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## Structural Report

F45

17433

**Date 23/04/2018**

for the system by

**Global Truss**  
Furong Industrial Area  
Shajing Town

Baoan District Shenzhen China

Compiled by:

Aachen, 23<sup>rd</sup> April 2018



This Structural Report includes pages

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# 1 PRELIMINARY NOTES

## 1.1 Basics

The currently applicable regulations and standards, in particular:

DIN EN 1991-1	Actions on structures (Eurocode 1)
DIN EN 13814	Fairground and amusement park machinery and structures
DIN EN 13782	Temporary Structures – Tents
DIN EN 1993-1	Design of steel structures
DIN EN 1999-1	Design of aluminium structures

## 1.2 Materials

Tubes	Aluminium EN AW-6082 T6
Bolts	Güte mid. 8.8 (grade min. 10.9)

## 1.3 General remarks

The truss system is part of a "modular construction system" with the different truss lengths

1500mm, 2000mm and 3000mm.

The Trusses consist of 2 upper and 3 lower main chords (round tube 50 x 4mm), which are arranged in a quadratic shape. The center chord at the bottom is connected to the outer chords by cross tubes (round tube 50 x 4mm). The trusses also consist of welded diagonal bracings (round tube 25 x 3mm). The truss type F44-P is stiffened by diagonal bracings at the top and at both vertical sides.

The distance between system lines of the mainchords is 35 cm in vertical- and 35 cm in horizontal direction.

The trusses are connected at the 4 outer mainchords with couplers consisting of female fittings, connectors and bolts. The center chord of the bottom is not connected with couplers.

The loads are applied acc. chapter 1.4. The allowable loads are listed in tables (see chapter 6).

The verification of the single parts is done according the safety concept of EN 1990 with a partial safety factor of the loading side of 1.50 for payloads.

For applications which can be calculated on the basis of other codes, the partial safety factors can be adjusted (for example temporary structures acc. EN 13814,  $\gamma_F = 1.35$  for payloads).

To use the resulting allowable loads with British Standard (BS) and ANSI, the allowable loads listed in tables have to be multiplied by 0.85

## 1.4 Geometry and loadings

The selfweight of the truss is approx. 15 kg/m

For the paylodas there are 2 loadcases taken into account:

LC 1) The load can be applied as a distributed load, as multiple point loads or as single point loads on the central bottom chord.

The allowable loading on the F45-truss is limited by two conditions:

- 1) First condition is the local load transfer from the central bottom chord to the bracing node.
- 2) Second condition is the global load transfer to the truss supports.

**Resulting allowable loading see chapter 6**

The following principle loadcases and loading situations are taken into account:

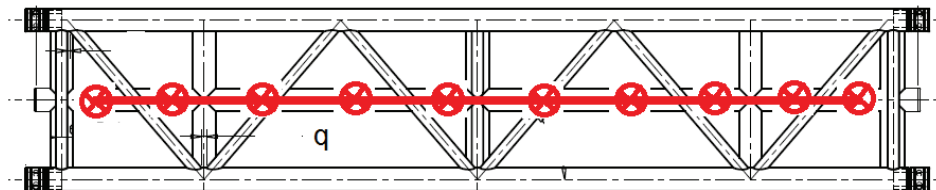
Structural system:



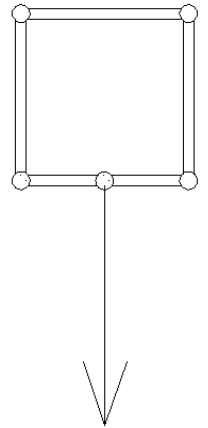
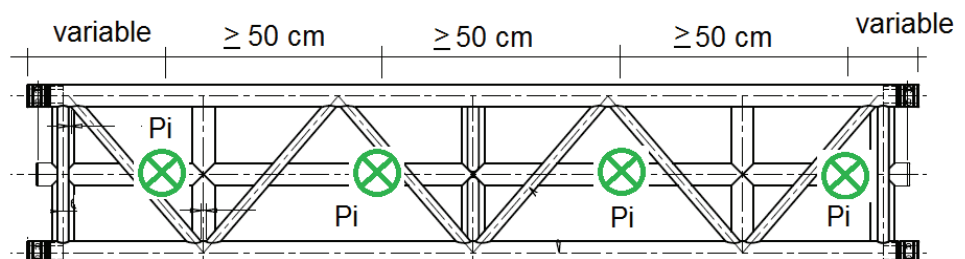
single span girder

Loading situations

1a) uniformly distributed load (UDL) on central bottom chord



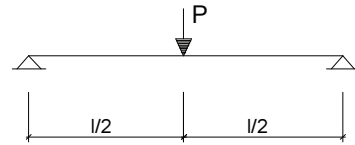
1b) multiple point load on central bottom chord with maximum point load of  $P_i \leq 300 \text{ kg}$  and distances  $\geq 50 \text{ cm}$  (equivalent to a distributed load of  $\leq 600 \text{ kg/m}$ ). No restrictions concerning position on the central bottom chord but allowable loading in dependence of the span has to be respected, see chapter 6.



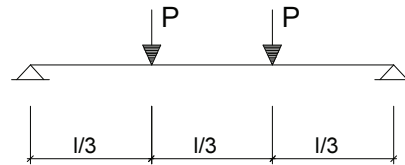


1c) Single point loads on central bottom chord

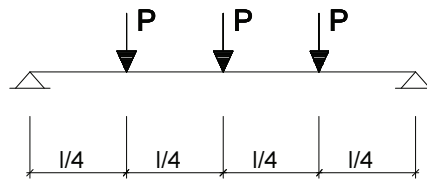
Single-load in 1/2 point



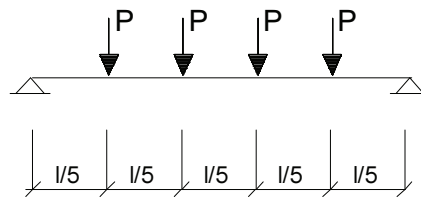
Single-load in 1/3 points



Single-load in 1/4 points



Single-load in 1/5 points

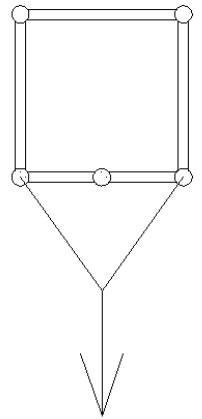
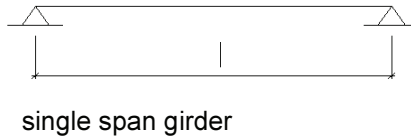




LC 2) The load can be applied as a distributed load or as single point loads on the side chords:

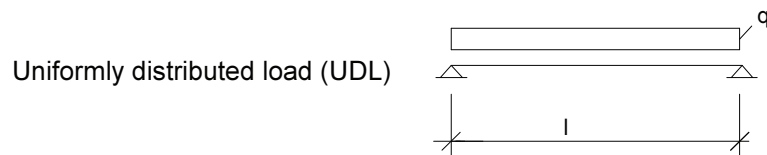
The following principle loadcases and loading situations are taken into account:

Structural system:



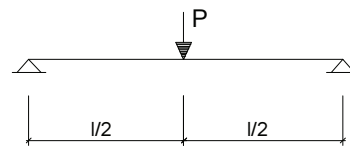
Loading situations

2a) uniformly distributed load (UDL) on side chords

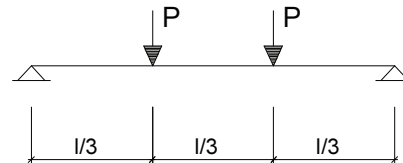


2b) Single point loads on central bottom chord

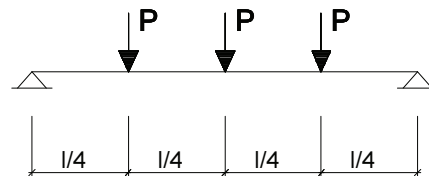
Single-load in 1/2 point



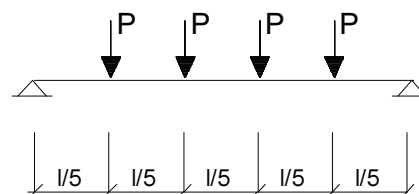
Single-load in 1/3 points



Single-load in 1/4 points

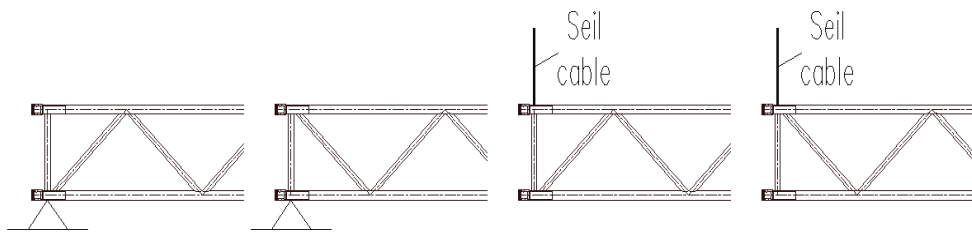


Single-load in 1/5 points

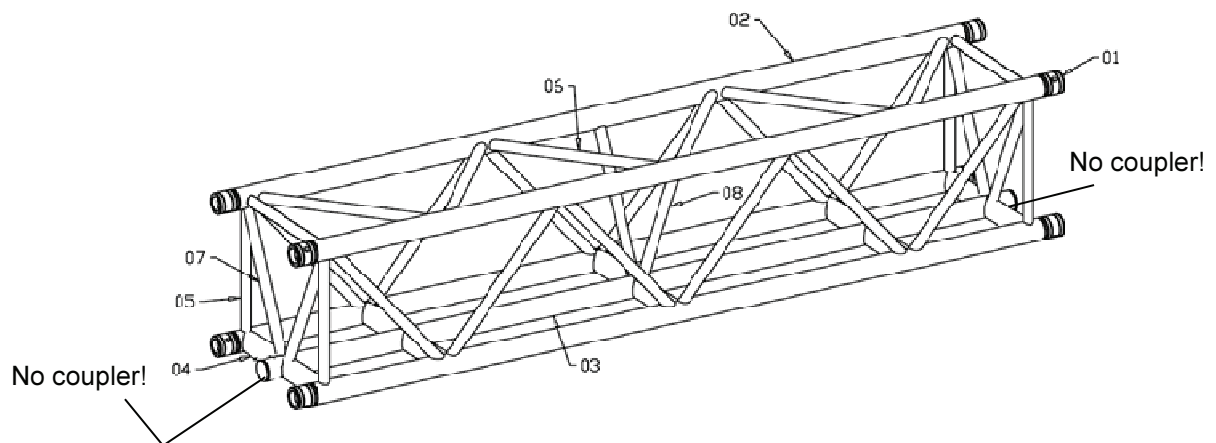




For the support or suspension there are the following possibilities:



The trusses are connected at the 4 outer mainchords with couplers consisting of female fittings, connectors and bolts. The center chord of the bottom is not connected with couplers.





## 2 SYSTEM

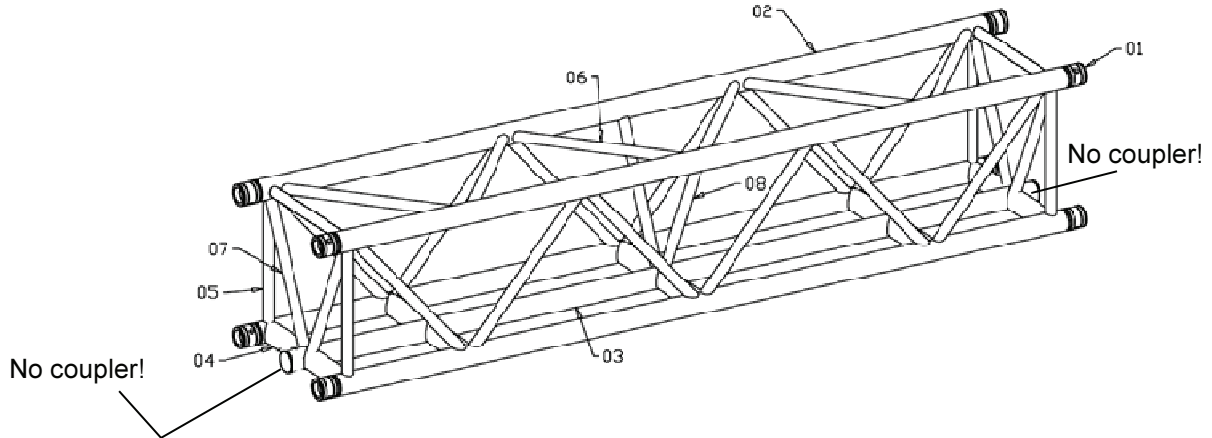
Drawings F45

see annex





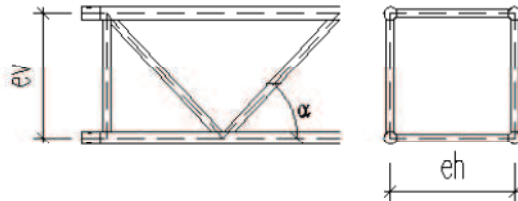
### 3 SECTION- AND MATERIAL PROPERTIES



#### Querschnittswerte Rohre / properties Tubes

	D [mm]	t [mm]	A [cm <sup>2</sup> ]	I [cm <sup>4</sup> ]	Wel [cm <sup>3</sup> ]	i [cm]
Gurtrohre / main chords	50,0	4	5,78	15,41	6,16	1,63
vertikal Diagonalen / Bracing	25	3	2,07	1,28	1,02	0,79
horizontal Diagonalen / Bracing	25	3	2,07	1,28	1,02	0,79

#### Geometrie Traverse / truss geometry



Achsabstand Gurtrohre	vertikal	ev	35	[cm]
distance axes main chords	horizontal	eh	35	[cm]
min. Neigung Diagonalen	vertikal	$\alpha$	41	[°]
min. gradient bracing	horizontal	$\alpha$	41	[°]

#### Kenwerte Gesamttraverse / properties truss-Section

$A$	$= 4 \times A_G$	$=$	23,12	[cm <sup>2</sup> ]
$I_{yy}$	$= 4 \times I_G + 4 \times A_G \times (ev/2)^2$	$=$	7142,77	[cm <sup>4</sup> ]
$I_{zz}$	$= 4 \times I_G + 4 \times A_G \times (eh/2)^2$	$=$	7142,77	[cm <sup>4</sup> ]
$I_t$	$=$ Näherung aus Erfahrungswerten	$=$	1666,38	[cm <sup>4</sup> ]
$i_y$	$= (I_{yy}/A)^{1/2}$	$=$	17,58	[cm]
$i_z$	$= (I_{zz}/A)^{1/2}$	$=$	17,58	[cm]

Index G : Querschnittseigenschaft Gurtrohr  
section properties main chord



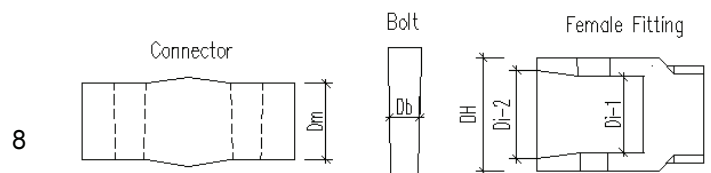
Material properties

<b>Gurtrohre + Diagonalen</b> chords and bracing	EN AW 6082 T6 (AlMgSi1)		
zulässige Spannungen nach EN-1999-1-1 / allowable stress acc. to EN-1999-1-1			
Teilsicherheitsbeiwerte Material / partial safety factors material			
YM1=	1,10	Beulklasse / BC=	A
YM2=	1,25		
0,2%-Dehngrenze / 0,2%-Proof Strength		Zugfestigkeit / ultimate tensile strength	
fo ≤5mm=	250 [N/mm <sup>2</sup> ]	fu ≤5mm=	290 [N/mm <sup>2</sup> ]
fo >5mm=	260 [N/mm <sup>2</sup> ]	fu >5mm=	310 [N/mm <sup>2</sup> ]
fo,haz=	125 [N/mm <sup>2</sup> ]	fu,haz=	185 [N/mm <sup>2</sup> ]
Festigkeit der Schweißnaht Strength of welding seams		fw=	190 [N/mm <sup>2</sup> ]
Faktor für die WEZ-Werte beim WIG-Schweißen: Factor for HAZ-values for TIG-welding:			0,8

<b>Bolzen / Bolt</b>	42 CrMo (8.8)
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<b>Verbinder / Connector</b>	EN AW 2011 T6 (AlCuBiPb)		
0,2%-Dehngrenze / 0,2%-Proof Strength		Zugfestigkeit / ultimate tensile strength	
fo>	230 [N/mm <sup>2</sup> ]	fu>	310 [N/mm <sup>2</sup> ]

<b>Hülse / Female fitting</b>	EN AW 6082 T6		
zulässige Spannungen nach EN-1999-1-1 / allowable stress acc. to EN-1999-1-1			
Teilsicherheitsbeiwerte Material / partial safety factors material			
YM1=	1,10		
YM2=	1,25		
0,2%-Dehngrenze / 0,2%-Proof Strength		Zugfestigkeit / ultimate tensile strength	
fo=	250 [N/mm <sup>2</sup> ]	fu=	290 [N/mm <sup>2</sup> ]





Querschnitts- und Materialeigenschaften der Gurtrohre / Section- and material properties of the chord tubes			
Material	E=	70000	[N/mm <sup>2</sup> ]
	fo=	250,00	[N/mm <sup>2</sup> ]
	fo/YM1=	227,27	[N/mm <sup>2</sup> ]
	fo,haz=	125,00	[N/mm <sup>2</sup> ]
	fu=	290,00	[N/mm <sup>2</sup> ]
	fu/YM2=	232,00	[N/mm <sup>2</sup> ]
	fu,haz=	185,00	[N/mm <sup>2</sup> ]
	fu,haz/YM2=	148,00	[N/mm <sup>2</sup> ]
Querschnitt cross section	D0=	50,00	[mm]
	A=	5,78	[cm <sup>2</sup> ]
	I=	15,41	[cm <sup>4</sup> ]
	i=	1,63	[cm]
Bestimmung der QS-Klasse Determination of section-class	β=	10,61	[-]
	ε=	1,00	[-]
	QS-Klasse=	2	
			3 · (D0 / t) <sup>0,5</sup> nach 6.10 (250 / fo) <sup>0,5</sup> nach Kap. 6.1.4.4 acc. chapter 6.1.4.4
Beiwerte Biegeknicken Coefficients for buckling	BC=	A	[-]
	α=	0,20	[-]
	λ0=	0,10	[-]
teff im Bereich der WEZ teff in heat affected zone	red-Faktor=	0,8	[-] (WIG πIG)
	Knotenpunkt mit 1 Diagonalen / node with 1 bracing		
	D1=	25,00	[mm]
	U <sub>WEZ</sub> =	85,00	[mm] D1 + 2 · 30
	U <sub>Total</sub> =	157,08	[mm]
	teff,o/t=	0,68	[-] [1 - (1 - red-Faktor · fo,haz / fo) · U <sub>WEZ</sub> / U <sub>Total</sub> ]
	teff,u/t=	0,74	[-] [1 - (1 - red-Faktor · fu,haz / fu) · U <sub>WEZ</sub> / U <sub>Total</sub> ]
	Knotenpunkt mit 2 Diagonalen / node with 2 bracing		
	D1=	25,00	[mm]
	D2=	25,00	[mm]
	U <sub>WEZ</sub> =	124,27	[mm] π / 4 · D0 + D1 / 2 + D2 / 2 + 2 · 30
	U <sub>Total</sub> =	157,08	[mm]
	teff,o / t=	0,53	[-] [1 - (1 - red-Faktor · fo,haz / fo) · U <sub>WEZ</sub> / U <sub>Total</sub> ]
	teff,u / t=	0,61	[-] [1 - (1 - red-Faktor · fu,haz / fu) · U <sub>WEZ</sub> / U <sub>Total</sub> ]

Querschnitts- und Materialeigenschaften der Diagonalen / Section- and material properties of the bracing			
Material	E=	70000	[N/mm <sup>2</sup> ]
	fo=	250,00	[N/mm <sup>2</sup> ]
	fo/YM1=	227,27	[N/mm <sup>2</sup> ]
	BC=	A	[-]
	α=	0,20	[-]
	λ0=	0,1	[-]
Querschnitt / cross section	D0=	25	[mm]
	A=	2,07	[cm <sup>2</sup> ]
	I=	1,28	[cm <sup>4</sup> ]
	i=	0,79	[cm]



## 4 ALLOWABLE LOADING SINGLE COMPONENTS

Outer chords at top and bottom

Gurtrohr im Bereich der WEZ an der Kupplung main chord in heat affected zone at coupler			
$NR_d = A \times 0,8^* \times f_{u,haz} / Y_{M2} =$	<b>68,44</b>	[kN]	*(WIG $\tau_{IG}$ ) örtliche Schweißnaht nach Kap. 6.2.9.3 (1) local welding seam acc. chapter 6.2.9.3 (1)
Gurtrohr im Bereich der WEZ main chord in heat affected zone Knotenpunkt mit 1 Diagonalen / node with 1 bracing			
$NR_d = A_{eff} \times f_o / Y_{M1} =$ (mit $A_{eff} = t_{eff,o} / t \times A$ )	<b>88,72</b>	[kN]	örtliche Schweißnaht nach Kap. 6.2.9.3 (2) local welding seam acc. Chapter 6.2.9.3 (2)
Knotenpunkt mit 2 Diagonalen / node with 2 bracing			
$NR_d = A_{eff} \times f_o / Y_{M1} =$ (mit $A_{eff} = t_{eff,o} / t \times A$ )	<b>69,01</b>	[kN]	örtliche Schweißnaht nach Kap. 6.2.9.3 (2) local welding seam acc. Chapter 6.2.9.3 (2)
Knicken Gurtrohr zw. Knoten mit 1 Diagonale in der Mitte buckling main chord between nodes with 1 bracing in the middle			
$sk =$	<b>80,00</b>	[cm]	
$N_{cr} =$	166,30	[kN]	
$\lambda^* =$	0,93	[-]	
$\phi =$	1,02	[-]	
$X =$	0,70	[-]	
$A_1 =$	3,74	[cm <sup>2</sup> ]	nach Tab. 6.5
$\kappa =$	0,84	[-]	acc. table 6.5
$NR_d = X \times \kappa \times A_{eff} \times f_o / Y_{M1} =$ (mit $A_{eff} = A$ für QSK 1,2 und 3, s. EN 1999-1-1 Kap. 6.3.1.1)	<b>77,82</b>	[kN]	nach Gl. 6.49 acc. equation 6.49
Knicken Gurtrohr zw. Knoten ohne Diagonale in der Mitte buckling main chord between nodes without bracing in the middle			
$sk =$	<b>80,00</b>	[cm]	
$N_{cr} =$	166,30	[kN]	
$\lambda^* =$	0,93	[-]	
$\phi =$	1,02	[-]	
$X =$	0,70	[-]	
$NR_d = X \times A \times f_o / Y_{M1} =$	<b>92,12</b>	[kN]	nach Gl. 6.49 acc. equation 6.49
Schweißnaht zwischen Gurtrohr und Hülse welding seam between chord and female conical coupler			
$f_w =$	190,00	[N/mm <sup>2</sup> ]	
$Y_{mw} =$	1,25	[-]	
$NR_d = A \times f_w / Y_{M1} =$	<b>87,86</b>	[kN]	nach Gl. 8.29 acc. equation 8.29

relevant for main chord tubes:  **$NR_d = 68,44$  kN**



### Bending of the center chord at the bottom and of the cross tubes:

Lokale Biegung unteres inneres Gurtrohr Knotenpunkt mit Querrohr				
Local bending of lower inner chord with lateral tube				
örtliche Schweißnaht nach Kap. 6.2.9.3 (2)				
local welding seam acc. Chapter 6.2.9.3 (2)				
	$\alpha$ =	0,55	[-]	nach Tab. 6.4
Nebenrechnung QS-Kl. 3	D=	50,0	[mm]	
Auxiliary calculation for class 3	red-Faktor=	0,8	[-]	(WIG TIG)
	$\rho_{0,haz}$ =	0,5	[-]	$f_{0,haz} / f_0$
	$t_{0,eff}$ =	1,60	[mm]	$t_{eff,o} / t \cdot t$
	$W_{el,haz} = \pi \times R^2 \times t_{0,eff}$ =	2,66	[cm <sup>2</sup> ]	mit $R = D / 2 - t / 2$
	$W_{el}$ =	6,16	[cm <sup>2</sup> ]	
	$W_{pl,haz} = 4 \times R^2 \times t_{0,eff}$ =	3,39	[cm <sup>2</sup> ]	mit $R = D / 2 - t / 2$
	$\beta_3$ =	18	nach Kap. 6.1.4.4	nach Kap. 6.1.4.4
	$\beta_2$ =	13	nach Kap. 6.1.4.4	nach Kap. 6.1.4.4
	$\alpha_{,3w}$ =	0,61	[-]	
	$MoRd = \alpha \cdot W_{el} \cdot f_0 / yM1$ =	<b>76,95</b>	[kNcm]	nach Gl. 6.24 acc. equation 6.24

### Bracing

Diagonale im Bereich der WEZ				
bracing in heat affected zone				
	$NRd = A \times 0,8 \times f_{u,haz} / Y_{M2}$ =	<b>24,55</b>	[kN]	*(WIG TIG) örtliche Schweißnaht nach Kap. 6.2.9.3 (1) local welding seam acc. chapter 6.2.9.3 (1)
Knicken Diagonale	$s_k$ =	<b>45,00</b>	[cm]	
buckling bracing	$N_{cr}$ =	43,59	[kN]	
	$\lambda^*$ =	1,09	[-]	
	$\phi$ =	1,19	[-]	
	$X$ =	0,60	[-]	
	$NRd = X \times A_G \times f_0 / Y_{M1}$ =	<b>28,07</b>	[kN]	nach Gl. 6.49 acc. equation 6.49
Schweißnaht zwischen Diagonale und Gurtrohr				
welding seam between chord and female conical coupler				
	$f_w$ =	<b>190,00</b>	[N/mm <sup>2</sup> ]	
	$Y_{mw}$ =	<b>1,25</b>	[-]	
	$NRd = A \times f_w / Y_{M1}$ =	<b>31,52</b>	[kN]	nach Gl. 8.29 acc. equation 8.29

relevant for bracing tubes:

**$NR_{dD} = 24,55 \text{ kN}$**



### Allowable normal force at coupler:

<b>Bolzen / Bolt</b>		
Material / material (8.8)	fy,bk=	64,00 [kN/cm <sup>2</sup> ]
	fu,bk=	80,00 [kN/cm <sup>2</sup> ]
Geometrie / geometry	Db=	1,08 [cm]
	Ab=	0,91 [cm <sup>2</sup> ]
zul Normalkraft aus Abscheren n. EN 1999-1-1 allow able loading due to shearing acc. to EN 1999-1-1		
	NRd = 2 x 0,60 x Ab x fub,k / 1,25=	<b>69,71 [kN]</b>
<b>Verbinder / Connector</b>		
Material / material	EN AW 2011 (AlCuBiPb F37)	
Geometrie / geometry	Dm=	29 [mm]
<u>Lochleibung in Verbinder</u> Bearing stress in connector	fu / YM2=	248,00 [N/mm <sup>2</sup> ]
	do=	11 [mm]
	t=	29 [mm]
	e1=	17,1 [mm]
	αb=	0,52 [-]
	e2=	14,5 [mm]
	k1=	1,99090909 [-]
	NRd = k1 x αb x fu x d x t / YM2=	81,62 [kN]
Nachweis Restquerschnitt auf Zug Remaining section under tension		
	NRd = 0,9 x A <sub>net</sub> x fu / YM2=	<b>76,23 [kN]</b>
<b>Hülse / Female Fitting</b>		
Geometrie / geometry	DH=	50 [mm]
	Di-1=	29 [mm]
	Di-2=	35 [mm]
	Di-m=	32 [mm]
<u>Lochleibung in Hülse</u> Bearing stress in female fitting	fu / YM2=	232 [N/mm <sup>2</sup> ]
	do=	13 [mm]
	t = DH - Di-m=	18 [mm]
	e1>	23 [mm]
	αb=	0,59
	e2>	20 [mm]
	k1=	2,5
	NRd = k1 x αb x fu x d x t / YM2=	<b>80,04 [kN]</b>

The allowable normal force of the coupler is not relevant compared to the allowable normal force of the tube (NRd<sub>G</sub> = 68,44 kN < 69,71 kN).



### Interaction bending and normal force at coupler of the outer chords

Verification of interaction bending and normal force at coupler

$$\Rightarrow (Nsd_G / NRd_G)^{1,3} + (Msd_G / MRd_G) < 1,0$$

mit  $Nsd_G = Nsd / 4 + Msd / (2 \cdot 0,35 \text{ m})$

und  $Msd_G = 0,25 \cdot Qsd \cdot 8,0 \text{ cm} = 2,0 \text{ cm} \cdot Qsd$

$\Rightarrow a = \text{factor for cantilever at the coupler} = 2,0 \text{ cm}$

$Nsd, Msd$  und  $Qsd$ : global internal forces in the truss (in kN resp. kNm)

The global internal forces include the following safety factors acc. Eurocode:

selfweight of the truss:  $yF = 1,35$

Net load on the truss:  $yF = 1,50$

$NRd_G$  = allowable loading of the chord in the heat affected zone (see following table):

Gurtrohr im Bereich der WEZ an der Kupplung main chord in heat affected zone at coupler			
$NRd = A \times 0,8^* \times fu, haz / YM2 =$	<b>68,44</b>	[kN]	*(WIG TIG) örtliche Schweißnaht nach Kap. 6.2.9.3 (1) local welding seam acc. chapter 6.2.9.3 (1)

$MRd_G = MuRd$  (see following table):

Lokale Biegung Gurtrohr Knotenpunkt vollst. in WEZ Local bending of chord			
örtliche Schweißnaht nach Kap. 6.2.9.3 (1) local welding seam acc. Chapter 6.2.9.3 (1)			
$D =$	50	[mm]	
red-Faktor =	0,8	[-]	(WIG TIG)
$\rho_{0, haz} =$	0,64	[-]	$fu, haz / fu$
$t_{u, eff} =$	2,04	[mm]	red-Faktor $\cdot \rho_{u, haz} \cdot t$
$W_{net} = \pi \times R^2 \times t_{u, eff} =$	3,39	[cm <sup>3</sup> ]	mit $R = D / 2 - t / 2$
$MuRd = W_{net} \cdot fu / yM2 =$	<b>78,71</b>	[kNcm]	nach Gl. 6.24 acc. equation 6.24



The following 4 cases are taken into account.

1. Verification of the center chords at the bottom at UDL-loads or multiple single point loads (LC 1a and 1b)

The loads at center chord at the bottom are loaded at the worst points with multiple single point loads at a distance of 50 cm between each load.

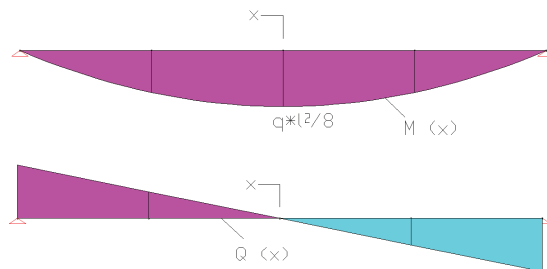
2. Verification of the center chord at the bottom with single point loads (LC 1c)

No requirements for position of coupler (see below).

3. Verification of the outer chords with uniformly distributed load (UDL) (LC 2a)

The coupler is always located at the theoretically worst point. This results from the following extremum-calculation:

Note: For the determination of the worst position of the coupler, the exponent 1,3, for the relation of actual load to the allowable load is not taken into account with sufficient accuracy.



$$M_{sd}(x) = q_{sd} \cdot L^2 / 8 - q_{sd} \cdot x^2 / 2$$

$$Q_{sd}(x) = q_{sd} \cdot x$$

$$NR_{dG} = 68,44 \text{ kN}$$

$$MR_{dG} = 78,71 \text{ kNcm}$$

$$\text{M-Q Interaction} \quad M_{sd}(x) / (2 \cdot 0,35 \cdot 68,44) + Q_{sd}(x) \cdot 2,0 / 78,71$$

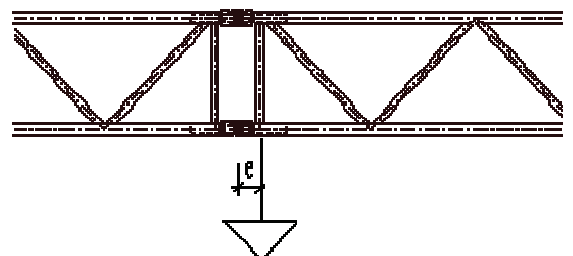
$$\text{Extreme value:} \quad d/dx \sigma(x) = 0$$

$$\Rightarrow x = 2 \cdot 0,35 \cdot 68,44 \cdot 2,0 / 78,71 = 1,217 \text{ m}$$

(from middle of span)

4. Verification of the side chords with single point loads (LC 2b)

No requirements for position of coupler (Distance between load and coupler is  $e \geq 9,5 \text{ cm}$ , see below)







## Summary

Following points are relevant for the determination of the allowable loads:

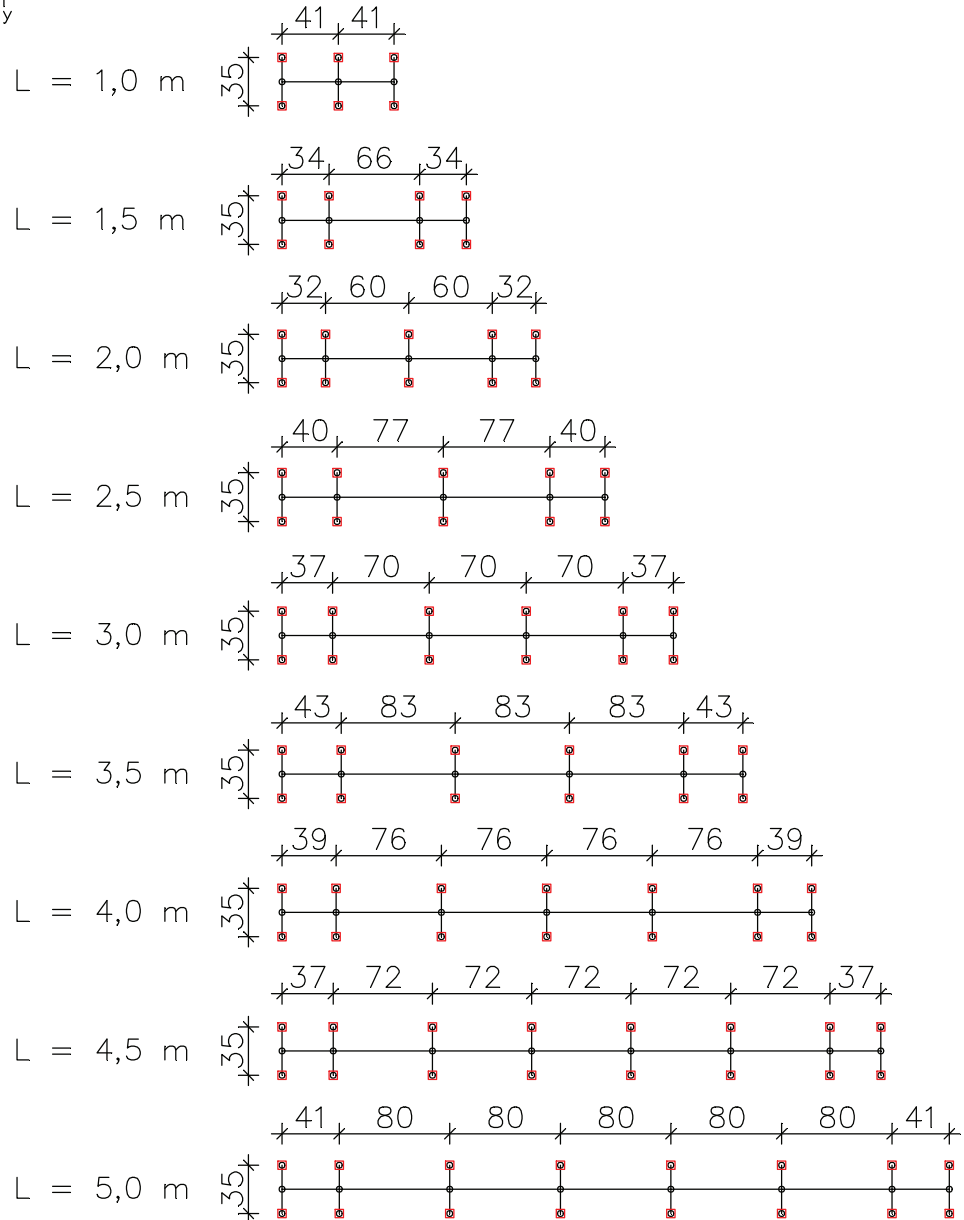
1. Allowable bending moment of the center chord at the bottom and the cross tubes ( $MR_{dG}$ )  $\Rightarrow MR_{dG} = 76,95 \text{ kNm}$
2. Allowable normal force in main chord ( $NR_{dG}$ )  
Main chord in heat affected zone at coupler is relevant  $\Rightarrow NR_{dG} = 68,44 \text{ kN}$
3. Global shear force in truss (Q)  
Allowable normal force in diagonals at nodes is relevant  $\Rightarrow NR_{dD} = 24,55 \text{ kN}$   
  
zul shear force from  $QR_d / (2 \cdot \sin 41^\circ) < 0,9 \cdot NR_{dD}$   
\* 10% reduction because of minor stresses  
 $\Rightarrow \text{allow. } QR_d = 0,9 \cdot 24,55 \cdot 2 \cdot \sin 41^\circ \Rightarrow QR_d = 28,99 \text{ kN}$
4. Interaction bending and normal force at coupler  $\Rightarrow$  see page 13



## 5 ALLOWABLE LOADING SINGLE SPAN GIRDER

### 5.1 Center chords at bottom

Systems [cm]:

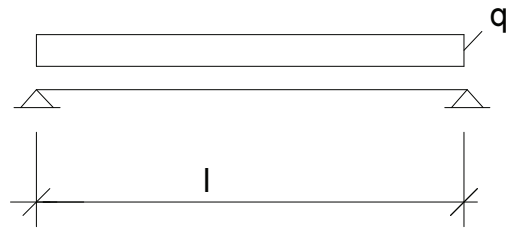


Loadings:	Multiple point loads at a distance of 50 cm Single point load (CPL or at 1/3-, 1/4- or 1/5-pts)	Pi = 3,0 kN see following pages Pi = 5,0 kN
Calculation		see following pages
Verification:	Multiple point loads max M <sub>Ed</sub> = 1,5 · 45 kNcm = 67,5 kNcm	< MRd = 76,95 kNcm
	Single point load max M <sub>Ed</sub> = 1,5 · 5 · 35 / 4 = 66 kNcm	< MRd = 76,95 kNcm



## 5.2 Outer chords + bracing uniformly distributed load (UDL)

System:



**Loading**

$$q_{sd} = p_{sd} + g_{sd}$$

(Net load + selfweight, incl. safety factors)

Normal force in chords:

$$\begin{aligned} NR_d &\geq q_{sd} \cdot L^2 / 8 / (n \cdot b) \\ \Rightarrow q_{sd} &\leq NR_d \cdot (n \cdot b) \cdot 8 / L^2 \\ \Rightarrow \text{zul } p &= (NR_d \cdot (n \cdot b) \cdot 8 / L^2 - g_{sd}) / \gamma_F \end{aligned}$$

Normal force in bracing:

$$\begin{aligned} QR_d &\geq q_{sd} \cdot L / 2 \\ \Rightarrow q_{sd} &\leq QR_d \cdot 2 / L \\ \Rightarrow \text{zul } p &= (QR_d \cdot 2 / L - g_{sd}) / \gamma_F \end{aligned}$$

Interaction at coupler:

Verification of interaction bending and normal force at coupler by an iterative method.

$$\Rightarrow (N_{sdG} / NR_{dG})^{1,3} + (M_{sdG} / MR_{dG}) < 1,0$$

The coupler is located at  $e = 1,217$  m from the middle of the span (theoretically worst point, see extremum-calculation in chapter 4)

Center chord at bottom:

$$\text{zul } p \leq 6,0 \text{ kN/m}$$

Limit of deflection:

$$\begin{aligned} \text{Limit of deflection max. } u &= L / f \\ \Rightarrow \text{zul } p &= (L / f) / (5/384 \cdot L^4 / E / I_{yy}) - g \end{aligned}$$

3 different limitations are taken into account:

$$\begin{aligned} \text{max. } u &= L / 100 \\ \text{max. } u &= L / 200 \\ \text{max. } u &= L / 300 \end{aligned}$$

Loading tables:

see following pages



### Uniformly distributed load UDL

	zulässige Belastung in Abhängigkeit von allowable load as a function of			
	NRd	QRd	Interaction at coupler	Deflection L/100
L [m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]
4,00	15,84	9,53	12,60	59,85
5,00	10,09	7,60	8,75	30,57
6,00	6,96	6,31	6,31	17,63
7,00	5,08	5,39	4,73	11,05
8,00	3,86	4,70	3,65	7,35
9,00	3,02	4,16	2,89	5,12
10,00	2,42	3,73	2,34	3,69
11,00	1,98	3,38	1,92	2,74
12,00	1,64	3,09	1,60	2,07
13,00	1,38	2,84	1,35	1,60
14,00	1,17	2,63	1,15	1,25
15,00	1,00	2,44	0,99	0,99
16,00	0,86	2,28	0,85	0,79
17,00	0,75	2,14	0,74	0,63
18,00	0,66	2,01	0,65	0,51
19,00	0,57	1,90	0,57	0,41
20,00	0,51	1,80	0,50	0,33
21,00	0,45	1,71	0,44	0,27
22,00	0,39	1,62	0,39	0,21
23,00	0,35	1,55	0,35	0,17
24,00	0,31	1,48	0,31	0,13

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 6,0$  kN/m

### Uniformly distributed load UDL

	zulässige Belastung in Abhängigkeit von allowable load as a function of			
	NRd	QRd	Interaction at coupler	Deflection L/200
L [m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]
4,00	15,84	9,53	12,60	29,85
5,00	10,09	7,60	8,75	15,21
6,00	6,96	6,31	6,31	8,74
7,00	5,08	5,39	4,73	5,45
8,00	3,86	4,70	3,65	3,60
9,00	3,02	4,16	2,89	2,49
10,00	2,42	3,73	2,34	1,77
11,00	1,98	3,38	1,92	1,29
12,00	1,64	3,09	1,60	0,96
13,00	1,38	2,84	1,35	0,73
14,00	1,17	2,63	1,15	0,55
15,00	1,00	2,44	0,99	0,42
16,00	0,86	2,28	0,85	0,32
17,00	0,75	2,14	0,74	0,24
18,00	0,66	2,01	0,65	0,18
19,00	0,57	1,90	0,57	0,13
20,00	0,51	1,80	0,50	0,09
21,00	0,45	1,71	0,44	0,06
22,00	0,39	1,62	0,39	0,03

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 6,0$  kN/m



### Uniformly distributed load UDL

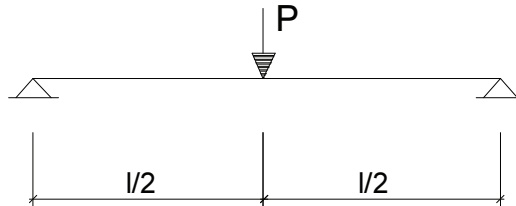
	zulässige Belastung in Abhängigkeit von allowable load as a function of			
	NRd	QRd	Interaction at coupler	Deflection L/300
L [m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]	zul q [kN/m]
4,00	15,84	9,53	12,60	19,85
5,00	10,09	7,60	8,75	10,09
6,00	6,96	6,31	6,31	5,78
7,00	5,08	5,39	4,73	3,58
8,00	3,86	4,70	3,65	2,35
9,00	3,02	4,16	2,89	1,61
10,00	2,42	3,73	2,34	1,13
11,00	1,98	3,38	1,92	0,81
12,00	1,64	3,09	1,60	0,59
13,00	1,38	2,84	1,35	0,43
14,00	1,17	2,63	1,15	0,32
15,00	1,00	2,44	0,99	0,23
16,00	0,86	2,28	0,85	0,16
17,00	0,75	2,14	0,74	0,11
18,00	0,66	2,01	0,65	0,07
19,00	0,57	1,90	0,57	0,04
20,00	0,51	1,80	0,50	0,01

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 6,0$  kN/m



### 5.3 Outer chords + bracing single point load at 1/2-point

System:



**Loading**

Psd + gsd

(Net load + selfweight, incl. safety factors)

Normal force in chords:

$$\begin{aligned}NRd &\geq (Psd \cdot L / 4 + gsd \cdot L^2 / 8) / (n \cdot b) \\ \Rightarrow Psd &\leq [NRd \cdot (n \cdot b) - gsd \cdot L^2 / 8] \cdot 4 / L \\ \Rightarrow \text{zul } P &= [NRd \cdot (n \cdot b) - gsd \cdot L^2 / 8] \cdot 4 / L / yF\end{aligned}$$

Normal force in bracing:

$$\begin{aligned}QRd &\geq Psd / 2 + gsd \cdot L / 2 \\ \Rightarrow Psd &\leq (QRd - gsd \cdot L / 2) \cdot 2 \\ \Rightarrow \text{zul } P &= (QRd - gsd \cdot L / 2) \cdot 2 / yF\end{aligned}$$

Interaction at coupler:

Verification of interaction bending and normal force at coupler by an iterative method.

$$\Rightarrow (Nsd_G / NRd_G)^{1,3} + (Msd_G / MRd_G) < 1,0$$

The coupler is located at  $e = 0,095$  m from the coupler

Center chord at bottom:

$$\text{zul } P \leq 5,0 \text{ kN}$$

Limit of deflection:

$$\begin{aligned}\text{Limit of deflection max. } u &= L / f \\ \Rightarrow \text{zul } P &= [L / f - g \cdot (5/384 \cdot L^4 / E / I_{yy})] / (L^3/48 / E / I_{yy})\end{aligned}$$

3 different limitations are taken into account:

$$\text{max. } u = L / 100$$

$$\text{max. } u = L / 200$$

$$\text{max. } u = L / 300$$

Loading tables:

see following pages



### Single-load in 1/2point

zulässige Belastung in Abhängigkeit von				
allowable load as a function of				
	Nrd	Qrd	Interaction at coupler	Deflection L/100
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	31,67	38,12	22,09	149,63
5,00	25,22	37,99	18,79	95,54
6,00	20,89	37,85	16,29	66,11
7,00	17,78	37,72	14,34	48,33
8,00	15,44	37,59	12,76	36,76
9,00	13,59	37,45	11,46	28,80
10,00	12,11	37,32	10,37	23,07
11,00	10,88	37,19	9,44	18,82
12,00	9,85	37,05	8,64	15,56
13,00	8,96	36,92	7,93	13,00
14,00	8,19	36,79	7,31	10,95
15,00	7,52	36,65	6,75	9,28
16,00	6,92	36,52	6,25	7,89
17,00	6,38	36,39	5,80	6,73
18,00	5,90	36,25	5,39	5,74
19,00	5,46	36,12	5,01	4,89
20,00	5,05	35,99	4,66	4,15
21,00	4,68	35,85	4,33	3,50
22,00	4,34	35,72	4,03	2,92
23,00	4,02	35,59	3,74	2,41
24,00	3,72	35,45	3,48	1,94

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN

### Single-load in 1/2point

zulässige Belastung in Abhängigkeit von				
allowable load as a function of				
	Nrd	Qrd	Interaction at coupler	Deflection L/200
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	31,67	38,12	22,09	74,63
5,00	25,22	37,99	18,79	47,54
6,00	20,89	37,85	16,29	32,78
7,00	17,78	37,72	14,34	23,84
8,00	15,44	37,59	12,76	18,01
9,00	13,59	37,45	11,46	13,98
10,00	12,11	37,32	10,37	11,07
11,00	10,88	37,19	9,44	8,90
12,00	9,85	37,05	8,64	7,22
13,00	8,96	36,92	7,93	5,90
14,00	8,19	36,79	7,31	4,83
15,00	7,52	36,65	6,75	3,94
16,00	6,92	36,52	6,25	3,21
17,00	6,38	36,39	5,80	2,58
18,00	5,90	36,25	5,39	2,04
19,00	5,46	36,12	5,01	1,56
20,00	5,05	35,99	4,66	1,15
21,00	4,68	35,85	4,33	0,78
22,00	4,34	35,72	4,03	0,44

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN



### Single-load in 1/2point

zulässige Belastung in Abhängigkeit von allowable load as a function of				
	Nrd	Qrd	Interaction at coupler	Deflection L/300
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	31,67	38,12	22,09	49,63
5,00	25,22	37,99	18,79	31,54
6,00	20,89	37,85	16,29	21,67
7,00	17,78	37,72	14,34	15,68
8,00	15,44	37,59	12,76	11,76
9,00	13,59	37,45	11,46	9,04
10,00	12,11	37,32	10,37	7,07
11,00	10,88	37,19	9,44	5,59
12,00	9,85	37,05	8,64	4,44
13,00	8,96	36,92	7,93	3,53
14,00	8,19	36,79	7,31	2,79
15,00	7,52	36,65	6,75	2,17
16,00	6,92	36,52	6,25	1,64
17,00	6,38	36,39	5,80	1,19
18,00	5,90	36,25	5,39	0,80
19,00	5,46	36,12	5,01	0,46
20,00	5,05	35,99	4,66	0,15

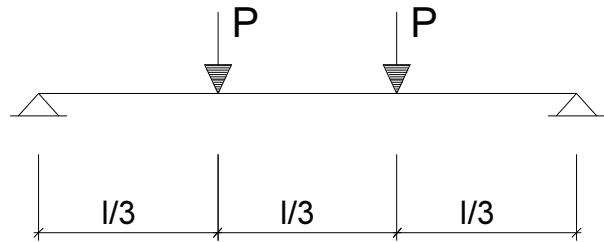
Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN





### 5.4 Outer chords + bracing single point load at 1/3-points

System:



**Loading**

Psd + gsd

(Net load + selfweight, incl. safety factors)

Normal force in chords:

$$NRd \geq (Psd \cdot L / 3 + gsd \cdot L^2 / 8) / (n \cdot b)$$

$$\Rightarrow Psd \leq [NRd \cdot (n \cdot b) - gsd \cdot L^2 / 8] \cdot 3 / L$$

$$\Rightarrow \text{zul } P = [NRd \cdot (n \cdot b) - gsd \cdot L^2 / 8] \cdot 3 / L / yF$$

Normal force in bracing:

$$QRd \geq Psd / 2 - gsd \cdot L / 2$$

$$\Rightarrow Psd \leq (QRd + gsd \cdot L / 2)$$

$$\Rightarrow \text{zul } P = (QRd + gsd \cdot L / 2) / yF$$

Interaction at coupler:

Verification of interaction bending and normal force at coupler by an iterative method.

$$\Rightarrow (Nsd_G / NRd_G)^{1,3} + (Msd_G / MRd_G) < 1,0$$

The coupler is located at e = 0,095 m from the coupler

Center chord at bottom:

$$\text{zul } P \leq 5,0 \text{ kN}$$

Limit of deflection:

$$\text{Limit of deflection max. } u = L / f$$

$$\Rightarrow \text{zul } P = [L / f - g \cdot (5/384 \cdot L^4/E/I_{yy})] / (23/684 \cdot L^3/E/I_{yy})$$

3 different limitations are taken into account:

$$\text{max. } u = L / 100$$

$$\text{max. } u = L / 200$$

$$\text{max. } u = L / 300$$

Loading tables:

see following pages



### Single-load in 1/3points

zulässige Belastung in Abhängigkeit von				
allowable load as a function of				
	Nrd	Qrd	Interaction at coupler	Deflection L/100
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	23,75	19,06	13,58	87,83
5,00	18,91	18,99	11,93	56,08
6,00	15,67	18,93	10,57	38,81
7,00	13,34	18,86	9,45	28,37
8,00	11,58	18,79	8,53	21,58
9,00	10,20	18,73	7,74	16,90
10,00	9,08	18,66	7,07	13,54
11,00	8,16	18,59	6,49	11,04
12,00	7,38	18,53	5,98	9,13
13,00	6,72	18,46	5,52	7,63
14,00	6,14	18,39	5,12	6,43
15,00	5,64	18,33	4,76	5,45
16,00	5,19	18,26	4,43	4,63
17,00	4,79	18,19	4,12	3,95
18,00	4,42	18,13	3,85	3,37
19,00	4,09	18,06	3,59	2,87
20,00	3,79	17,99	3,36	2,43
21,00	3,51	17,93	3,14	2,05
22,00	3,26	17,86	2,93	1,71
23,00	3,02	17,79	2,74	1,41
24,00	2,79	17,73	2,56	1,14

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN

### Single-load in 1/3points

zulässige Belastung in Abhängigkeit von				
allowable load as a function of				
	Nrd	Qrd	Interaction at coupler	Deflection L/200
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	23,75	19,06	13,58	43,81
5,00	18,91	18,99	11,93	27,90
6,00	15,67	18,93	10,57	19,24
7,00	13,34	18,86	9,45	13,99
8,00	11,58	18,79	8,53	10,57
9,00	10,20	18,73	7,74	8,21
10,00	9,08	18,66	7,07	6,50
11,00	8,16	18,59	6,49	5,22
12,00	7,38	18,53	5,98	4,24
13,00	6,72	18,46	5,52	3,46
14,00	6,14	18,39	5,12	2,83
15,00	5,64	18,33	4,76	2,32
16,00	5,19	18,26	4,43	1,88
17,00	4,79	18,19	4,12	1,51
18,00	4,42	18,13	3,85	1,20
19,00	4,09	18,06	3,59	0,92
20,00	3,79	17,99	3,36	0,67
21,00	3,51	17,93	3,14	0,46
22,00	3,26	17,86	2,93	0,26

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN



### Single-load in 1/3points

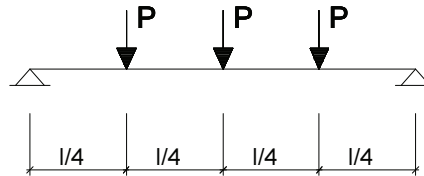
	zulässige Belastung in Abhängigkeit von allowable load as a function of			
	Nrd	Qrd	Interaction at coupler	Deflection L/300
			0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	23,75	19,06	13,58	29,13
5,00	18,91	18,99	11,93	18,51
6,00	15,67	18,93	10,57	12,72
7,00	13,34	18,86	9,45	9,20
8,00	11,58	18,79	8,53	6,90
9,00	10,20	18,73	7,74	5,31
10,00	9,08	18,66	7,07	4,15
11,00	8,16	18,59	6,49	3,28
12,00	7,38	18,53	5,98	2,61
13,00	6,72	18,46	5,52	2,07
14,00	6,14	18,39	5,12	1,63
15,00	5,64	18,33	4,76	1,27
16,00	5,19	18,26	4,43	0,96
17,00	4,79	18,19	4,12	0,70
18,00	4,42	18,13	3,85	0,47
19,00	4,09	18,06	3,59	0,27
20,00	3,79	17,99	3,36	0,09

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN



### **5.5 Outer chords + bracing single point load at 1/4-points**

System:



#### **Loading**

Psd + gsd

(Net load + selfweight, incl. safety factors)

Normal force in chords:

$$NR_d \geq (P_{sd} \cdot L / 4 + g_{sd} \cdot L^2 / 8) / (n \cdot b)$$

$$\Rightarrow P_{sd} \leq [NR_d \cdot (n \cdot b) - g_{sd} \cdot L^2 / 8] \cdot 2 / L$$

$$\Rightarrow \text{zul } P = [NR_d \cdot (n \cdot b) - g_{sd} \cdot L^2 / 8] \cdot 2 / L / \gamma_F$$

Normal force in bracing:

$$QR_d \geq 3 / 2 \cdot P_{sd} + g_{sd} \cdot L / 2$$

$$\Rightarrow P_{sd} \leq (QR_d - g_{sd} \cdot L / 2) \cdot 2 / 3$$

$$\Rightarrow \text{zul } P = (QR_d - g_{sd} \cdot L / 2) \cdot 2 / 3 / \gamma_F$$

Interaction at coupler:

Verification of interaction bending and normal force at coupler by an iterative method.

$$\Rightarrow (N_{sdG} / NR_{dG})^{1,3} + (M_{sdG} / MR_{dG}) < 1,0$$

The coupler is located at  $e = 0,095$  m from the coupler

Center chord at bottom:

$$\text{zul } P \leq 5,0 \text{ kN}$$

Limit of deflection:

Limit of deflection max.  $u = L / f$

$$\Rightarrow \text{zul } P = [L / f - g \cdot (5/384 \cdot L^4/E/I_{yy})] / (1/20,21 \cdot L^3/E/I_{yy})$$

3 different limitations are taken into account:

$$\text{max. } u = L / 100$$

$$\text{max. } u = L / 200$$

$$\text{max. } u = L / 300$$

Loading tables:

see following pages



**Single-load in 1/4points**

zulässige Belastung in Abhängigkeit von					
allowable load as a function of					
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/100
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	15,84	12,71	10,42	12,76	63,00
5,00	12,61	12,66	9,31	10,56	40,23
6,00	10,45	12,62	8,37	8,99	27,84
7,00	8,89	12,57	7,57	7,81	20,35
8,00	7,72	12,53	6,90	6,89	15,48
9,00	6,80	12,48	6,32	6,14	12,12
10,00	6,05	12,44	5,82	5,53	9,72
11,00	5,44	12,40	5,38	5,01	7,92
12,00	4,92	12,35	4,99	4,56	6,55
13,00	4,48	12,31	4,64	4,18	5,47
14,00	4,10	12,26	4,33	3,84	4,61
15,00	3,76	12,22	4,05	3,54	3,91
16,00	3,46	12,17	3,79	3,27	3,32
17,00	3,19	12,13	3,55	3,02	2,83
18,00	2,95	12,08	3,33	2,80	2,42
19,00	2,73	12,04	3,13	2,60	2,06
20,00	2,53	12,00	2,94	2,41	1,75
21,00	2,34	11,95	2,77	2,24	1,47
22,00	2,17	11,91	2,60	2,08	1,23
23,00	2,01	11,86	2,44	1,93	1,01
24,00	1,86	11,82	2,30	1,79	0,82

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN

**Single-load in 1/4points**

zulässige Belastung in Abhängigkeit von					
allowable load as a function of					
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/200
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	15,84	12,71	10,42	12,76	31,42
5,00	12,61	12,66	9,31	10,56	20,02
6,00	10,45	12,62	8,37	8,99	13,80
7,00	8,89	12,57	7,57	7,81	10,04
8,00	7,72	12,53	6,90	6,89	7,58
9,00	6,80	12,48	6,32	6,14	5,89
10,00	6,05	12,44	5,82	5,53	4,66
11,00	5,44	12,40	5,38	5,01	3,75
12,00	4,92	12,35	4,99	4,56	3,04
13,00	4,48	12,31	4,64	4,18	2,48
14,00	4,10	12,26	4,33	3,84	2,03
15,00	3,76	12,22	4,05	3,54	1,66
16,00	3,46	12,17	3,79	3,27	1,35
17,00	3,19	12,13	3,55	3,02	1,09
18,00	2,95	12,08	3,33	2,80	0,86
19,00	2,73	12,04	3,13	2,60	0,66
20,00	2,53	12,00	2,94	2,41	0,48
21,00	2,34	11,95	2,77	2,24	0,33
22,00	2,17	11,91	2,60	2,08	0,19

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN



**Single-load in 1/4points**

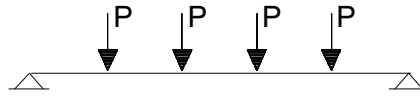
	zulässige Belastung in Abhängigkeit von				
	allowable load as a function of				
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/300
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	15,84	12,71	10,42	12,76	20,90
5,00	12,61	12,66	9,31	10,56	13,28
6,00	10,45	12,62	8,37	8,99	9,12
7,00	8,89	12,57	7,57	7,81	6,60
8,00	7,72	12,53	6,90	6,89	4,95
9,00	6,80	12,48	6,32	6,14	3,81
10,00	6,05	12,44	5,82	5,53	2,98
11,00	5,44	12,40	5,38	5,01	2,35
12,00	4,92	12,35	4,99	4,56	1,87
13,00	4,48	12,31	4,64	4,18	1,49
14,00	4,10	12,26	4,33	3,84	1,17
15,00	3,76	12,22	4,05	3,54	0,91
16,00	3,46	12,17	3,79	3,27	0,69
17,00	3,19	12,13	3,55	3,02	0,50
18,00	2,95	12,08	3,33	2,80	0,34
19,00	2,73	12,04	3,13	2,60	0,19
20,00	2,53	12,00	2,94	2,41	0,06

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN

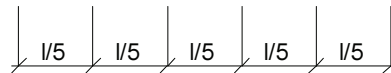


### 5.5 Outer chords + bracing single point load at 1/5-points

System:



**Loading**



Psd + gsd

(Net load + selfweight, incl. safety factors)

Normal force in chords:

$$\begin{aligned} NR_d &\geq (P_{sd} \cdot 3/5 \cdot L + g_{sd} \cdot L^2/8) / (n \cdot b) \\ \Rightarrow P_{sd} &\leq [NR_d \cdot (n \cdot b) - g_{sd} \cdot L^2/8] \cdot 5/3 \\ \Rightarrow \text{zul } P &= [NR_d \cdot (n \cdot b) - g_{sd} \cdot L^2/8] \cdot 5/3 / L / \gamma_F \end{aligned}$$

Normal force in bracing:

$$\begin{aligned} QR_d &\geq 2 \cdot P_{sd} + g_{sd} \cdot L/2 \\ \Rightarrow P_{sd} &\leq (QR_d - g_{sd} \cdot L/2) / 2 \\ \Rightarrow \text{zul } P &= (QR_d - g_{sd} \cdot L/2) / 2 / \gamma_F \end{aligned}$$

Interaction at coupler:

Verification of interaction bending and normal force at coupler by an iterative method.

$$\Rightarrow (N_{sdG} / NR_{dG})^{1.3} + (M_{sdG} / MR_{dG}) < 1,0$$

The coupler is located at  $e = 0,095$  m from the coupler

Center chord at bottom:

$$\text{zul } P \leq 5,0 \text{ kN}$$

Limit of deflection:

$$\begin{aligned} \text{Limit of deflection max. } u &= L / f \\ \Rightarrow \text{zul } P &= [L / f - g \cdot (5/384 \cdot L^4/E/I_{yy})] / (1/15,87 \cdot L^3/E/I_{yy}) \end{aligned}$$

3 different limitations are taken into account:

$$\text{max. } u = L / 100$$

$$\text{max. } u = L / 200$$

$$\text{max. } u = L / 300$$

Loading tables:

see following pages



**Single-load in 1/5points**

zulässige Belastung in Abhängigkeit von					
allowable load as a function of					
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/100
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	13,20	9,53	8,59	9,35	49,47
5,00	10,51	9,50	7,78	7,91	31,59
6,00	8,71	9,46	7,09	6,84	21,86
7,00	7,41	9,43	6,48	6,01	15,98
8,00	6,43	9,40	5,96	5,34	12,15
9,00	5,66	9,36	5,50	4,80	9,52
10,00	5,05	9,33	5,10	4,34	7,63
11,00	4,53	9,30	4,74	3,95	6,22
12,00	4,10	9,26	4,42	3,61	5,14
13,00	3,73	9,23	4,13	3,32	4,30
14,00	3,41	9,20	3,87	3,06	3,62
15,00	3,13	9,16	3,64	2,83	3,07
16,00	2,88	9,13	3,42	2,62	2,61
17,00	2,66	9,10	3,22	2,43	2,23
18,00	2,46	9,06	3,04	2,26	1,90
19,00	2,27	9,03	2,87	2,10	1,62
20,00	2,11	9,00	2,71	1,95	1,37
21,00	1,95	8,96	2,56	1,82	1,16
22,00	1,81	8,93	2,42	1,69	0,97
23,00	1,68	8,90	2,28	1,57	0,80
24,00	1,55	8,86	2,16	1,46	0,64

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN

**Single-load in 1/5points**

zulässige Belastung in Abhängigkeit von					
allowable load as a function of					
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/200
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	13,20	9,53	8,59	9,35	24,67
5,00	10,51	9,50	7,78	7,91	15,72
6,00	8,71	9,46	7,09	6,84	10,84
7,00	7,41	9,43	6,48	6,01	7,88
8,00	6,43	9,40	5,96	5,34	5,95
9,00	5,66	9,36	5,50	4,80	4,62
10,00	5,05	9,33	5,10	4,34	3,66
11,00	4,53	9,30	4,74	3,95	2,94
12,00	4,10	9,26	4,42	3,61	2,39
13,00	3,73	9,23	4,13	3,32	1,95
14,00	3,41	9,20	3,87	3,06	1,60
15,00	3,13	9,16	3,64	2,83	1,30
16,00	2,88	9,13	3,42	2,62	1,06
17,00	2,66	9,10	3,22	2,43	0,85
18,00	2,46	9,06	3,04	2,26	0,67
19,00	2,27	9,03	2,87	2,10	0,52
20,00	2,11	9,00	2,71	1,95	0,38
21,00	1,95	8,96	2,56	1,82	0,26
22,00	1,81	8,93	2,42	1,69	0,15

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN





### Single-load in 1/5points

	zulässige Belastung in Abhängigkeit von				
	allowable load as a function of				
	Nrd	Qrd	Interaction at coupler 1	Interaction at coupler 2	Deflection L/300
			0,095	0,095	= e [m]
L [m]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]	zul P [kN]
4,00	13,20	9,53	8,59	9,35	16,41
5,00	10,51	9,50	7,78	7,91	10,43
6,00	8,71	9,46	7,09	6,84	7,16
7,00	7,41	9,43	6,48	6,01	5,18
8,00	6,43	9,40	5,96	5,34	3,89
9,00	5,66	9,36	5,50	4,80	2,99
10,00	5,05	9,33	5,10	4,34	2,34
11,00	4,53	9,30	4,74	3,95	1,85
12,00	4,10	9,26	4,42	3,61	1,47
13,00	3,73	9,23	4,13	3,32	1,17
14,00	3,41	9,20	3,87	3,06	0,92
15,00	3,13	9,16	3,64	2,83	0,72
16,00	2,88	9,13	3,42	2,62	0,54
17,00	2,66	9,10	3,22	2,43	0,39
18,00	2,46	9,06	3,04	2,26	0,27
19,00	2,27	9,03	2,87	2,10	0,15
20,00	2,11	9,00	2,71	1,95	0,05

Note: If the load is applied at the center bottom chord (LC1) it has to be  $\leq 5,0$  kN



## 6 SUMMARY OF RESULTS

### 6.1 Allowable loadings at center bottom chord (LC1):

The values of the following tables are only valid for single-span girder.

The truss-elements have to be braced with diagonals.

Loads have to be applied acc. chapter 1.4.

Loads at the middle of the couplers are not allowed.

The specified values include partial safety coefficients on the loadings side acc. EN 1990 of  $\gamma_F = 1.50$  for payloads and  $\gamma_G = 1.35$  for selfweight of the truss.

For applications which can be calculated on the basis of other codes, the partial safety factors can be adjusted (for example temporary structures acc. EN 13814,  $\gamma_F = 1.35$  for payloads).

To use the resulting allowable loads with British Standard (BS) and ANSI, allowable loads listed in tables have to be multiplied by 0.85.

#### 6.1.1 Limitation of deflection = L/100

Allowable load F45 Loading applied on the central bottom chord



Span Spannweite		UDL on cBC UDL on cBC		Einzellasten / Single point loads							
				in 1/2 Point in 1/2 Punkt		in 1/3 Points in 1/3 Punkten		in 1/4 Points in 1/4 Punkten		in 1/5 Points in 1/5 Punkten	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	600	403	500	1103	500	1103	500	1103	500	1103
5	16,4	600	403	500	1103	500	1103	500	1103	500	1103
6	19,7	600	403	500	1103	500	1103	500	1103	500	1103
7	23,0	473	318	500	1103	500	1103	500	1103	500	1103
8	26,2	365	245	500	1103	500	1103	500	1103	500	1103
9	29,5	289	194	500	1103	500	1103	500	1103	480	1057
10	32,8	234	157	500	1103	500	1103	500	1103	434	957
11	36,1	192	129	500	1103	500	1103	500	1103	395	871
12	39,4	160	108	500	1103	500	1103	456	1006	361	797
13	42,7	135	91	500	1103	500	1103	418	921	332	732
14	45,9	115	77	500	1103	500	1103	384	846	306	675
15	49,2	99	66	500	1103	476	1049	354	780	283	624
16	52,5	79	53	500	1103	443	976	327	720	261	575
17	55,8	63	43	500	1103	395	871	283	625	223	491
18	59,1	51	34	500	1103	337	743	242	533	190	419
19	62,3	41	28	489	1078	287	633	206	454	162	356
20	65,6	33	22	415	915	243	537	175	385	137	302
21	68,9	27	18	350	771	205	453	147	325	116	255
22	72,2	21	14	292	644	171	378	123	271	97	213
23	75,5	17	11	241	531	141	312	101	223	80	176
24	78,7	13	9	194	429	114	252	82	181	64	142



Load limited by allowable local loading on the Bottom chord



Load limited by allowable deflection of L/100



### 6.1.2 Limitation of deflection = L/200

Allowable load F45 Loading applied on the central bottom chord



Span		UDL on cBC		Einzellasten / Single point loads							
Spannweite		UDL on cBC		in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	600	403	500	1103	500	1103	500	1103	500	1103
5	16,4	600	403	500	1103	500	1103	500	1103	500	1103
6	19,7	600	403	500	1103	500	1103	500	1103	500	1103
7	23,0	473	318	500	1103	500	1103	500	1103	500	1103
8	26,2	360	242	500	1103	500	1103	500	1103	500	1103
9	29,5	249	167	500	1103	500	1103	500	1103	462	1019
10	32,8	177	119	500	1103	500	1103	466	1028	366	807
11	36,1	129	87	500	1103	500	1103	375	826	294	649
12	39,4	96	65	500	1103	424	935	304	671	239	527
13	42,7	73	49	500	1103	346	763	248	547	195	430
14	45,9	55	37	483	1064	283	625	203	448	160	352
15	49,2	42	28	394	870	232	511	166	366	130	288
16	52,5	32	22	321	707	188	415	135	298	106	234
17	55,8	24	16	258	569	151	334	109	239	85	188
18	59,1	18	12	204	449	120	264	86	189	67	149
19	62,3	13	9	156	345	92	203	66	145	52	114
20	65,6	9	6	115	253	67	149	48	107	38	84
21	68,9	6	4	78	171	46	101	33	72	26	57
22	72,2	3	2	44	98	26	57	19	41	15	32



Load limited by allowable local loading on the Bottom chord



Load limited by allowable deflection of L/200



### 6.1.3 Limitation of deflection = L/300

Allowable load F45 Loading applied on the central bottom chord



Span		Einzellasten / Single point loads									
Spannweite		UDL on cBC		in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	600	403	500	1103	500	1103	500	1103	500	1103
5	16,4	600	403	500	1103	500	1103	500	1103	500	1103
6	19,7	578	388	500	1103	500	1103	500	1103	500	1103
7	23,0	358	241	500	1103	500	1103	500	1103	500	1103
8	26,2	235	158	500	1103	500	1103	495	1092	389	857
9	29,5	161	108	500	1103	500	1103	381	840	299	659
10	32,8	113	76	500	1103	415	916	298	657	234	516
11	36,1	81	55	500	1103	328	724	235	519	185	408
12	39,4	59	40	444	980	261	575	187	413	147	324
13	42,7	43	29	353	778	207	457	149	328	117	257
14	45,9	32	21	279	614	163	360	117	259	92	203
15	49,2	23	16	217	478	127	280	91	201	72	158
16	52,5	16	11	164	362	96	213	69	153	54	120
17	55,8	11	8	119	263	70	155	50	111	39	87
18	59,1	7	5	80	177	47	104	34	75	27	59
19	62,3	4	3	46	101	27	59	19	42	15	33
20	65,6	1	1	15	33	9	19	6	14	5	11



Load limited by allowable local loading on the Bottom chord



Load limited by allowable deflection of L/300



## 6.2 Allowable loadings at side chord (LC2):

The values of the following tables are only valid for single-span girder.

The truss-elements have to be braced with diagonals.

Loads have to be applied acc. chapter 1.4.

Loads at the middle of the couplers are not allowed.

The specified values include partial safety coefficients on the loadings side acc. EN 1990 of  $\gamma_F = 1.50$  for payloads and  $\gamma_G = 1.35$  for selfweight of the truss.

For applications which can be calculated on the basis of other codes, the partial safety factors can be adjusted (for example temporary structures acc. EN 13814,  $\gamma_F = 1.35$  for payloads).

To use the resulting allowable loads with British Standard (BS) and ANSI, allowable loads listed in tables have to be multiplied by 0.85.

### 6.2.1 Limitation of deflection = L/100

Allowable load F45 Loading applied on the side chords



Span		UDL on cBC		in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
Spannweite		UDL on cBC		in 1/2 Punkt		in 1/3 Punkten		in 1/4 Punkten		in 1/5 Punkten	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	953	640	2209	4870	1358	2994	1042	2298	859	1895
5	16,4	760	511	1879	4143	1193	2631	931	2053	778	1716
6	19,7	631	424	1629	3593	1057	2330	837	1845	684	1507
7	23,0	473	318	1434	3161	945	2084	757	1670	601	1324
8	26,2	365	245	1276	2814	853	1880	689	1519	534	1178
9	29,5	289	194	1146	2527	774	1707	614	1354	480	1057
10	32,8	234	157	1037	2287	707	1559	553	1218	434	957
11	36,1	192	129	944	2082	649	1431	501	1104	395	871
12	39,4	160	108	864	1904	598	1318	456	1006	361	797
13	42,7	135	91	793	1749	552	1218	418	921	332	732
14	45,9	115	77	731	1612	512	1129	384	846	306	675
15	49,2	99	66	675	1489	476	1049	354	780	283	624
16	52,5	79	53	625	1379	443	976	327	720	261	575
17	55,8	63	43	580	1279	395	871	283	625	223	491
18	59,1	51	34	539	1188	337	743	242	533	190	419
19	62,3	41	28	489	1078	287	633	206	454	162	356
20	65,6	33	22	415	915	243	537	175	385	137	302
21	68,9	27	18	350	771	205	453	147	325	116	255
22	72,2	21	14	292	644	171	378	123	271	97	213
23	75,5	17	11	241	531	141	312	101	223	80	176
24	78,7	13	9	194	429	114	252	82	181	64	142

Load limited by allowable deflection of L/100



### 6.2.2 Limitation of deflection = L/200

Allowable load F45 Loading applied on the side chords



Span		UDL on cBC		in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
Spannweite		UDL on cBC		in 1/2 Punkt		in 1/3 Punkten		in 1/4 Punkten		in 1/5 Punkten	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	953	640	2209	4870	1358	2994	1042	2298	859	1895
5	16,4	760	511	1879	4143	1193	2631	931	2053	778	1716
6	19,7	631	424	1629	3593	1057	2330	837	1845	684	1507
7	23,0	473	318	1434	3161	945	2084	757	1670	601	1324
8	26,2	360	242	1276	2814	853	1880	689	1519	534	1178
9	29,5	249	167	1146	2527	774	1707	589	1298	462	1019
10	32,8	177	119	1037	2287	650	1433	466	1028	366	807
11	36,1	129	87	890	1962	522	1152	375	826	294	649
12	39,4	96	65	722	1593	424	935	304	671	239	527
13	42,7	73	49	590	1300	346	763	248	547	195	430
14	45,9	55	37	483	1064	283	625	203	448	160	352
15	49,2	42	28	394	870	232	511	166	366	130	288
16	52,5	32	22	321	707	188	415	135	298	106	234
17	55,8	24	16	258	569	151	334	109	239	85	188
18	59,1	18	12	204	449	120	264	86	189	67	149
19	62,3	13	9	156	345	92	203	66	145	52	114
20	65,6	9	6	115	253	67	149	48	107	38	84
21	68,9	6	4	78	171	46	101	33	72	26	57
22	72,2	3	2	44	98	26	57	19	41	15	32



### 6.2.3 Limitation of deflection = L/300

Allowable load F45 Loading applied on the side chords



Span		Einzellasten / Single point loads									
Spannweite		UDL on cBC		in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[kg/m]	[lbs/ft]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
4	13,1	953	640	2209	4870	1358	2994	1042	2298	859	1895
5	16,4	760	511	1879	4143	1193	2631	931	2053	778	1716
6	19,7	578	388	1629	3593	1057	2330	837	1845	684	1507
7	23,0	358	241	1434	3161	920	2029	660	1456	518	1143
8	26,2	235	158	1176	2593	690	1522	495	1092	389	857
9	29,5	161	108	904	1994	531	1170	381	840	299	659
10	32,8	113	76	707	1560	415	916	298	657	234	516
11	36,1	81	55	559	1233	328	724	235	519	185	408
12	39,4	59	40	444	980	261	575	187	413	147	324
13	42,7	43	29	353	778	207	457	149	328	117	257
14	45,9	32	21	279	614	163	360	117	259	92	203
15	49,2	23	16	217	478	127	280	91	201	72	158
16	52,5	16	11	164	362	96	213	69	153	54	120
17	55,8	11	8	119	263	70	155	50	111	39	87
18	59,1	7	5	80	177	47	104	34	75	27	59
19	62,3	4	3	46	101	27	59	19	42	15	33
20	65,6	1	1	15	33	9	19	6	14	5	11

Load limited by allowable deflection of L/300



### 6.3 Deflections at max. allowable loadings on center bottom chords (LC1):

#### 6.3.1 Limitation of deflection = L/100

Deflections [cm] for F45 at max. allowable loading on central Bottom chord

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
				in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,41	0,16	0,14	0,06	0,24	0,09	0,33	0,13	0,41	0,16
5	16,4	1,00	0,39	0,28	0,11	0,47	0,18	0,64	0,25	0,81	0,32
6	19,7	2,07	0,82	0,50	0,20	0,82	0,32	1,12	0,44	1,41	0,56
7	23,0	3,05	1,20	0,81	0,32	1,31	0,52	1,79	0,70	2,25	0,89
8	26,2	4,05	1,60	1,22	0,48	1,98	0,78	2,69	1,06	3,38	1,33
9	29,5	5,19	2,05	1,77	0,70	2,84	1,12	3,86	1,52	4,66	1,83
10	32,8	6,47	2,55	2,47	0,97	3,94	1,55	5,33	2,10	5,85	2,30
11	36,1	7,89	3,11	3,34	1,31	5,29	2,08	7,15	2,82	7,19	2,83
12	39,4	9,44	3,72	4,40	1,73	6,93	2,73	8,60	3,39	8,67	3,41
13	42,7	11,14	4,38	5,68	2,24	8,90	3,50	10,18	4,01	10,29	4,05
14	45,9	12,97	5,11	7,20	2,83	11,22	4,42	11,90	4,68	12,07	4,75
15	49,2	14,95	5,89	8,98	3,54	13,35	5,25	13,76	5,42	13,98	5,51
16	52,5	16,00	6,30	11,06	4,35	15,40	6,06	15,77	6,21	16,00	6,30
17	55,8	17,00	6,69	13,46	5,30	17,00	6,69	17,00	6,69	17,00	6,69
18	59,1	18,00	7,09	16,20	6,38	18,00	7,09	18,00	7,09	18,00	7,09
19	62,3	19,00	7,48	19,00	6,38	19,00	7,48	19,00	7,48	19,00	7,48
20	65,6	20,00	7,87	20,00	6,38	20,00	7,87	20,00	7,87	20,00	7,87
21	68,9	21,00	8,27	21,00	6,38	21,00	8,27	21,00	8,27	21,00	8,27
22	72,2	22,00	8,66	22,00	6,38	22,00	8,66	22,00	8,66	22,00	8,66
23	75,5	23,00	9,06	23,00	6,38	23,00	9,06	23,00	9,06	23,00	9,06
24	78,7	24,00	9,45	24,00	6,38	24,00	9,45	24,00	9,45	24,00	9,45

#### 6.3.2 Limitation of deflection = L/200

Deflections [cm] for F45 at max. allowable loading on central Bottom chord

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
				in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,41	0,16	0,14	0,06	0,24	0,09	0,33	0,13	0,41	0,16
5	16,4	1,00	0,39	0,28	0,11	0,47	0,18	0,64	0,25	0,81	0,32
6	19,7	2,07	0,82	0,50	0,20	0,82	0,32	1,12	0,44	1,41	0,56
7	23,0	3,05	1,20	0,81	0,32	1,31	0,52	1,79	0,70	2,25	0,89
8	26,2	4,00	1,57	1,22	0,48	1,98	0,78	2,69	1,06	3,38	1,33
9	29,5	4,50	1,77	1,77	0,70	2,84	1,12	3,86	1,52	4,50	1,77
10	32,8	5,00	1,97	2,47	0,97	3,94	1,55	5,00	1,97	5,00	1,97
11	36,1	5,50	2,17	3,34	1,31	5,29	2,08	5,50	2,17	5,50	2,17
12	39,4	6,00	2,36	4,40	1,73	6,00	2,36	6,00	2,36	6,00	2,36
13	42,7	6,50	2,56	5,68	2,24	6,50	2,56	6,50	2,56	6,50	2,56
14	45,9	7,00	2,76	7,00	2,76	7,00	2,76	7,00	2,76	7,00	2,76
15	49,2	7,50	2,95	7,50	2,95	7,50	2,95	7,50	2,95	7,50	2,95
16	52,5	8,00	3,15	8,00	3,15	8,00	3,15	8,00	3,15	8,00	3,15
17	55,8	8,50	3,35	8,50	3,35	8,50	3,35	8,50	3,35	8,50	3,35
18	59,1	9,00	3,54	9,00	3,54	9,00	3,54	9,00	3,54	9,00	3,54
19	62,3	9,50	3,74	9,50	3,74	9,50	3,74	9,50	3,74	9,50	3,74
20	65,6	10,00	3,94	10,00	3,94	10,00	3,94	10,00	3,94	10,00	3,94
21	68,9	10,50	4,13	10,50	4,13	10,50	4,13	10,50	4,13	10,50	4,13
22	72,2	11,00	4,33	11,00	4,33	11,00	4,33	11,00	4,33	11,00	4,33





### 6.3.3 Limitation of deflection = L/300

Deflections [cm] for F45 at max. allowable loading on central Bottom chord

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
				in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,41	0,16	0,14	0,06	0,24	0,09	0,33	0,13	0,41	0,16
5	16,4	1,00	0,39	0,28	0,11	0,47	0,18	0,64	0,25	0,81	0,32
6	19,7	2,00	0,79	0,50	0,20	0,82	0,32	1,12	0,44	1,41	0,56
7	23,0	2,33	0,92	0,81	0,32	1,31	0,52	1,79	0,70	2,25	0,89
8	26,2	2,67	1,05	1,22	0,48	1,98	0,78	2,67	1,05	2,67	1,05
9	29,5	3,00	1,18	1,77	0,70	2,84	1,12	3,00	1,18	3,00	1,18
10	32,8	3,33	1,31	2,47	0,97	3,33	1,31	3,33	1,31	3,33	1,31
11	36,1	3,67	1,44	3,34	1,31	3,67	1,44	3,67	1,44	3,67	1,44
12	39,4	4,00	1,57	4,00	1,57	4,00	1,57	4,00	1,57	4,00	1,57
13	42,7	4,33	1,71	4,33	1,71	4,33	1,71	4,33	1,71	4,33	1,71
14	45,9	4,67	1,84	4,67	1,84	4,67	1,84	4,67	1,84	4,67	1,84
15	49,2	5,00	1,97	5,00	1,97	5,00	1,97	5,00	1,97	5,00	1,97
16	52,5	5,33	2,10	5,33	2,10	5,33	2,10	5,33	2,10	5,33	2,10
17	55,8	5,67	2,23	5,67	2,23	5,67	2,23	5,67	2,23	5,67	2,23
18	59,1	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36
19	62,3	6,33	2,49	6,33	2,49	6,33	2,49	6,33	2,49	6,33	2,49
20	65,6	6,67	2,62	6,67	2,62	6,67	2,62	6,67	2,62	6,67	2,62

### 6.4 Deflections at max. allowable loadings on side chords (LC2):

#### 6.4.1 Limitation of deflection = L/100

Deflections [cm] for F45 at max. allowable loading on the side chords

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
				in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
[m]	[ft]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,65	0,25	0,60	0,24	0,63	0,25	0,67	0,26	0,70	0,28
5	16,4	1,26	0,50	1,00	0,39	1,08	0,43	1,18	0,46	1,25	0,49
6	19,7	2,18	0,86	1,52	0,60	1,67	0,66	1,84	0,72	1,91	0,75
7	23,0	3,05	1,20	2,14	0,84	2,39	0,94	2,66	1,05	2,69	1,06
8	26,2	4,05	1,60	2,88	1,13	3,26	1,28	3,65	1,44	3,60	1,42
9	29,5	5,19	2,05	3,73	1,47	4,26	1,68	4,68	1,84	4,66	1,83
10	32,8	6,47	2,55	4,71	1,85	5,41	2,13	5,85	2,30	5,85	2,30
11	36,1	7,89	3,11	5,80	2,28	6,70	2,64	7,16	2,82	7,19	2,83
12	39,4	9,44	3,72	7,02	2,76	8,13	3,20	8,60	3,39	8,67	3,41
13	42,7	11,14	4,38	8,36	3,29	9,72	3,83	10,18	4,01	10,29	4,05
14	45,9	12,97	5,11	9,84	3,87	11,45	4,51	11,90	4,68	12,07	4,75
15	49,2	14,95	5,89	11,45	4,51	13,35	5,25	13,76	5,42	13,98	5,51
16	52,5	16,00	6,30	13,20	5,20	15,40	6,06	15,77	6,21	16,00	6,30
17	55,8	17,00	6,69	15,10	5,94	17,00	6,69	17,00	6,69	17,00	6,69
18	59,1	18,00	7,09	17,14	6,75	18,00	7,09	18,00	7,09	18,00	7,09
19	62,3	19,00	7,48	19,00	7,48	19,00	7,48	19,00	7,48	19,00	7,48
20	65,6	20,00	7,87	20,00	7,87	20,00	7,87	20,00	7,87	20,00	7,87
21	68,9	21,00	8,27	21,00	8,27	21,00	8,27	21,00	8,27	21,00	8,27
22	72,2	22,00	8,66	22,00	8,66	22,00	8,66	22,00	8,66	22,00	8,66
23	75,5	23,00	9,06	23,00	9,06	23,00	9,06	23,00	9,06	23,00	9,06
24	78,7	24,00	9,45	24,00	9,45	24,00	9,45	24,00	9,45	24,00	9,45



### 6.4.2 Limitation of deflection = L/200

Deflections [cm] for F45 at max. allowable loading on the side chords

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
[m]	[ft]	[cm]	[inch]	in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
				[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,65	0,25	0,60	0,24	0,63	0,25	0,67	0,26	0,70	0,28
5	16,4	1,26	0,50	1,00	0,39	1,08	0,43	1,18	0,46	1,25	0,49
6	19,7	2,18	0,86	1,52	0,60	1,67	0,66	1,84	0,72	1,91	0,75
7	23,0	3,05	1,20	2,14	0,84	2,39	0,94	2,66	1,05	2,69	1,06
8	26,2	4,00	1,57	2,88	1,13	3,26	1,28	3,65	1,44	3,60	1,42
9	29,5	4,50	1,77	3,73	1,47	4,26	1,68	4,50	1,77	4,50	1,77
10	32,8	5,00	1,97	4,71	1,85	5,00	1,97	5,00	1,97	5,00	1,97
11	36,1	5,50	2,17	5,50	2,17	5,50	2,17	5,50	2,17	5,50	2,17
12	39,4	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36
13	42,7	6,50	2,56	6,50	2,56	6,50	2,56	6,50	2,56	6,50	2,56
14	45,9	7,00	2,76	7,00	2,76	7,00	2,76	7,00	2,76	7,00	2,76
15	49,2	7,50	2,95	7,50	2,95	7,50	2,95	7,50	2,95	7,50	2,95
16	52,5	8,00	3,15	8,00	3,15	8,00	3,15	8,00	3,15	8,00	3,15
17	55,8	8,50	3,35	8,50	3,35	8,50	3,35	8,50	3,35	8,50	3,35
18	59,1	9,00	3,54	9,00	3,54	9,00	3,54	9,00	3,54	9,00	3,54
19	62,3	9,50	3,74	9,50	3,74	9,50	3,74	9,50	3,74	9,50	3,74
20	65,6	10,00	3,94	10,00	3,94	10,00	3,94	10,00	3,94	10,00	3,94
21	68,9	10,50	4,13	10,50	4,13	10,50	4,13	10,50	4,13	10,50	4,13
22	72,2	11,00	4,33	11,00	4,33	11,00	4,33	11,00	4,33	11,00	4,33

### 6.4.3 Limitation of deflection = L/300

Deflections [cm] for F45 at max. allowable loading on the side chords

Vorhandene Durchbiegung [cm] F45 unter max. zul. Lasten

Span		UDL		Einzellasten / Single point loads							
[m]	[ft]	[cm]	[inch]	in 1/2 Point		in 1/3 Points		in 1/4 Points		in 1/5 Points	
				[cm]	[inch]	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
4	13,1	0,65	0,25	0,60	0,24	0,63	0,25	0,67	0,26	0,70	0,28
5	16,4	1,26	0,50	1,00	0,39	1,08	0,43	1,18	0,46	1,25	0,49
6	19,7	2,00	0,79	1,52	0,60	1,67	0,66	1,84	0,72	1,91	0,75
7	23,0	2,33	0,92	2,14	0,84	2,33	0,92	2,33	0,92	2,33	0,92
8	26,2	2,67	1,05	2,67	1,05	2,67	1,05	2,67	1,05	2,67	1,05
9	29,5	3,00	1,18	3,00	1,18	3,00	1,18	3,00	1,18	3,00	1,18
10	32,8	3,33	1,31	3,33	1,31	3,33	1,31	3,33	1,31	3,33	1,31
11	36,1	3,67	1,44	3,67	1,44	3,67	1,44	3,67	1,44	3,67	1,44
12	39,4	4,00	1,57	4,00	1,57	4,00	1,57	4,00	1,57	4,00	1,57
13	42,7	4,33	1,71	4,33	1,71	4,33	1,71	4,33	1,71	4,33	1,71
14	45,9	4,67	1,84	4,67	1,84	4,67	1,84	4,67	1,84	4,67	1,84
15	49,2	5,00	1,97	5,00	1,97	5,00	1,97	5,00	1,97	5,00	1,97
16	52,5	5,33	2,10	5,33	2,10	5,33	2,10	5,33	2,10	5,33	2,10
17	55,8	5,67	2,23	5,67	2,23	5,67	2,23	5,67	2,23	5,67	2,23
18	59,1	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36	6,00	2,36
19	62,3	6,33	2,49	6,33	2,49	6,33	2,49	6,33	2,49	6,33	2,49
20	65,6	6,67	2,62	6,67	2,62	6,67	2,62	6,67	2,62	6,67	2,62