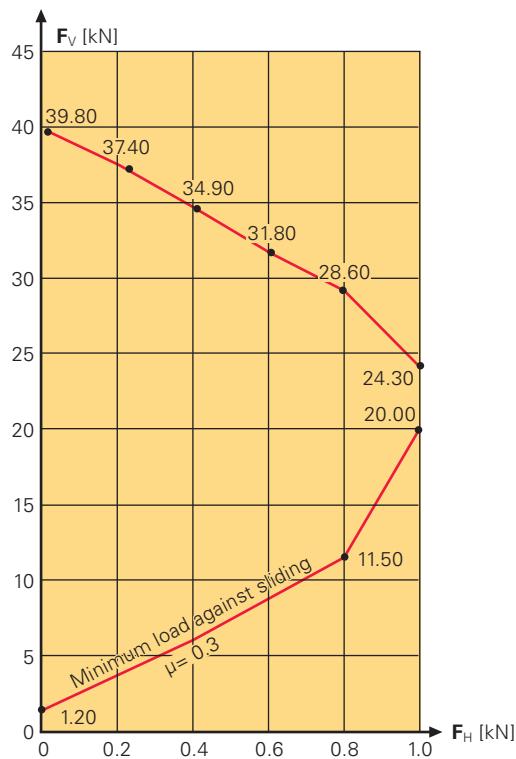
PERI UP Rosett Shoring Tower

Unrestrained, 1.5 m x 1.5 m, $h \leq 8.39$ m,
with Additional Ledgers

Application conditions

- unrestrained at the top
- with wind
- **with additional ledgers** in the top and bottom units
- Head Spindle or Cross Forkhead
- height $h \leq 8.39$ m

Perm. leg load



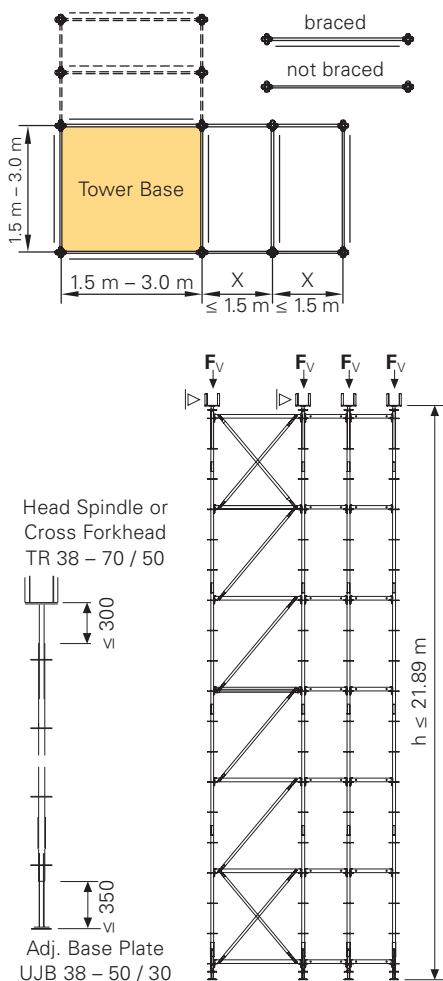
PERI UP Rosett Shoring Tower

Restrained at the Top, $h \leq 21.89$ m, with Additional Frames

Application conditions

- restrained at the top
- tower base 1.5 m x 1.5 m up to 3.0 m x 3.0 m
- **without additional ledgers** in the top and bottom units
- horizontal cross strut min. every 9 m
- maximum 2 additional frames per side possible
- x = Ledger UH 25 to UH 150, bays are not braced
- from $h = 8.33$ m, crossed diagonal braces in top and bottom units
- tower and additional frames to be braced with Ledger Brace UBL
- Head Spindle or Cross Forkhead
- $h \leq 21.89$ m

Ground plan



Perm. leg load

h [m]	F _V [kN]									
	Tower Base [m]									
	1.5 x			2.0 x			2.5 x		3.0 x	
q = 0.5	1.5	2.0	2.5	3.0	2.0	2.5	3.0	2.5	3.0	3.0
1.83 - 8.39										
8.33 - 8.89	32.6	31.8	31.1	30.2	32.5	31.8	31.0	32.6	31.8	32.6
8.83 - 9.39	32.2	31.3	30.5	29.5	32.1	31.2	30.4	32.0	31.2	32.1
9.33 - 9.89	31.8	30.9	30.0	28.9	31.6	30.7	29.8	31.5	30.6	31.5
9.83 - 10.39	31.4	30.4	29.4	28.3	31.2	30.2	29.1	31.0	30.1	30.9
10.33 - 10.89	31.0	30.0	28.9	27.6	30.7	29.6	28.5	30.5	29.5	30.4
10.83 - 11.39	30.6	29.6	28.4	27.0	30.3	29.1	27.9	29.9	28.9	29.8
11.33 - 11.89	30.2	29.1	27.8	26.4	29.8	28.6	27.3	29.4	28.3	29.2
11.83 - 12.39	29.8	28.7	27.3	25.7	29.4	28.0	26.7	28.9	27.7	28.7
12.33 - 12.89	29.4	28.2	26.7	25.1	28.9	27.5	26.1	28.4	27.1	28.1
12.83 - 13.39	29.0	27.8	26.2	24.5	28.5	27.0	25.5	27.8	26.5	27.5
13.33 - 13.89	28.6	27.4	25.7	23.8	28.0	26.4	24.9	27.3	25.9	27.0
13.83 - 14.39	28.2	26.9	25.1	23.2	27.6	25.9	24.2	26.8	25.4	26.4
14.33 - 14.89	27.8	26.5	24.6	22.6	27.1	25.4	23.6	26.3	24.8	25.8
14.83 - 15.39	27.4	26.0	24.0	21.9	26.7	24.8	23.0	25.7	24.2	25.3
15.33 - 15.89	27.0	25.6	23.5	21.3	26.2	24.3	22.4	25.2	23.6	24.7
15.83 - 16.39										
16.33 - 16.89										
16.83 - 17.39										
17.33 - 17.89										
17.83 - 18.39										
18.33 - 18.89										
18.83 - 19.39										
19.33 - 19.89										
19.83 - 20.39										
20.33 - 20.89										
20.83 - 21.39										
21.33 - 21.89										

Permissible leg loads on request.

all ground plans	without wind, q = 0
38.0	
37.9	
37.8	
37.7	
37.6	
37.5	
37.4	
37.3	
37.2	
37.1	
37.0	
36.9	
36.8	
36.7	
36.6	
36.5	
36.5	
36.4	
36.4	
36.4	
36.3	
36.3	
36.3	
36.3	
36.2	
36.2	
36.2	
36.1	
36.1	

PERI UP Rosett Shoring Tower

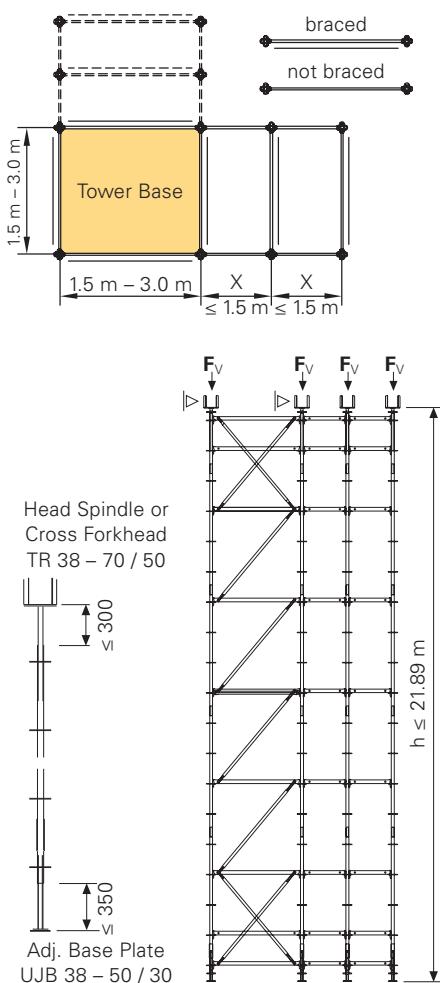
Restrained at the Top, $h \leq 21.89$ m, with Additional Ledgers, with Additional Frames

PERI

Application conditions

- restrained at the top
- ground plan 1.5 m x 1.5 m up to 3.0 m x 3.0 m
- **with additional ledgers** in the top and bottom units
- horizontal cross strut min. every 9 m
- maximum 2 additional frames per side possible
- x = Ledger UH 25 to UH 150, bays are not braced
- from $h = 8.33$ m, crossed diagonal braces in top and bottom units
- tower and additional frames to be braced with Ledger Brace UBL
- Head Spindle or Cross Forkhead
- $h \leq 21.89$ m

Ground plan



Perm. leg load

h [m]	F _v [kN]									
	Tower Base [m]									
	1.5 x			2.0 x			2.5 x			3.0 x
	1.5	2.0	2.5	3.0	2.0	2.5	3.0	2.5	3.0	3.0
q = 0.5	38.2									
8.33 - 8.39	37.2	36.4	35.7	34.9	36.7	36.1	35.3	36.5	35.8	36.4
8.83 - 9.39	36.8	36.0	35.2	34.3	36.3	35.6	34.8	36.0	35.3	35.9
9.33 - 9.89	36.3	35.5	34.6	33.8	35.8	35.1	34.2	35.5	34.7	35.3
9.83 - 10.39	35.9	35.0	34.1	33.2	35.4	34.5	33.7	35.0	34.2	34.8
10.33 - 10.89	35.5	34.6	33.6	32.6	34.9	34.0	33.1	34.5	33.6	34.2
10.83 - 11.39	35.1	34.1	33.1	32.0	34.5	33.5	32.5	34.0	33.1	33.7
11.33 - 11.89	34.7	33.6	32.6	31.4	34.0	33.0	32.0	33.5	32.5	33.1
11.83 - 12.39	34.2	33.2	32.0	30.9	33.6	32.5	31.4	32.9	32.0	32.6
12.33 - 12.89	33.8	32.7	31.5	30.3	33.1	32.0	30.9	32.4	31.4	32.0
12.83 - 13.39	33.4	32.2	31.0	29.7	32.7	31.5	30.3	31.9	30.9	31.5
13.33 - 13.89	33.0	31.8	30.5	29.1	32.2	31.0	29.7	31.4	30.3	30.9
13.83 - 14.39	32.6	31.3	30.0	28.5	31.8	30.4	29.2	30.9	29.8	30.4
14.33 - 14.89	32.1	30.8	29.4	28.0	31.3	29.9	28.6	30.4	29.2	29.8
14.83 - 15.39	31.7	30.4	28.9	27.4	30.9	29.4	28.1	29.9	28.7	29.3
15.33 - 15.89	31.3	29.9	28.4	26.8	30.4	28.9	27.5	29.4	28.1	28.7
15.83 - 16.39										
16.33 - 16.89										
16.83 - 17.39										
17.33 - 17.89										
17.83 - 18.39										
18.33 - 18.89										
18.83 - 19.39										
19.33 - 19.89										
19.83 - 20.39										
20.33 - 20.89										
20.83 - 21.39										
21.33 - 21.89										

without wind, q = 0

Permissible leg loads on request.

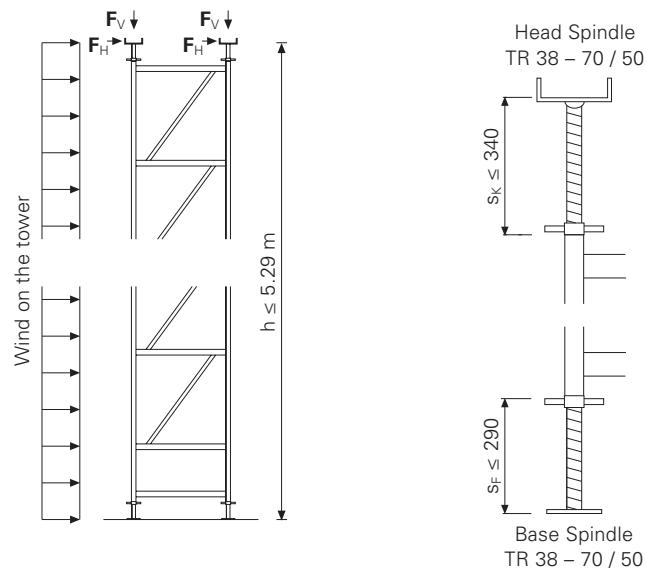
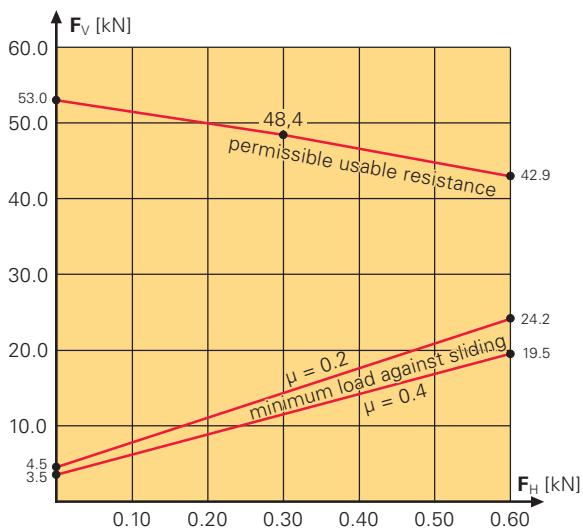
ST 100 Stacking Tower

Free-Standing, with Head Spindle

Application conditions (D1)

- free-standing
- with wind
- with diagonal bracing
- $h \leq 5.29 \text{ m}$

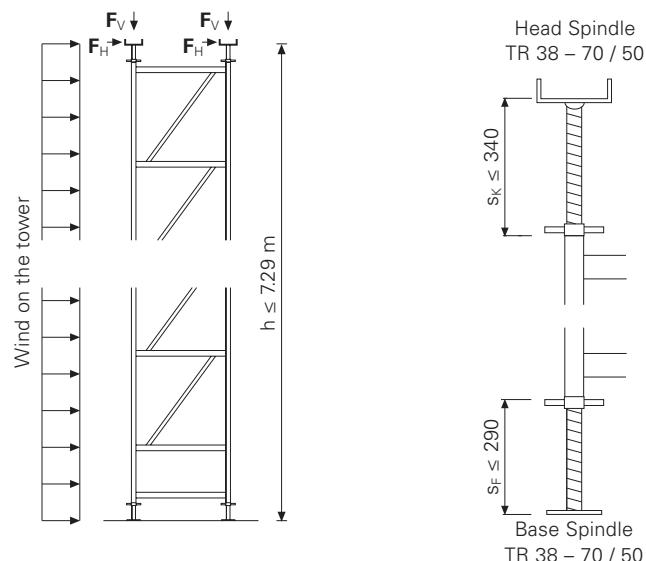
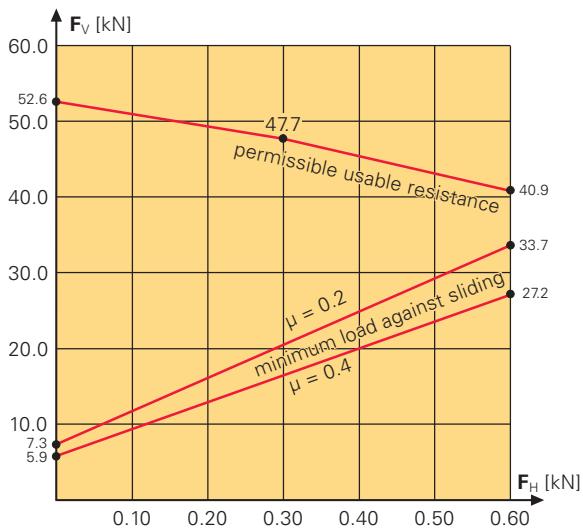
Perm. leg load



Application conditions (D2)

- free-standing
- with wind
- with diagonal bracing
- $h \leq 7.29 \text{ m}$

Perm. leg load



ST 100 Stacking Tower

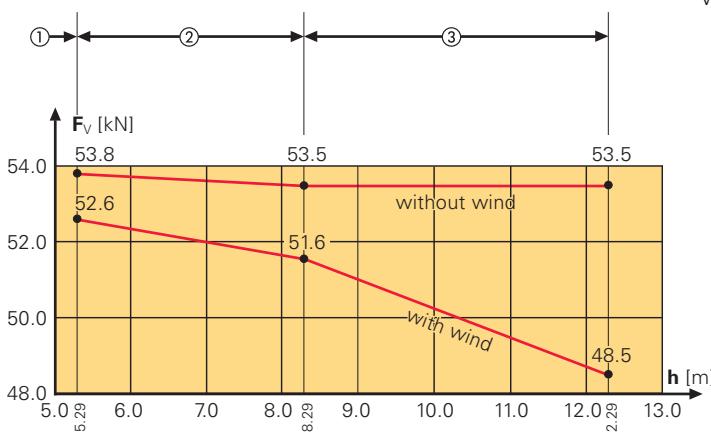
Restrained at the Top, with Head Spindle

PERI

Application conditions (D3)

- restrained at the top
- with/without wind
- ① $h \leq 5.29$ m:
1 diagonal strut each at the top and bottom
- ② $5.29 \text{ m} < h \leq 8.29$ m:
2 diagonal struts each at the top and bottom
- ③ $8.29 \text{ m} < h \leq 12.29$ m:
3 diagonal struts each at the top and bottom plus horizontal cross strut at approx. $h/2$

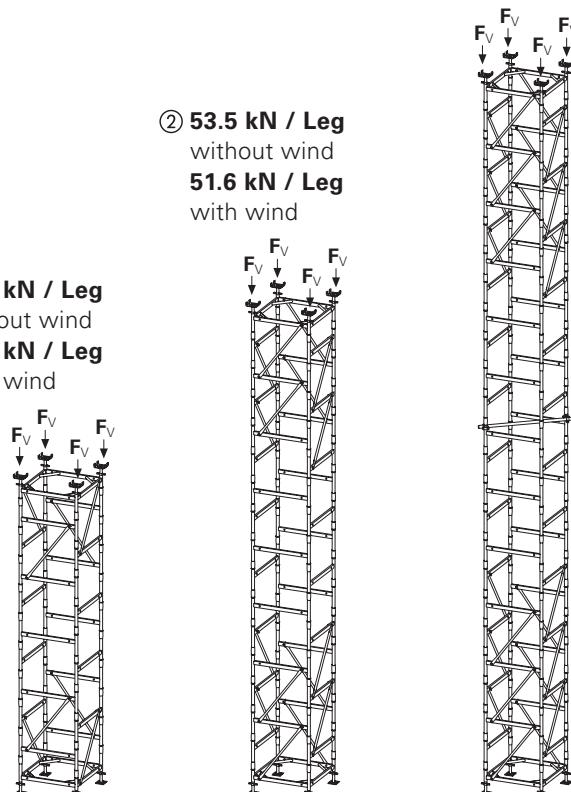
Perm. leg load



③ **53.5 kN / Leg**
without wind
48.5 kN / Leg
with wind

② **53.5 kN / Leg**
without wind
51.6 kN / Leg
with wind

① **53.8 kN / Leg**
without wind
52.6 kN / Leg
with wind



$h \leq 5.29$ m:
1 diagonal strut each at the top and bottom.

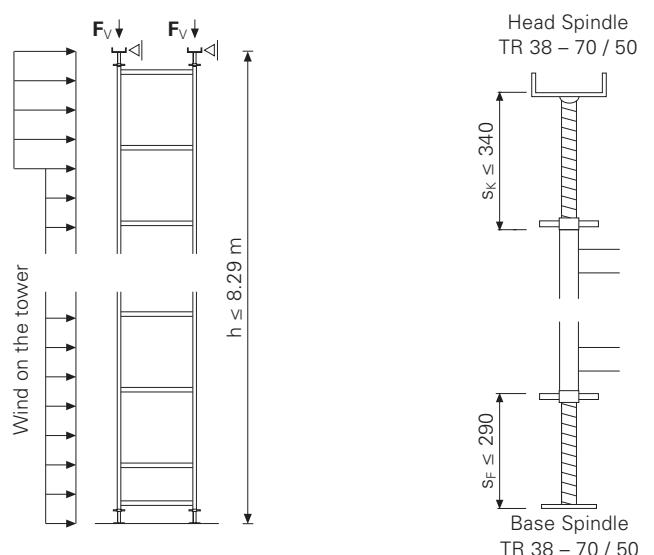
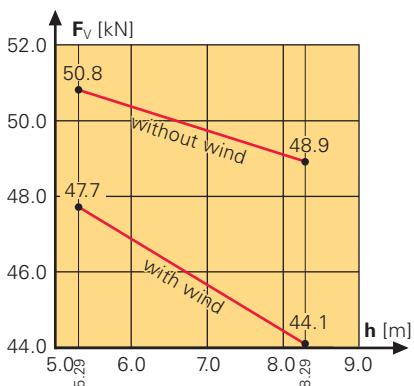
$h 5.29 \text{ m} - 8.29 \text{ m}$:
2 diagonal struts each at the top and bottom.

$h 8.29 \text{ m} - 12.29 \text{ m}$:
3 diagonal struts each at the top and bottom.
Plus horizontal cross strut at $h/2$.

Application conditions (D4)

- restrained at the top
- without diagonal bracing
- with/without wind
- $h \leq 8.29$ m

Perm. leg load



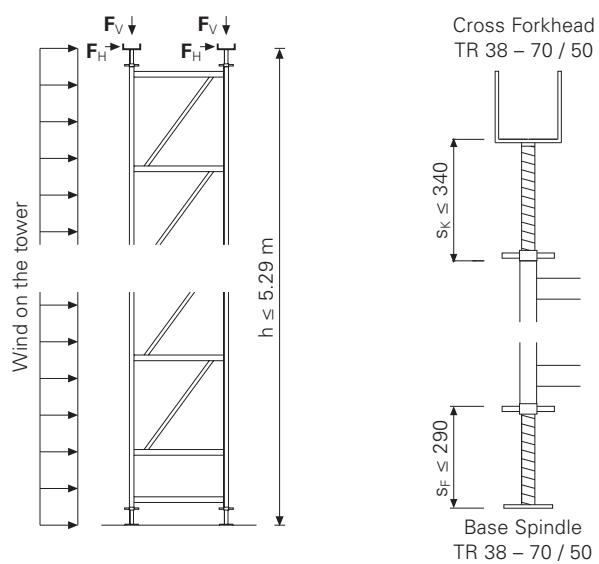
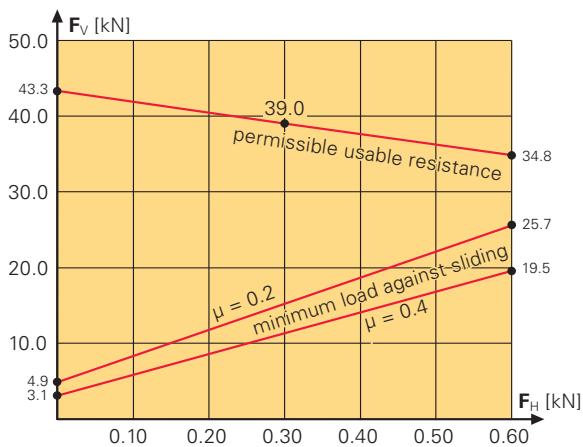
ST 100 Stacking Tower

Free-Standing, with Cross Forkhead

Application conditions (D5)

- free-standing
- with wind
- with diagonal bracing
- $h \leq 5.29 \text{ m}$

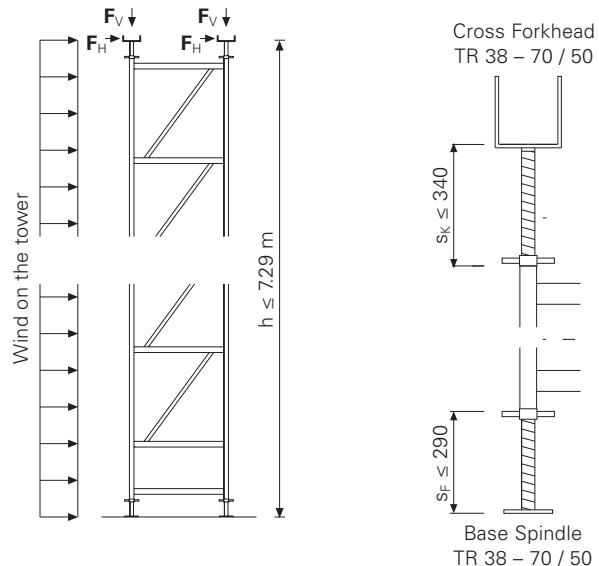
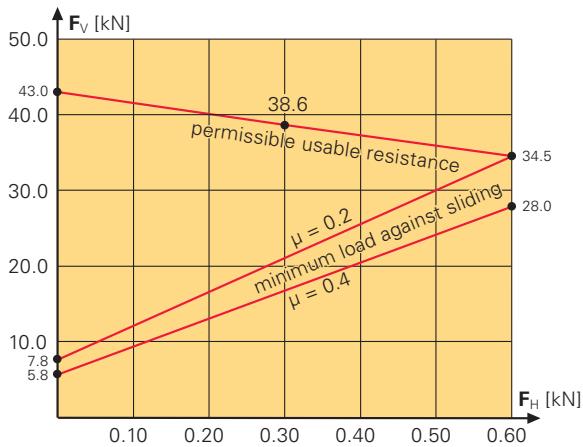
Perm. leg load



Application conditions (D6)

- free-standing
- with wind
- with diagonal bracing
- $h \leq 7.29 \text{ m}$

Perm. leg load



ST 100 Stacking Tower

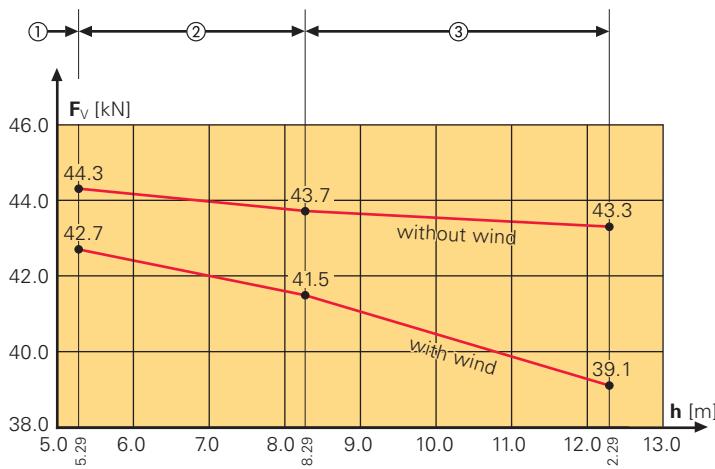
Restrained at the Top, with Cross Forkhead

PERI

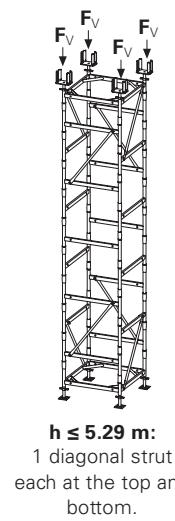
Application conditions (D7)

- restrained at the top
- with/without wind
- ① $h \leq 5.29$ m:
1 diagonal strut each at the top and bottom
- ② $5.29 < h \leq 8.29$ m:
2 diagonal struts each at the top and bottom
- ③ $8.29 < h \leq 12.29$ m:
3 diagonal struts each at the top and bottom plus horizontal cross strut at approx. $h/2$

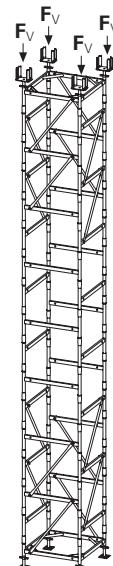
Perm. leg load



① **44.3 kN / Leg**
without wind
42.7 kN / Leg
with wind



② **43.7 kN / Leg**
without wind
41.5 kN / Leg
with wind



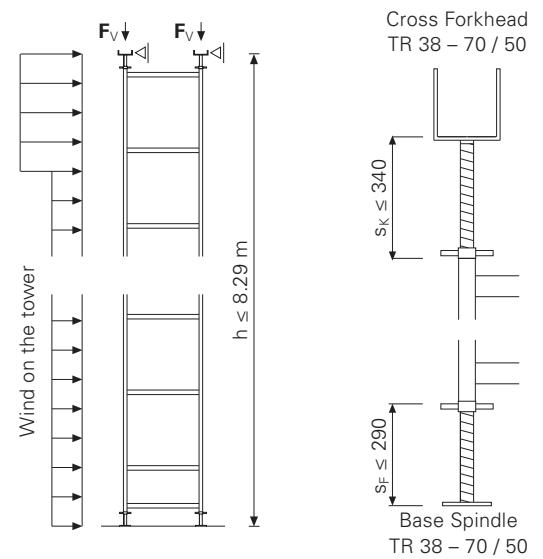
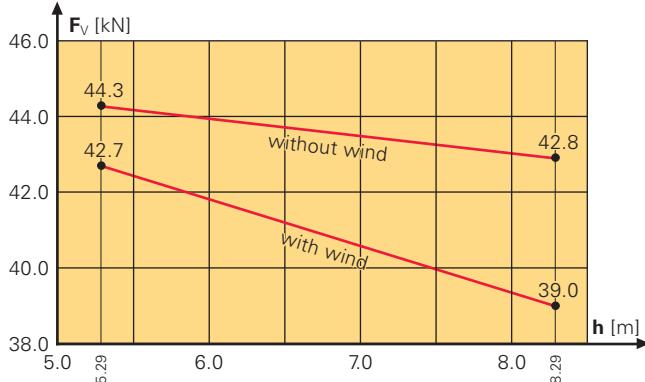
③ **43.3 kN / Leg**
without wind
39.1 kN / Leg
with wind



Application conditions (D8)

- restrained at the top
- without diagonal bracing
- with/without wind
- $h \leq 8.29$ m

Perm. leg load



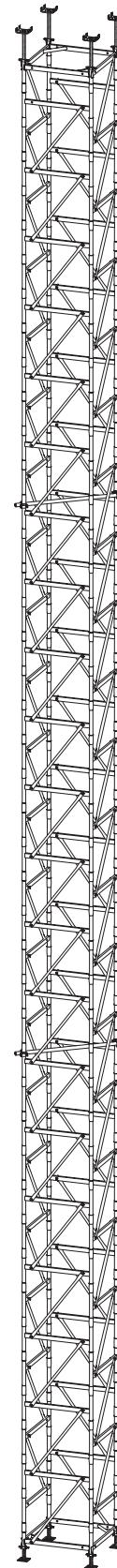
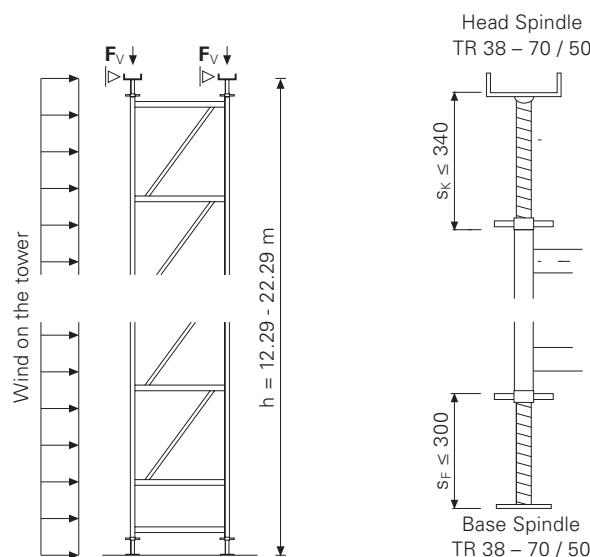
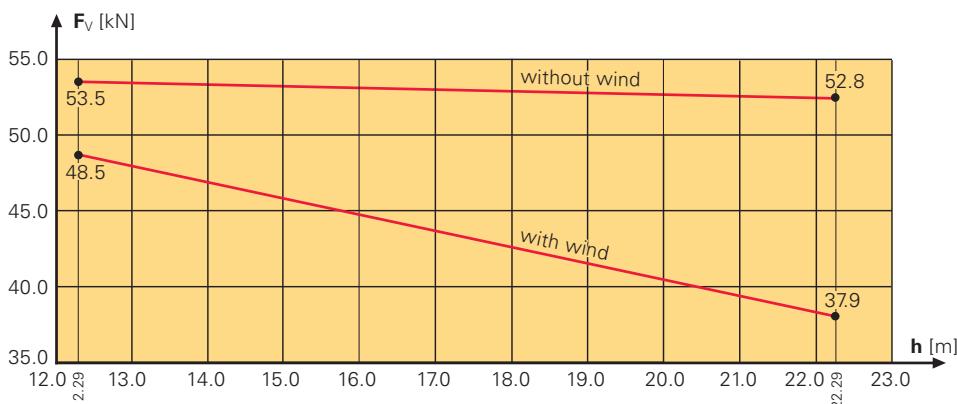
ST 100 Stacking Tower

Restrained at the Top, $12.29 \text{ m} \leq h \leq 22.29 \text{ m}$,
with Head Spindle

Supplement for (D3)

- restrained at the top
- with/without wind
- with diagonal bracing all around
- 2 horizontal cross struts at every $h/3$

Perm. leg load



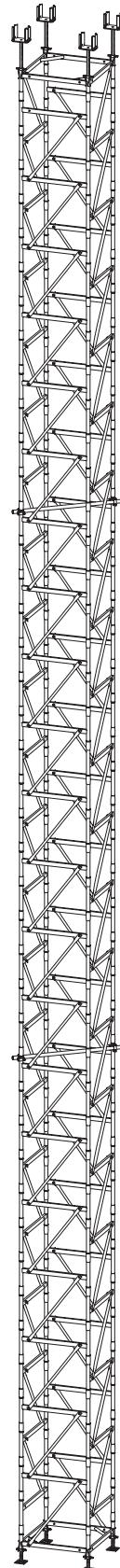
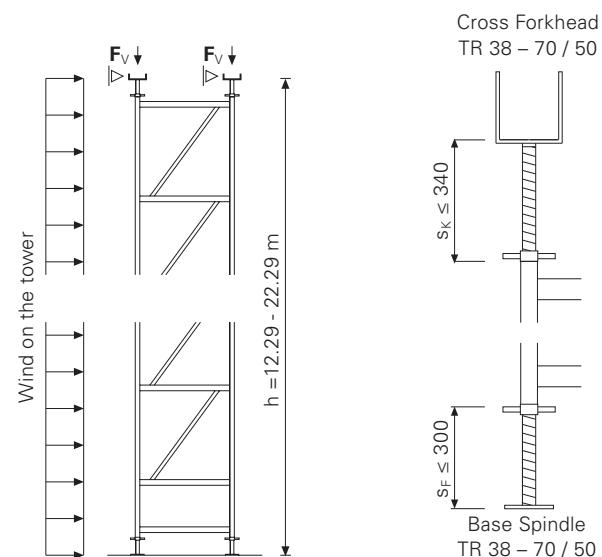
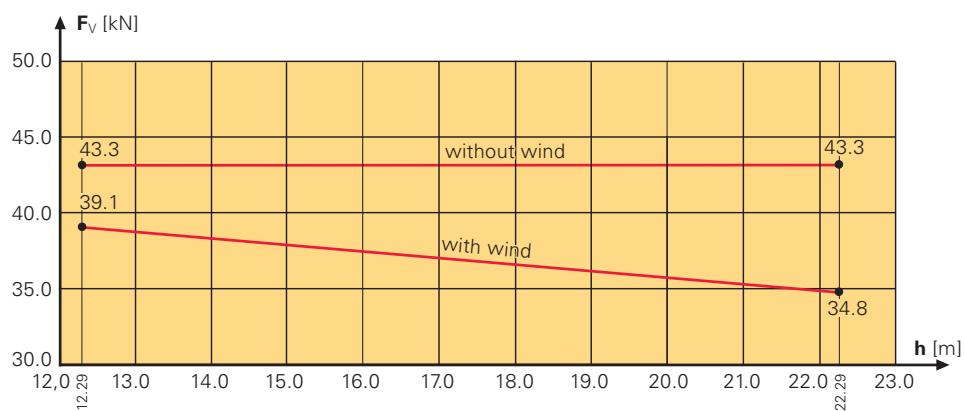
ST 100 Stacking Tower

Restrained at the Top, $12.29 \text{ m} \leq h \leq 22.29 \text{ m}$,
with Cross Forkhead

Supplement for (D7)

- restrained at the top
- with/without wind
- with diagonal bracing all around
- 2 horizontal cross struts at every $h/3$

Perm. leg load

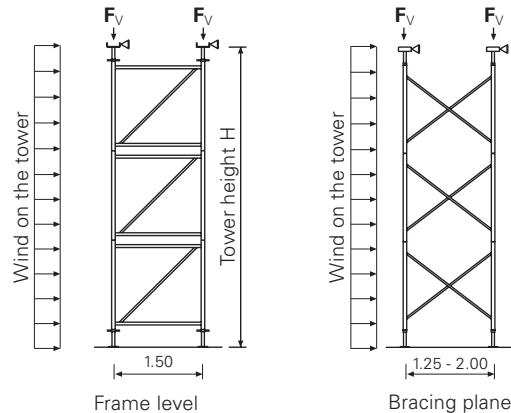


PD 8 Slab Table

Restrained at the Top, with Base Spindle

Application conditions

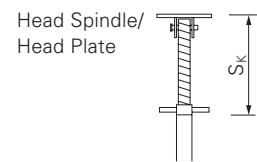
- restrained at the top
- with base restraint
- frame spacing 1.25 m – 2.00 m



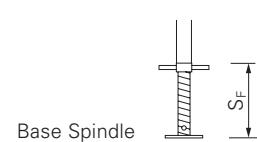
Perm. leg load for frame spacing 1.25 m to 2.00 m [kN] in accordance with EN 12812									
Tower height [m]	$S_K \leq 30 \text{ cm}, S_F \leq 30 \text{ cm}$			$S_K \leq 30 \text{ cm}, S_F \leq 50 \text{ cm}$			$S_K \leq 30 \text{ cm}, S_F \leq 80 \text{ cm}$		
	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$
4.5	55.4	53.3	50.2	51.8	47.9	43.9	41.6	34.8	30.6
5.0	55.4	53.2	49.5	52.0	47.4	42.7	42.1	34.7	30.0
5.5	55.4	53.1	48.9	52.2	46.8	41.5	42.6	34.6	29.4
6.0	55.4	53.1	48.2	52.4	46.3	40.2	43.1	34.5	28.9
6.5	55.4	53.0	47.6	52.6	45.7	39.0	43.6	34.4	28.3
7.0	55.4	52.9	46.9	52.8	45.2	37.8	44.1	34.3	27.7
7.5	55.3	51.7	44.6	52.8	44.1	35.9	44.0	33.6	26.1
8.0	55.2	50.6	42.3	52.8	43.0	34.1	43.8	32.8	24.6
8.5	55.1	49.4	39.9	52.8	41.9	32.2	43.7	32.1	23.0
9.0	55.1	48.2	37.6	52.8	40.9	30.3	43.6	31.3	21.4
9.5	55.0	47.0	35.3	52.8	39.8	28.4	43.4	30.6	19.8
10.0	54.9	45.9	33.0	52.8	38.7	26.6	43.3	29.8	18.3
10.5	54.8	44.7	30.6	52.8	37.6	24.7	43.1	29.1	16.7
11.0	54.7	43.5	28.3	52.8	36.5	22.8	43.0	28.3	15.1
11.5	54.7	42.3	25.5	52.7	34.8		42.7	27.3	
12.0	54.7	41.0	22.7	52.6	33.1		42.3	26.2	
12.5	54.7	39.8	19.8	52.5	31.4		42.0	25.2	
13.0	54.6	38.5	17.0	52.5	29.6		41.6	24.2	
13.5	54.6	37.3	14.2	52.4	27.9		41.3	23.2	
14.0	54.6	36.0		52.3	26.2		40.9	22.1	
14.5	54.6	34.8		52.2	24.5		40.6	21.1	

Spindle configuration

Head Spindle Cross Head Spindle TR 48-75/47 or Spindle Tube TR 48-75/40 with Head Plate for an extension length of up to $S_K \leq 30 \text{ cm}$.

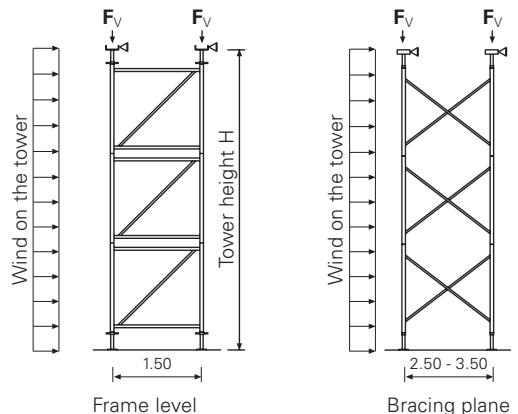


Base Spindle Spindle Tube TR 48-75/40 with End Plate or Spindle Tube TR 48-116/80 with End Plate for an extension length of up to $S_F \leq 50 \text{ cm}$. Spindle Tube TR 48-116/80 with End Plate for an extension length of up to $S_F \leq 80 \text{ cm}$.



Application conditions

- restrained at the top
- with base restraint
- frame spacing 2.50 m – 3.50 m

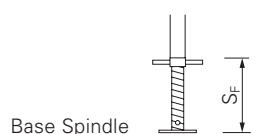
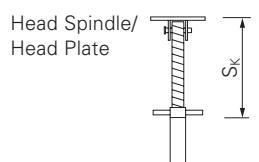


Perm. leg load for frame spacing 2.50 m to 3.50 m [kN] in accordance with EN 12812									
Tower height [m]	$S_K \leq 30 \text{ cm}, S_F \leq 30 \text{ cm}$			$S_K \leq 30 \text{ cm}, S_F \leq 50 \text{ cm}$			$S_K \leq 30 \text{ cm}, S_F \leq 80 \text{ cm}$		
	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$	without wind $q=0 \text{ kN/m}^2$	with wind $q=0.5 \text{ kN/m}^2$	with wind $q=0.8 \text{ kN/m}^2$
4.5	55.4	53.3	51.7	51.5	49.8	46.7	44.2	37.8	33.5
5.0	55.4	53.3	51.2	51.7	49.4	45.4	44.5	37.4	32.6
5.5	55.4	53.2	50.8	51.9	49.0	44.1	44.8	37.0	31.7
6.0	55.4	53.2	50.3	52.1	48.6	42.8	45.0	36.7	30.9
6.5	55.4	53.1	49.9	52.3	48.2	41.5	45.3	36.3	30.0
7.0	55.4	53.1	49.4	52.5	47.8	40.2	45.6	35.9	29.1
7.5	55.3	52.5	47.5	52.5	46.7	38.4	45.6	35.2	27.6
8.0	55.2	51.9	45.7	52.5	45.6	36.6	45.6	34.5	26.2
8.5	55.1	51.3	43.8	52.5	44.5	34.7	45.6	33.8	24.7
9.0	55.0	50.8	42.0	52.5	43.4	32.9	45.6	33.1	23.3
9.5	54.9	50.2	40.1	52.4	42.2	31.1	45.5	32.4	21.8
10.0	54.8	49.6	38.2	52.4	41.1	29.3	45.5	31.7	20.3
10.5	54.7	49.0	36.4	52.4	40.0	27.4	45.5	31.0	18.9
11.0	54.6	48.4	34.5	52.4	38.9	25.6	45.5	30.3	17.4
11.5	54.6	46.6	32.2	52.4	38.1		45.0	29.5	
12.0	54.5	44.7	30.0	52.4	37.3		44.5	28.7	
12.5	54.5	42.9	27.7	52.4	36.5		44.0	27.9	
13.0	54.4	41.0	25.5	52.4	35.8		43.6	27.1	
13.5	54.4	39.2	23.2	52.4	35.0		43.1	26.3	
14.0	54.3	37.3	21.0	52.4	34.2		42.6	25.5	
14.5	54.3	35.5	18.7	52.4	33.4		42.1	24.7	

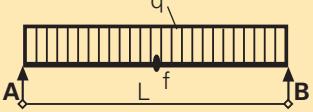
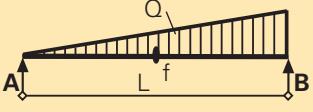
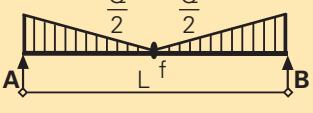
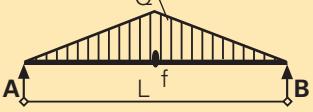
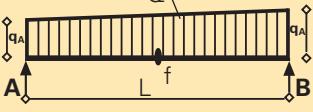
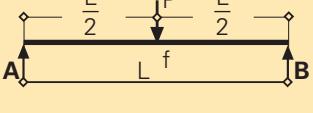
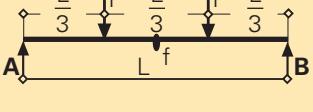
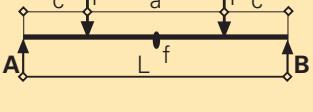
Spindle configuration

Head Spindle Cross Head Spindle TR 48-75/47 **or** Spindle Tube TR 48-75/40 with Head Plate for an extension length of up to $S_K \leq 30 \text{ cm}$.

Base Spindle Spindle Tube TR 48-75/40 with End Plate **or** Spindle Tube TR 48-116/80 with End Plate for an extension length of up to $S_F \leq 50 \text{ cm}$. Spindle Tube TR 48-116/80 with End Plate for an extension length of up to $S_F \leq 80 \text{ cm}$.

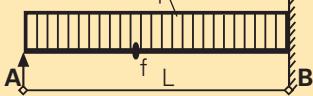
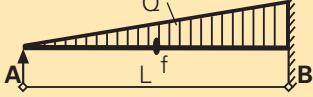
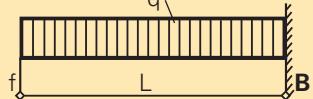
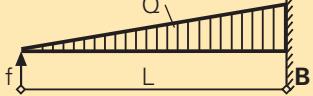
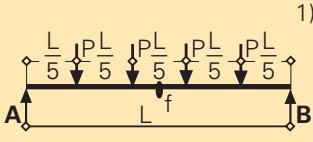
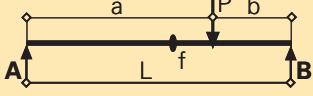
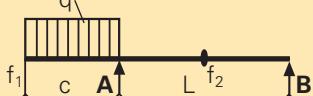


General Tables and Formulae

Load Case	Support Forces Q = Total Load q = Continuous Load P = Concentrated Load	Bending Moment	Maximum Deflection
			General
	$A = B = 0.5 \cdot q \cdot L$	$\max M = 0.125 \cdot q \cdot L^2$	$f = \frac{5 \cdot q \cdot L^4}{384 \cdot E \cdot I}$
	$A = 0.333 \cdot Q$ $B = 0.667 \cdot Q$	$\max M = 0.1280 \cdot Q \cdot L$	$f = \frac{5 \cdot Q \cdot L^3}{382 \cdot E \cdot I}$
	$A = B = 0.500 \cdot Q$	$\max M = 0.0833 \cdot Q \cdot L$	$f = \frac{3 \cdot Q \cdot L^3}{320 \cdot E \cdot I}$
	$A = B = 0.500 \cdot Q$	$\max M = 0.1667 \cdot Q \cdot L$	$f = \frac{Q \cdot L^3}{60 \cdot E \cdot I}$
	$A = 0.333 \cdot q_A \cdot L + 0.167 \cdot q_B \cdot L$ $B = 0.167 \cdot q_A \cdot L + 0.333 \cdot q_B \cdot L$	$\max M = 0.1265 \cdot Q \cdot L$	$f = \frac{5 \cdot Q \cdot L^3}{383 \cdot E \cdot I}$
	$A = B = 0.500 \cdot P$	$\max M = 0.2500 \cdot P \cdot L$	$f = \frac{P \cdot L^3}{48 \cdot E \cdot I}$
	$A = B = P$	$\max M = 0.3333 \cdot P \cdot L$	$f = \frac{23 \cdot P \cdot L^3}{648 \cdot E \cdot I}$
	$A = B = P$	$\max M = P \cdot c$	$f = \frac{P \cdot c}{24 \cdot E \cdot I} \cdot (3L^2 - 4c^2)$

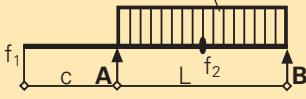
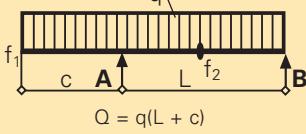
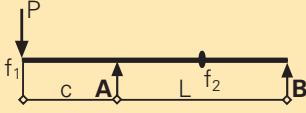
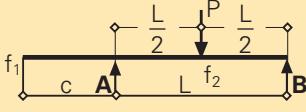
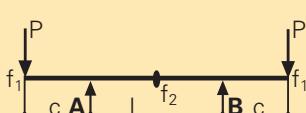
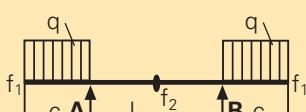
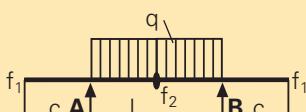
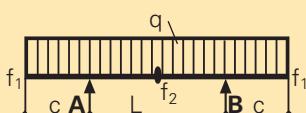
Maximum Deflection		I required for Timber	
For Conifer Timber	Rectangular Cross-Section	For perm. f = L/300	For perm. f = L/200
$q \text{ [kN/m]}$ $Q \text{ [kN]}$ $c, L \text{ [m]}$ $I \text{ [cm}^4]$ $E = 10\,000 \text{ N/mm}^2$ $\Rightarrow f \text{ [mm]}$	$\sigma \text{ [N/mm}^2]$ $c, L \text{ [m]}$ $E = 10\,000 \text{ N/mm}^2$ $h \text{ [cm]}$ $\Rightarrow f \text{ [mm]}$	$M \text{ [kNm]}$ $c, L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$	$M \text{ [kNm]}$ $c, L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$
$f = 130.2 \cdot \frac{q \cdot L^4}{I}$	$f = \frac{\sigma \cdot L^2}{0.48 \cdot h}$	$I = 313 \cdot \max M \cdot L$	$I = 208 \cdot \max M \cdot L$
$f = 131.0 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.489 \cdot h}$	$I = 306 \cdot \max M \cdot L$	$I = 204 \cdot \max M \cdot L$
$f = 93.8 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.444 \cdot h}$	$I = 338 \cdot \max M \cdot L$	$I = 225 \cdot \max M \cdot L$
$f = 166.7 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.50 \cdot h}$	$I = 300 \cdot \max M \cdot L$	$I = 200 \cdot \max M \cdot L$
$f = 130.3 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.484 \cdot h}$	$I = 309 \cdot \max M \cdot L$	$I = 206 \cdot \max M \cdot L$
$f = 208.3 \cdot \frac{P \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.60 \cdot h}$	$I = 250 \cdot \max M \cdot L$	$I = 167 \cdot \max M \cdot L$
$f = 355.0 \cdot \frac{P \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.47 \cdot h}$	$I = 319 \cdot \max M \cdot L$	$I = 213 \cdot \max M \cdot L$
$f = 416.7 \cdot \frac{P \cdot c}{I} \cdot (3L^2 - 4c^2)$	$f = \frac{\sigma}{1.20 \cdot h} \cdot (3L^2 - 4c^2)$	$I = 125 \cdot \max M \cdot \frac{(3L^2 - 4c^2)}{L}$	$I = 83 \cdot \max M \cdot \frac{(3L^2 - 4c^2)}{L}$

General Tables and Formulae

Load Case	Support Forces Q = Total Load q = Continuous Load P = Concentrated Load	Bending Moment	Maximum Deflection
			General
	$A = B = 1.500 \cdot P$	$\max M = 0.5000 \cdot P \cdot L$	$f = \frac{19 \cdot P \cdot L^3}{384 \cdot E \cdot I}$
	$A = 0.375 \cdot Q$ $B = 0.625 \cdot Q$	$M_B = -0.1250 \cdot q \cdot L^2$ $\max M = 0.0703 \cdot q \cdot L^2$	$f = \frac{q \cdot L^4}{185 \cdot E \cdot I}$
	$A = 0.200 \cdot Q$ $B = 0.800 \cdot Q$	$M_B = -0.1335 \cdot Q \cdot L$ $\max M = 0.0596 \cdot Q \cdot L$	$f = \frac{Q \cdot L^3}{210 \cdot E \cdot I}$
	$B = q \cdot L$	$M_B = -0.5 \cdot q \cdot L^2$	$f = \frac{q \cdot L^4}{8 \cdot E \cdot I}$
	$B = Q$	$M_B = -0.3333 \cdot Q \cdot L$	$f = \frac{Q \cdot L^3}{15 \cdot E \cdot I}$
	$A = B = 2 \cdot P$	$\max M = 0.6 \cdot P \cdot L$	$f = \frac{63 \cdot P \cdot L^3}{1000 \cdot E \cdot I}$
	$A = \frac{P \cdot b}{L}$ $B = \frac{P \cdot a}{L}$	$\max M = \frac{P \cdot a \cdot b}{L}$	$f \approx \frac{P \cdot b \cdot (3L^2 - 4b^2)}{48 \cdot E \cdot I}$ $f \text{ with } x = \frac{L}{2}$
	$A = q \cdot c \cdot \left(1 + \frac{c}{2 \cdot L}\right)$ $B = -q \cdot \frac{c^2}{2 \cdot L}$	$M_A = -0.5 \cdot q \cdot c^2$	$f_1 = \frac{q \cdot c^3}{24 \cdot E \cdot I} \cdot (4L + 3c)$ $f_2 = -\frac{q \cdot L^2 \cdot c^2}{32 \cdot E \cdot I}$

Maximum Deflection		I required for Timber	
For Conifer Timber	Rectangular Cross-Section	For perm. f = L/300	For perm. f = L/200
$q \text{ [kN/m]}$ $Q \text{ [kN]}$ $c. L \text{ [m]}$ $I \text{ [cm}^4]$ $E = 10\,000 \text{ N/mm}^2$ $\Rightarrow f \text{ [mm]}$	$\sigma \text{ [N/mm}^2]$ $c. L \text{ [m]}$ $E = 10\,000 \text{ N/mm}^2$ $h \text{ [cm]}$ $\Rightarrow f \text{ [mm]}$	$M \text{ [kNm]}$ $c. L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$	$M \text{ [kNm]}$ $c. L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$
$f = 495.0 \cdot \frac{P \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.505 \cdot h}$	$I = 297 \cdot \max M \cdot L$	$I = 198 \cdot \max M \cdot L$
$f = 54.1 \cdot \frac{q \cdot L^4}{I}$	$f = \frac{\sigma_B \cdot L^2}{1.156 \cdot h}$	$I = 231 \cdot \max M \cdot L$	$I = 154 \cdot \max M \cdot L$
$f = 40.0 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma_B \cdot L^2}{1.40 \cdot h}$	$I = 240 \cdot \max M \cdot L$	$I = 160 \cdot \max M \cdot L$
$f = 1250.0 \cdot \frac{q \cdot L^4}{I}$	$f = \frac{\sigma_B \cdot L^2}{0.20 \cdot h}$	$I = 375 \cdot M_B \cdot L$	–
$f = 666.7 \cdot \frac{Q \cdot L^3}{I}$	$f = \frac{\sigma_B \cdot L^2}{0.25 \cdot h}$	$I = 300 \cdot M_B \cdot L$	–
$f = 630.0 \cdot \frac{P \cdot L^3}{I}$	$f = \frac{\sigma \cdot L^2}{0.476 \cdot h}$	$I = 315 \cdot \max M \cdot L$	$I = 210 \cdot \max M \cdot L$
$f \approx 208.3 \cdot \frac{P \cdot b \cdot (3L^2 - 4b^2)}{I}$	$f = \frac{\sigma \cdot L}{2.4 \cdot a \cdot h} \cdot (3L^2 - 4b^2)$	$I \approx 624.9 \cdot \frac{\max M \cdot (3L^2 - 4b^2)}{a}$	$I \approx 41.66 \cdot \frac{\max M \cdot (3L^2 - 4b^2)}{a}$
$f_1 = 416.7 \cdot \frac{q \cdot c^3}{I} (4L + 3c)$ $f_2 = -312.5 \cdot \frac{q \cdot L^2 \cdot c^2}{I}$	$f_1 = \frac{\sigma_A \cdot c}{0.60 \cdot h} \cdot (4L + 3c)$ $f_2 = -\frac{\sigma_A \cdot L^2}{0.80 \cdot h}$	$I_1 = 125 \cdot M_A \cdot (4L + 3c)$	–

General Tables and Formulae

Load Case	Support Forces Q = Total Load q = Continuous Load P = Concentrated Load	Bending Moment	Maximum Deflection	
			General	
	$A = B = 0.5 \cdot q \cdot L$	$\max M = 0.125 \cdot q \cdot L^2$	$f_1 = -\frac{q \cdot L^3 \cdot c}{24 \cdot E \cdot I}$	$f_2 = \frac{5 \cdot q \cdot L^4}{384 \cdot E \cdot I}$
	$A = Q \cdot \frac{L + c}{2 \cdot L}$ $B = Q \cdot \frac{L - c}{2 \cdot L}$	$M_A = -0.5 \cdot q \cdot c^2$ $\max M = 0.5 \cdot \frac{B^2}{q}$	$f_1 = \frac{q \cdot c^3 \cdot (4L + 3c) - q \cdot L^3 \cdot c}{24 \cdot E \cdot I}$ $f_2 \approx \frac{q \cdot L^2 \cdot (5L^2 - 12c^2)}{384 \cdot E \cdot I}$	
	$A = P \cdot \frac{L + c}{L}$ $B = -P \cdot \frac{c}{L}$	$M_A = -P \cdot c$	$f_1 = \frac{P \cdot c^2 \cdot (L + c)}{3 \cdot E \cdot I}$ $f_2 = -\frac{P \cdot L^2 \cdot c}{15.6 \cdot E \cdot I}$	
	$A = B = 0.5 \cdot P$	$\max M = 0.25 \cdot P \cdot L$	$f_1 = -\frac{P \cdot L^2 \cdot c}{16 \cdot E \cdot I}$ $f_2 = -\frac{P \cdot L^3}{48 \cdot E \cdot I}$	
	$A = B = P$	$M_A = M_B = \max M = -P \cdot c$	$f_1 = \frac{P \cdot c^2 (1.5L + c)}{3 \cdot E \cdot I}$ $f_2 = -\frac{P \cdot L^2 \cdot c}{8 \cdot E \cdot I}$	
	$A = B = q \cdot c$	$M_A = M_B = \max M = -0.5 \cdot q \cdot c^2$	$f_1 = \frac{q \cdot c^3}{24 \cdot E \cdot I} \cdot (6L + 3c)$ $f_2 = -\frac{q \cdot L^2 \cdot c^2}{16 \cdot E \cdot I}$	
	$A = B = 0.5 \cdot q \cdot L$	$\max M = 0.125 \cdot q \cdot L^2$	$f_1 = -\frac{q \cdot L^3 \cdot c}{24 \cdot E \cdot I}$ $f_2 = -\frac{5 \cdot q \cdot L^4}{384 \cdot E \cdot I}$	
	$A = B = 0.5 \cdot q \cdot (L + 2c)$	$M_A = M_B = -0.5 \cdot q \cdot c^2$ $\max M = q \cdot \left(\frac{L^2}{8} - \frac{c^2}{2} \right)$	$f_1 = q \cdot c \cdot \frac{c^2 (6L + 3c) - L^3}{24 \cdot E \cdot I}$ $f_2 = \frac{q \cdot L^2}{384 \cdot E \cdot I} \cdot (5L^2 - 24c^2)$	

Maximum Deflection		I required for Timber	
For Conifer Timber	Rectangular Cross-Section	For perm. f = L/300	For perm. f = L/200
$q \text{ [kN/m]}$ $c \text{ [m]}$ $I \text{ [cm}^4]$ $E = 10\,000 \text{ N/mm}^2$ $\Rightarrow f \text{ [mm]}$	$\sigma \text{ [N/mm}^2]$ $c \text{ [m]}$ $E = 10\,000 \text{ N/mm}^2$ $h \text{ [cm]}$ $\Rightarrow f \text{ [mm]}$	$M \text{ [kNm]}$ $c \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$	$M \text{ [kNm]}$ $c \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$
$f_1 = -416.7 \cdot \frac{q \cdot L^3 \cdot c}{I}$ $f_2 = 130.2 \cdot \frac{q \cdot L^4}{I}$	$f_1 = \frac{\sigma \cdot L \cdot c}{0.15 \cdot h}$ $f_2 = \frac{\sigma \cdot L^2}{0.48 \cdot h}$	$I_2 = 313 \cdot \max M \cdot L$	$I_2 = 208 \cdot \max M \cdot L$
$f_1 = 416.7 \cdot \frac{q \cdot c^3 (4L + 3c) - q \cdot L^3 \cdot c}{I}$ $f_2 = 26.0 \cdot \frac{q \cdot L^2 \cdot (5L^2 - 12c^2)}{I}$	$f_1 = \frac{\sigma_A \cdot c}{0.60 \cdot h} \cdot \left(c(4L + 3c) - \frac{L^3}{c} \right)$ $f_2 = \frac{\sigma_A \cdot L^2}{0.96 \cdot c^2 \cdot h} \cdot (5L^2 - 12c^2)$	$I_1 = 125 \cdot M_A \cdot \frac{c^2 (4L + 3c) - L^3}{c^2}$ $I_2 = 15.6 \cdot M_A \cdot \frac{L \cdot (5L^2 - 12c^2)}{c^2}$	$I_2 = 10.4 \cdot M_A \cdot \frac{L (5L^2 - 12c^2)}{c^2}$
$f_1 = 3333.0 \cdot \frac{P \cdot c^2 \cdot (L + c)}{I}$ $f_2 = -641 \cdot \frac{P \cdot L^2 \cdot c}{I}$	$f_1 = \frac{\sigma_A \cdot c}{0.15 \cdot h} \cdot (L + c)$ $f_2 = \frac{\sigma_A \cdot L^2}{0.78 \cdot h}$	$I_1 = 500 \cdot M_A \cdot (L + c)$	$-$
$f_1 = -625 \cdot \frac{P \cdot L^2 \cdot c}{I}$ $f_2 = 208.3 \cdot \frac{P \cdot L^3}{I}$	$f_1 = -\frac{\sigma \cdot L \cdot c}{0.20 \cdot h}$ $f_2 = \frac{\sigma \cdot L^2}{0.60 \cdot h}$	$I_2 = 250 \cdot \max M \cdot L$	$I_2 = 167 \cdot \max M \cdot L$
$f_1 = 3333.3 \cdot \frac{P \cdot c^2 (1.5L + c)}{I}$ $f_2 = -1.25 \cdot \frac{P \cdot L^2 \cdot c}{I}$	$f_1 = \frac{\sigma_A \cdot c}{0.15 \cdot h} \cdot (1.5L + c)$ $f_2 = \frac{\sigma_A \cdot L^2}{0.40 \cdot h}$	$I_1 = 500 \cdot M_A \cdot (1.5L + c)$	$-$
$f_1 = 416.7 \cdot \frac{q \cdot c^3}{I} \cdot (6L + 3c)$ $f_2 = -625 \cdot \frac{q \cdot L^2 \cdot c^2}{I}$	$f_1 = \frac{\sigma_A \cdot c}{0.60 \cdot h} \cdot (6L + 3c)$ $f_2 = \frac{\sigma_A \cdot L^2}{0.40 \cdot h}$	$I_1 = 125 \cdot M_A \cdot (6L + 3c)$	$-$
$f_1 = -416.7 \cdot \frac{q \cdot L^3 \cdot c}{I}$ $f_2 = 130.2 \cdot \frac{q \cdot L^4}{I}$	$f_1 = -\frac{\sigma \cdot L \cdot c}{0.15 \cdot h}$ $f_2 = \frac{\sigma \cdot L^2}{0.48 \cdot h}$	$I_2 = 313 \cdot \max M \cdot L$	$I_2 = 208 \cdot \max M \cdot L$
$f_1 = 416.7 \cdot \frac{q \cdot c}{I} \cdot \left[c^2(6L + 3c) - L^3 \right]$ $f_2 = 26 \cdot \frac{q \cdot L^2}{I} \cdot (5L^2 - 24c^2)$	$f_1 = \frac{\sigma_A \cdot c}{0.60 \cdot h} \cdot \left[c(6L + 3c) \cdot \frac{L^3}{c} \right]$ $f_2 = \frac{\sigma_A \cdot L^2}{0.96 \cdot c^2 \cdot h} \cdot (5L^2 - 24c^2)$	$I_1 = 125 \cdot M_A \cdot \frac{c^2(6L + 3c) - L^3}{c^2}$ $I_2 = 15.6 \cdot M_A \cdot \frac{L(5L^2 - 24c^2)}{c^2}$	$I_2 = 10.4 \cdot M_A \cdot \frac{L(5L^2 - 24c^2)}{c^2}$

General Tables and Formulae

Load Case	Support Forces Q = Total Load q = Continuous Load P = Concentrated Load	Bending Moment	Maximum Deflection	
			General	
 Unfavourable Loading	$A = C = 0.375 \cdot q \cdot L$ $B = 1.25 \cdot q \cdot L$	$M_1 = + 0.0703 \cdot q \cdot L^2$ $M_I = - 0.1250 \cdot q \cdot L^2$	$f_1 = \frac{0.0054 \cdot q \cdot L^4}{E \cdot I}$	
	$A = C = 0.4375 \cdot q \cdot L$ $B = 1.25 \cdot q \cdot L$	$M_1 = + 0.0957 \cdot q \cdot L^2$ $M_I = - 0.1250 \cdot q \cdot L^2$	$f_1 = \frac{0.0092 \cdot q \cdot L^4}{E \cdot I}$	
 Unfavourable Loading	$A = D = 0.4 \cdot q \cdot L$ $B = C = 1.1 \cdot q \cdot L$	$M_1 = + 0.0800 \cdot q \cdot L^2$ $M_2 = + 0.0250 \cdot q \cdot L^2$ $M_I = - 0.1000 \cdot q \cdot L^2$	$f_1 = \frac{0.0068 \cdot q \cdot L^4}{E \cdot I}$ $f_1 = \frac{0.00052 \cdot q \cdot L^4}{E \cdot I}$	
	$A = D = 0.45 \cdot q \cdot L$ $B = C = 1.20 \cdot q \cdot L$	$M_1 = + 0.1013 \cdot q \cdot L^2$ $M_2 = + 0.0750 \cdot q \cdot L^2$ $M_I = - 0.1167 \cdot q \cdot L^2$	$f_1 = \frac{0.0099 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.00675 \cdot q \cdot L^4}{E \cdot I}$	
 Unfavourable Loading	$A = E = 0.393 \cdot q \cdot L$ $B = D = 1.143 \cdot q \cdot L$ $C = 0.928 \cdot q \cdot L$	$M_1 = + 0.0772 \cdot q \cdot L^2$ $M_2 = + 0.0364 \cdot q \cdot L^2$ $M_I = - 0.1071 \cdot q \cdot L^2$ $M_{II} = - 0.0714 \cdot q \cdot L^2$	$f_1 = \frac{0.0065 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.0019 \cdot q \cdot L^4}{E \cdot I}$	
	$A = E = 0.446 \cdot P \cdot L$ $B = D = 1.223 \cdot q \cdot L$ $C = 1.142 \cdot q \cdot L$	$M_1 = + 0.0997 \cdot q \cdot L^2$ $M_2 = + 0.0805 \cdot q \cdot L^2$ $M_I = - 0.1205 \cdot q \cdot L^2$ $M_{II} = - 0.1071 \cdot q \cdot L^2$	$f_1 = \frac{0.0097 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.00738 \cdot q \cdot L^4}{E \cdot I}$	
 Unfavourable Loading	$A = F = 0.395 \cdot q \cdot L$ $B = E = 1.132 \cdot q \cdot L$ $C = D = 0.973 \cdot q \cdot L$	$M_1 = + 0.0779 \cdot q \cdot L^2$ $M_2 = + 0.0332 \cdot q \cdot L^2$ $M_3 = + 0.0461 \cdot q \cdot L^2$ $M_I = - 0.1053 \cdot q \cdot L^2$ $M_{II} = - 0.0789 \cdot q \cdot L^2$	$f_1 = \frac{0.0065 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.0015 \cdot q \cdot L^4}{E \cdot I}$ $f_3 = \frac{0.0032 \cdot q \cdot L^4}{E \cdot I}$	
	$A = F = 0.4474 \cdot q \cdot L$ $B = E = 1.2177 \cdot q \cdot L$ $C = D = 1.1675 \cdot q \cdot L$	$M_1 = + 0.1001 \cdot q \cdot L^2$ $M_2 = + 0.0787 \cdot q \cdot L^2$ $M_3 = + 0.0855 \cdot q \cdot L^2$ $M_I = - 0.1196 \cdot q \cdot L^2$ $M_{II} = - 0.1112 \cdot q \cdot L^2$	$f_1 = \frac{0.0097 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.0073 \cdot q \cdot L^4}{E \cdot I}$ $f_3 = \frac{0.0081 \cdot q \cdot L^4}{E \cdot I}$	
	$A = G = 0.394 \cdot q \cdot L$ $B = F = 1.135 \cdot q \cdot L$ $C = E = 0.962 \cdot q \cdot L$ $D = 1.019 \cdot q \cdot L$	$M_1 = + 0.0777 \cdot q \cdot L^2$ $M_2 = + 0.0340 \cdot q \cdot L^2$ $M_3 = + 0.0433 \cdot q \cdot L^2$ $M_I = - 0.1058 \cdot q \cdot L^2$ $M_{II} = - 0.0769 \cdot q \cdot L^2$ $M_{III} = - 0.0865 \cdot q \cdot L^2$	$f_1 = \frac{0.0064 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.0016 \cdot q \cdot L^4}{E \cdot I}$ $f_3 = \frac{0.0028 \cdot q \cdot L^4}{E \cdot I}$	
	$A = H = 0.394 \cdot q \cdot L$ $B = G = 1.134 \cdot q \cdot L$ $C = F = 0.965 \cdot q \cdot L$ $D = E = 1.007 \cdot q \cdot L$	$M_1 = + 0.0778 \cdot q \cdot L^2$ $M_2 = + 0.0338 \cdot q \cdot L^2$ $M_3 = + 0.0440 \cdot q \cdot L^2$ $M_4 = + 0.0405 \cdot q \cdot L^2$ $M_I = - 0.1056 \cdot q \cdot L^2$ $M_{II} = - 0.0775 \cdot q \cdot L^2$ $M_{III} = - 0.0845 \cdot q \cdot L^2$	$f_1 = \frac{0.0065 \cdot q \cdot L^4}{E \cdot I}$ $f_2 = \frac{0.0016 \cdot q \cdot L^4}{E \cdot I}$ $f_3 = \frac{0.0029 \cdot q \cdot L^4}{E \cdot I}$ $f_4 = \frac{0.0024 \cdot q \cdot L^4}{E \cdot I}$	

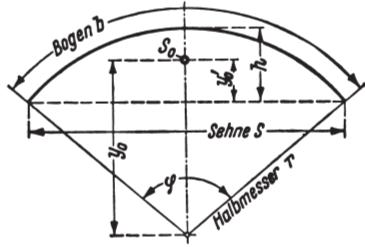
Maximum Deflection		I required for Timber	
For Conifer Timber	Rectangular Cross-Section	For perm. f = L/300	For perm. f = L/200
$q \text{ [kN/m]}$ $Q \text{ [kN]}$ $c. L \text{ [m]}$ $I \text{ [cm}^4]$ $E = 10\,000 \text{ N/mm}^2$ $\Rightarrow f \text{ [mm]}$	$\sigma \text{ [N/mm}^2]$ $c. L \text{ [m]}$ $E = 10\,000 \text{ N/mm}^2$ $h \text{ [cm]}$ $\Rightarrow f \text{ [mm]}$	$M \text{ [kNm]}$ $c. L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$	$M \text{ [kNm]}$ $c. L \text{ [m]}$ $\Rightarrow I \text{ [cm}^4]$
$f_1 = \frac{54 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.65 \cdot h}$	$I_1 = 230 \cdot M_1 \cdot L$	$I_1 = 153 \cdot M_1 \cdot L$
$f_1 = \frac{92 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.52 \cdot h}$	$I_1 = 288 \cdot M_1 \cdot L$	$I_1 = 193 \cdot M_1 \cdot L$
$f_1 = \frac{68 \cdot q \cdot L^4}{I}$ $f_2 = \frac{5.2 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.58 \cdot h}$ $f_2 = \frac{\sigma_2 \cdot L^2}{2.4 \cdot h}$	$I_1 = 258 \cdot M_1 \cdot L$ $I_2 = 62 \cdot M_2 \cdot L$	$I_1 = 172 \cdot M_1 \cdot L$ $I_2 = 42 \cdot M_2 \cdot L$
$f_1 = \frac{99 \cdot q \cdot L^4}{I}$ $f_2 = \frac{67.5 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.51 \cdot h}$ $f_2 = \frac{\sigma_2 \cdot L^2}{0.55 \cdot h}$	$I_1 = 293 \cdot M_1 \cdot L$ $I_2 = 270 \cdot M_2 \cdot L$	$I_1 = 195 \cdot M_1 \cdot L$ $I_2 = 180 \cdot M_2 \cdot L$
$f_1 = \frac{65 \cdot q \cdot L^4}{I}$ $f_2 = \frac{19 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.59 \cdot h}$ $f_2 = \frac{\sigma_2 \cdot L^2}{0.96 \cdot h}$	$I_1 = 253 \cdot M_1 \cdot L$ $I_2 = 157 \cdot M_2 \cdot L$	$I_1 = 168 \cdot M_1 \cdot L$ $I_2 = 104 \cdot M_2 \cdot L$
$f_1 = \frac{97 \cdot q \cdot L^4}{I}$ $f_2 = \frac{73.8 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.518 \cdot h}$ $f_2 = \frac{\sigma_2 \cdot L^2}{0.545 \cdot h}$	$I_1 = 292 \cdot M_1 \cdot L$ $I_2 = 275 \cdot M_2 \cdot L$	$I_1 = 195 \cdot M_1 \cdot L$ $I_2 = 183 \cdot M_2 \cdot L$
$f_1 = \frac{65 \cdot q \cdot L^4}{I}$ $f_2 = \frac{15 \cdot q \cdot L^4}{I}$ $f_3 = \frac{32 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.60 \cdot h}$ $f_2 = \frac{\sigma_3 \cdot L^2}{0.72 \cdot h}$	$I_1 = 250 \cdot M_1 \cdot L$ $I_2 = 136 \cdot M_2 \cdot L$ $I_3 = 208 \cdot M_3 \cdot L$	$I_1 = 167 \cdot M_1 \cdot L$ $I_2 = 90 \cdot M_2 \cdot L$ $I_3 = 139 \cdot M_3 \cdot L$
$f_1 = \frac{97 \cdot q \cdot L^4}{I}$ $f_2 = \frac{73 \cdot q \cdot L^4}{I}$ $f_3 = \frac{81 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.516 \cdot h}$ $f_3 = \frac{\sigma_3 \cdot L^2}{0.527 \cdot h}$	$I_1 = 291 \cdot M_1 \cdot L$ $I_2 = 278 \cdot M_2 \cdot L$ $I_3 = 284 \cdot M_3 \cdot L$	$I_1 = 194 \cdot M_1 \cdot L$ $I_2 = 185 \cdot M_2 \cdot L$ $I_3 = 189 \cdot M_3 \cdot L$
$f_1 = \frac{65 \cdot q \cdot L^4}{I}$ $f_2 = \frac{16 \cdot q \cdot L^4}{I}$ $f_3 = \frac{28 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.597 \cdot h}$ $f_3 = \frac{\sigma_3 \cdot L^2}{0.77 \cdot h}$	$I_1 = 247 \cdot M_1 \cdot L$ $I_2 = 141 \cdot M_2 \cdot L$ $I_3 = 194 \cdot M_3 \cdot L$	$I_1 = 165 \cdot M_1 \cdot L$ $I_2 = 94 \cdot M_2 \cdot L$ $I_3 = 129 \cdot M_3 \cdot L$
$f_1 = \frac{65 \cdot q \cdot L^4}{I}$ $f_2 = \frac{16 \cdot q \cdot L^4}{I}$ $f_3 = \frac{29 \cdot q \cdot L^4}{I}$ $f_4 = \frac{24 \cdot q \cdot L^4}{I}$	$f_1 = \frac{\sigma_1 \cdot L^2}{0.597 \cdot h}$ $f_3 = \frac{\sigma_3 \cdot L^2}{0.76 \cdot h}$	$I_1 = 246 \cdot M_1 \cdot L$ $I_2 = 142 \cdot M_2 \cdot L$ $I_3 = 198 \cdot M_3 \cdot L$ $I_4 = 178 \cdot M_4 \cdot L$	$I_1 = 164 \cdot M_1 \cdot L$ $I_2 = 95 \cdot M_2 \cdot L$ $I_3 = 132 \cdot M_3 \cdot L$ $I_4 = 118 \cdot M_4 \cdot L$

General Tables and Formulae

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12. 3. 1. 3.
12. 3. 2.

12.3.1.3. Kreisbögen (s. auch Abschn. 12.6.14.)



$$y_0 = \frac{r s}{b}; b = r \pi \frac{\varphi^\circ}{180^\circ}; s = 2 r \sin \frac{\varphi}{2}; h = r \left(1 - \cos \frac{\varphi}{2}\right).$$

Für die verschiedenen Kreisteile ergeben sich die Werte y_0 , b , s u. h , indem der Halbmesser r mit dem zugehörigen Zahlenwert aus nachstehender Tafel vervielfältigt wird; z.B. wie groß ist b bei $\varphi = 30^\circ$ ($\frac{1}{12}$ Kreis) u. $r = 6\,000 \text{ mm}$? $b = 0,5236 \cdot 6\,000 \approx 3\,142 \text{ mm}$.

Kreis	φ°	φ°	b	s	h	y_0
$\frac{1}{2}$	180	200	3,1416	2,00000	1,00000	0,6366
$\frac{1}{3}$	120	133 $\frac{1}{3}$	2,0944	1,73206	0,50000	0,8270
$\frac{1}{4}$	90	100	1,5708	1,41422	0,29289	0,9003
$\frac{1}{5}$	72	80	1,2566	1,17558	0,19098	0,9355
$\frac{1}{6}$	60	66 $\frac{2}{3}$	1,0472	1,00000	0,13397	0,9549
$\frac{1}{8}$	45	50	0,7854	0,76536	0,07612	0,9745
$\frac{1}{10}$	36	40	0,6283	0,61804	0,04894	0,9837
$\frac{1}{12}$	30	33 $\frac{1}{3}$	0,5236	0,51764	0,03407	0,9886
$\frac{1}{15}$	24	26 $\frac{2}{3}$	0,4189	0,41582	0,02185	0,9926
$\frac{1}{20}$	18	20	0,3142	0,31286	0,01230	0,9957

$$y_0 \text{ für den Halbkreis} = \frac{2r}{\pi}$$

$$y_0' = y_0 + h - r; \text{ bei flachen Kreisbögen kann angenähert } y_0' = \frac{2}{3}h \text{ gesetzt werden.}$$

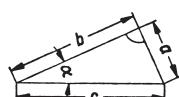
12. 3. 2. Flächen

(Inhalte, Schwerpunktsabstände, Trägheits-, Widerstandsmomente u. ergänzende Angaben)

Bezeichnung u. Querschnitt		Flächeninhalt	Schwerpunkts-abstand u. sonstige Maßbestimmungen	Trägheitsmoment	Kleinstes Widerstandsmoment	
					Dreieck	Rauten
Dreieck		$F = \frac{b h}{2}$	$e_x = \frac{1}{3}h$ (S. auch Abschn. 12.3.2., 5. Forts.)	$J_x = \frac{b h^3}{36}$; $J_y = \frac{h b^3}{48}$ $J_b = \frac{b h^3}{12}$; $J_s = \frac{b h^3}{4}$	$W_x = \frac{b h^3}{24}$	$W_y = \frac{h b^3}{24}$
Bei einem gleichseitigen Dreieck wird $h = 0,8660 b$		$F = 0,4330 b^2$	$e_x = 0,2887 b$ $e_y = 0,5 b$	$J_x = J_y = 0,01804 b^4$	$W_x = 0,03125 b^3$ $W_y = 0,03608 b^3$	
Rauten		$F = \frac{b h}{2}$	$e_x = \frac{h}{2}$ $e_y = \frac{b}{2}$	$J_x = \frac{b h^3}{48}$ $J_y = \frac{h b^3}{48}$	$W_x = \frac{b h^3}{24}$	$W_y = \frac{h b^3}{24}$
Rechteck		$F = b h$	$e_x = \frac{h}{2}$ $e_y = \frac{b}{2}$	$J_x = \frac{b h^3}{12}$ $J_y = \frac{h b^3}{12}$ $J_b = \frac{b h^3}{3}$	$W_x = \frac{b h^3}{6}$	$W_y = \frac{h b^3}{6}$
Quadrat		$F = h^2$	$e_x = e_y = \frac{h}{2}$ $e_\xi = e_\eta = \frac{h}{2} \sqrt{2}$ $\approx 0,7071 h$	$J_x = J_y = \frac{h^4}{12}$ $J_\xi = J_\eta = \frac{h^4}{12}$	$W_x = W_y = \frac{h^3}{6}$ $W_\xi = W_\eta = \frac{\sqrt{2}}{12} h^3$ $\approx 0,1178 h^3$	
Regelm. 6-Eck	Vielecks, Abschn. 12.3.2., 5. Fortsetzung	$F = \frac{\sqrt{3}}{2} a^2 \approx 0,866 a^2$	$e_x = \frac{a}{2} \approx 0,866 r$ $e_y = r$ $a = r \sqrt{3}$; $r = \frac{a}{\sqrt{3}}$	$J_x = J_y = \frac{5 \sqrt{3}}{144} a^4$ $= J_\xi = J_\eta = \frac{5 \sqrt{3}}{144} a^4$ $\approx 0,0601 a^4$	$W_x = W_\xi = \frac{5 \sqrt{3}}{72} a^3$ $\approx 0,1203 a^3$ $W_y = W_\eta = \frac{5}{48} a^3$ $\approx 0,1042 a^3$	

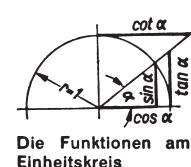
Auszug aus
„Stahl im Hochbau“
Ausgabe 1969
13. Auflage

Bezeichnung u. Querschnitt		Flächeninhalt u. sonstige Maßbestimmungen	Schwerpunkts- abstand	Trägheitsmoment	Kleinstes Wider- standsmaß
Regelm. 8-Eck		$F \approx 0,8284 a^2$	$e_x = e_y = \frac{a}{2}$ $e_\xi = e_\eta = \frac{\sqrt{s^2 + a^2}}{2} \approx 0,5412 a$ $s = \frac{a}{1+\sqrt{2}} \approx 0,4142 a$ $t = \frac{s}{2}\sqrt{2} \approx 0,2929 a$	$J_x = J_y = J_\eta = J_\xi \approx 0,05473 a^4$	$W_x = W_y \approx 0,1095 a^3$ $W_\xi = W_\eta \approx 0,10107 a^3$
Trapez*)		$F = \frac{h}{2} (a + b)$	$e_x = \frac{h}{3} \frac{a + 2b}{a + b}$	$J_x = \frac{h^3}{36} \frac{a^2 + 4ab + b^2}{a + b}$ $J_y = \frac{h}{48} (a^3 + a^2b + ab^2 + b^3)$	$W_x = \frac{J_x}{h - e_x}$ $W_y = \frac{2J_y}{a}$
Kreis		$F = \pi r^2 = \frac{\pi d^2}{4}$ $U = \text{Umfang} = d\pi$ (s. Tafel 12.8.5.3.)	$e_x = \frac{d}{2}$	$J_x = J_y = \frac{\pi d^4}{64} = \frac{\pi r^4}{4}$ $\approx 0,05 d^3 \approx 0,7854 r^4$	$W_x = W_y = \frac{\pi d^3}{32} = \frac{\pi r^3}{4} \approx 0,1 d^3 \approx 0,7854 r^3$
Halbkreis		$F = \frac{\pi}{2} r^2 = 1,57080 r^2$	$e_x = \frac{4r}{3\pi} \approx 0,4244 r$	$J_x = r^4 \left(\frac{\pi}{8} - \frac{8}{9\pi} \right) \approx 0,1098 r^4$ $J_y = \frac{\pi r^4}{8} \approx 0,3297 r^4$	$W_x \approx 0,1907 r^3$ $W_y = \frac{\pi r^3}{8} \approx 0,3927 r^3$
Kreisabschnitt		$F = \frac{r^2}{2} \left(\frac{\pi \varphi^0}{180^\circ} - \sin \varphi \right)$ $= \frac{r(b-s) + sh}{2}$ $r = \frac{s^2}{8h} + \frac{h}{2}$ Bogenlänge: $b = r\pi \frac{\varphi^0}{180^\circ} = 0,01745 r \varphi^0$ $\tan \frac{\varphi}{2} = \frac{s}{2(r-h)}$	$e_m = \frac{s^3}{12F}$ $= \frac{2}{3} \frac{r^3 \sin^3 \frac{\varphi}{2}}{F}$ Sehnenlänge: $s = 2r \sin \frac{\varphi}{2} = 2\sqrt{h(2r-h)}$ $h = r \left(1 - \cos \frac{\varphi}{2} \right) = r - \sqrt{r^2 - \left(\frac{s}{2} \right)^2}$ Ordinatenhöhe: $y = \sqrt{r^2 - z^2} = (r-h)$	$J_x = \frac{r^4}{16} \left(\frac{\pi \varphi^0}{90^\circ} - \sin 2\varphi \right) - \frac{20r^4(1-\cos\varphi)^3}{\pi\varphi^0 - 180^\circ \sin\varphi}$ $J_y = \frac{r^4}{48} \left(\frac{\pi \varphi^0}{30^\circ} - A \right)$ $A = 8 \sin \varphi - \sin 2\varphi$ (Vorzeichen der Sinuswerte beachten!)	$W_x = \frac{J_x}{h - e_x}$ $W_y = \frac{2J_y}{s}$
Bei $h = \frac{1}{2} r$, das ist bei $\varphi = 120^\circ$, wird					
		$F \approx 0,61418 r^2$	$e_x \approx 0,2050 r$	$J_x \approx 0,01066 r^4$	$W_x \approx 0,03613 r^3$
Kreisausschnitt		$F = \frac{b r}{2} = \frac{\varphi^0}{360^\circ} r^2 \pi$ $b = \text{Bogenlänge} = r\pi \frac{\varphi^0}{180^\circ} \approx 0,01745 r \varphi^0$ $\varphi^0 = \frac{180^\circ b}{\pi r}$	$e_x = \frac{2}{3} \frac{r s}{b}$ $= \frac{2}{3} \sin \frac{\varphi}{2} \frac{360^\circ r}{\varphi^0 \pi}$ $= \frac{r^2 s}{3 F}$	$J_x = J_s \frac{360^\circ}{\varphi^0 \pi} \sin^2 \frac{\varphi}{2} \frac{4 r^4}{9}$ $J_y = \frac{r^4}{8} \left[\pi \frac{\varphi^0}{180^\circ} - \sin \varphi \right]$ $J_s = \frac{r^4}{8} \left[\pi \frac{\varphi^0}{180^\circ} + \sin \varphi \right]$	$W_{x_0} = \frac{J_x}{r - e_x};$ $W_{x_u} = \frac{J_x}{e_x}$ $W_y = \frac{2}{s} J_y$

Trigonometrie**Rechtwinkliges Dreieck**

$$\sin \alpha = \frac{a}{c} \quad \cos \alpha = \frac{b}{c}$$

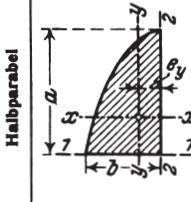
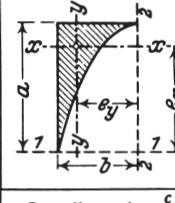
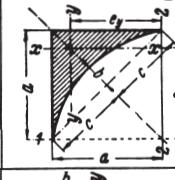
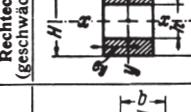
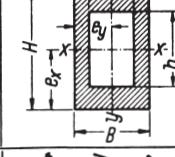
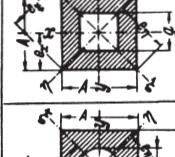
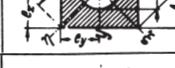
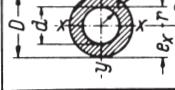
$$\tan \alpha = \frac{a}{b} \quad \cot \alpha = \frac{b}{a}$$

Auszug aus
"Wendehorst"
17. Auflage**Schiefwinkliges Dreieck $R(r)$ = Radius des Um-(In-)Kreises $s = \frac{1}{2} (a+b+c)$**

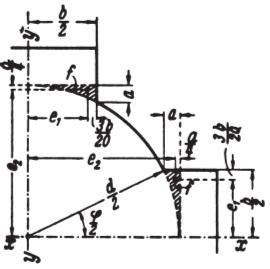
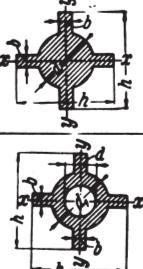
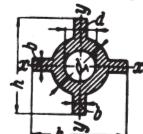
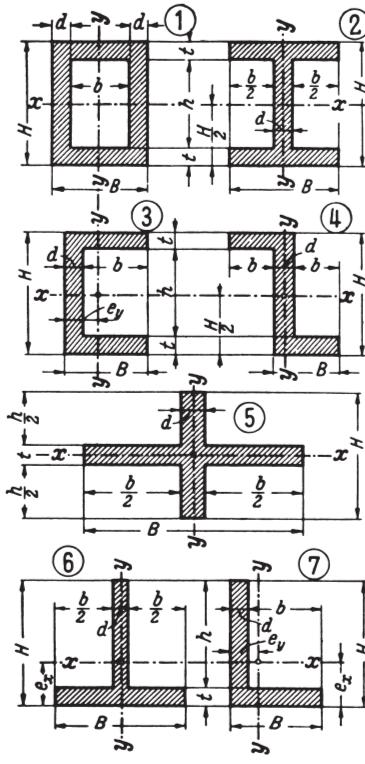
$$\begin{aligned}
 & \text{Sinussatz: } a : b : c = \sin \alpha : \sin \beta : \sin \gamma \quad \frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma} = 2R \\
 & \text{Cosinussatz: } a^2 = b^2 + c^2 - 2bc \cos \alpha \quad (\text{zykl. Vertauschung}) \\
 & \text{Tangensatz: } \frac{a+b}{a-b} = \frac{\tan \frac{\alpha+\beta}{2}}{\tan \frac{\alpha-\beta}{2}} \\
 & \text{Cotangensatz: } \cot \frac{\alpha}{2} = \sqrt{\frac{s(s-a)}{(s-b)(s-c)}} = \frac{s-a}{r} \quad \tan \frac{\gamma}{2} = \sqrt{\frac{(s-a)(s-b)}{s(s-c)}} \\
 & \text{Flächensatz: } 2F = ab \sin \gamma = bc \sin \alpha = ac \sin \beta = 4R^2 \sin \alpha \sin \beta \sin \gamma = \frac{abc}{2R}
 \end{aligned}$$

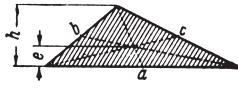
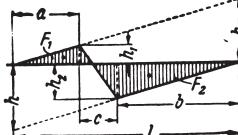
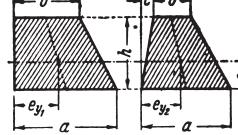
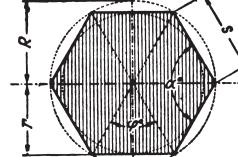
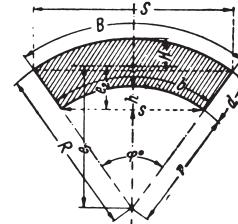
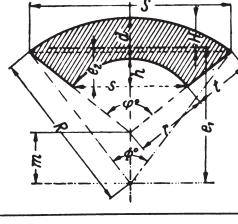
General Tables and Formulae

Bezeichnung u. Querschnitt	Flächeninhalt u. sonstige Maßbestimmungen	Schwerpunkts- abstand	Trägheitsmoment	Kleinstes Wider- standsmoment																					
Viertelkreis		$F = \frac{\pi}{4} r^2 \approx 0,7854 r^2$	$e_x \approx 0,4244 r$ $e_y \approx 0,5756 r$ $e_\eta \approx 0,6002 r$ $e_\xi \approx 0,7071 r$	$J_x = J_y \approx 0,05488 r^4$ $J_h = J_v \approx 0,1963 r^4$ $J_\xi \approx 0,07135 r^4$ $J_\eta \approx 0,03841 r^4$ Zentrifugalmomente: $J_{rv} \approx 0,01647 r^4$ $J_{hv} = \frac{r^4}{8}$	$W_x = W_y \approx 0,09534 r^3$ — $W_\xi \approx 0,1009 r^3$ $W_\eta \approx 0,06399 r^3$																				
Kreis-Hohlkehle		$F = r^2 \left(1 - \frac{\pi}{4}\right) \approx 0,2146 r^2$	$e_1 \approx 0,2234 r$ $e_x \approx 0,7766 r$ $e_\eta \approx 1,0983 r$ $e_\xi \approx 0,7071 r$ $e_y \approx 0,3159 r$ $e_z \approx 0,3912 r$	$J_x = J_y \approx 0,00755 r^4$ $J_h = J_v \approx 0,1370 r^4$ $J_\xi \approx 0,011984 r^4$ $J_\eta \approx 0,003105 r^4$ Zentrifugalmomente: $J_{xy} \approx 0,00444 r^4$ $J_{hv} = \frac{r^4}{8} = 0,125 r^4$	$W_x = W_y \approx 0,00972 r^3$ — $W_\xi \approx 0,016950 r^3$ $W_\eta \approx 0,007937 r^3$																				
Vollellipse ¹⁾		$F = a b \pi$	$e_x = a; e_y = b$	$J_x = \frac{\pi}{4} b a^3 \approx 0,7854 b a^3$ $J_y = \frac{\pi}{4} a b^3 \approx 0,7854 a b^3$	$W_x = \frac{\pi}{4} b a^2 \approx 0,7854 b a^2$ $W_y = \frac{\pi}{4} a b^2 \approx 0,7854 a b^2$																				
	Konstrukt. 12.7.7.		Umfang $U = \mu (a + b)$	<table border="1"><tr><td>$\frac{a-b}{a+b}$</td><td>0,10</td><td>0,20</td><td>0,30</td><td>0,40</td><td>0,50</td><td>0,60</td><td>0,70</td><td>0,80</td><td>0,90</td></tr><tr><td>$\mu = 3,1495$</td><td>3,1731</td><td>3,2127</td><td>3,2686</td><td>3,3412</td><td>3,4314</td><td>3,5401</td><td>3,6691</td><td>3,8208</td><td></td></tr></table>	$\frac{a-b}{a+b}$	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	$\mu = 3,1495$	3,1731	3,2127	3,2686	3,3412	3,4314	3,5401	3,6691	3,8208		
$\frac{a-b}{a+b}$	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90																
$\mu = 3,1495$	3,1731	3,2127	3,2686	3,3412	3,4314	3,5401	3,6691	3,8208																	
Halbellipse		$F = \frac{\pi}{2} a b \approx 1,571 a b$	$e_x = \frac{4}{3\pi} a \approx 0,4244 a$	$J_x \approx 0,1098 b a^3$ $J_y = \frac{\pi}{8} a b^3 \approx 0,3927 a b^3$ $J_1 = \frac{\pi}{8} b a^3 \approx 0,3927 b a^3$	$W_x = \frac{J_x}{a - e_x} \approx 0,1907 b a^2$ $W_y = \frac{\pi}{8} a b^2 \approx 0,3927 a b^2$ —																				
Viertellellipse		$F = \frac{\pi}{4} a b \approx 0,7854 a b$	$e_x = \frac{4}{3\pi} a \approx 0,4244 a$ $e_y = \frac{4}{3\pi} b \approx 0,4244 b$	$J_x \approx 0,05488 b a^3$ $J_y \approx 0,05488 a b^3$ $J_1 \approx 0,1963 b a^3$ $J_2 \approx 0,1963 a b^3$	$W_x = \frac{J_x}{a - e_x} \approx 0,09534 b a^2$ $W_y = \frac{J_y}{b - e_y} \approx 0,09534 a b^2$ —																				
Ellipsen-Hohlkehle		$F = \left(1 - \frac{\pi}{4}\right) a b \approx 0,2146 a b$	$e_x \approx 0,7766 a$ $e_y \approx 0,7766 b$	$J_x \approx 0,00755 b a^3$ $J_y \approx 0,00755 a b^3$	$W_x = \frac{J_x}{e_x} \approx 0,00972 b a^2$ $W_y = \frac{J_y}{e_y} \approx 0,00972 a b^2$																				
Vollparabel		$F = \frac{4}{3} a b$	$e_x = \frac{2}{5} a$	$J_x = \frac{16}{175} b a^3 = 0,09143 b a^3$ $J_y = \frac{4}{15} a b^3 = 0,2666 a b^3$ $J_1 = \frac{32}{105} b a^3 = 0,3048 b a^3$	$W_x = \frac{16}{105} b a^2 = 0,1524 b a^2$ $W_y = \frac{4}{15} a b^2 = 0,2666 a b^2$ —																				
	Konstr. s. Abschn. 12.7.9.			Umfang $U = 2b + \text{Bogenlänge}$ Bogenlänge = $p \left[\frac{b}{p^2} \sqrt{p^2 + b^2} + \ln(b + \sqrt{p^2 + b^2}) - \ln p \right]$, worin $2p$ der Parameter, x u. y die Ordinaten sind. (Scheitelgleichung) $y^2 = 2px$. Näherungsformel für die flache Parabel: Bogenlänge $\approx 2b \left[1 + \frac{2}{3} \alpha^2 - \frac{2}{5} \alpha^4 \right]$, worin $\alpha = \frac{a}{b}$																					

Bezeichnung u. Querschnitt	Flächeninhalt u. sonstige Maßbestimmungen	Schwerpunkts- abstand	Trägheitsmoment	Kleinstes Wider- standsmoment	
Halbparabel		$F = \frac{2}{3} a b$	$e_x = \frac{2}{5} a$ $e_y = \frac{3}{8} b$	$J_x = \frac{8}{175} b a^3$ $\approx 0,04571 b a^3$ $J_y = \frac{19}{480} a b^3$ $\approx 0,03958 a b^3$ $J_1 = \frac{16}{105} b a^3$ $\approx 0,1524 b a^3$ $J_s = \frac{2}{15} a b^3$ $\approx 0,1333 a b^3$	$W_x = \frac{8}{105} b a^2$ $\approx 0,07619 b a^2$ $W_y = \frac{19}{300} a b^2$ $\approx 0,06333 a b^2$ —
Halbparabel- Hohlkehle		$F = \frac{1}{3} a b$	$e_x = \frac{7}{10} a$ $e_y = \frac{3}{4} b$	$J_x = \frac{37}{2100} b a^3$ $\approx 0,01762 b a^3$ $J_y = \frac{1}{80} a b^3$ $= 0,01250 a b^3$ $J_1 = \frac{19}{105} b a^3$ $\approx 0,1810 b a^3$ $J_s = \frac{1}{5} a b^3$	$W_x = \frac{37}{1470} b a^2$ $\approx 0,02517 b a^2$ $W_y = \frac{1}{60} a b^2$ $\approx 0,01667 a b^2$ —
Vollparabel- Hohlkehle	Grundlage: $b = \frac{c}{2}$ 	$F = \frac{1}{6} a^2$	$e_x = e_y = \frac{4}{5} a$ $c = \frac{\sqrt{2}}{2} a \approx 0,7071 a$	$J_x = J_y = \frac{11}{2100} a^4$ $\approx 0,00524 a^4$ $J_1 = J_s = \frac{47}{420} a^4$ $\approx 0,1119 a^4$	$W_x = W_y = \frac{11}{1680} a^3$ $\approx 0,00655 a^3$ —
Rechteck (geschwacht)		$F = b(H-h)$	$e_x = \frac{H}{2}$ $e_y = \frac{b}{2}$	$J_x = \frac{b}{12} (H^3 - h^3)$ $J_y = \frac{b^3}{12} (H-h)$	$W_x = \frac{b}{6H} (H^3 - h^3)$ $W_y = \frac{b^3}{6} (H-h)$
Hohorrechteck		$F = BH - bh$	$e_x = \frac{H}{2}$ $e_y = \frac{B}{2}$	$J_x = \frac{1}{12} (BH^3 - bh^3)$ $J_y = \frac{1}{12} (BH^3 - hb^3)$	$W_x = \frac{1}{6H} (BH^3 - bh^3)$ $W_y = \frac{1}{6B} (HB^3 - hb^3)$
Hohloquadrat		$F = A^2 - a^2$	$e_x = e_y = \frac{A}{2}$ $e_\xi = e_\eta \approx 0,7071 A$	$J_x = J_y = J_\xi = J_\eta = \frac{A^4 - a^4}{12}$	$W_x = W_y = \frac{1}{6} \frac{A^4 - a^4}{A}$ $W_\xi = W_\eta = \frac{\sqrt{2}}{12} \frac{A^4 - a^4}{A}$ $\approx 0,11785 \frac{A^4 - a^4}{A}$
		$F = A^2 - \frac{\pi d^2}{4}$	$e_x = e_y = \frac{A}{2}$ $e_\xi = e_\eta \approx 0,7071 A$	$J_x = J_y = J_\xi = J_\eta = \frac{1}{12} (A^4 - \frac{3\pi}{16} d^4)$	$W_x = W_y = \frac{1}{6A} (A^4 - \frac{3\pi}{16} d^4)$ $W_\xi = W_\eta \approx \frac{J_\xi}{0,7071 A}$
Kreisring		$F = \frac{\pi}{4} (D^2 - d^2) = \pi s (D - s)$	$e_x = e_y = \frac{D}{2}$	$J_x = \begin{cases} = \frac{\pi}{64} (D^4 - d^4) \\ = \frac{\pi}{4} (R^4 - r^4) \end{cases}$ $J_y = \begin{cases} = \frac{\pi}{32} \frac{D^4 - d^4}{D} \\ = \frac{\pi}{4} \frac{R^4 - r^4}{R} \end{cases}$	$W_x = \begin{cases} = \frac{\pi}{32} \frac{D^4 - d^4}{D} \\ = \frac{\pi}{4} \frac{R^4 - r^4}{R} \end{cases}$ $W_y = \begin{cases} = \frac{\pi}{32} \frac{D^4 - d^4}{D} \\ = \frac{\pi}{4} \frac{R^4 - r^4}{R} \end{cases}$

General Tables and Formulae

Querschnitt		Flächeninhalte, Trägheitsmomente u. sonstige Angaben	Kleinste Widerstandsmomente																			
		$F = 2b(h-d) + \frac{\pi d^3}{4}$ $J_x = J_y = \frac{1}{12} \left[\frac{3\pi}{16} d^4 + b(h^3 - d^3) + b^3(h-d) \right]$	$W_x = W_y = \frac{2J_x}{h}$																			
		$F = 2b(h-d_1) + \frac{\pi}{4}(d_1^3 - d^3)$ $J_x = J_y = \frac{1}{12} \left[\frac{3\pi}{16} (d_1^4 - d^4) + b(h^3 - d_1^3) + b^3(h-d_1) \right]$	$W_x = W_y = \frac{2J_x}{h}$																			
<p>In vorstehenden Formeln sind die 8 Flächenteile f nicht berücksichtigt; ihr Zuwachs an F u. J beträgt:</p> $F_z = 4 \left[a b - \frac{d^2}{8} \left(\frac{\varphi^\circ \pi}{180^\circ} - \sin \varphi^\circ \right) \right]. \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{worin ist: } a = \frac{1}{2} \left(d - \sqrt{d^2 - b^2} \right); \sin \frac{\varphi^\circ}{2} = \frac{b}{d}; e_1 = \frac{7}{20} b; e_2 = \frac{d}{2} - \frac{a}{4}.$																						
		<table border="1"> <thead> <tr> <th colspan="2">Für Querschnitt 1 bis 7: $F = B H - b h$</th> </tr> <tr> <th colspan="2">Für Querschnitt:</th> </tr> </thead> <tbody> <tr> <td>1 bis 4</td><td> $J_x = \frac{1}{12} (B H^3 - b h^3)$ $W_x = \frac{2J_x}{H}$ </td></tr> <tr> <td>1</td><td> $J_y = \frac{1}{12} (B H^3 - b h^3)$ $W_y = \frac{2J_y}{B}$ </td></tr> <tr> <td>2</td><td> $J_y = \frac{1}{12} (2t B^3 + h d^3)$ $W_y = \frac{2J_y}{B}$ </td></tr> <tr> <td>3</td><td> $J_y = \frac{1}{3} (2t B^3 + h d^3) - (2t B + d h) e_y^2$ $e_y = \frac{1}{2} \frac{2t B^2 + h d^2}{2t B + h d}$ $W_y = \frac{J_y}{B - e_y}$ </td></tr> <tr> <td>4</td><td> $J_y = \frac{1}{12} [(2B - d)^3 t + (h + t) d^3]$ $W_y = \frac{2J_y}{2B - d}$ </td></tr> <tr> <td>5</td><td> $J_x = \frac{1}{12} (d H^3 + b t^3)$ $J_y = \frac{1}{12} (t B^3 + h d^3)$ $W_x = \frac{2J_x}{H}$ $W_y = \frac{2J_y}{B}$ </td></tr> <tr> <td>6</td><td> $J_x = \frac{1}{3} (d H^3 + b t^3) - (d H + b t) e_x^2$ $e_x = \frac{1}{2} \frac{d H^2 + b t^2}{d H + b t}$ $J_y = \frac{1}{12} (t B^3 + h d^3)$ $W_x = \frac{J_x}{H - e_x}$ $W_y = \frac{2J_y}{B}$ </td></tr> <tr> <td>7</td><td> $J_x = \frac{1}{3} (d H^3 + b t^3) - (d H + b t) e_x^2$ $e_x = \frac{1}{2} \frac{d H^2 + b t^2}{d H + b t}$ $J_y = \frac{1}{3} (h d^3 + t B^3) - (d H + b t) e_y^2$ $e_y = \frac{1}{2} \frac{t B^2 + h d^2}{t B + h d}$ $W_x = \frac{J_x}{H - e_x}$ $W_y = \frac{J_y}{B - e_y}$ </td></tr> </tbody> </table>	Für Querschnitt 1 bis 7: $F = B H - b h$		Für Querschnitt:		1 bis 4	$J_x = \frac{1}{12} (B H^3 - b h^3)$ $W_x = \frac{2J_x}{H}$	1	$J_y = \frac{1}{12} (B H^3 - b h^3)$ $W_y = \frac{2J_y}{B}$	2	$J_y = \frac{1}{12} (2t B^3 + h d^3)$ $W_y = \frac{2J_y}{B}$	3	$J_y = \frac{1}{3} (2t B^3 + h d^3) - (2t B + d h) e_y^2$ $e_y = \frac{1}{2} \frac{2t B^2 + h d^2}{2t B + h d}$ $W_y = \frac{J_y}{B - e_y}$	4	$J_y = \frac{1}{12} [(2B - d)^3 t + (h + t) d^3]$ $W_y = \frac{2J_y}{2B - d}$	5	$J_x = \frac{1}{12} (d H^3 + b t^3)$ $J_y = \frac{1}{12} (t B^3 + h d^3)$ $W_x = \frac{2J_x}{H}$ $W_y = \frac{2J_y}{B}$	6	$J_x = \frac{1}{3} (d H^3 + b t^3) - (d H + b t) e_x^2$ $e_x = \frac{1}{2} \frac{d H^2 + b t^2}{d H + b t}$ $J_y = \frac{1}{12} (t B^3 + h d^3)$ $W_x = \frac{J_x}{H - e_x}$ $W_y = \frac{2J_y}{B}$	7	$J_x = \frac{1}{3} (d H^3 + b t^3) - (d H + b t) e_x^2$ $e_x = \frac{1}{2} \frac{d H^2 + b t^2}{d H + b t}$ $J_y = \frac{1}{3} (h d^3 + t B^3) - (d H + b t) e_y^2$ $e_y = \frac{1}{2} \frac{t B^2 + h d^2}{t B + h d}$ $W_x = \frac{J_x}{H - e_x}$ $W_y = \frac{J_y}{B - e_y}$
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Bezeichnung u. Querschnitt		Flächeninhalt	Schwerpunktsabstand
		u. sonstige Maßbestimmungen	
Dreieck		$F = \frac{a h}{2} = \frac{a b \sin \gamma}{2}$ $= \sqrt{s(s-a)(s-b)(s-c)}$ $s = \frac{a+b+c}{2}$	$e = \frac{h}{3}$ <p>Der Schwerpunkt liegt im Schnittpunkt der Eckverbindungslien mit den Mitten der gegenüberliegenden Seiten.</p>
Einfußfläche		$F_1 = \frac{h}{2} \frac{a^2}{a+b}$ $F_2 = \frac{h}{2} \frac{b^2}{a+b}$ $F_3 = F_1 = \frac{h}{2}(b-a)$	Schwerpunktlage für die einzelnen Flächen s. „Dreieck“. $h_1 = \frac{ah}{l}; h_2 = \frac{bh}{l}$, worin $l = a + b + c$
Trapez (s. auch 12.3.2., 1. Forts.)		$F = \frac{h}{2}(a+b)$	$e_x = \frac{h}{3} \frac{a+2b}{a+b}$ $e_{y_1} = \frac{1}{3} \frac{a^2+a b+b^2}{a+b}$ $e_{y_2} = \frac{1}{3} \left(a+b+c - b \frac{a-c}{a+b} \right)$
Regelmäßiges Vieleck		$F = \frac{n s^2}{4} \cot \frac{\varphi}{2}$ $= \frac{n R^2}{2} \sin \varphi$ $= n r^2 \tan \frac{\varphi}{2}$ $(n = \text{Seitenzahl } \geq 3)$	$R = \frac{r}{\cos \frac{180^\circ}{n}} = \frac{s}{2 \sin \frac{180^\circ}{n}}$ $\varphi^\circ = \frac{360^\circ}{n}$ $r = R \cos \frac{180^\circ}{n} = \frac{s}{2} \cot \frac{180^\circ}{n}$ $\alpha^\circ = 180^\circ - \varphi^\circ$ $s = 2 R \sin \frac{180^\circ}{n} = 2 \sqrt{R^2 - r^2}$
Gewölbeformen		Trägheitsmoment für jede Schwerpunktsachse = $\frac{F}{24} (6 R^2 - s^2)$	
		$F = \frac{\varphi^\circ \pi}{360^\circ} (R^2 - r^2)$ $= \frac{\varphi^\circ \pi}{180^\circ} R_m d = \frac{1}{2} (RB - rb)$	$e_1 = \frac{2}{3} \frac{R^3 - r^3}{R^2 - r^2} \sin \frac{\varphi}{2} \frac{360^\circ}{\varphi^\circ \pi}$ $e_2 = e_1 - r + h$
		worin: Mittlerer Halbmesser $R_m = \frac{R+r}{2}$; $R = \frac{S^2}{8H} + \frac{H}{2}$; $r = \frac{s^2}{8h} + \frac{h}{2}$ $B = \pi R \frac{\varphi^\circ}{180^\circ}$; $b = \pi r \frac{\varphi^\circ}{180^\circ}$ $S = 2 R \sin \frac{\varphi}{2}$; $s = 2 r \sin \frac{\varphi}{2}$; $H = R - R \cos \frac{\varphi}{2}$; $h = r - r \cos \frac{\varphi}{2}$	
		$F = \frac{\pi}{360^\circ} (R^2 \Phi^\circ - r^2 \varphi^\circ) - \frac{1}{2} m S$	$e_1 = \frac{120 (S R^2 - s r^2) - 60 S m (R + m - H) - \pi \varphi m r^2}{360^\circ F}$ $e_2 = e_1 - m - r + h$
		worin: $R = \frac{S^2}{8H} + \frac{H}{2}$; $r = \frac{s^2}{8h} + \frac{h}{2}$; $S = s + 2 t \cos \alpha = 2 \sqrt{H(2R-H)}$ $\sin \frac{\Phi}{2} = \frac{S}{2R}$; $\sin \frac{\varphi}{2} = \frac{s}{2r}$; $s = 2 r \sin \frac{\varphi}{2} = 2 \sqrt{h(2r-h)}$ $m = R - d - r$; $\cos \alpha = \frac{S}{2r}$; $H = h + d - t \sin \alpha = R - R \cos \frac{\Phi}{2}$; $h = r - r \cos \frac{\varphi}{2}$	
		$F = s(d+h) - \frac{r^2}{2} \left(\frac{\varphi^\circ \pi}{180^\circ} - \sin \varphi \right)$	$e = \frac{s(d+h)^2 - 2 F_1 e_1}{2 F}$
		worin: $s = 2 r \sin \frac{\varphi}{2} = 2 \sqrt{h(2r-h)}$; $h = r - r \cos \frac{\varphi}{2}$; $r = \frac{s^2}{8h} + \frac{h}{2}$; $\sin \frac{\varphi}{2} = \frac{s}{2r}$ $F_1 = \frac{r^2}{2} \left(\frac{\varphi^\circ \pi}{180^\circ} - \sin \varphi \right)$; $e_1 = \frac{2}{3} \frac{r^3 \sin \frac{\varphi}{2}}{F_1} - r + h$; $F = \text{Querschnittsfläche}$	

General Tables and Formulae

Körper	Berechnung	Körper	Berechnung
Würfel 	$V = a^3$ $O = 6 a^2$ $M = 4 a^3$ $x = \frac{a}{2}$ $d = \sqrt[3]{3 a^2} \approx 1,7321 a$	Zylinderhuf 	$V = \frac{2}{3} R^2 h$; $M = 2 R h$ $x = \frac{3}{32} \pi h$; $y = \frac{3}{16} \pi R$
Rechteckiges Prisma 	$V = a b h$ $O = 2(a b + a h + b h)$ $M = 2 h (a + b)$ $x = \frac{h}{2}$ $d = \sqrt{a^2 + b^2 + h^2}$	Kreiskegel 	$V = \frac{\pi R^2 h}{3}$; $x = \frac{h}{4}$ $M = \pi R s$ $s = \sqrt{R^2 + h^2}$
Sechseitiges Prisma 	$V \approx 2,598 a^2 h$ $O \approx 5,1963 a^2 + 6 a h$ $M = 6 a h$ $x = \frac{h}{2}$ $d = \sqrt{h^2 + 4 a^2}$	Abgestumpfter Kreiskegel (Runder Kübel) (Elliptisch geformter Kübel s. folgende Seite)	$V = \frac{\pi h}{3} (R^2 + R r + r^2)$ $M = \pi s \alpha$ $\alpha = R + r$; $\beta = R - r$ $s = \sqrt{\beta^2 + h^2}$ $x = \frac{h}{4} \frac{R^2 + 2 R r + 3 r^2}{R^2 + R r + r^2}$
Prisma mit regelmäßiger Vieleck-Grundfläche. G = Grundfläche, a = Seitenlänge, n = Seitenzahl. 	$V = G h$ $O = 2 G + n h a$ $M = n h a$ $x = \frac{h}{2}$ Berechnung von G s. Abschn. 12.3.2., 5. Forts.	Pyramide 	$V = \frac{G h}{3}$ } Berechnung von G $x = \frac{h}{4}$ } s. Abschn. 12.3.2., 5. Forts.
Zylinder 	$V = r^2 \pi h = G h$ $O = 2 \pi r (r + h)$ $M = 2 \pi r h$ $x = \frac{h}{2}$	Abgestumpfte Pyramide Berechnung von G u. g s. Abschn. 12.3.2., 5. Forts.	$V = \frac{h}{3} (G + g + \sqrt{G g})$ g = Kopffläche $x = \frac{h}{4} \frac{G + 2 \sqrt{G g} + 3 g}{G + \sqrt{G g} + g}$
Hohlyzylinder 	$V_{\text{Mantel}} = \pi h (R^2 - r^2)$ $= \pi h s (2 R - s)$ $= \pi h s (2 r + s)$ $x = \frac{h}{2}$	Kugel 	$V = \frac{\pi d^3}{6} = \frac{4}{3} \pi r^3 \approx 0,5235988 d^3$ $O = 4 \pi r^2 = \pi d^2$ $r = \sqrt[3]{\frac{3 V}{4 \pi}} \approx 0,62035 \sqrt[3]{V}$
Abgestumpfter Zylinder 	$V = R^2 \pi \frac{h_1 + h_2}{2}$ $M = R \pi (h_1 + h_2)$ $D = \sqrt{4 R^2 + (h_2 - h_1)^2}$ $x = \frac{h_1 + h_2}{4} + \frac{(h_2 - h_1)^2}{16 (h_2 + h_1)}$ $y = \frac{R h_2 - h_1}{4 h_2 + h_1}$	Kugelabschnitt (Kugelkalotte) 	$V = \frac{\pi h}{6} (3 a^2 + h^2)$ $= \frac{\pi h^3}{3} (3 r - h)$ $O = \pi h (4 r - h)$ $M = 2 \pi r h = \pi (a^2 + h^2)$ $a = \sqrt{h (2 r - h)}$ $x = \frac{h (4 r - h)}{4 (3 r - h)}$

Körper	Berechnung	Körper	Berechnung
Kugelausschnitt 	$V = \frac{2\pi r^2 h}{3} \approx 2,094395 r^2 h$ $M = \pi a r$ $O = \pi r (2h + a)$ $x = \frac{3}{8} (2r - h)$		Faß a) Kreisrunde Wölbung: Angenähert ist $V = \pi \frac{l}{12} (2D^3 M + D^2 E)$ b) Parabolische Wölbung: Genau ist $V = \pi \frac{l}{15} (2D^3 M + D_M D_E + \frac{3}{4} D^2 E)$ $D_M, D_E = \emptyset$
Kugelzone (Kugelschicht) 	$V = \frac{\pi h}{6} (3a^2 + 3b^2 + h^2)$ Ist $a = r$ so ist $V = \frac{\pi h}{3} (3r^2 - h^2)$ $M = 2\pi r h$ $r^2 = a^2 + \left(\frac{a^2 - b^2 - h^2}{2h}\right)^2$		Kübel (Elliptische Form) Mit den Halbachsen a_o, b_o bzw. a_u, b_u , ist $V = 2\pi \frac{h}{6} [(2a_o + a_u)b_o + (2a_u + a_o)b_u]$ $\frac{h}{2} [3a_u b_u + a_u b_o + b_u a_o + a_o b_o]$ $x = \frac{h}{2} [2a_u b_u + a_u b_o + b_u a_o + 2a_o b_o]$
Zylindrischer Ring 	$V = 2\pi^2 R r^2 = \frac{1}{4}\pi^2 D d^2$ $O = 4\pi^2 R r = \pi^2 D d$		Umdrehungsparaboloid $V = \frac{D_u^2 \pi h}{4 \cdot 2}$ $D_u = \text{unterer } \emptyset$
Ellipsoid 	$V = \frac{4}{3} a b c \pi$		
Obelisk (Fundament) 	$V = \frac{h}{6} [(2a + a_1)b + (2a_1 + a)b_1]$ $= \frac{h}{6} [a(b + (a + a_1)(b + b_1) + a_1 b_1)]$ $x = \frac{h}{2} \frac{a b + a b_1 + a_1 b + 3 a_1 b_1}{2 a b + a b_1 + a_1 b + 2 a_1 b_1}$		Wird in nebenstehender Gleichung von V $a_1 = x_1 a, b_1 = y_1 b$, so ist: $V = \frac{h}{6} G [x_1 + y_1 + 2(1 + x_1 y_1)]$ $= \frac{h}{6} G \alpha \text{ u. } x = \frac{h}{2} \left(1 - \frac{1 - x_1 y_1}{\alpha}\right)$ $\alpha = x_1 + y_1 + 2(1 + x_1 y_1)$
Guldinsche Regel. Der Flächeninhalt der erzeugten Umdrehungsfläche, die durch Drehung einer Linie von der Länge l um eine, in ihrer Ebene liegende, sie nicht schneidende Achse entsteht, ist gleich der Linienlänge l multipliziert mit dem Weg, den der Schwerpunkt S_0 der Linie mit dem Achsenabstand r beschreibt, also $M = 2\pi r l$.		Der Inhalt des erzeugten Umdrehungskörpers, der durch Drehung einer ebenen Fläche F um eine, in ihrer Ebene liegende, sie nicht schneidende Achse entsteht, ist gleich dem Flächeninhalt F multipliziert mit dem Weg, den der Schwerpunkt S_0 der Fläche mit dem Achsenabstand r beschreibt, also $V = 2\pi r F$.	
Für 2 gleichlaufende Umdrehungssachsen im Abstand a ist allgemein, wenn sich M_1 u. V_1 auf die eine, M_2 u. V_2 auf die andere Achse beziehen, $M_1 = 2\pi a l_1 \pm M_2$ u. $V_1 = 2\pi a F_1 \pm V_2$. Hierbei gilt —, wenn l_1 oder F_1 zwischen den gleichlaufenden Achsen liegt; im anderen Falle gilt +.			

Auszug aus: Meinert: „Materialersparnis durch wirtsch. Formung der Verpackungsbehälter“, AWF-Mitt. 22 1940, H. 5, S. 25;

Es ist für den Werkstoffaufwand eines Behälters nicht einerlei, welche Form dieser hat. Das Fassungsvermögen jedes Behälters wird, bezogen auf den Materialverbrauch, um so größer, je mehr sich Länge, Breite u. Höhe gleichen, je mehr also bei einem rechteckigen Behälter dessen Form sich der Würfelform nähert oder bei einem runden Behälter die \emptyset der Boden- u. Deckelflächen mit der Höhe übereinstimmen.

Die Richtigkeit dieser in der Praxis oft nicht beachteten Tatsache wird in dieser Abhandlung durch mehrere vergleichende Beispiele bewiesen, u.a.

Rechteckiger Behälter $2,0 \times 1,0 \times 0,50$ m: Inhalt 1 m^3 , erfordert $2(2,0 \cdot 1,0 + 0,5 \cdot 2,0 + 0,5 \cdot 1,0) = 7,0 \text{ m}^2$ Stahlblech für die Wandung;

Würfelförmiger Behälter $1,0 \times 1,0 \times 1,0$ m: Inhalt 1 m^3 , erfordert $6(1,0 \cdot 1,0) = 6,0 \text{ m}^2$ Stahlblech für die Wandung; mithin eine Stahlersparnis von rd. 15%.

Auszug aus
„Stahl im Hochbau“
Ausgabe 1969
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