1. Eingabedaten Wandscheibe aus Brettsperrholz

Nachweise nach DIN EN 1995, Deutschland, Nutzungsklasse 1

1.1. Berechnungseinstellungen

Netzdichtefaktor = 2 [-]

2. Systembeschreibung

Systemlänge l = 8500 mm, Systemhöhe h = 3100 mm

2.1. Wandtyp

Leno 2 200 5s, Aufbau 40.0-**40.0**-40.0-**40.0**-40.0 Nadelvollholz C24
Decklagen in y-Richtung, d = 200.0 mm ⇒ d_x = 80 mm, d_y = 120 mm,
Schmalflächen nicht verleimt

2.2. Brandschutz

Feuerwiderstandsdauer t_f = 30 min
Abbrandrate β_n = 0.700 mm/min

Seite	Brand	geschßtzt	t_{ch} [min]	t_f [min]	k_2 [-]	d_{ef} [mm]
+z	-	-	---	---	---	---
-z	x	-	---	---	---	28.0

Brandquerschnitt ⇒ 12.0-**40.0**-40.0-**40.0**-40.0

2.3. Verformung

Grenzwerte nach DIN EN 1995-1-1, Tab 7.2
Nachweispunkte Scheibe

Nr	x [mm]	y [mm]	l [mm]	Richtung	α [°]	Kragarm	Fixpunkt
1	4250	1550	2650	y	90	x	x

2.4. Statische Werte

Schubkorrekturfaktor κ_x = 0.174823, κ_y = 0.137467
Brettbreite b = 185 mm, Achsabstand der Bretter a = 185 mm
Nachweis nach Brettsperrholzhandbuch mit t* = 160.0 mm, t_m = 40.0 mm

2.5. Festigkeiten

$f_{c0,k}$ = 21.00 N/mm², $f_{t0,k}$ = 14.50 N/mm², $f_{v,k}$ = 3.08 N/mm², $f_{tor,k}$ = 2.50 N/mm², $f_{vR,k}$ = 0.70 N/mm²
Bitte die Schichtaufbauten und die Festigkeiten mit den aktuellen Herstellerangaben ßberprßfen

2.6. Rechteckige Öffnungen

Name	x [mm]	y [mm]	Breite [mm]	Höhe [mm]
Öffnung 1	-4350	-950	2300	1500
Öffnung 2	3150	-1050	1100	1500
Öffnung 3	-250	-850	1000	800

2.7. Linienlager

Name	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	Lager - x kN/mm²	Lager - y kN/mm²	Lager - mz kNm/m
Lagerlinie 1	-4250	1550	1600	1550	starr	starr	frei

2.8. Fugen

Name	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	Feder-p_l kN/m²	Feder-p_m kN/m²	Feder-m_n kNm/m
Fuge 1	-1750	-1550	-1750	1550	59878	106023	1060
Fuge 2	250	-1550	250	1550	171080	343328	421
Fuge 3	2450	-1550	2450	1550	74847	132529	848

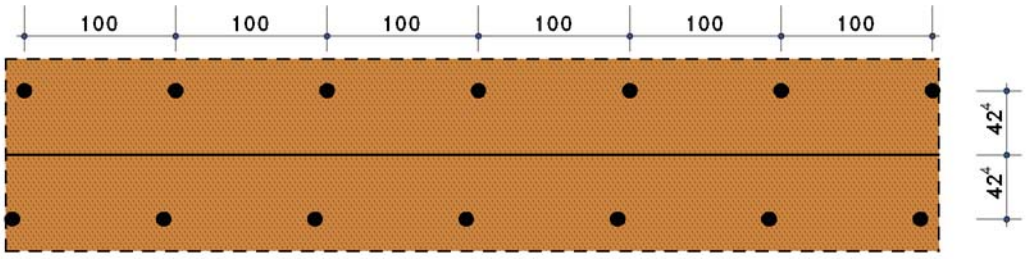
2.8.1. Fuge 1

Stoß mittels Vollgewindeschrauben unter 45°

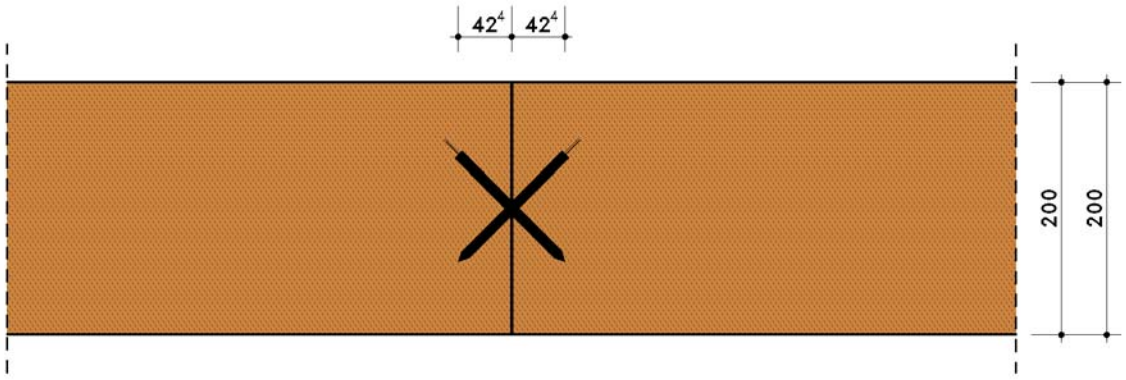
Verbindungsmittel

ASSY-plus VG Zylinderkopf, 8 x 120 mm, l_{ef} = 101 mm, d_1 = 5.0 mm, d_k = 10.0 mm
aus Kohlenstoffstahl, nicht vorgebohrt
Einschraubwinkel β = 45.0 °
Verwendung der Holzarten: Fichte, Tanne oder Kiefer
Unterlegscheibe d = 28 mm
$k_{ser,quer}$ = 2993.89 N/mm, $k_{ser,axial}$ = 12000.00 N/mm

$F_{v,Rk}$ wird gemäß DIN EN 1995, 8.2.2(2) erhöht
$M_{y,k}$ = 23000.00 Nmm, $R_{tu,k}$ = 22000 N, $F_{ax,k}$ = 3608 N, $F_{vR,k}$ = 1896 N
Verbindungsmittelabstand e_x = 100 mm
Draufsicht Maßstab 1:50



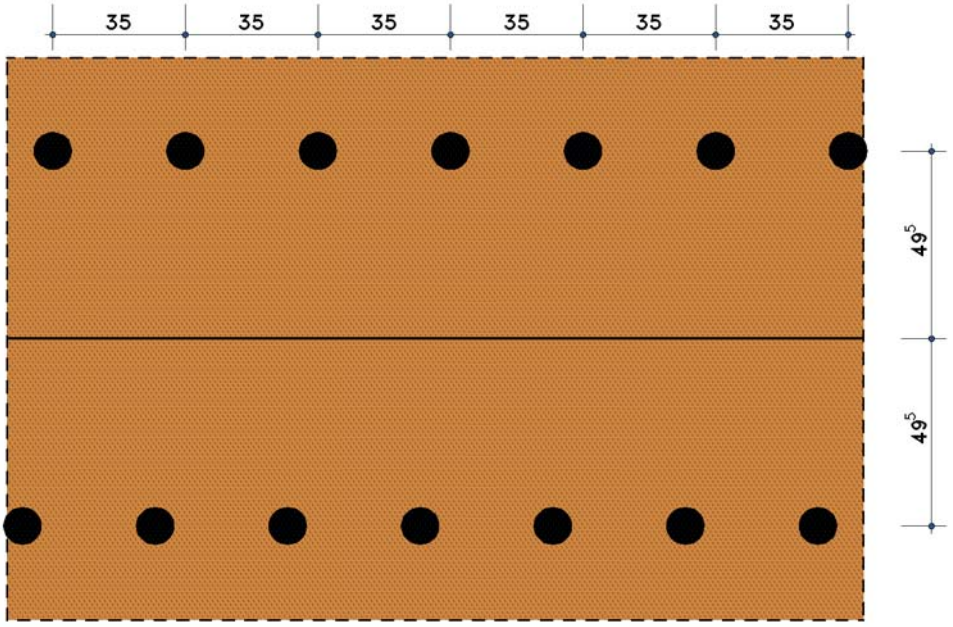
Schnitt Maßstab 1:60



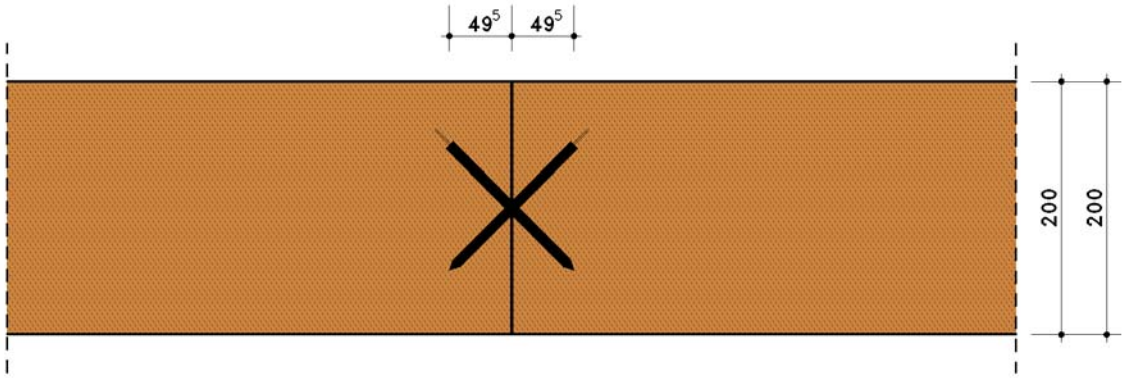
2.8.2. Fuge 2

Stoß mittels Vollgewindeschrauben unter 45°

Verbindungsmittel
ASSY-plus VG Zylinderkopf, 8 x 140 mm, l_{ef} = 121 mm, d_1 = 5.0 mm, d_K = 10.0 mm
aus Kohlenstoffstahl, nicht vorgebohrt
Einschraubwinkel β = 45.0 °
Verwendung der Holzarten: Fichte, Tanne oder Kiefer
Unterlegscheibe d = 28 mm
$k_{ser,quer}$ = 2993.89 N/mm, $k_{ser,axial}$ = 14000.00 N/mm
$F_{v,Rk}$ wird gemäß DIN EN 1995, 8.2.2(2) erhöht
$M_{y,k}$ = 23000.00 Nmm, $R_{tu,k}$ = 22000 N, $F_{ax,k}$ = 4488 N, $F_{vR,k}$ = 2282 N
Verbindungsmittelabstand e_x = 35 mm
Draufsicht Maßstab 1:20



Schnitt Maßstab 1:60

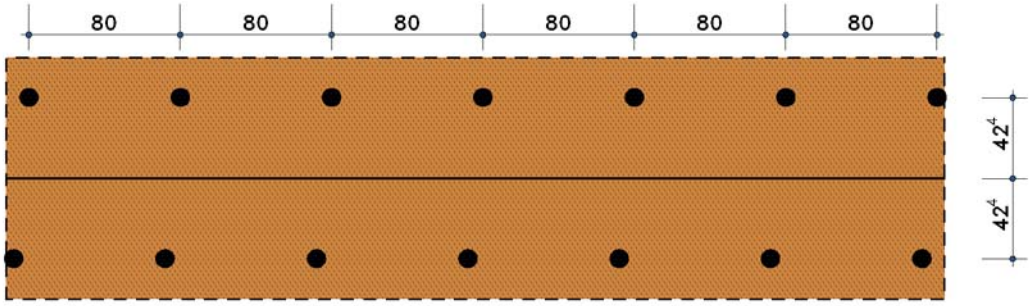


2.8.3. Fuge 3

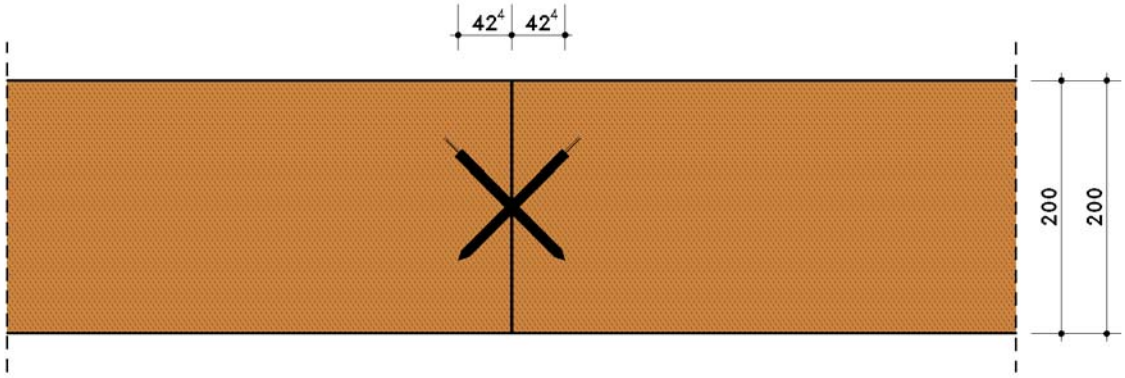
Stoß mittels Vollgewindeschrauben unter 45°

Verbindungsmittel

ASSY-plus VG Zylinderkopf, 8 x 120 mm, l_{ef} = 101 mm, d_1 = 5.0 mm, d_k = 10.0 mm
aus Kohlenstoffstahl, nicht vorgebohrt
Einschraubwinkel β = 45.0 °
Verwendung der Holzarten: Fichte, Tanne oder Kiefer
Unterlegscheibe d = 28 mm
$k_{ser,quer}$ = 2993.89 N/mm, $k_{ser,axial}$ = 12000.00 N/mm
$F_{v,Rk}$ wird gemäß DIN EN 1995, 8.2.2(2) erhöht
$M_{y,k}$ = 23000.00 Nmm, $R_{tu,k}$ = 22000 N, $F_{ax,k}$ = 3608 N, $F_{vR,k}$ = 1896 N
Verbindungsmittelabstand e_x = 80 mm
Draufsicht Maßstab 1:40

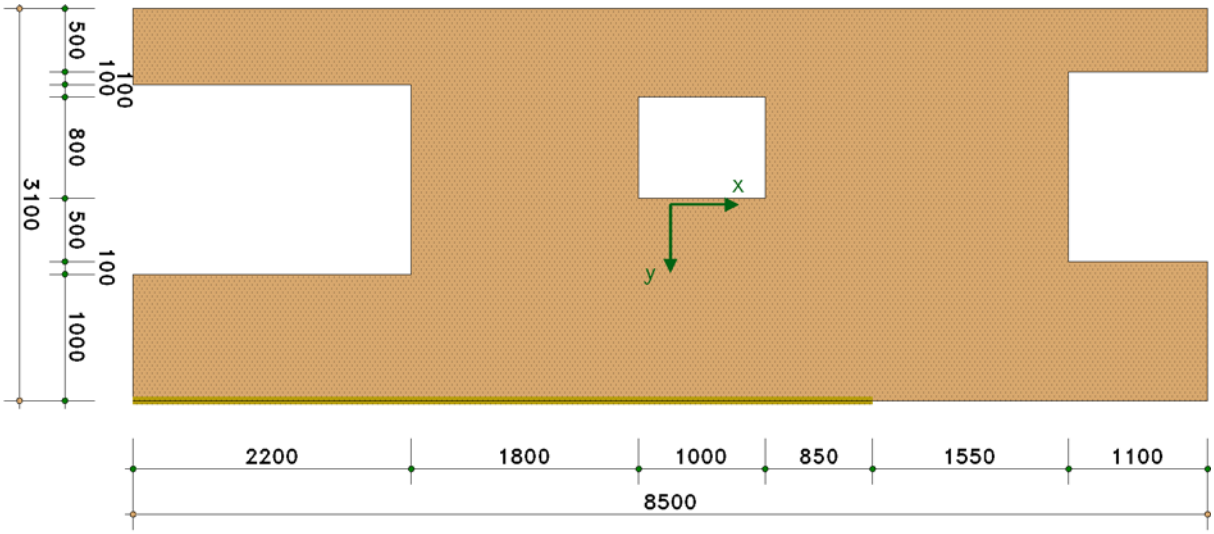


Schnitt Maßstab 1:60



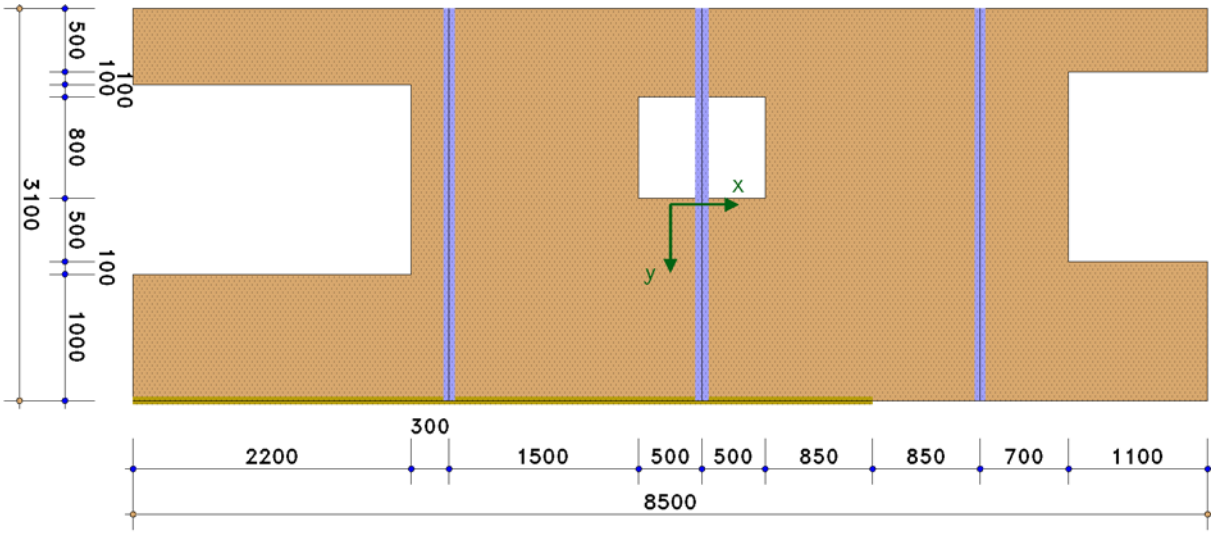
2.9. Wandscheibe

Ansicht Maßstab 1:599



2.10. Alle Fugen

Ansicht Maßstab 1:599



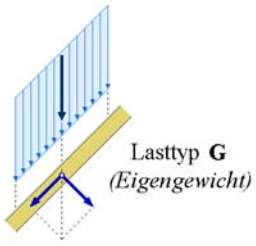
3. Einwirkungen / Lasten

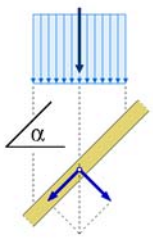
Beschreibung der Belastungsstruktur

Auf der linken Seite sind die Beziehungen der Einwirkungen, Lastfallordner und Lastfälle zueinander in einer Baumstruktur dargestellt. Auf der rechten Seite sind die überlagerungsspezifischen Eigenschaften den links stehenden Objekten zugeordnet angegeben. Ein Lastfallordner entspricht überlagerungstechnisch einer Extremierung der in ihm definierten Objekte und kann seinerseits wiederum additiv oder alternativ überlagert werden.

verwendete Symbole: Einwirkung | Lastfallordner | Lastfall | Imperfektionsfälle

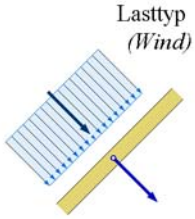
1: ständige Lasten	**ständige Lasten**
1: g1	additiv
2: g2	additiv
3: g3	additiv
4: g4	additiv
8: g5o	additiv
9: g5u	additiv
2: Nutzlasten (1)	**veränderliche Nutzlasten in Wohn-, Büroräumen**
5: Nutzlasten (1/1)	additiv
3: Schneelasten	**veränderliche Schneelasten**
6: Schneelast (1)	alternativ in Gruppe A
4: Windlasten	**veränderliche Windlasten**
7: WH1	alternativ in Gruppe B
10: WH2	additiv





Lasttyp **S**
(Schnee)

Beim Lasttyp S wird die Lastresultierende mit dem Faktor *cos α* reduziert.



Lasttyp **W**
(Wind)

1: Ständige Einwirkung: ständige Lasten

g1

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g1 Dach 2,10*1,91	G	-4250	-1550	4250	-1550	0.00	0.00	3.60	3.60

g2

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g2 Wand 0,95*(3,10+	G	-4250	-1550	4250	-1550	0.00	0.00	3.00	3.00

g3

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g3 Decke 2,10*1,91	G	-4250	-1550	4250	-1550	0.00	0.00	3.50	3.50

g4

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g4 Wand 0,95*3,10	G	-4250	-1550	4250	-1550	0.00	0.00	2.50	2.50

g5o

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g5 Wand 0,95*(3,10+	G	4250	-1550	4250	-1050	0.00	0.00	4.50	4.50

g5u

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
g5 Wand 0,95*(3,10+	G	4250	450	4250	1550	0.00	0.00	4.50	4.50

2: Veränderliche Einwirkung: Nutzlasten (1)
Nutzlasten (1/1)

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
q Decke 2,03*2,00	S	-4250	1550	4250	1550	0.00	0.00	4.00	4.00

3: Veränderliche Einwirkung: Schneelasten
Schneelast (1)

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
Schnee Dach 2,03*1,	S	-4250	-1550	4250	-1550	0.00	0.00	3.20	3.20

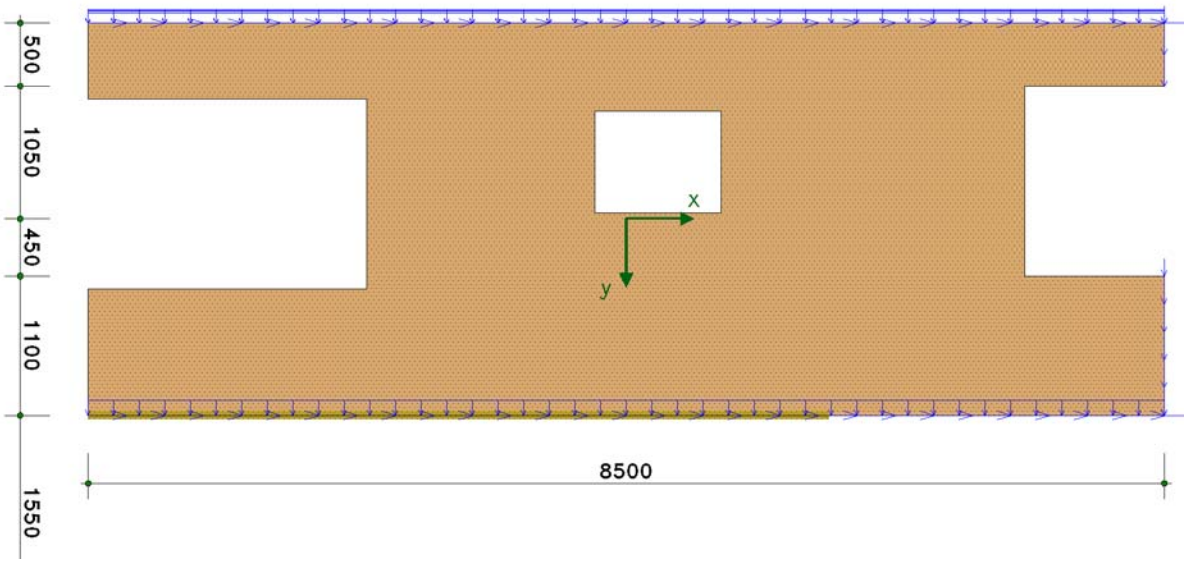
4: Veränderliche Einwirkung: Windlasten
WH1

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
WH1 unten 1,3*3,10*	W	-4250	1550	4250	1550	2.97	2.97	0.00	0.00

WH2

Name Linienlast	Typ [-]	x_a [mm]	y_a [mm]	x_e [mm]	y_e [mm]	$qx(l)_a$ [kN/m]	$qx(l)_e$ [kN/m]	$qy(m)_a$ [kN/m]	$qy(m)_e$ [kN/m]
WH2 oben 1,3*1,95*1	W	-4250	-1550	4250	-1550	1.87	1.87	0.00	0.00

Alle Lasten Maßstab 1:598



4. Nachweise

Bei Anwendung der Überlagerungsregeln nach Eurocode bedeuten:

Ψ_{dom}	Kombinationsbeiwert für eine	führende	Verkehrslasteinwirkung	(Leiteinwirkung)
Ψ_{sub}	Kombinationsbeiwert für eine	nichtführende	Verkehrslasteinwirkung	(Begleiteinwirkung)
γ_{sup}	Teilsicherheitsbeiwert für	ungünstig	wirkende Laststellungen	
γ_{inf}	Teilsicherheitsbeiwert für	günstig	wirkende Laststellungen	

Überlagerungsregeln Brückenbau und DIN 1055-100 verhalten sich wie Eurocode.
Bei nichtlinearer Berechnung bleiben Extremalbildungsvorschriften unberücksichtigt

Werden nachfolgend Nachweise nach Eurocode aufgeführt, so gilt:
Der nationale Anhang "Deutschland" wird berücksichtigt.

Nachweis 1: EC 5 Tragfähigkeit (Th.I.Ord.)

EC 5 Tragfähigkeit (Th.I.Ord.): Tragfähigkeit nach DIN EN 1995

Das gesamte Bauwerk ist der Nutzungsklasse 1 zugeordnet

1: Standardkombination

Extremalbildungsvorschrift zum Nachweis 1, Typ: benutzerdefiniert, Überlagerungsregel: Eurocode

LF	Ψ_{dom}	Ψ_{sub}	γ_{sup}	γ_{inf}
Gruppe 1: kmod = 0.60				
1	1.00	1.00	1.35	1.00
2	1.00	1.00	1.35	1.00
4	1.00	1.00	1.35	1.00
8	1.00	1.00	1.35	1.00
9	1.00	1.00	1.35	1.00
Gruppe 2: kmod = 0.80				
1	1.00	1.00	1.35	1.00
2	1.00	1.00	1.35	1.00
4	1.00	1.00	1.35	1.00
8	1.00	1.00	1.35	1.00
9	1.00	1.00	1.35	1.00
5	1.00	0.70	1.50	0.00
Gruppe 3: kmod = 0.90				
1	1.00	1.00	1.35	1.00
2	1.00	1.00	1.35	1.00
4	1.00	1.00	1.35	1.00
8	1.00	1.00	1.35	1.00
9	1.00	1.00	1.35	1.00
5	1.00	0.70	1.50	0.00
6	1.00	0.50	1.50	0.00
Gruppe 4: kmod = 1.00				
1	1.00	1.00	1.35	1.00
2	1.00	1.00	1.35	1.00
4	1.00	1.00	1.35	1.00
8	1.00	1.00	1.35	1.00
9	1.00	1.00	1.35	1.00
5	1.00	0.70	1.50	0.00
6	1.00	0.50	1.50	0.00
7	1.00	0.60	1.50	0.00
10	1.00	0.60	1.50	0.00

Nachweis 2: EC 5 Verformungen

EC 5 Verformungen: Gebrauchstauglichkeit nach DIN EN 1995

Das gesamte Bauwerk ist der Nutzungsklasse 1 zugeordnet

Nachweisoptionen zum Nachweis 2:

Nachweis von
- w(inst)
- w(fin)
- w(net,fin)

1: Standardkombination (erste Teilkombination)

Extremalbildungsvorschrift zum Nachweis 2, **Teilnachweis: w_{inst}** (Durchbiegungen auf charakteristischem Niveau ohne Kriecheinfluss)

Einw.	Ψ_{dom}	Ψ_{sub}	γ_{sup}	γ_{inf}
1	1.00	1.00	1.00	1.00
2	1.00	0.70	1.00	0.00
3	1.00	0.50	1.00	0.00
4	1.00	0.60	1.00	0.00

1: Standardkombination (zweite Teilkombination)

Extremalbildungsvorschrift zum Nachweis 2, **Teilnachweis: w_{fin}** ($= w_{inst} + w_{creep} = w_{inst}$ mit Kriecheinfluss); $k_{def} = 0.60$

Einw.	Ψ_{dom}	Ψ_{sub}	γ_{sup}	γ_{inf}	(Ψ_2)
1	1.60	1.60	1.00	1.00	1.00
2	1.18	0.88	1.00	0.00	0.30
3	1.00	0.50	1.00	0.00	0.00
4	1.00	0.60	1.00	0.00	0.00

1: Standardkombination (dritte Teilkombination)

Extremalbildungsvorschrift zum Nachweis 2, **Teilnachweis: $w_{net,fin}$** (quasiständige Netto-Enddurchbiegung); $k_{def} = 0.60$

Einw.	Ψ_{dom}	Ψ_{sub}	γ_{sup}	γ_{inf}
1	1.00	1.00	1.60	1.60
2	0.30	0.30	1.60	0.00
3	0.00	0.00	1.60	0.00
4	0.00	0.00	1.60	0.00

Nachweis 3: EC 5 Brandschutz

EC 5 Brandschutz: Brandschutznachweis nach DIN EN 1995

Das gesamte Bauwerk ist der Nutzungsklasse 1 zugeordnet

1: Standardkombination

Extremalbildungsvorschrift zum Nachweis 3, Typ: standard, Überlagerungsregel: Eurocode

Einw.	Ψ_{dom}	Ψ_{sub}	γ_{sup}	γ_{inf}
1	1.00	1.00	1.00	1.00
2	0.30	0.30	1.00	0.00
3	0.00	0.00	1.00	0.00
4	0.20	0.00	1.00	0.00

5. Lastfallergebnisse

5.1. Flächenergebnisse

5.1.1. 1 : g1

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -190.24 kN/m, max n_{xx} = 124.78 kN/m

Normalkräfte n_{yy} [kN/m]
min n_{yy} = -134.70 kN/m, max n_{yy} = 33.23 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -15.03 kN/m, max n_{xy} = 6.62 kN/m

5.1.2. 2 : g2

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -158.53 kN/m, max n_{xx} = 103.98 kN/m

Normalkräfte n_{yy} [kN/m]
min n_{yy} = -112.25 kN/m, max n_{yy} = 27.69 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -12.53 kN/m, max n_{xy} = 5.52 kN/m

5.1.3. 3 : g3

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -184.95 kN/m, max n_{xx} = 121.31 kN/m

Normalkräfte n_{yy} [kN/m]
min n_{yy} = -130.96 kN/m, max n_{yy} = 32.30 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -14.62 kN/m, max n_{xy} = 6.44 kN/m

5.1.4. 4 : g4

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -132.11 kN/m, max n_{xx} = 86.65 kN/m

Normalkräfte n_{yy} [kN/m]
min n_{yy} = -93.54 kN/m, max n_{yy} = 23.07 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -10.44 kN/m, max n_{xy} = 4.60 kN/m

5.1.5. 8 : g5o

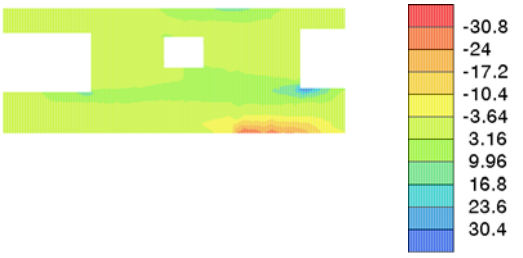
Normalkräfte n_{xx} [kN/m]
min n_{xx} = -54.49 kN/m, max n_{xx} = 45.16 kN/m

Normalkräfte n_{yy} [kN/m]
min n_{yy} = -27.01 kN/m, max n_{yy} = 6.35 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -1.92 kN/m, max n_{xy} = 5.57 kN/m

5.1.6. 9 : g5u

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -30.83 kN/m, max n_{xx} = 30.36 kN/m

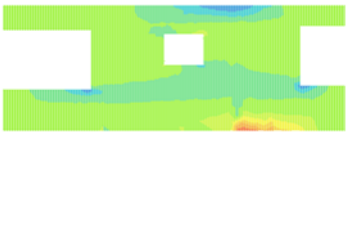


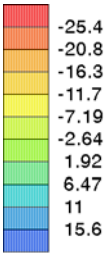
Normalkräfte n_{yy} [kN/m]
min n_{yy} = -25.95 kN/m, max n_{yy} = 24.12 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -1.82 kN/m, max n_{xy} = 5.12 kN/m

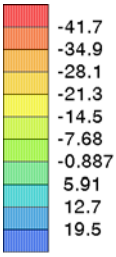
5.1.7. 5 : Nutzlasten (1/1)

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -25.40 kN/m, max n_{xx} = 15.57 kN/m

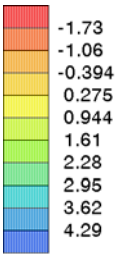




Normalkräfte n_{yy} [kN/m]
min n_{yy} = -41.67 kN/m, max n_{yy} = 19.51 kN/m

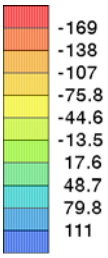


Normalkräfte n_{xy} [kN/m]
min n_{xy} = -1.73 kN/m, max n_{xy} = 4.29 kN/m

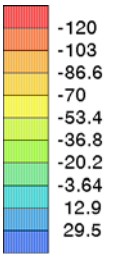


5.1.8. 6 (Gruppe A): Schneelast (1)

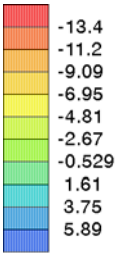
Normalkräfte n_{xx} [kN/m]
min n_{xx} = -169.10 kN/m, max n_{xx} = 110.91 kN/m



Normalkräfte n_{yy} [kN/m]
min n_{yy} = -119.73 kN/m, max n_{yy} = 29.53 kN/m

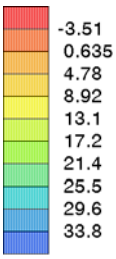


Normalkräfte n_{xy} [kN/m]
min n_{xy} = -13.36 kN/m, max n_{xy} = 5.89 kN/m

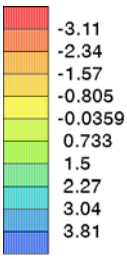


5.1.9. 7 (Gruppe B): WH1

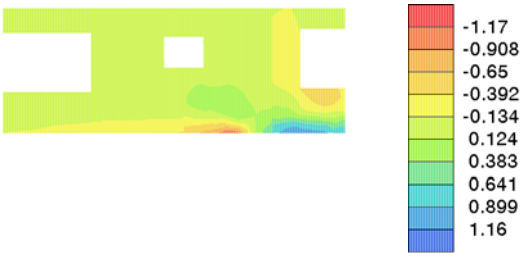
Normalkräfte n_{xx} [kN/m]
min n_{xx} = -3.51 kN/m, max n_{xx} = 33.79 kN/m



Normalkräfte n_{yy} [kN/m]
min n_{yy} = -3.11 kN/m, max n_{yy} = 3.81 kN/m



Normalkräfte n_{xy} [kN/m]
min n_{xy} = -1.17 kN/m, max n_{xy} = 1.16 kN/m



5.1.10. 10 : WH2

Normalkräfte n_{xx} [kN/m]
min n_{xx} = -31.76 kN/m, max n_{xx} = 44.36 kN/m

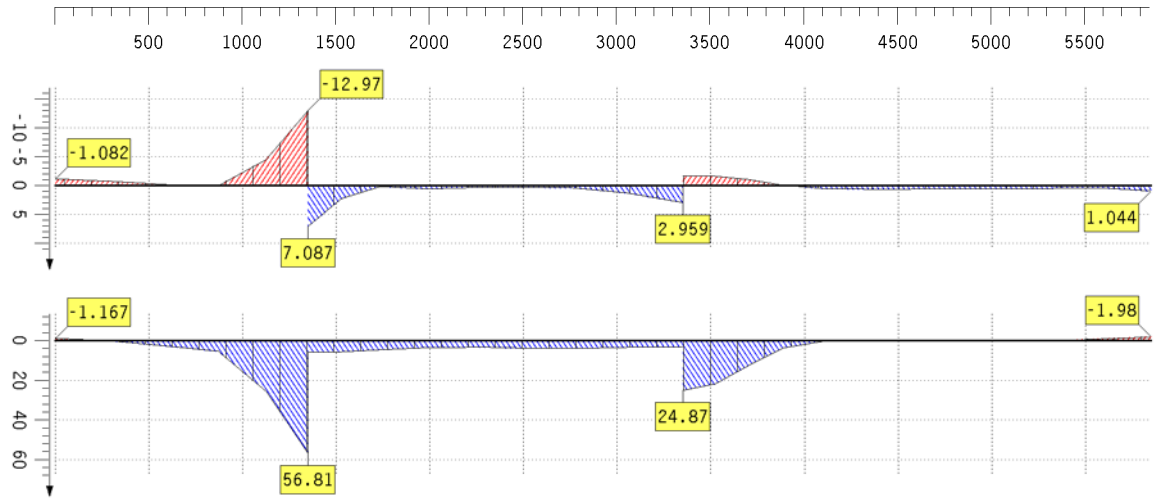
Normalkräfte n_{yy} [kN/m]
min n_{yy} = -42.51 kN/m, max n_{yy} = 55.14 kN/m

Normalkräfte n_{xy} [kN/m]
min n_{xy} = -6.43 kN/m, max n_{xy} = 2.12 kN/m

5.2. Linienlagerergebnisse

5.2.1. 1 : g1

Auflagergrößen Lagerlinie 1

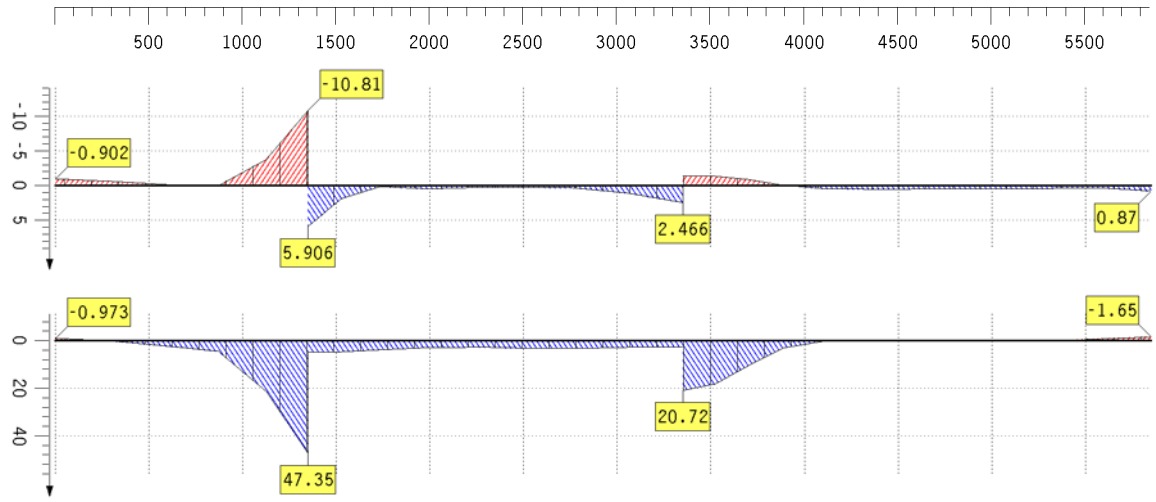


pl [kN/m]
min/max
12.970 / 7.087
Int = -0.391

pm [kN/m]
min/max
1.980 / 56.814
Int = 35.133

5.2.2. 2 : g2

Auflagergrößen Lagerlinie 1

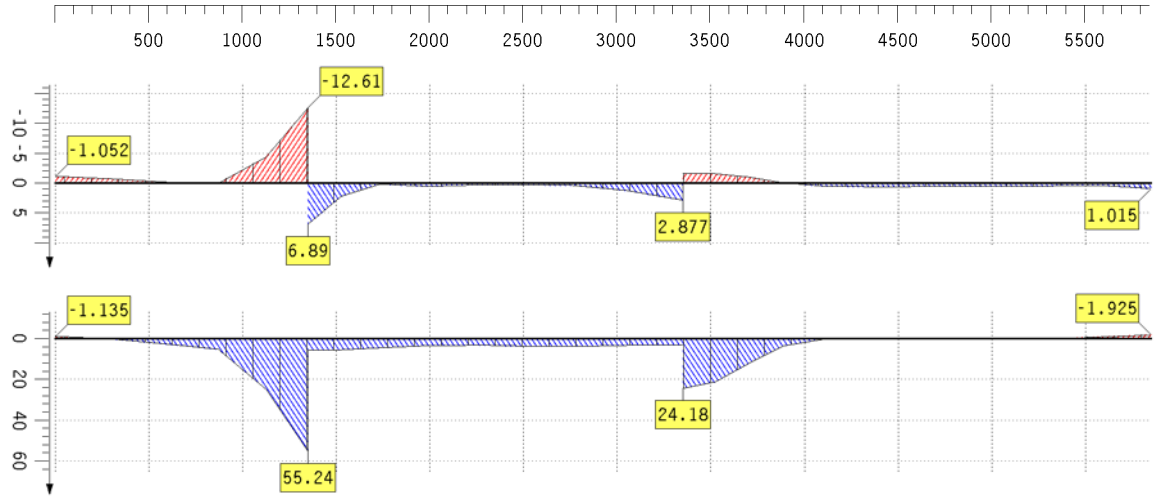


pl [kN/m]
min/max
10.808 / 5.906
Int = -0.326

pm [kN/m]
min/max
1.650 / 47.345
Int = 29.277

5.2.3. 3 : g3

Auflagergrößen Lagerlinie 1

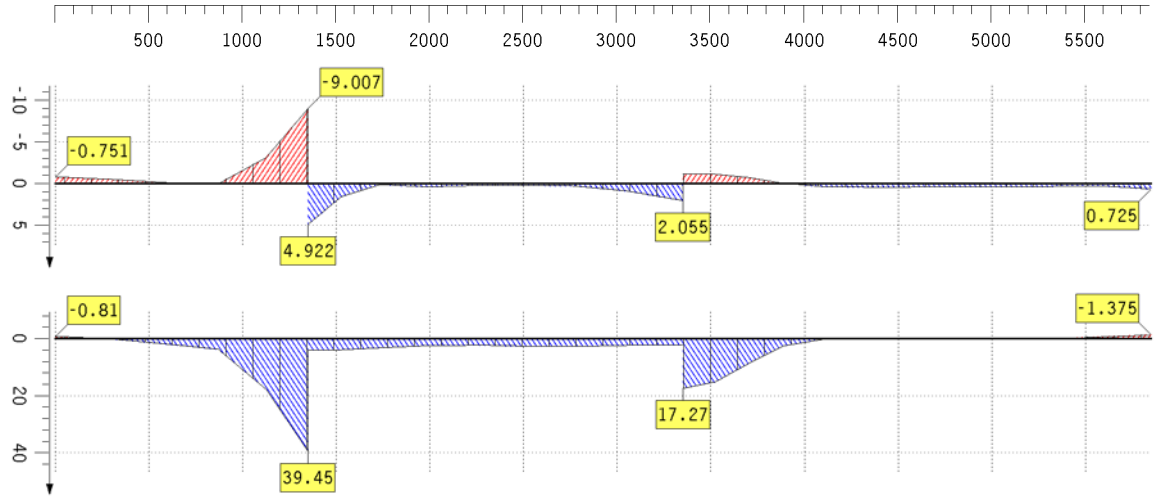


pl [kN/m]
min/max
12.609 / 6.890
Int = -0.380

pm [kN/m]
min/max
1.925 / 55.236
Int = 34.157

5.2.4. 4 : g4

Auflagergrößen Lagerlinie 1

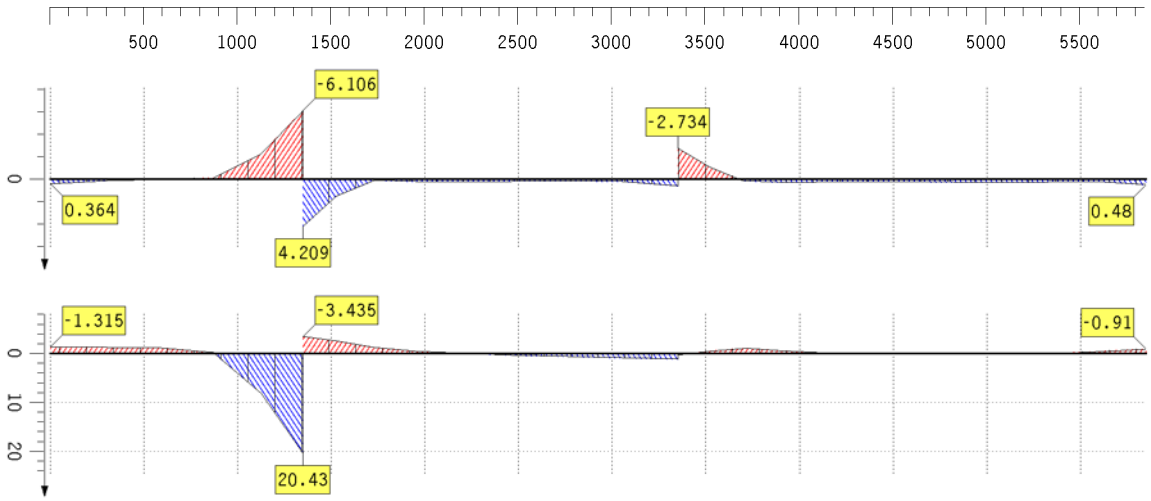


pl [kN/m]
min/max
9.007 / 4.922
Int = -0.271

pm [kN/m]
min/max
1.375 / 39.454
Int = 24.398

5.2.5. 8 : g5o

Auflagergrößen Lagerlinie 1

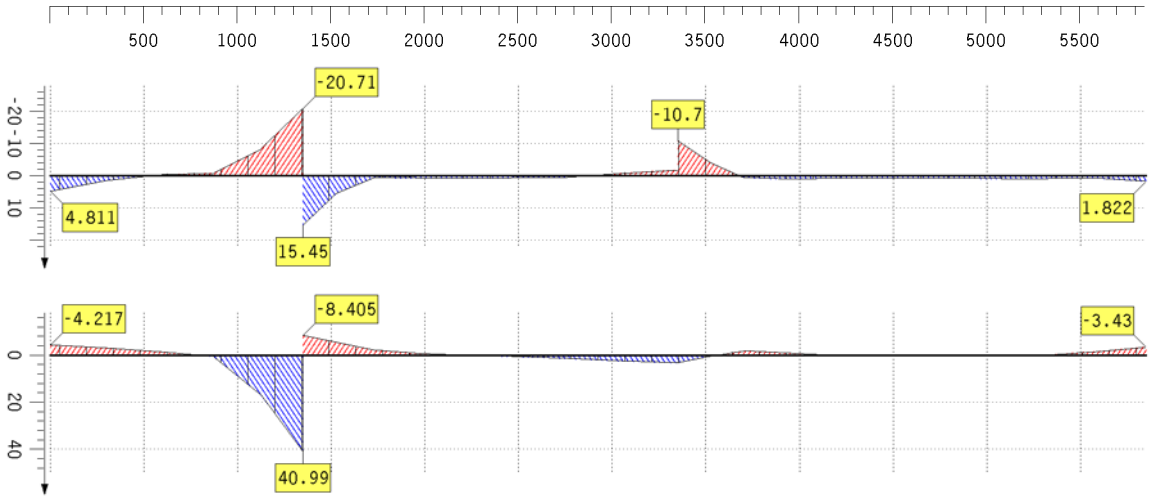


pl [kN/m]
min/max
6.106 / 4.209
Int = -0.074

pm [kN/m]
min/max
3.435 / 20.431
Int = 2.933

5.2.6. 9 : g5u

Auflagergrößen Lagerlinie 1

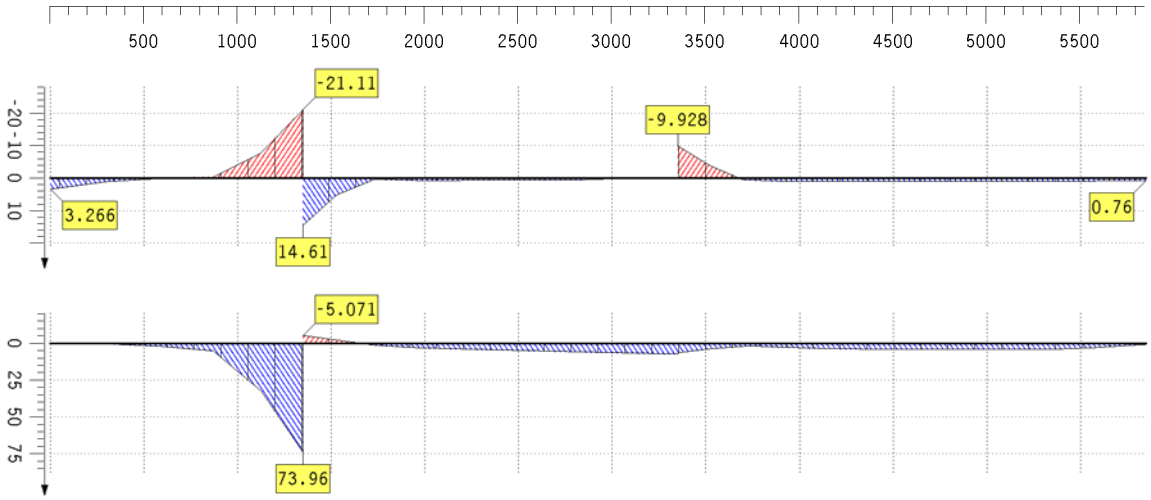


pl [kN/m]
min/max
20.715 / 15.453
Int = 0.025

pm [kN/m]
min/max
8.405 / 40.989
Int = 6.190

5.2.7. 5 : Nutzlasten (1/1)

Auflagergrößen Lagerlinie 1

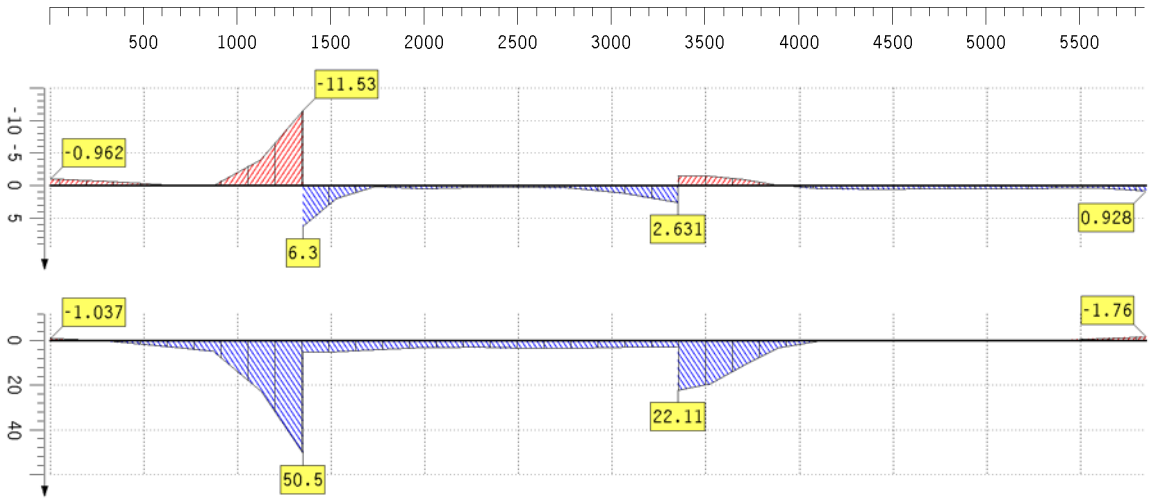


pl [kN/m]
min/max
21.106 / 14.606
Int = -0.125

pm [kN/m]
min/max
5.071 / 73.965
Int = 37.009

5.2.8. 6 (Gruppe A): Schneelast (1)

Auflagergrößen Lagerlinie 1

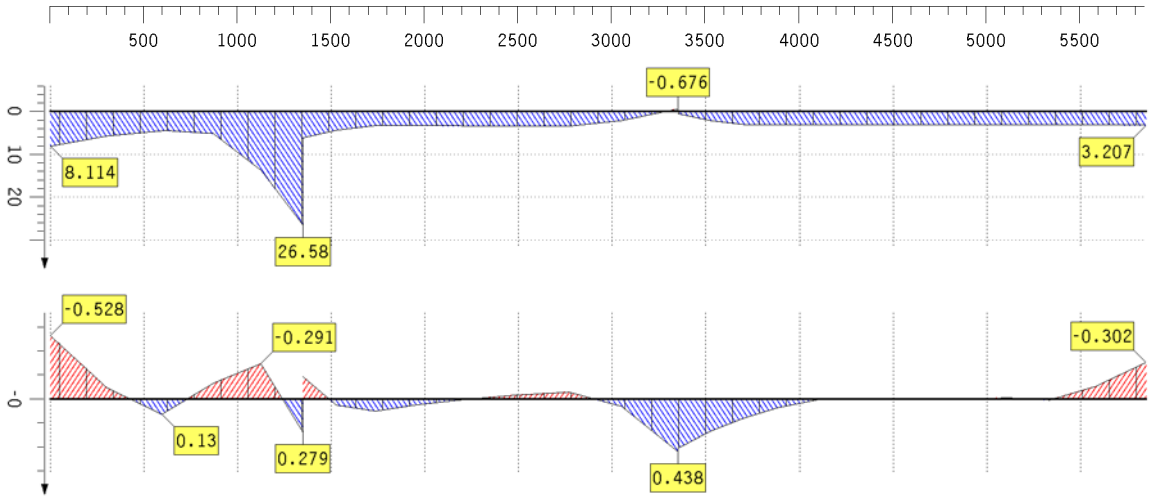


pl [kN/m]
min/max
11.529 / 6.300
Int = -0.347

pm [kN/m]
min/max
1.760 / 50.501
Int = 31.229

5.2.9. 7 (Gruppe B): WH1

Auflagergrößen Lagerlinie 1

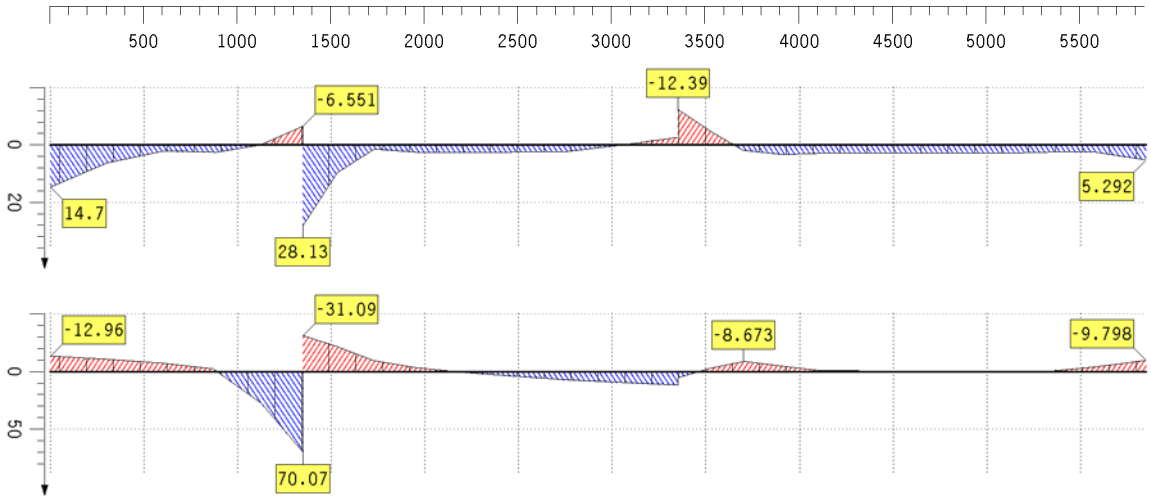


pl [kN/m]
min/max
0.676 / 26.576
Int = 27.206

pm [kN/m]
min/max
0.528 / 0.438
Int = -0.004

5.2.10. 10 : WH2

Auflagergrößen Lagerlinie 1



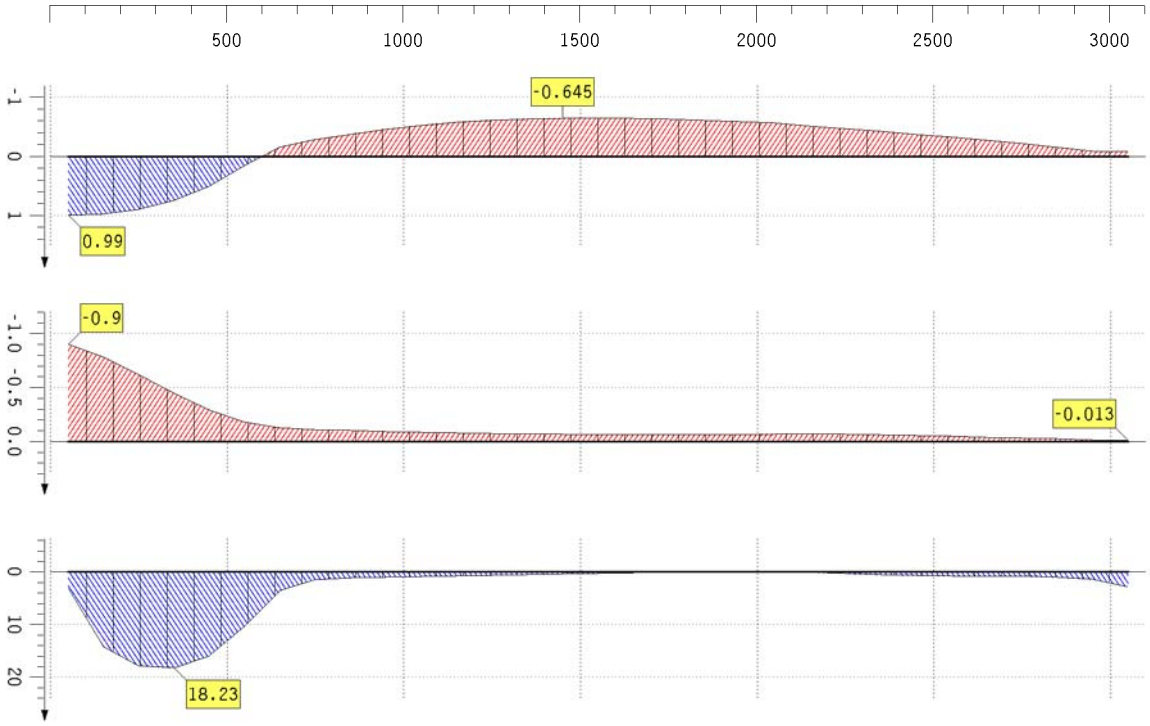
pl [kN/m]
min/max
12.394 / 28.132
Int = 17.503

pm [kN/m]
min/max
31.086 / 70.066
Int = -1.832

5.3. Fugenergebnisse

5.3.1. 1 : g1

Schnittgrößen Fuge 1

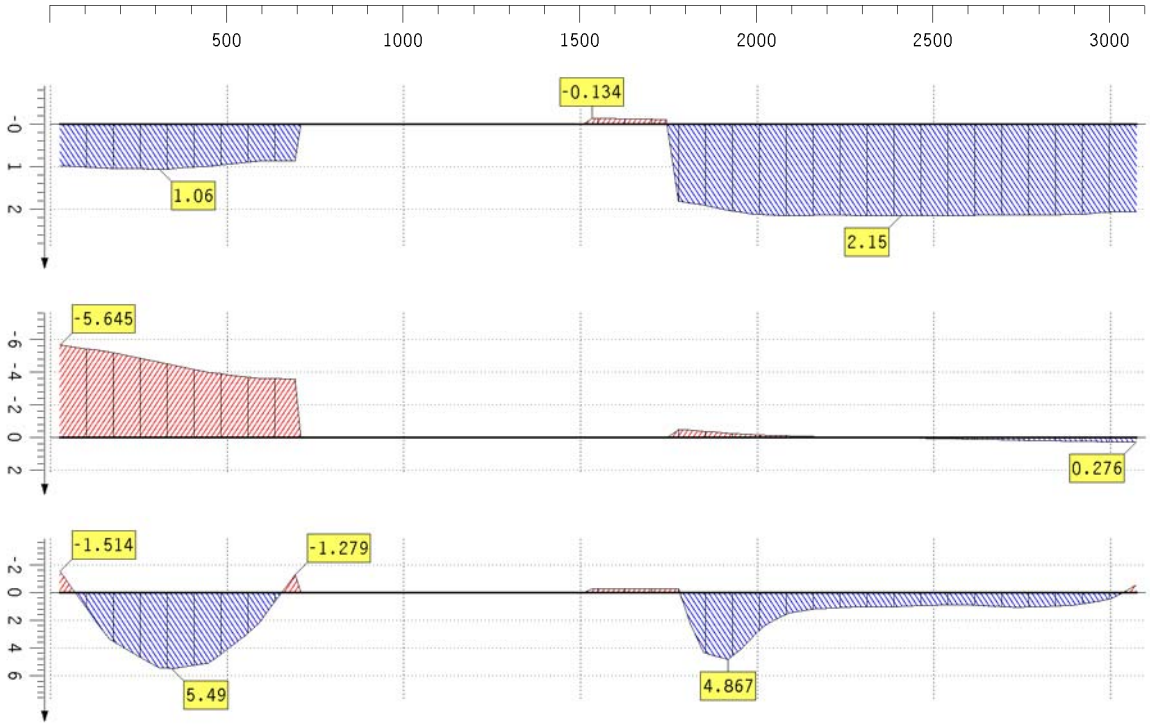


N [kN]
min/max
0.645 / 0.990

Vy [kN]
min/max
0.900 / -0.013

Mz [kNm]
min/max
0.160 / 18.230

Schnittgrößen Fuge 2

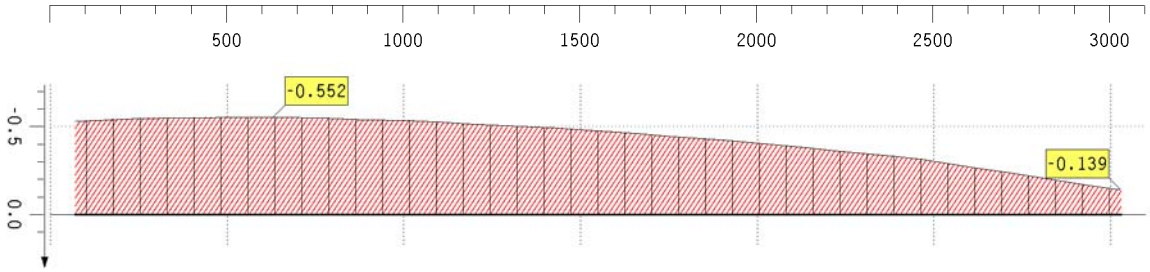


N [kN]
min/max
0.134 / 2.150

Vy [kN]
min/max
5.645 / 0.276

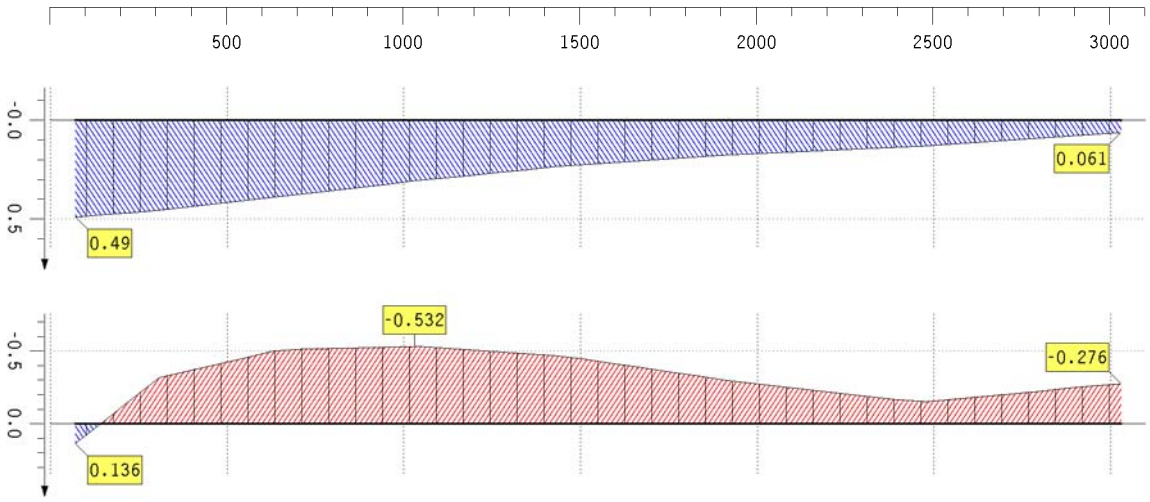
Mz [kNm]
min/max
1.514 / 5.490

Schnittgrößen Fuge 3



N [kN]
min/max
0.552 / -0.139

Schnittgrößen Fuge 3

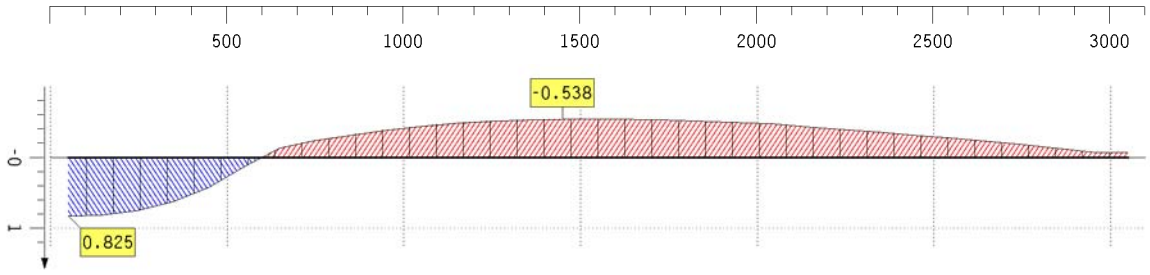


Vy [kN]
min/max
.061 / 0.490

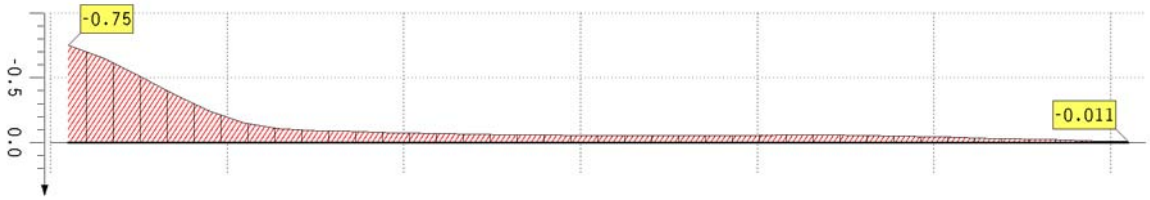
Mz [kNm]
min/max
0.532 / 0.136

5.3.2. 2 : g2

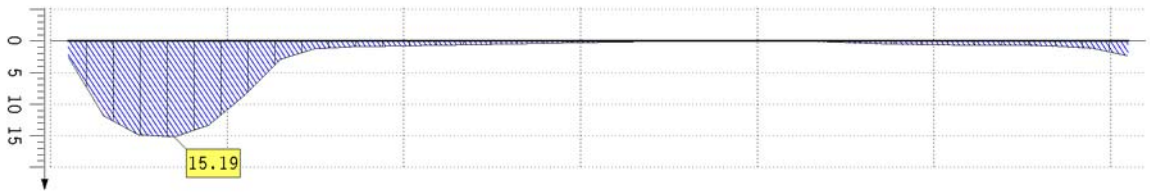
Schnittgrößen Fuge 1



N [kN]
min/max
0.538 / 0.825

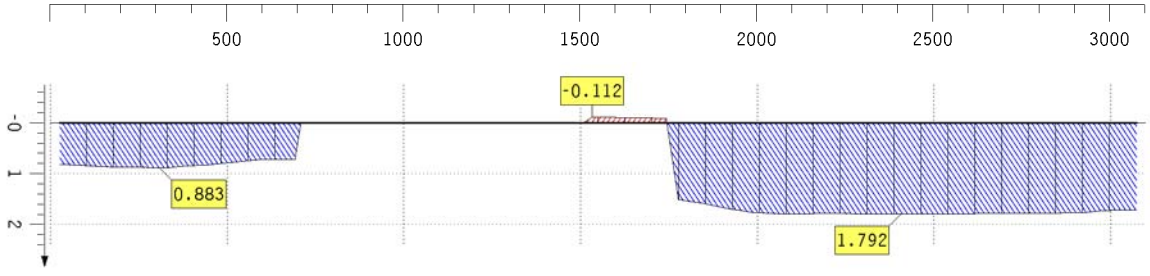


Vy [kN]
min/max
0.750 / -0.011

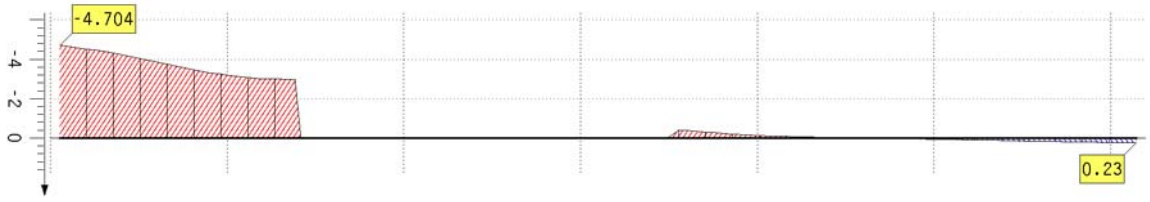


Mz [kNm]
min/max
0.134 / 15.192

Schnittgrößen Fuge 2

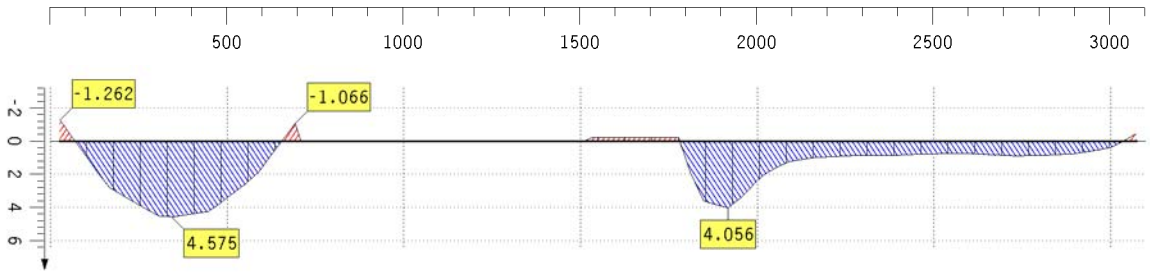


N [kN]
min/max
0.112 / 1.792



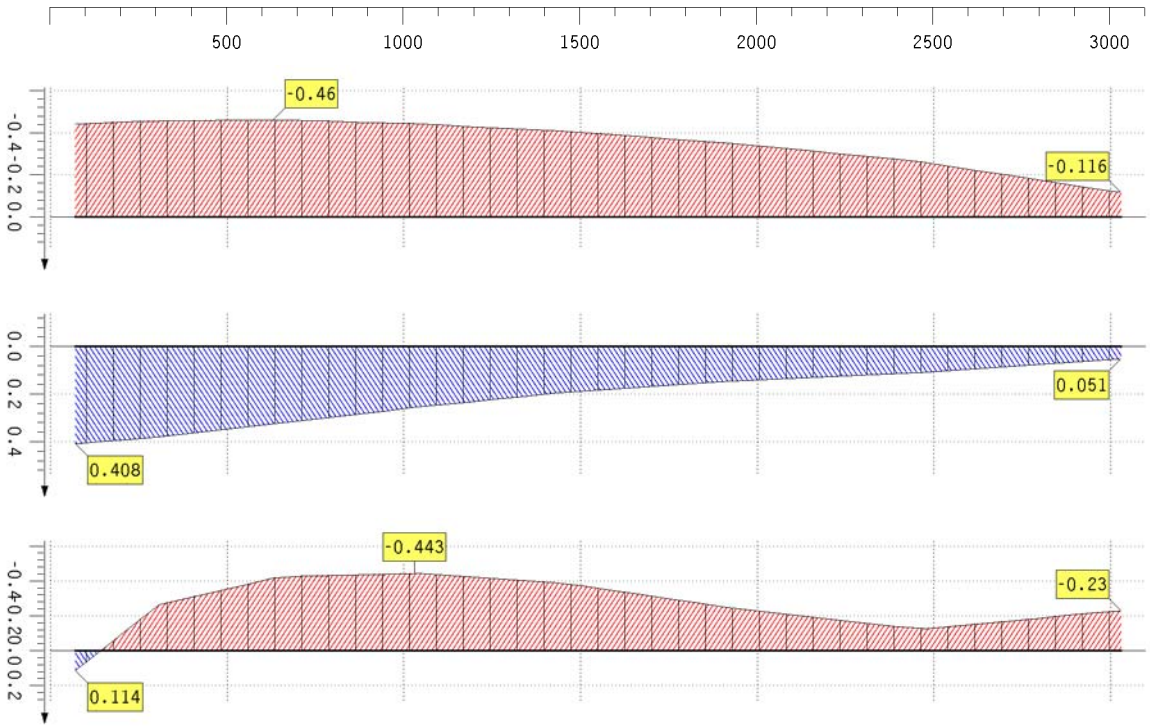
Vy [kN]
min/max
4.704 / 0.230

Schnittgrößen Fuge 2



Mz [kNm]
min/max
1.262 / 4.575

Schnittgrößen Fuge 3



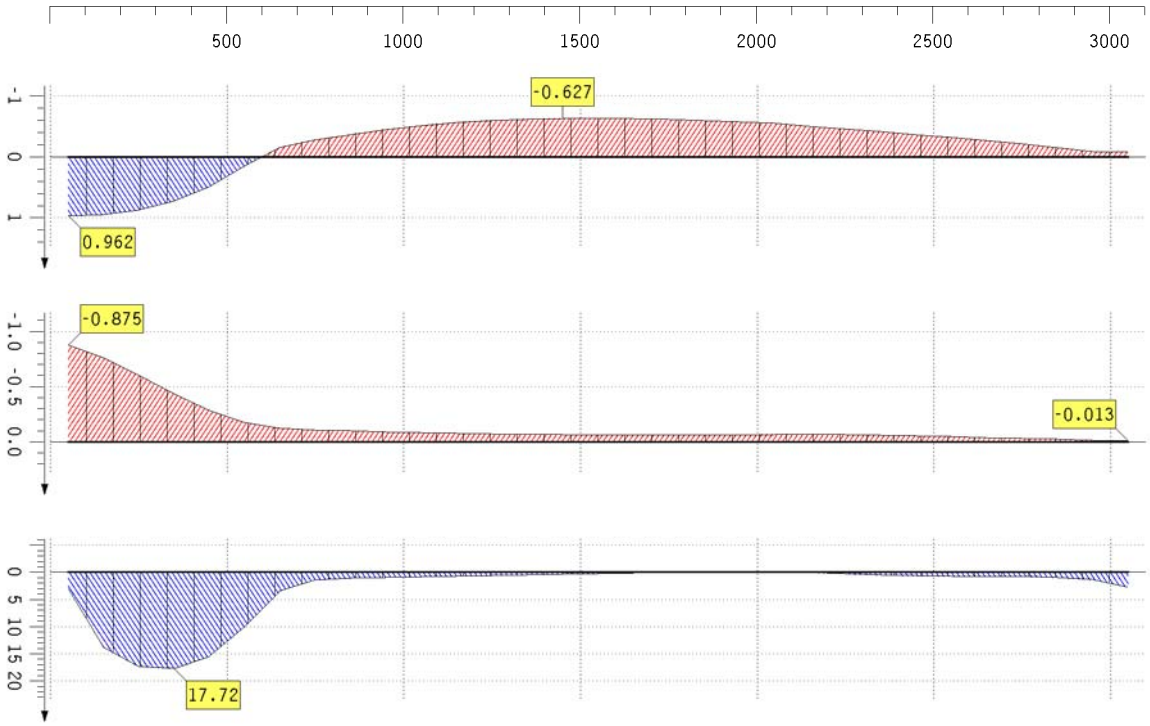
N [kN]
min/max
0.460 / -0.116

Vy [kN]
min/max
.051 / 0.408

Mz [kNm]
min/max
0.443 / 0.114

5.3.3. 3 : g3

Schnittgrößen Fuge 1

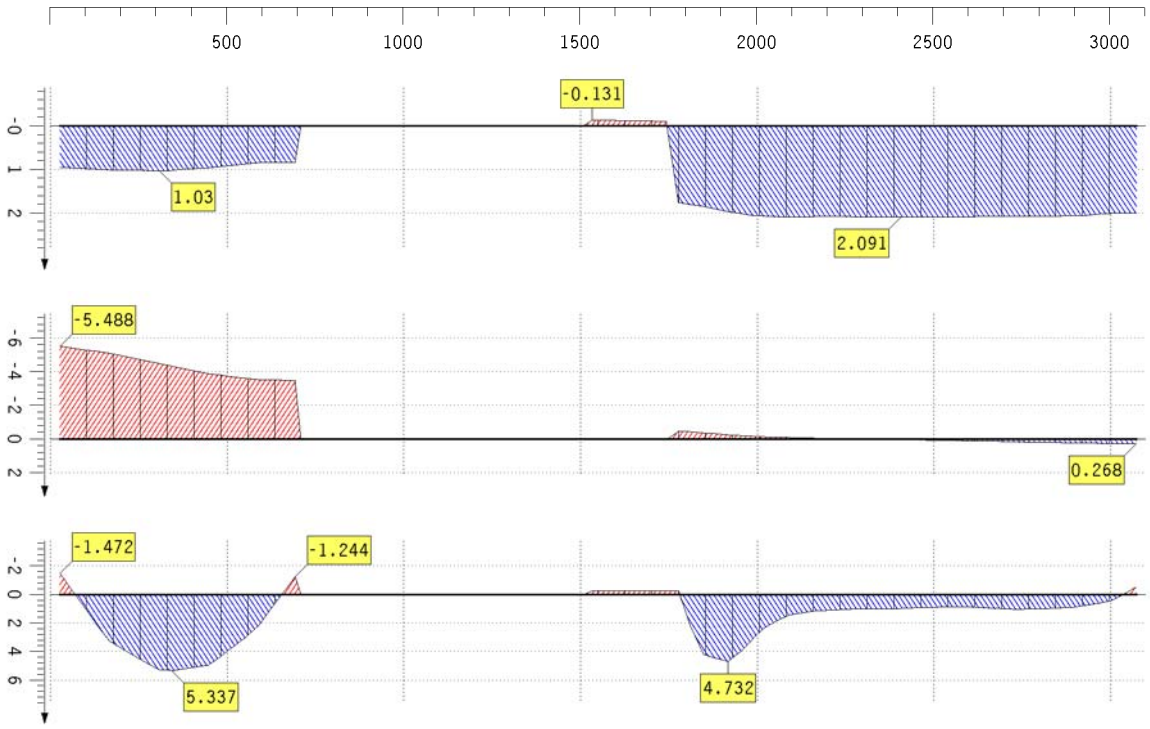


N [kN]
min/max
0.627 / 0.962

Vy [kN]
min/max
0.875 / -0.013

Mz [kNm]
min/max
0.156 / 17.724

Schnittgrößen Fuge 2

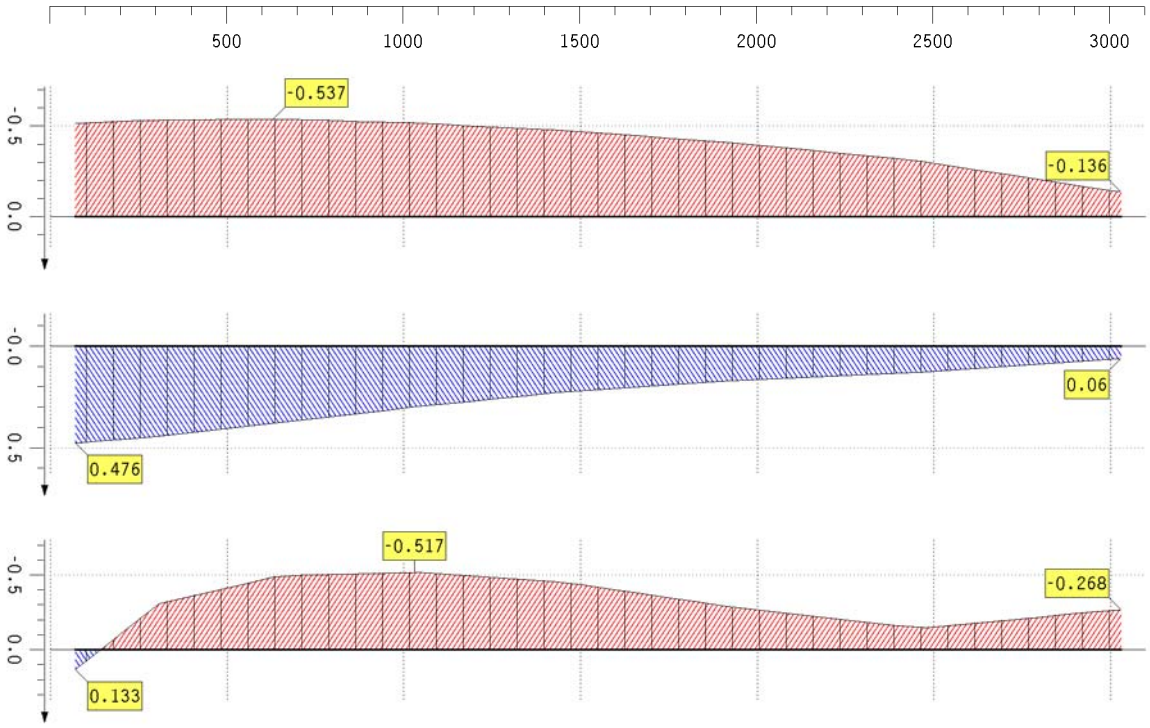


N [kN]
min/max
0.131 / 2.091

Vy [kN]
min/max
5.488 / 0.268

Mz [kNm]
min/max
1.472 / 5.337

Schnittgrößen Fuge 3



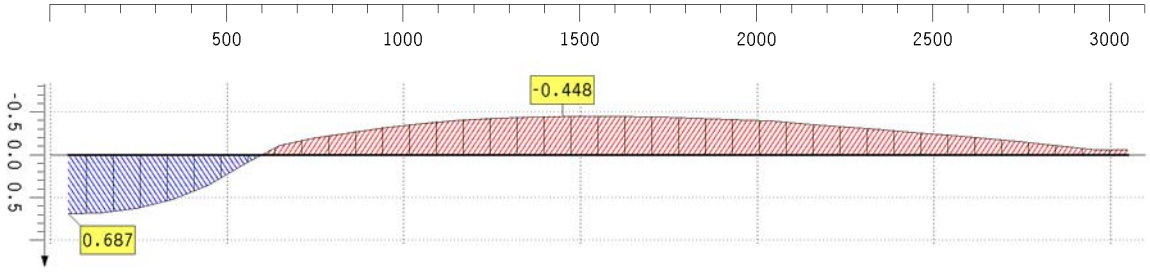
N [kN]
min/max
0.537 / -0.136

Vy [kN]
min/max
.060 / 0.476

Mz [kNm]
min/max
0.517 / 0.133

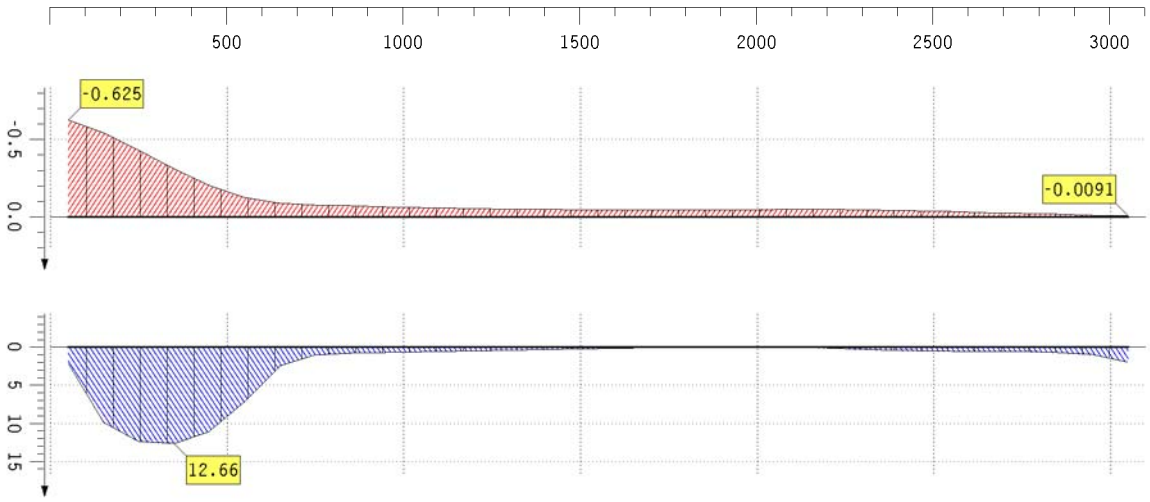
5.3.4. 4 : g4

Schnittgrößen Fuge 1



N [kN]
min/max
0.448 / 0.687

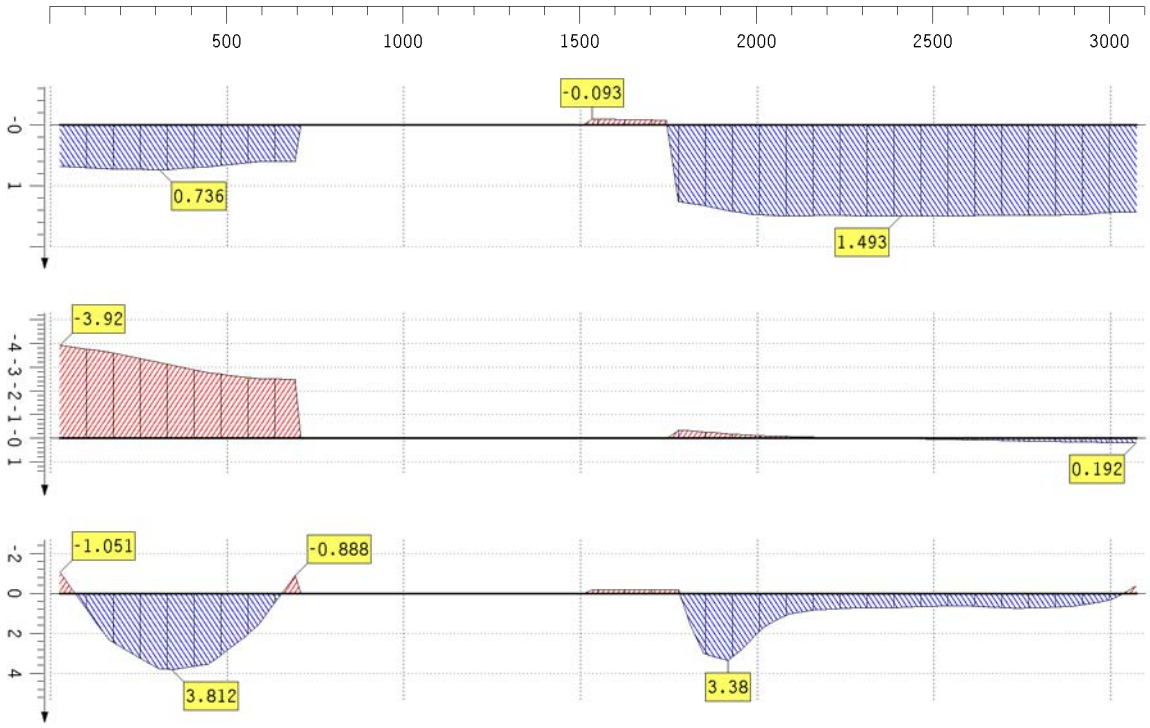
Schnittgrößen Fuge 1



Vy [kN]
min/max
0.625 / -0.009

Mz [kNm]
min/max
0.111 / 12.660

Schnittgrößen Fuge 2

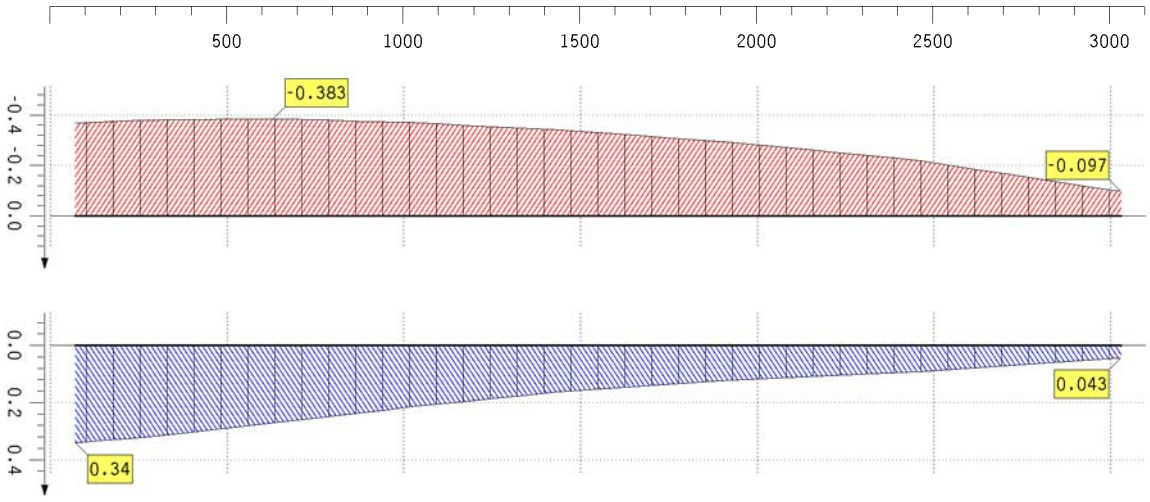


N [kN]
min/max
0.093 / 1.493

Vy [kN]
min/max
3.920 / 0.192

Mz [kNm]
min/max
1.051 / 3.812

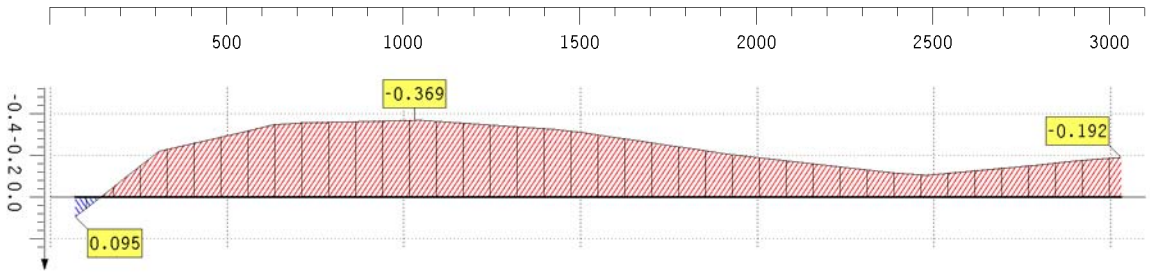
Schnittgrößen Fuge 3



N [kN]
min/max
0.383 / -0.097

Vy [kN]
min/max
.043 / 0.340

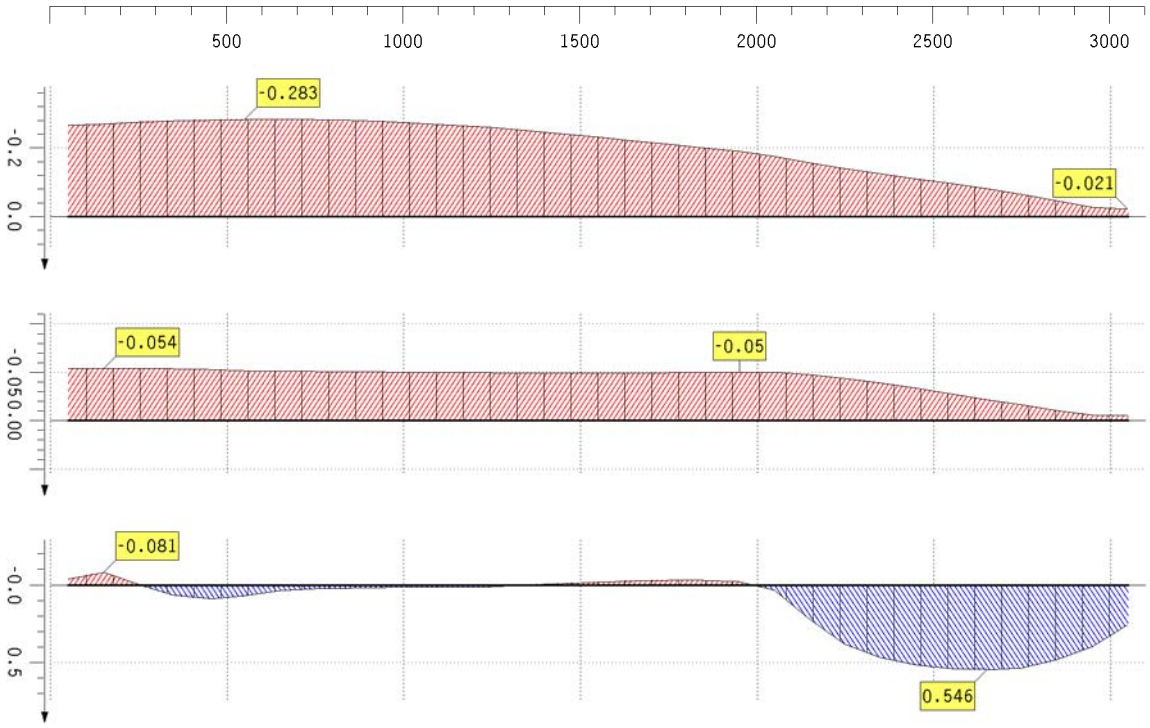
Schnittgrößen Fuge 3



Mz [kNm]
min/max
0.369 / 0.095

5.3.5. 8 : g5o

Schnittgrößen Fuge 1

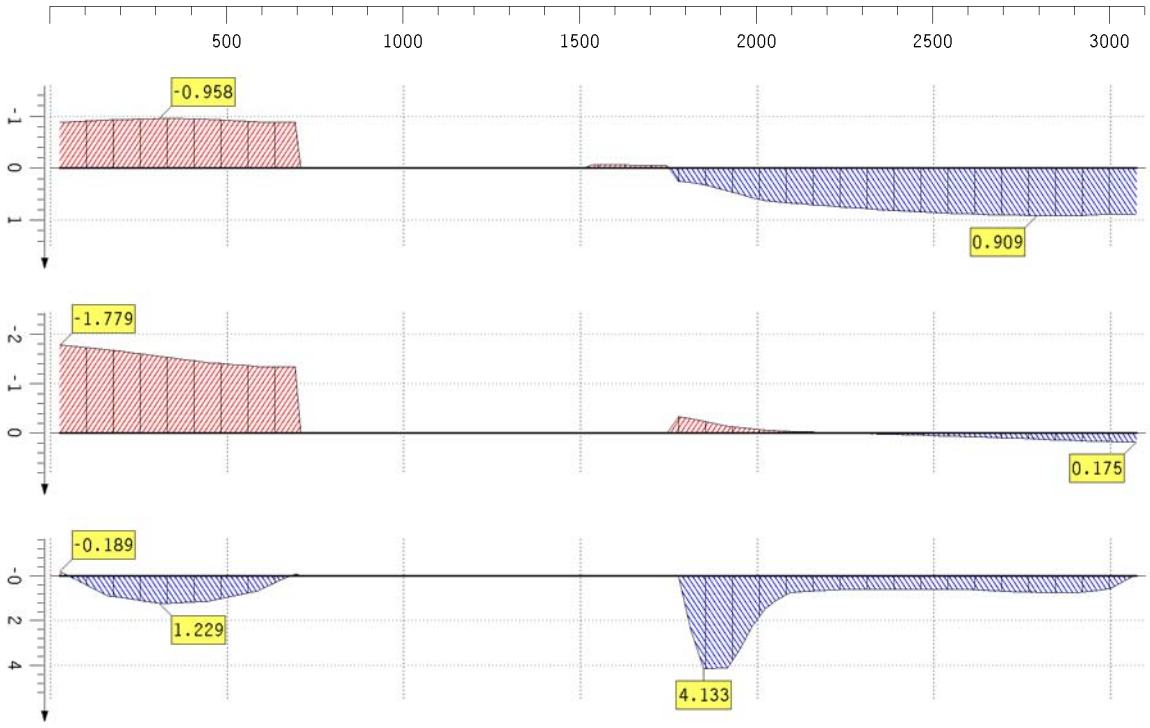


N [kN]
min/max
0.283 / -0.021

Vy [kN]
min/max
0.054 / -0.005

Mz [kNm]
min/max
0.081 / 0.546

Schnittgrößen Fuge 2

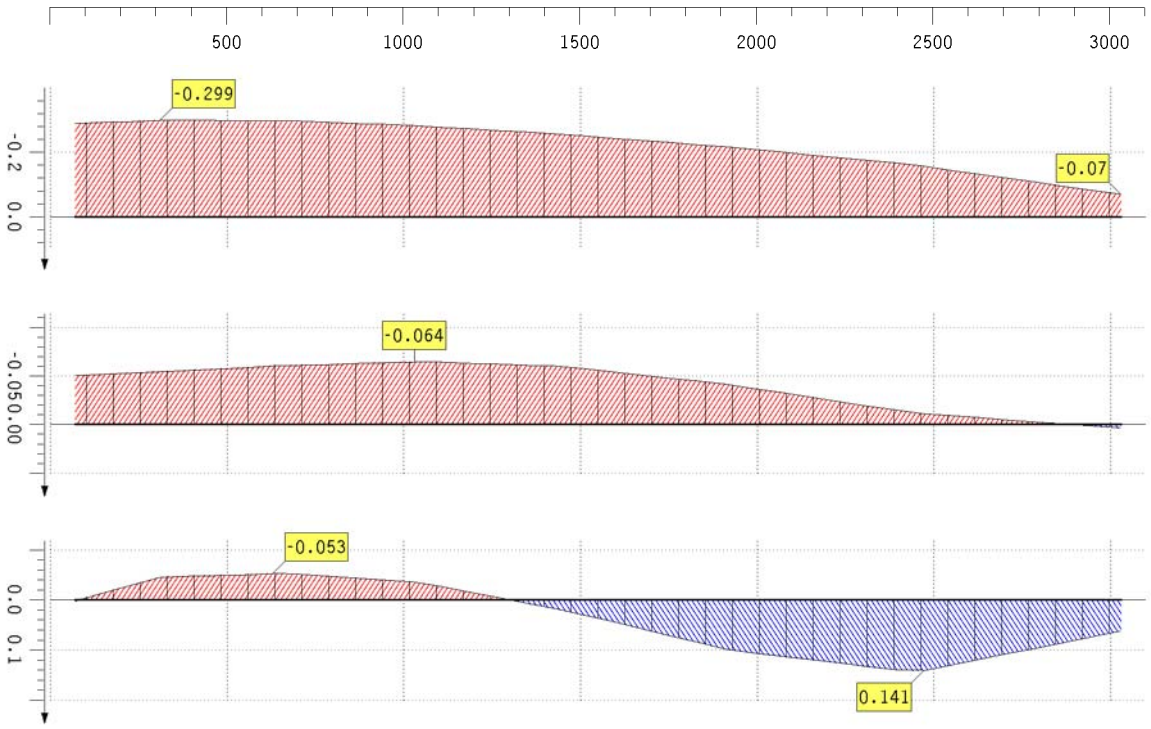


N [kN]
min/max
0.958 / 0.909

Vy [kN]
min/max
1.779 / 0.175

Mz [kNm]
min/max
0.189 / 4.133

Schnittgrößen Fuge 3



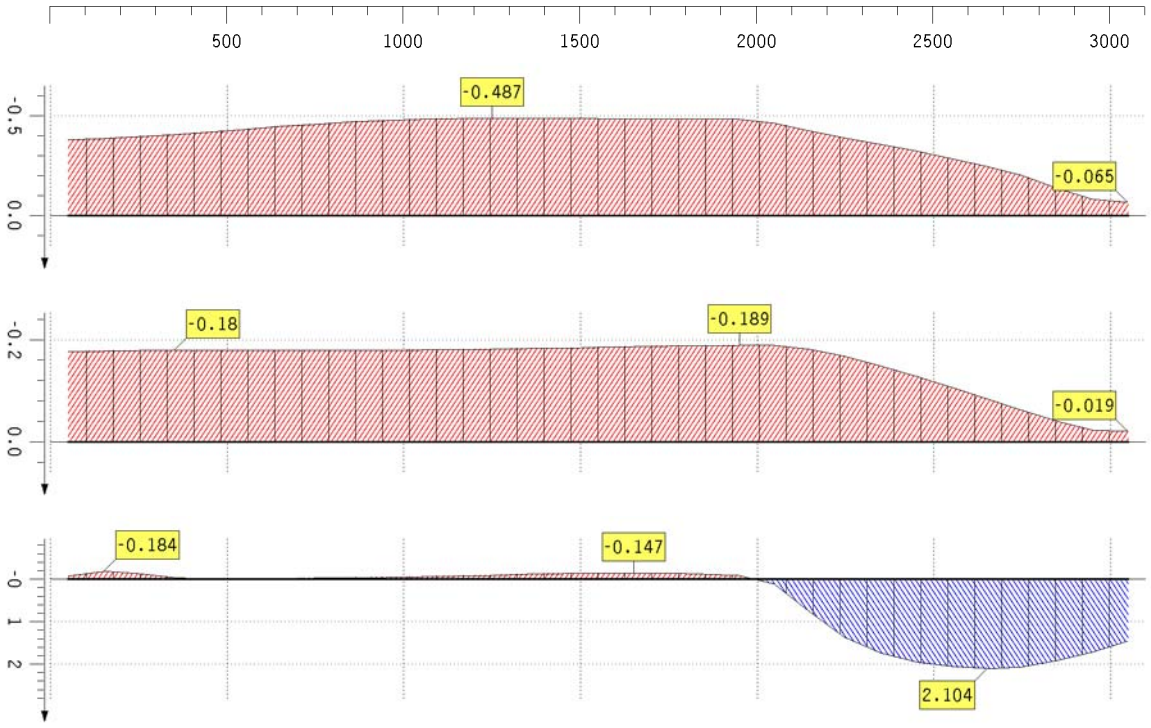
N [kN]
min/max
0.299 / -0.070

Vy [kN]
min/max
0.064 / 0.004

Mz [kNm]
min/max
0.053 / 0.141

5.3.6. 9 : g5u

Schnittgrößen Fuge 1

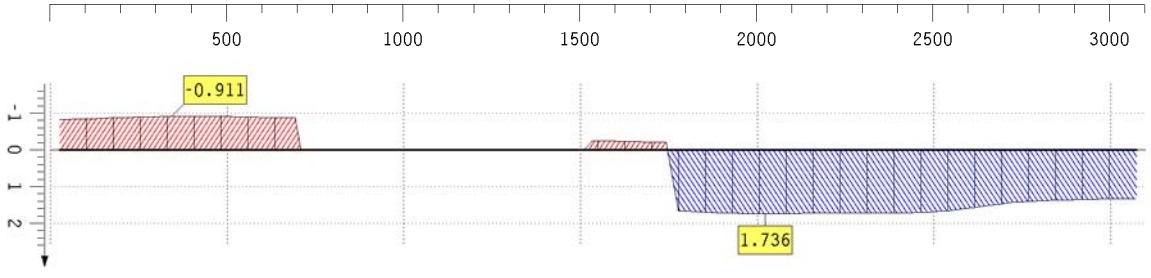


N [kN]
min/max
0.487 / -0.065

Vy [kN]
min/max
0.189 / -0.019

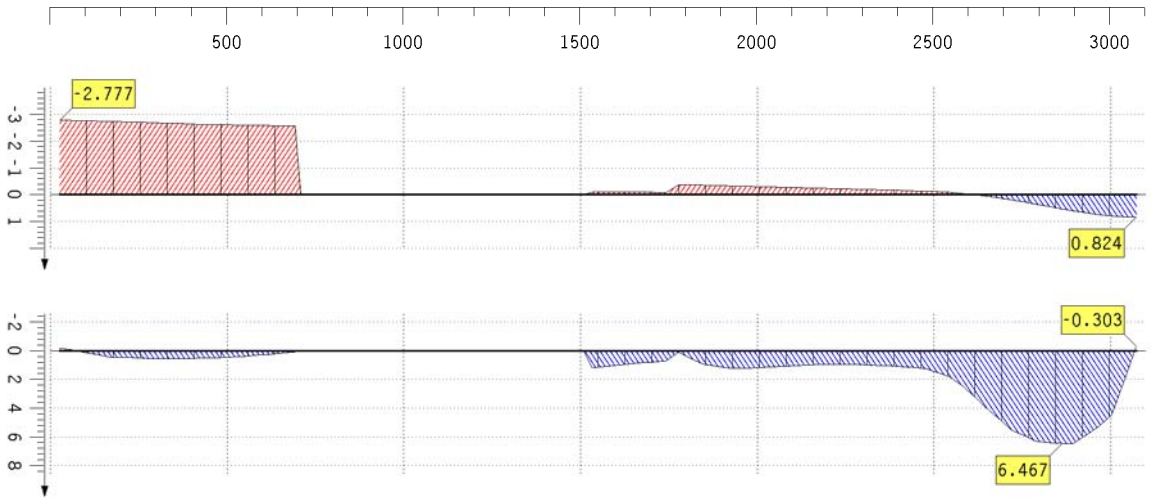
Mz [kNm]
min/max
0.184 / 2.104

Schnittgrößen Fuge 2



N [kN]
min/max
0.911 / 1.736

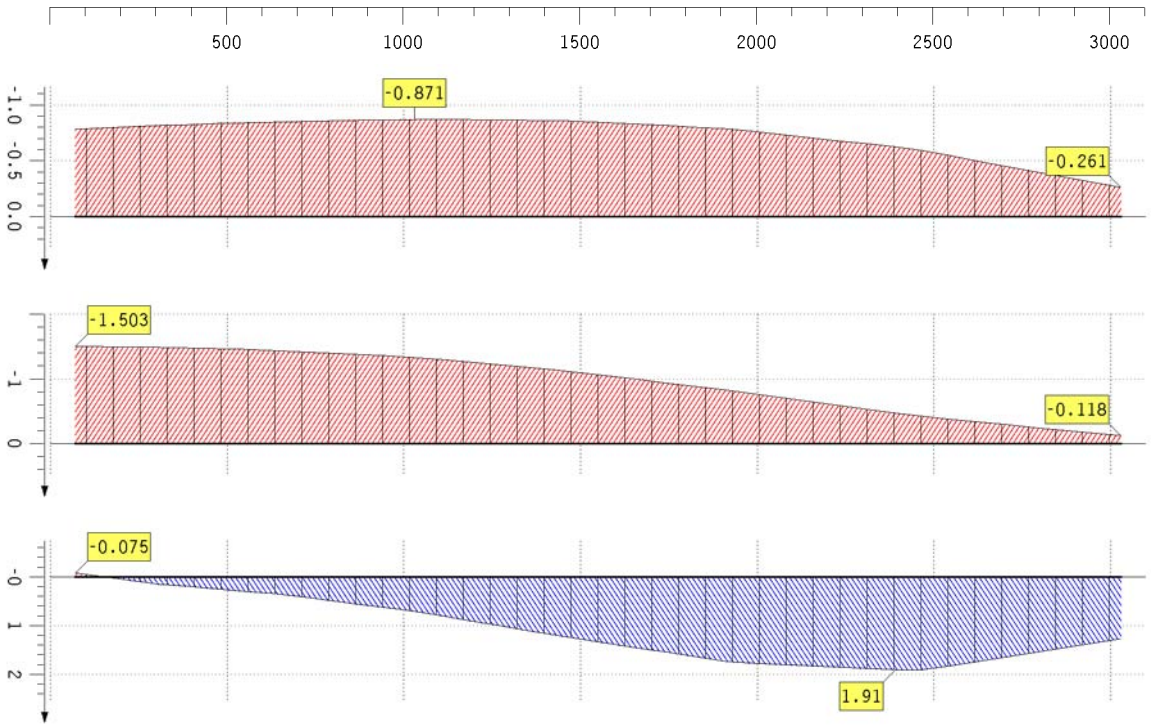
Schnittgrößen Fuge 2



Vy [kN]
min/max
2.777 / 0.824

Mz [kNm]
min/max
0.303 / 6.467

Schnittgrößen Fuge 3



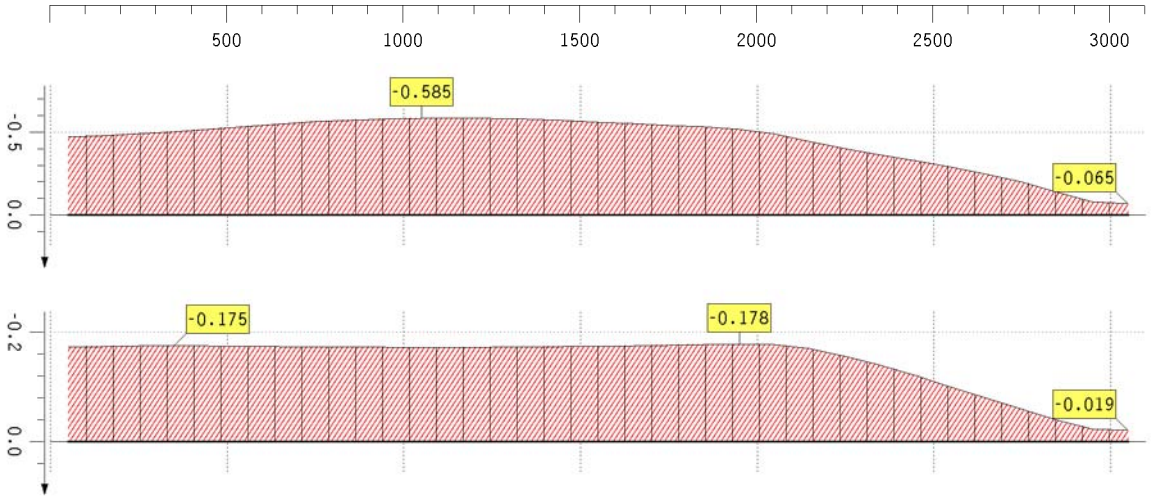
N [kN]
min/max
0.871 / -0.261

Vy [kN]
min/max
1.503 / -0.118

Mz [kNm]
min/max
0.075 / 1.910

5.3.7. 5 : Nutzlasten (1/1)

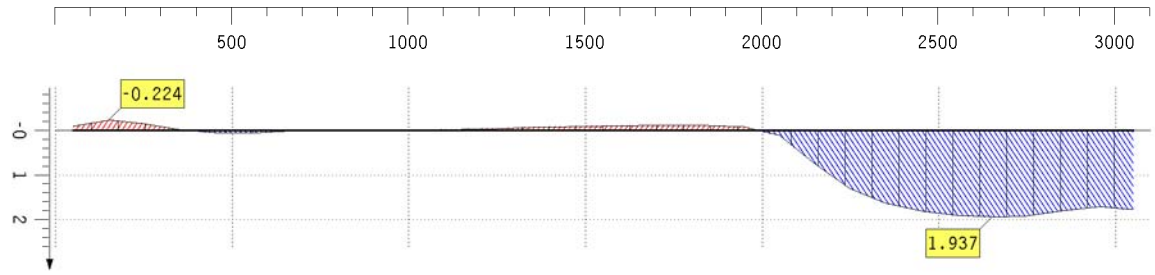
Schnittgrößen Fuge 1



N [kN]
min/max
0.585 / -0.065

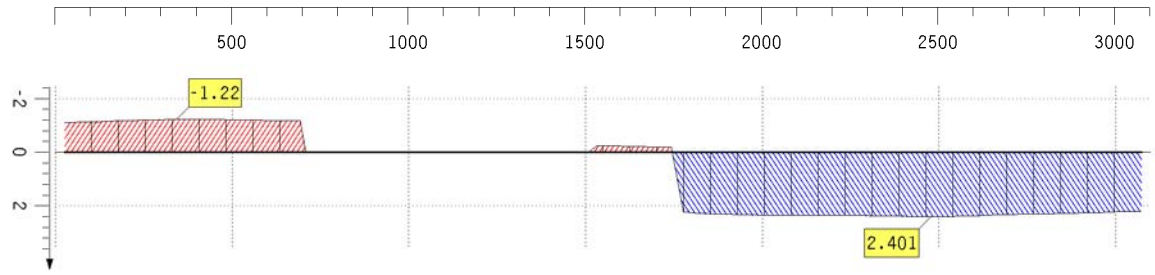
Vy [kN]
min/max
0.178 / -0.019

Schnittgrößen Fuge 1

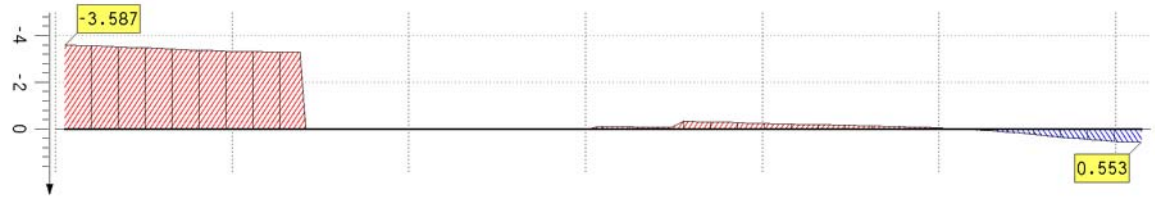


Mz [kNm]
min/max
0.224 / 1.937

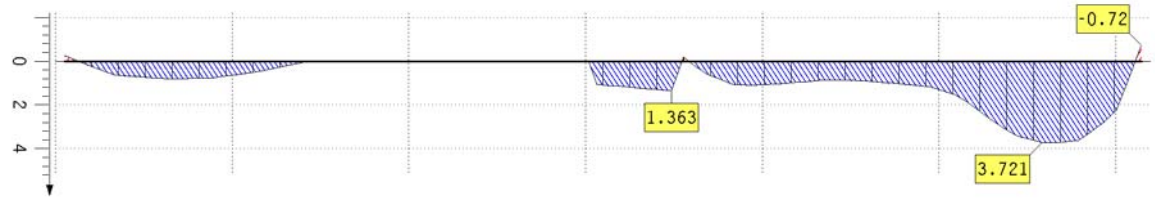
Schnittgrößen Fuge 2



N [kN]
min/max
1.220 / 2.401

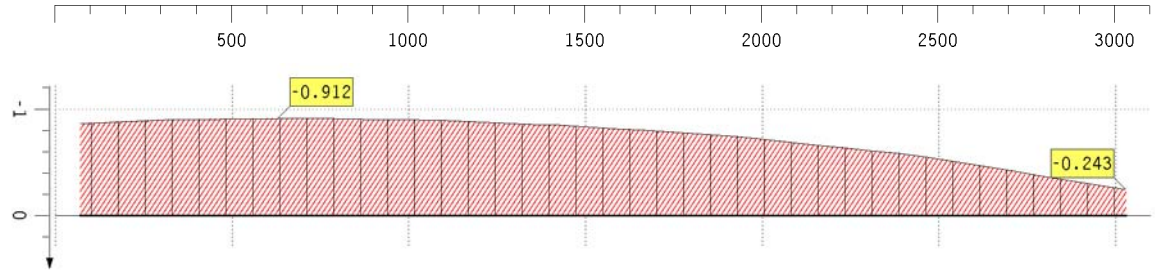


Vy [kN]
min/max
3.587 / 0.553

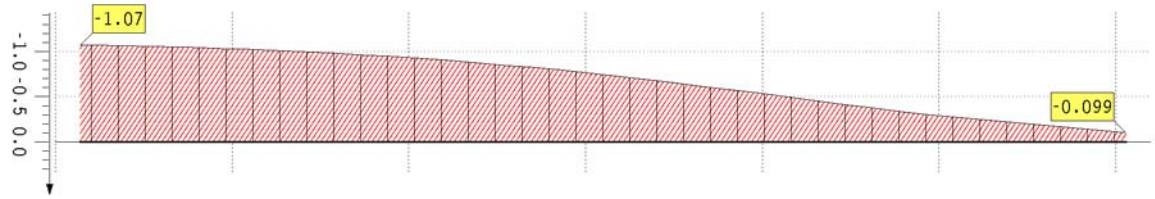


Mz [kNm]
min/max
0.720 / 3.721

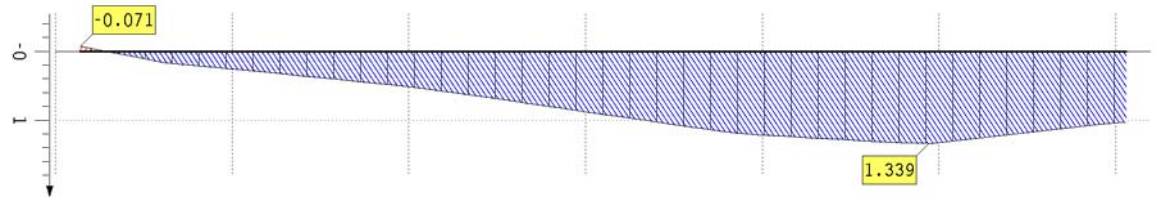
Schnittgrößen Fuge 3



N [kN]
min/max
0.912 / -0.243



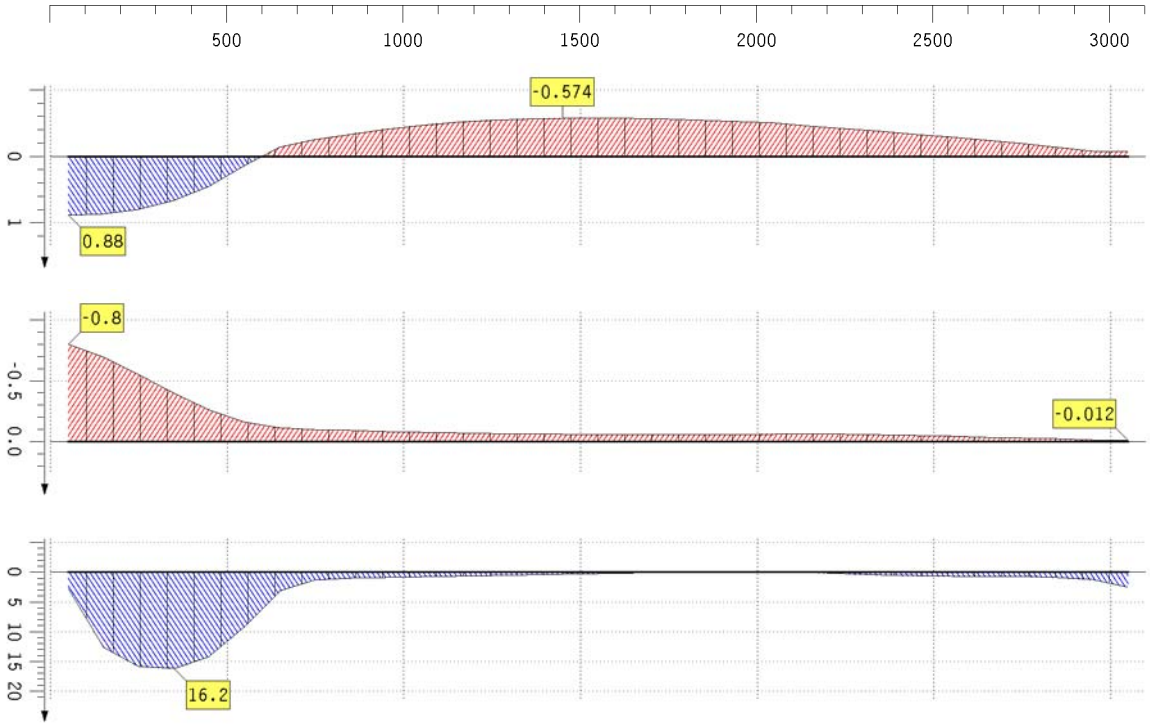
Vy [kN]
min/max
1.070 / -0.099



Mz [kNm]
min/max
0.071 / 1.339

5.3.8. 6 (Gruppe A): Schneelast (1)

Schnittgrößen Fuge 1

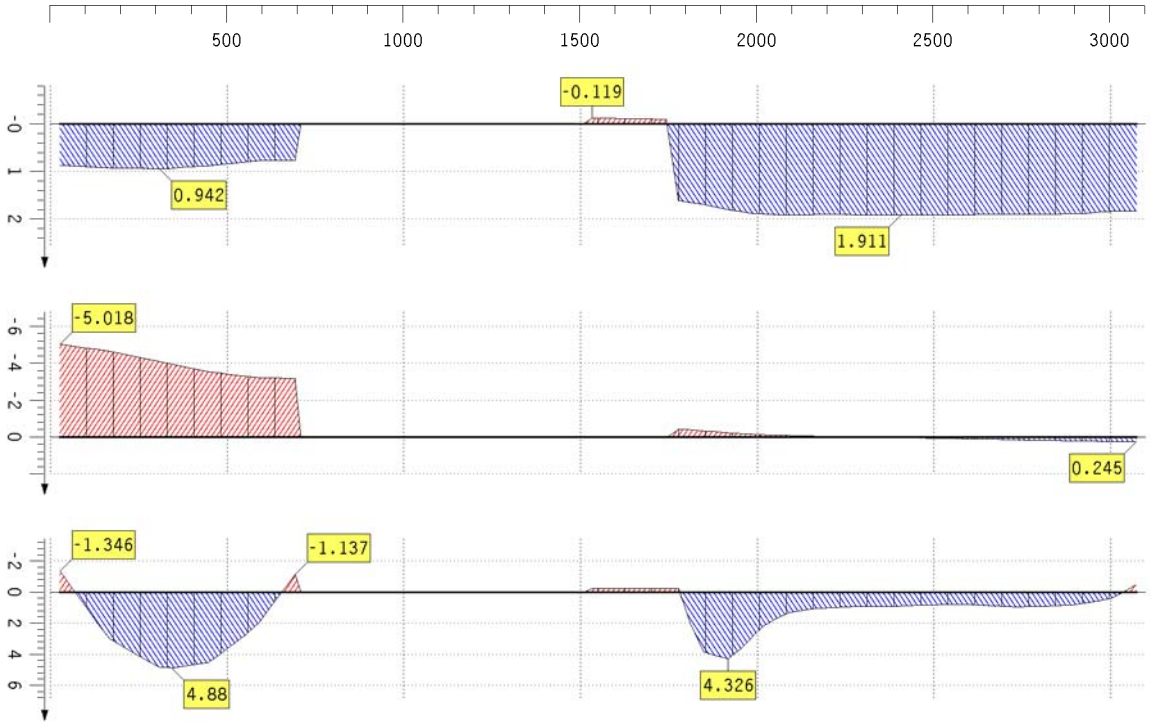


N [kN]
min/max
0.574 / 0.880

Vy [kN]
min/max
0.800 / -0.012

Mz [kNm]
min/max
0.143 / 16.205

Schnittgrößen Fuge 2

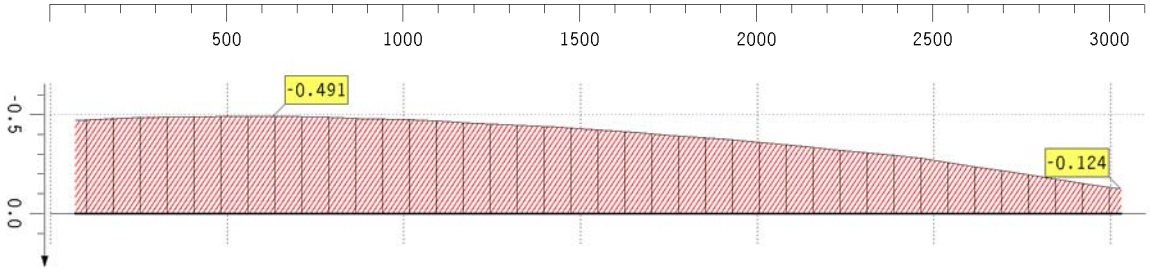


N [kN]
min/max
0.119 / 1.911

Vy [kN]
min/max
5.018 / 0.245

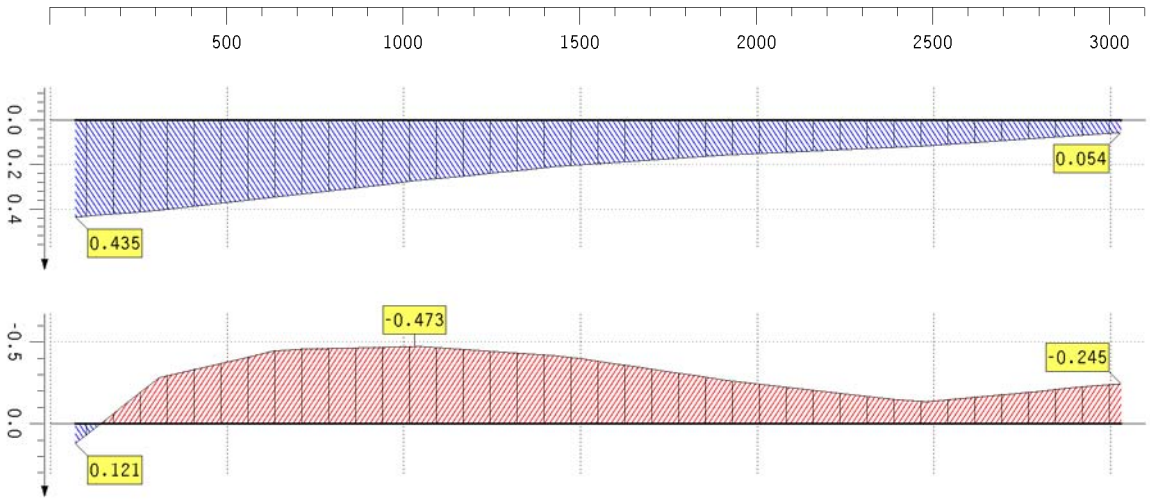
Mz [kNm]
min/max
1.346 / 4.880

Schnittgrößen Fuge 3



N [kN]
min/max
0.491 / -0.124

Schnittgrößen Fuge 3

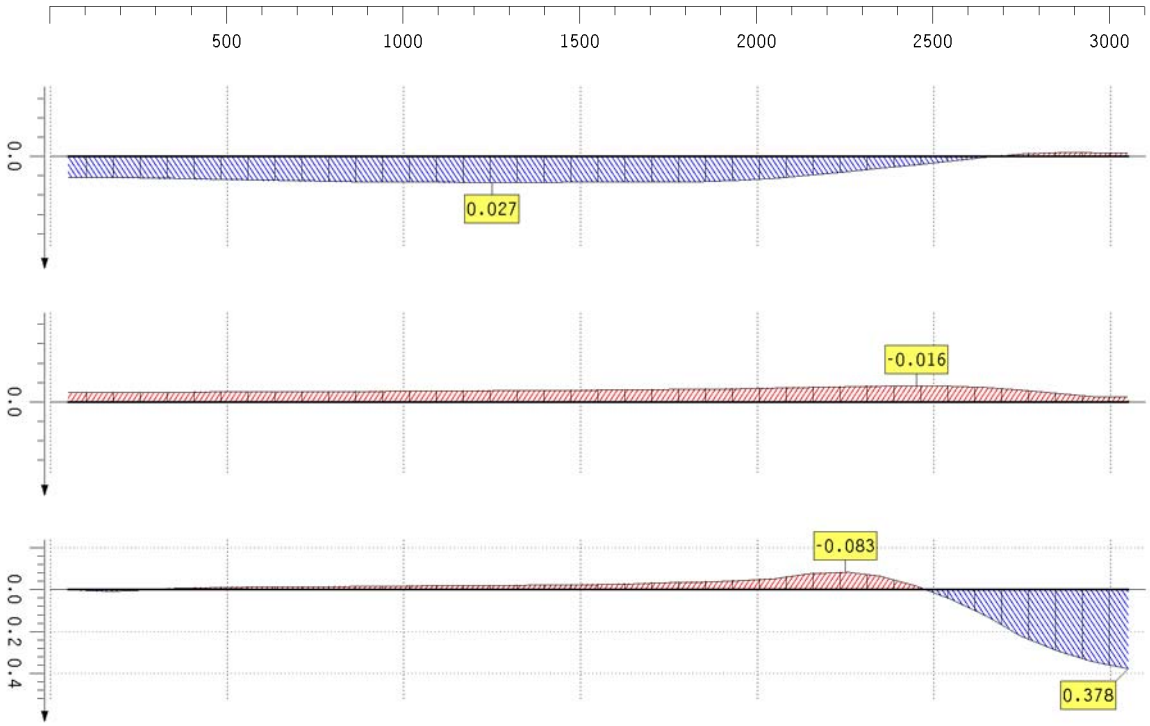


Vy [kN]
min/max
.054 / 0.435

Mz [kNm]
min/max
0.473 / 0.121

5.3.9. 7 (Gruppe B): WH1

Schnittgrößen Fuge 1

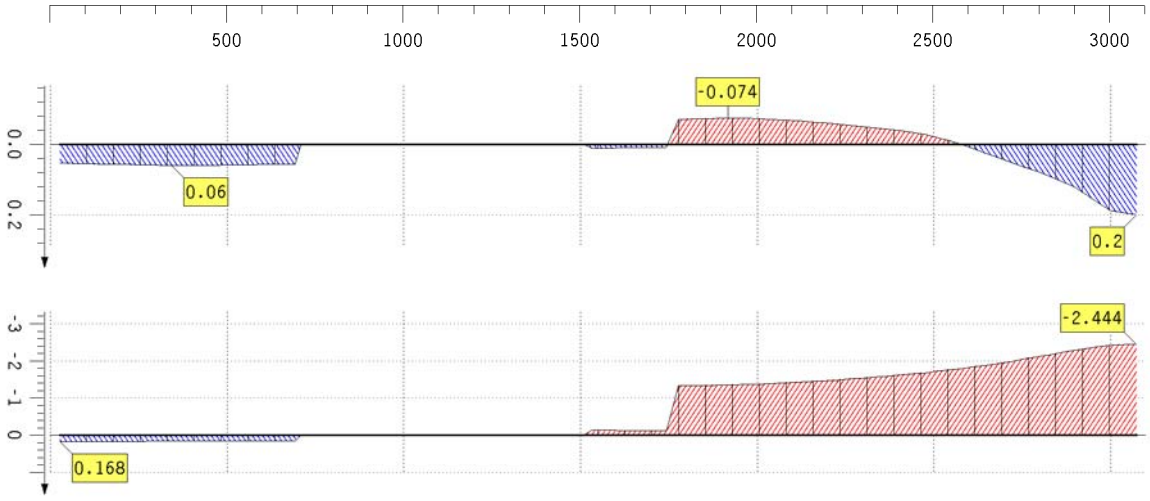


N [kN]
min/max
0.004 / 0.027

Vy [kN]
min/max
0.016 / -0.004

Mz [kNm]
min/max
0.083 / 0.378

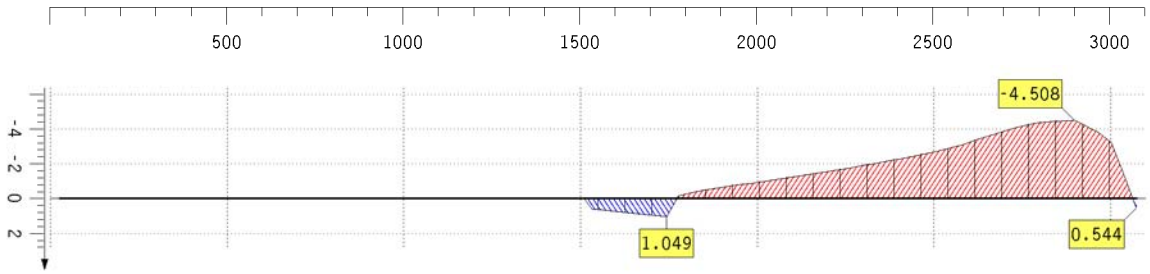
Schnittgrößen Fuge 2



N [kN]
min/max
0.074 / 0.200

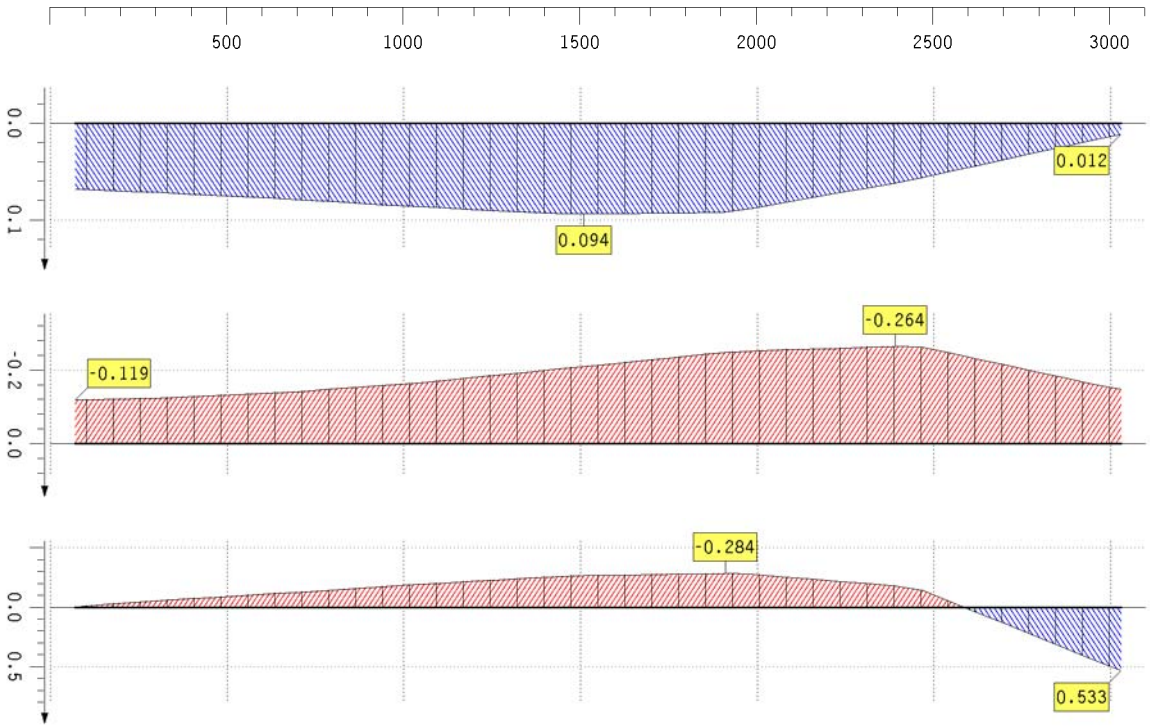
Vy [kN]
min/max
2.444 / 0.168

Schnittgrößen Fuge 2



Mz [kNm]
min/max
4.508 / 1.049

Schnittgrößen Fuge 3



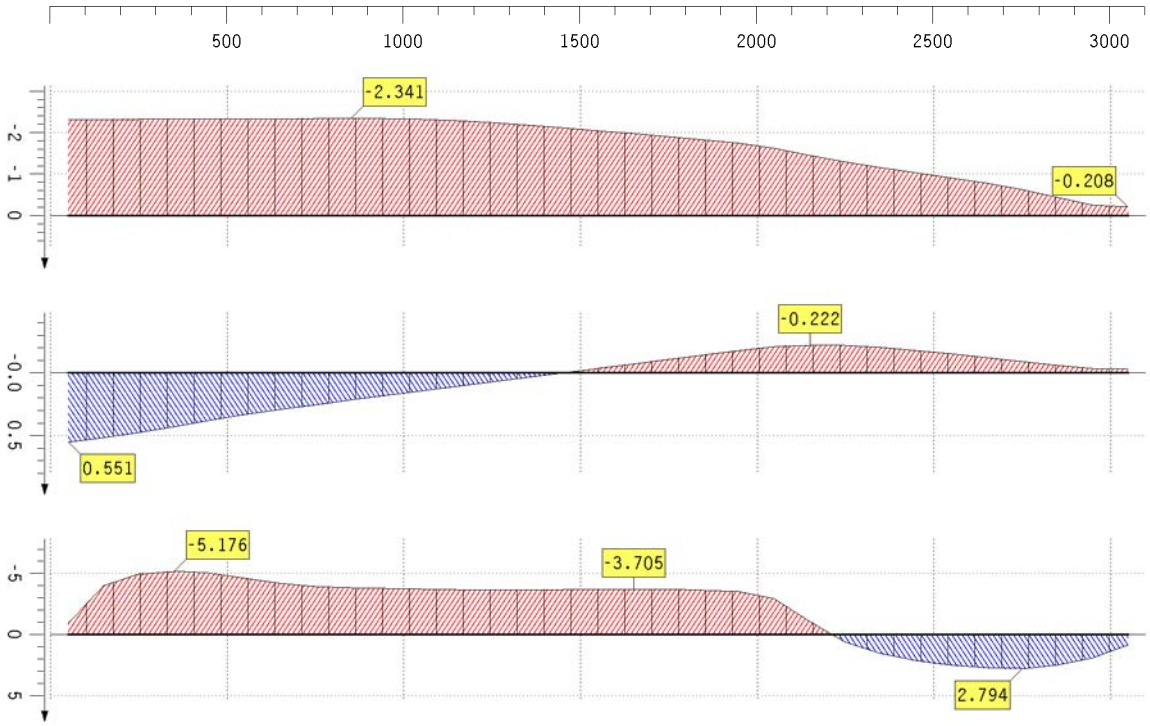
N [kN]
min/max
.012 / 0.094

Vy [kN]
min/max
0.264 / -0.119

Mz [kNm]
min/max
0.284 / 0.533

5.3.10. 10 : WH2

Schnittgrößen Fuge 1

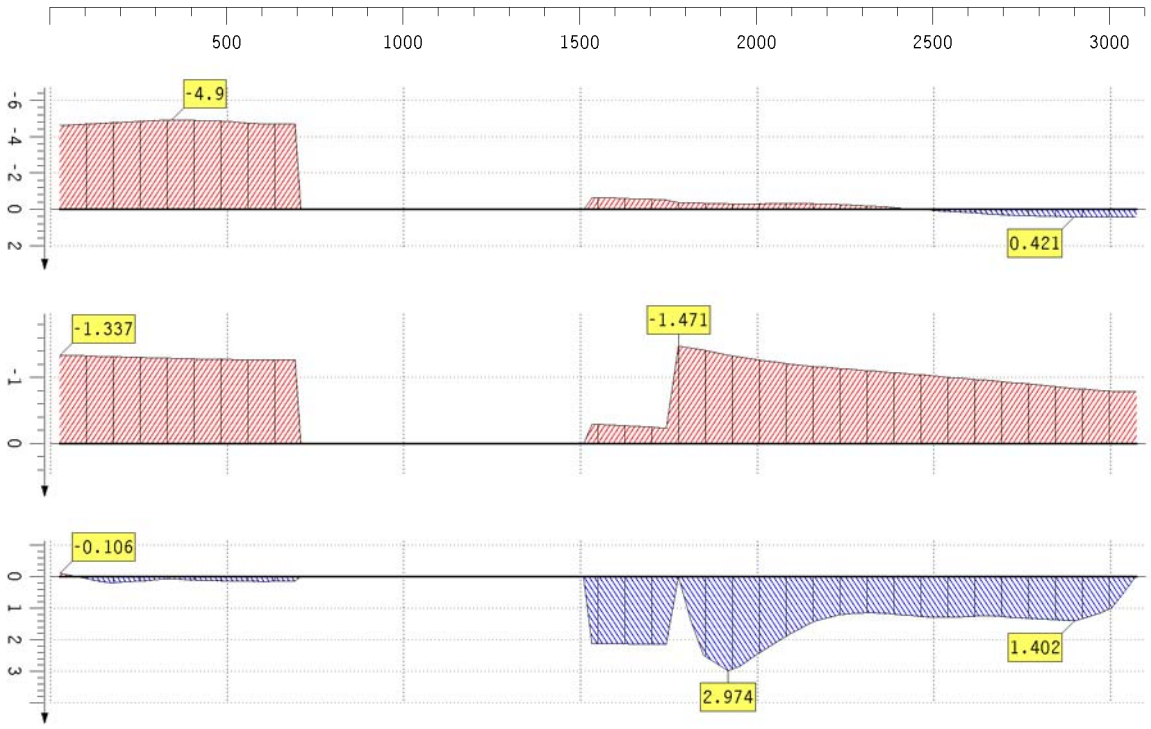


N [kN]
min/max
2.341 / -0.208

Vy [kN]
min/max
0.222 / 0.551

Mz [kNm]
min/max
5.176 / 2.794

Schnittgrößen Fuge 2

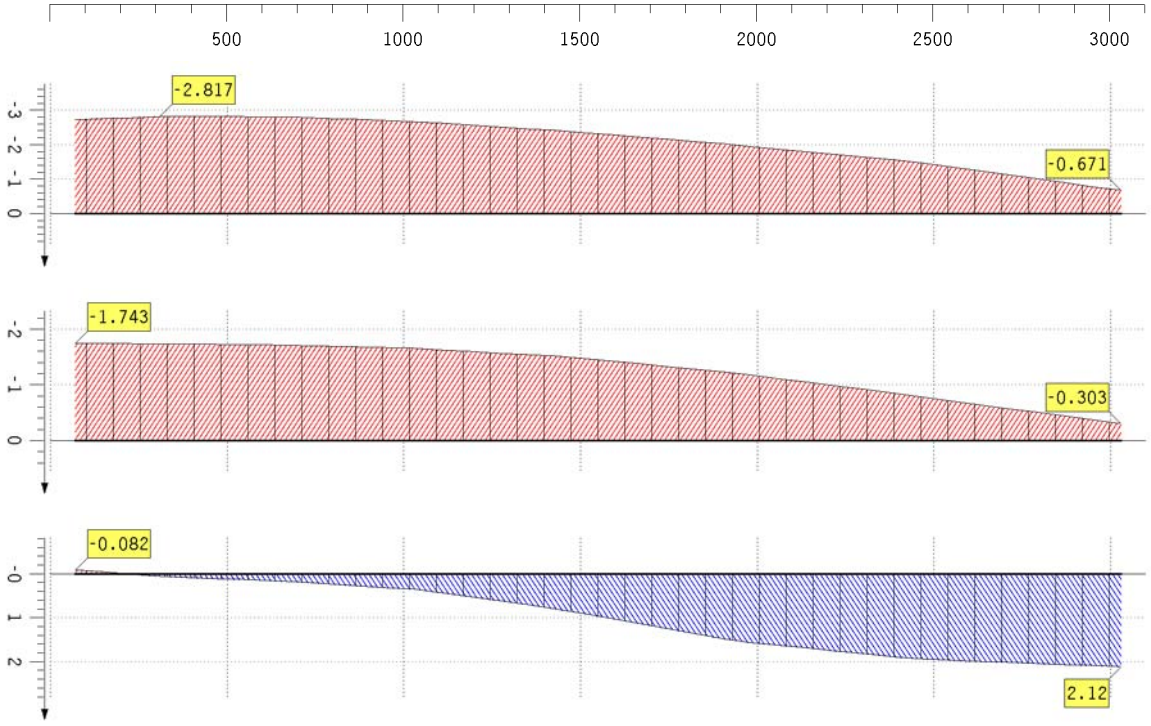


N [kN]
min/max
4.900 / 0.421

Vy [kN]
min/max
1.471 / -0.228

Mz [kNm]
min/max
0.106 / 2.974

Schnittgrößen Fuge 3



N [kN]
min/max
2.817 / -0.671

Vy [kN]
min/max
1.743 / -0.303

Mz [kNm]
min/max
0.082 / 2.120

6. Lastsummen

6.1. 1 : g1

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	30.6000	0.0000
Auflager	0.0000	-30.6000	0.0000
Σ	0.0000	0.0000	0.0000

6.2. 2 : g2

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	25.5000	0.0000
Auflager	0.0000	-25.5000	0.0000
Σ	0.0000	0.0000	0.0000

6.3. 3 : g3

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	29.7500	0.0000
Auflager	0.0000	-29.7500	0.0000
Σ	0.0000	0.0000	0.0000

6.4. 4 : g4

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	21.2500	0.0000
Auflager	0.0000	-21.2500	0.0000
Σ	0.0000	0.0000	0.0000

6.5. 8 : g5o

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	2.2500	0.0000
Auflager	0.0000	-2.2500	0.0000
Σ	0.0000	0.0000	0.0000

6.6. 9 : g5u

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	4.9500	0.0000
Auflager	0.0000	-4.9500	0.0000
Σ	0.0000	0.0000	0.0000

6.7. 5 : Nutzlasten (1/1)

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	34.0000	0.0000
Auflager	0.0000	-34.0000	0.0000
Σ	0.0000	0.0000	0.0000

6.8. 6 (Gruppe A): Schneelast (1)

Richtung	x [kN]	y [kN]	z [kN]
Lasten	0.0000	27.2000	0.0000
Auflager	0.0000	-27.2000	0.0000
Σ	0.0000	0.0000	0.0000

6.9. 7 (Gruppe B): WH1

Richtung	x [kN]	y [kN]	z [kN]
Lasten	25.2875	0.0000	0.0000
Auflager	-25.2875	-0.0000	0.0000
Σ	0.0000	0.0000	0.0000

6.10. 10 : WH2

Richtung	x [kN]	y [kN]	z [kN]
Lasten	15.9035	0.0000	0.0000
Auflager	-15.9035	0.0000	0.0000
Σ	0.0000	0.0000	0.0000

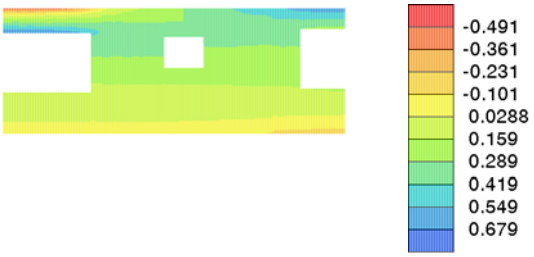
7. Nachweisergebnisse

7.1. EC 5 Tragfähigkeit (Th.I.Ord.)

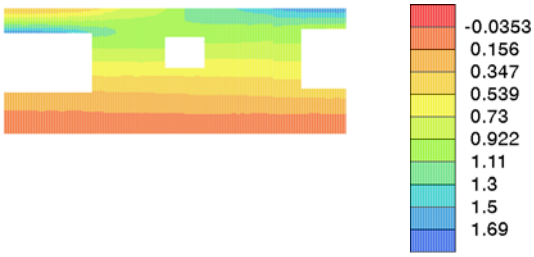
7.2. EC 5 Verformungen

7.2.1. Verformung Flächenergebnisse

Verformung min u_x [mm]
min u_x = -0.5 mm, max u_x = 0.7 mm



Verformung max u_x [mm]
min u_x = -0.0 mm, max u_x = 1.7 mm



Verformung min u_y [mm]
min u_y = -0.0 mm, max u_y = 4.3 mm

Verformung max u_y [mm]
min u_y = -0.0 mm, max u_y = 9.0 mm

7.2.2. Verformung Punktergebnisse

Nachweispunkte Scheibenebene

Nr	x [mm]	y [mm]	Wxy,inst [mm]	Wxy,instReq [mm]	Wxy,fin [mm]	Wxy,finReq [mm]	Uxy [-]
1	4250	1550	1.9	13.3	2.7	13.3	0.204

7.3. EC 5 Brandschutz

Achtung! Fugen werden im Brandfall nicht nachgewiesen!

7.3.1. Brandschutz Flächenergebnisse

Normalkräfte min n_{xx} [kN/m]
min n_{xx} = -668.51 kN/m, max n_{xx} = 428.53 kN/m

Normalkräfte max n_{xx} [kN/m]
min n_{xx} = -666.00 kN/m, max n_{xx} = 434.94 kN/m

Normalkräfte min n_{yy} [kN/m]
min n_{yy} = -471.74 kN/m, max n_{yy} = 119.01 kN/m

Normalkräfte max n_{yy} [kN/m]
min n_{yy} = -469.75 kN/m, max n_{yy} = 120.33 kN/m

Normalkräfte min n_{xy} [kN/m]
min n_{xy} = -52.89 kN/m, max n_{xy} = 28.17 kN/m

Normalkräfte max n_{xy} [kN/m]
min n_{xy} = -52.79 kN/m, max n_{xy} = 28.37 kN/m

Normalspannungen $\sigma_{xx,min}$ [N/mm²]
min $\sigma_{xx,min}$ = -8.36 N/mm², max $\sigma_{xx,min}$ = 5.36 N/mm²

Normalspannungen $\sigma_{yy,min}$ [N/mm²]
min $\sigma_{yy,min}$ = -5.13 N/mm², max $\sigma_{yy,min}$ = 1.29 N/mm²

Normalspannungen $\sigma_{xx,max}$ [N/mm²]
min $\sigma_{xx,max}$ = -8.33 N/mm², max $\sigma_{xx,max}$ = 5.44 N/mm²

Normalspannungen $\sigma_{yy,min}$ [N/mm²]
min $\sigma_{yy,max}$ = -5.11 N/mm², max $\sigma_{yy,max}$ = 1.31 N/mm²

Schubspannungen τ_{xy} [N/mm²]
min τ\xy = 0.01 N/mm², max τ_{xy} = 0.66 N/mm²

Schubspannungen τ_{yx} [N/mm²]
min τ_{yx} = 0.01 N/mm², max τ_{yx} = 0.66 N/mm²

Torsionsschubspannungen τ_{tor} [N/mm²]
min τ_{tor} = 0.00 N/mm², max τ_{tor} = 0.21 N/mm²

Ausnutzung $U_{\sigma xx}$
min $U_{\sigma xx}$ = 0.000, max $U_{\sigma xx}$ = 0.398

Ausnutzung $U_{\sigma yy}$
min $U_{\sigma yy}$ = 0.000, max $U_{\sigma yy}$ = 0.244

Ausnutzung $U_{\sigma yy}$
min $U_{\sigma yy}$ = 0.000, max $U_{\sigma yy}$ = 0.244

Ausnutzung $U_{\sigma yy}$
min $U_{\sigma yy}$ = 0.000, max $U_{\sigma yy}$ = 0.244

Ausnutzung $U_{\sigma yy}$
min $U_{\sigma yy}$ = 0.000, max $U_{\sigma yy}$ = 0.244

Gesamtausnutzung U
min U = 0.006, max U = 0.398

8. Detailnachweispunkte

POSITION 1, KNOTEN 344 BEI X = 1.69 M, Y = 1.34 M

Querschnittsbeschreibung

Leno 2 200 5s, Aufbau 40.0-**40.0**-40.0-**40.0**-40.0 Nadelvollholz C24
d_x = 80.0 mm, d_y = 120.0 mm, b = 185 mm, e = 185 mm (Achsabst. d. Bretter), t^* = 160.0 mm, t_m = 40.0 mm
$f_{c0,k}$ = 21.00 N/mm², $f_{t0,k}$ = 14.50 N/mm², $f_{v,k}$ = 3.08 N/mm², $f_{tor,k}$ = 2.50 N/mm²

Lastfallergebnisse

Nr	u_x mm	u_y mm	v_z ‰	n_{xx} kN/m	n_{yy} kN/m	n_{xy} kN/m	Bezeichnung
Einwirkung 1: ständige Lasten							
1	0.00	0.01	0.00	-8.22	-25.19	2.51	g1
2	0.00	0.01	0.00	-6.85	-20.99	2.09	g2
3	0.00	0.01	0.00	-7.99	-24.49	2.44	g3
4	0.00	0.01	0.00	-5.71	-17.49	1.74	g4
8	0.00	0.00	0.00	-4.09	-9.33	0.96	g5o
9	0.00	0.01	0.00	-17.27	-19.26	1.28	g5u
Einwirkung 2: Nutzlasten (1)							
5	0.00	0.02	0.00	-15.12	-29.26	2.99	Nutzlasten (1/1)
Einwirkung 3: Schneelasten							
6	0.00	0.01	0.00	-7.31	-22.39	2.23	Schneelast (1)
Einwirkung 4: Windlasten							
7	0.01	0.00	0.00	16.11	1.70	-0.24	WH1
10	0.02	0.02	0.00	-6.48	-31.07	0.85	WH2

Nachweis 1: EC 5 Tragfähigkeit (Th.I.Ord.)

Ergebnisse der Lastkombinationen

Typ	u_x mm	u_y mm	v_z ‰	n_{xx} kN/m	n_{yy} kN/m	n_{xy} kN/m	Faktorisierung
Extremierung 1: Fall 1 (kmod=0.60)							
min u_x	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_x	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
min u_y	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_y	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
min v_z	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max v_z	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
min n_{xx}	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
max n_{xx}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{yy}	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
max n_{yy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{xy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max n_{xy}	0.01	0.06	0.00	-56.89	-124.57	11.58	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)
Extremierung 2: Fall 2 (kmod=0.80)							
min u_x	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_x	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
min u_y	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_y	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
min v_z	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max v_z	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
min n_{xx}	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
max n_{xx}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{yy}	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
max n_{yy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{xy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max n_{xy}	0.01	0.09	0.00	-79.57	-168.45	16.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
Extremierung 3: Fall 3 (kmod=0.90)							
min u_x	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_x	0.01	0.10	0.00	-83.73	-188.88	18.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf6
min u_y	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_y	0.01	0.10	0.00	-83.73	-188.88	18.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf6
min v_z	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max v_z	0.01	0.10	0.00	-83.73	-188.88	18.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf6
min n_{xx}	0.01	0.09	0.00	-85.05	-185.25	17.74	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5+0.5*1.5*Lf6
max n_{xx}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{yy}	0.01	0.10	0.00	-83.73	-188.88	18.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf6
max n_{yy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
min n_{xy}	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max n_{xy}	0.01	0.10	0.00	-83.73	-188.88	18.07	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf6
Extremierung 4: Fall 4 (kmod=1.00)							
min u_x	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_x	0.05	0.11	0.00	-63.81	-216.14	17.31	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10+0.5*1.5*Lf6+1.5*Lf7
min u_y	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max u_y	0.05	0.11	0.00	-63.81	-216.14	17.31	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10+0.5*1.5*Lf6+1.5*Lf7
min v_z	0.00	0.05	0.00	-42.14	-92.27	8.58	Lf1+Lf2+Lf4+Lf8+Lf9
max v_z	0.05	0.11	0.00	-63.81	-216.14	17.31	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10+0.5*1.5*Lf6+1.5*Lf7
min n_{xx}	0.03	0.11	0.00	-90.88	-213.21	18.50	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5+0.6*1.5*Lf10+0.5*1.5*Lf6
max n_{xx}	0.02	0.05	0.00	-17.98	-89.73	8.22	Lf1+Lf2+Lf4+Lf8+Lf9+1.5*Lf7
min n_{yy}	0.04	0.11	0.00	-87.97	-218.69	17.67	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10+0.5*1.5*Lf6
max n_{yy}	0.02	0.05	0.00	-17.98	-89.73	8.22	Lf1+Lf2+Lf4+Lf8+Lf9+1.5*Lf7
min n_{xy}	0.02	0.05	0.00	-17.98	-89.73	8.22	Lf1+Lf2+Lf4+Lf8+Lf9+1.5*Lf7
max n_{xy}	0.03	0.11	0.00	-89.56	-216.84	18.83	1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+0.6*1.5*Lf10+1.5*Lf6

Nachweis der Lastkombinationen

Extremierung 1/1: min n_{xx}
Schnittgrößen: nxx = -56.89 N/mm, nyy = -124.57 N/mm, nxy = 11.58 N/mm, k_{mod} = 0.60
σ_{xx} = -0.711 N/mm², σ_{yy} = -1.038 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.073, $U_{\sigma y}$ = 0.107 ⇒ **U_σ = 0.107**
τ_{xy} = 0.145 N/mm², τ_{yx} = 0.145 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.102, $U_{\tau yx}$ = 0.102 ⇒ **U_τ = 0.102**
n_{xy} = 11.583 N/mm², τ_{tor} = 0.047 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.041**
⇒ **U = 0.107**

Extremierung 1/1: max n_{xx}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.60
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.054, $U_{\sigma y}$ = 0.079 ⇒ **U_σ = 0.079**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.075, $U_{\tau yx}$ = 0.075 ⇒ **U_τ = 0.075**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.030**
⇒ **U = 0.079**

Extremierung 1/1: min n_{yy}
Schnittgrößen: nxx = -56.89 N/mm, nyy = -124.57 N/mm, nxy = 11.58 N/mm, k_{mod} = 0.60
σ_{xx} = -0.711 N/mm², σ_{yy} = -1.038 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.073, $U_{\sigma y}$ = 0.107 ⇒ **U_σ = 0.107**
τ_{xy} = 0.145 N/mm², τ_{yx} = 0.145 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.102, $U_{\tau yx}$ = 0.102 ⇒ **U_τ = 0.102**
n_{xy} = 11.583 N/mm², τ_{tor} = 0.047 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.041**
⇒ **U = 0.107**

Extremierung 1/1: max n_{yy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.60

σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.054, $U_{\sigma y}$ = 0.079 ⇒ **U_σ = 0.079**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.075, $U_{\tau yx}$ = 0.075 ⇒ **U_τ = 0.075**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.030**
⇒ **U = 0.079**

Extremierung 1/1: min n_{xy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.60
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.054, $U_{\sigma y}$ = 0.079 ⇒ **U_σ = 0.079**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.075, $U_{\tau yx}$ = 0.075 ⇒ **U_τ = 0.075**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.030**
⇒ **U = 0.079**

Extremierung 1/1: max n_{xy}
Schnittgrößen: nxx = -56.89 N/mm, nyy = -124.57 N/mm, nxy = 11.58 N/mm, k_{mod} = 0.60
σ_{xx} = -0.711 N/mm², σ_{yy} = -1.038 N/mm², γ = 1.30, $f_{c0,d}$ = 9.692 N/mm², $f_{t0,d}$ = 6.692 N/mm²
$U_{\sigma x}$ = 0.073, $U_{\sigma y}$ = 0.107 ⇒ **U_σ = 0.107**
τ_{xy} = 0.145 N/mm², τ_{yx} = 0.145 N/mm², $f_{v,d}$ = 1.423 N/mm²
$U_{\tau xy}$ = 0.102, $U_{\tau yx}$ = 0.102 ⇒ **U_τ = 0.102**
n_{xy} = 11.583 N/mm², τ_{tor} = 0.047 N/mm², $f_{tor,d}$ = 1.154 N/mm², **U_{tor} = 0.041**
⇒ **U = 0.107**

Extremierung 1/2: min n_{xx}
Schnittgrößen: nxx = -79.57 N/mm, nyy = -168.45 N/mm, nxy = 16.07 N/mm, k_{mod} = 0.80
σ_{xx} = -0.995 N/mm², σ_{yy} = -1.404 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.077, $U_{\sigma y}$ = 0.109 ⇒ **U_σ = 0.109**
τ_{xy} = 0.201 N/mm², τ_{yx} = 0.201 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.106, $U_{\tau yx}$ = 0.106 ⇒ **U_τ = 0.106**
n_{xy} = 16.066 N/mm², τ_{tor} = 0.065 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.042**
⇒ **U = 0.109**

Extremierung 1/2: max n_{xx}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.80
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.041, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.057, $U_{\tau yx}$ = 0.057 ⇒ **U_τ = 0.057**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.023**
⇒ **U = 0.060**

Extremierung 1/2: min n_{yy}
Schnittgrößen: nxx = -79.57 N/mm, nyy = -168.45 N/mm, nxy = 16.07 N/mm, k_{mod} = 0.80
σ_{xx} = -0.995 N/mm², σ_{yy} = -1.404 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.077, $U_{\sigma y}$ = 0.109 ⇒ **U_σ = 0.109**
τ_{xy} = 0.201 N/mm², τ_{yx} = 0.201 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.106, $U_{\tau yx}$ = 0.106 ⇒ **U_τ = 0.106**
n_{xy} = 16.066 N/mm², τ_{tor} = 0.065 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.042**
⇒ **U = 0.109**

Extremierung 1/2: max n_{yy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.80
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.041, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.057, $U_{\tau yx}$ = 0.057 ⇒ **U_τ = 0.057**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.023**
⇒ **U = 0.060**

Extremierung 1/2: min n_{xy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.80
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.041, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.057, $U_{\tau yx}$ = 0.057 ⇒ **U_τ = 0.057**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.023**
⇒ **U = 0.060**

Extremierung 1/2: max n_{xy}
Schnittgrößen: nxx = -79.57 N/mm, nyy = -168.45 N/mm, nxy = 16.07 N/mm, k_{mod} = 0.80
σ_{xx} = -0.995 N/mm², σ_{yy} = -1.404 N/mm², γ = 1.30, $f_{c0,d}$ = 12.923 N/mm², $f_{t0,d}$ = 8.923 N/mm²
$U_{\sigma x}$ = 0.077, $U_{\sigma y}$ = 0.109 ⇒ **U_σ = 0.109**
τ_{xy} = 0.201 N/mm², τ_{yx} = 0.201 N/mm², $f_{v,d}$ = 1.897 N/mm²
$U_{\tau xy}$ = 0.106, $U_{\tau yx}$ = 0.106 ⇒ **U_τ = 0.106**
n_{xy} = 16.066 N/mm², τ_{tor} = 0.065 N/mm², $f_{tor,d}$ = 1.538 N/mm², **U_{tor} = 0.042**
⇒ **U = 0.109**

Extremierung 1/3: min n_{xx}

Schnittgrößen: nxx = -85.05 N/mm, nyy = -185.25 N/mm, nxy = 17.74 N/mm, k_{mod} = 0.90
σ_{xx} = -1.063 N/mm², σ_{yy} = -1.544 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.073, $U_{\sigma y}$ = 0.106 ⇒ **U_σ = 0.106**
τ_{xy} = 0.222 N/mm², τ_{yx} = 0.222 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.104, $U_{\tau yx}$ = 0.104 ⇒ **U_τ = 0.104**
n_{xy} = 17.738 N/mm², τ_{tor} = 0.072 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.042**
⇒ **U = 0.106**

Extremierung 1/3: max n_{xx}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.90
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.036, $U_{\sigma y}$ = 0.053 ⇒ **U_σ = 0.053**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.050, $U_{\tau yx}$ = 0.050 ⇒ **U_τ = 0.050**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.020**
⇒ **U = 0.053**

Extremierung 1/3: min n_{yy}
Schnittgrößen: nxx = -83.73 N/mm, nyy = -188.88 N/mm, nxy = 18.07 N/mm, k_{mod} = 0.90
σ_{xx} = -1.047 N/mm², σ_{yy} = -1.574 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.072, $U_{\sigma y}$ = 0.108 ⇒ **U_σ = 0.108**
τ_{xy} = 0.226 N/mm², τ_{yx} = 0.226 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.106, $U_{\tau yx}$ = 0.106 ⇒ **U_τ = 0.106**
n_{xy} = 18.066 N/mm², τ_{tor} = 0.073 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.042**
⇒ **U = 0.108**

Extremierung 1/3: max n_{yy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.90
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.036, $U_{\sigma y}$ = 0.053 ⇒ **U_σ = 0.053**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.050, $U_{\tau yx}$ = 0.050 ⇒ **U_τ = 0.050**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.020**
⇒ **U = 0.053**

Extremierung 1/3: min n_{xy}
Schnittgrößen: nxx = -42.14 N/mm, nyy = -92.27 N/mm, nxy = 8.58 N/mm, k_{mod} = 0.90
σ_{xx} = -0.527 N/mm², σ_{yy} = -0.769 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.036, $U_{\sigma y}$ = 0.053 ⇒ **U_σ = 0.053**
τ_{xy} = 0.107 N/mm², τ_{yx} = 0.107 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.050, $U_{\tau yx}$ = 0.050 ⇒ **U_τ = 0.050**
n_{xy} = 8.580 N/mm², τ_{tor} = 0.035 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.020**
⇒ **U = 0.053**

Extremierung 1/3: max n_{xy}
Schnittgrößen: nxx = -83.73 N/mm, nyy = -188.88 N/mm, nxy = 18.07 N/mm, k_{mod} = 0.90
σ_{xx} = -1.047 N/mm², σ_{yy} = -1.574 N/mm², γ = 1.30, $f_{c0,d}$ = 14.538 N/mm², $f_{t0,d}$ = 10.038 N/mm²
$U_{\sigma x}$ = 0.072, $U_{\sigma y}$ = 0.108 ⇒ **U_σ = 0.108**
τ_{xy} = 0.226 N/mm², τ_{yx} = 0.226 N/mm², $f_{v,d}$ = 2.135 N/mm²
$U_{\tau xy}$ = 0.106, $U_{\tau yx}$ = 0.106 ⇒ **U_τ = 0.106**
n_{xy} = 18.066 N/mm², τ_{tor} = 0.073 N/mm², $f_{tor,d}$ = 1.731 N/mm², **Utor = 0.042**
⇒ **U = 0.108**

Extremierung 1/4: min n_{xx}
Schnittgrößen: nxx = -90.88 N/mm, nyy = -213.21 N/mm, nxy = 18.50 N/mm, k_{mod} = 1.00
σ_{xx} = -1.136 N/mm², σ_{yy} = -1.777 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.070, $U_{\sigma y}$ = 0.110 ⇒ **U_σ = 0.110**
τ_{xy} = 0.231 N/mm², τ_{yx} = 0.231 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.098, $U_{\tau yx}$ = 0.098 ⇒ **U_τ = 0.098**
n_{xy} = 18.501 N/mm², τ_{tor} = 0.075 N/mm², $f_{tor,d}$ = 1.923 N/mm², **Utor = 0.039**
⇒ **U = 0.110**

Extremierung 1/4: max n_{xx}
Schnittgrößen: nxx = -17.98 N/mm, nyy = -89.73 N/mm, nxy = 8.22 N/mm, k_{mod} = 1.00
σ_{xx} = -0.225 N/mm², σ_{yy} = -0.748 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.014, $U_{\sigma y}$ = 0.046 ⇒ **U_σ = 0.046**
τ_{xy} = 0.103 N/mm², τ_{yx} = 0.103 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.043, $U_{\tau yx}$ = 0.043 ⇒ **U_τ = 0.043**
n_{xy} = 8.220 N/mm², τ_{tor} = 0.033 N/mm², $f_{tor,d}$ = 1.923 N/mm², **Utor = 0.017**
⇒ **U = 0.046**

Extremierung 1/4: min n_{yy}
Schnittgrößen: nxx = -87.97 N/mm, nyy = -218.69 N/mm, nxy = 17.67 N/mm, k_{mod} = 1.00
σ_{xx} = -1.100 N/mm², σ_{yy} = -1.822 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.068, $U_{\sigma y}$ = 0.113 ⇒ **U_σ = 0.113**
τ_{xy} = 0.221 N/mm², τ_{yx} = 0.221 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.093, $U_{\tau yx}$ = 0.093 ⇒ **U_τ = 0.093**
n_{xy} = 17.665 N/mm², τ_{tor} = 0.072 N/mm², $f_{tor,d}$ = 1.923 N/mm², **Utor = 0.037**
⇒ **U = 0.113**

Nachweis der Lastkombinationen

Extremierung 1/4: max n_{yy}
Schnittgrößen: nxx = -17.98 N/mm, nyy = -89.73 N/mm, nxy = 8.22 N/mm, k_{mod} = 1.00
σ_{xx} = -0.225 N/mm², σ_{yy} = -0.748 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.014, $U_{\sigma y}$ = 0.046 ⇒ **U_σ = 0.046**
τ_{xy} = 0.103 N/mm², τ_{yx} = 0.103 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.043, $U_{\tau yx}$ = 0.043 ⇒ **U_τ = 0.043**
n_{xy} = 8.220 N/mm², τ_{tor} = 0.033 N/mm², $f_{tor,d}$ = 1.923 N/mm², **U_{tor} = 0.017**
⇒ **U = 0.046**

Extremierung 1/4: min n_{xy}
Schnittgrößen: nxx = -17.98 N/mm, nyy = -89.73 N/mm, nxy = 8.22 N/mm, k_{mod} = 1.00
σ_{xx} = -0.225 N/mm², σ_{yy} = -0.748 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.014, $U_{\sigma y}$ = 0.046 ⇒ **U_σ = 0.046**
τ_{xy} = 0.103 N/mm², τ_{yx} = 0.103 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.043, $U_{\tau yx}$ = 0.043 ⇒ **U_τ = 0.043**
n_{xy} = 8.220 N/mm², τ_{tor} = 0.033 N/mm², $f_{tor,d}$ = 1.923 N/mm², **U_{tor} = 0.017**
⇒ **U = 0.046**

Extremierung 1/4: max n_{xy}
Schnittgrößen: nxx = -89.56 N/mm, nyy = -216.84 N/mm, nxy = 18.83 N/mm, k_{mod} = 1.00
σ_{xx} = -1.120 N/mm², σ_{yy} = -1.807 N/mm², γ = 1.30, $f_{c0,d}$ = 16.154 N/mm², $f_{t0,d}$ = 11.154 N/mm²
$U_{\sigma x}$ = 0.069, $U_{\sigma y}$ = 0.112 ⇒ **U_σ = 0.112**
τ_{xy} = 0.235 N/mm², τ_{yx} = 0.235 N/mm², $f_{v,d}$ = 2.372 N/mm²
$U_{\tau xy}$ = 0.099, $U_{\tau yx}$ = 0.099 ⇒ **U_τ = 0.099**
n_{xy} = 18.829 N/mm², τ_{tor} = 0.076 N/mm², $f_{tor,d}$ = 1.923 N/mm², **U_{tor} = 0.040**
⇒ **U = 0.112**

Zusammenfassung:

$\sigma_{xx,min}$ = -1.14 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5+0.6*1.5*Lf10. ...+0.5*1.5*Lf6
$\sigma_{yy,min}$ = -1.82 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10. ...+0.5*1.5*Lf6
$\sigma_{xx,max}$ = -0.22 N/mm²	Ex1/4:Lf1+Lf2+Lf4+Lf8+Lf9+1.5*Lf7
$\sigma_{yy,max}$ = -0.75 N/mm²	Ex1/4:Lf1+Lf2+Lf4+Lf8+Lf9+1.5*Lf7
τ_{xy} = 0.24 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5..... ...+0.6*1.5*Lf10+1.5*Lf6
τ_{yx} = 0.24 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5..... ...+0.6*1.5*Lf10+1.5*Lf6
τ_{tor} = 0.08 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5..... ...+0.6*1.5*Lf10+1.5*Lf6
$U_{\sigma,xx}$ = 0.11 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10. ...+0.5*1.5*Lf6
$U_{\sigma,yy}$ = 0.11 N/mm²	Ex1/2:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
U_τ = 0.04 N/mm²	Ex1/2:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+1.5*Lf5
$U_{\tau,tor}$ = 0.11 N/mm²	Ex1/4:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10. ...+0.5*1.5*Lf6

Max. Ausnutzung: U = 0.113 ≤ 1 ⇒ **Nachweis erfüllt**

Nachweis 2: EC 5 Verformungen

Ergebnisse der Lastkombinationen

Typ	u_x mm	u_y mm	v_z ‰	n_{xx} kN/m	n_{yy} kN/m	n_{xy} kN/m	Faktorisierung
Extremierung 1: Teil A: winst							
min u_x	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max u_x	0.03	0.09	0.00	-54.75	-177.81	14.83	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.7*Lf5+Lf10+0.5*Lf6+Lf7
min u_y	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max u_y	0.03	0.09	0.00	-54.75	-177.81	14.83	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.7*Lf5+Lf10+0.5*Lf6+Lf7
min v_z	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max v_z	0.03	0.09	0.00	-54.75	-177.81	14.83	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.7*Lf5+Lf10+0.5*Lf6+Lf7
min n_{xx}	0.02	0.09	0.00	-72.80	-175.86	15.63	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
max n_{xx}	0.01	0.06	0.00	-34.03	-115.07	10.78	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf7
min n_{yy}	0.03	0.09	0.00	-70.85	-179.51	15.07	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.7*Lf5+Lf10+0.5*Lf6
max n_{yy}	0.01	0.06	0.00	-34.03	-115.07	10.78	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf7
min n_{xy}	0.01	0.06	0.00	-34.03	-115.07	10.78	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf7
max n_{xy}	0.02	0.09	0.00	-71.92	-178.28	15.85	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.7*Lf5+0.6*Lf10+Lf6
Extremierung 2: Teil B: wfin							
min u_x	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max u_x	0.04	0.13	0.00	-87.55	-253.14	21.98	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+Lf10+0.5*Lf6+Lf7
min u_y	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max u_y	0.04	0.13	0.00	-87.55	-253.14	21.98	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+Lf10+0.5*Lf6+Lf7
min v_z	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max v_z	0.04	0.13	0.00	-87.55	-253.14	21.98	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+Lf10+0.5*Lf6+Lf7
min n_{xx}	0.02	0.13	0.00	-105.60	-251.19	22.78	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+1.18*Lf5+0.6*Lf10+0.5*Lf6
max n_{xx}	0.02	0.09	0.00	-64.11	-185.13	17.39	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+Lf7
min n_{yy}	0.03	0.13	0.00	-103.66	-254.84	22.22	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+Lf10+0.5*Lf6
max n_{yy}	0.02	0.09	0.00	-64.11	-185.13	17.39	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+Lf7

Ergebnisse der Lastkombinationen

Typ	u_x mm	u_y mm	v_z ‰	n_{xx} kN/m	n_{yy} kN/m	n_{xy} kN/m	Faktorisierung
min n_{xy}	0.02	0.09	0.00	-64.11	-185.13	17.39	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+Lf7
max n_{xy}	0.02	0.13	0.00	-104.72	-253.61	23.00	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+0.6*Lf10+Lf6
Extremierung 3: Teil C: wnet,fin							
min u_x	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max u_x	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5
min u_y	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max u_y	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5
min v_z	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max v_z	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5
min n_{xx}	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5
max n_{xx}	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
min n_{yy}	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5
max n_{yy}	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
min n_{xy}	0.01	0.09	0.00	-80.22	-186.83	17.63	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)
max n_{xy}	0.01	0.10	0.00	-87.47	-200.87	19.06	1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.3*1.6*Lf5

Nachweis der Lastkombinationen

Extremierung 1/1: min n_{xx}
Schnittgrößen: nxx = -72.80 N/mm, nyy = -175.86 N/mm, nxy = 15.63 N/mm, k_{mod} = 1.00
Extremierung 1/1: max n_{xx}
Schnittgrößen: nxx = -34.03 N/mm, nyy = -115.07 N/mm, nxy = 10.78 N/mm, k_{mod} = 1.00
Extremierung 1/1: min n_{yy}
Schnittgrößen: nxx = -70.85 N/mm, nyy = -179.51 N/mm, nxy = 15.07 N/mm, k_{mod} = 1.00
Extremierung 1/1: max n_{yy}
Schnittgrößen: nxx = -34.03 N/mm, nyy = -115.07 N/mm, nxy = 10.78 N/mm, k_{mod} = 1.00
Extremierung 1/1: min n_{xy}
Schnittgrößen: nxx = -34.03 N/mm, nyy = -115.07 N/mm, nxy = 10.78 N/mm, k_{mod} = 1.00
Extremierung 1/1: max n_{xy}
Schnittgrößen: nxx = -71.92 N/mm, nyy = -178.28 N/mm, nxy = 15.85 N/mm, k_{mod} = 1.00
Extremierung 1/2: min n_{xx}
Schnittgrößen: nxx = -105.60 N/mm, nyy = -251.19 N/mm, nxy = 22.78 N/mm, k_{mod} = 1.00
Extremierung 1/2: max n_{xx}
Schnittgrößen: nxx = -64.11 N/mm, nyy = -185.13 N/mm, nxy = 17.39 N/mm, k_{mod} = 1.00
Extremierung 1/2: min n_{yy}
Schnittgrößen: nxx = -103.66 N/mm, nyy = -254.84 N/mm, nxy = 22.22 N/mm, k_{mod} = 1.00
Extremierung 1/2: max n_{yy}
Schnittgrößen: nxx = -64.11 N/mm, nyy = -185.13 N/mm, nxy = 17.39 N/mm, k_{mod} = 1.00
Extremierung 1/2: min n_{xy}
Schnittgrößen: nxx = -64.11 N/mm, nyy = -185.13 N/mm, nxy = 17.39 N/mm, k_{mod} = 1.00
Extremierung 1/2: max n_{xy}
Schnittgrößen: nxx = -104.72 N/mm, nyy = -253.61 N/mm, nxy = 23.00 N/mm, k_{mod} = 1.00
Extremierung 1/3: min n_{xx}
Schnittgrößen: nxx = -87.47 N/mm, nyy = -200.87 N/mm, nxy = 19.06 N/mm, k_{mod} = 1.00
Extremierung 1/3: max n_{xx}
Schnittgrößen: nxx = -80.22 N/mm, nyy = -186.83 N/mm, nxy = 17.63 N/mm, k_{mod} = 1.00
Extremierung 1/3: min n_{yy}
Schnittgrößen: nxx = -87.47 N/mm, nyy = -200.87 N/mm, nxy = 19.06 N/mm, k_{mod} = 1.00
Extremierung 1/3: max n_{yy}
Schnittgrößen: nxx = -80.22 N/mm, nyy = -186.83 N/mm, nxy = 17.63 N/mm, k_{mod} = 1.00
Extremierung 1/3: min n_{xy}
Schnittgrößen: nxx = -80.22 N/mm, nyy = -186.83 N/mm, nxy = 17.63 N/mm, k_{mod} = 1.00
Extremierung 1/3: max n_{xy}
Schnittgrößen: nxx = -87.47 N/mm, nyy = -200.87 N/mm, nxy = 19.06 N/mm, k_{mod} = 1.00
Zusammenfassung:
$\sigma_{xx,min}$ = +0.00 N/mm² Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
$\sigma_{yy,min}$ = +0.00 N/mm² Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
$\sigma_{xx,max}$ = +0.00 N/mm² Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
$\sigma_{yy,max}$ = +0.03 N/mm² Ex1/2:1.6*(Lf1+Lf2+Lf3+Lf4+Lf8+Lf9)+0.88*Lf5+Lf10.....
...+0.5*Lf6
$U_{\sigma,xx}$ = 0.00 N/mm² Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
$U_{\tau,tor}$ = 0.00 N/mm² Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+Lf5+0.6*Lf10+0.5*Lf6
Max. Ausnutzung: U = 0.000 ≤ 1 ⇒ **Nachweis erfüllt**

Nachweis 3: EC 5 Brandschutz

Ergebnisse der Lastkombinationen

Typ	u_x mm	u_y mm	v_z ‰	n_{xx} kN/m	n_{yy} kN/m	n_{xy} kN/m	Faktorisierung
Extremierung 1: Fall 1 (kmod=1.00)							
min u_x	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max u_x	0.01	0.07	0.00	-52.75	-131.42	12.04	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10+0.2*Lf7
min u_y	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max u_y	0.01	0.07	0.00	-52.75	-131.42	12.04	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10+0.2*Lf7
min v_z	0.01	0.06	0.00	-50.14	-116.77	11.02	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9
max v_z	0.01	0.07	0.00	-52.75	-131.42	12.04	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10+0.2*Lf7
min n_{xx}	0.01	0.07	0.00	-55.97	-131.76	12.08	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
max n_{xx}	0.01	0.06	0.00	-46.91	-116.43	10.97	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.2*Lf7
min n_{yy}	0.01	0.07	0.00	-55.97	-131.76	12.08	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
max n_{yy}	0.01	0.06	0.00	-46.91	-116.43	10.97	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.2*Lf7
min n_{xy}	0.01	0.06	0.00	-46.91	-116.43	10.97	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.2*Lf7
max n_{xy}	0.01	0.07	0.00	-55.97	-131.76	12.08	Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10

Nachweis der Lastkombinationen

Extremierung 1/1: min n_{xx}
Schnittgrößen: nxx = -55.97 N/mm, nyy = -131.76 N/mm, nxy = 12.08 N/mm, k_{mod} = 1.00
σ_{xx} = -0.700 N/mm², σ_{yy} = -1.432 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.033, $U_{\sigma y}$ = 0.068 ⇒ **U_σ = 0.068**
τ_{xy} = 0.151 N/mm², τ_{yx} = 0.151 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.049, $U_{\tau yx}$ = 0.049 ⇒ **U_τ = 0.049**
n_{xy} = 12.085 N/mm², τ_{tor} = 0.049 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.020**
⇒ **U = 0.068**

Extremierung 1/1: max n_{xx}
Schnittgrößen: nxx = -46.91 N/mm, nyy = -116.43 N/mm, nxy = 10.97 N/mm, k_{mod} = 1.00
σ_{xx} = -0.586 N/mm², σ_{yy} = -1.266 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.028, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.137 N/mm², τ_{yx} = 0.137 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.044, $U_{\tau yx}$ = 0.044 ⇒ **U_τ = 0.044**
n_{xy} = 10.971 N/mm², τ_{tor} = 0.044 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.018**
⇒ **U = 0.060**

Extremierung 1/1: min n_{yy}
Schnittgrößen: nxx = -55.97 N/mm, nyy = -131.76 N/mm, nxy = 12.08 N/mm, k_{mod} = 1.00
σ_{xx} = -0.700 N/mm², σ_{yy} = -1.432 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.033, $U_{\sigma y}$ = 0.068 ⇒ **U_σ = 0.068**
τ_{xy} = 0.151 N/mm², τ_{yx} = 0.151 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.049, $U_{\tau yx}$ = 0.049 ⇒ **U_τ = 0.049**
n_{xy} = 12.085 N/mm², τ_{tor} = 0.049 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.020**
⇒ **U = 0.068**

Extremierung 1/1: max n_{yy}
Schnittgrößen: nxx = -46.91 N/mm, nyy = -116.43 N/mm, nxy = 10.97 N/mm, k_{mod} = 1.00
σ_{xx} = -0.586 N/mm², σ_{yy} = -1.266 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.028, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.137 N/mm², τ_{yx} = 0.137 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.044, $U_{\tau yx}$ = 0.044 ⇒ **U_τ = 0.044**
n_{xy} = 10.971 N/mm², τ_{tor} = 0.044 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.018**
⇒ **U = 0.060**

Extremierung 1/1: min n_{xy}
Schnittgrößen: nxx = -46.91 N/mm, nyy = -116.43 N/mm, nxy = 10.97 N/mm, k_{mod} = 1.00
σ_{xx} = -0.586 N/mm², σ_{yy} = -1.266 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.028, $U_{\sigma y}$ = 0.060 ⇒ **U_σ = 0.060**
τ_{xy} = 0.137 N/mm², τ_{yx} = 0.137 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.044, $U_{\tau yx}$ = 0.044 ⇒ **U_τ = 0.044**
n_{xy} = 10.971 N/mm², τ_{tor} = 0.044 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.018**
⇒ **U = 0.060**

Extremierung 1/1: max n_{xy}
Schnittgrößen: nxx = -55.97 N/mm, nyy = -131.76 N/mm, nxy = 12.08 N/mm, k_{mod} = 1.00
σ_{xx} = -0.700 N/mm², σ_{yy} = -1.432 N/mm², γ = 1.00, $f_{c0,d}$ = 21.000 N/mm², $f_{t0,d}$ = 14.500 N/mm²
$U_{\sigma x}$ = 0.033, $U_{\sigma y}$ = 0.068 ⇒ **U_σ = 0.068**
τ_{xy} = 0.151 N/mm², τ_{yx} = 0.151 N/mm², $f_{v,d}$ = 3.083 N/mm²
$U_{\tau xy}$ = 0.049, $U_{\tau yx}$ = 0.049 ⇒ **U_τ = 0.049**
n_{xy} = 12.085 N/mm², τ_{tor} = 0.049 N/mm², $f_{tor,d}$ = 2.500 N/mm², **$U_{\tau,tor}$ = 0.020**
⇒ **U = 0.068**

Zusammenfassung:

$\sigma_{xx,min}$ = -0.70 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
$\sigma_{yy,min}$ = -1.43 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
$\sigma_{xx,max}$ = -0.59 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.2*Lf7
$\sigma_{yy,max}$ = -1.27 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.2*Lf7
τ_{xy} = 0.15 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
τ_{yx} = 0.15 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
τ_{tor} = 0.05 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10

Nachweis der Lastkombinationen

$U_{\sigma,xx}$ = 0.07 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
$U_{\sigma,yy}$ = 0.05 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
U_{τ} = 0.02 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10
$U_{\tau,tor}$ = 0.07 N/mm²	Ex1/1:Lf1+Lf2+Lf3+Lf4+Lf8+Lf9+0.3*Lf5+0.2*Lf10

Max. Ausnutzung: U = 0.068 ≤ 1 ⇒ **Nachweis erfüllt**

Zusammenfassung aller Nachweise

Lastkombination Ausnutzung: Nw1:Ex1/4[min n_{yy}]:1.35*(Lf1+Lf2+Lf4+Lf8+Lf9)+0.7*1.5*Lf5+1.5*Lf10 +0.5*1.5*Lf6

Max. Ausnutzung: U = 0.113 ≤ 1 ⇒ **Nachweis erfüllt**

9. Zusammenfassung

Gesamtausnutzung aller Nachweise $u_{max,Ges}$ = 0.960 ≤ 1 ⇒ ok.