Project : Alu 20m (+Alu 15m)
EN13782

May 2006

Veldeman Structure Solutions
Tel.: +32 (0)89 47 31 31 Fax: +32 (0)89 47 37 77 E-mail: info@veldemangroup.be Website: www.veldemangroup.be
E.F.S. n.v. Industrieterrein Vostert 1220 3960 Bree (Belgium) BTW-BE-0435.395.782. RPR Tongeren

VELDEMAN STRUCTURE SOLUTIONS

Content

VELDEMAN
STRUCTURE SOLUTIONS

Project : Alu 20m (x 25m)

acc. to EN 13782

esa : Alu20x25_EN13782
mcd : Alu20x25_EN13782
Units : kN / m

Date : 08/05/06

Reference:J:\Engineering\Berekeningen strukturen\Normen\EC\EN 13782\aluhal\doc v1.1.mcd(R)

= Region for variable input

= Region for the input of forces from computer program Esa prima win

= Region for the output of results

Structural calculation of the alu 20m (15m) structure according to EUROCODE 13782 for temporary structures.

1. Introduction.

This note describes the structural calculations for the relocatable alu 20m structure manufactured by **Georges Veldeman N.V.** Belgium. The length of the structure can reach any value as long as it's a multiple of the span distance. **This calculation note implies at the same time the alu 15m structure, because the 15m structure is the shortened version of the 20m structure.**

For a length of 35 m or less, two bays with bracing cables are needed. If the length is higher than 35 m, an additional bay with bracing cables is needed. The maximum distance between two bays with bracing cables is 25 m. There should always be a bay with bracing cables at both ends of the structure.

Building geometry

Distance between two arches	$Span\_distance := 5 \cdot m$
Slope of the roof	$\beta := 18deg$
Height of the peak	$H_{peak} := 5.92 \cdot m$
Height of the eaves	$H_{eaves} := 2.8 \cdot m$
Height of the bottom floor	$H_{bottom} := 0 \cdot m$
Width of the structure	$Width := 20 \cdot m$
Length of the structure	$Length := 25 \cdot m$

Design criteria

Ground snow load : $s_k := 0.0 \frac{kN}{m^2}$ ->

- 20kg/m² : removing snow at heigth>8cm
- 0kg/m² : - **outside season** or
  - snow settling on the tent is prevented by heating the tent in such a way that the whole roof cladding has an outside air temp of > 2°C

Basic wind speed :

$v_{0\_5m} = 101.823 \frac{km}{hr}$	- 5m
$v_{5\_10m} = 111.542 \frac{km}{hr}$	5m - 10m
$v_{10\_15m} =$ "height < 10m"	10m - 15m
$v_{15\_20m} =$ "height < 10m"	15m - 20m
$v_{20\_25m} =$ "height < 10m"	20m -

The external loadings on the fabric like wind and snow, are transmitted directly to the main arch. The function of the purlins is to keep the distance between the arches and to ensure the longitudinal stability in combination with the cable bracing system.

2. Determination of the loads.

2.1. Dead load.

2.1.1. Uniform loading.

The self weight of the aluminium structure is calculated by the computerprogram Esa prima win.

Weight of the fabric

$$Weight_{fabric} := 0.650 \cdot \frac{kg}{m^2} \cdot Span\_distance$$

$$Weight_{fabric} = 3.25 \frac{kg}{m}$$

2.1.2. Local loadings.

Local loadings are for example the weight of the peak splice and the connection splices.

$$Weight_{peak\_splice} := 20 \cdot kg$$

$$Weight_{eaves\_splice} := 20 \cdot kg$$

2.1.3. Lighting weight

We put on every arc 2 points with an extra weight of 50 kg, to take into account the weight of the lights inside the structure.

$ExtraWeight_{lighting} := 50 \cdot kg$ x 2 points for every arc (in the peak of the structure, left and right of the peak)

2.2. Snow load.

<formulas: see document section 1.1>

Ground snow load :

$s_k = 0 \frac{kN}{m^2}$

exposure coefficient $C_{es} = 1$ **<1.1>**

thermal coefficient $C_{ts} = 1$ **<1.2>**

shape coefficient μ: Table 7.2

$\mu_1 = 0.8$ **<1.3>**

$\mu_2 = 0.86$ **<1.4>**

Case 1

$s_{case1\_wind} = 0 \frac{kN}{m}$

$s_{case1\_lee} = 0 \frac{kN}{m}$

Case 2

<1.5>

$s_{case2\_wind} = 0 \frac{kN}{m}$

$s_{case2\_lee} = 0 \frac{kN}{m}$

Case 3

$s_{case3\_lee} = 0 \frac{kN}{m}$

2.3. Wind load.

<formulas: see document section 1.2>

The wind pressure acc. to NEN EN 13782 (art. 6.4.2.2) equals : **<1.6>**

$q_{0\_5m} = 0.5 \frac{kN}{m^2}$ $v_{0\_5m} = 101.823 \frac{km}{hr}$

$q_{5\_10m} = 0.6 \frac{kN}{m^2}$ $v_{5\_10m} = 111.542 \frac{km}{hr}$

$q_{10\_15m} =$ "height < 10m" $v_{10\_15m} =$ "height < 10m"

$q_{15\_20m} =$ "height < 10m" $v_{15\_20m} =$ "height < 10m"

$q_{20\_25m} =$ "height < 10m" $v_{20\_25m} =$ "height < 10m"

The total wind load for one arch equals : **<1.7>**

$p_{0\_5m} = 2.5 \frac{kN}{m}$ $p_{10\_15m} = 0$

$p_{5\_10m} = 3 \frac{kN}{m}$ $p_{15\_20m} = 0$

$p_{20\_25m} = 0$

Internal windpressure coefficients Cpi

$C_{pi\_o} := 0.0$ Overpressure

$C_{pi\_u} := -0.25$ Underpressure

<1.10>

External windpressure coefficients Cp

Wind normal to sidewall of structure **<1.8>**

$C_{p1s} = 0.8$ $C_{p2s} = -0.029$ $C_{p3s} = -0.4$ $C_{p4s} = -0.4$ $C_{p5s} = -0.4$ $C_{p6s} = -0.4$

Wind normal to gablewall of structure **<1.9>**

$C_{p1g} = -0.4$ $C_{p2g} = -0.4$ $C_{p3g} = -0.4$ $C_{p4g} = -0.4$ $C_{p5g} = 0.8$ $C_{p6g} = -0.4$

The total wind load normal to the side equals :

Overpressure **<1.11>**

$P_{wind\_1so\_0.5} = 2\,\frac{kN}{m}$

$P_{wind\_1so\_5.10} = 0$

windward wall

$P_{wind\_2so\_0.5} = -0.073\,\frac{kN}{m}$ $P_{wind\_2so\_10.15} = 0$

$P_{wind\_2so\_5.10} = -0.088\,\frac{kN}{m}$ $P_{wind\_2so\_15.20} = 0$

windward roof

$P_{wind\_3so\_0.5} = -1\,\frac{kN}{m}$ $P_{wind\_3so\_10.15} = 0$

$P_{wind\_3so\_5.10} = -1.2\,\frac{kN}{m}$ $P_{wind\_3so\_15.20} = 0$

leeward roof

$P_{wind\_4so\_0.5} = -1\,\frac{kN}{m}$

$P_{wind\_4so\_5.10} = 0$

leeward wall

$P_{wind\_5so\_0.5} = -0.2\,\frac{kN}{m^2}$ $P_{wind\_6so\_0.5} = -0.2\,\frac{kN}{m^2}$

$P_{wind\_5so\_5.10} = -0.24\,\frac{kN}{m^2}$ $P_{wind\_6so\_5.10} = -0.24\,\frac{kN}{m^2}$

$P_{wind\_5so\_10.15} = 0$ $P_{wind\_6so\_10.15} = 0\,\frac{1}{m}$

gable walls

Underpressure **<1.11>**

$P_{wind\_1su\_0.5} = 2.625 \frac{kN}{m}$

$P_{wind\_1su\_5.10} = 0$

windward wall

$P_{wind\_2su\_0.5} = 0.552 \frac{kN}{m}$ $P_{wind\_2su\_10.15} = 0$

$P_{wind\_2su\_5.10} = 0.662 \frac{kN}{m}$ $P_{wind\_2su\_15.20} = 0$

windward roof

$P_{wind\_3su\_0.5} = -0.375 \frac{kN}{m}$ $P_{wind\_3su\_10.15} = 0$

$P_{wind\_3su\_5.10} = -0.45 \frac{kN}{m}$ $P_{wind\_3su\_15.20} = 0$

leeward roof

$P_{wind\_4su\_0.5} = -0.375 \frac{kN}{m}$

$P_{wind\_4su\_5.10} = 0$

leeward wall

$P_{wind\_5su\_0.5} = -0.075 \frac{kN}{m^2}$ $P_{wind\_6su\_0.5} = -0.075 \frac{kN}{m^2}$

$P_{wind\_5su\_5.10} = -0.09 \frac{kN}{m^2}$ $P_{wind\_6su\_5.10} = -0.09 \frac{kN}{m^2}$

$P_{wind\_5su\_10.15} = 0$ $P_{wind\_6su\_10.15} = 0$

gable walls

<u>The total wind load normal to the gable equals :</u>

<u>Overpressure</u> **<1.12>**

$P_{wind\_1go\_0.5} = -1\frac{kN}{m}$ $P_{wind\_4go\_0.5} = -1\frac{kN}{m}$ side walls

$P_{wind\_1go\_5.10} = 0$ $P_{wind\_4go\_5.10} = 0$

$P_{wind\_2go\_0.5} = -1\frac{kN}{m}$ $P_{wind\_2go\_10.15} = 0$ roof

$P_{wind\_2go\_5.10} = -1.2\frac{kN}{m}$ $P_{wind\_2go\_15.20} = 0$

$P_{wind\_3go\_0.5} = -1\frac{kN}{m}$ $P_{wind\_3go\_10.15} = 0$ roof

$P_{wind\_3go\_5.10} = -1.2\frac{kN}{m}$ $P_{wind\_3go\_15.20} = 0$

$P_{wind\_5go\_0.5} = 0.4\frac{kN}{m^2}$

$P_{wind\_5go\_5.10} = 0.48\frac{kN}{m^2}$ windward gable wall

$P_{wind\_5go\_10.15} = 0$

$P_{wind\_6go\_0.5} = -0.2\frac{kN}{m^2}$

$P_{wind\_6go\_5.10} = -0.24\frac{kN}{m^2}$ leeward gable wall

$P_{wind\_6go\_10.15} = 0$

Underpressure **<1.12>**

$P_{wind\_1gu\_0.5} = -0.375 \frac{kN}{m}$ $P_{wind\_4gu\_0.5} = -0.375 \frac{kN}{m}$ side walls

$P_{wind\_1gu\_5.10} = 0$ $P_{wind\_4gu\_5.10} = 0$

$P_{wind\_2gu\_0.5} = -0.375 \frac{kN}{m}$ $P_{wind\_2gu\_10.15} = 0$

roof

$P_{wind\_2gu\_5.10} = -0.45 \frac{kN}{m}$ $P_{wind\_2gu\_15.20} = 0$

$P_{wind\_3gu\_0.5} = -0.375 \frac{kN}{m}$ $P_{wind\_3gu\_10.15} = 0$

roof

$P_{wind\_3gu\_5.10} = -0.45 \frac{kN}{m}$ $P_{wind\_3gu\_15.20} = 0$

$P_{wind\_5gu\_0.5} = 0.525 \frac{kN}{m^2}$

$P_{wind\_5gu\_5.10} = 0.63 \frac{kN}{m^2}$ windward gable wall

$P_{wind\_5gu\_10.15} = 0$

$P_{wind\_6gu\_0.5} = -0.075 \frac{kN}{m^2}$

$P_{wind\_6gu\_5.10} = -0.09 \frac{kN}{m^2}$ leeward gable wall

$P_{wind\_6gu\_10.15} = 0$

3. Materials.

3.1. Properties.

$\gamma_M = 1.1$	partial safety factor
$\gamma_{Mb} = 1.25$	partial safety factor for bolts and pins
$\gamma_{Mr} = 1.25$	partial safety factor for rivets

3.2. Aluminium.

Quality = 6061 T6.

Yield stress	$R_{e\_alu} = 240 \frac{N}{mm^2}$
Tensile strength	$R_{t\_alu} = 260 \frac{N}{mm^2}$
Modulus of elasticity	$E_{alu} = 7 \times 10^4 \frac{N}{mm^2}$
Admissible stress	$\sigma_{adm\_alu} = 218.182 \frac{N}{mm^2}$

3.3. Steel.

	Steel quality S235.	**Steel quality S355.**
Yield stress	$R_{e\_S235} = 235 \frac{N}{mm^2}$	$R_{e\_S355} = 355 \frac{N}{mm^2}$
Tensile strength	$R_{t\_S235} = 360 \frac{N}{mm^2}$	$R_{t\_S355} = 510 \frac{N}{mm^2}$
Modulus of elasticity	$\sigma_{adm\_S235} = 213.636 \frac{N}{mm^2}$	$\sigma_{adm\_S355} = 322.727 \frac{N}{mm^2}$
Admissible stress	$E_{steel} = 2.1 \times 10^5 \frac{N}{mm^2}$	

3.4. Bolts - class = 8.8.

Yield stress	$R_{e\_bolt} = 640 \frac{N}{mm^2}$
Tensile strength	$R_{t\_bolt} = 800 \frac{N}{mm^2}$

3.5. Used profiles

Aluminium
0 = pas utilisé
1 = alu60/60/3
2 = alu70/50/2.5/3
3 = alu88/66/2
4 = alu70/70/4.5
5 = alu97/77/3.1
6 = alu129/89/3.1
7 = alu130/70
8 = alu133/70
9 = alu133/70+80/5
10 = alu158/100
20 = alu240/100
200 = alu232/92
220 = alu240+232
30 = alu270/100
300 = alu260/91
330 = alu270+260
40 = alu310/130
400 = alu297_8/117
401 = alu297_11/117
402 = alu297_24.5/117
440 = alu310+297_8
441 = alu310+297_11
442 = alu310+297_24.5
50 = alu380/166

Steel
60 = K70/70/2
70 = K70/70/3
80 = K80/80/4
90 = K120/120/3
100 = plat en acier 80/12

The principal profile of the foot

$prof\_foot_{prin} := 20$

$foot_{prin} = "alu240/100"$

$A_{foot\_prin} = 2.32 \times 10^{3}\ mm^{2}$

$I_{y\_foot\_prin} = 1.68 \times 10^{7}\ mm^{4}$

$I_{z\_foot\_prin} = 3.9 \times 10^{6}\ mm^{4}$

$W_{ely\_foot\_prin} = 1.4 \times 10^{5}\ mm^{3}$

$W_{elz\_foot\_prin} = 7.79 \times 10^{4}\ mm^{3}$

$h_{foot\_prin} = 240\ mm$

$b_{foot\_prin} = 100\ mm$

The reinforcement profile of the foot

$prof\_foot_{reinf} := 200$

$foot_{reinf} = "alu232/92"$

$A_{foot\_reinf} = 2.371 \times 10^{3}\ mm^{2}$

$I_{y\_foot\_reinf} = 1.62 \times 10^{7}\ mm^{4}$

$I_{z\_foot\_reinf} = 2.69 \times 10^{6}\ mm^{4}$

$W_{ely\_foot\_reinf} = 1.39 \times 10^{5}\ mm^{3}$

$W_{elz\_foot\_reinf} = 5.85 \times 10^{4}\ mm^{3}$

$h_{foot\_reinf} = 0.232\ m$

$b_{foot\_reinf} = 0.092\ m$

The reinforced profile of the foot

$prof\_foot_{prin\_reinf} := prof\_foot_{prin} + prof\_foot_{reinf}$

$foot_{prin\_reinf} = "alu240+232"$

$A_{foot\_p\_r} = 4.691 \times 10^{3}\ mm^{2}$

$I_{y\_foot\_p\_r} = 3.29 \times 10^{7}\ mm^{4}$

$I_{z\_foot\_p\_r} = 6.58 \times 10^{6}\ mm^{4}$

$W_{ely\_foot\_p\_r} = 2.74 \times 10^{5}\ mm^{3}$

$W_{elz\_foot\_p\_r} = 1.32 \times 10^{5}\ mm^{3}$

$h_{foot\_p\_r} = 240\ mm$

$b_{foot\_p\_r} = 100\ mm$

The principal profile of the roof

$prof\_roof_{prin} := 20$

$roof_{prin} = "alu240/100"$

$A_{roof\_prin} = 2.32 \times 10^{3}\ mm^{2}$

$I_{y\_roof\_prin} = 1.68 \times 10^{7}\ mm^{4}$

$I_{z\_roof\_prin} = 3.9 \times 10^{6}\ mm^{4}$

$W_{ely\_roof\_prin} = 1.4 \times 10^{5}\ mm^{3}$

$W_{elz\_roof\_prin} = 7.79 \times 10^{4}\ mm^{3}$

$h_{roof\_prin} = 240\ mm$

$b_{roof\_prin} = 100\ mm$

The reinforcement profile of the roof

$prof\_roof_{reinf} := 200$

$roof_{reinf} = "alu232/92"$

$A_{roof\_reinf} = 2.371 \times 10^{3}\ mm^{2}$

$I_{y\_roof\_reinf} = 1.62 \times 10^{7}\ mm^{4}$

$I_{z\_roof\_reinf} = 2.69 \times 10^{6}\ mm^{4}$

$W_{ely\_roof\_reinf} = 1.39 \times 10^{5}\ mm^{3}$

$W_{elz\_roof\_reinf} = 5.85 \times 10^{4}\ mm^{3}$

$h_{roof\_reinf} = 232\ mm$

$b_{roof\_reinf} = 92\ mm$

The reinforced profile of the roof

$prof\_roof_{prin\_reinf} := prof\_roof_{prin} + prof\_roof_{reinf}$

$roof_{prin\_reinf} = "alu240+232"$

$A_{roof\_p\_r} = 4.691 \times 10^{3}\ mm^{2}$

$I_{y\_roof\_p\_r} = 3.29 \times 10^{7}\ mm^{4}$

$I_{z\_roof\_p\_r} = 6.58 \times 10^{6}\ mm^{4}$

$W_{ely\_roof\_p\_r} = 2.74 \times 10^{5}\ mm^{3}$

$W_{elz\_roof\_p\_r} = 1.32 \times 10^{5}\ mm^{3}$

$h_{roof\_p\_r} = 240\ mm$

$b_{roof\_p\_r} = 100\ mm$

Gable upright

$prof\_gable_{up} := 8$

$gable_{up} = "alu133/70"$

$A_{gable\_up} = 1.604 \times 10^{3}\ mm^{2}$

$I_{y\_gable\_up} = 3.82 \times 10^{6}\ mm^{4}$

$I_{z\_gable\_up} = 1.06 \times 10^{6}\ mm^{4}$

$W_{ely\_gable\_up} = 5.74 \times 10^{4}\ mm^{3}$

$W_{elz\_gable\_up} = 3.02 \times 10^{4}\ mm^{3}$

$h_{gable\_up} = 133\ mm$

$b_{gable\_up} = 70\ mm$

Gable upright 2

$prof\_gable_{up2} := 0$

$gable_{up2} = "not used"$

$A_{gable\_up2} = "not used"$

$I_{y\_gable\_up2} = "not used"$

$I_{z\_gable\_up2} = "not used"$

$W_{ely\_gable\_up2} = "not used"$

$W_{elz\_gable\_up2} = "not used"$

$h_{gable\_up2} = "not used"$

$b_{gable\_up2} = "not used"$

Horizontal beam gable

$prof\_gable_{hor} := 7$

$gable_{hor} = "alu130/70"$

$A_{gable\_hor} = 1.497 \times 10^{3}\ mm^{2}$

$I_{y\_gable\_hor} = 3.12 \times 10^{6}\ mm^{4}$

$I_{z\_gable\_hor} = 1.12 \times 10^{6}\ mm^{4}$

$W_{ely\_gable\_hor} = 4.81 \times 10^{4}\ mm^{3}$

$W_{elz\_gable\_hor} = 3.19 \times 10^{4}\ mm^{3}$

$h_{gable\_hor} = 130\ mm$

$b_{gable\_hor} = 70\ mm$

Purlin: strong section 1

$prof\_purlin_{strong1} := 8$

$purlin_{strong1} = "alu133/70"$

$A_{purlin\_strong1} = 1.604 \times 10^{3}\ mm^{2}$

$I_{y\_purlin\_strong1} = 3.82 \times 10^{6}\ mm^{4}$

$I_{z\_purlin\_strong1} = 1.06 \times 10^{6}\ mm^{4}$

$W_{ely\_purlin\_strong1} = 5.74 \times 10^{4}\ mm^{3}$

$W_{elz\_purlin\_strong1} = 3.02 \times 10^{4}\ mm^{3}$

$h_{purlin\_strong1} = 133\ mm$

$b_{purlin\_strong1} = 70\ mm$

Purlin: strong section 2

$prof\_purlin_{strong2} := 0$

$purlin_{strong2} = "not used"$

$A_{purlin\_strong2} = "not used"$

$I_{y\_purlin\_strong2} = "not used"$

$I_{z\_purlin\_strong2} = "not used"$

$W_{ely\_purlin\_strong2} = "not used"$

$W_{elz\_purlin\_strong2} = "not used"$

$h_{purlin\_strong2} = "not used"$

$b_{purlin\_strong2} = "not used"$

Purlin: strong section 3

$prof\_purlin_{strong3} := 0$

$purlin_{strong3} = "not used"$

$A_{purlin\_strong3} = "not used"$

$I_{y\_purlin\_strong3} = "not used"$

$I_{z\_purlin\_strong3} = "not used"$

$W_{ely\_purlin\_strong3} = "not used"$

$W_{elz\_purlin\_strong3} = "not used"$

$h_{purlin\_strong3} = "not used"$

$b_{purlin\_strong3} = "not used"$

Purlin: weak section

$prof\_purlin_{weak} := 1$

$purlin_{weak} = "alu60/60/3"$

$A_{purlin\_weak} = 660\ mm^{2}$

$I_{y\_purlin\_weak} = 3.51 \times 10^{5}\ mm^{4}$

$I_{z\_purlin\_weak} = 3.51 \times 10^{5}\ mm^{4}$

$W_{ely\_purlin\_weak} = 1.17 \times 10^{4}\ mm^{3}$

$W_{elz\_purlin\_weak} = 1.17 \times 10^{4}\ mm^{3}$

$h_{purlin\_weak} = 60\ mm$

$b_{purlin\_weak} = 60\ mm$

Corner bar (steel)

$prof\_bar_{corner} := 0$

$bar_{corner} = \text{"not used"}$

$A_{corner\_bar} = \text{"not used"}$

$I_{y\_corner\_bar} = \text{"not used"}$

$I_{z\_corner\_bar} = \text{"not used"}$

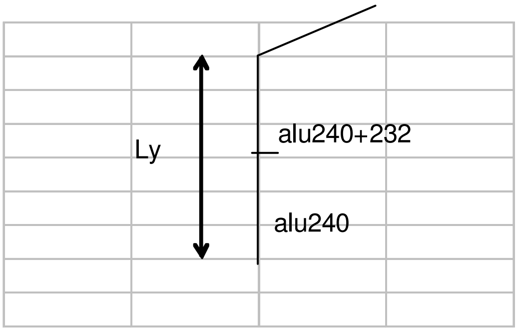
$W_{ely\_corner\_bar} = \text{"not used"}$

$W_{elz\_corner\_bar} = \text{"not used"}$

$h_{corner\_bar} = \text{"not used"}$

$b_{corner\_bar} = \text{"not used"}$

4. Control of the main profiles. <formulas: see document 3>



$k_y := 1.0$ $k_z := 1.0$ buckling factor

$L_{yf} := 2662 \cdot mm$ buckling length of the foot profile in the strong direction

$L_{yr} := 10545 \cdot mm$ buckling length of the roof profile in the strong direction

$L_{zf} := 2662mm$ buckling length of the foot profile in the weak direction

$L_{zr} := 2670mm$ buckling length of the roof profile in the weak direction (max. distance between two purlins)

4.1 Foot (alu240)

$L_y := L_{yf}$
$L_z := L_{zf}$

$profile := prof\_foot_{prin}$

$prof_{control}(profile) = "alu240/100"$

$classification(profile) = 3$ <3.1>

Shape factor :

$\alpha_{y\_prof} = 1.002$ $\alpha_{z\_prof} = 1.001$ <3.2>

Profile capacity :

$N_{rd\_prof} = 506.182\,kN$

$M_{yrd\_prof} = 30.62\,kN\cdot m$ <3.3>

$M_{zrd\_prof} = 17.02\,kN\cdot m$

Slenderness :

$\lambda_{y\_prof} = 31.282$ $\lambda_{z\_prof} = 64.926$ <3.4>

$\lambda_{by\_prof} = 0.583$ $\lambda_{bz\_prof} = 1.21$ <3.5>

Reduction coefficient for buckling :

$\phi_{y\_prof} = 0.718$ $\phi_{z\_prof} = 1.343$ <3.6>

$\chi_{y\_prof} = 0.879$ $\chi_{z\_prof} = 0.519$ <3.7>

4.1.1 Bending and axial compression (art. 5.9.4)

4.1.1.1 Maximum moment

$M_y := 11.8 \cdot kN \cdot m$ {comb. 8, member 146, x=1.355m}

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 2.7 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.404$ <3.8>

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 85.45 \frac{N}{mm^2}$ <3.10>

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.392$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.1.1.2 Maximum normal force

$M_y := 10.3 \cdot kN \cdot m$

$M_z := 0.4 \cdot kN \cdot m$

$N_v := 7.8 \cdot kN$ **{comb. 8, member 140, x = 1.355 m}**

Buckling control

$buckling_{control\_unity} = 0.391$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$$\sigma_{control} = 82.062 \frac{N}{mm^2}$$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.376$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.1.2 Bending and axial traction (art. 5.9.3.3)

4.1.2.1 Maximum moment

$M_y := 16.2 \cdot kN \cdot m$ **{comb. 3, member 20, x = 1.355m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 4.5 \cdot kN$ normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.525$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 117.654 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.539$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.1.2.2 Maximum normal force

$M_y := 13.0 \cdot kN \cdot m$

$M_z := 0.2 \cdot kN \cdot m$

$N_v := 14.2 \cdot kN$ **{comb. 5, member 40, x=1.355m}**

Unity control

$bending\_traction_{control\_unity} = 0.428$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 101.542 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.465$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.2 Foot (alu240+232)

$L_y := L_{yf}$
$L_z := L_{zf}$

$profile := prof\_foot_{prin\_reinf}$

$prof_{control}(profile) = "alu240+232"$

$classification(profile) = 1$ **<3.1>**

Shape factor :

$\alpha_{y\_prof} = 1.303$ $\alpha_{z\_prof} = 1.235$ **<3.2>**

Profile capacity :

$N_{rd\_prof} = 1.023 \times 10^{3}\ kN$

$M_{yrd\_prof} = 77.891\ kN \cdot m$ **<3.3>**

$M_{zrd\_prof} = 35.564\ kN \cdot m$

Slenderness :

$\lambda_{y\_prof} = 31.787$ $\lambda_{z\_prof} = 71.077$ **<3.4>**

$\lambda_{by\_prof} = 0.592$ $\lambda_{bz\_prof} = 1.325$ **<3.5>**

Reduction coefficient for buckling :

$\phi_{y\_prof} = 0.725$ $\phi_{z\_prof} = 1.5$ **<3.6>**

$\chi_{y\_prof} = 0.876$ $\chi_{z\_prof} = 0.454$ **<3.7>**

4.2.1 Bending and axial compression (art. 5.9.4)

4.2.1.1 Maximum moment

$M_y := 22.1 \cdot kN \cdot m$ {comb. 8, member 145, x=1.307m}

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 2.6 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.292$ <3.8>

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 81.162 \frac{N}{mm^2}$ <3.10>

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.372$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.2.1.2 Maximum normal force

$M_y := 19.7 \cdot kN \cdot m$

$M_z := 0.6 \cdot kN \cdot m$

$N_v := 7.6 \cdot kN$ **{comb. 8, member 141, x = 1.307 m}**

Buckling control

$buckling_{control\_unity} = 0.285$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 78.033 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.358$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.2.2 Bending and axial traction (art. 5.9.3.3)

4.2.2.1 Maximum moment

$M_y := 28.3 \cdot kN \cdot m$ **{comb. 5, member 149, x = 1.307m}**

$M_z := 0.4 \cdot kN \cdot m$

$N_v := 14.3 \cdot kN$ normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.361$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 109.31 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.501$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.2.2.2 Maximum normal force

$M_y := 28.3 \cdot kN \cdot m$

$M_z := 0.4 \cdot kN \cdot m$

$N_v := 14.3 \cdot kN$ **{comb. 5, member 149, x=1.307m}**

Unity control

$bending\_traction_{control\_unity} = 0.361$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 109.31 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.501$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.3 Roof (alu240+232)

$L_y := L_{yr}$
$L_z := L_{zr}$

$profile := prof\_roof_{prin\_reinf}$

$prof_{control}(profile) = $ "alu240+232"

classification(profile) = 1 <3.1>

Shape factor :

$\alpha_{y\_prof} = 1.303$ $\alpha_{z\_prof} = 1.235$ <3.2>

Profile capacity :

$N_{rd\_prof} = 1.023 \times 10^3 \, kN$

$M_{yrd\_prof} = 77.891 \, kN \cdot m$ <3.3>

$M_{zrd\_prof} = 35.564 \, kN \cdot m$

Slenderness :

$\lambda_{y\_prof} = 125.916$ $\lambda_{z\_prof} = 71.29$ <3.4>

$\lambda_{by\_prof} = 2.347$ $\lambda_{bz\_prof} = 1.329$ <3.5>

Reduction coefficient for buckling :

$\phi_{y\_prof} = 3.479$ $\phi_{z\_prof} = 1.506$ <3.6>

$\chi_{y\_prof} = 0.165$ $\chi_{z\_prof} = 0.452$ <3.7>

4.3.1 Bending and axial compression (art. 5.9.4)

4.3.1.1 Maximum moment

$M_y := 21.5 \cdot kN \cdot m$ **{comb. 8, member 166, x=1.250m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 7.8 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.354$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 80.082 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.367$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.3.1.2 Maximum normal force

$M_y := 0.2 \cdot kN \cdot m$

$M_z := 1.8 \cdot kN \cdot m$

$N_v := 19.9 \cdot kN$ **{comb. 6, member 3, x = 0.0 m}**

Buckling control

$buckling_{control\_unity} = 0.228$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \leq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 18.649 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.085$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \leq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

4.3.2 Bending and axial traction (art. 5.9.3.3)

4.3.2.1 Maximum moment

$M_y := 28.1 \cdot kN \cdot m$ **{comb. 5, member 42, x = 0.0m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 13.1 \cdot kN$ normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.357$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \leq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 105.285 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.483$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \leq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

4.3.2.2 Maximum normal force

$M_y := 25.2 \cdot kN \cdot m$

$M_z := 0.1 \cdot kN \cdot m$

$N_v := 15.3 \cdot kN$ **{comb. 5, member 173, x=0.0m}**

Unity control

$bending\_traction_{control\_unity} = 0.321$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 95.936 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.44$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.4 Roof (alu240)

$L_y := L_{yr}$
$L_z := L_{zr}$

$profile := prof\_roof_{prin}$

$prof_{control}(profile) = "alu240/100"$

$classification(profile) = 3$ **<3.1>**

Shape factor :

$\alpha_{y\_prof} = 1.002$ $\alpha_{z\_prof} = 1.001$ **<3.2>**

Profile capacity :

$N_{rd\_prof} = 506.182\,kN$

$M_{yrd\_prof} = 30.62\,kN \cdot m$ **<3.3>**

$M_{zrd\_prof} = 17.02\,kN \cdot m$

Slenderness :

$\lambda_{y\_prof} = 123.918$ $\lambda_{z\_prof} = 65.121$ **<3.4>**

$\lambda_{by\_prof} = 2.31$ $\lambda_{bz\_prof} = 1.214$ **<3.5>**

Reduction coefficient for buckling :

$\phi_{y\_prof} = 3.388$ $\phi_{z\_prof} = 1.348$ **<3.6>**

$\chi_{y\_prof} = 0.17$ $\chi_{z\_prof} = 0.517$ **<3.7>**

4.4.1 Bending and axial compression (art. 5.9.4)

4.4.1.1 Maximum moment

$M_y := 21.3 \cdot kN \cdot m$ **{comb. 8, member 168, x=0.0m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 7.8 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.837$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 155.505 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.713$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.4.1.2 Maximum normal force

$M_y := 9.4 \cdot kN \cdot m$

$M_z := 0.3 \cdot kN \cdot m$

$N_v := 32.4 \cdot kN$ **{comb. 10, member 18, x = 0.0 m}**

Buckling control

$buckling_{control\_unity} = 0.758$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 84.955 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.389$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.4.2 Bending and axial traction (art. 5.9.3.3)

4.4.2.1 Maximum moment

$M_y := 20.9 \cdot kN \cdot m$ **{comb. 3, member 24, x = 0.0m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 7.4 \cdot kN$ normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.681$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 152.475 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.699$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

4.4.2.2 Maximum normal force

$M_y := 14.5 \cdot kN \cdot m$

$M_z := 0.7 \cdot kN \cdot m$

$N_v := 15.5 \cdot kN$

{comb. 5, member 174, x=0.0m}

Unity control

$bending\_traction_{control\_unity} = 0.482$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 119.227 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.546$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

5. Control of the rivets. <formulas: see document 5>

The principal profile is connected to the reinforcement profile by the rivets.

$R_{t\_rivet\_steel} := 308 \frac{N}{mm^2}$ $R_{t\_rivet\_alu} := 182 \frac{N}{mm^2}$

5.1 Foot profile

$D_{rivet} := 6.0 \cdot mm$ diameter of the rivet

$D_0 := 6.2 \cdot mm$ diameter of the rivethole

$e_1 := 46 \cdot mm$ end distance

$p_1 := 140 \cdot mm$ distance between two rivets

rivet := "alu" material of rivet pin = "steel" or "alu"

$prof\_prin := prof\_foot_{prin}$ $prof_{control}(prof\_prin) =$ "alu240/100"

$prof\_reinf := prof\_foot_{reinf}$ $prof_{control}(prof\_reinf) =$ "alu232/92"

$A_{rivet}(D_0) = 30.191\, mm^2$ **<5.2>**

The maximum shear force equals :

$F_{max} := 12.8 \cdot kN$ **{comb. 5, member 41, x=1.307m}**

Shear resistance for the rivets

$F_{vRd\_rivet} = 2.637\, kN$ **<5.4>**

Bearing resistance

$\alpha_r = 0.7$ **<5.5>**

$F_{bRd\_prin} = 6.77\, kN$ principal profile

<5.6>

$F_{bRd\_reinf} = 6.77\, kN$ reinforcement profile

The static moment of the reinforcement profile equals:

$S_{reinforcement}(prof\_reinf) = 88.83\, cm^3$ **<5.13>**

The maximum distance between two rivets equals:

$L_{Max} = 76.316\,mm$ <5.14>

We have 4 rivets per section. The real distance between the rivets equals : $p_1 = 140\,mm$
The maximum admissable distance between two rows of rivets equals:

$L_{Max\_row} = 305.263\,mm$ <5.15>

The real distance is smaller than the maximum admissable distance between two rows of rivets.
The real force on the rivets equals :

$F_{Max\_real} = 1.21\,kN$ <5.16>

Stress control in the rivets :

maximum stress

$stress\_rivet = 83.469\,\frac{N}{mm^2}$ <5.17> <------> $R_{t\_rivet} = 182\,\frac{N}{mm^2}$

$$stress\_control := \begin{cases} \text{"OK"} & \text{if } stress\_rivet \le R_{t\_rivet} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress\_control = \text{"OK"}$

Stress control in the principal profile :

maximum stress

$stress\_prof_{prin} = 46.451\,\frac{N}{mm^2}$ <5.18> <------> $R_{t\_alu} = 260\,\frac{N}{mm^2}$

$$stress\_control := \begin{cases} \text{"OK"} & \text{if } stress\_prof_{prin} \le R_{t\_alu} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress\_control = \text{"OK"}$

Stress control in the reinforcement profile :

maximum stress

$stress\_prof_{reinf} = 46.451\,\frac{N}{mm^2}$ <5.19> <------> $R_{t\_alu} = 260\,\frac{N}{mm^2}$

$$stress\_control := \begin{cases} \text{"OK"} & \text{if } stress\_prof_{reinf} \le R_{t\_alu} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress\_control = \text{"OK"}$

5.2 Roof profile

$D_{rivet} := 6.0 \cdot mm$	diameter of the rivet
$D_0 := 6.2 \cdot mm$	diameter of the rivethole
$e_1 := 40 \cdot mm$	end distance
$p_1 := 120 \cdot mm$	distance between two rivets
rivet := "alu"	material of rivet pin = "steel" or "alu"

$prof\_prin := prof\_roof_{prin}$ — $prof_{control}(prof_prin) = $ "alu240/100"

$prof\_reinf := prof\_roof_{reinf}$ — $prof_{control}(prof_reinf) = $ "alu232/92"

$A_{rivet}(D_0) = 30.191\ mm^2$ **<5.2>**

The maximum shear force equals :

$F_{max} := 10.1 \cdot kN$ **{comb. 5, member 42, x=0.0m}**

Shear resistance for the rivets

$F_{vRd\_rivet} = 2.637\,kN$ **<5.4>**

Bearing resistance

$\alpha_r = 0.7$ **<5.5>**

$F_{bRd\_prin} = 6.77\,kN$ principal profile

<5.6>

$F_{bRd\_reinf} = 6.77\,kN$ reinforcement profile

The static moment of the reinforcement profile equals:

$S_{reinforcement}(prof\_reinf) = 88.83\,cm^3$ **<5.13>**

The maximum distance between two rivets equals:

$L_{Max} = 96.717\,mm$ <5.14>

We have 4 rivets per section. The real distance between the rivets equals : $p_1 = 120\,mm$
The maximum admissable distance between two rows of rivets equals:

$L_{Max\_row} = 386.868\,mm$ <5.15>

The real distance is smaller than the maximum admissable distance between two rows of rivets.
The real force on the rivets equals :

$F_{Max\_real} = 0.818\,kN$ <5.16>

Stress control in the rivets :

maximum stress

$stress\_rivet = 56.453\,\frac{N}{mm^2}$ <5.17> <------> $R_{t\_rivet} = 182\,\frac{N}{mm^2}$

$stress\_control := \begin{cases} "OK" & \text{if } stress\_rivet \le R_{t\_rivet} \\ "NOK" & \text{otherwise} \end{cases}$

$stress\_control = "OK"$

Stress control in the principal profile :

maximum stress

$stress\_prof_{prin} = 31.417\,\frac{N}{mm^2}$ <5.18> <------> $R_{t\_alu} = 260\,\frac{N}{mm^2}$

$stress\_control := \begin{cases} "OK" & \text{if } stress\_prof_{prin} \le R_{t\_alu} \\ "NOK" & \text{otherwise} \end{cases}$

$stress\_control = "OK"$

Stress control in the reinforcement profile :

maximum stress

$stress\_prof_{reinf} = 31.417\,\frac{N}{mm^2}$ <5.19> <------> $R_{t\_alu} = 260\,\frac{N}{mm^2}$

$stress\_control := \begin{cases} "OK" & \text{if } stress\_prof_{reinf} \le R_{t\_alu} \\ "NOK" & \text{otherwise} \end{cases}$

$stress\_control = "OK"$

6. Peak splice.

6.1. Steel profile <formulas: see document 6>

Section K160/90/5 + 2x 50/30/3 above and beneath.
The weakest section however is at the top : the tube K160/90/5 is shortened at the top.
The splice is connected to the main profiles by 2 bolts M16-8.8.

$material := R_{e\_S235}$

Maximum moment at the section:

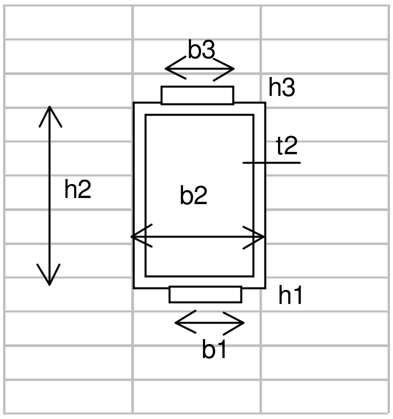
$M_y := 1.9\ kN \cdot m$

$M_z := 1.1\ kN \cdot m$

$S_v := 2.1\ kN$

$N_v := 14.5\ kN$

{Comb. 5, member 9, x = 1.394m}



example of section numbering

number of parts ([1]): $n := 4$

	Width	Height	Wall thickness ([2])	Gravity point of the part in y-direction	Gravity point of the part in z-direction
Part 1:	$b_1 := 90 \cdot mm$	$h_1 := 5 \cdot mm$	$t_1 := \frac{h_1}{2}$	$y1 := \frac{h_1}{2}$	$z1 := 45 \cdot mm$
Part 2:	$b_2 := 5 \cdot mm$	$h_2 := 135 \cdot mm$	$t_2 := \frac{h_2}{2}$	$y2 := h_1 + \frac{h_2}{2}$	$z2 := 45 \cdot mm$
Part 3:	$b_3 := 5 \cdot mm$	$h_3 := 135 \cdot mm$	$t_3 := \frac{h_3}{2}$	$y3 := h_1 + \frac{h_3}{2}$	$z3 := 45 \cdot mm$
Part 4:	$b_4 := 79 \cdot mm$	$h_4 := 12 \cdot mm$	$t_4 := \frac{h_4}{2}$	$y4 := h_1 + h_2 - \frac{h_4}{2}$	$z4 := 45 \cdot mm$

([1]) part = either a tube or a plate
([2]) if the part is a plate, the wall thickness = height / 2

Section

$A_{section} = 2.748 \times 10^{3}\,mm^{2}$ **<6.1>**

Gravity point

$y_{v} = 82.253\,mm$ **<6.2>**

$z_{v} = 45\,mm$ **<6.3>**

Moment of inertia

$I_{tot\_y} = 7.592 \times 10^{6}\,mm^{4}$ **<6.4>**

$I_{tot\_z} = 7.996 \times 10^{5}\,mm^{4}$ **<6.5>**

Von mise stress

$\sigma_{st} = 87.768\,\frac{N}{mm^{2}}$ **<6.6>**

$\tau_{st} = 0.764\,\frac{N}{mm^{2}}$ **<6.7>**

$\sigma_{vonmise} = 87.778\,\frac{N}{mm^{2}}$ **<6.8>**

$\sigma_{adm}(material) = 213.636\,\frac{N}{mm^{2}}$

$$stress := \begin{cases} \text{"OK"} & \text{if } \sigma_{vonmise} \le \sigma_{adm}(material) \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

6.2. Weld.

The connection is welded through the full cross section, so that the welded connection is as strong as the steel profile itself and hasn't to be checked.

6.3. Control of the bolts <formulas: see document 5>

Maximum moment at the gravity point of the bolted connection:

$M_v := 1.9$ kN·m **{Comb. 5, member 9, x = 1.394m}**

$N_v := 14.5$ kN

$S_v := 2.1$ kN

Number of bolts:

$n_{bolt} := 2$

The coordinates of the bolts are:

$x1 := 0mm$	$y1 := 0mm$	$x3 := 0mm$	$y3 := 0mm$	$x5 := 0mm$	$y5 := 0mm$
$x2 := 290mm$	$y2 := 0mm$	$x4 := 0mm$	$y4 := 0mm$	$x6 := 0mm$	$y6 := 0mm$

The properties of the bolt equal:

$D_b := 16 \cdot mm$ diameter of the bolt

$D_0 := 18 \cdot mm$ diameter of the bolthole

$F_{ub} := R_{t\_bolt}$ bolt material

The properties of the connection equal:

$e_{1\_out} := 48 \cdot mm$ enddistance of the outside profile

$e_{1\_in} := 50 \cdot mm$ enddistance of the inside profile

$p_1 := 290 \cdot mm$ distance between two bolts

$t_{out} := t_{alu}(prof\_roof_{prin})$ wall thickness of the outside profile

$t_{in} := 5mm$ wall thickness of the inside profile

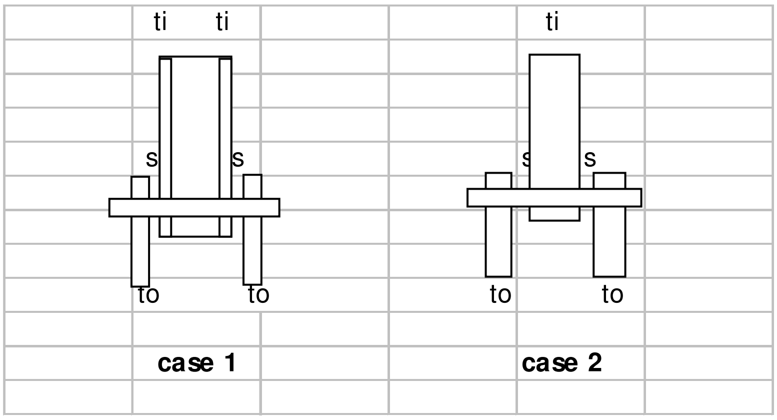
$s_{margin} := 2mm$ margin between the inside profile and the outside profile

$f_{y\_out} := R_{e\_alu}$ yield stress of the material on the outside

$f_{u\_out} := R_{t\_alu}$ tensile strength of the material on the outside

$f_{y\_in} := R_{e\_S235}$ yield stress of the material on the inside

$f_{u\_in} := R_{t\_S235}$ tensile strength of the material on the inside



case := 1

$$F_{res} := \begin{cases} F_R(M_v, N_v, S_v, n_{bolt}, x1, x2, x3, x4, x5, x6, y1, y2, y3, y4, y5, y6) \cdot kN & \text{if } n_{bolt} > 1 \\ \frac{\sqrt{N_v^2 + S_v^2}}{2} \cdot kN & \text{if } n_{bolt} = 1 \end{cases}$$ **<5.1>**

$F_{res} = 5.252\,kN$

$A_{bolt}(D_b) = 201.062\,mm^2$ **<5.2>**

Control of the shear force in the bolts

$c(F_{ub}) = 0.6$ **<5.3>**

bolt_force = 5.252 kN

shear_resist = 77.208 kN **<5.4>**

control_shear := | "OK" if bolt_force ≤ shear_resist
| "NOK" otherwise

control_shear = "OK"

Control of the bearing force in the aluminium profile

$\alpha_{out} = 0.889$ **<5.5>**

$bolt\_force = 5.252\,kN$

$bearing\_resist\_out = 22.187\,kN$ **<5.6>**

$$control\_bearing := \begin{cases} \text{"OK"} & \text{if } bolt\_force \le bearing\_resist\_out \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control\_bearing = \text{"OK"}$

Control of the bearing force in the steel profile

$\alpha_{in} = 0.926$ **<5.5>**

$bolt\_force = 5.252\,kN$

$bearing\_resist\_in = 53.333\,kN$ **<5.6>**

$$control\_bearing := \begin{cases} \text{"OK"} & \text{if } bolt\_force \le bearing\_resist\_in \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control\_bearing = \text{"OK"}$

Moment control in the bolts

$W(D_b) = 402.124\,mm^3$ **<5.7>**

$d = 6\,mm$ **<5.9>**

$moment = 0.032\,kN \cdot m$

$moment\_capacity = 0.206\,kN \cdot m$ **<5.8>**

$$control\_moment := \begin{cases} \text{"OK"} & \text{if } moment \le moment\_capacity \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control\_moment = \text{"OK"}$

7. Straight splice.

7.1. Alu profile

Section alu profile 232
The splice is connected to the main profiles by 4 bolts M16-8.8.

$material := R_{e\_alu}$

Maximum moment :

$M_y := 13.9kN \cdot m$ **{Comb. 8, member 26, x = 2.769m}**

$M_z := 0.0 \cdot kN \cdot m$

$S_v := 3.2kN$

$N_v := 3.9kN$

Section

$A_{alu232} = 2.371 \times 10^3\ mm^2$

Gravity point

$y_{y\_alu232} = 116\,mm$

$y_{z\_alu232} = 46\,mm$

Moment of inertia

$I_{y\_alu232} = 1.62 \times 10^7\ mm^4$

$I_{z\_alu232} = 2.69 \times 10^6\ mm^4$

Von mise stress

$$\sigma_{alu232} := \frac{N_v}{A_{alu232}} + \frac{M_y \cdot y_{y\_alu232}}{I_{y\_alu232}} + \frac{M_z \cdot y_{z\_alu232}}{I_{z\_alu232}}$$

$$\tau_{alu232} := \frac{S_v}{A_{alu232}}$$

$$\sigma_{vonm} := \sqrt{\sigma_{alu232}^2 + 3 \cdot \tau_{alu232}^2}$$

$$\sigma_{vonm} = 101.203 \frac{N}{mm^2}$$

$$\sigma_{adm}(material) = 218.182 \frac{N}{mm^2}$$

$$stress := \begin{cases} "OK" & \text{if } \sigma_{vonm} \le \sigma_{adm}(material) \\ "NOK" & \text{otherwise} \end{cases}$$

stress = "OK"

7.2. Control of the bolts <formulas: see document 5>

Maximum moment at the gravity point of the bolted connection:

$M_v := 13.9$ kN·m {Comb. 8, member 26, x = 2.769m}

$N_v := 3.9$ kN

$S_v := 3.2$ kN

Number of bolts:

$n_{bolt} := 4$

The coordinates of the bolts are:

$x1 := 0mm$	$y1 := 100mm$	$x3 := 0mm$	$y3 := 0mm$	$x5 := 0mm$	$y5 := 0mm$
$x2 := 570mm$	$y2 := 100mm$	$x4 := 570mm$	$y4 := 0mm$	$x6 := 0mm$	$y6 := 0mm$

The properties of the bolt equal:

$D_b := 16 \cdot mm$ diameter of the bolt

$D_0 := 19 \cdot mm$ diameter of the bolthole

$F_{ub} := R_{t\_bolt}$ bolt material

The properties of the connection equal:

$e_{1\_out} := 50 \cdot mm$ enddistance of the outside profile

$e_{1\_in} := 80 \cdot mm$ enddistance of the inside profile

$p_1 := 100 \cdot mm$ distance between two bolts

$t_{out} := t_{alu}(prof\_roof_{prin})$ wall thickness of the outside profile

$t_{in} := t_{alu232}$ wall thickness of the inside profile

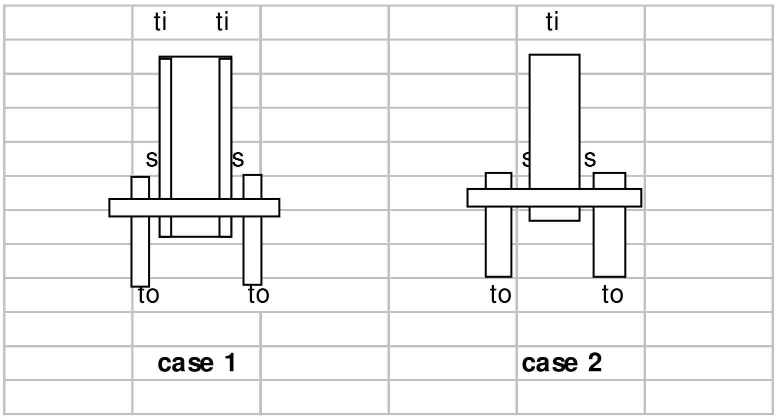
$s_{margin} := 1mm$ margin between the inside profile and the outside profile

$f_{y\_out} := R_{e\_alu}$ yield stress of the material on the outside

$f_{u\_out} := R_{t\_alu}$ tensile strength of the material on the outside

$f_{y\_in} := R_{e\_alu}$ yield stress of the material on the inside

$f_{u\_in} := R_{t\_alu}$ tensile strength of the material on the inside



case := 1

$$F_{res} := \begin{cases} F_R(M_v, N_v, S_v, n_{bolt}, x1, x2, x3, x4, x5, x6, y1, y2, y3, y4, y5, y6)\cdot kN & \text{if } n_{bolt} > 1 \\ \dfrac{\sqrt{N_v^2 + S_v^2}}{2}\cdot kN & \text{if } n_{bolt} = 1 \end{cases}$$ <5.1>

$F_{res} = 6.496\,kN$

$A_{bolt}(D_b) = 201.062\,mm^2$ <5.2>

Control of the shear force in the bolts

$c(F_{ub}) = 0.6$ <5.3>

bolt_force = 6.496 kN

shear_resist = 77.208 kN <5.4>

$$control\_shear := \begin{cases} \text{"OK"} & \text{if } bolt\_force \le shear\_resist \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control_shear = "OK"

Control of the bearing force in the aluminium profile

$\alpha_{out} = 0.877$ <5.5>

$bolt\_force = 6.496\,kN$

$bearing\_resist\_out = 21.895\,kN$ <5.6>

$$control\_bearing := \begin{cases} "OK" & \text{if } bolt\_force \le bearing\_resist\_out \\ "NOK" & \text{otherwise} \end{cases}$$

$control\_bearing = "OK"$

Control of the bearing force in the steel profile

$\alpha_{in} = 1$ <5.5>

$bolt\_force = 6.496\,kN$

$bearing\_resist\_in = 24.96\,kN$ <5.6>

$$control\_bearing := \begin{cases} "OK" & \text{if } bolt\_force \le bearing\_resist\_in \\ "NOK" & \text{otherwise} \end{cases}$$

$control\_bearing = "OK"$

Moment control in the bolts

$W(D_b) = 402.124\,mm^3$ <5.7>

$d = 4\,mm$ <5.9>

$moment = 0.026\,kN \cdot m$

$moment\_capacity = 0.206\,kN \cdot m$ <5.8>

$$control\_moment := \begin{cases} "OK" & \text{if } moment \le moment\_capacity \\ "NOK" & \text{otherwise} \end{cases}$$

$control\_moment = "OK"$

8. Eaves splice.

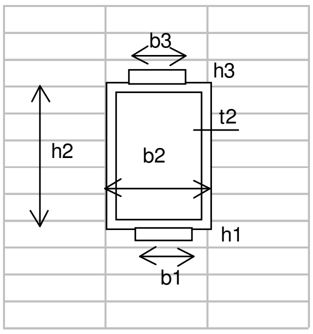
8.1. Steel profile <formulas: see document 6>

Section 2x 70/10 , 2x 140/4 , K120/40/3 , 45/10
The splice is connected to the main profiles by 6 bolts M16-8.8.

$material := R_{e\_S235}$

Maximum moment at the section:

$M_y := 28.3\ kN \cdot m$ **{Comb. 5, member 41, x = 1.307m}**
$M_z := 0.4\ kN \cdot m$
$S_v := 12.8\ kN$
$N_v := 14.3\ kN$



example of section numbering

number of parts ([1]): $n := 6$

([1]) part = either a tube or a plate
([2]) if the part is a plate, the wall thickness = height / 2

	Width	Height	Wall thickness ([2])	Gravity point of the part in y-direction	Gravity point of the part in z-direction
Part 1:	$b_1 := 70 \cdot mm$	$h_1 := 10 \cdot mm$	$t_1 := \frac{h_1}{2}$	$y1 := \frac{h_1}{2}$	$z1 := 41.5 \cdot mm$
Part 2:	$b_2 := 4 \cdot mm$	$h_2 := 140 \cdot mm$	$t_2 := \frac{h_2}{2}$	$y2 := 78mm$	$z2 := 41.5 \cdot mm$
Part 3:	$b_3 := 4 \cdot mm$	$h_3 := 140 \cdot mm$	$t_3 := \frac{h_3}{2}$	$y3 := 78mm$	$z3 := 41.5 \cdot mm$
Part 4:	$b_4 := 70 \cdot mm$	$h_4 := 10 \cdot mm$	$t_4 := \frac{h_4}{2}$	$y4 := 156mm - \frac{h_4}{2}$	$z4 := 41.5 \cdot mm$
Part 5:	$b_5 := 40 \cdot mm$	$h_5 := 120 \cdot mm$	$t_5 := 3mm$	$y5 := 156mm + \frac{h_5}{2}$	$z5 := 41.5 \cdot mm$
Part 6:	$b_6 := 45 \cdot mm$	$h_6 := 10 \cdot mm$	$t_6 := \frac{h_6}{2}$	$y6 := 156mm + h_5 + \frac{h_6}{2}$	$z6 := 41.5 \cdot mm$

Section

$A_{section} = 3.894 \times 10^3\ mm^2$ <6.1>

Gravity point

$y_v = 151.795\ mm$ <6.2>

$z_v = 41.5\ mm$ <6.3>

Moment of inertia

$I_{tot\_y} = 3.471 \times 10^7\ mm^4$ <6.4>

$I_{tot\_z} = 9.157 \times 10^5\ mm^4$ <6.5>

Von mise stress

$\sigma_{st} = 145.573 \frac{N}{mm^2}$ <6.6>

$\tau_{st} = 3.287 \frac{N}{mm^2}$ <6.7>

$\sigma_{vonmise} = 145.684 \frac{N}{mm^2}$ <6.8>

$\sigma_{adm}(material) = 213.636 \frac{N}{mm^2}$

stress := | "OK" if $\sigma_{vonmise} \le \sigma_{adm}(material)$
| "NOK" otherwise

stress = "OK"

8.2. Weld.

The connection is welded through the full cross section, so that the welded connection is as strong as the steel profile itself and has not to be checked.

8.3. Control of the bolts <formulas: see document 5>

Maximum moment at the gravity point of the bolted connection:

$M_v := 28.3$ $kN \cdot m$ {Comb. 5, member 41, x = 1.307m}

$N_v := 14.3$ kN

$S_v := 12.8$ kN

Number of bolts:

$n_{bolt} := 6$

The coordinates of the bolts are:

$x1 := 0mm$	$y1 := 100mm$	$x3 := 0mm$	$y3 := 50mm$	$x5 := 0mm$	$y5 := 0mm$
$x2 := 158mm$	$y2 := 100mm$	$x4 := 174mm$	$y4 := 50mm$	$x6 := 190mm$	$y6 := 0mm$

The properties of the bolt equal:

$D_b := 16 \cdot mm$ diameter of the bolt

$D_0 := 18.5 \cdot mm$ diameter of the bolthole

$F_{ub} := R_{t\_bolt}$ bolt material

The properties of the connection equal:

$e_{1\_out} := 40 \cdot mm$ enddistance of the outside profile

$e_{1\_in} := 41 \cdot mm$ enddistance of the inside profile

$p_1 := 158 \cdot mm$ distance between two bolts

$t_{out} := t_{alu}(prof\_foot_{prin\_reinf})$ wall thickness of the outside profile

$t_{in} := 4mm$ wall thickness of the inside profile

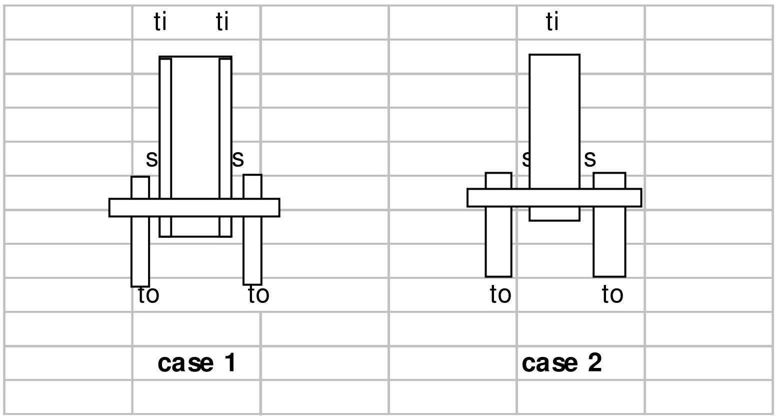
$s_{margin} := 1.5mm$ margin between the inside profile and the outside profile

$f_{y\_out} := R_{e\_alu}$ yield stress of the material on the outside

$f_{u\_out} := R_{t\_alu}$ tensile strength of the material on the outside

$f_{y\_in} := R_{e\_S235}$ yield stress of the material on the inside

$f_{u\_in} := R_{t\_S235}$ tensile strength of the material on the inside



$case := 1$

$$F_{res} := \begin{cases} F_R(M_v, N_v, S_v, n_{bolt}, x1, x2, x3, x4, x5, x6, y1, y2, y3, y4, y5, y6) \cdot kN & \text{if } n_{bolt} > 1 \\ \frac{\sqrt{N_v^2 + S_v^2}}{2} \cdot kN & \text{if } n_{bolt} = 1 \end{cases}$$ <5.1>

$F_{res} = 30.455\,kN$

$A_{bolt}(D_b) = 201.062\,mm^2$ <5.2>

Control of the shear force in the bolts

$c(F_{ub}) = 0.6$ <5.3>

$bolt\_force = 30.455\,kN$

$shear\_resist = 77.208\,kN$ <5.4>

$$control\_shear := \begin{cases} \text{"OK"} & \text{if } bolt\_force \le shear\_resist \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control\_shear = \text{"OK"}$

Control of the bearing force in the aluminium profile

$\alpha_{out} = 0.721$ <5.5>

bolt_force = 30.455 kN

bearing_resist_out = 35.978 kN <5.6>

$$\text{control\_bearing} := \begin{cases} \text{"OK"} & \text{if bolt\_force} \le \text{bearing\_resist\_out} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control_bearing = "OK"

Control of the bearing force in the steel profile

$\alpha_{in} = 0.739$ <5.5>

bolt_force = 30.455 kN

bearing_resist_in = 34.041 kN <5.6>

$$\text{control\_bearing} := \begin{cases} \text{"OK"} & \text{if bolt\_force} \le \text{bearing\_resist\_in} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control_bearing = "OK"

Moment control in the bolts

$W(D_b) = 402.124\ mm^3$ <5.7>

d = 6.5 mm <5.9>

moment = 0.198 kN·m

moment_capacity = 0.206 kN·m <5.8>

$$\text{control\_moment} := \begin{cases} \text{"OK"} & \text{if moment} \le \text{moment\_capacity} \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control_moment = "OK"

8.4. Aluminium rail profile : connection with roof.

The forces are :

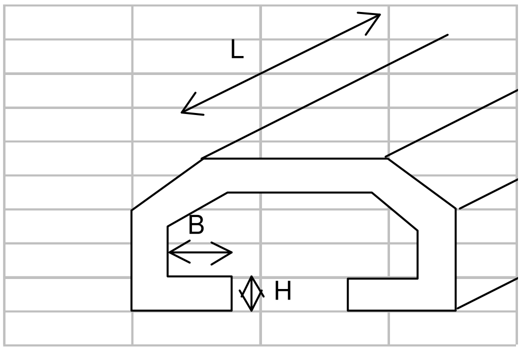
$M_v := 28.1 \cdot kN \cdot m$ **{comb. 5, member 42, x=0.0m}**

$S_v := 10.1 \cdot kN$

$N_v := 13.1 \cdot kN$

Section

$L := 390 \cdot mm$ $B := 10 \cdot mm$ $H := 14 \cdot mm$



Control of the alu profile

This moment causes stress in the alu profile.

$$M_{v2} := \frac{M_v}{2} \qquad S_{v2} := \frac{S_v}{2}$$

$$M_{v2} = 14.05\,kN \cdot m \qquad S_{v2} = 5.05\,kN$$

$$\sigma_c := \frac{M_{v2} \cdot \frac{L}{2}}{\frac{B \cdot L^3}{12}}$$

$$\sigma_c = 55.424 \frac{N}{mm^2}$$

The force in the section equals :

$$F_S := \sigma_c \cdot B + \frac{S_{v2}}{L}$$

$$F_S = 567.189 \frac{kN}{m}$$

So we become :

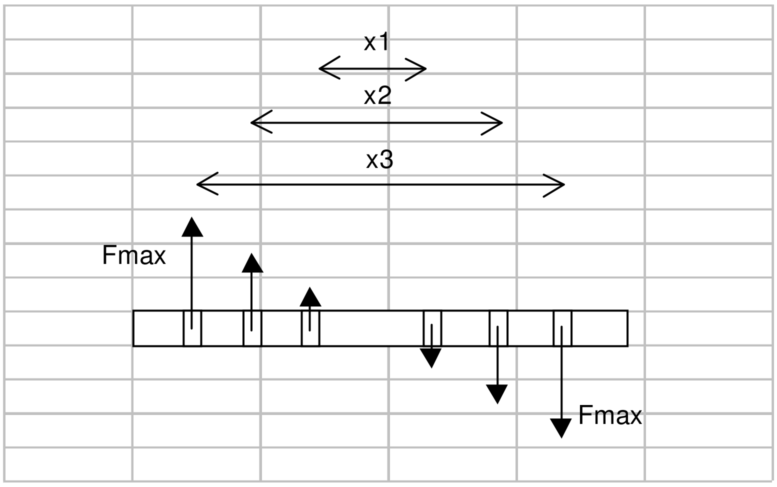
$$\tau_c := \frac{F_S}{H}$$

$$\tau_c = 40.514 \frac{N}{mm^2}$$

$$\sigma_{vonmise} := \sqrt{3 \cdot \tau_c^{\,2}}$$

$$\sigma_{vonmise} = 70.171 \frac{N}{mm^2} \qquad \sigma_{adm\_alu} = 218.182 \frac{N}{mm^2}$$

The moment is supported by 6 bolts M16. The moment causes the following force in the outside bolts :



$x1 := 130 \cdot mm$ $x2 := 220 \cdot mm$ $x3 := 310 \cdot mm$

$$F_{max} := \frac{M_V \cdot x3}{x1^2 + x2^2 + x3^2} \qquad F_{max} = 53.971\,kN$$

$$F_N := \frac{N_V}{6}$$

$$F_N = 2.183\,kN$$

$D_b := 16mm$ diameter bolt

$A_{bolt}(D_b) = 201.062\ mm^2$ section bolt <**5.2**>

Control of the shear force in the bolts

$c(F_{ub}) = 0.6$ <**5.3**>

$bolt\_force := F_N$

$shear\_resist = 77.208\ kN$ <**5.4**>

$control\_shear := \begin{cases} \text{"OK"} & \text{if } bolt\_force \le shear\_resist \\ \text{"NOK"} & \text{otherwise} \end{cases}$

$control\_shear = \text{"OK"}$

Control of the traction resistance in the bolts

$traction\_bolts := F_{max}$

$traction\_bolts = 53.971\ kN$

$traction\_resist = 115.812\ kN$ <**5.10**>

$control\_traction := \begin{cases} \text{"OK"} & \text{if } traction\_bolts \le traction\_resist \\ \text{"NOK"} & \text{otherwise} \end{cases}$

$control\_traction = \text{"OK"}$

The unity control for bolts and pins resisting traction and shear force at the same time, must always be smaller than or equal to 1 (ENV9 form. 6.20, ENV3 form. 6.6)

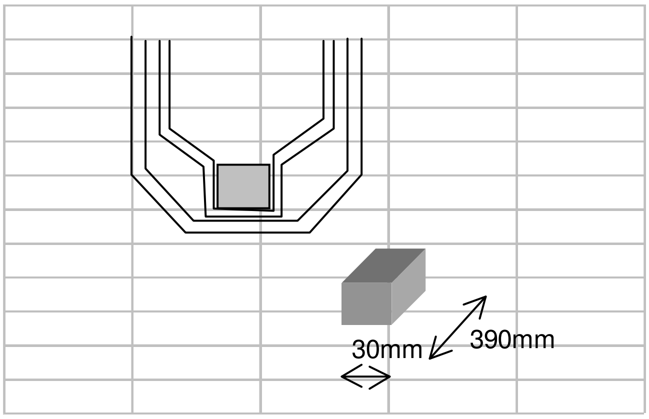
$$unity\_traction\_shear := \frac{F_N}{F_{vRd}(F_{ub}, D_b)} + \frac{F_{max}}{1.4 \cdot F_{tRd}(F_{ub}, D_b)}$$

$unity\_traction\_shear = 0.361$

$$unity\_control := \begin{cases} \text{"OK"} & \text{if } unity\_traction\_shear \le 1 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

unity_control = "OK"

Resistance against perforation in the alu main profile



$$F_{pRd} := \frac{(2 \cdot 390mm + 2 \cdot 30mm) \cdot t_{alu}(prof\_roof_{prin\_reinf}) \cdot R_{e\_alu}}{\sqrt{3}\,\gamma_M}$$

$F_{pRd} = 634.875\ kN$

$$F_p := S_v + \frac{M_v}{\frac{30 \cdot mm \cdot (390 \cdot mm)^2}{6}} \cdot 30mm \cdot 390mm$$

$F_p = 442.408\ kN$

$$control := \begin{cases} \text{"OK"} & \text{if } F_p \le F_{pRd} \\ \text{"NOK"} & \text{if } F_p > F_{pRd} \end{cases}$$

control = "OK"

Resistance against sliding between the two guide rails

Two pins dia 16mm (S235) prevent sliding between the inner and the outer guide rail.

$D_p := 16mm$ diameter pin

$A_{bolt}(D_p) = 201.062\ mm^2$ section pin **<5.2>**

$F_{ub} := R_{t\_S235}$ material pin

$N_{v\_max} := 19.9kN$ maximum force **{comb. 6, member 3, x=0.0}**

So we become :

$$pin\_force := \frac{N_{v\_max}}{2}$$

$pin\_force = 9.95\ kN$

$shear\_resist = 34.744\ kN$ **<5.4>**

$$control\_shear := \begin{vmatrix} \text{"OK"} & \text{if } pin\_force \le shear\_resist \\ \text{"NOK"} & \text{otherwise} \end{vmatrix}$$

$control\_shear = \text{"OK"}$

9. Purlins. <formulas: see document 3>

$k_y := 1.0$ $k_z := 1.0$ $L_y := 4900mm$ $L_z := 4900mm$

9.1. Peak and eaves purlin : alu133/70.

$profile := prof\_purlin_{strong1}$

$prof_{control}(profile) = "alu133/70"$

$classification(profile) = 2$ <3.1>

Shape factor :

$\alpha_{y\_prof} = 1.256$ $\alpha_{z\_prof} = 1.248$ <3.2>

Profile capacity :

$N_{rd\_prof} = 349.964\,kN$

$M_{yrd\_prof} = 15.731\,kN\cdot m$ <3.3>

$M_{zrd\_prof} = 8.225\,kN\cdot m$

Slenderness :

$\lambda_{y\_prof} = 100.408$ $\lambda_{z\_prof} = 190.61$ <3.4>

$\lambda_{by\_prof} = 1.871$ $\lambda_{bz\_prof} = 3.553$ <3.5>

Reduction coefficient for buckling :

$\phi_{y\_prof} = 2.428$ $\phi_{z\_prof} = 7.156$ <3.6>

$\chi_{y\_prof} = 0.252$ $\chi_{z\_prof} = 0.075$ <3.7>

9.1.1 Compression

$M_y := 0.0 \cdot kN \cdot m$

$M_z := 0.0 \cdot kN \cdot m$

$N_{comp} := 11.2 \cdot kN$ **{comb. 5, member 59, x=5.0m}**

Buckling control

$buckling_{control\_unity} = 0.507$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 6.983 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.032$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

9.1.2 Traction

$N_{traction} := 8.8 \cdot kN$ **{comb. 5, member 65, x=5.0m}**

$bending\_traction_{control\_unity} = 8.329 \times 10^{-3}$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 5.486 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.025$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

9.2. Normal purlin : alu60/60/3.

$profile := prof\_purlin_{weak}$

$prof_{control}(profile) = "alu60/60/3"$

$classification(profile) = 1$ **<3.1>**

Shape factor :

$\alpha_{y\_prof} = 1.188$ $\alpha_{z\_prof} = 1.188$ **<3.2>**

Profile capacity :

$N_{rd\_prof} = 144\,kN$

$M_{yrd\_prof} = 3.033\,kN \cdot m$ **<3.3>**

$M_{zrd\_prof} = 3.033\,kN \cdot m$

Slenderness :

$\lambda_{y\_prof} = 212.478$ $\lambda_{z\_prof} = 212.478$ **<3.4>**

$\lambda_{by\_prof} = 3.96$ $\lambda_{bz\_prof} = 3.96$ **<3.5>**

Reduction coefficient for buckling :

$\phi_{y\_prof} = 8.728$ $\phi_{z\_prof} = 8.728$ **<3.6>**

$\chi_{y\_prof} = 0.061$ $\chi_{z\_prof} = 0.061$ **<3.7>**

9.2.1 Compression

$N_{comp} := 5.0 \cdot kN$ **{comb. 6, member 79, x=0.0m}**

Buckling control

$buckling_{control\_unity} = 0.641$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 7.576 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.035$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

9.2.2 Traction

$N_{traction} := 2.2 \cdot kN$ **{comb. 7, member 81, x=0.0m}**

$bending\_traction_{control\_unity} = 4.358 \times 10^{-3}$ **<3.9>**

$$control := \begin{cases} "OK" & \text{if } bending\_traction_{control\_unity} \leq 1.0 \\ "NOK" & \text{otherwise} \end{cases}$$

$control = "OK"$

Stress control

$\sigma_{control} = 3.333 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.015$

$$stress := \begin{cases} "OK" & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \leq 1.0 \\ "NOK" & \text{otherwise} \end{cases}$$

$stress = "OK"$

10. Gable end.

<formulas: see document 3>

10.1. Gable upright N°1 : alu133/70

$k_y := 1.0$ $k_z := 1.0$ $L_y := 4250mm$ $L_z := 2662mm$

$profile := prof\_gable_{up}$

$prof_{control}(profile) = "alu133/70"$

$classification(profile) = 2$ **<3.1>**

Shape factor :

$\alpha_{y\_prof} = 1.256$ $\alpha_{z\_prof} = 1.248$ **<3.2>**

Profile capacity :

$N_{rd\_prof} = 349.964\,kN$

$M_{yrd\_prof} = 15.731\,kN\cdot m$ **<3.3>**

$M_{zrd\_prof} = 8.225\,kN\cdot m$

Slenderness :

$\lambda_{y\_prof} = 87.088$ $\lambda_{z\_prof} = 103.552$ **<3.4>**

$\lambda_{by\_prof} = 1.623$ $\lambda_{bz\_prof} = 1.93$ **<3.5>**

Reduction coefficient for buckling :

$\phi_{y\_prof} = 1.97$ $\phi_{z\_prof} = 2.546$ **<3.6>**

$\chi_{y\_prof} = 0.324$ $\chi_{z\_prof} = 0.238$ **<3.7>**

10.1.1 Bending + compression

$M_y := 2.6 \cdot kN \cdot m$ **{comb. 7, member 104, x=2.662m}**

$M_z := 1.7 \cdot kN \cdot m$

$N_v := 6.9 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.41$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 105.696 \frac{N}{mm^2}$ **<3.10>**

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.484$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

10.1.2. Bending + traction

$M_y := 9.3 \cdot kN \cdot m$ **{comb. 10, member 104, x = 2.662m}**

$M_z := 0.1 \cdot kN \cdot m$

$N_v := 0.8 \cdot kN$ normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.586$ **<3.9>**

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$\sigma_{control} = 165.699 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.759$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

10.2. Gable upright N°2 : alu133/70

$k_y := 1.0$ $k_z := 1.0$ $L_y := 5920mm$ $L_z := 3258mm$

$profile := prof\_gable_{up}$

$prof_{control}(profile) = $ "alu133/70"

classification(profile) = 2 <3.1>

Shape factor :

$\alpha_{y\_prof} = 1.256$ $\alpha_{z\_prof} = 1.248$ <3.2>

Profile capacity :

$N_{rd\_prof} = 349.964\,kN$

$M_{yrd\_prof} = 15.731\,kN \cdot m$ <3.3>

$M_{zrd\_prof} = 8.225\,kN \cdot m$

Slenderness :

$\lambda_{y\_prof} = 121.309$ $\lambda_{z\_prof} = 126.736$ <3.4>

$\lambda_{by\_prof} = 2.261$ $\lambda_{bz\_prof} = 2.362$ <3.5>

Reduction coefficient for buckling :

$\phi_{y\_prof} = 3.272$ $\phi_{z\_prof} = 3.516$ <3.6>

$\chi_{y\_prof} = 0.177$ $\chi_{z\_prof} = 0.163$ <3.7>

10.2.1 Bending + compression

$M_y := 3.1 \cdot kN \cdot m$ **{comb. 10, member 127, x=0.0m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 9.4 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.427$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 59.826 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.274$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

10.2.2 Bending + traction

$M_y := 12.5 \cdot kN \cdot m$

{comb. 10, member 108, x = 2.662m}

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 12.3 \cdot kN$

normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.804$

<3.9>

$$control := \begin{cases} \text{"OK"} & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

control = "OK"

Stress control

$$\sigma_{control} = 225.273 \frac{N}{mm^2}$$

<3.10>

$$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 1.033$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.1 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

10.3. Gable horizontal : alu130/70

$k_y := 1.0$ $k_z := 1.0$ $L_y := 4930mm$ $L_z := 4930mm$

$profile := prof\_gable_{hor}$

$prof_{control}(profile) = "alu130/70"$

$classification(profile) = 2$ <3.1>

Shape factor :

$\alpha_{y\_prof} = 1.312$ $\alpha_{z\_prof} = 1.191$ <3.2>

Profile capacity :

$N_{rd\_prof} = 326.618\,kN$

$M_{yrd\_prof} = 13.767\,kN\cdot m$ <3.3>

$M_{zrd\_prof} = 8.291\,kN\cdot m$

Slenderness :

$\lambda_{y\_prof} = 107.989$ $\lambda_{z\_prof} = 180.239$ <3.4>

$\lambda_{by\_prof} = 2.013$ $\lambda_{bz\_prof} = 3.359$ <3.5>

Reduction coefficient for buckling :

$\phi_{y\_prof} = 2.717$ $\phi_{z\_prof} = 6.469$ <3.6>

$\chi_{y\_prof} = 0.22$ $\chi_{z\_prof} = 0.083$ <3.7>

10.3.1 Bending + compression

$M_y := 2.3 \cdot kN \cdot m$ **{comb. 3, member 111, x=2.567m}**

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 1.1 \cdot kN$ normal force / compression

Buckling control

$buckling_{control\_unity} = 0.238$ **<3.8>**

$$control := \begin{cases} \text{"OK"} & \text{if } buckling_{control\_unity} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$control = \text{"OK"}$

Stress control

$\sigma_{control} = 48.651 \dfrac{N}{mm^2}$ **<3.10>**

$\dfrac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.223$

$$stress := \begin{cases} \text{"OK"} & \text{if } \dfrac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

$stress = \text{"OK"}$

10.3.2 Bending + traction

$M_y := 5.5 \cdot kN \cdot m$

{comb. 3, member 617, x = 2.5m}

$M_z := 0.0 \cdot kN \cdot m$

$N_v := 6.9 \cdot kN$

normal force / traction

Unity control

$bending\_traction_{control\_unity} = 0.399$ **<3.9>**

$$control := \begin{cases} "OK" & \text{if } bending\_traction_{control\_unity} \le 1.0 \\ "NOK" & \text{otherwise} \end{cases}$$

$control = "OK"$

Stress control

$\sigma_{control} = 119.193 \frac{N}{mm^2}$ **<3.10>**

$\frac{\sigma_{control}}{\sigma_{adm\_alu}} = 0.546$

$$stress := \begin{cases} "OK" & \text{if } \frac{\sigma_{control}}{\sigma_{adm\_alu}} \le 1.0 \\ "NOK" & \text{otherwise} \end{cases}$$

$stress = "OK"$

11. Wind bracing cable.

Side

The maximum force in the bracing cable equals :

$N_{max} := 10.6 \cdot kN$ **{Comb. 10, member 118}**

$$Security(S) := \begin{cases} \text{"OK"} & \text{if } S \geq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

1. Cable tightener : 3/4" x 12 Type 2 2360 kg

$MBL := 118 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 11.132$ $Security(S) = \text{"OK"}$

2. Steel cable - diameter 10 mm - 6 x 19

$MBL := 58.9 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 5.557$ $Security(S) = \text{"OK"}$

3. D-fastener - dia 9/16 - 0.6 ton

$MBL := 30 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 2.83$ $Security(S) = \text{"OK"}$

4. Eyebolt M16

$MBL := 35 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 3.302$ $Security(S) = \text{"OK"}$

Roof

The maximum force in the bracing cable equals :

$N_{max} := 20.5 \cdot kN$ **{Comb. 5, member 116}**

$$Security(S) := \begin{cases} \text{"OK"} & \text{if } S \geq 1.0 \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

1. Cable tightener : 3/4" x 12 Type 2 2360 kg

$MBL := 118 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 5.756$ $Security(S) = \text{"OK"}$

2. Steel cable - diameter 10 mm - 6 x 37 + TWK

$MBL := 52 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 2.537$ $Security(S) = \text{"OK"}$

3. D-fastener - dia 9/16 - 0.6 ton

$MBL := 30 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 1.463$ $Security(S) = \text{"OK"}$

4. Eyebolt M16

$MBL := 35 \cdot kN$ Minimum break load

The security factor equals :

$$S := \frac{MBL}{N_{max}}$$

$S = 1.707$ $Security(S) = \text{"OK"}$

12. Connection of arch to baseplate.

The reaction forces are (in kN):

$$R := \begin{pmatrix} 14.3 & 0.0 & 3.5 \\ 0.3 & 10.1 & 2.0 \\ 8.8 & 8.6 & 18.3 \\ 0.4 & 0.6 & 10.1 \end{pmatrix} \quad \text{kN}$$

row 1 = {comb. 3, node 35} with max Rx
row 2 = {comb. 10, node 1} with max Ry
row 3 = {comb. 5, node 69} with max Rz
row 4 = {comb. 8, node 104} with max Rz downforce

$R_x := R^{\langle 0\rangle} \quad R_y := R^{\langle 1\rangle} \quad R_z := R^{\langle 2\rangle}$

$R_{x\_df} := \left(R^{\langle 0\rangle T}\right)^{\langle 3\rangle}\cdot kN \qquad R_{x\_df} = (0.4)\,kN$

$R_{y\_df} := \left(R^{\langle 1\rangle T}\right)^{\langle 3\rangle}\cdot kN \qquad R_{y\_df} = (0.6)\,kN$

$R_{z\_df} := \left(R^{\langle 2\rangle T}\right)^{\langle 3\rangle}\cdot kN \qquad R_{z\_df} = (10.1)\,kN$

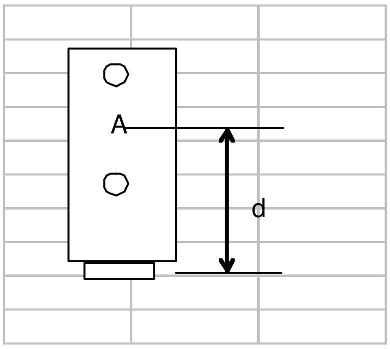
12.1. Steel profile <formulas: see document 6>

Section K90/90/3
The splice is connected to the main profiles by 2 bolts M12-8.8.

$material := R_{e\_S235}$

Maximum forces at the gravity point of the bolted connection:

$d := 160mm$

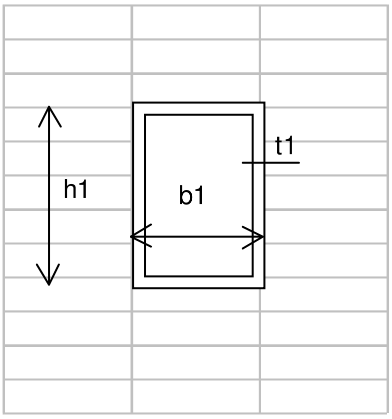


$M_y := R_x \cdot d$

$M_z := R_y \cdot d$

$N_v := R_z$

$S_v := \sqrt{R_x^{\,2} + R_y^{\,2}}$



$$M_y = \begin{pmatrix} 2.288 \\ 0.048 \\ 1.408 \\ 0.064 \end{pmatrix} m \qquad N_v = \begin{pmatrix} 3.5 \\ 2 \\ 18.3 \\ 10.1 \end{pmatrix} \qquad S_v = \begin{pmatrix} 14.3 \\ 10.104 \\ 12.304 \\ 0.721 \end{pmatrix}$$

$$M_z = \begin{pmatrix} 0 \\ 1.616 \\ 1.376 \\ 0.096 \end{pmatrix} m$$

number of parts (1): $n := 1$

	Width	Height	Wall thickness (2)	Gravity point of the part in y-direction	Gravity point of the part in z-direction
Part 1:	$b_1 := 90 \cdot mm$	$h_1 := 90 \cdot mm$	$t_1 := 3 \cdot mm$	$y1 := 45 \cdot mm$	$z1 := 45 \cdot mm$

(1) part = either a tube or a plate
(2) if the part is a plate, the wall thickness = height / 2

Section

$A_{section} = 1.044 \times 10^3\ mm^2$ <6.1>

Gravity point

$y_v = 45\ mm$ <6.2>

$z_v = 45\ mm$ <6.3>

Moment of inertia

$I_{tot\_y} = 1.319 \times 10^6\ mm^4$ <6.4>

$I_{tot\_z} = 1.319 \times 10^6\ mm^4$ <6.5>

Von mise stress

$$\sigma_{st} = 112.541 \frac{N}{mm^2}$$ <6.6>

$$\tau_{st} = 11.786 \frac{N}{mm^2}$$ <6.7>

$$\sigma_{vonmise} = 114.377 \frac{N}{mm^2}$$ <6.8>

$$\sigma_{adm}(material) = 213.636 \frac{N}{mm^2}$$

$$stress := \begin{cases} "OK" & \text{if } \sigma_{vonmise} \le \sigma_{adm}(material) \\ "NOK" & \text{otherwise} \end{cases}$$

stress = "OK"

12.2. Control of the bolts (2xM12) <formulas: see document 5>

The forces in the bolts are:

$M_v := M_y$

$N_v := R_z$

$S_v := R_x$

$M_v = \begin{pmatrix} 2.288 \\ 0.048 \\ 1.408 \\ 0.064 \end{pmatrix} m \quad N_v = \begin{pmatrix} 3.5 \\ 2 \\ 18.3 \\ 10.1 \end{pmatrix} \quad S_v = \begin{pmatrix} 14.3 \\ 0.3 \\ 8.8 \\ 0.4 \end{pmatrix}$

Number of bolts:

$n_{bolt} := 2$

The coordinates of the bolts are:

$x1 := 0mm$ $y1 := 0mm$ $x3 := 0mm$ $y3 := 0mm$ $x5 := 0mm$ $y5 := 0mm$

$x2 := 200mm$ $y2 := 0mm$ $x4 := 0mm$ $y4 := 0mm$ $x6 := 0mm$ $y6 := 0mm$

The properties of the bolt equal:

$D_b := 12 \cdot mm$ diameter of the bolt

$D_0 := 14 \cdot mm$ diameter of the bolthole

$F_{ub} := R_{t\_bolt}$ bolt material

The properties of the connection equal:

$e_{1\_out} := 35 \cdot mm$ enddistance of the outside profile

$e_{1\_in} := 35 \cdot mm$ enddistance of the inside profile

$p_1 := 200 \cdot mm$ distance between two bolts

$t_{out} := t_{alu}(prof\_foot_{prin})$ wall thickness of the outside profile

$t_{in} := t_1$ wall thickness of the inside profile

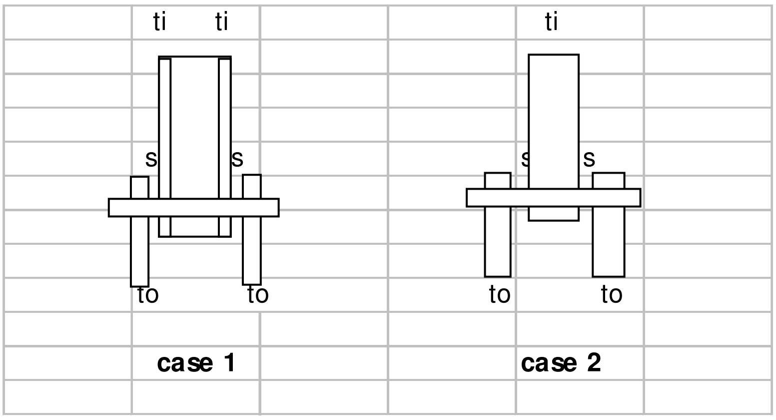
$s_{margin} := 2mm$ margin between the inside profile and the outside profile

$f_{y\_out} := R_{e\_alu}$ yield stress of the material on the outside

$f_{u\_out} := R_{t\_alu}$ tensile strength of the material on the outside

$f_{y\_in} := R_{e\_S235}$ yield stress of the material on the inside

$f_{u\_in} := R_{t\_S235}$ tensile strength of the material on the inside



case := 1

$F_{res} = 9.336\,kN$ **<5.1>**

$A_{bolt}(D_b) = 113.097\,mm^2$ **<5.2>**

Control of the shear force in the bolts

$c(F_{ub}) = 0.6$ **<5.3>**

bolt_force = 9.336 kN

shear_resist = 43.429 kN **<5.4>**

control_shear := | "OK" if bolt_force ≤ shear_resist
| "NOK" otherwise

control_shear = "OK"

Control of the bearing force in the aluminium profile

$\alpha_{out} = 0.833$ **<5.5>**

bolt_force = 9.336 kN

bearing_resist_out = 15.6 kN **<5.6>**

control_bearing := | "OK" if bolt_force ≤ bearing_resist_out
| "NOK" otherwise

control_bearing = "OK"

Control of the bearing force in the steel profile

$\alpha_{in} = 0.833$ **<5.5>**

bolt_force = 9.336 kN

bearing_resist_in = 21.6 kN **<5.6>**

control_bearing := | "OK" if bolt_force ≤ bearing_resist_in
| "NOK" otherwise

control_bearing = "OK"

Moment control in the bolts

$W(D_b) = 169.646\ mm^3$ **<5.7>**

d = 5 mm **<5.9>**

moment = 0.047 kN·m

moment_capacity = 0.087 kN·m **<5.8>**

control_moment := | "OK" if moment ≤ moment_capacity
| "NOK" otherwise

control_moment = "OK"

12.3. Control of the pin in the footplate M16 **<formulas: see document 5>**

$n_{bolt} := 1$ number of bolts

The properties of the bolt equal:

$D_b := 16 \cdot mm$ diameter of the bolt

$D_0 := 18.9 \cdot mm$ diameter of the bolthole

$F_{ub} := R_{t\_S235}$ bolt material

$F_{res} = 14.722\,kN$ **<5.1>**

$A_{bolt}(D_b) = 201.062\,mm^2$ **<5.2>**

<u>Control of the shear force in the bolts</u>

$c(F_{ub}) = 0.6$ **<5.3>**

bolt_force = 14.722 kN

shear_resist = 34.744 kN **<5.4>**

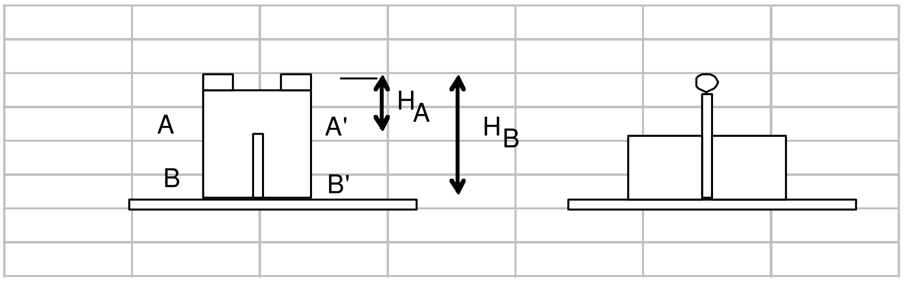
control_shear := | "OK" if bolt_force ≤ shear_resist
| "NOK" otherwise

control_shear = "OK"

13. Baseplate.

13.1. Bending of the vertical steel plates.

material := R_{e_S235}



$H_A := 70mm$

$H_B := 163mm$

a) Section AA' (Fe 140/10)

The forces are:

$M_y := R_y \cdot H_A$

$M_z := R_x \cdot H_A$

$N_v := R_z$

$S_v := \sqrt{R_x^{\ 2} + R_y^{\ 2}}$

$M_y = \begin{pmatrix} 0 \\ 0.475 \\ 0.404 \\ 0.028 \end{pmatrix} m \quad M_z = \begin{pmatrix} 0.672 \\ 0.014 \\ 0.414 \\ 0.019 \end{pmatrix} m \quad N_v = \begin{pmatrix} 3.5 \\ 2 \\ 18.3 \\ 10.1 \end{pmatrix} \quad S_v = \begin{pmatrix} 14.3 \\ 10.104 \\ 12.304 \\ 0.721 \end{pmatrix}$

number of parts ([1]): $n := 1$

	Width	Height	Wall thickness ([2])	Gravity point of the part in y-direction	Gravity point of the part in z-direction
Part 1:	$b_1 := 140 \cdot mm$	$h_1 := 10 \cdot mm$	$t_1 := 5 \cdot mm$	$y1 := 5 \cdot mm$	$z1 := 70 \cdot mm$

([1]) part = either a tube or a plate
([2]) if the part is a plate, the wall thickness = height / 2

Section

$A_{section} = 1.4 \times 10^{3}\ mm^{2}$ **<6.1>**

Gravity point

$y_{v} = 5\ mm$ **<6.2>**

$z_{v} = 70\ mm$ **<6.3>**

Moment of inertia

$I_{tot\_y} = 1.167 \times 10^{4}\ mm^{4}$ **<6.4>**

$I_{tot\_z} = 2.287 \times 10^{6}\ mm^{4}$ **<6.5>**

Von mise stress

$\sigma_{st} = 205.303 \frac{N}{mm^{2}}$ **<6.6>**

$\tau_{st} = 7.217 \frac{N}{mm^{2}}$ **<6.7>**

$\sigma_{vonmise} = 205.683 \frac{N}{mm^{2}}$ **<6.8>**

$\sigma_{adm}(material) = 213.636 \frac{N}{mm^{2}}$

stress := | "OK" if $\sigma_{vonmise} \le \sigma_{adm}(material)$
"NOK" otherwise

stress = "OK"

b) Section BB' (Fe140/10 + 2x Fe70/10)

The forces are:

$M_y := R_y \cdot H_B$

$M_z := R_x \cdot H_B$

$N_v := R_z$

$S_v := \sqrt{R_x^2 + R_y^2}$

$$M_y = \begin{pmatrix} 0 \\ 1.646 \\ 1.402 \\ 0.098 \end{pmatrix} m \qquad M_z = \begin{pmatrix} 2.331 \\ 0.049 \\ 1.434 \\ 0.065 \end{pmatrix} m \qquad N_v = \begin{pmatrix} 3.5 \\ 2 \\ 18.3 \\ 10.1 \end{pmatrix} \qquad S_v = \begin{pmatrix} 14.3 \\ 10.104 \\ 12.304 \\ 0.721 \end{pmatrix}$$

number of parts (1): $n := 3$

	Width	Height	Wall thickness (2)	Gravity point of the part in y-direction	Gravity point of the part in z-direction
Part 1:	$b_1 := 10 \cdot mm$	$h_1 := 70 \cdot mm$	$t_1 := 35 \cdot mm$	$y1 := 35 \cdot mm$	$z1 := 70 \cdot mm$
Part 2:	$b_2 := 140 \cdot mm$	$h_2 := 10 \cdot mm$	$t_2 := 5 \cdot mm$	$y2 := 75 \cdot mm$	$z2 := 70 \cdot mm$
Part 3:	$b_3 := 10 \cdot mm$	$h_3 := 70 \cdot mm$	$t_3 := 35 \cdot mm$	$y3 := 115 \cdot mm$	$z3 := 70 \cdot mm$

(1) part = either a tube or a plate
(2) if the part is a plate, the wall thickness = height / 2

Section

$A_{section} = 2.8 \times 10^3 \, mm^2$ **<6.1>**

Gravity point

$y_v = 75 \, mm$ **<6.2>**

$z_v = 70 \, mm$ **<6.3>**

Moment of inertia

$I_{tot\_y} = 2.823 \times 10^6\ mm^4$ <6.4>

$I_{tot\_z} = 2.298 \times 10^6\ mm^4$ <6.5>

Von mise stress

$\sigma_{st} = 87.461 \frac{N}{mm^2}$ <6.6>

$\tau_{st} = 4.394 \frac{N}{mm^2}$ <6.7>

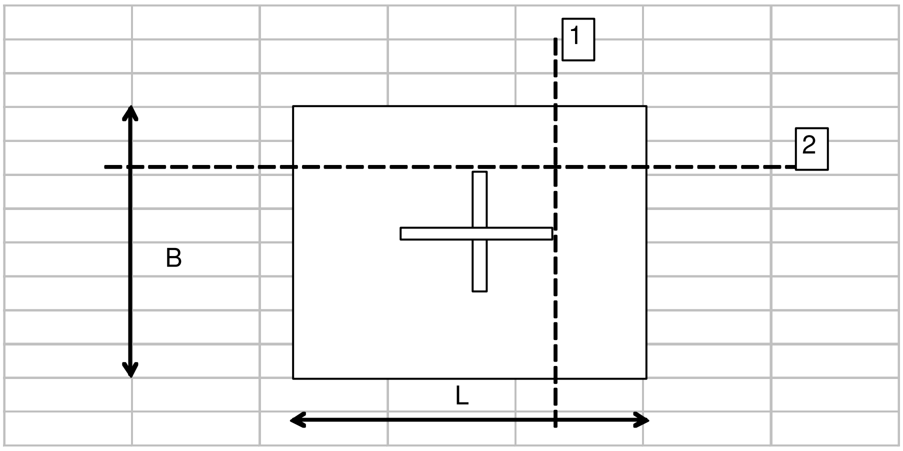
$\sigma_{vonmise} = 87.791 \frac{N}{mm^2}$ <6.8>

$\sigma_{adm}(material) = 213.636 \frac{N}{mm^2}$

$$stress := \begin{cases} \text{"OK"} & \text{if } \sigma_{vonmise} \le \sigma_{adm}(material) \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

13.2. Bending of the horizontal steel plate. <formulas: see document 7>



The checked sections

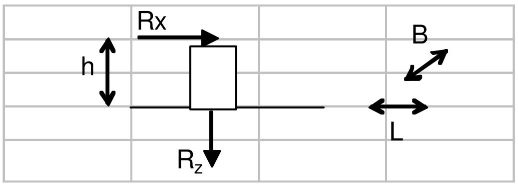
$B_p := 300 \cdot mm$ $H_p := 10 \cdot mm$ $L_p := 300 \cdot mm$

L = length of the horizontal plate in y direction
B = width of the horizontal plate in x direction
H = thickness of the horizontal plate

material := R_{e_S235}

baseplate := "side"

a) Section 1



$R_{x\_df} = (0.4)\,kN$

$R_{z\_df} = (10.1)\,kN$ **{Comb 8, node 104}**

$h_p := H_B + H_p$

Maximum groundpressure : $p_{max\_ground} := 100 \frac{kN}{m^2}$

$p_{ground}(\sigma) :=$ | "OK, no need for terrain verification" if $\sigma \le p_{max\_ground}$
| "terrain verrification needed" otherwise

$\sigma_{Max} = 0.128 \frac{N}{mm^2}$ <7.1> $p_{ground}(\sigma_{Max})$ = "terrain verrification needed"

$\sigma_{Min} = 0.097 \frac{N}{mm^2}$

$p_{Max} = 38.28 \frac{kN}{m}$ <7.2>

$p_{Min} = 29.053 \frac{kN}{m}$

$a_1 := 80mm$ distance from the border of the plate till section 1

$p_{r1} = 2.46 \frac{kN}{m}$ **<7.3>**

$a_{\Delta 1} = 170.554\,mm$ **<7.4>**

$p_{ax1} = 35.82 \frac{kN}{m}$ **<7.5>**

Gravity distance:

$a_{g1} = 40.443\,mm$ **<7.6>**

Maximum moment:

$M_{max1} = 0.12\,kN \cdot m$ **<7.7>**

Section 1: at distance a1

$M_y := \frac{M_{max1}}{kN}$

number of parts ([1]): $n := 1$

	Width	Height	Wall thickness ([2])	Gravity point of the part in y-direction
Part 1:	$b_1 := B_p$	$h_1 := H_p$	$t_1 := \frac{H_p}{2}$	$y1 := \frac{H_p}{2}$

Section

$A_{section} = 3 \times 10^3 \, mm^2$ **<6.1>**

Gravity point

$y_v = 5 \, mm$ **<6.2>**

Moment of inertia

$I_{tot\_y} = 2.5 \times 10^4 \, mm^4$ **<6.4>**

Von mise stress

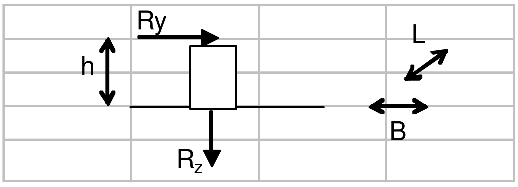
$\sigma_{vonmise} = 23.974 \, \frac{N}{mm^2}$ **<6.8>**

$\sigma_{adm}(material) = 213.636 \, \frac{N}{mm^2}$

$$stress := \begin{cases} \text{"OK"} & \text{if } \sigma_{vonmise} \le \sigma_{adm}(material) \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

b) Section 2



$R_{y\_df} = (0.6)\,kN$

$R_{z\_df} = (10.1)\,kN$ **{Comb 18, node 57}**

$\sigma_{Max} = 0.135\,\frac{N}{mm^2}$ **<7.1>** $p_{ground}(\sigma_{Max})$ = "terrain verrification needed"

$\sigma_{Min} = 0.089\,\frac{N}{mm^2}$

$p_{Max} = 40.587\,\frac{kN}{m}$ **<7.2>**

$p_{Min} = 26.747\,\frac{kN}{m}$

$a_2 := 75mm$ distance from the border of the plate till section 2

$p_{r2} = 3.46\,\frac{kN}{m}$ **<7.3>**

$a_{\Delta 2} = 180.832\,mm$ **<7.4>**

$p_{ax2} = 37.127\,\frac{kN}{m}$ **<7.5>**

Gravity distance:

$a_{g2} = 38.057\,mm$ **<7.6>**

Maximum moment:

$M_{max2} = 0.111\,kN \cdot m$ **<7.7>**

Section 2: at distance a2

$$M_y := \frac{M_{max2}}{kN}$$

number of parts ([1]): $n := 1$

	Width	Height	Wall thickness ([2])	Gravity point of the part in y-direction
Part 1:	$b_1 := L_p$	$h_1 := H_p$	$t_1 := \frac{H_p}{2}$	$y1 := \frac{H_p}{2}$

([1]) part = either a tube or a plate
([2]) if the part is a plate, the wall thickness = height / 2

Section

$A_{section} = 3 \times 10^3\ mm^2$ **<6.1>**

Gravity point

$y_v = 5\ mm$ **<6.2>**

Moment of inertia

$I_{tot\_y} = 2.5 \times 10^4\ mm^4$ **<6.4>**

Von mise stress

$\sigma_{vonmise} = 22.181 \frac{N}{mm^2}$ **<6.8>**

$$\sigma_{adm}(material) = 213.636 \frac{N}{mm^2}$$

$$stress := \begin{cases} \text{"OK"} & \text{if } \sigma_{vonmise} \le \sigma_{adm}(material) \\ \text{"NOK"} & \text{otherwise} \end{cases}$$

stress = "OK"

14. Anchorage.

14.1. Weight anchors.

EN 13782, Art. 7.2: verification against overturning, sliding and lifting.

Safety against overturning :

The lifting forces at the left side are :

node	wind side (overpr.) : Rz -	safety factor	permanent loads : down force	safety factor
1	$Wso_1 := 1.9kN$	$\gamma_w := 1.2$	$P_1 := 0.9kN$	$\gamma_p := 1.0$
18	$Wso_{18} := 4.4kN$		$P_{18} := 2.8kN$	
35	$Wso_{35} := 4.5kN$		$P_{35} := 2.8kN$	
52	$Wso_{52} := 6.8kN$		$P_{52} := 2.8kN$	
69	$Wso_{69} := 4.4kN$		$P_{69} := 2.8kN$	
86	$Wso_{86} := 1.9kN$		$P_{86} := 0.9kN$	

The stabilising moment proportion equals :

$$M_{ST.k} := \gamma_p \cdot (P_1 + P_{18} + P_{35} + P_{52} + P_{69} + P_{86}) \cdot Width$$

The overturning moment proportion equals :

$$M_{K.k} := \gamma_w \cdot (Wso_1 + Wso_{18} + Wso_{35} + Wso_{52} + Wso_{69} + Wso_{86}) \cdot Width$$

So, the total resulting weight to prevent overturning, becomes :

$$L_{o\_tot} := \frac{M_{K.k} - M_{ST.k}}{\gamma_p \cdot Width} \qquad L_{o\_tot} = 15.68\,kN$$

Safety against sliding :

The sliding forces are :

node	wind side (overpr.) : Rx + Ry	safety factor	permanent loads : down force	safety factor
1	$Wss_1 := 3.2kN$	$\gamma_w := 1.2$	$P_1 = 0.9\,kN$	$\gamma_p := 1.0$
18	$Wss_{18} := 10.8kN$		$P_{18} = 2.8\,kN$	
35	$Wss_{35} := 11.0kN$		$P_{35} = 2.8\,kN$	
52	$Wss_{52} := 11.0kN$		$P_{52} = 2.8\,kN$	
69	$Wss_{69} := 10.8kN$		$P_{69} = 2.8\,kN$	
86	$Wss_{86} := 3.2kN$		$P_{86} = 0.9\,kN$	
13	$Wss_{13} := 2.4kN$		$P_{13} := 0.9kN$	
34	$Wss_{34} := 0.0kN$		$P_{34} := 2.8kN$	
51	$Wss_{51} := 0.2kN$		$P_{51} := 2.8kN$	
68	$Wss_{68} := 0.2kN$		$P_{68} := 2.8kN$	
85	$Wss_{85} := 0.0kN$		$P_{85} := 2.8kN$	
102	$Wss_{102} := 2.4kN$		$P_{102} := 0.9kN$	

The coefficient of friction equals (table 3) :

$\mu := 0.5$ friction of concrete on concrete

$$\Sigma H := \gamma_w \cdot \left[\left(Wss_1 + Wss_{18} + Wss_{35} + Wss_{52} + Wss_{69} + Wss_{86} \right) \ldots \atop + Wss_{13} + Wss_{34} + Wss_{51} + Wss_{68} + Wss_{85} + Wss_{102} \right]$$

$$\Sigma N := \gamma_p \cdot \left(P_1 + P_{18} + P_{35} + P_{52} + P_{69} + P_{86} + P_{13} + P_{34} + P_{51} + P_{68} + P_{85} + P_{102} \right)$$

So, the total resulting weight to prevent sliding, becomes :

$$L_{s\_tot} := \frac{\Sigma H - \Sigma N \cdot \mu}{\gamma_p} \qquad L_{s\_tot} = 53.24\,kN$$

Safety against lifting

The lifting forces are :

node	wind gable (overpr.) : Rz -	safety factor	permanent loads : down force	safety factor
1	$Wsl_1 := 6.9kN$	$\gamma_w := 1.2$	$P_1 = 0.9\,kN$	$\gamma_p := 1.0$
18	$Wsl_{18} := 4.8kN$		$P_{18} = 2.8\,kN$	
35	$Wsl_{35} := 10.6kN$		$P_{35} = 2.8\,kN$	
52	$Wsl_{52} := 10.6kN$		$P_{52} = 2.8\,kN$	
69	$Wsl_{69} := 16.3kN$		$P_{69} = 2.8\,kN$	
86	$Wsl_{86} := 4.0kN$		$P_{86} = 0.9\,kN$	
13	$Wsl_{13} := 6.9kN$		$P_{13} = 0.9\,kN$	
34	$Wsl_{34} := 4.8kN$		$P_{34} = 2.8\,kN$	
51	$Wsl_{51} := 10.6kN$		$P_{51} = 2.8\,kN$	
68	$Wsl_{68} := 10.6kN$		$P_{68} = 2.8\,kN$	
85	$Wsl_{85} := 16.3kN$		$P_{85} = 2.8\,kN$	
102	$Wsl_{102} := 4.0kN$		$P_{102} = 0.9\,kN$	

The sum of the vertical stabilising load components equals :

$$\Sigma V_P := \gamma_p \cdot \left(P_1 + P_{18} + P_{35} + P_{52} + P_{69} + P_{86} + P_{13} + P_{34} + P_{51} + P_{68} + P_{85} + P_{102}\right)$$

The sum of the vertical lifting load components equals :

$$\Sigma V_W := \gamma_w \cdot \left[\begin{array}{l}\left(Wsl_1 + Wsl_{18} + Wsl_{35} + Wsl_{52} + Wsl_{69} + Wsl_{86}\right) \ldots \\ + Wsl_{13} + Wsl_{34} + Wsl_{51} + Wsl_{68} + Wsl_{85} + Wsl_{102}\end{array}\right]$$

So, the total resulting weight to prevent lifting, becomes :

$$L_{1\_tot} := \frac{\Sigma V_W - \Sigma V_P}{\gamma_p}$$

$$L_{1\_tot} = 101.68\,kN$$

Distribution of the weights

At the corner :

nodes : 1 13 86 102

The minimum weight per baseplate for the lift force : $w_{min\_corner} := \gamma_w \cdot max(Wsl_1, Wsl_{13}, Wsl_{86}, Wsl_{102})$

$g_{min\_corner} = 828\ kg$

At the wind bracings :

nodes : 18 34 69 85

The minimum weight per baseplate for the lift force : $w_{min\_bracing} := \gamma_w \cdot max(Wsl_{18}, Wsl_{34}, Wsl_{69}, Wsl_{85})$

$g_{min\_bracing} = 1956\ kg$

At the sides :

nodes : 35 52 51 68

The minimum weight per baseplate for the lift force : $w_{min\_side} := \gamma_w \cdot max(Wsl_{35}, Wsl_{52}, Wsl_{51}, Wsl_{68})$

$g_{min\_side} = 1272\ kg$

The total anchor weight for the structure equals :

$$anchor\_weight := 4 \cdot w_{min\_corner} + 4 \cdot w_{min\_bracing} + 4 \cdot w_{min\_side}$$

$$anchor\_weight = 162.24\ kN$$

$$verification_{weight\_anchors} := \begin{cases} "OK" & \text{if } anchor\_weight \geq max(L_{o\_tot}, L_{s\_tot}, L_{l\_tot}) \\ "NOK" & \text{otherwise} \end{cases}$$

$verification_{weight\_anchors} = "OK"$

15. Conclusion.

The relocatable Alu 20m structure, and consequently the Alu 15m, manufactured by EFS N.V., Veldeman Structure Solutions in Bree Belgium complies with the stipulations of the European Standard EN 13782 under the following conditions:

basic windspeed = 100km/h at base
111km/h at top

The structure will be able to resist this load if the structure is well anchored to the ground and when it is completely closed.

Bree, May 2006

____
for EFS nv,
Veldeman Structure Solutions

VELDEMAN
STRUCTURE SOLUTIONS

ENCLOSURE 1 :

$N := newton$

$kN := 1000 \cdot N$

$psf := \frac{lbf}{ft^2}$

$ksi := 1000 \cdot \frac{lbf}{in^2}$

$kip := 1000 \cdot lbf$

$psf := 47.88026 \cdot Pa$

$1 \cdot ksi = 6.89476 \frac{N}{mm^2}$

Document : Formulas NEN-EN13782
ENV 1999-1-1
ENV 1993-1-1
ENV 1991-2-3

Doc. 1. Wind + snow load.

1.1. Snowload.

The snow load on a roof shall determined from : (acc. eurocode ENV 1991 - 2 - 3 : 1995, § 5.1)

$s = \mu_i \cdot C_{es} \cdot C_{ts} \cdot s_k$

the snow load shape coefficient μ_i

the exposure coefficient, which usually has the value 1 $C_{es} := 1.0$

the thermal coefficient, which usually has the value 1 $C_{ts} := 1.0$

the characteristic value of the snow load on the ground (kN/m2) $s_k(p_f) := p_f$

duopitch roof : acc eurocode env 1991-2-3 §7.2 (5), table 7.2

angle of pitch of roof : α

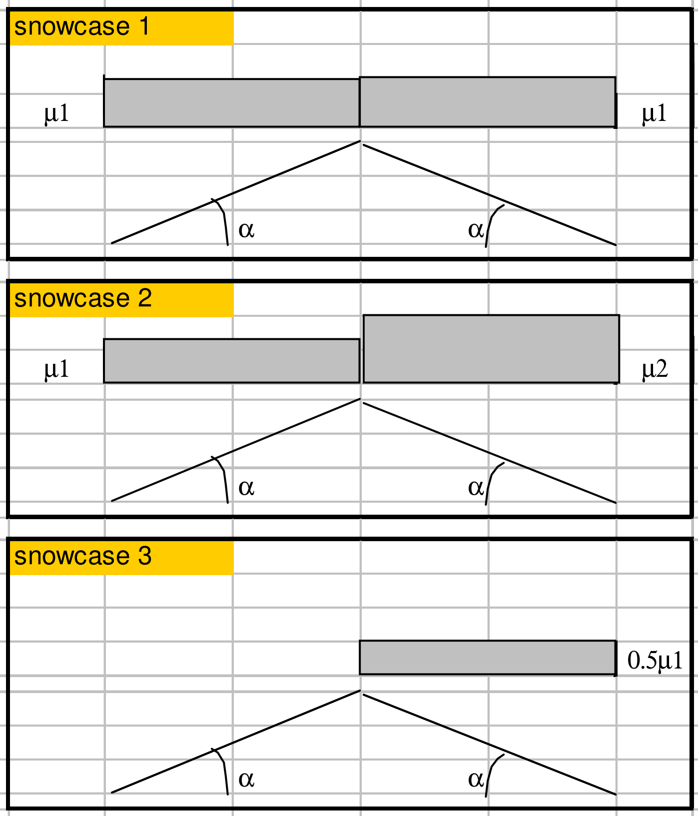
$$\mu_1(\alpha) := \begin{cases} 0.8 & \text{if } 0\cdot deg \le \alpha \le 15\cdot deg \\ 0.8 & \text{if } 15\cdot deg < \alpha \le 30\cdot deg \\ \dfrac{0.8\cdot\left(60 - \dfrac{\alpha}{deg}\right)}{30} & \text{if } 30\cdot deg < \alpha \le 60\cdot deg \\ 0 & \text{if } \alpha \ge 60\cdot deg \end{cases}$$

<1.1>

$$\mu_2(\alpha) := \begin{cases} 0.8 & \text{if } 0\cdot deg \le \alpha \le 15\cdot deg \\ 0.8 + \dfrac{0.6\cdot\left(\dfrac{\alpha}{deg} - 15\right)}{30} & \text{if } 15\cdot deg < \alpha \le 30\cdot deg \\ \dfrac{1.1\cdot\left(60 - \dfrac{\alpha}{deg}\right)}{30} & \text{if } 30\cdot deg < \alpha \le 60\cdot deg \\ 0 & \text{if } \alpha \ge 60\cdot deg \end{cases}$$

<1.2>

Snowcase according to eurocode 1991-2-3, table 7.2



snowcase 1 :

$$s_{1\_windward}(\alpha, p_f, Span\_distance) := \mu_1(\alpha)\cdot(C_{es}\cdot C_{ts}\cdot s_k(p_f))\cdot Span\_distance$$

$$s_{1\_leeward}(\alpha, p_f, Span\_distance) := \mu_1(\alpha)\cdot(C_{es}\cdot C_{ts}\cdot s_k(p_f))\cdot Span\_distance$$

snowcase 2 :

$$s_{2\_windward}(\alpha, p_f, Span\_distance) := \mu_1(\alpha)\cdot(C_{es}\cdot C_{ts}\cdot s_k(p_f))\cdot Span\_distance$$ **<1.3>**

$$s_{2\_leeward}(\alpha, p_f, Span\_distance) := \mu_2(\alpha)\cdot(C_{es}\cdot C_{ts}\cdot s_k(p_f))\cdot Span\_distance$$

snowcase 3 :

$$s_{3\_leeward}(\alpha, p_f, Span\_distance) := 0.5\mu_1(\alpha)\cdot(C_{es}\cdot C_{ts}\cdot s_k(p_f))\cdot Span\_distance$$

1.2. Wind load. acc. to NEN-EN 13782 (2005)

Dynamic windpressure (art. 6.4.2.2) **<1.6>**

$$q_5(H_{peak}, Width) := \begin{cases} \left(0.3\frac{kN}{m^2}\right) & \text{if } H_{peak} \le 5m \wedge Width \le 10m \\ \left(0.5\frac{kN}{m^2}\right) & \text{otherwise} \end{cases}$$

$$v_5(H_{peak}, Width) := \sqrt{1600\, q_5(H_{peak}, Width)} \cdot \left(\frac{m^2}{s \cdot kN^{0.5}}\right)$$

$$q_{10}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \left(0.6\frac{kN}{m^2}\right) & \text{otherwise} \end{cases}$$

$$v_{10}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \left[\sqrt{1600\, q_{10}(H_{peak})} \cdot \left(\frac{m^2}{s \cdot kN^{0.5}}\right)\right] & \text{otherwise} \end{cases}$$

$$q_{15}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \left(0.66\frac{kN}{m^2}\right) & \text{otherwise} \end{cases}$$

$$v_{15}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \left[\sqrt{1600\, q_{15}(H_{peak})} \cdot \left(\frac{m^2}{s \cdot kN^{0.5}}\right)\right] & \text{otherwise} \end{cases}$$

$$q_{20}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \text{"height < 15m"} & \text{if } 10m < H_{peak} \le 15m \\ \left(0.71\frac{kN}{m^2}\right) & \text{otherwise} \end{cases}$$

$$v_{20}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \text{"height < 15m"} & \text{if } 10m < H_{peak} \le 15m \\ \left[\sqrt{1600\, q_{20}(H_{peak})} \cdot \left(\frac{m^2}{s \cdot kN^{0.5}}\right)\right] & \text{otherwise} \end{cases}$$

$$q_{25}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \text{"height < 15m"} & \text{if } 10m < H_{peak} \le 15m \\ \text{"height < 20m"} & \text{if } 15m < H_{peak} \le 20m \\ \left(0.76\frac{kN}{m^2}\right) & \text{otherwise} \end{cases}$$

$$v_{25}(H_{peak}) := \begin{cases} \text{"height < 5m"} & \text{if } H_{peak} \le 5m \\ \text{"height < 10m"} & \text{if } 5m < H_{peak} \le 10m \\ \text{"height < 15m"} & \text{if } 10m < H_{peak} \le 15m \\ \text{"height < 20m"} & \text{if } 15m < H_{peak} \le 20m \\ \left[\sqrt{1600\, q_{25}(H_{peak})} \cdot \left(\frac{m^2}{s \cdot kN^{0.5}}\right)\right] & \text{otherwise} \end{cases}$$

The total wind load for one arch equals : **<1.7>**

$p_{wind\_5}(H_{peak}, width, span) := q_5(H_{peak}, width)\cdot span$

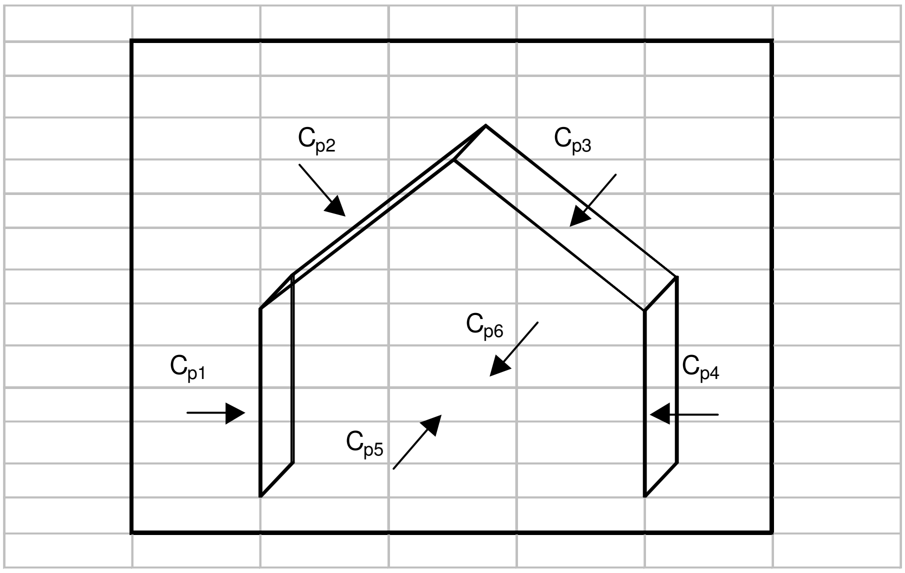
$p_{wind\_10}(H_{peak}, span) := \begin{cases} 0 & \text{if } H_{peak} \le 5m \\ q_{10}(H_{peak})\cdot span & \text{otherwise} \end{cases}$

$p_{wind\_20}(H_{peak}, span) := \begin{cases} 0 & \text{if } H_{peak} \le 15m \\ q_{20}(H_{peak})\cdot span & \text{otherwise} \end{cases}$

$p_{wind\_15}(H_{peak}, span) := \begin{cases} 0 & \text{if } H_{peak} \le 10m \\ q_{15}(H_{peak})\cdot span & \text{otherwise} \end{cases}$

$p_{wind\_25}(H_{peak}, span) := \begin{cases} 0 & \text{if } H_{peak} \le 20m \\ q_{25}(H_{peak})\cdot span & \text{otherwise} \end{cases}$

External windpressure coefficients Cp



Aerodynamic coefficients for structures of conventional shape (NEN-EN 13782 Fig 2)

Wind normal to sidewall of structure **<1.8>**

$C_{p1s} := 0.8$

$C_{p2s}(\alpha) := 1.2\cdot\sin(\alpha) - 0.4$

$C_{p3s} := -0.4$ $C_{p5s} := -0.4$

$C_{p4s} := -0.4$ $C_{p6s} := -0.4$

Wind normal to gablewall of structure **<1.9>**

$C_{p1g} := -0.4$

$C_{p2g} := -0.4$

$C_{p3g} := -0.4$

$C_{p4g} := -0.4$

$C_{p5g} := 0.8$

$C_{p6g} := -0.4$

Internal windpressure coefficients Cpi

C_{pi_o}	Overpressure	**<1.10>**
C_{pi_u}	Underpressure	

The total wind load normal to the side equals :

Overpressure / Underpressure **<1.11>**

$$p_{wind\_1so}(p_{wind}, C_{pi}) := (C_{p1s} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_2so}(p_{wind}, \alpha, C_{pi}) := (C_{p2s}(\alpha) - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_3so}(p_{wind}, C_{pi}) := (C_{p3s} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_4so}(p_{wind}, C_{pi}) := (C_{p4s} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_5so}(p_{wind}, span, C_{pi}) := (C_{p5s} - C_{pi}) \cdot \frac{p_{wind}}{span}$$

$$p_{wind\_6so}(p_{wind}, span, C_{pi}) := (C_{p6s} - C_{pi}) \cdot \frac{p_{wind}}{span}$$

The total wind load normal to the gable equals :

Overpressure / Underpressure **<1.12>**

$$p_{wind\_1go}(p_{wind}, C_{pi}) := (C_{p1g} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_2go}(p_{wind}, C_{pi}) := (C_{p2g} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_3go}(p_{wind}, C_{pi}) := (C_{p3g} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_4go}(p_{wind}, C_{pi}) := (C_{p4g} - C_{pi}) \cdot p_{wind}$$

$$p_{wind\_5go}(p_{wind}, span, C_{pi}) := (C_{p5g} - C_{pi}) \cdot \frac{p_{wind}}{span}$$

$$p_{wind\_6go}(p_{wind}, span, C_{pi}) := (C_{p6g} - C_{pi}) \cdot \frac{p_{wind}}{span}$$

1.3. Load combinations.

(see anex, Esa prima win)

1. - self weight (1\1,35) + permanent load (1\1,35)
2. - self weight (1\1,35) + permanent load (1\1,35) + wind load (1\1,5)
3. - self weight (1\1,35) + permanent load (1\1,35) + snow load (1\1,5)
4. - self weight (1\1,35) + permanent load (1\1,35) + windload (1\1,35) + snow load (1\1,35)

Doc. 2. Materials.

2.1. Properties.

$\gamma_M := 1.1$	partial safety factor
$\gamma_{Mb} := 1.25$	partial safety factor for bolts and pins
$\gamma_{Mr} := 1.25$	partial safety factor for rivets

2.2. Aluminium.

Quality = 6061 T6.

Yield stress	$R_{e\_alu} := 240 \cdot \frac{N}{mm^2}$
Tensile strength	$R_{t\_alu} := 260 \cdot \frac{N}{mm^2}$
Modulus of elasticity	$E_{alu} := 70000 \cdot \frac{N}{mm^2}$
Admissible stress	$\sigma_{adm\_alu} := \frac{R_{e\_alu}}{\gamma_M}$

	2.2.1. ALU 380/166	2.2.2. ALU 310/130
Wall thickness	$t_{alu380} := 6mm$	$t_{alu310} := 4.5mm$
Section	$A_{alu380} := 7216 \cdot mm^2$	$A_{alu310} := 4375 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu380} := 1.27 \cdot 10^8 \cdot mm^4$	$I_{y\_alu310} := 5.05 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu380} := 3.33 \cdot 10^7 \cdot mm^4$	$I_{z\_alu310} := 1.25 \cdot 10^7 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu380} := 190 \cdot mm$	$y_{y\_alu310} := 155 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu380} := 83 \cdot mm$	$y_{z\_alu310} := 65 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu380} := 6.66 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu310} := 3.26 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu380} := 4.01 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu310} := 1.92 \cdot 10^5 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu380} := 8.66 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu310} := 4.26 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu380} := 4.66 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu310} := 2.22 \cdot 10^5 \cdot mm^3$

	2.2.3. ALU 297_8/117	**2.2.4. ALU 297_11/117**
Wall thickness	$t_{alu297\_8} := 4mm$	$t_{alu297\_11} := 4.5mm$
Section	$A_{alu297\_8} := 3509 \cdot mm^2$	$A_{alu297\_11} := 4237 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu297\_8} := 3.86 \cdot 10^7 \cdot mm^4$	$I_{y\_alu297\_11} := 4.89 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu297\_8} := 6.88 \cdot 10^6 \cdot mm^4$	$I_{z\_alu297\_11} := 7.78 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu297\_8} := 148.5 \cdot mm$	$y_{y\_alu297\_11} := 148.5 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu297\_8} := 58.5 \cdot mm$	$y_{z\_alu297\_11} := 58.5 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu297\_8} := 2.56 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu297\_11} := 3.25 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu297\_8} := 1.18 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu297\_11} := 1.33 \cdot 10^5 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu297\_8} := 3.30 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu297\_11} := 4.11 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu297\_8} := 1.41 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu297\_11} := 1.63 \cdot 10^5 \cdot mm^3$

	2.2.5. ALU 297_24.5/117	**2.2.6. ALU 310+297_8**
Wall thickness	$t_{alu297\_24.5} := 4mm$	$t_{alu310297\_8} := t_{alu310} + t_{alu297\_8}$
Section	$A_{alu297\_24.5} := 5574 \cdot mm^2$	$A_{alu310297\_8} := 7884 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu297\_24.5} := 7.46 \cdot 10^7 \cdot mm^4$	$I_{y\_alu310297\_8} := 8.91 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu297\_24.5} := 7.60 \cdot 10^6 \cdot mm^4$	$I_{z\_alu310297\_8} := 1.94 \cdot 10^7 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu297\_24.5} := 148.5 \cdot mm$	$y_{y\_alu310297\_8} := 155 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu297\_24.5} := 58.5 \cdot mm$	$y_{z\_alu310297\_8} := 65 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu297\_24.5} := 5.02 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu310297\_8} := 5.75 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu297\_24.5} := 1.30 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu310297\_8} := 2.98 \cdot 10^5 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu297\_24.5} := 6.02 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu310297\_8} := 7.56 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu297\_24.5} := 1.75 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu310297\_8} := 3.64 \cdot 10^5 \cdot mm^3$

	2.2.7. ALU 310+297_11	**2.2.8. ALU 310+297_24.5**
Wall thickness	$t_{alu310297\_11} := t_{alu310} + t_{alu297\_11}$	$t_{alu310297\_24.5} := t_{alu310} + t_{alu297\_24.5}$
Section	$A_{alu310297\_11} := 8612 \cdot mm^2$	$A_{alu310297\_24.5} := 9949 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu310297\_11} := 9.94 \cdot 10^7 \cdot mm^4$	$I_{y\_alu310297\_24.5} := 1.25 \cdot 10^8 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu310297\_11} := 2.03 \cdot 10^7 \cdot mm^4$	$I_{z\_alu310297\_24.5} := 2.01 \cdot 10^7 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu310297\_11} := 155 \cdot mm$	$y_{y\_alu310297\_24.5} := 155 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu310297\_11} := 65 \cdot mm$	$y_{z\_alu310297\_24.5} := 65 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu310297\_11} := 6.41 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu310297\_24.5} := 8.07 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu310297\_11} := 3.12 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu310297\_24.5} := 3.09 \cdot 10^5 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu310297\_11} := 8.37 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu310297\_24.5} := 1.03 \cdot 10^6 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu310297\_11} := 3.86 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu310297\_24.5} := 3.97 \cdot 10^5 \cdot mm^3$

	2.2.9. ALU 270/100	**2.2.10. ALU 260/91**
Wall thickness	$t_{alu270} := 3.5 \cdot mm$	$t_{alu260} := 4mm$
Section	$A_{alu270} := 3110 \cdot mm^2$	$A_{alu260} := 3257 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu270} := 2.71 \cdot 10^7 \cdot mm^4$	$I_{y\_alu260} := 2.55 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu270} := 5.11 \cdot 10^6 \cdot mm^4$	$I_{z\_alu260} := 3.58 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu270} := 135 \cdot mm$	$y_{y\_alu260} := 130 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu270} := 50 \cdot mm$	$y_{z\_alu260} := 45.5 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu270} := 2.01 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu260} := 1.96 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu270} := 1.02 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu260} := 7.86 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu270} := 2.64 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu260} := 2.60 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu270} := 1.20 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu260} := 9.95 \cdot 10^4 \cdot mm^3$

	2.2.11. ALU 270+260	2.2.12. ALU 240/100
Wall thickness	$t_{alu270260} := t_{alu270} + t_{alu260}$	$t_{alu240} := 3 \cdot mm$
Section	$A_{alu270260} := 6367 \cdot mm^2$	$A_{alu240} := 2320 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu270260} := 5.26 \cdot 10^7 \cdot mm^4$	$I_{y\_alu240} := 1.68 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu270260} := 8.69 \cdot 10^6 \cdot mm^4$	$I_{z\_alu240} := 3.90 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu270260} := 135 \cdot mm$	$y_{y\_alu240} := 120 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu270260} := 50 \cdot mm$	$y_{z\_alu240} := 50 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu270260} := 3.90 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu240} := 1.40 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu270260} := 1.74 \cdot 10^5 \cdot mm^3$	$W_{elz\_alu240} := 7.79 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu270260} := 5.25 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu240} := 1.79 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu270260} := 2.19 \cdot 10^5 \cdot mm^3$	$W_{plz\_alu240} := 9.04 \cdot 10^4 \cdot mm^3$

	2.2.13. ALU 232/92	2.2.14. ALU 240+232
Wall thickness	$t_{alu232} := 3mm$	$t_{alu240232} := t_{alu240} + t_{alu232}$
Section	$A_{alu232} := 2371 \cdot mm^2$	$A_{alu240232} := 4691 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu232} := 1.62 \cdot 10^7 \cdot mm^4$	$I_{y\_alu240232} := 3.29 \cdot 10^7 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu232} := 2.69 \cdot 10^6 \cdot mm^4$	$I_{z\_alu240232} := 6.58 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu232} := 116 \cdot mm$	$y_{y\_alu240232} := 120 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu232} := 46 \cdot mm$	$y_{z\_alu240232} := 50 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu232} := 1.39 \cdot 10^5 \cdot mm^3$	$W_{ely\_alu240232} := 2.74 \cdot 10^5 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu232} := 5.85 \cdot 10^4 \cdot mm^3$	$W_{elz\_alu240232} := 1.32 \cdot 10^5 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu232} := 1.78 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu240232} := 3.57 \cdot 10^5 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu232} := 7.25 \cdot 10^4 \cdot mm^3$	$W_{plz\_alu240232} := 1.63 \cdot 10^5 \cdot mm^3$

	2.2.15. ALU 158/100	2.2.16. ALU 133/70
Wall thickness	$t_{alu158} := 2.5mm$	$t_{alu133} := 3mm$
Section	$A_{alu158} := 1836 \cdot mm^2$	$A_{alu133} := 1604 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu158} := 6.41 \cdot 10^6 \cdot mm^4$	$I_{y\_alu133} := 3.82 \cdot 10^6 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu158} := 2.74 \cdot 10^6 \cdot mm^4$	$I_{z\_alu133} := 1.06 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu158} := 79 \cdot mm$	$y_{y\_alu133} := 66.5 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu158} := 50 \cdot mm$	$y_{z\_alu133} := 35 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu158} := 8.12 \cdot 10^4 \cdot mm^3$	$W_{ely\_alu133} := 5.74 \cdot 10^4 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu158} := 5.49 \cdot 10^4 \cdot mm^3$	$W_{elz\_alu133} := 3.02 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu158} := 1.01 \cdot 10^5 \cdot mm^3$	$W_{ply\_alu133} := 7.21 \cdot 10^4 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu158} := 6.67 \cdot 10^4 \cdot mm^3$	$W_{plz\_alu133} := 3.77 \cdot 10^4 \cdot mm^3$

	2.2.17. ALU 133/70 + ALU 80/5	2.2.18. ALU 130/70
Wall thickness	$t_{alu133r} := 8mm$	$t_{alu130} := 3mm$
Section	$A_{alu133r} := 2404 \cdot mm^2$	$A_{alu130} := 1497 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu133r} := 4.25 \cdot 10^6 \cdot mm^4$	$I_{y\_alu130} := 3.12 \cdot 10^6 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu133r} := 2.18 \cdot 10^6 \cdot mm^4$	$I_{z\_alu130} := 1.12 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu133r} := 66.5 \cdot mm$	$y_{y\_alu130} := 65 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu133r} := 40 \cdot mm$	$y_{z\_alu130} := 35 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu133r} := 6.37 \cdot 10^4 \cdot mm^3$	$W_{ely\_alu130} := 4.81 \cdot 10^4 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu133r} := 5.46 \cdot 10^4 \cdot mm^3$	$W_{elz\_alu130} := 3.19 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu133r} := 8.81 \cdot 10^4 \cdot mm^3$	$W_{ply\_alu130} := 6.31 \cdot 10^4 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu133r} := 6.77 \cdot 10^4 \cdot mm^3$	$W_{plz\_alu130} := 3.80 \cdot 10^4 \cdot mm^3$

	2.2.19. ALU 129/89/3.1	2.2.20. ALU 97/77/2.25
Wall thickness	$t_{alu129} := 3.1mm$	$t_{alu97} := 3.1mm$
Section	$A_{alu129} := 1290\cdot mm^2$	$A_{alu97} := 747\cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu129} := 3.05\cdot 10^6\cdot mm^4$	$I_{y\_alu97} := 1.04\cdot 10^6\cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu129} := 1.72\cdot 10^6\cdot mm^4$	$I_{z\_alu97} := 7.29\cdot 10^5\cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu129} := 64.5\cdot mm$	$y_{y\_alu97} := 48.5\cdot mm$
Height of the profile in z-direction	$y_{z\_alu129} := 44.5\cdot mm$	$y_{z\_alu97} := 38.5\cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu129} := 4.72\cdot 10^4\cdot mm^3$	$W_{ely\_alu97} := 2.14\cdot 10^4\cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu129} := 3.87\cdot 10^4\cdot mm^3$	$W_{elz\_alu97} := 1.89\cdot 10^4\cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu129} := 5.66\cdot 10^4\cdot mm^3$	$W_{ply\_alu97} := 2.53\cdot 10^4\cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu129} := 4.39\cdot 10^4\cdot mm^3$	$W_{plz\_alu97} := 2.16\cdot 10^4\cdot mm^3$

	2.2.21. ALU 70/70/4.5	2.2.22. ALU 88/66/2/3
Wall thickness	$t_{alu70} := 4.5mm$	$t_{alu88} := 2mm$
Section	$A_{alu70} := 1165\cdot mm^2$	$A_{alu88} := 720\cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu70} := 8.29\cdot 10^5\cdot mm^4$	$I_{y\_alu88} := 8.90\cdot 10^5\cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu70} := 8.29\cdot 10^5\cdot mm^4$	$I_{z\_alu88} := 4.75\cdot 10^5\cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu70} := 35\cdot mm$	$y_{y\_alu88} := 44\cdot mm$
Height of the profile in z-direction	$y_{z\_alu70} := 35\cdot mm$	$y_{z\_alu88} := 33\cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu70} := 2.37\cdot 10^4\cdot mm^3$	$W_{ely\_alu88} := 2.02\cdot 10^4\cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu70} := 2.37\cdot 10^4\cdot mm^3$	$W_{elz\_alu88} := 1.44\cdot 10^4\cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu70} := 2.85\cdot 10^4\cdot mm^3$	$W_{ply\_alu88} := 2.34\cdot 10^4\cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu70} := 2.85\cdot 10^4\cdot mm^3$	$W_{plz\_alu88} := 1.69\cdot 10^4\cdot mm^3$

	2.2.23. ALU 70/50/2.5/3	**2.2.24. ALU 60/60/3**
Wall thickness	$t_{alu7050} := 2.5mm$	$t_{alu60} := 3mm$
Section	$A_{alu7050} := 596 \cdot mm^2$	$A_{alu60} := 660 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_alu7050} := 4.18 \cdot 10^5 \cdot mm^4$	$I_{y\_alu60} := 3.51 \cdot 10^5 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_alu7050} := 2.29 \cdot 10^5 \cdot mm^4$	$I_{z\_alu60} := 3.51 \cdot 10^5 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_alu7050} := 35 \cdot mm$	$y_{y\_alu60} := 30 \cdot mm$
Height of the profile in z-direction	$y_{z\_alu7050} := 25 \cdot mm$	$y_{z\_alu60} := 30 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_alu7050} := 1.19 \cdot 10^4 \cdot mm^3$	$W_{ely\_alu60} := 1.17 \cdot 10^4 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_alu7050} := 9.17 \cdot 10^3 \cdot mm^3$	$W_{elz\_alu60} := 1.17 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_alu7050} := 1.44 \cdot 10^4 \cdot mm^3$	$W_{ply\_alu60} := 1.39 \cdot 10^4 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_alu7050} := 1.08 \cdot 10^4 \cdot mm^3$	$W_{plz\_alu60} := 1.39 \cdot 10^4 \cdot mm^3$

2.3. Steel.

	Steel quality S235.	**Steel quality S355.**
Yield stress	$R_{e\_S235} := 235 \cdot \frac{N}{mm^2}$	$R_{e\_S355} := 355 \cdot \frac{N}{mm^2}$
Tensile strength	$R_{t\_S235} := 360 \cdot \frac{N}{mm^2}$	$R_{t\_S355} := 510 \cdot \frac{N}{mm^2}$
Admissible stress	$\sigma_{adm\_S235} := \frac{R_{e\_S235}}{\gamma_M}$	$\sigma_{adm\_S355} := \frac{R_{e\_S355}}{\gamma_M}$
Modulus of elasticity	$E_{steel} := 210000 \cdot \frac{N}{mm^2}$	

	2.3.1. K70/70/2.	**2.3.2. K70/70/3.**
Section	$A_{K70\_2} := 544 \cdot mm^2$	$A_{K70\_3} := 800 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_K70\_2} := 4.20 \cdot 10^5 \cdot mm^4$	$I_{y\_K70\_3} := 6.01 \cdot 10^5 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_K70\_2} := 4.20 \cdot 10^5 \cdot mm^4$	$I_{z\_K70\_3} := 6.01 \cdot 10^5 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_K70\_2} := 35 \cdot mm$	$y_{y\_K70\_3} := 35 \cdot mm$
Height of the profile in z-direction	$y_{z\_K70\_2} := 35 \cdot mm$	$y_{z\_K70\_3} := 35 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_K70\_2} := 1.20 \cdot 10^4 \cdot mm^3$	$W_{ely\_K70\_3} := 1.72 \cdot 10^4 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_K70\_2} := 1.20 \cdot 10^4 \cdot mm^3$	$W_{elz\_K70\_3} := 1.72 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_K70\_2} := 1.39 \cdot 10^4 \cdot mm^3$	$W_{ply\_K70\_3} := 2.02 \cdot 10^4 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_K70\_2} := 1.39 \cdot 10^4 \cdot mm^3$	$W_{plz\_K70\_3} := 2.02 \cdot 10^4 \cdot mm^3$

	2.3.3. K80/80/4.	**2.3.4. K120/120/3.**
Section	$A_{K80} := 1200 \cdot mm^2$	$A_{K120} := 1380 \cdot mm^2$
Moment of inertia in the y-direction	$I_{y\_K80} := 1.17 \cdot 10^7 \cdot mm^4$	$I_{y\_K120} := 3.12 \cdot 10^6 \cdot mm^4$
Moment of inertia in the z-direction	$I_{z\_K80} := 1.17 \cdot 10^7 \cdot mm^4$	$I_{z\_K120} := 3.12 \cdot 10^6 \cdot mm^4$
Height of the profile in y-direction	$y_{y\_K80} := 40 \cdot mm$	$y_{y\_K120} := 60 \cdot mm$
Height of the profile in z-direction	$y_{z\_K80} := 40 \cdot mm$	$y_{z\_K120} := 60 \cdot mm$
Elastic resistance in the y-direction	$W_{ely\_K80} := 2.93 \cdot 10^4 \cdot mm^3$	$W_{ely\_K120} := 5.21 \cdot 10^4 \cdot mm^3$
Elastic resistance in the z-direction	$W_{elz\_K80} := 2.93 \cdot 10^4 \cdot mm^3$	$W_{elz\_K120} := 5.34 \cdot 10^4 \cdot mm^3$
Plastic resistance in the y-direction	$W_{ply\_K80} := 3.47 \cdot 10^4 \cdot mm^3$	$W_{ply\_K120} := 6.16 \cdot 10^4 \cdot mm^3$
Plastic resistance in the z-direction	$W_{plz\_K80} := 3.47 \cdot 10^4 \cdot mm^3$	$W_{plz\_K120} := 6.16 \cdot 10^4 \cdot mm^3$

2.4. Bolts - class = 8.8.

Yield stress $R_{e\_bolt} := 640 \cdot \frac{N}{mm^2}$

Tensile strength $R_{t\_bolt} := 800 \cdot \frac{N}{mm^2}$

$$\sigma_{adm}(material) := \begin{cases} \sigma_{adm\_alu} & \text{if } material = R_{e\_alu} \\ \sigma_{adm\_S235} & \text{if } material = R_{e\_S235} \\ \sigma_{adm\_S355} & \text{if } material = R_{e\_S355} \end{cases}$$

Doc. 3. Aluminium profile. acc. to ENV 1999-1-1: Mai 1998

$t_{alu}(profile) :=$

"not used" if profile = 0
t_{alu60} if profile = 1
$t_{alu7050}$ if profile = 2
t_{alu88} if profile = 3
t_{alu70} if profile = 4
t_{alu97} if profile = 5
t_{alu129} if profile = 6
t_{alu130} if profile = 7
t_{alu133} if profile = 8
$t_{alu133r}$ if profile = 9
t_{alu158} if profile = 10
t_{alu240} if profile = 20
t_{alu232} if profile = 200
$t_{alu240232}$ if profile = 220
t_{alu270} if profile = 30
t_{alu260} if profile = 300
$t_{alu270260}$ if profile = 330
t_{alu310} if profile = 40
t_{alu297_8} if profile = 400
t_{alu297_11} if profile = 401
$t_{alu297\_24.5}$ if profile = 402
$t_{alu310297\_8}$ if profile = 440
$t_{alu310297\_11}$ if profile = 441
$t_{alu310297\_24.5}$ if profile = 442
t_{alu380} if profile = 50

$d_{alu}(profile) :=$

"not used" if profile = 0
(54mm) if profile = 1
(64mm) if profile = 2
(82mm) if profile = 3
(61mm) if profile = 4
(92.5mm) if profile = 5
(122.8mm) if profile = 6
(96mm) if profile = 7
(122mm) if profile = 8
(80mm) if profile = 9
(100mm) if profile = 10
(168mm) if profile = 20
(162mm) if profile = 200
(162mm) if profile = 220
(170mm) if profile = 30
(164mm) if profile = 300
(164mm) if profile = 330
(205mm) if profile = 40
(200mm) if profile = 400
(200mm) if profile = 401
(200mm) if profile = 402
(200mm) if profile = 440
(200mm) if profile = 441
(200mm) if profile = 442
(245mm) if profile = 50

$A_{alu}(profile) :=$

"not used"	if profile = 0
A_{alu60}	if profile = 1
$A_{alu7050}$	if profile = 2
A_{alu88}	if profile = 3
A_{alu70}	if profile = 4
A_{alu97}	if profile = 5
A_{alu129}	if profile = 6
A_{alu130}	if profile = 7
A_{alu133}	if profile = 8
$A_{alu133r}$	if profile = 9
A_{alu158}	if profile = 10
A_{alu240}	if profile = 20
A_{alu232}	if profile = 200
$A_{alu240232}$	if profile = 220
A_{alu270}	if profile = 30
A_{alu260}	if profile = 300
$A_{alu270260}$	if profile = 330
A_{alu310}	if profile = 40
A_{alu297_8}	if profile = 400
A_{alu297_11}	if profile = 401
$A_{alu297\_24.5}$	if profile = 402
$A_{alu310297\_8}$	if profile = 440
$A_{alu310297\_11}$	if profile = 441
$A_{alu310297\_24.5}$	if profile = 442
A_{alu380}	if profile = 50

$$y_{y\_alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ y_{y\_alu60} & \text{if } profile = 1 \\ y_{y\_alu7050} & \text{if } profile = 2 \\ y_{y\_alu88} & \text{if } profile = 3 \\ y_{y\_alu70} & \text{if } profile = 4 \\ y_{y\_alu97} & \text{if } profile = 5 \\ y_{y\_alu129} & \text{if } profile = 6 \\ y_{y\_alu130} & \text{if } profile = 7 \\ y_{y\_alu133} & \text{if } profile = 8 \\ y_{y\_alu133r} & \text{if } profile = 9 \\ y_{y\_alu158} & \text{if } profile = 10 \\ y_{y\_alu240} & \text{if } profile = 20 \\ y_{y\_alu232} & \text{if } profile = 200 \\ y_{y\_alu240232} & \text{if } profile = 220 \\ y_{y\_alu270} & \text{if } profile = 30 \\ y_{y\_alu260} & \text{if } profile = 300 \\ y_{y\_alu270260} & \text{if } profile = 330 \\ y_{y\_alu310} & \text{if } profile = 40 \\ y_{y\_alu297\_8} & \text{if } profile = 400 \\ y_{y\_alu297\_11} & \text{if } profile = 401 \\ y_{y\_alu297\_24.5} & \text{if } profile = 402 \\ y_{y\_alu310297\_8} & \text{if } profile = 440 \\ y_{y\_alu310297\_11} & \text{if } profile = 441 \\ y_{y\_alu310297\_24.5} & \text{if } profile = 442 \\ y_{y\_alu380} & \text{if } profile = 50 \end{cases}$$

$$y_{z\_alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ y_{z\_alu60} & \text{if } profile = 1 \\ y_{z\_alu7050} & \text{if } profile = 2 \\ y_{z\_alu88} & \text{if } profile = 3 \\ y_{z\_alu70} & \text{if } profile = 4 \\ y_{z\_alu97} & \text{if } profile = 5 \\ y_{z\_alu129} & \text{if } profile = 6 \\ y_{z\_alu130} & \text{if } profile = 7 \\ y_{z\_alu133} & \text{if } profile = 8 \\ y_{z\_alu133r} & \text{if } profile = 9 \\ y_{z\_alu158} & \text{if } profile = 10 \\ y_{z\_alu240} & \text{if } profile = 20 \\ y_{z\_alu232} & \text{if } profile = 200 \\ y_{z\_alu240232} & \text{if } profile = 220 \\ y_{z\_alu270} & \text{if } profile = 30 \\ y_{z\_alu260} & \text{if } profile = 300 \\ y_{z\_alu270260} & \text{if } profile = 330 \\ y_{z\_alu310} & \text{if } profile = 40 \\ y_{z\_alu297\_8} & \text{if } profile = 400 \\ y_{z\_alu297\_11} & \text{if } profile = 401 \\ y_{z\_alu297\_24.5} & \text{if } profile = 402 \\ y_{z\_alu310297\_8} & \text{if } profile = 440 \\ y_{z\_alu310297\_11} & \text{if } profile = 441 \\ y_{z\_alu310297\_24.5} & \text{if } profile = 442 \\ y_{z\_alu380} & \text{if } profile = 50 \end{cases}$$

$$I_{y\_alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ I_{y\_alu60} & \text{if } profile = 1 \\ I_{y\_alu7050} & \text{if } profile = 2 \\ I_{y\_alu88} & \text{if } profile = 3 \\ I_{y\_alu70} & \text{if } profile = 4 \\ I_{y\_alu97} & \text{if } profile = 5 \\ I_{y\_alu129} & \text{if } profile = 6 \\ I_{y\_alu130} & \text{if } profile = 7 \\ I_{y\_alu133} & \text{if } profile = 8 \\ I_{y\_alu133r} & \text{if } profile = 9 \\ I_{y\_alu158} & \text{if } profile = 10 \\ I_{y\_alu240} & \text{if } profile = 20 \\ I_{y\_alu232} & \text{if } profile = 200 \\ I_{y\_alu240232} & \text{if } profile = 220 \\ I_{y\_alu270} & \text{if } profile = 30 \\ I_{y\_alu260} & \text{if } profile = 300 \\ I_{y\_alu270260} & \text{if } profile = 330 \\ I_{y\_alu310} & \text{if } profile = 40 \\ I_{y\_alu297\_8} & \text{if } profile = 400 \\ I_{y\_alu297\_11} & \text{if } profile = 401 \\ I_{y\_alu297\_24.5} & \text{if } profile = 402 \\ I_{y\_alu310297\_8} & \text{if } profile = 440 \\ I_{y\_alu310297\_11} & \text{if } profile = 441 \\ I_{y\_alu310297\_24.5} & \text{if } profile = 442 \\ I_{y\_alu380} & \text{if } profile = 50 \end{cases}$$

$$I_{z\_alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ I_{z\_alu60} & \text{if } profile = 1 \\ I_{z\_alu7050} & \text{if } profile = 2 \\ I_{z\_alu88} & \text{if } profile = 3 \\ I_{z\_alu70} & \text{if } profile = 4 \\ I_{z\_alu97} & \text{if } profile = 5 \\ I_{z\_alu129} & \text{if } profile = 6 \\ I_{z\_alu130} & \text{if } profile = 7 \\ I_{z\_alu133} & \text{if } profile = 8 \\ I_{z\_alu133r} & \text{if } profile = 9 \\ I_{z\_alu158} & \text{if } profile = 10 \\ I_{z\_alu240} & \text{if } profile = 20 \\ I_{z\_alu232} & \text{if } profile = 200 \\ I_{z\_alu240232} & \text{if } profile = 220 \\ I_{z\_alu270} & \text{if } profile = 30 \\ I_{z\_alu260} & \text{if } profile = 300 \\ I_{z\_alu270260} & \text{if } profile = 330 \\ I_{z\_alu310} & \text{if } profile = 40 \\ I_{z\_alu297\_8} & \text{if } profile = 400 \\ I_{z\_alu297\_11} & \text{if } profile = 401 \\ I_{z\_alu297\_24.5} & \text{if } profile = 402 \\ I_{z\_alu310297\_8} & \text{if } profile = 440 \\ I_{z\_alu310297\_11} & \text{if } profile = 441 \\ I_{z\_alu310297\_24.5} & \text{if } profile = 442 \\ I_{z\_alu380} & \text{if } profile = 50 \end{cases}$$

$$W_{ply}(\text{profile}) := \begin{cases} \text{"not used"} & \text{if profile} = 0 \\ W_{ply\_alu60} & \text{if profile} = 1 \\ W_{ply\_alu7050} & \text{if profile} = 2 \\ W_{ply\_alu88} & \text{if profile} = 3 \\ W_{ply\_alu70} & \text{if profile} = 4 \\ W_{ply\_alu97} & \text{if profile} = 5 \\ W_{ply\_alu129} & \text{if profile} = 6 \\ W_{ply\_alu130} & \text{if profile} = 7 \\ W_{ply\_alu133} & \text{if profile} = 8 \\ W_{ply\_alu133r} & \text{if profile} = 9 \\ W_{ply\_alu158} & \text{if profile} = 10 \\ W_{ply\_alu240} & \text{if profile} = 20 \\ W_{ply\_alu232} & \text{if profile} = 200 \\ W_{ply\_alu240232} & \text{if profile} = 220 \\ W_{ply\_alu270} & \text{if profile} = 30 \\ W_{ply\_alu260} & \text{if profile} = 300 \\ W_{ply\_alu270260} & \text{if profile} = 330 \\ W_{ply\_alu310} & \text{if profile} = 40 \\ W_{ply\_alu297\_8} & \text{if profile} = 400 \\ W_{ply\_alu297\_11} & \text{if profile} = 401 \\ W_{ply\_alu297\_24.5} & \text{if profile} = 402 \\ W_{ply\_alu310297\_8} & \text{if profile} = 440 \\ W_{ply\_alu310297\_11} & \text{if profile} = 441 \\ W_{ply\_alu310297\_24.5} & \text{if profile} = 442 \\ W_{ply\_alu380} & \text{if profile} = 50 \end{cases}$$

$$W_{plz}(\text{profile}) := \begin{cases} \text{"not used"} & \text{if profile} = 0 \\ W_{plz\_alu60} & \text{if profile} = 1 \\ W_{plz\_alu7050} & \text{if profile} = 2 \\ W_{plz\_alu88} & \text{if profile} = 3 \\ W_{plz\_alu70} & \text{if profile} = 4 \\ W_{plz\_alu97} & \text{if profile} = 5 \\ W_{plz\_alu129} & \text{if profile} = 6 \\ W_{plz\_alu130} & \text{if profile} = 7 \\ W_{plz\_alu133} & \text{if profile} = 8 \\ W_{plz\_alu133r} & \text{if profile} = 9 \\ W_{plz\_alu158} & \text{if profile} = 10 \\ W_{plz\_alu240} & \text{if profile} = 20 \\ W_{plz\_alu232} & \text{if profile} = 200 \\ W_{plz\_alu240232} & \text{if profile} = 220 \\ W_{plz\_alu270} & \text{if profile} = 30 \\ W_{plz\_alu260} & \text{if profile} = 300 \\ W_{plz\_alu270260} & \text{if profile} = 330 \\ W_{plz\_alu310} & \text{if profile} = 40 \\ W_{plz\_alu297\_8} & \text{if profile} = 400 \\ W_{plz\_alu297\_11} & \text{if profile} = 401 \\ W_{plz\_alu297\_24.5} & \text{if profile} = 402 \\ W_{plz\_alu310297\_8} & \text{if profile} = 440 \\ W_{plz\_alu310297\_11} & \text{if profile} = 441 \\ W_{plz\_alu310297\_24.5} & \text{if profile} = 442 \\ W_{plz\_alu380} & \text{if profile} = 50 \end{cases}$$

$W_{ely}(profile) :=$ | "not used" if profile = 0
W_{ely_alu60} if profile = 1
$W_{ely\_alu7050}$ if profile = 2
W_{ely_alu88} if profile = 3
W_{ely_alu70} if profile = 4
W_{ely_alu97} if profile = 5
W_{ely_alu129} if profile = 6
W_{ely_alu130} if profile = 7
W_{ely_alu133} if profile = 8
$W_{ely\_alu133r}$ if profile = 9
W_{ely_alu158} if profile = 10
W_{ely_alu240} if profile = 20
W_{ely_alu232} if profile = 200
$W_{ely\_alu240232}$ if profile = 220
W_{ely_alu270} if profile = 30
W_{ely_alu260} if profile = 300
$W_{ely\_alu270260}$ if profile = 330
W_{ely_alu310} if profile = 40
$W_{ely\_alu297\_8}$ if profile = 400
$W_{ely\_alu297\_11}$ if profile = 401
$W_{ely\_alu297\_24.5}$ if profile = 402
$W_{ely\_alu310297\_8}$ if profile = 440
$W_{ely\_alu310297\_11}$ if profile = 441
$W_{ely\_alu310297\_24.5}$ if profile = 442
W_{ely_alu380} if profile = 50

$W_{elz}(profile) :=$ | "not used" if profile = 0
W_{elz_alu60} if profile = 1
$W_{elz\_alu7050}$ if profile = 2
W_{elz_alu88} if profile = 3
W_{elz_alu70} if profile = 4
W_{elz_alu97} if profile = 5
W_{elz_alu129} if profile = 6
W_{elz_alu130} if profile = 7
W_{elz_alu133} if profile = 8
$W_{elz\_alu133r}$ if profile = 9
W_{elz_alu158} if profile = 10
W_{elz_alu240} if profile = 20
W_{elz_alu232} if profile = 200
$W_{elz\_alu240232}$ if profile = 220
W_{elz_alu270} if profile = 30
W_{elz_alu260} if profile = 300
$W_{elz\_alu270260}$ if profile = 330
W_{elz_alu310} if profile = 40
$W_{elz\_alu297\_8}$ if profile = 400
$W_{elz\_alu297\_11}$ if profile = 401
$W_{elz\_alu297\_24.5}$ if profile = 402
$W_{elz\_alu310297\_8}$ if profile = 440
$W_{elz\_alu310297\_11}$ if profile = 441
$W_{elz\_alu310297\_24.5}$ if profile = 442
W_{elz_alu380} if profile = 50

$prof_{control}(profile) :=$

"not used" if profile = 0
"alu60/60/3" if profile = 1
"alu70/50/2.5/3" if profile = 2
"alu88/66/2" if profile = 3
"alu70/70/4.5" if profile = 4
"alu97/77/3.1" if profile = 5
"alu129/89/3.1" if profile = 6
"alu130/70" if profile = 7
"alu133/70" if profile = 8
"alu133/70+80/5" if profile = 9
"alu158/100" if profile = 10
"alu240/100" if profile = 20
"alu232/92" if profile = 200
"alu240+232" if profile = 220
"alu270/100" if profile = 30
"alu260/91" if profile = 300
"alu270+260" if profile = 330
"alu310/130" if profile = 40
"alu297_8/117" if profile = 400
"alu297_11/117" if profile = 401
"alu297_24.5/117" if profile = 402
"alu310+297_8" if profile = 440
"alu310+297_11" if profile = 441
"alu310+297_24.5" if profile = 442
"alu380/166" if profile = 50

$$b_{alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ 60mm & \text{if } profile = 1 \\ 50mm & \text{if } profile = 2 \\ 66mm & \text{if } profile = 3 \\ 70mm & \text{if } profile = 4 \\ 77mm & \text{if } profile = 5 \\ 89mm & \text{if } profile = 6 \\ 70mm & \text{if } profile = 7 \\ 70mm & \text{if } profile = 8 \\ 80mm & \text{if } profile = 9 \\ 100mm & \text{if } profile = 10 \\ 100mm & \text{if } profile = 20 \\ 92mm & \text{if } profile = 200 \\ 100mm & \text{if } profile = 220 \\ 100mm & \text{if } profile = 30 \\ 91mm & \text{if } profile = 300 \\ 100mm & \text{if } profile = 330 \\ 130mm & \text{if } profile = 40 \\ 117mm & \text{if } profile = 400 \\ 117mm & \text{if } profile = 401 \\ 117mm & \text{if } profile = 402 \\ 130mm & \text{if } profile = 440 \\ 130mm & \text{if } profile = 441 \\ 130mm & \text{if } profile = 442 \\ 166mm & \text{if } profile = 50 \end{cases}$$

$$h_{alu}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ 60mm & \text{if } profile = 1 \\ 70mm & \text{if } profile = 2 \\ 88mm & \text{if } profile = 3 \\ 70mm & \text{if } profile = 4 \\ 97mm & \text{if } profile = 5 \\ 129mm & \text{if } profile = 6 \\ 130mm & \text{if } profile = 7 \\ 133mm & \text{if } profile = 8 \\ 133mm & \text{if } profile = 9 \\ 158mm & \text{if } profile = 10 \\ 240mm & \text{if } profile = 20 \\ 232mm & \text{if } profile = 200 \\ 240mm & \text{if } profile = 220 \\ 270mm & \text{if } profile = 30 \\ 260mm & \text{if } profile = 300 \\ 270mm & \text{if } profile = 330 \\ 310mm & \text{if } profile = 40 \\ 297mm & \text{if } profile = 400 \\ 297mm & \text{if } profile = 401 \\ 297mm & \text{if } profile = 402 \\ 310mm & \text{if } profile = 440 \\ 310mm & \text{if } profile = 441 \\ 310mm & \text{if } profile = 442 \\ 380mm & \text{if } profile = 50 \end{cases}$$

Bending and axiale compression

Profil classification

$\beta(\text{profile}) := 0.40\cdot\left(\frac{d_{alu}(\text{profile})}{t_{alu}(\text{profile})}\right)$ Slenderness parameter (art.5.4.3)

$\varepsilon := \sqrt{\frac{250\cdot\frac{N}{mm^2}}{R_{e\_alu}}}$ $\varepsilon = 1.021$

$\beta1 := 11\cdot\varepsilon$ $\beta1 = 11.227$ Table 5.1 (heat treated, unwelded)

$\beta2 := 16\cdot\varepsilon$ $\beta2 = 16.33$

$\beta3 := 22\cdot\varepsilon$ $\beta3 = 22.454$

$$\text{classification}(\text{profile}) := \begin{cases} 1 & \text{if } \beta(\text{profile}) \le \beta1 \\ 2 & \text{if } \beta1 < \beta(\text{profile}) \le \beta2 \\ 3 & \text{if } \beta2 < \beta(\text{profile}) \le \beta3 \\ 4 & \text{if } \beta3 < \beta(\text{profile}) \end{cases}$$ **<3.1>**

Profile properties

Shape factor (table 5.3, no welding)

$$\alpha_y(\text{profile}) := \begin{cases} \frac{W_{ply}(\text{profile})}{W_{ely}(\text{profile})} & \text{if classification(profile)} = 1 \vee 2 \\ \left[1 + \frac{\beta3 - \beta(\text{profile})}{\beta3 - \beta2}\cdot\left(\frac{W_{ply}(\text{profile})}{W_{ely}(\text{profile})} - 1\right)\right] & \text{if classification(profile)} = 3 \end{cases}$$ **<3.2>** form 5.15

$$\alpha_z(\text{profile}) := \begin{cases} \min\left(1.25, \frac{W_{plz}(\text{profile})}{W_{elz}(\text{profile})}\right) & \text{if classification(profile)} = 1 \vee 2 \\ \min\left[1.25, 1 + \frac{\beta3 - \beta(\text{profile})}{\beta3 - \beta2}\cdot\left(\frac{W_{plz}(\text{profile})}{W_{elz}(\text{profile})} - 1\right)\right] & \text{if classification(profile)} = 3 \end{cases}$$

ENV 1999-1-1, art. 5.9.4(6): Profile capacity

$$N_{rd}(profile) := A_{alu}(profile)\cdot\frac{R_{e\_alu}}{\gamma_M}$$ <3.3>

$$M_{yrd}(profile) := \frac{\alpha_y(profile)\cdot W_{ely}(profile)\cdot R_{e\_alu}}{\gamma_M}$$

$$M_{zrd}(profile) := \frac{\alpha_z(profile)\cdot W_{elz}(profile)\cdot R_{e\_alu}}{\gamma_M}$$

Buckling control

Hollow cross sections (art. 5.9.4.2(4))

$\psi_c := 0.8$

$\omega o := 1.0$ $\quad \omega x := 1.0$ for beams without localized welds

Buckling stress (art. 5.8.4.1)

$\alpha := 0.20$ Values of imperfection factor (table 5.6, heat treated)

$\lambda o := 0.1$ Values of imperfection factor (table 5.6, heat treated)

$\eta := 1.0$

Slenderness :

$$\lambda_1 := \pi\cdot\sqrt{\frac{E_{alu}}{\eta\cdot R_{e\_alu}}} \qquad \lambda_1 = 53.653$$

$$\lambda_y(profile, k_y, L_y) := \frac{k_y\cdot L_y}{\sqrt{\frac{I_{y\_alu}(profile)}{A_{alu}(profile)}}} \qquad \lambda_z(profile, k_z, L_z) := \frac{k_z\cdot L_z}{\sqrt{\frac{I_{z\_alu}(profile)}{A_{alu}(profile)}}}$$ <3.4>

$$\lambda_{by}(profile, k_y, L_y) := \frac{\lambda_y(profile, k_y, L_y)}{\lambda_1} \qquad \lambda_{bz}(profile, k_z, L_z) := \frac{\lambda_z(profile, k_z, L_z)}{\lambda_1}$$ <3.5>

Reduction coefficients :

$$\phi_y(profile, k_y, L_y) := 0.5\cdot\left[1 + \alpha\cdot\left(\lambda_{by}(profile, k_y, L_y) - \lambda o\right) + \lambda_{by}(profile, k_y, L_y)^2\right]$$ <3.6>

$$\phi_z(profile, k_z, L_z) := 0.5\cdot\left[1 + \alpha\cdot\left(\lambda_{bz}(profile, k_z, L_z) - \lambda o\right) + \lambda_{bz}(profile, k_z, L_z)^2\right]$$

$$\chi_y(profile, k_y, L_y) := \frac{1}{\phi_y(profile, k_y, L_y) + \sqrt{\phi_y(profile, k_y, L_y)^2 - \lambda_{by}(profile, k_y, L_y)^2}}$$

form 5.33 **<3.7>**

$$\chi_z(profile, k_z, L_z) := \frac{1}{\phi_z(profile, k_z, L_z) + \sqrt{\phi_z(profile, k_z, L_z)^2 - \lambda_{bz}(profile, k_z, L_z)^2}}$$

form 5.33

$$\chi_{min}(profile, k_y, k_z, L_y, L_z) := \min(\chi_y(profile, k_y, L_y), \chi_z(profile, k_z, L_z))$$

$$buckling(profile, k_y, k_z, L_y, L_z, N_{Ed}, M_{yEd}, M_{zEd}) := \left(\frac{N_{Ed}}{\chi_{min}(profile, k_y, k_z, L_y, L_z) \cdot \omega x \cdot N_{rd}(profile)}\right)^{\psi_c} \dots + \left(\frac{1}{\omega o}\right) \cdot \left[\left(\frac{M_{yEd}}{M_{yrd}(profile)}\right)^{1.7} \dots + \left(\frac{M_{zEd}}{M_{zrd}(profile)}\right)^{1.7}\right]^{0.6}$$

form 5.46 **<3.8>**

Bending and axial tension

Hollow cross sections (art. 5.9.3.3(1))

$\psi := 1.3$

$\omega o = 1$

$$equation(profile, N_{Ed}, M_{yEd}, M_{zEd}) := \left[\left(\frac{N_{Ed}}{\omega o \cdot N_{rd}(profile)}\right)^{\psi} \dots + \left[\left(\frac{M_{yEd}}{\omega o \cdot M_{yrd}(profile)}\right)^{1.7} + \left(\frac{M_{zEd}}{\omega o \cdot M_{zrd}(profile)}\right)^{1.7}\right]^{0.6}\right]$$

form 5.43 **<3.9>**

Stress

$$\sigma_s(profile, N_{Ed}, M_{yEd}, M_{zEd}) := \frac{N_{Ed}}{A_{alu}(profile)} + \frac{M_{yEd} \cdot y_{y\_alu}(profile)}{I_{y\_alu}(profile)} + \frac{M_{zEd} \cdot y_{z\_alu}(profile)}{I_{z\_alu}(profile)}$$

<3.10>

Doc. 4. Steel profile. acc. to ENV 1993-1-1: April 1992

$$t_w(\text{profile}) := \begin{vmatrix} (2mm) & \text{if profile} = 60 \\ (3mm) & \text{if profile} = 70 \\ (4mm) & \text{if profile} = 80 \\ (3mm) & \text{if profile} = 90 \\ (10mm) & \text{if profile} = 100 \end{vmatrix}$$

$$t_f(\text{profile}) := \begin{vmatrix} (2mm) & \text{if profile} = 60 \\ (3mm) & \text{if profile} = 70 \\ (4mm) & \text{if profile} = 80 \\ (3mm) & \text{if profile} = 90 \\ (0mm) & \text{if profile} = 100 \end{vmatrix}$$

$$d_{st}(\text{profile}) := \begin{vmatrix} (66mm) & \text{if profile} = 60 \\ (64mm) & \text{if profile} = 70 \\ (72mm) & \text{if profile} = 80 \\ (114mm) & \text{if profile} = 90 \\ (80mm) & \text{if profile} = 100 \end{vmatrix}$$

$$b_{st}(\text{profile}) := \begin{vmatrix} (70mm) & \text{if profile} = 60 \\ (70mm) & \text{if profile} = 70 \\ (80mm) & \text{if profile} = 80 \\ (120mm) & \text{if profile} = 90 \\ (130mm) & \text{if profile} = 100 \end{vmatrix}$$

$$A_{steel}(\text{profile}) := \begin{vmatrix} \text{"not used"} & \text{if profile} = 0 \\ A_{K70\_2} & \text{if profile} = 60 \\ A_{K70\_3} & \text{if profile} = 70 \\ A_{K80} & \text{if profile} = 80 \\ A_{K120} & \text{if profile} = 90 \\ 2\left(t_w(\text{profile})\cdot d_{st}(\text{profile})\right) & \text{if profile} = 100 \end{vmatrix}$$

$$y_{y\_steel}(\text{profile}) := \begin{vmatrix} y_{y\_K70\_2} & \text{if profile} = 60 \\ y_{y\_K70\_3} & \text{if profile} = 70 \\ y_{y\_K80} & \text{if profile} = 80 \\ y_{y\_K120} & \text{if profile} = 90 \\ \dfrac{d_{st}(\text{profile})}{2} & \text{if profile} = 100 \end{vmatrix}$$

$$y_{z\_steel}(\text{profile}) := \begin{vmatrix} y_{z\_K70\_2} & \text{if profile} = 60 \\ y_{z\_K70\_3} & \text{if profile} = 70 \\ y_{z\_K80} & \text{if profile} = 80 \\ y_{z\_K120} & \text{if profile} = 90 \\ \dfrac{t_w(\text{profile})}{2} & \text{if profile} = 100 \end{vmatrix}$$

$$I_{y\_steel}(\text{profile}) := \begin{vmatrix} \text{"not used"} & \text{if profile} = 0 \\ I_{y\_K70\_2} & \text{if profile} = 60 \\ I_{y\_K70\_3} & \text{if profile} = 70 \\ I_{y\_K80} & \text{if profile} = 80 \\ I_{y\_K120} & \text{if profile} = 90 \\ \left(2\cdot\dfrac{t_w(\text{profile})\cdot d_{st}(\text{profile})^3}{12}\right) & \text{if profile} = 100 \end{vmatrix}$$

$$I_{z\_steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ I_{z\_K70\_2} & \text{if } profile = 60 \\ I_{z\_K70\_3} & \text{if } profile = 70 \\ I_{z\_K80} & \text{if } profile = 80 \\ I_{z\_K120} & \text{if } profile = 90 \\ \left(\frac{d_{st}(profile)\cdot t_w(profile)^3}{12}\right) & \text{if } profile = 100 \end{cases}$$

$$W_{ely\_steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ W_{ely\_K70\_2} & \text{if } profile = 60 \\ W_{ely\_K70\_3} & \text{if } profile = 70 \\ W_{ely\_K80} & \text{if } profile = 80 \\ W_{ely\_K120} & \text{if } profile = 90 \end{cases}$$

$$W_{elz\_steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ W_{elz\_K70\_2} & \text{if } profile = 60 \\ W_{elz\_K70\_3} & \text{if } profile = 70 \\ W_{elz\_K80} & \text{if } profile = 80 \\ W_{elz\_K120} & \text{if } profile = 90 \end{cases}$$

$$W_{ply\_steel}(profile) := \begin{cases} W_{ply\_K70\_2} & \text{if } profile = 60 \\ W_{ply\_K70\_3} & \text{if } profile = 70 \\ W_{ply\_K80} & \text{if } profile = 80 \\ W_{ply\_K120} & \text{if } profile = 90 \end{cases}$$

$$W_{plz\_steel}(profile) := \begin{cases} W_{plz\_K70\_2} & \text{if } profile = 60 \\ W_{plz\_K70\_3} & \text{if } profile = 70 \\ W_{plz\_K80} & \text{if } profile = 80 \\ W_{plz\_K120} & \text{if } profile = 90 \end{cases}$$

$$prof_{contr\_steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ \text{"K70/70/2"} & \text{if } profile = 60 \\ \text{"K70/70/3"} & \text{if } profile = 70 \\ \text{"K80/80/4"} & \text{if } profile = 80 \\ \text{"K120/120/3"} & \text{if } profile = 90 \\ \text{"plat 80/10"} & \text{if } profile = 100 \end{cases}$$

$$b_{steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ (70mm) & \text{if } profile = 60 \\ (70mm) & \text{if } profile = 70 \\ (80mm) & \text{if } profile = 80 \\ (120mm) & \text{if } profile = 90 \end{cases}$$

$$h_{steel}(profile) := \begin{cases} \text{"not used"} & \text{if } profile = 0 \\ (70mm) & \text{if } profile = 60 \\ (70mm) & \text{if } profile = 70 \\ (80mm) & \text{if } profile = 80 \\ (120mm) & \text{if } profile = 90 \end{cases}$$

Buckling control

Profile classification

$$\varepsilon(R_e) := \sqrt{\frac{235\cdot\left(\frac{N}{mm^2}\right)}{R_e}}$$

Table 5.3.1

$$\text{classification}_{web}(\text{profile}, R_e) := \begin{cases} 1 & \text{if } \frac{d_{st}(\text{profile})}{t_w(\text{profile})} \le 72\cdot\varepsilon(R_e) \\ 2 & \text{if } 72\cdot\varepsilon(R_e) < \frac{d_{st}(\text{profile})}{t_w(\text{profile})} \le 83\cdot\varepsilon(R_e) \\ 3 & \text{if } 83\cdot\varepsilon(R_e) < \frac{d_{st}(\text{profile})}{t_w(\text{profile})} \le 124\cdot\varepsilon(R_e) \end{cases}$$

$$\text{classification}_{flange}(\text{profile}, R_e) := \begin{cases} 1 & \text{if } \frac{b_{st}(\text{profile}) - 3\cdot t_f(\text{profile})}{t_f(\text{profile})} \le 33\cdot\varepsilon(R_e) \\ 2 & \text{if } 10\cdot\varepsilon(R_e) < \frac{b_{st}(\text{profile}) - 3\cdot t_f(\text{profile})}{t_f(\text{profile})} \le 38\cdot\varepsilon(R_e) \\ 3 & \text{if } 11\cdot\varepsilon(R_e) < \frac{b_{st}(\text{profile}) - 3\cdot t_f(\text{profile})}{t_f(\text{profile})} \le 42\cdot\varepsilon(R_e) \end{cases}$$

$$\text{classification}_{tot}(\text{profile}, R_e) := \begin{cases} \text{classification}_{web}(\text{profile}, R_e) & \text{if } t_f(\text{profile}) = 0 \\ \max(\text{classification}_{web}(\text{profile}, R_e), \text{classification}_{flange}(\text{profile}, R_e)) & \text{otherwise} \end{cases}$$ **<4.1>**

Profile art. 5.5.1

$$\beta_A(profile, R_e) := \begin{cases} 1 & \text{if } classification_{tot}(profile, R_e) = 1 \vee 2 \vee 3 \\ \text{"A.eff/A"} & \text{otherwise} \end{cases}$$ **<4.2>**

Slenderness :

$$\lambda_{steel\_y}(profile, k_y, L_y) := \frac{k_y \cdot L_y}{\sqrt{\frac{I_{y\_steel}(profile)}{A_{steel}(profile)}}} \qquad \lambda_{steel\_z}(profile, k_z, L_z) := \frac{k_z \cdot L_z}{\sqrt{\frac{I_{z\_steel}(profile)}{A_{steel}(profile)}}}$$ **<4.3>**

$$\lambda_{steel\_1}(R_e) := \pi \cdot \sqrt{\frac{E_{steel}}{R_e}}$$ **<4.4>**

$$\lambda_{steel\_by}(profile, k_y, L_y, R_e) := \frac{\lambda_{steel\_y}(profile, k_y, L_y)}{\lambda_{steel\_1}(R_e)} \cdot \sqrt{\beta_A(profile, R_e)}$$

<4.5>

$$\lambda_{steel\_bz}(profile, k_z, L_z, R_e) := \frac{\lambda_{steel\_z}(profile, k_z, L_z)}{\lambda_{steel\_1}(R_e)} \cdot \sqrt{\beta_A(profile, R_e)}$$

Shape factor :

$$\alpha_{st\_y}(profile) := \begin{cases} 0.49 & \text{if } t_f(profile) = 0 \\ 0.21 & \text{otherwise} \end{cases} \qquad \alpha_{st\_z}(profile) := \begin{cases} 0.49 & \text{if } t_f(profile) = 0 \\ 0.21 & \text{otherwise} \end{cases}$$

Table 5.5.1
Table 5.5.3 **<4.6>**

Reduction coefficients :

$$\phi_{steel\_y}(profile, k_y, L_y, R_e) := 0.5 \cdot \left[1 + \alpha_{st\_y}(profile) \cdot \left(\lambda_{steel\_by}(profile, k_y, L_y, R_e) - 0.2\right) + \lambda_{steel\_by}(profile, k_y, L_y, R_e)^2\right]$$

<4.7>

$$\phi_{steel\_z}(profile, k_z, L_z, R_e) := 0.5 \cdot \left[1 + \alpha_{st\_z}(profile) \cdot \left(\lambda_{steel\_bz}(profile, k_z, L_z, R_e) - 0.2\right) + \lambda_{steel\_bz}(profile, k_z, L_z, R_e)^2\right]$$

$$\chi_{steel\_y}(profile, k_y, L_y, R_e) := \frac{1}{\phi_{steel\_y}(profile, k_y, L_y, R_e) + \sqrt{\phi_{steel\_y}(profile, k_y, L_y, R_e)^2 - \lambda_{steel\_by}(profile, k_y, L_y, R_e)^2}}$$ form 5.46 **<4.8>**

$$\chi_{steel\_z}(profile, k_z, L_z, R_e) := \frac{1}{\phi_{steel\_z}(profile, k_z, L_z, R_e) + \sqrt{\phi_{steel\_z}(profile, k_z, L_z, R_e)^2 - \lambda_{steel\_bz}(profile, k_z, L_z, R_e)^2}}$$

$$\chi_{steel\_min}(profile, k_z, k_y, L_z, L_y, R_e) := \min(\chi_{steel\_z}(profile, k_z, L_z, R_e), \chi_{steel\_y}(profile, k_y, L_y, R_e))$$ facteur de réduction

Bending + axial compression (art. 5.5.4)

Factor relating to the equivalent uniform moment (fig 5.5.3):

$$\psi_y(M_{1\_y}, M_{2\_y}) := \begin{cases} \frac{M_{2\_y}}{M_{1\_y}} & \text{if } -1 \le \frac{M_{2\_y}}{M_{1\_y}} \le 1 \\ (-1) & \text{if } \frac{M_{2\_y}}{M_{1\_y}} < -1 \\ 1 & \text{if } \frac{M_{2\_y}}{M_{1\_y}} > 1 \end{cases} \qquad \psi_z(M_{1\_z}, M_{2\_z}) := \begin{cases} \frac{M_{2\_z}}{M_{1\_z}} & \text{if } -1 \le \frac{M_{2\_z}}{M_{1\_z}} \le 1 \\ (-1) & \text{if } \frac{M_{2\_z}}{M_{1\_z}} < -1 \\ 1 & \text{if } \frac{M_{2\_z}}{M_{1\_z}} > 1 \end{cases}$$ **<4.9>**

$$\beta_{M\psi y}(M_{1\_y}, M_{2\_y}) := 1.8 - 0.7 \cdot \psi_y(M_{1\_y}, M_{2\_y}) \qquad \beta_{M\psi z}(M_{1\_z}, M_{2\_z}) := 1.8 - 0.7 \cdot \psi_z(M_{1\_z}, M_{2\_z})$$ **<4.10>**

$$\beta_{MQ} := 1.3$$ **<4.11>** distributed load

Moments du to the shear load (fig. 5.5.3):

$$M_{Qy}(M_{1\_y}, M_{2\_y}, M_{m\_y}) := \left| \frac{M_{1\_y} - M_{2\_y}}{2} + M_{2\_y} - M_{m\_y} \right|$$

$$M_{Qz}(M_{1\_z}, M_{2\_z}, M_{m\_z}) := \left| \frac{M_{1\_z} - M_{2\_z}}{2} + M_{2\_z} - M_{m\_z} \right|$$ **<4.12>**

$$\Delta M_y(M_{1\_y}, M_{2\_y}, M_{m\_y}) := \begin{cases} \max(|M_{1\_y}|, |M_{2\_y}|, |M_{m\_y}|) & \text{if } (\text{sign}(M_{1\_y}) = \text{sign}(M_{m\_y})) \wedge (\text{sign}(M_{2\_y}) = \text{sign}(M_{m\_y})) \\ |\max(M_{1\_y}, M_{2\_y}, M_{m\_y})| + |\min(M_{1\_y}, M_{2\_y}, M_{m\_y})| & \text{otherwise} \end{cases}$$

<4.13>

$$\Delta M_z(M_{1\_z}, M_{2\_z}, M_{m\_z}) := \begin{cases} \max(|M_{1\_z}|, |M_{2\_z}|, |M_{m\_z}|) & \text{if } (\text{sign}(M_{1\_z}) = \text{sign}(M_{m\_z})) \wedge (\text{sign}(M_{2\_z}) = \text{sign}(M_{m\_z})) \\ |\max(M_{1\_z}, M_{2\_z}, M_{m\_z})| + |\min(M_{1\_z}, M_{2\_z}, M_{m\_z})| & \text{otherwise} \end{cases}$$

$$\beta_{My}(M_{1\_y},M_{2\_y},M_{m\_y}) := \beta_{M\psi y}(M_{1\_y},M_{2\_y}) + \frac{M_{Qy}(M_{1\_y},M_{2\_y},M_{m\_y})}{\Delta M_y(M_{1\_y},M_{2\_y},M_{m\_y})}\cdot(\beta_{MQ} - \beta_{M\psi y}(M_{1\_y},M_{2\_y}))$$

$$\beta_{Mz}(M_{1\_z},M_{2\_z},M_{m\_z}) := \beta_{M\psi z}(M_{1\_z},M_{2\_z}) + \frac{M_{Qz}(M_{1\_z},M_{2\_z},M_{m\_z})}{\Delta M_z(M_{1\_z},M_{2\_z},M_{m\_z})}\cdot(\beta_{MQ} - \beta_{M\psi z}(M_{1\_z},M_{2\_z}))$$

<4.14>

Coefficients μ (art 5.5.4)

classification = 1 ou 2 :

$$\mu_{yc1\_2}(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y}) := \min\left[0.9, \left[\lambda_{steel\_by}(profile,k_y,L_y,R_e)\cdot(2\cdot\beta_{My}(M_{1\_y},M_{2\_y},M_{m\_y}) - 4) \ldots + \frac{W_{ply\_steel}(profile) - W_{ely\_steel}(profile)}{W_{ely\_steel}(profile)}\right]\right]$$

$$\mu_{zc1\_2}(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z}) := \min\left[0.9, \left[\lambda_{steel\_bz}(profile,k_z,L_z,R_e)\cdot(2\cdot\beta_{My}(M_{1\_z},M_{2\_z},M_{m\_z}) - 4) \ldots + \frac{W_{plz\_steel}(profile) - W_{elz\_steel}(profile)}{W_{elz\_steel}(profile)}\right]\right]$$

classification = 3 :

$$\mu_{yc3}(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y}) := \min[0.9, \lambda_{steel\_by}(profile,k_y,L_y,R_e)\cdot(2\cdot\beta_{My}(M_{1\_y},M_{2\_y},M_{m\_y}) - 4)]$$

$$\mu_{zc3}(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z}) := \min[0.9, \lambda_{steel\_bz}(profile,k_z,L_z,R_e)\cdot(2\cdot\beta_{Mz}(M_{1\_z},M_{2\_z},M_{m\_z}) - 4)]$$

$$\mu_y(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y}) := \begin{cases} \mu_{yc1\_2}(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y}) & \text{if } classification_{tot}(profile,R_e) = 1 \\ \mu_{yc3}(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y}) & \text{if } classification_{tot}(profile,R_e) = 3 \end{cases}$$

<4.15>

$$\mu_z(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z}) := \begin{cases} \mu_{zc1\_2}(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z}) & \text{if } classification_{tot}(profile,R_e) = 1 \\ \mu_{zc3}(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z}) & \text{if } classification_{tot}(profile,R_e) = 3 \end{cases}$$

Coefficients k (art 5.5.4)

$$K_y(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y},N_{Ed}) := \min\left(1 - \frac{\mu_y(profile,k_y,L_y,R_e,M_{1\_y},M_{2\_y},M_{m\_y})\cdot N_{Ed}}{\chi_{steel\_y}(profile,k_y,L_y,R_e)\cdot A_{steel}(profile)\cdot R_e}, 1.5\right)$$

$$K_z(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z},N_{Ed}) := \min\left(1 - \frac{\mu_z(profile,k_z,L_z,R_e,M_{1\_z},M_{2\_z},M_{m\_z})\cdot N_{Ed}}{\chi_{steel\_z}(profile,k_z,L_z,R_e)\cdot A_{steel}(profile)\cdot R_e}, 1.5\right)$$

<4.16>

Stress: bending + axial compression

$$\sigma_{bending\_comp}(profile, N_{Ed}, M_{1\_y}, M_{1\_z}, M_{m\_y}, M_{m\_z}) := \frac{N_{Ed}}{A_{steel}(profile)} + \frac{\max(|M_{1\_y}|, |M_{m\_y}|) \cdot y_{y\_steel}(profile)}{I_{y\_steel}(profile)} \ldots + \frac{\max(|M_{1\_z}|, |M_{m\_z}|) \cdot y_{z\_steel}(profile)}{I_{z\_steel}(profile)}$$

<4.17>

Stress: bending + axial traction

$$\sigma_{flexion\_traction}(profile, N_{Ed}, M_{yEd}, M_{zEd}) := \frac{N_{Ed}}{A_{steel}(profile)} + \frac{M_{yEd} \cdot y_{y\_steel}(profile)}{I_{y\_steel}(profile)} \ldots + \frac{M_{zEd} \cdot y_{z\_steel}(profile)}{I_{z\_steel}(profile)}$$

<4.18>

Axial compression (art. 5.5.1)

Profile capacity :

$$N_{bRd}(profile, R_e, k_y, k_z, L_y, L_z) := \chi_{steel\_min}(profile, k_z, k_y, L_z, L_y, R_e) \cdot \beta_A(profile, R_e) \cdot A_{steel}(profile) \cdot \frac{R_e}{\gamma_M}$$

<4.19>

form 5.45

$$buckling_{steel}(profile, R_e, k_y, k_z, L_y, L_z, N_{Ed}) := \begin{cases} \dfrac{\frac{N_{Ed}}{2}}{N_{bRd}(profile, R_e, k_y, k_z, L_y, L_z)} & \text{if } t_f(profile) = 0 \\ \dfrac{N_{Ed}}{N_{bRd}(profile, R_e, k_y, k_z, L_y, L_z)} & \text{otherwise} \end{cases}$$

<4.20>

Stress: axial compression or traction

$$\sigma_{comp\_trac}(profile, N_{Ed}) := \frac{N_{Ed}}{A_{steel}(profile)}$$

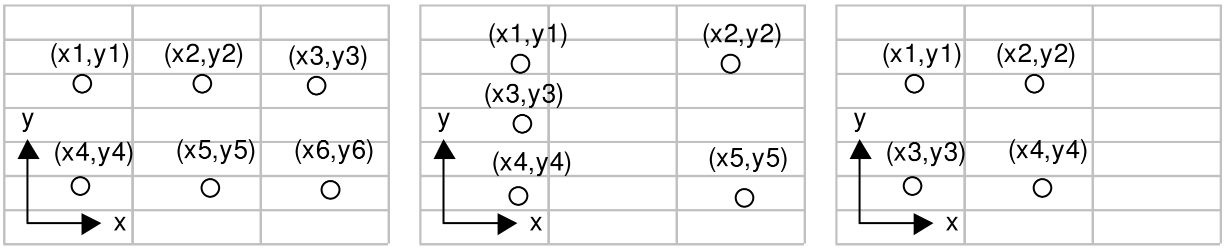
<4.21>

Doc. 5. Bolts, pins and rivets acc. to ENV1999-1-1:1998 + ENV1993-1-1:1992

The coordinates for max 6 bolts:

$$x(x_1, x_2, x_3, x_4, x_5, x_6) := \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix} \qquad y(y_1, y_2, y_3, y_4, y_5, y_6) := \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \end{pmatrix}$$

A few examples :



Resulting force on one bolt:

$$F_R(m_v, n_v, v_v, n, x_1, x_2, x_3, x_4, x_5, x_6, y_1, y_2, y_3, y_4, y_5, y_6) :=$$

{kN,kNm}			{m}		{m}		{m}
M	-1.8	y1	0	x1	0	Xz	0.0725
N	-17	y2	0	x2	0.15	Yz	0
V	-14	y3	0	x3	0	B	0.0105
n	2	y4	0	x4	0		
	-7.5	y5	0	x5	0		
	9.6	y6	0	x6	0		
Forces on the bolts:							
			{kN}		{kN}		{kN}
Fx1	0	Fy1	-6.4	Fm1	6.38	Fm	6.3753
Fx2	0	Fy2	-6.4	Fm2	6.38	Fmx	0
Fx3	0	Fy3	-6.4	Fm3	6.38	Fmy	-6.375
Fx4	0	Fy4	-6.4	Fm4	6.38	Fn	-4.175
Fx5	0	Fy5	-6.4	Fm5	6.38	Fv	-3.375
Fx6	0	Fy6	-6.4	Fm6	6.38	Fr	10.607

<5.1>

$$\left(m_v \;\; n_v \;\; v_v \;\; n \;\; y(y_1, y_2, y_3, y_4, y_5, y_6) \;\; x(x_1, x_2, x_3, x_4, x_5, x_6)\right)$$

with:
* M, N and V : the outside forces on the bolts
* n : number of the bolts
* Xz : centre of gravity of the bolts in x direction
* Yz : centre of gravity of the bolts in y direction
* Fx, Fy : The force on 1 bolt in x or y direction, due to the moment force
* Fmx, Fmy : The biggest force on 1 bolt with Fx and Fy the moment force in the same bolt
* Fn : The force on 1 bolt due to the normal force
* Fv : The force on 1 bolt due to the shear force
* Fr : The resulting force on 1 bolt

Shear resistance for bolts, pins and rivets :
(ENV1999 table 6.4, 6.7 and 6.5, ENV1993 table 6.5.3, 6.5.7 and 6.5.5)

$$A_{bolt}(D_{bolt}) := \frac{\pi \cdot D_{bolt}^2}{4}$$

area of the bolt and the pin **<5.2>**

$$A_{rivet}(d_0) := \frac{\pi \cdot d_0^2}{4}$$

area of the rivet **<5.2>**

$$c(f_{ub}) := \begin{cases} 0.6 & \text{if } f_{ub} < 1000 \frac{N}{mm^2} \\ 0.5 & \text{if } f_{ub} \geq 1000 \frac{N}{mm^2} \end{cases}$$

<5.3>

$$F_{vRd}(f_{ub}, D_{bolt}) := \frac{c(f_{ub}) \cdot f_{ub} \cdot A_{bolt}(D_{bolt})}{\gamma_{Mb}}$$

Shear resistance for bolts and pins
(ENV9: table 6.4 form. 6.13) **<5.4>**

$$F_{vRd\_r}(f_{ub}, d_0) := \frac{0.6 \cdot f_{ub} \cdot A_{rivet}(d_0)}{\gamma_{Mr}}$$

Shear resistance for rivets
(ENV9: table 6.5 form. 6.22) **<5.4>**

Bearing resistance for bolts, pins and rivets :
(ENV1999 table 6.4 and 6.7, ENV1993 table 6.5.3 and 6.5.7)

$$\alpha(e_1, p_1, d_0, f_{ub}, f_u) := \min\left(\frac{e_1}{3 \cdot d_0}, \frac{p_1}{3 \cdot d_0} - \frac{1}{4}, \frac{f_{ub}}{f_u}, 1.0\right)$$

ENV9: table 6.4 form. 6.16 **<5.5>**
table 6.5 form. 6.24

$$F_{bRd}(e_1, p_1, d_0, f_{ub}, f_u, f_y, D_{bolt}, t, n) := \begin{cases} \frac{2.5 \cdot \alpha(e_1, p_1, d_0, f_{ub}, f_u) \cdot f_u \cdot D_{bolt} \cdot t}{\gamma_{Mb}} & \text{if } n > 1 \\ \frac{1.5 \cdot t \cdot D_{bolt} \cdot f_y}{\gamma_{Mb}} & \text{if } n = 1 \end{cases}$$

ENV9: table 6.4 form. 6.15 (free rotation not required)

ENV9: table 6.7 (free rotation required)

<5.6>

$$F_{bRd\_r}(e_1, p_1, d_0, f_{ub}, f_u, t) := \frac{2.5 \cdot \alpha(e_1, p_1, d_0, f_{ub}, f_u) \cdot f_u \cdot d_0 \cdot t}{\gamma_{Mr}}$$

ENV9: table 6.5 form. 6.23

Moment resistance for bolts and pins : (ENV1999 table 6.7, ENV1993 table 6.5.7)

$$W(D_{bolt}) := \pi \cdot \left(\frac{D_{bolt}^{\;3}}{32} \right)$$ moment resistance **<5.7>**

$$M_{Rd}(f_{ub}, D_{bolt}) := \frac{0.8 \cdot f_{ub} \cdot W(D_{bolt})}{\gamma_{Mb}}$$ moment capacity **<5.8>**

$$sp(t_i, t_o, s, C) := \begin{cases} \left(\dfrac{t_i}{2} + s + \dfrac{t_o}{2} \right) & \text{if } C = 1 \\ \dfrac{(2 \cdot t_o + 4 \cdot s + t_i)}{8} & \text{if } C = 2 \end{cases}$$

margin between connected parts **<5.9>**

C = 1 : exterior tube is connected with interior tube
C = 2 : 3 plates are connected together

Traction resistance for bolts : (ENV1999 tableau 6.4, ENV1993 tableau 6.5.3)

$$F_{tRd}(f_{ub}, D_{bolt}) := \frac{0.9 \cdot f_{ub} \cdot A_{bolt}(D_{bolt})}{\gamma_{Mb}}$$ ENV9: table 6.4 form. 6.17 **<5.10>**

Resistance against perforation of the bolts and the nuts (ENV3 form. 6.5)

$$d_{nut}(D_{bolt}) := \begin{cases} 10mm & \text{if } D_{bolt} = 6mm \\ 13mm & \text{if } D_{bolt} = 8mm \\ 17mm & \text{if } D_{bolt} = 10mm \\ 19mm & \text{if } D_{bolt} = 12mm \\ 22mm & \text{if } D_{bolt} = 14mm \\ 24mm & \text{if } D_{bolt} = 16mm \\ 27mm & \text{if } D_{bolt} = 18mm \\ 30mm & \text{if } D_{bolt} = 20mm \\ 34mm & \text{if } D_{bolt} = 22mm \\ 36mm & \text{if } D_{bolt} = 24mm \\ 41mm & \text{if } D_{bolt} = 27mm \\ 46mm & \text{if } D_{bolt} = 30mm \\ 50mm & \text{if } D_{bolt} = 33mm \\ 55mm & \text{if } D_{bolt} = 36mm \end{cases}$$ **<5.11>**

$$B_{pRd}(D_{bolt}, t, f_u) := \frac{0.6 \cdot \pi \cdot d_{nut}(D_{bolt}) \cdot t \cdot f_u}{\gamma_{Mb}}$$

maximum perforation force **<5.12>**

Connection by rivets :

Connection between the principal profile and the reinforcement profile

The static moment of the reinforcement profile equals:

$$s(reinf) := \begin{cases} (91.27mm) & \text{if } A_{alu}(reinf) = A_{alu297\_8} \\ (79.97mm) & \text{if } A_{alu}(reinf) = A_{alu260} \\ (74.93mm) & \text{if } A_{alu}(reinf) = A_{alu232} \end{cases}$$

$$S_{reinforcement}(reinf) := 0.5 \cdot A_{alu}(reinf) \cdot s(reinf)$$ **<5.13>**

The maximum distance between two rivets equals:

$$L_{max}\left(F_{max}, e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, prin, reinf\right) := \frac{\min\begin{pmatrix} F_{vRd\_r}\left(R_{t\_rivet}, D_0\right) \\ F_{bRd\_r}\left(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, t_{alu}(prin)\right) \\ F_{bRd\_r}\left(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, t_{alu}(reinf)\right) \end{pmatrix} \cdot I_{y\_alu}(prin + reinf}{F_{max} \cdot S_{reinforcement}(reinf)}$$

<5.14>

We have 4 rivets per section.
The maximum distance between two rows of rivets equals:

$$L_{max\_row}\left(F_{max}, e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, prin, reinf\right) := L_{max}\left(F_{max}, e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, prin, reinf\right) \cdot 4$$ **<5.15>**

The real force on the rivets becomes:

$$F_{max\_real}\left(p_1, F_{max}, prin, reinf\right) := \frac{p_1 \cdot F_{max} \cdot S_{reinforcement}(reinf)}{I_{y\_alu}(prin + reinf) \cdot 4}$$ **<5.16>**

The stress in the rivet:

$$R_{t\_rivet\_real}\left(p_1, D_0, F_{max}, prin, reinf\right) := \frac{F_{max\_real}\left(p_1, F_{max}, prin, reinf\right) \cdot \gamma_{Mr}}{0.6 \cdot A_{rivet}\left(D_0\right)}$$ **<5.17>**

The stress in the principal profile:

$$R_{t\_prin\_real}(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, F_{max}, prin, reinf) := \frac{F_{max\_real}(p_1, F_{max}, prin, reinf)\cdot\gamma_{Mr}}{2.5\cdot\alpha(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu})\cdot D_0\cdot t_{alu}(prin)}$$ **<5.18>**

The stress in the reinforcement profile:

$$R_{t\_reinf\_real}(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu}, F_{max}, prin, reinf) := \frac{F_{max\_real}(p_1, F_{max}, prin, reinf)\cdot\gamma_{Mr}}{2.5\cdot\alpha(e_1, p_1, D_0, R_{t\_rivet}, R_{t\_alu})\cdot D_0\cdot t_{alu}(reinf)}$$ **<5.19>**

Doc. 6. Steel connection

$$B(b_1, b_2, b_3, b_4, b_5, b_6, b_7) := \begin{pmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \\ b_5 \\ b_6 \\ b_7 \end{pmatrix} \qquad H(h_1, h_2, h_3, h_4, h_5, h_6, h_7) := \begin{pmatrix} h_1 \\ h_2 \\ h_3 \\ h_4 \\ h_5 \\ h_6 \\ h_7 \end{pmatrix}$$

$$T(t_1, t_2, t_3, t_4, t_5, t_6, t_7) := \begin{pmatrix} t_1 \\ t_2 \\ t_3 \\ t_4 \\ t_5 \\ t_6 \\ t_7 \end{pmatrix}$$

$$Y(y1, y2, y3, y4, y5, y6, y7) := \begin{pmatrix} y1 \\ y2 \\ y3 \\ y4 \\ y5 \\ y6 \\ y7 \end{pmatrix} \qquad Z(z1, z2, z3, z4, z5, z6, z7) := \begin{pmatrix} z1 \\ z2 \\ z3 \\ z4 \\ z5 \\ z6 \\ z7 \end{pmatrix}$$

Length [m]		Height [m]		Thickness [m]		Gravity point [m]			
b1	0.03	h1	0.04	t1	0.00	y1	0.02	z1	0.05
b2	0.07	h2	0.01	t2	0.01	y2	0.05	z2	0.05
b3	0.00	h3	0.14	t3	0.07	y3	0.12	z3	0.05
b4	0.00	h4	0.14	t4	0.07	y4	0.12	z4	0.08
b5	0.07	h5	0.07	t5	0.01	y5	0.20	z5	0.08
b6	0.05	h6	0.15	t6	0.00	y6	0.31	z6	0.08
b7	0.15	h7	0.25	t7	0.01	y7	0.01	z7	0.08
						H	0.3844		
n	6								

Section

A=b x h - (b-2t)(h-2t)

A1	0.00	m²		A5	0.00	m²
A2	0.00	m²		A6	0.00	m²
A3	0.00	m²		A7	0.00	m²
A4	0.00	m²				
Atot	4.67E-03	m²	**<6.1>**			

Gravity point

Yg = [(A1 x y1) + (A2 x y2) + …] / Atot

Yg	0.17	m	
Yv	0.22	m	**<6.2>**

Zg = [(A1 x z1) + (A2 x z2) + …] / Atot

Zg	0.06	m	
Zv	0.06	m	**<6.3>**

Moment of inertia

Iy = [b x h^3 - (b-2t)(h-2t)^3] / 12

I1	8.14E-08	m^4	I5	9.21E-07	m^4
I2	5.83E-09	m^4	I6	3.11E-06	m^4
I3	9.15E-07	m^4	I7	4.03E-05	m^4
I4	9.15E-07	m^4			

Iz = [h x b^3 - (b-2t)(b-2t)^3] / 12

I1	5.08E-08	m^4	I5	9.21E-07	m^4
I2	2.86E-07	m^4	I6	5.40E-07	m^4
I3	7.47E-10	m^4	I7	1.82E-05	m^4
I4	7.47E-10	m^4			

$a_y = y - Yg$

a1	-0.15	m	a5	0.03	m
a2	-0.12	m	a6	0.14	m
a3	-0.05	m	a7	-0.16	m
a4	-0.05	m			

$a_z = z - Zg$

a1	-0.02	m	a5	0.01	m
a2	-0.02	m	a6	0.01	m
a3	-0.02	m	a7	0.01	m
a4	0.01	m			

Itot = (I1 + a1^2 . A1) + (I2 + a2^2 . A2) + …

Iy_tot	5.24E-05	m^4	**<6.4>**
Iz_tot	2.76E-06	m^4	**<6.5>**

Von mises stress control

σ = (Nv / Atot) + [(My x Yv)/Iy_tot] + [(Mz x Zv)/Iz_tot]

σ	8.08E+04	kN/m²	**<6.6>**

τ = Sv / Atot

τ	1.15E+04	kN/m²	**<6.7>**

$\sigma_{vm} = \text{sqrt}(\sigma^2 + 3.\tau^2)$

σ_{vm}	8.32E+04	kN/m²	**<6.8>**

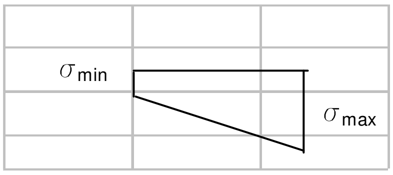
Doc. 7. Baseplate

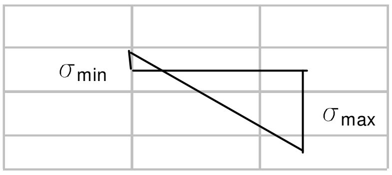
7.1. Bending of the horizontal steel plate.

$$\sigma_{max}(R_x,R_z,B_p,L,h_p,v,P) := \begin{cases} \left[\dfrac{|R_z|}{B_p\cdot L} + \dfrac{|R_x|\cdot(h_p)}{\dfrac{B_p\cdot L^2}{6}}\right] & \text{if } P = \text{"side"} \\ \left[\dfrac{|R_z|}{B_p\cdot L} + \dfrac{|R_x|\cdot(h_p)\cdot v}{\dfrac{B_p\cdot L^3}{12} + \left(v - \dfrac{L}{2}\right)^2\cdot B_p\cdot L}\right] & \text{if } P = \text{"corner"} \end{cases}$$

<7.1>

$$\sigma_{min}(R_x,R_z,B_p,L,h_p,v,P) := \begin{cases} \left[\dfrac{|R_z|}{B_p\cdot L} - \dfrac{|R_x|\cdot(h_p)}{\dfrac{B_p\cdot L^2}{6}}\right] & \text{if } P = \text{"side"} \\ \left[\dfrac{|R_z|}{B_p\cdot L} - \dfrac{|R_x|\cdot(h_p)\cdot v}{\dfrac{B_p\cdot L^3}{12} + \left(v - \dfrac{L}{2}\right)^2\cdot B_p\cdot L}\right] & \text{if } P = \text{"corner"} \end{cases}$$

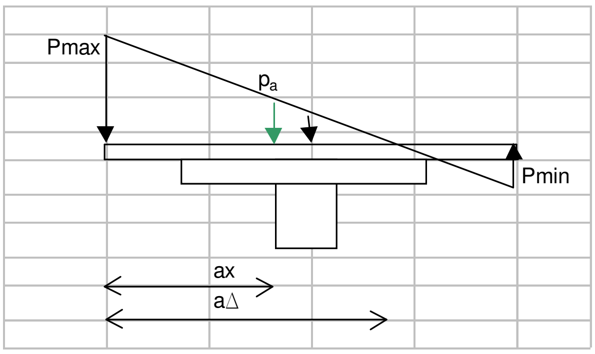


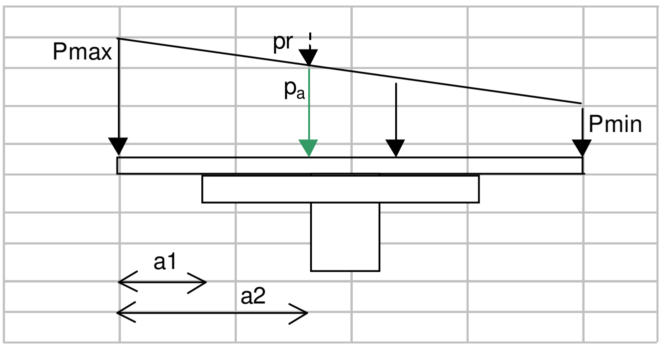


$$p_{max}(R_x,R_z,B_p,L,h_p,v,P) := \sigma_{max}(R_x,R_z,B_p,L,h_p,v,P)\cdot B_p$$

<7.2>

$$p_{min}(R_x,R_z,B_p,L,h_p,v,P) := \sigma_{min}(R_x,R_z,B_p,L,h_p,v,P)\cdot B_p$$





a_1	distance from the side of the plate to the reinforcement
a_2	distance from the side of the plate to the support

$$p_r(a_x, R_x, R_z, B_p, L, h_p, v, P) := \frac{a_x \cdot \left(p_{max}(R_x, R_z, B_p, L, h_p, v, P) - p_{min}(R_x, R_z, B_p, L, h_p, v, P)\right)}{L}$$ **<7.3>**

$$a_\Delta(R_x, R_z, B_p, L, h_p, v, P) := \frac{L}{\left|\frac{p_{min}(R_x, R_z, B_p, L, h_p, v, P)}{p_{max}(R_x, R_z, B_p, L, h_p, v, P)}\right| + 1}$$ **<7.4>**

$$p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P) := \begin{cases} \left(p_{max}(R_x, R_z, B_p, L, h_p, v, P) + -p_r(a_x, R_x, R_z, B_p, L, h_p, v, P)\right) & \text{if } p_{min}(R_x, R_z, B_p, L, h_p, v, P) \ge 0 \\ \frac{p_{max}(R_x, R_z, B_p, L, h_p, v, P) \cdot \left(a_\Delta(R_x, R_z, B_p, L, h_p, v, P) - a_x\right)}{a_\Delta(R_x, R_z, B_p, L, h_p, v, P)} & \text{otherwise} \end{cases}$$ **<7.5>**

Distance of the gravity point:

$$a_g(a_x, R_x, R_z, B_p, L, h_p, v, P) := \begin{cases} \frac{\left(p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P) \cdot a_x \cdot \frac{a_x}{2}\right) + \frac{\left(p_{max}(R_x, R_z, B_p, L, h_p, v, P) + -p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P)\right) \cdot a_x}{2} \cdot \frac{2 \cdot a_x}{3}}{\left(\frac{p_{max}(R_x, R_z, B_p, L, h_p, v, P) + p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P)}{2}\right) \cdot a_x} & \text{if } p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P) > 0 \\ \left(\frac{2}{3} \cdot a_\Delta(R_x, R_z, B_p, L, h_p, v, P)\right) & \text{if } p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P) \le 0 \end{cases}$$

<7.6>

Maximum moment:

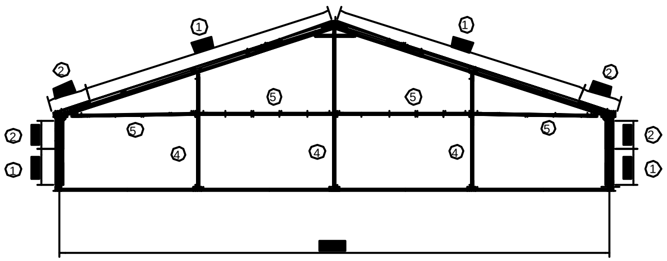
$$M_{max}(a_x, R_x, R_z, B_p, L, h_p, v, P) := \left(\frac{p_{max}(R_x, R_z, B_p, L, h_p, v, P) + p_{ax}(a_x, R_x, R_z, B_p, L, h_p, v, P)}{2}\right) \cdot a_x \cdot a_g(a_x, R_x, R_z, B_p, L, h_p, v, P)$$ **<7.7>**

VELDEMAN
STRUCTURE SOLUTIONS

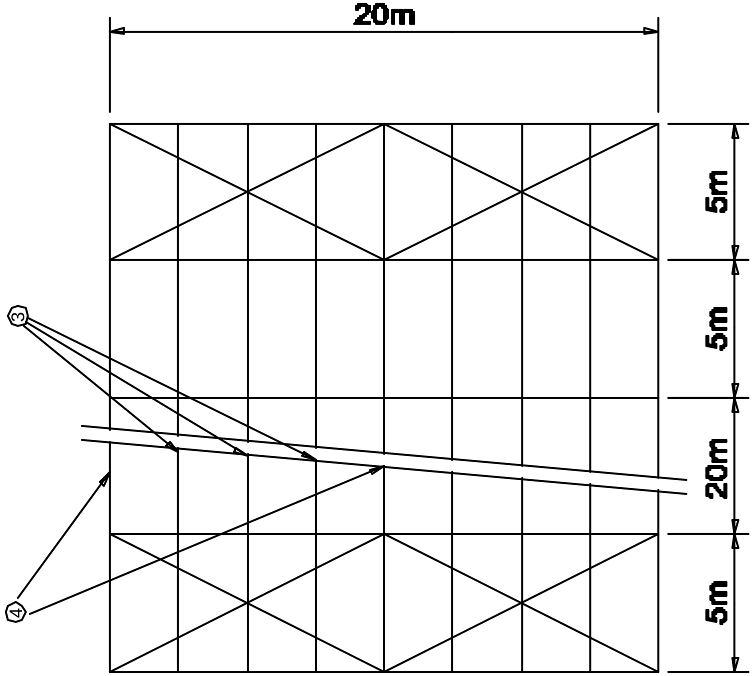
ENCLOSURE 2 :

Drawings of the Alu 20m structure

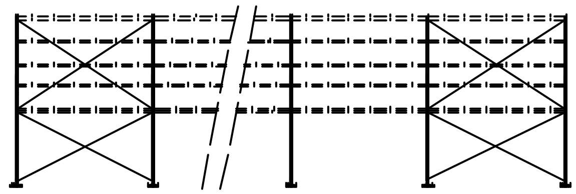
Front view

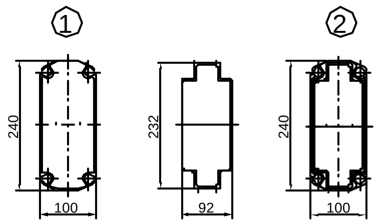


View from above

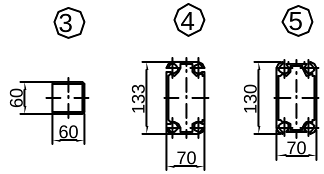


Side view





Alu240 Alu232 Alu240+232



Alu60 Alu133 Alu130

VELDEMAN
STRUCTURE SOLUTIONS

Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

Global structure alu20m

PROJECTIE			NR. ONGEGALV.	
SCHAAL		A3		
DATUM	08/02/05	EB	CODENR.	BAL20_2.8E01

Datum afdruk : woensdag 10 mei 2006 14:24:09 Door : ####

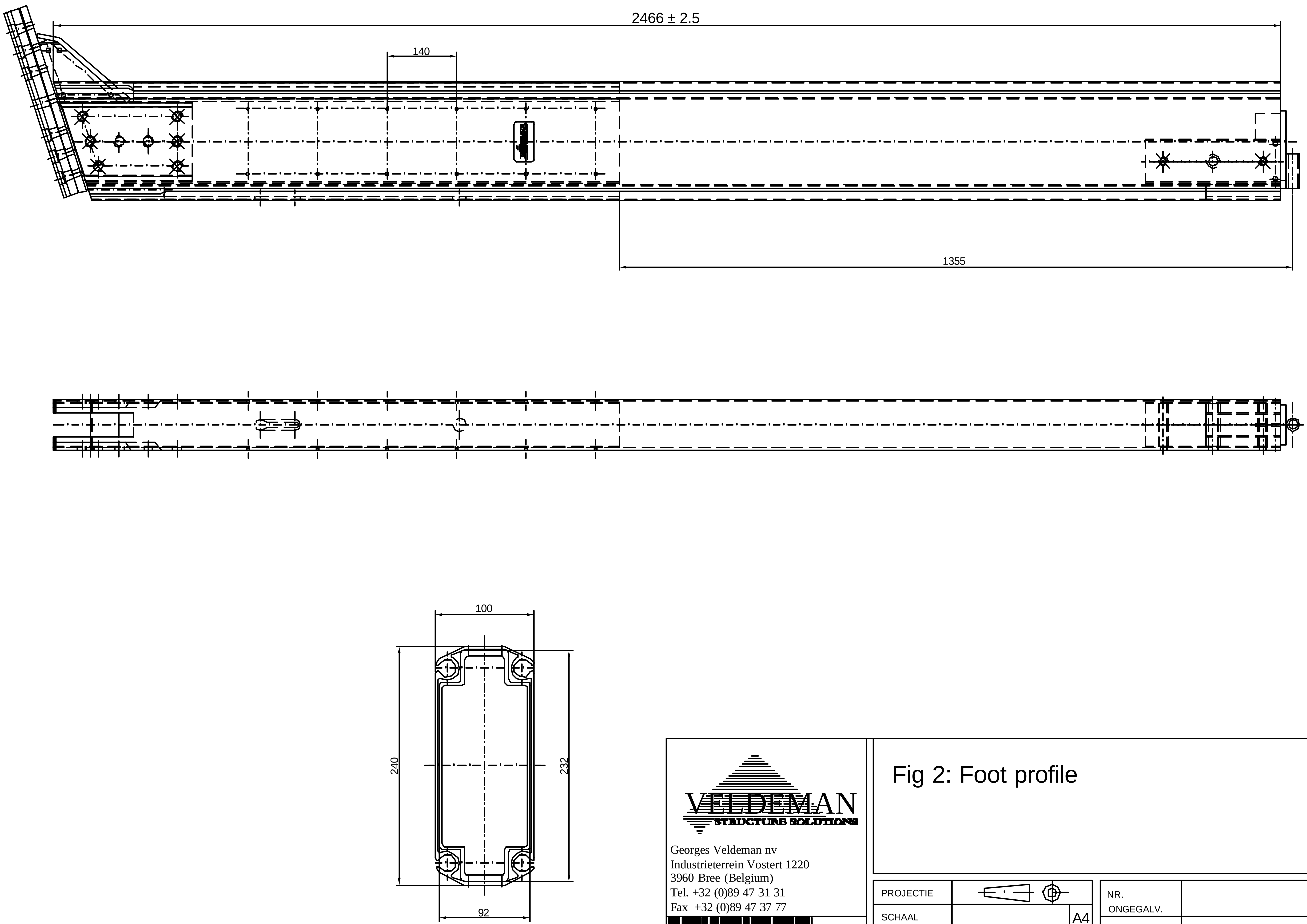
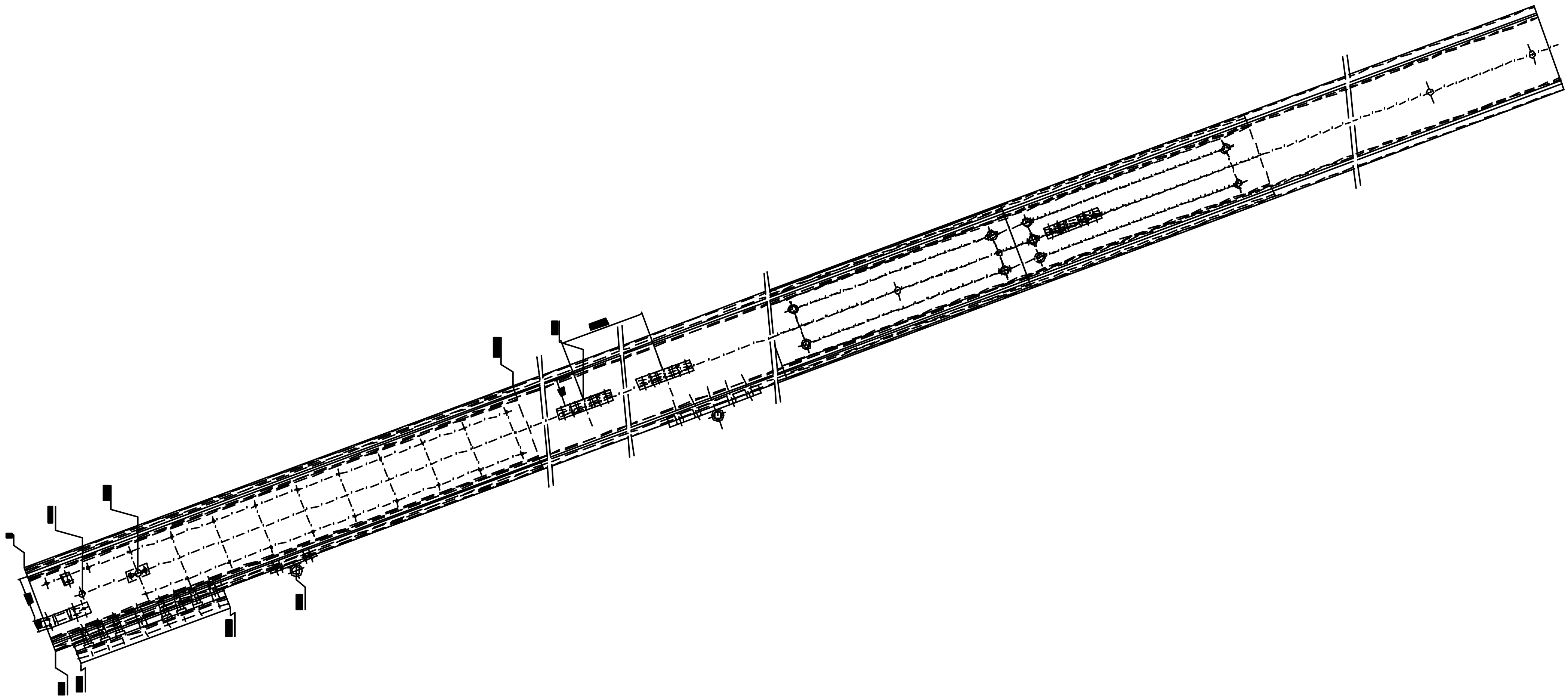
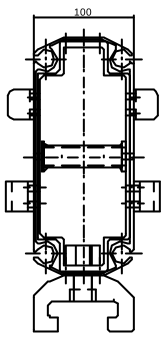


Fig 2: Foot profile

VELDEMAN
STRUCTURE SOLUTIONS
Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

PROJECTIE			NR. ONGEGALV.	
SCHAAL		A4	CODENR.	BAL20_2.8E02
DATUM	10/05/06	eb		





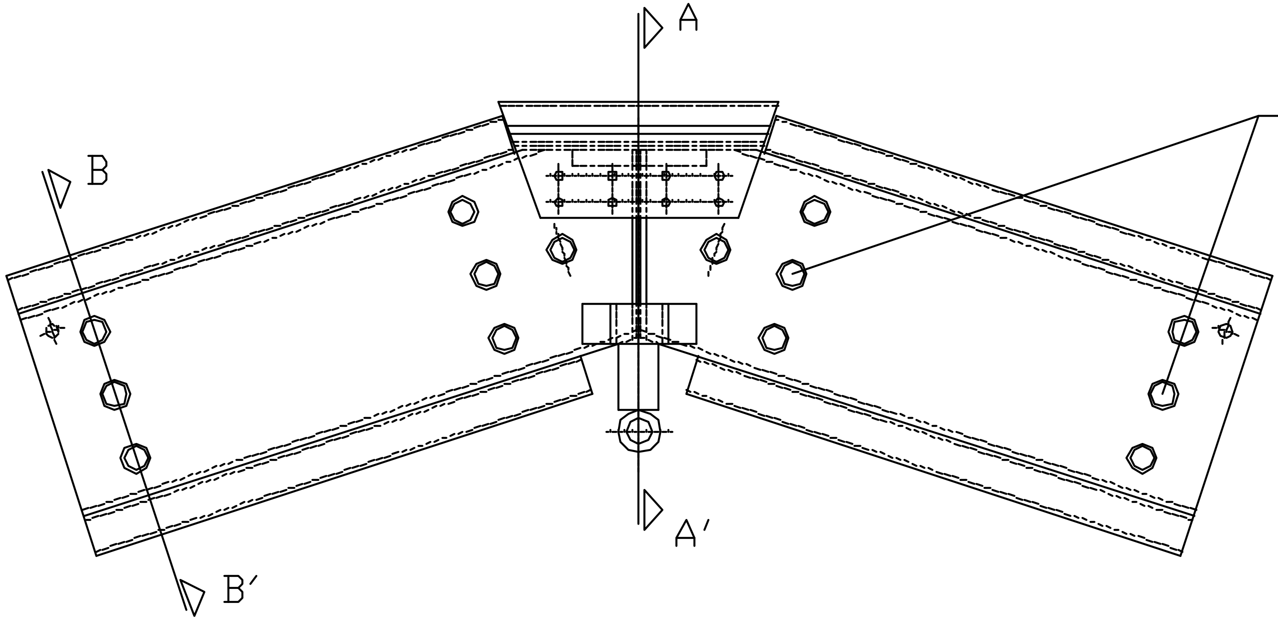
VELDEMAN
STRUCTURE SOLUTIONS

Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

[redacted]

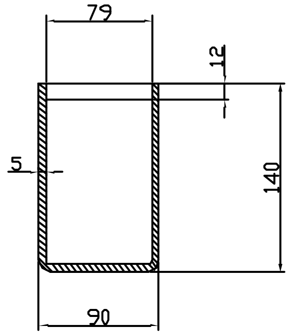
Fig 3: Roof profile

PROJECTIE			NR. ONGEGALV.	
SCHAAL		A4	CODENR.	BAL20_2.8E03
DATUM		eb		

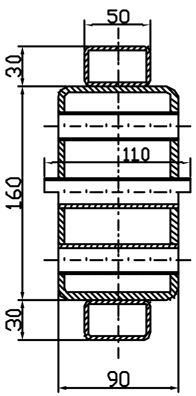


Steel grade =
S235

Section A-A'



Section B-B'

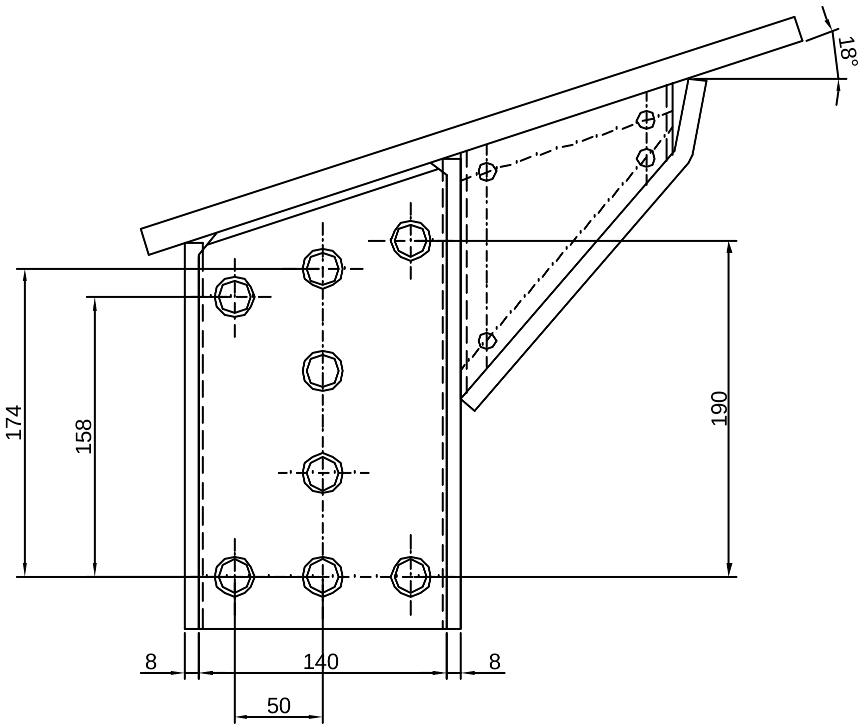


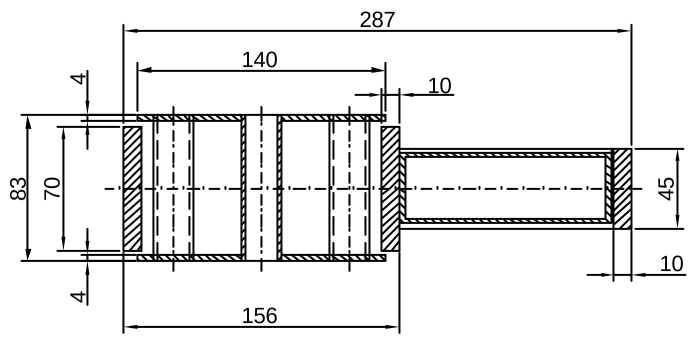
VELDEMAN
TENT TECHNOLOGY

Georges Veldeman nv
Industriezone Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

Fig 4: Peak splice

PROJECTIE		NR. ONGEGALV.	
SCHAAL	1/4	CODENR.	BAL20_2.8E04
DATUM			

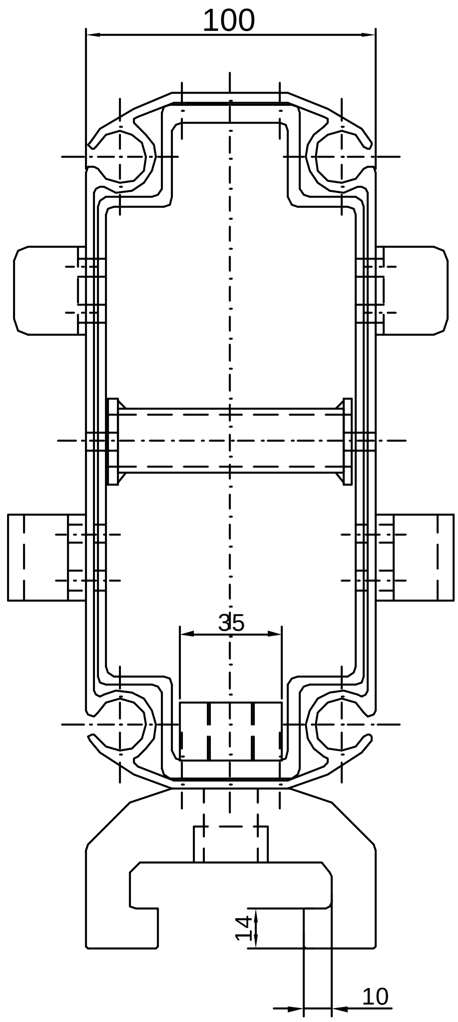




VELDEMAN
STRUCTURE SOLUTIONS
Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

Fig 5: Eaves splice

PROJECTIE			NR. ONGEGALV.	
SCHAAL		A4	CODENR.	BAL20_2.8E05
DATUM		eb		

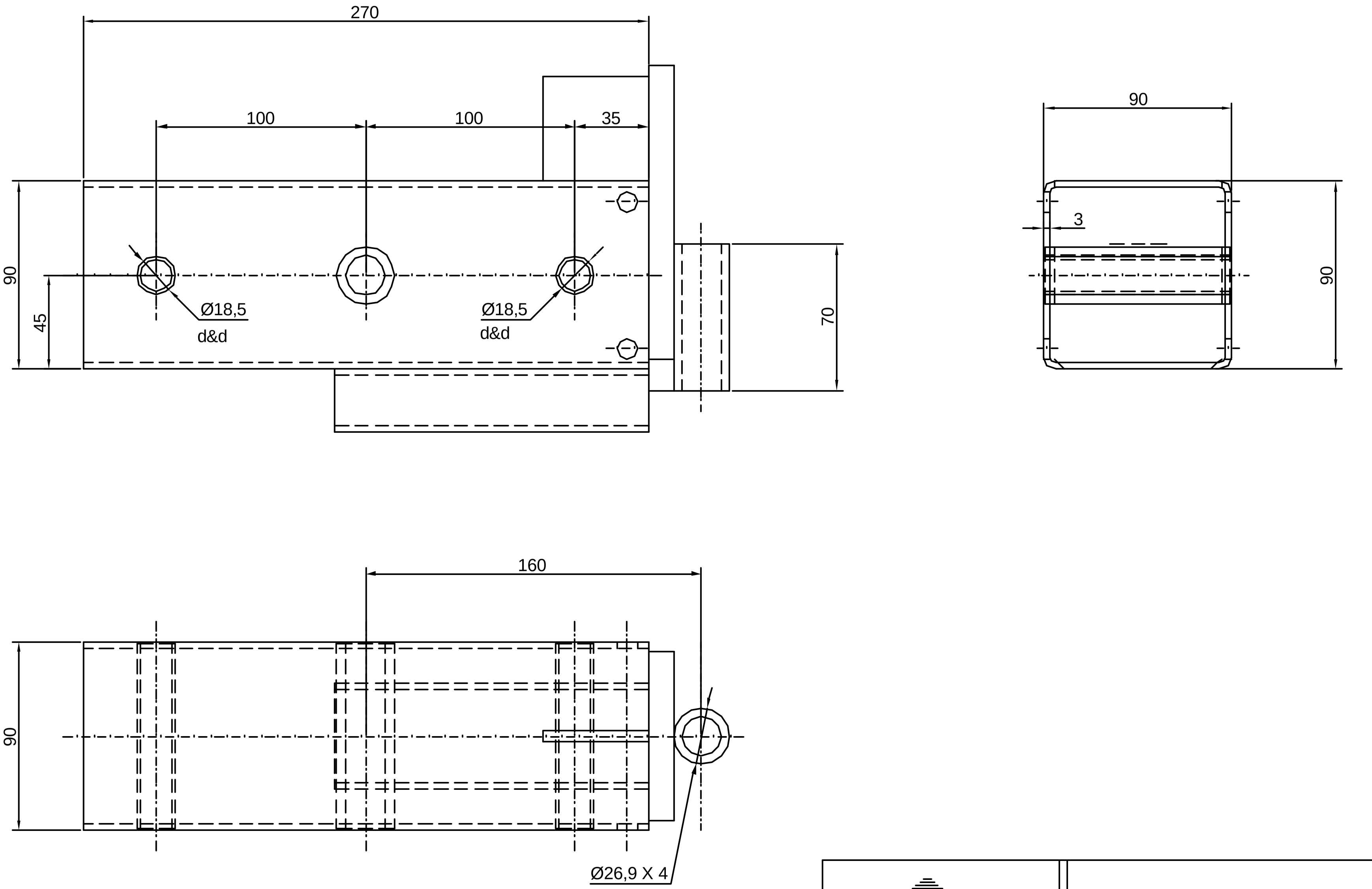


VELDEMAN
STRUCTURE SOLUTIONS
Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

Fig 6: Aluminium rail profile

PROJECTIE		NR. ONGEGALV.	
SCHAAL	A4		
DATUM	eb	CODENR.	BAL20_2.8E06

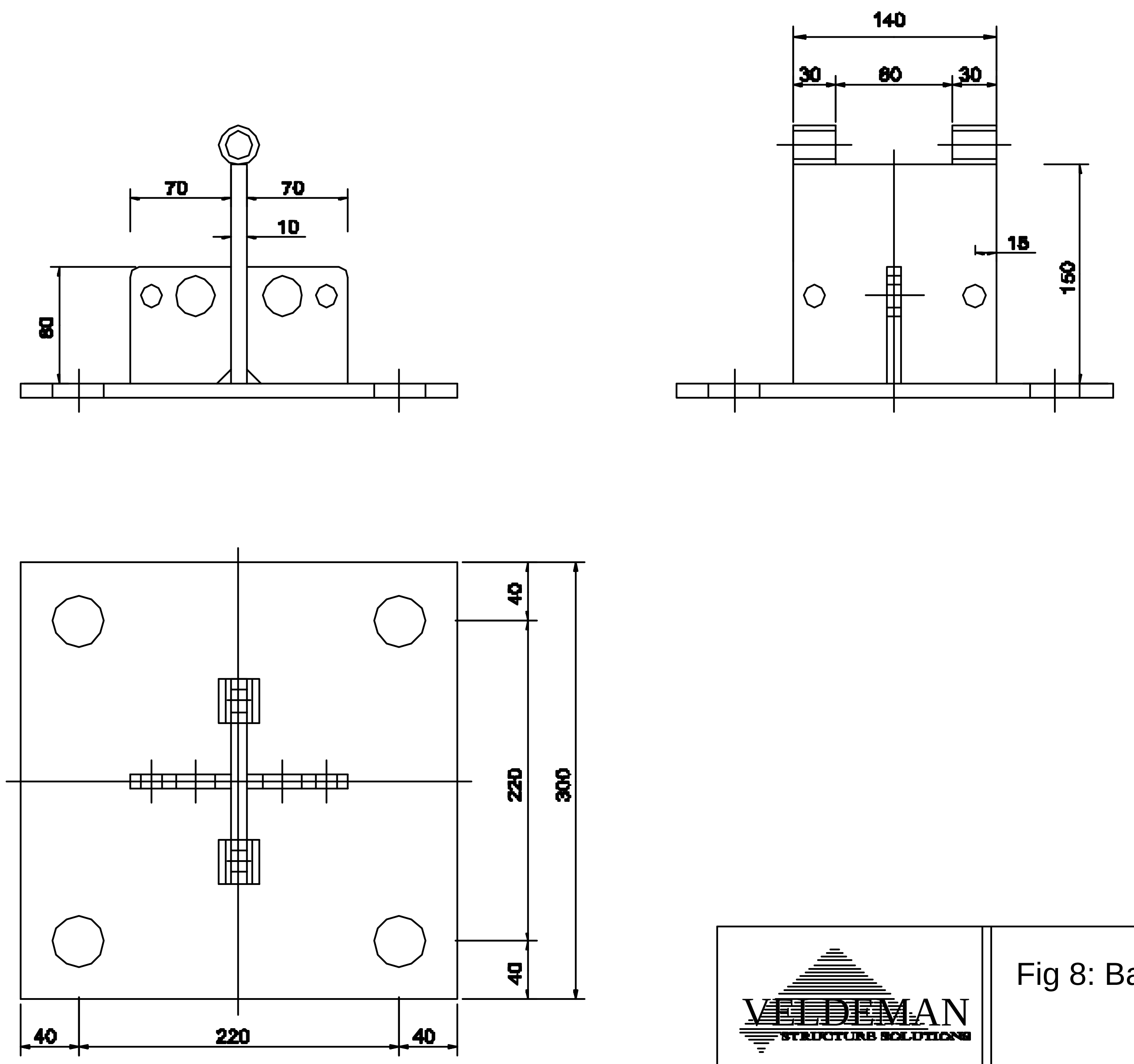
Datum afdruk : woensdag 10 mei 2006 14:26:10 Door : ####



VELDEMAN
STRUCTURE SOLUTIONS
Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77
[redacted]

Fig 7: Connection of arch to baseplate

PROJECTIE			NR. ONGEGALV.	
SCHAAL		A4	CODENR.	BAL20_2.8E07
DATUM		eb		



VELDEMAN
STRUCTURE SOLUTIONS

Georges Veldeman nv
Industrieterrein Vostert 1220
3960 Bree (Belgium)
Tel. +32 (0)89 47 31 31
Fax +32 (0)89 47 37 77

Fig 8: Baseplate

PROJECTIE		
SCHAAL		A4
DATUM	10/05/06	eb

NR. ONGEGALV.	
CODENR.	BAL20_2.8E08

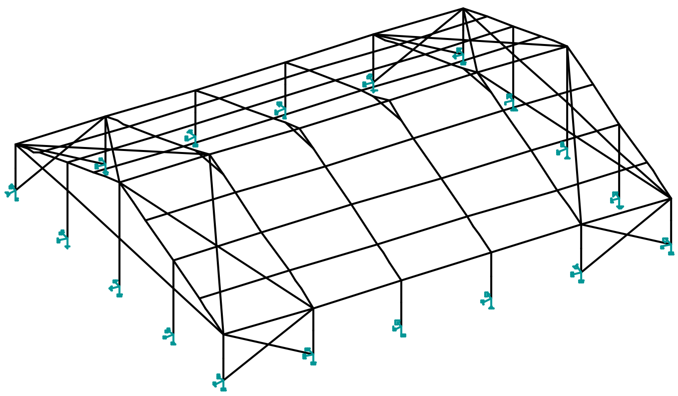
Datum afdruk : donderdag 11 mei 2006 15:20:34 Door : ####

VELDEMAN
STRUCTURE SOLUTIONS

ENCLOSURE 3 :

Print out of calculation results of the Alu 20m x 25m structure by program ESA PRIMA WIN (release 3.50.63).

Contents



Basic data
Type of structure : Frame XYZ

Number of nodes:	126
Number of members:	193
Number of 1D macros:	61
Number of bound. lines:	0
Number of 2D macros:	0
Number of profiles :	12
Number of cases:	9
Number of materials:	3

Material

Name:		
6061 T6		
	E modulus	71000.00 MPa
	Poisson coeff.	0.30
	Density	0.000 kg/mm^3
	Extensibility	2.4e-005 mm/mm.K
E 24		
	Ultimate strength	360.000 MPa
	Yield design	240.000 MPa
	E modulus	210000.00 MPa
	Poisson coeff.	0.30
	Density	0.000 kg/mm^3
	Extensibility	1.2e-005 mm/mm.K
6x37 +1TWK		
	Ultimate strength	1770.000 MPa
	Yield design	664.000 MPa
	E modulus	80000.00 MPa
	Poisson coeff.	0.30
	Density	0.000 kg/mm^3
	Extensibility	1.2e-005 mm/mm.K

List of material
Group of members : 1/193

no.	Name:	quality	unit weight kg/mm	length mm	weight kg
1	ALU 240 (General)	6061 T6	0.01	127809.45	800.60
2	ALU240/232 (General)	6061 T6	0.01	30685.04	384.42

no.	Name:	quality	unit weight kg/mm	length mm	weight kg
3	B42.4/3.2	E 24	0.00	10608.00	32.50
4	Alu133/70 (General)	6061 T6	0.00	75000.00	324.83
5	Alu60/60/3 (General)	6061 T6	0.00	150000.00	267.51
6	Alu130/70 (General)	6061 T6	0.00	40120.00	162.17
11	Alu133/70 (General)	6061 T6	0.00	28852.77	124.96
12	Dia 10 6x37 + 1TWK (R10)	6x37 +1TWK	0.00	138684.88	48.04

The total weight of the structure: 2145.04 kg
Surface for painting:
mm^2

Nodes

node	X mm	Y mm	Z mm
1	0	0	0
2	0	0	1355
3	0	0	2662
4	1189	0	3048
5	7530	0	5109
6	8704	0	5490
7	10030	0	5920
8	11356	0	5490
9	12530	0	5109
10	18871	0	3048
11	20060	0	2662
12	20060	0	1355
13	20060	0	0
14	15163	0	4253
15	17702	0	3428
16	2358	0	3428
17	4897	0	4253
18	0	5000	0
19	0	5000	1355
20	0	5000	2662
21	1189	5000	3048
22	2358	5000	3428
23	4897	5000	4253
24	7530	5000	5109
25	8704	5000	5490
26	10030	5000	5920

node	X mm	Y mm	Z mm
27	11356	5000	5490
28	12530	5000	5109
29	15163	5000	4253
30	17702	5000	3428
31	18871	5000	3048
32	20060	5000	2662
33	20060	5000	1355
34	20060	5000	0
35	0	10000	0
36	0	10000	1355
37	0	10000	2662
38	1189	10000	3048
39	2358	10000	3428
40	4897	10000	4253
41	7530	10000	5109
42	8704	10000	5490
43	10030	10000	5920
44	11356	10000	5490
45	12530	10000	5109
46	15163	10000	4253
47	17702	10000	3428
48	18871	10000	3048
49	20060	10000	2662
50	20060	10000	1355
51	20060	10000	0
52	0	15000	0
53	0	15000	1355
54	0	15000	2662
55	1189	15000	3048
56	2358	15000	3428
57	4897	15000	4253
58	7530	15000	5109
59	8704	15000	5490
60	10030	15000	5920
61	11356	15000	5490
62	12530	15000	5109
63	15163	15000	4253
64	17702	15000	3428
65	18871	15000	3048
66	20060	15000	2662
67	20060	15000	1355
68	20060	15000	0
69	0	20000	0

node	X mm	Y mm	Z mm
70	0	20000	1355
71	0	20000	2662
72	1189	20000	3048
73	2358	20000	3428
74	4897	20000	4253
75	7530	20000	5109
76	8704	20000	5490
77	10030	20000	5920
78	11356	20000	5490
79	12530	20000	5109
80	15163	20000	4253
81	17702	20000	3428
82	18871	20000	3048
83	20060	20000	2662
84	20060	20000	1355
85	20060	20000	0
86	0	25000	0
87	0	25000	1355
88	0	25000	2662
89	1189	25000	3048
90	2358	25000	3428
91	4897	25000	4253
92	7530	25000	5109
93	8704	25000	5490
94	10030	25000	5920
95	11356	25000	5490
96	12530	25000	5109
97	15163	25000	4253
98	17702	25000	3428
99	18871	25000	3048
100	20060	25000	2662
101	20060	25000	1355
102	20060	25000	0
103	10030	0	0
104	4897	0	0
105	15163	0	0
106	10030	0	2662
107	15163	0	2662
108	4897	0	2662
109	18287	25000	3238
110	1773	25000	3238
111	18287	20000	3238
112	1773	20000	3238

node	X mm	Y mm	Z mm
113	18287	15000	3238
114	1773	15000	3238
115	18287	10000	3238
116	1773	10000	3238
117	18287	5000	3238
118	1773	5000	3238
119	18287	0	3238
120	1773	0	3238
121	4897	25000	0
122	4897	25000	2662
123	15163	25000	0
124	15163	25000	2662
125	10030	25000	0
126	10030	25000	2662

Members

macro	memb	node 1	node 2	length mm	Rx deg	profile	quality
1	1	1	2	1355	0.00	1 - ALU 240 (General)	6061 T6
	2	2	3	1307	0.00	2 - ALU240/232 (General)	6061 T6
2	3	3	4	1250	0.00	2 - ALU240/232 (General)	6061 T6
	4	4	120	614	0.00	1 - ALU 240 (General)	6061 T6
	5	120	16	614	0.00	1 - ALU 240 (General)	6061 T6
	6	16	17	2670	0.00	1 - ALU 240 (General)	6061 T6
	7	17	5	2769	0.00	1 - ALU 240 (General)	6061 T6
	8	5	6	1234	0.00	1 - ALU 240 (General)	6061 T6
	9	6	7	1394	0.00	1 - ALU 240 (General)	6061 T6
3	10	18	19	1355	0.00	1 - ALU 240 (General)	6061 T6
	11	19	20	1307	0.00	2 - ALU240/232 (General)	6061 T6
4	12	20	21	1250	0.00	2 - ALU240/232 (General)	6061 T6
	13	21	118	614	0.00	1 - ALU 240 (General)	6061 T6
	14	118	22	614	0.00	1 - ALU 240 (General)	6061 T6
	15	22	23	2670	0.00	1 - ALU 240 (General)	6061 T6
	16	23	24	2769	0.00	1 - ALU 240 (General)	6061 T6
	17	24	25	1234	0.00	1 - ALU 240 (General)	6061 T6
	18	25	26	1394	0.00	1 - ALU 240 (General)	6061 T6
5	19	25	27	2652	0.00	3 - B42.4/3.2	E 24
6	20	35	36	1355	0.00	1 - ALU 240 (General)	6061 T6
	21	36	37	1307	0.00	2 - ALU240/232 (General)	6061 T6
7	22	37	38	1250	0.00	2 - ALU240/232 (General)	6061 T6

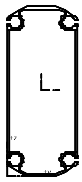
macro	memb	node 1	node 2	length mm	Rx deg	profile	quality
	23	38	116	614	0.00	1 - ALU 240 (General)	6061 T6
	24	116	39	614	0.00	1 - ALU 240 (General)	6061 T6
	25	39	40	2670	0.00	1 - ALU 240 (General)	6061 T6
	26	40	41	2769	0.00	1 - ALU 240 (General)	6061 T6
	27	41	42	1234	0.00	1 - ALU 240 (General)	6061 T6
	28	42	43	1394	0.00	1 - ALU 240 (General)	6061 T6
8	29	42	44	2652	0.00	3 - B42.4/3.2	E 24
9	30	52	53	1355	0.00	1 - ALU 240 (General)	6061 T6
	31	53	54	1307	0.00	2 - ALU240/232 (General)	6061 T6
10	32	54	55	1250	0.00	2 - ALU240/232 (General)	6061 T6
	33	55	114	614	0.00	1 - ALU 240 (General)	6061 T6
	34	114	56	614	0.00	1 - ALU 240 (General)	6061 T6
	35	56	57	2670	0.00	1 - ALU 240 (General)	6061 T6
	36	57	58	2769	0.00	1 - ALU 240 (General)	6061 T6
	37	58	59	1234	0.00	1 - ALU 240 (General)	6061 T6
	38	59	60	1394	0.00	1 - ALU 240 (General)	6061 T6
11	39	59	61	2652	0.00	3 - B42.4/3.2	E 24
12	40	69	70	1355	0.00	1 - ALU 240 (General)	6061 T6
	41	70	71	1307	0.00	2 - ALU240/232 (General)	6061 T6
13	42	71	72	1250	0.00	2 - ALU240/232 (General)	6061 T6
	43	72	112	614	0.00	1 - ALU 240 (General)	6061 T6
	44	112	73	614	0.00	1 - ALU 240 (General)	6061 T6
	45	73	74	2670	0.00	1 - ALU 240 (General)	6061 T6
	46	74	75	2769	0.00	1 - ALU 240 (General)	6061 T6
	47	75	76	1234	0.00	1 - ALU 240 (General)	6061 T6
	48	76	77	1394	0.00	1 - ALU 240 (General)	6061 T6
14	49	76	78	2652	0.00	3 - B42.4/3.2	E 24
15	50	86	87	1355	0.00	1 - ALU 240 (General)	6061 T6
	51	87	88	1307	0.00	2 - ALU240/232 (General)	6061 T6
16	52	88	89	1250	0.00	2 - ALU240/232 (General)	6061 T6
	53	89	110	614	0.00	1 - ALU 240 (General)	6061 T6
	54	110	90	614	0.00	1 - ALU 240 (General)	6061 T6
	55	90	91	2670	0.00	1 - ALU 240 (General)	6061 T6
	56	91	92	2769	0.00	1 - ALU 240 (General)	6061 T6
	57	92	93	1234	0.00	1 - ALU 240 (General)	6061 T6
	58	93	94	1394	0.00	1 - ALU 240 (General)	6061 T6
17	59	3	20	5000	0.00	4 - Alu133/70 (General)	6061 T6
	60	20	37	5000	0.00	4 - Alu133/70 (General)	6061 T6
	61	37	54	5000	0.00	4 - Alu133/70 (General)	6061 T6
	62	54	71	5000	0.00	4 - Alu133/70 (General)	6061 T6
	63	71	88	5000	0.00	4 - Alu133/70 (General)	6061 T6
18	64	7	26	5000	0.00	4 - Alu133/70 (General)	6061 T6
	65	26	43	5000	0.00	4 - Alu133/70 (General)	6061 T6

macro	memb	node 1	node 2	length mm	Rx deg	profile	quality
	66	43	60	5000	0.00	4 - Alu133/70 (General)	6061 T6
	67	60	77	5000	0.00	4 - Alu133/70 (General)	6061 T6
	68	77	94	5000	0.00	4 - Alu133/70 (General)	6061 T6
19	69	11	32	5000	0.00	4 - Alu133/70 (General)	6061 T6
	70	32	49	5000	0.00	4 - Alu133/70 (General)	6061 T6
	71	49	66	5000	0.00	4 - Alu133/70 (General)	6061 T6
	72	66	83	5000	0.00	4 - Alu133/70 (General)	6061 T6
	73	83	100	5000	0.00	4 - Alu133/70 (General)	6061 T6
20	74	16	22	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	75	22	39	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	76	39	56	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	77	56	73	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	78	73	90	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
21	79	17	23	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	80	23	40	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	81	40	57	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	82	57	74	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	83	74	91	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
22	84	5	24	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	85	24	41	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	86	41	58	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	87	58	75	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	88	75	92	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
23	89	9	28	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	90	28	45	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	91	45	62	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	92	62	79	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	93	79	96	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
24	94	14	29	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	95	29	46	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	96	46	63	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	97	63	80	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	98	80	97	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
25	99	15	30	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	100	30	47	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	101	47	64	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	102	64	81	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
	103	81	98	5000	0.00	5 - Alu60/60/3 (General)	6061 T6
26	104	104	108	2662	90.00	11 - Alu133/70 (General)	6061 T6
	105	108	17	1591	90.00	11 - Alu133/70 (General)	6061 T6
27	106	105	107	2662	90.00	11 - Alu133/70 (General)	6061 T6
	107	107	14	1591	90.00	11 - Alu133/70 (General)	6061 T6
28	108	103	106	2662	90.00	11 - Alu133/70 (General)	6061 T6

macro	memb	node 1	node 2	length mm	Rx deg	profile	quality
	109	106	7	3258	90.00	11 - Alu133/70 (General)	6061 T6
29	110	3	108	4897	90.00	6 - Alu130/70 (General)	6061 T6
	111	108	106	5133	90.00	6 - Alu130/70 (General)	6061 T6
	112	106	107	5133	90.00	6 - Alu130/70 (General)	6061 T6
	113	107	11	4897	90.00	6 - Alu130/70 (General)	6061 T6
30	114	13	32	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
31	115	34	11	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
32	116	11	26	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
33	117	32	7	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
34	118	1	20	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
35	119	18	3	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
36	120	3	26	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
37	121	20	7	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
38	122	121	122	2662	90.00	11 - Alu133/70 (General)	6061 T6
	123	122	91	1591	90.00	11 - Alu133/70 (General)	6061 T6
39	124	123	124	2662	90.00	11 - Alu133/70 (General)	6061 T6
	125	124	97	1591	90.00	11 - Alu133/70 (General)	6061 T6
40	126	125	126	2662	90.00	11 - Alu133/70 (General)	6061 T6
	127	126	94	3258	90.00	11 - Alu133/70 (General)	6061 T6
41	128	88	122	4897	90.00	6 - Alu130/70 (General)	6061 T6
	129	122	126	5133	90.00	6 - Alu130/70 (General)	6061 T6
	130	126	124	5133	90.00	6 - Alu130/70 (General)	6061 T6
	131	124	100	4897	90.00	6 - Alu130/70 (General)	6061 T6
42	132	85	100	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
43	133	102	83	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
44	134	83	94	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
45	135	100	77	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
46	136	69	88	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
47	137	86	71	5664	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
48	138	71	94	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
49	139	88	77	11671	0.00	12 - Dia 10 6x37 + 1TWK (R10...	6x37 +1TWK
50	140	13	12	1355	0.00	1 - ALU 240 (General)	6061 T6
	141	12	11	1307	0.00	2 - ALU240/232 (General)	6061 T6
51	142	34	33	1355	0.00	1 - ALU 240 (General)	6061 T6
	143	33	32	1307	0.00	2 - ALU240/232 (General)	6061 T6
52	144	51	50	1355	0.00	1 - ALU 240 (General)	6061 T6
	145	50	49	1307	0.00	2 - ALU240/232 (General)	6061 T6
53	146	68	67	1355	0.00	1 - ALU 240 (General)	6061 T6
	147	67	66	1307	0.00	2 - ALU240/232 (General)	6061 T6
54	148	85	84	1355	0.00	1 - ALU 240 (General)	6061 T6
	149	84	83	1307	0.00	2 - ALU240/232 (General)	6061 T6
55	150	102	101	1355	0.00	1 - ALU 240 (General)	6061 T6
	151	101	100	1307	0.00	2 - ALU240/232 (General)	6061 T6

macro	memb	node 1	node 2	length mm	Rx deg	profile	quality
56	152	11	10	1250	0.00	2 - ALU240/232 (General)	6061 T6
	153	10	119	614	0.00	1 - ALU 240 (General)	6061 T6
	154	119	15	614	0.00	1 - ALU 240 (General)	6061 T6
	155	15	14	2670	0.00	1 - ALU 240 (General)	6061 T6
	156	14	9	2769	0.00	1 - ALU 240 (General)	6061 T6
	157	9	8	1234	0.00	1 - ALU 240 (General)	6061 T6
	158	8	7	1394	0.00	1 - ALU 240 (General)	6061 T6
57	159	32	31	1250	0.00	2 - ALU240/232 (General)	6061 T6
	160	31	117	614	0.00	1 - ALU 240 (General)	6061 T6
	161	117	30	614	0.00	1 - ALU 240 (General)	6061 T6
	162	30	29	2670	0.00	1 - ALU 240 (General)	6061 T6
	163	29	28	2769	0.00	1 - ALU 240 (General)	6061 T6
	164	28	27	1234	0.00	1 - ALU 240 (General)	6061 T6
	165	27	26	1394	0.00	1 - ALU 240 (General)	6061 T6
58	166	49	48	1250	0.00	2 - ALU240/232 (General)	6061 T6
	167	48	115	614	0.00	1 - ALU 240 (General)	6061 T6
	168	115	47	614	0.00	1 - ALU 240 (General)	6061 T6
	169	47	46	2670	0.00	1 - ALU 240 (General)	6061 T6
	170	46	45	2769	0.00	1 - ALU 240 (General)	6061 T6
	171	45	44	1234	0.00	1 - ALU 240 (General)	6061 T6
	172	44	43	1394	0.00	1 - ALU 240 (General)	6061 T6
59	173	66	65	1250	0.00	2 - ALU240/232 (General)	6061 T6
	174	65	113	614	0.00	1 - ALU 240 (General)	6061 T6
	175	113	64	614	0.00	1 - ALU 240 (General)	6061 T6
	176	64	63	2670	0.00	1 - ALU 240 (General)	6061 T6
	177	63	62	2769	0.00	1 - ALU 240 (General)	6061 T6
	178	62	61	1234	0.00	1 - ALU 240 (General)	6061 T6
	179	61	60	1394	0.00	1 - ALU 240 (General)	6061 T6
60	180	83	82	1250	0.00	2 - ALU240/232 (General)	6061 T6
	181	82	111	614	0.00	1 - ALU 240 (General)	6061 T6
	182	111	81	614	0.00	1 - ALU 240 (General)	6061 T6
	183	81	80	2670	0.00	1 - ALU 240 (General)	6061 T6
	184	80	79	2769	0.00	1 - ALU 240 (General)	6061 T6
	185	79	78	1234	0.00	1 - ALU 240 (General)	6061 T6
	186	78	77	1394	0.00	1 - ALU 240 (General)	6061 T6
61	187	100	99	1250	0.00	2 - ALU240/232 (General)	6061 T6
	188	99	109	614	0.00	1 - ALU 240 (General)	6061 T6
	189	109	98	614	0.00	1 - ALU 240 (General)	6061 T6
	190	98	97	2670	0.00	1 - ALU 240 (General)	6061 T6
	191	97	96	2769	0.00	1 - ALU 240 (General)	6061 T6
	192	96	95	1234	0.00	1 - ALU 240 (General)	6061 T6
	193	95	94	1394	0.00	1 - ALU 240 (General)	6061 T6

Profiles

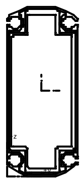


ALU 240 (General)

Profile no. 1 - ALU 240 (General)
Material : 1 - 6061 T6

A:	2.319993e+003 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	1.675432e+007 mm^4	Iz:	3.895877e+006 mm^4
Iyz:	3.870310e+000 mm^4	It:	2.065020e+007 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	1.396194e+005 mm^3	Welz:	7.791748e+004 mm^3
Wply:	1.788524e+005 mm^3	Wplz:	9.035651e+004 mm^3
cy:	50.00 mm	cz:	120.00 mm
iy:	84.98 mm	iz:	40.98 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section



ALU240/232 (General)

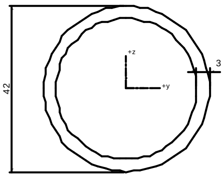
Profile no. 2 - ALU240/232 (General)
Material : 1 - 6061 T6

1	- 6061 T6
2	- 6061 T6

A:	4.690648e+003 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	3.291946e+007 mm^4	Iz:	6.585148e+006 mm^4
Iyz:	-1.390684e+001 mm^4	It:	3.950460e+007 mm^4
Iw:	0.000000e+000 mm^6		

A:	4.690648e+003 mm^2		
Wely:	2.743242e+005 mm^3	Welz:	1.317015e+005 mm^3
Wply:	3.570655e+005 mm^3	Wplz:	1.628792e+005 mm^3
cy:	50.00 mm	cz:	120.00 mm
iy:	83.77 mm	iz:	37.47 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section



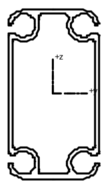
B42.4/3.2

Profile no. 3 - B42.4/3.2
Material : 2 - E 24

A:	3.902569e+002 mm^2		
Ay/A:	0.637	Az/A:	0.637
Iy:	7.472917e+004 mm^4	Iz:	7.472917e+004 mm^4
Iyz:	-3.011416e-007 mm^4	It:	1.513903e+005 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	3.524960e+003 mm^3	Welz:	3.550850e+003 mm^3
Wply:	4.877246e+003 mm^3	Wplz:	4.877246e+003 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	13.84 mm	iz:	13.84 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		133.03 mm	

Type for check: Circular hollow section

Diameter	42.40 mm	Thickness of web	3.20 mm

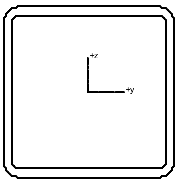


Alu133/70 (General)

Profile no. 4 - Alu133/70 (General)
Material : 1 - 6061 T6

A:	1.604102e+003 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	3.818656e+006 mm^4	Iz:	1.057790e+006 mm^4
Iyz:	2.525217e-008 mm^4	It:	4.876446e+006 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	5.742340e+004 mm^3	Welz:	3.022257e+004 mm^3
Wply:	7.213053e+004 mm^3	Wplz:	3.774137e+004 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	48.79 mm	iz:	25.68 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section

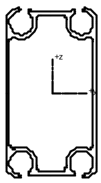


Alu60/60/3 (General)

Profile no. 5 - Alu60/60/3 (General)
Material : 1 - 6061 T6

A:	6.605234e+002 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	3.510982e+005 mm^4	Iz:	3.510982e+005 mm^4
Iyz:	-1.092637e+001 mm^4	It:	7.021964e+005 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	1.170302e+004 mm^3	Welz:	1.170302e+004 mm^3
Wply:	1.394310e+004 mm^3	Wplz:	1.394310e+004 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	23.06 mm	iz:	23.06 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section

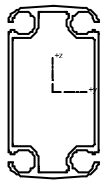


Alu130/70 (General)

Profile no. 6 - Alu130/70 (General)
Material : 1 - 6061 T6

A:	1.497113e+003 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	3.124341e+006 mm^4	Iz:	1.116041e+006 mm^4
Iyz:	6.637474e+002 mm^4	It:	4.240382e+006 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	4.805314e+004 mm^3	Welz:	3.187422e+004 mm^3
Wply:	6.307383e+004 mm^3	Wplz:	3.804318e+004 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	45.68 mm	iz:	27.30 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section

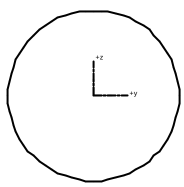


Alu133/70 (General)

Profile no. 11 - Alu133/70 (General)
Material : 1 - 6061 T6

A:	1.604102e+003 mm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	3.818656e+006 mm^4	Iz:	1.057790e+006 mm^4
Iyz:	2.525217e-008 mm^4	It:	4.876446e+006 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	5.742340e+004 mm^3	Welz:	3.022257e+004 mm^3
Wply:	7.213053e+004 mm^3	Wplz:	3.774137e+004 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	48.79 mm	iz:	25.68 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		0.00 mm	

Type for check: Untypical section

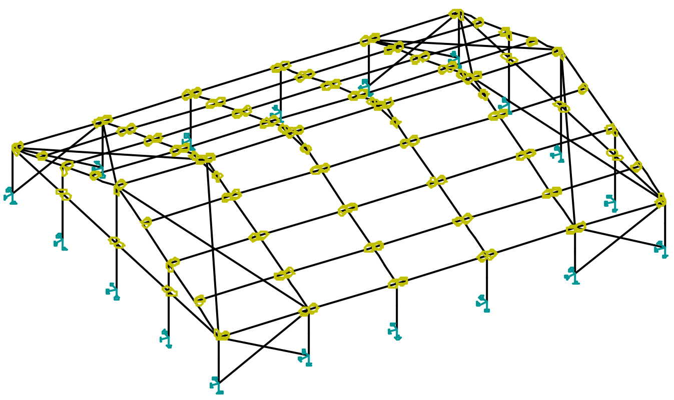


Dia 10 6x37 + 1TWK (R10)

Profile no. 12 - Dia 10 6x37 + 1TWK (R10)
Material : 3 - 6x37 +1TWK

A:	7.850000e+001 mm^2		
Ay/A:	0.850	Az/A:	0.850
Iy:	4.814015e+002 mm^4	Iz:	4.814015e+002 mm^4
Iyz:	0.000000e+000 mm^4	It:	9.628029e+002 mm^4
Iw:	0.000000e+000 mm^6		
Wely:	9.698743e+001 mm^3	Welz:	9.698743e+001 mm^3
Wply:	1.664764e+002 mm^3	Wplz:	1.664764e+002 mm^3
cy:	0.00 mm	cz:	0.00 mm
iy:	2.48 mm	iz:	2.48 mm
dy:	0.00 mm	dz:	0.00 mm
Outline :		31.38 mm	

Type for check: Untypical section



Hinges

Supports

support	node	type	Size mm
1	1	XYZ	0.00
2	13	XYZ	0.00

support	node	type	Size mm
3	18	XYZ	0.00
4	34	XYZ	0.00
5	35	XYZ	0.00
6	51	XYZ	0.00
7	52	XYZ	0.00
8	68	XYZ	0.00
9	69	XYZ	0.00
10	85	XYZ	0.00
11	86	XYZ	0.00
12	102	XYZ	0.00
13	103	XYZ	0.00
14	104	XYZ	0.00
15	105	XYZ	0.00
16	121	XYZ	0.00
17	123	XYZ	0.00
18	125	XYZ	0.00

Loadcases

Case	Name:	Description
1	self weight	Self weight. Direction -Z
2	dead load - fabric	Permanent - Loads
3	dead load - connections	Permanent - Loads
4	dead load - sum	Permanent Summational load case 2. dead load - fabric, 1.00 3. dead load - connections, 1.00
5	dead load - lights	Permanent - Loads
6	wind side over	Variable - wind Excl.
7	wind side under	Variable - wind Excl.
8	wind gable over	Variable - wind Excl.
9	wind gable under	Variable - wind Excl.

Variable loads group

Name:		Description
snow	Excl.	EC1 - load type Cat A : Domestic
wind	Excl.	EC1 - load type Cat A : Domestic

Loadcase no. 3 - nodal loads

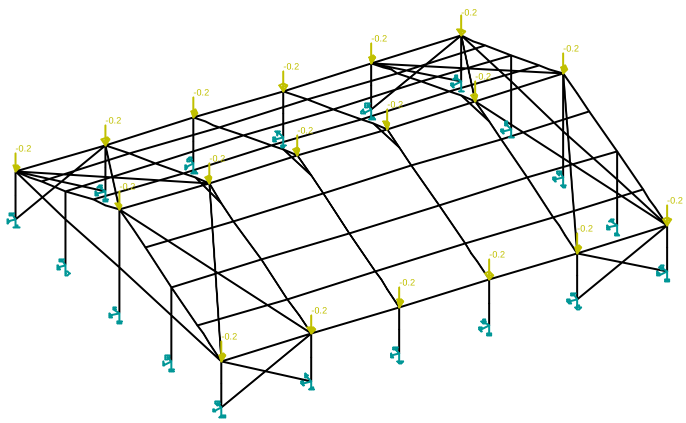
node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
3	0.00	0.00	-0.20	0.00	0.00	0.00
7	0.00	0.00	-0.20	0.00	0.00	0.00
11	0.00	0.00	-0.20	0.00	0.00	0.00
20	0.00	0.00	-0.20	0.00	0.00	0.00
26	0.00	0.00	-0.20	0.00	0.00	0.00
32	0.00	0.00	-0.20	0.00	0.00	0.00
37	0.00	0.00	-0.20	0.00	0.00	0.00
43	0.00	0.00	-0.20	0.00	0.00	0.00
49	0.00	0.00	-0.20	0.00	0.00	0.00
54	0.00	0.00	-0.20	0.00	0.00	0.00
60	0.00	0.00	-0.20	0.00	0.00	0.00
66	0.00	0.00	-0.20	0.00	0.00	0.00
71	0.00	0.00	-0.20	0.00	0.00	0.00
77	0.00	0.00	-0.20	0.00	0.00	0.00
83	0.00	0.00	-0.20	0.00	0.00	0.00
88	0.00	0.00	-0.20	0.00	0.00	0.00
94	0.00	0.00	-0.20	0.00	0.00	0.00
100	0.00	0.00	-0.20	0.00	0.00	0.00

Loadcase no. 4 - nodal loads

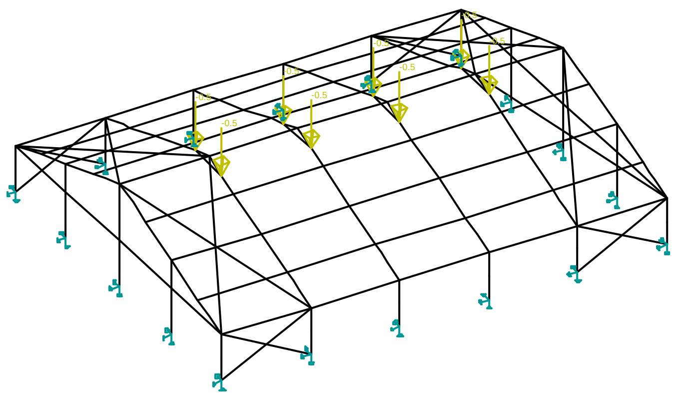
node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
3	0.00	0.00	-0.20	0.00	0.00	0.00
7	0.00	0.00	-0.20	0.00	0.00	0.00
11	0.00	0.00	-0.20	0.00	0.00	0.00
20	0.00	0.00	-0.20	0.00	0.00	0.00
26	0.00	0.00	-0.20	0.00	0.00	0.00
32	0.00	0.00	-0.20	0.00	0.00	0.00
37	0.00	0.00	-0.20	0.00	0.00	0.00
43	0.00	0.00	-0.20	0.00	0.00	0.00
49	0.00	0.00	-0.20	0.00	0.00	0.00
54	0.00	0.00	-0.20	0.00	0.00	0.00
60	0.00	0.00	-0.20	0.00	0.00	0.00
66	0.00	0.00	-0.20	0.00	0.00	0.00
71	0.00	0.00	-0.20	0.00	0.00	0.00
77	0.00	0.00	-0.20	0.00	0.00	0.00
83	0.00	0.00	-0.20	0.00	0.00	0.00
88	0.00	0.00	-0.20	0.00	0.00	0.00
94	0.00	0.00	-0.20	0.00	0.00	0.00
100	0.00	0.00	-0.20	0.00	0.00	0.00

Loadcase no. 5 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
25	0.00	0.00	-0.50	0.00	0.00	0.00
27	0.00	0.00	-0.50	0.00	0.00	0.00
42	0.00	0.00	-0.50	0.00	0.00	0.00
44	0.00	0.00	-0.50	0.00	0.00	0.00
59	0.00	0.00	-0.50	0.00	0.00	0.00
61	0.00	0.00	-0.50	0.00	0.00	0.00
76	0.00	0.00	-0.50	0.00	0.00	0.00
78	0.00	0.00	-0.50	0.00	0.00	0.00



Nodal loads.Loadcases - 3



Nodal loads.Loadcases - 5

Loadcase no. 2 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
2	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
7	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
10	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
13	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
16	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
56	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
57	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
58	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
59	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
60	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
61	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02

Loadcase no. 4 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
2	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
7	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
10	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
13	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
16	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
56	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02
57	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
58	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
59	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
60	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.03 -0.03
61	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-0.02 -0.02

Loadcase no. 6 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
1	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.26 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.27	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	-0.27 -0.26	0.00 0.00
2	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.04 0.04
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	-0.13 0.00	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	-0.24 -0.26	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	-0.26 -0.13	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.04 0.04
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 -0.04	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	-0.04 -0.06	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	-0.06 -0.08	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	-0.08 -0.13	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	-0.13 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 -0.18	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	-0.18 -0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	-0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 -0.24	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00
3	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.00 -2.00
4	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.09 0.09
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.07 0.07
6	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.00 -2.00
7	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.07 0.07
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.09 0.09
9	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.00 -2.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
10	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.07 0.07
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.09 0.09
12	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.00 -2.00
13	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.07 0.07
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.09 0.09
15	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.27 0.26	0.00 0.00
16	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.04 0.04
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.08 0.13	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.04 0.06	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.06 0.08	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.18 0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.24	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.24 0.26	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.18	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.04 0.04
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.04	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.26 0.13	0.00 0.00
26	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.53 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 -0.27	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	-0.27 -0.28	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	-0.53 -0.53	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	-0.28 -0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 -0.53	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	-0.00 0.00	0.00 0.00
27	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	-0.28 -0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 -0.27	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	-0.00 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 -0.53	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	-0.53 -0.53	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	-0.27 -0.28	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.53 0.00	0.00 0.00
28	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.53	0.00 0.00
	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.53 0.00	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 -0.55	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	-0.55 0.00	0.00 0.00
29	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	-0.46 -0.37	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	-0.54 -0.46	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.53	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	-0.53 -0.54	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	-0.31 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 -0.37	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	-0.37 -0.46	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.31	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	-0.31 -0.32	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	-0.54 -0.53	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	-0.53 0.00	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	-0.46 -0.54	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 -0.27	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	-0.27 -0.38	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	-0.38 -0.32	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	-0.32 -0.32	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	-0.32 -0.31	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	-0.27 0.00	0.00 0.00
	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	-0.32 -0.38	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	-0.38 -0.27	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	-0.37 0.00	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	-0.32 -0.32	0.00 0.00
38	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.53 0.53	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.28 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.27 0.28	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
39	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.53 0.53	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.27 0.28	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.28 0.00	0.00 0.00
40	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 0.55	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	0.55 0.00	0.00 0.00
41	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.32 0.38	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.31	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.31 0.32	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.32 0.32	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	0.54 0.53	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	0.53 0.54	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	0.54 0.46	0.00 0.00
	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	0.46 0.37	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.37 0.00	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	0.38 0.27	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.27 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.37	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.37 0.46	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	0.46 0.54	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.31 0.00	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.32 0.32	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.27 0.38	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	0.38 0.32	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.32 0.31	0.00 0.00
50	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.50 -0.50
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.26 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.27	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	-0.27 -0.26	0.00 0.00
51	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
52	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
53	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
54	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
55	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.27 0.26	0.00 0.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.50 -0.50
56	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	-0.26 -0.13	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	-0.13 0.00	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	-0.06 -0.08	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 -0.04	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	-0.18 -0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	-0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 -0.24	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	-0.24 -0.26	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	-0.04 -0.06	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 -0.18	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	-0.13 0.00	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	-0.08 -0.13	0.00 0.00
57	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
58	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
59	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
60	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
61	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.04 0.06	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.06 0.08	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.08 0.13	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.18 0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.24	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.24 0.26	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.26 0.13	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.04	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.18	0.00 0.00

Loadcase no. 7 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
1	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.31 -1.31
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.10 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	-0.10 -0.10	0.00 0.00
2	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.33 -0.33
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	-0.05 0.00	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	-0.09 -0.10	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	-0.10 -0.05	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.28 -0.28
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 -0.01	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	-0.01 -0.02	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	-0.02 -0.03	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	-0.03 -0.05	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	-0.05 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 -0.07	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	-0.07 -0.09	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	-0.09 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 -0.09	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.08	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	-0.08 0.00	0.00 0.00
3	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.63 -2.63
4	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.66 -0.66
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.55 -0.55
6	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.63 -2.63
7	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.55 -0.55
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.66 -0.66
9	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.63 -2.63
10	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.55 -0.55
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.66 -0.66
12	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-2.63 -2.63
13	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.55 -0.55
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.66 -0.66

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
15	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.31 -1.31
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.10 0.10	0.00 0.00
16	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.28 -0.28
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.03 0.05	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.01 0.02	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.02 0.03	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.07 0.09	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.09 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.09	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.09 0.10	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.07	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.33 -0.33
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.01	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.08 0.00	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.10 0.05	0.00 0.00
26	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 -0.10	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	-0.10 -0.11	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	-0.20 -0.20	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	-0.11 -0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	-0.00 0.00	0.00 0.00
27	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	-0.11 -0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 -0.10	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	-0.00 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	-0.20 -0.20	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	-0.10 -0.11	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00
28	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 -0.21	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	-0.21 0.00	0.00 0.00
29	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	-0.17 -0.14	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	-0.20 -0.17	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.20	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	-0.20 -0.20	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	-0.12 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 -0.14	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	-0.14 -0.17	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.12	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	-0.12 -0.12	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	-0.20 -0.20	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	-0.20 0.00	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	-0.17 -0.20	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 -0.10	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	-0.10 -0.14	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	-0.14 -0.12	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	-0.12 -0.12	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	-0.12 -0.12	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	-0.10 0.00	0.00 0.00
	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	-0.12 -0.14	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	-0.14 -0.10	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	-0.14 0.00	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	-0.12 -0.12	0.00 0.00
38	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.11 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.10 0.11	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
39	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.10 0.11	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.11 0.00	0.00 0.00
40	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 0.21	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	0.21 0.00	0.00 0.00
41	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.12 0.14	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.12	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	0.20 0.17	0.00 0.00
	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	0.17 0.14	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.14 0.00	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	0.14 0.10	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.14	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.14 0.17	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	0.17 0.20	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.12 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.10 0.14	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	0.14 0.12	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
50	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.19 -0.19
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	-0.10 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	-0.10 -0.10	0.00 0.00
51	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
52	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
53	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
54	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
55	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.10 0.10	0.00 0.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.19 -0.19
56	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	-0.10 -0.05	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	-0.05 0.00	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	-0.08 0.00	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	-0.02 -0.03	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 -0.08	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 -0.01	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	-0.07 -0.09	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	-0.09 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 -0.09	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	-0.09 -0.10	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	-0.01 -0.02	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 -0.07	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	-0.05 0.00	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	-0.03 -0.05	0.00 0.00
57	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
58	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
59	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
60	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
61	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.08 0.00	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.01 0.02	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.02 0.03	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.03 0.05	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.07 0.09	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.09 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.09	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.09 0.10	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.10 0.05	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.01	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.07	0.00 0.00

Loadcase no. 8 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
1	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.52 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.53 0.52	0.00 0.00
2	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.49 0.51	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.51 0.26	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.08 0.12	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.12 0.16	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.16 0.27	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.27 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.37	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.37 0.50	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.50 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.49	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.41	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.41 0.00	0.00 0.00
3	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
4	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
6	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
7	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
9	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
10	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
12	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
13	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
15	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.27 0.26	0.00 0.00
16	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.08 0.13	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.04 0.06	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.06 0.08	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.18 0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.24	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.24 0.26	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.18	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.04	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.26 0.13	0.00 0.00
26	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.06 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.54	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.54 0.56	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	1.06 1.06	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.56 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 1.06	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
27	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.56 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.54	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 1.06	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	1.06 1.06	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.54 0.56	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.06 0.00	0.00 0.00
28	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 1.06	0.00 0.00
	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.06 0.00	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 1.10	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	1.10 0.00	0.00 0.00
29	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	0.93 0.74	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	1.08 0.93	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 1.06	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	1.06 1.08	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.62 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.74	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.74 0.93	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.62	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.62 0.64	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	1.08 1.06	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	1.06 0.00	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	0.93 1.08	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.54	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.54 0.76	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	0.76 0.65	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.65 0.64	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.64 0.62	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.54 0.00	0.00 0.00
	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.65 0.76	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	0.76 0.54	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.74 0.00	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.64 0.65	0.00 0.00
38	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.53 0.53	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.28 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.27 0.28	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
39	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.53 0.53	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.27 0.28	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.28 0.00	0.00 0.00
40	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 0.55	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	0.55 0.00	0.00 0.00
41	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.32 0.38	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.31	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.31 0.32	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.32 0.32	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	0.54 0.53	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	0.53 0.54	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	0.54 0.46	0.00 0.00
	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	0.46 0.37	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.37 0.00	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	0.38 0.27	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.27 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.37	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.37 0.46	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	0.46 0.54	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.31 0.00	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.32 0.32	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.27 0.38	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	0.38 0.32	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.32 0.31	0.00 0.00
50	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.50 -0.50

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.52 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.53 0.52	0.00 0.00
51	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
52	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
53	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
54	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-1.00 -1.00
55	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.27	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.27 0.26	0.00 0.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.50 -0.50
56	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.51 0.26	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.26 0.00	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.41 0.00	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.12 0.16	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.41	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.37 0.50	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.50 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.49	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.49 0.51	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.08 0.12	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.37	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.27 0.00	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.16 0.27	0.00 0.00
57	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
58	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
59	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
60	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.00 1.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	1.20 1.20
61	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.50 0.50
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.04 0.06	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.06 0.08	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.08 0.13	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.60 0.60
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.18 0.25	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.25 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.24	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.24 0.26	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.26 0.13	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.13 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.04	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.18	0.00 0.00

Loadcase no. 9 - distributed loads

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
1	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.69 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.70	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.70 0.69	0.00 0.00
2	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.35 0.00	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.64 0.67	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.67 0.35	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.10 0.15	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.15 0.20	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.20 0.35	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.35 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.48	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.48 0.66	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.66 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.64	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
3	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
4	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
6	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
7	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
9	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
10	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
12	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
13	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
15	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.10 0.10	0.00 0.00
16	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.03 0.05	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.01 0.02	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.02 0.03	0.00 0.00
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.07 0.09	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.09 0.00	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.09	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.09 0.10	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.07	0.00 0.00
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.01	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.08 0.00	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.10 0.05	0.00 0.00
26	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.40 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.70	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.70 0.74	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	1.40 1.40	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.74 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 1.40	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
27	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.74 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.70	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 1.40	0.00 0.00
	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	1.40 1.40	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.70 0.74	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.40 0.00	0.00 0.00

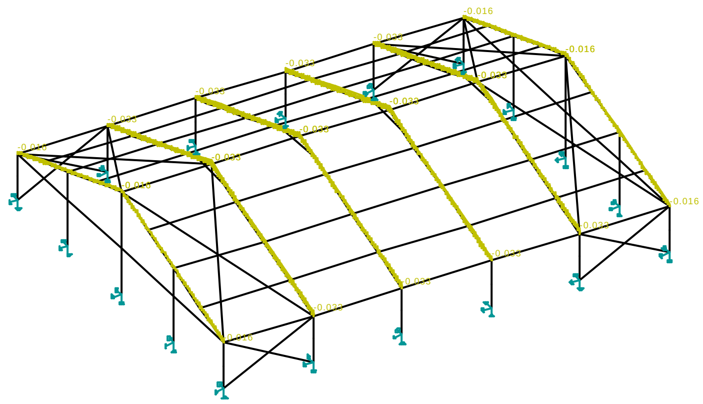
macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
28	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 1.40	0.00 0.00
	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	1.40 0.00	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 1.44	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	1.44 0.00	0.00 0.00
29	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	1.22 0.97	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	1.42 1.22	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 1.40	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	1.40 1.42	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.81 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.97	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.97 1.22	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.81	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.81 0.84	0.00 0.00
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	1.42 1.40	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	1.40 0.00	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	1.22 1.42	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.71	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.71 1.00	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	1.00 0.85	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.85 0.84	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.84 0.81	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.71 0.00	0.00 0.00
	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.85 1.00	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	1.00 0.71	0.00 0.00

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.97 0.00	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.84 0.85	0.00 0.00
38	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.11 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.10 0.11	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
39	force kN/m	1330.99 abs 1331.01	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	0.00 abs 1330.99	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	4252.50 abs 4252.82	0.00	0.00	glo len	0.00 0.00	0.00 0.00	0.00 0.00
	force kN/m	3331.55 abs 3583.64	0.00	0.00	glo len	0.00 0.00	0.10 0.11	0.00 0.00
	force kN/m	1331.01 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	2662.00 abs 3331.55	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3583.64 abs 4252.50	0.00	0.00	glo len	0.00 0.00	0.11 0.00	0.00 0.00
40	force kN/m	1331.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	2662.00 abs 4033.47	0.00	0.00	glo len	0.00 0.00	0.00 0.21	0.00 0.00
	force kN/m	4033.47 abs 5920.00	0.00	0.00	glo len	0.00 0.00	0.21 0.00	0.00 0.00
41	force kN/m	1756.89 abs 3565.98	0.00	0.00	glo len	0.00 0.00	0.12 0.14	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.12	0.00 0.00
	force kN/m	1331.00 abs 1756.79	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
	force kN/m	1756.79 abs 1756.89	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00

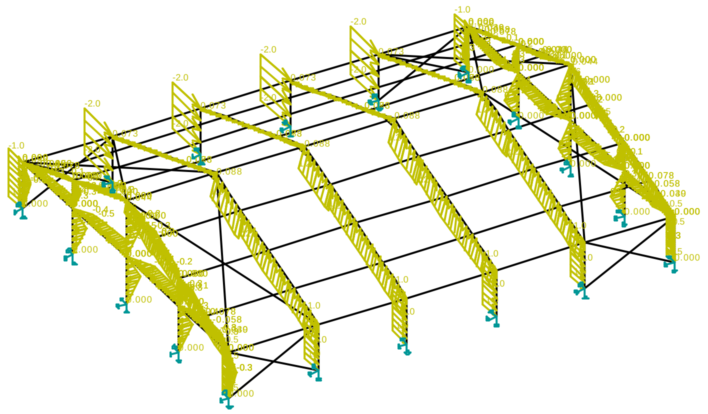
macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
	force kN/m	8654.25 abs 8699.00	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	8699.00 abs 10030.00	0.00	0.00	glo len	0.00 0.00	0.20 0.00	0.00 0.00
	force kN/m	10030.00 abs 11361.00	0.00	0.00	glo len	0.00 0.00	0.00 0.20	0.00 0.00
	force kN/m	11361.00 abs 11405.75	0.00	0.00	glo len	0.00 0.00	0.20 0.20	0.00 0.00
	force kN/m	11405.75 abs 13832.02	0.00	0.00	glo len	0.00 0.00	0.20 0.17	0.00 0.00
	force kN/m	13832.02 abs 14235.62	0.00	0.00	glo len	0.00 0.00	0.17 0.14	0.00 0.00
	force kN/m	14235.62 abs 15163.02	0.00	0.00	glo len	0.00 0.00	0.14 0.00	0.00 0.00
	force kN/m	15163.02 abs 15836.76	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	3565.98 abs 4223.24	0.00	0.00	glo len	0.00 0.00	0.14 0.10	0.00 0.00
	force kN/m	4223.24 abs 4896.98	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	4896.98 abs 5824.38	0.00	0.00	glo len	0.00 0.00	0.00 0.14	0.00 0.00
	force kN/m	5824.38 abs 6227.98	0.00	0.00	glo len	0.00 0.00	0.14 0.17	0.00 0.00
	force kN/m	6227.98 abs 8654.25	0.00	0.00	glo len	0.00 0.00	0.17 0.20	0.00 0.00
	force kN/m	18729.00 abs 20060.00	0.00	0.00	glo len	0.00 0.00	0.12 0.00	0.00 0.00
	force kN/m	18303.11 abs 18303.21	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
	force kN/m	15836.76 abs 16494.02	0.00	0.00	glo len	0.00 0.00	0.10 0.14	0.00 0.00
	force kN/m	16494.02 abs 18303.11	0.00	0.00	glo len	0.00 0.00	0.14 0.12	0.00 0.00
	force kN/m	18303.21 abs 18729.00	0.00	0.00	glo len	0.00 0.00	0.12 0.12	0.00 0.00
50	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.19 -0.19
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.69 0.00	0.00 0.00
	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.70	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.70 0.69	0.00 0.00
51	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
52	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38

macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
53	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
54	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.38 -0.38
55	force kN/m	0.00 abs 1331.00	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	1331.00 abs 1355.00	0.00	0.00	glo len	0.00 0.00	0.10 0.10	0.00 0.00
	force kN/m	1355.00 abs 2662.00	0.00	0.00	glo len	0.00 0.00	0.10 0.00	0.00 0.00
	force kN/m	0.00 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	-0.19 -0.19
56	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.67 0.35	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.35 0.00	0.00 0.00
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.53 0.00	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.15 0.20	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.53	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.10	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.48 0.66	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.66 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.64	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.64 0.67	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.10 0.15	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.48	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.35 0.00	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.20 0.35	0.00 0.00
57	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38

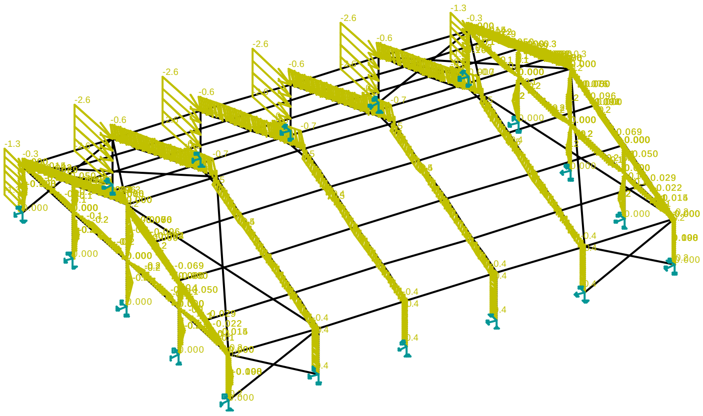
macro	type	dx mm	exY mm	exZ mm		X beg end	Y beg end	Z beg end
58	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
59	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
60	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.45 0.45
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.38 0.38
61	force kN/m	0.72 rel 1.00	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.23 0.23
	force kN/m	9152.00 abs 10545.87	0.00	0.00	glo len	0.00 0.00	0.08 0.00	0.00 0.00
	force kN/m	1250.09 abs 1864.54	0.00	0.00	glo len	0.00 0.00	0.01 0.02	0.00 0.00
	force kN/m	1864.54 abs 2479.00	0.00	0.00	glo len	0.00 0.00	0.02 0.03	0.00 0.00
	force kN/m	2479.00 abs 4232.83	0.00	0.00	glo len	0.00 0.00	0.03 0.05	0.00 0.00
	force kN/m	4232.83 abs 5148.30	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	0.00 rel 0.72	0.00	0.00	loc len	0.00 0.00	0.00 0.00	0.19 0.19
	force kN/m	5814.57 abs 7917.53	0.00	0.00	glo len	0.00 0.00	0.07 0.09	0.00 0.00
	force kN/m	7917.53 abs 7917.62	0.00	0.00	glo len	0.00 0.00	0.09 0.00	0.00 0.00
	force kN/m	7917.62 abs 7918.08	0.00	0.00	glo len	0.00 0.00	0.00 0.09	0.00 0.00
	force kN/m	7918.08 abs 8297.94	0.00	0.00	glo len	0.00 0.00	0.09 0.10	0.00 0.00
	force kN/m	8297.94 abs 9151.82	0.00	0.00	glo len	0.00 0.00	0.10 0.05	0.00 0.00
	force kN/m	9151.82 abs 9151.90	0.00	0.00	glo len	0.00 0.00	0.05 0.00	0.00 0.00
	force kN/m	9151.90 abs 9152.00	0.00	0.00	glo len	0.00 0.00	0.00 0.08	0.00 0.00
	force kN/m	0.00 abs 1250.09	0.00	0.00	glo len	0.00 0.00	0.00 0.01	0.00 0.00
	force kN/m	5149.37 abs 5814.57	0.00	0.00	glo len	0.00 0.00	0.00 0.07	0.00 0.00



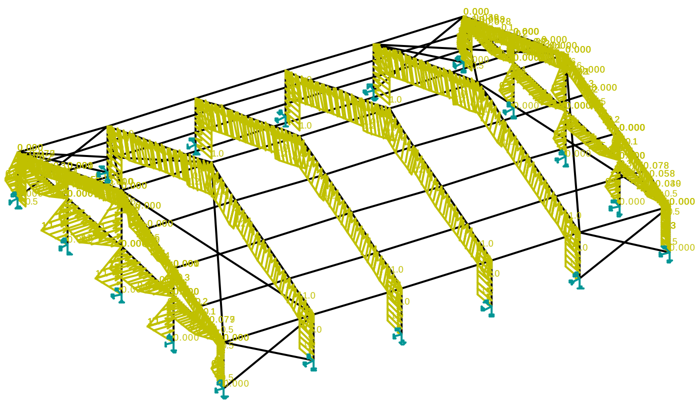
Distributed loads.Loadcases - 2



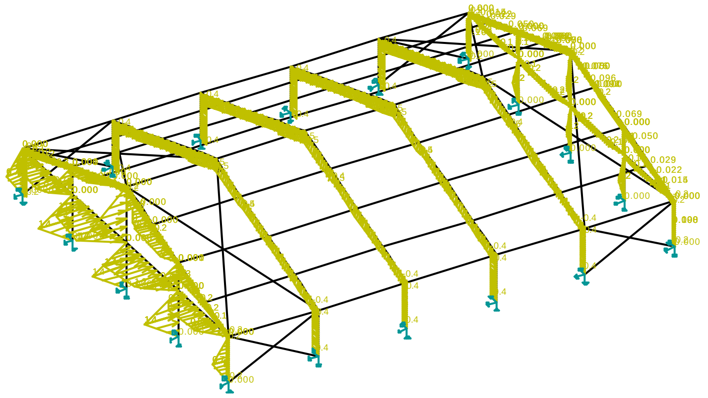
Distributed loads.Loadcases - 6



Distributed loads.Loadcases - 7



Distributed loads.Loadcases - 8



Distributed loads.Loadcases - 9

Combinations

Combi	Norm	Case	coeff
1.	EC simple-ultimate	1 self weight	1.00
		4 dead load - sum	1.00
		5 dead load - lights	1.00
		6 wind side over	1.00
		7 wind side under	1.00
		8 wind gable over	1.00
		9 wind gable under	1.00

Basic rules for generation of ultimate load combinations:
1 : 1.35*LC1 / 1.35*LC4 / 1.35*LC5
2 : 1.35*LC1 / 1.35*LC4 / 1.35*LC5 / 1.50*LC6 / 1.50*LC7 / 1.50*LC8 / 1.50*LC9
3 : 1.00*LC1 / 1.00*LC4 / 1.00*LC5 / 1.50*LC6 / 1.50*LC7 / 1.50*LC8 / 1.50*LC9

List of extreme ultimate load combinations
1/ 3 : +1.00*LC1+1.00*LC4+1.00*LC5
2/ 1 : +1.35*LC1+1.35*LC4+1.35*LC5
3/ 3 : +1.00*LC1+1.00*LC4+1.00*LC5+1.50*LC6
4/ 3 : +1.00*LC1+1.00*LC4+1.00*LC5+1.50*LC7
5/ 3 : +1.00*LC1+1.00*LC4+1.00*LC5+1.50*LC8
6/ 3 : +1.00*LC1+1.00*LC4+1.00*LC5+1.50*LC9
7/ 2 : +1.35*LC1+1.35*LC4+1.35*LC5+1.50*LC6

8/ 2 : +1.35*LC1+1.35*LC4+1.35*LC5+1.50*LC7
9/ 2 : +1.35*LC1+1.35*LC4+1.35*LC5+1.50*LC8
10/ 2 : +1.35*LC1+1.35*LC4+1.35*LC5+1.50*LC9

Nonlinear combination

Combi	Group of init. deformations	dx mm/m	dy mm/m	Group of init. curvatures	Case	coeff
C 1	0	0.00	0.00	0	1 self weight	1.00
	0	0.00	0.00	0	4 dead load - sum	1.00
	0	0.00	0.00	0	5 dead load - lights	1.00
C 2	0	0.00	0.00	0	1 self weight	1.35
	0	0.00	0.00	0	4 dead load - sum	1.35
	0	0.00	0.00	0	5 dead load - lights	1.35
C 3	0	0.00	0.00	0	1 self weight	1.00
	0	0.00	0.00	0	4 dead load - sum	1.00
	0	0.00	0.00	0	5 dead load - lights	1.00
	0	0.00	0.00	0	6 wind side over	1.50
C 4	0	0.00	0.00	0	1 self weight	1.00
	0	0.00	0.00	0	4 dead load - sum	1.00
	0	0.00	0.00	0	5 dead load - lights	1.00
	0	0.00	0.00	0	7 wind side under	1.50
C 5	0	0.00	0.00	0	1 self weight	1.00
	0	0.00	0.00	0	4 dead load - sum	1.00
	0	0.00	0.00	0	5 dead load - lights	1.00
	0	0.00	0.00	0	8 wind gable over	1.50
C 6	0	0.00	0.00	0	1 self weight	1.00
	0	0.00	0.00	0	4 dead load - sum	1.00
	0	0.00	0.00	0	5 dead load - lights	1.00
	0	0.00	0.00	0	9 wind gable under	1.50
C 7	0	0.00	0.00	0	1 self weight	1.35
	0	0.00	0.00	0	4 dead load - sum	1.35
	0	0.00	0.00	0	5 dead load - lights	1.35
	0	0.00	0.00	0	6 wind side over	1.50
C 8	0	0.00	0.00	0	1 self weight	1.35
	0	0.00	0.00	0	4 dead load - sum	1.35
	0	0.00	0.00	0	5 dead load - lights	1.35
	0	0.00	0.00	0	7 wind side under	1.50
C 9	0	0.00	0.00	0	1 self weight	1.35
	0	0.00	0.00	0	4 dead load - sum	1.35
	0	0.00	0.00	0	5 dead load - lights	1.35
	0	0.00	0.00	0	8 wind gable over	1.50
C 10	0	0.00	0.00	0	1 self weight	1.35
	0	0.00	0.00	0	4 dead load - sum	1.35
	0	0.00	0.00	0	5 dead load - lights	1.35

Combi	Group of init. deformations	dx mm/m	dy mm/m	Group of init. curvatures	Case	coeff
	0	0.00	0.00	0	9 wind gable under	1.50

Internal forces on foot (alu240)

Group of member(s) :1,10,20,30,40,50,140,142,144,146,148,150
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
1	1	3	1355.0	**6.5**	0.5	6.9	0.0	10.6	0.9
		10	0.0	**-3.0**	-0.8	-0.3	-0.0	0.0	0.0
		8	1355.0	5.5	0.2	7.0	0.0	**11.3**	0.4
		9	677.5	1.1	-0.3	0.0	-0.0	**-0.2**	-0.3
10		5	1355.0	**2.8**	-0.3	3.1	-0.0	2.8	-0.4
		8	0.0	**-9.7**	-0.0	3.5	0.0	-0.0	0.0
		3	1355.0	-0.4	-0.0	3.8	-0.0	**7.9**	-0.0
		10		-6.7	-0.3	-3.1	0.0	**-4.7**	-0.4
20		5		**13.2**	-0.2	9.5	-0.0	11.4	-0.3
		8	0.0	**-6.8**	0.0	8.2	-0.0	-0.0	-0.0
		3	1355.0	4.5	0.0	10.0	0.0	**16.2**	0.0
		2		-3.6	0.0	-2.7	-0.0	**-3.6**	0.0
30		5		**13.3**	-0.2	9.5	-0.0	11.4	-0.3
		8	0.0	**-6.8**	-0.0	8.2	0.0	-0.0	0.0
		3	1355.0	4.5	-0.0	10.0	-0.0	**16.2**	-0.0
		2		-3.6	-0.0	-2.7	0.0	**-3.6**	-0.0
40		5	677.5	**14.2**	-0.2	9.6	-0.0	6.1	-0.1
		8	0.0	**-9.7**	0.0	3.5	-0.0	-0.0	-0.0
		5	1355.0	14.2	-0.1	10.7	-0.0	**13.0**	-0.2
		2		-3.3	-0.0	-1.9	-0.0	**-2.6**	-0.0
50		3		**6.5**	-0.5	6.9	-0.0	10.6	-0.9
		10	0.0	**-4.2**	1.0	-0.3	-0.0	-0.0	0.0
		8	1355.0	5.5	-0.2	7.0	-0.0	**11.3**	-0.4
		9	677.5	-3.5	0.4	-0.1	-0.0	**-0.2**	0.2
140		5	1355.0	**1.6**	0.1	-0.5	0.0	**-0.1**	-0.4
		8	0.0	**-7.9**	0.3	7.8	-0.0	0.0	-0.0
			1355.0	-7.8	0.2	7.4	0.0	**10.3**	0.4
142		3		**8.6**	-0.0	-3.1	0.0	-2.8	-0.0
		10	0.0	**-6.8**	-0.3	3.9	0.0	0.0	0.0
			1355.0	-6.7	-0.3	3.1	-0.0	**4.7**	-0.4
		5		2.8	-0.3	-3.1	0.0	**-2.8**	-0.4
144				**13.2**	-0.2	-9.5	0.0	**-11.4**	-0.3
		2	0.0	**-3.7**	0.0	2.7	-0.0	0.0	-0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		8	1355.0	-2.7	0.0	8.3	0.0	**11.8**	0.0
146		5		**13.3**	-0.2	-9.5	0.0	**-11.4**	-0.3
		2	0.0	**-3.7**	-0.0	2.7	0.0	0.0	0.0
		8	1355.0	-2.7	-0.0	8.3	-0.0	**11.8**	-0.0
148		5	677.5	**14.2**	-0.2	-9.6	0.0	-6.1	-0.1
		2	0.0	**-3.4**	-0.0	2.0	0.0	-0.0	-0.0
		8	1355.0	0.2	0.0	2.2	0.0	**3.5**	0.0
		5		14.2	-0.1	-10.7	0.0	**-13.0**	-0.2
150		8	0.0	**-7.9**	-0.3	7.8	0.0	0.0	0.0
			1355.0	-7.8	-0.2	7.4	-0.0	**10.3**	-0.4

Internal forces on foot (alu240+232)

Group of member(s) :2,11,21,31,41,51,141,143,145,147,149,151
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
2	2	3	1307.0	**6.6**	0.3	5.0	0.1	18.3	1.3
		10	0.0	**-2.9**	-0.0	0.1	-0.0	-0.1	-0.7
		8	1307.0	5.7	0.1	4.5	0.0	**18.9**	0.5
		2		-1.2	0.0	-0.1	0.0	**-0.2**	0.0
11		5		**3.0**	-0.2	5.0	-0.0	8.1	-0.7
		8	0.0	**-9.6**	-0.0	-1.8	0.0	1.2	-0.0
		3	1307.0	-0.3	-0.0	-0.1	-0.0	**10.3**	-0.0
		10		-6.5	-0.2	-2.3	0.0	**-8.3**	-0.8
21		5		**13.3**	-0.1	11.6	-0.0	25.1	-0.5
		8	0.0	**-6.8**	0.0	2.8	0.0	7.4	0.0
		3	1307.0	4.5	0.0	6.1	0.0	**26.8**	0.0
		2		-3.4	0.0	-2.6	-0.0	**-7.1**	0.0
31		5		**13.4**	-0.1	11.6	-0.0	25.2	-0.5
		8	0.0	**-6.8**	-0.0	2.8	-0.0	7.4	-0.0
		3	1307.0	4.5	-0.0	6.1	-0.0	**26.8**	-0.0
		2		-3.4	-0.0	-2.6	0.0	**-7.1**	-0.0
41		5		**14.3**	-0.1	12.8	-0.1	**28.3**	-0.4
		8	0.0	**-9.6**	0.0	-1.8	-0.0	1.2	0.0
		2	1307.0	-3.0	-0.0	-1.9	-0.0	**-5.2**	-0.0
51		3		**6.6**	-0.3	5.0	-0.1	18.3	-1.3
		10	0.0	**-4.1**	1.1	0.1	-0.0	-0.2	1.4
		8	1307.0	5.7	-0.1	4.5	-0.0	**18.9**	-0.5
		2		-1.2	-0.0	-0.1	-0.0	**-0.2**	-0.0
141		5		**1.7**	0.7	-1.5	0.0	**-1.4**	0.3

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		8	0.0	**-7.8**	0.2	7.4	0.0	10.3	0.4
			1307.0	-7.6	0.1	7.0	0.0	**19.7**	0.6
143		3		**8.8**	-0.0	-5.0	0.0	-8.0	-0.0
		10	0.0	**-6.7**	-0.3	3.1	0.0	4.7	-0.4
			1307.0	-6.5	-0.2	2.3	-0.0	**8.3**	-0.8
		5		3.0	-0.2	-5.0	0.0	**-8.1**	-0.7
145				**13.3**	-0.1	-11.6	0.0	**-25.1**	-0.5
		2	0.0	**-3.6**	0.0	2.7	0.0	3.6	0.0
		8	1307.0	-2.6	0.0	7.5	0.0	**22.1**	0.0
147		5		**13.4**	-0.1	-11.6	0.0	**-25.2**	-0.5
		2	0.0	**-3.6**	-0.0	2.7	-0.0	3.6	-0.0
		8	1307.0	-2.6	-0.0	7.5	-0.0	**22.1**	-0.0
149		5		**14.3**	-0.1	-12.8	0.1	**-28.3**	-0.4
		2	0.0	**-3.3**	-0.0	1.9	0.0	2.6	-0.0
		8	1307.0	0.4	0.0	1.4	0.0	**5.8**	0.0
151			0.0	**-7.8**	-0.2	7.4	-0.0	10.3	-0.4
			1307.0	-7.6	-0.1	7.0	-0.0	**19.7**	-0.6
		5		-2.9	0.9	-1.4	0.0	**-1.1**	1.6

Internal forces on roof (alu240+232)

Group of member(s) :3,12,22,32,42,52,152,159,166,173,180,187
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
3	2	8	1250.1	**6.0**	-0.3	-4.3	0.4	14.3	0.2
		6	0.0	**-19.9**	0.0	-0.4	-0.2	0.2	-1.8
		8		5.9	-0.3	-3.6	0.4	**19.2**	0.6
		2		-0.6	-0.0	0.4	0.0	**-0.2**	0.0
12		5	1250.1	**7.2**	-0.5	-4.5	-0.6	1.8	-0.8
		8	0.0	**-9.5**	-0.0	5.9	-0.0	-4.1	-0.0
		3		-0.1	-0.0	-0.5	-0.0	**10.7**	-0.0
		10		-2.8	-0.6	0.1	-0.7	**-7.9**	-0.2
22		5	1250.1	**15.4**	-0.5	-7.6	-0.5	14.2	-0.7
		8	0.0	**-4.2**	0.0	5.0	-0.0	6.8	-0.0
		3		7.2	0.0	-2.8	-0.0	**26.0**	-0.0
		2		-3.4	-0.0	1.9	0.0	**-7.0**	0.0
32		5	1250.1	**15.5**	-0.5	-7.7	-0.5	14.5	-0.7
		8	0.0	**-4.2**	-0.0	5.0	0.0	6.8	0.0
		3		7.2	-0.0	-2.8	0.0	**26.0**	0.0
		2		-3.4	0.0	1.9	-0.0	**-7.0**	-0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
42		5	1250.1	**13.2**	-0.5	-8.2	-0.4	16.7	-0.7
		8	0.0	**-9.5**	0.0	5.9	0.0	-4.1	0.0
		5		13.1	-0.5	-10.1	-0.4	**28.1**	-0.0
		2		-4.8	0.0	1.5	-0.0	**-5.2**	-0.0
52		8	1250.1	**6.0**	0.3	-4.3	-0.4	14.3	-0.2
		3	0.0	**-0.8**	0.8	-4.4	-0.9	18.7	-1.5
		8		5.9	0.3	-3.6	-0.4	**19.2**	-0.6
		2		-0.6	0.0	0.4	-0.0	**-0.2**	-0.0
152		6		**-19.9**	-0.0	-0.4	0.2	0.2	1.8
		5		-16.0	0.2	-1.5	-0.1	**1.3**	1.1
		8		-8.8	0.3	4.5	-0.4	**-20.1**	-0.7
159		5	1250.1	**7.2**	0.5	-4.5	0.6	1.8	0.8
		8	0.0	**-9.2**	0.0	-1.9	0.0	-6.2	0.0
		5		7.1	0.5	-6.2	0.6	**8.4**	0.2
		8	1250.1	-9.1	0.0	-1.4	0.0	**-8.3**	0.0
166		5		**15.4**	0.5	-7.6	0.5	14.2	0.7
		8	0.0	**-7.9**	0.0	-0.4	0.0	-21.3	-0.0
		5		15.2	0.5	-9.5	0.5	**24.9**	0.1
		8	1250.1	-7.8	0.0	0.1	0.0	**-21.5**	0.0
173		5		**15.5**	0.5	-7.7	0.5	14.5	0.7
		8	0.0	**-7.9**	-0.0	-0.4	-0.0	-21.3	0.0
		5		15.3	0.5	-9.5	0.4	**25.2**	0.1
		8	1250.1	-7.8	-0.0	0.1	-0.0	**-21.5**	-0.0
180		5		**13.2**	0.5	-8.2	0.4	16.7	0.7
		8	0.0	**-9.2**	-0.0	-1.9	-0.0	-6.2	-0.0
		5		13.1	0.5	-10.1	0.4	**28.1**	0.0
		8	1250.1	-9.1	-0.0	-1.4	-0.0	**-8.3**	-0.0
187		6		**3.7**	1.6	-0.2	-1.8	0.0	0.2
		8	0.0	**-8.8**	-0.3	4.5	0.4	**-20.1**	0.7
		5		1.0	0.9	-1.5	-1.0	**1.3**	-0.5

Internal forces on roof (alu240)

Group of member(s)
:4/9,13/18,23/28,33/38,43/48,53/58,153/158,160/165,167/172,174/179,181/186,188/193
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
4	1	8	614.5	**6.0**	-0.3	-4.6	0.4	11.5	0.1
		6	0.0	**-19.8**	0.2	-0.2	-0.2	-0.2	-1.6
		8		6.0	-0.3	-4.3	0.4	**14.3**	0.2

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		5	614.5	-16.0	0.1	-0.4	0.1	**-0.5**	-1.2
5		8		**6.1**	-0.3	-4.9	0.4	8.6	-0.1
		6	0.0	**-19.8**	0.4	-0.1	-0.2	-0.2	-1.4
		8		6.0	-0.3	-4.6	0.4	**11.5**	0.1
		5	614.5	-16.0	0.3	0.1	0.1	**-0.6**	-1.1
6		8	2670.0	**6.2**	-0.0	-6.3	0.4	**-6.2**	-0.1
		6	0.0	**-19.7**	-1.2	0.1	-0.2	-0.2	-1.1
		8		6.1	0.1	-5.0	0.4	**8.7**	-0.1
7			2768.6	**2.7**	-0.2	1.2	0.2	-0.8	-0.3
		6	0.0	**-19.3**	-0.1	-0.6	-2.1	0.8	-3.0
		5		-14.6	-0.1	-1.9	-1.7	**1.9**	-2.6
		8		2.6	0.1	2.7	0.2	**-6.2**	-0.1
8			1234.3	**2.8**	0.4	0.4	0.2	0.0	0.3
		6	0.0	**-19.3**	-0.8	0.0	-2.1	-0.2	-0.2
		2		-0.5	-0.0	-0.0	0.0	**0.2**	0.0
		3		-3.0	1.4	1.2	0.5	**-1.5**	-0.7
9		8	1394.0	**2.9**	0.4	-0.5	0.2	-0.0	0.9
		6	0.0	**-19.2**	0.3	0.4	-2.1	0.1	-0.4
		5	1394.0	-14.5	1.1	2.1	-1.7	**1.9**	1.1
		2		-0.4	-0.0	-0.3	0.0	**-0.3**	-0.0
13		5	614.5	**7.2**	-0.5	-3.6	-0.6	-0.7	-1.1
		8	0.0	**-9.4**	-0.0	4.6	-0.0	2.5	-0.0
		3		0.0	-0.0	-0.5	-0.0	**10.1**	-0.0
		10		-2.7	-0.6	0.6	-0.7	**-7.5**	-1.0
14		5	614.5	**7.2**	-0.5	-2.8	-0.6	-2.7	-1.4
		8	0.0	**-9.4**	-0.0	4.0	-0.0	5.1	-0.0
		3		0.0	-0.0	-0.5	-0.0	**9.8**	-0.0
		10		-2.7	-0.6	0.9	-0.7	**-7.0**	-1.3
15		5	2670.0	**7.3**	-0.5	0.8	-0.6	-5.4	-2.6
		8	0.0	**-9.4**	-0.0	3.3	-0.0	7.3	-0.0
			2670.0	-9.4	-0.0	0.5	-0.0	**12.5**	-0.0
		10	0.0	-2.6	-0.5	1.1	-0.7	**-6.4**	-1.7
16		5	2768.6	**7.5**	0.5	4.7	-0.5	1.9	-1.1
		8	0.0	**-9.3**	0.0	0.4	-0.0	12.4	-0.0
			692.2	-9.3	0.0	-0.3	-0.0	**12.5**	-0.0
		5	0.0	7.4	0.6	0.7	-0.6	**-5.5**	-2.6
17			617.1	**7.6**	1.0	5.6	-0.6	4.9	-0.5
		8	0.0	**-9.2**	0.0	-2.6	-0.0	**9.6**	-0.0
18		10		**-32.4**	1.3	-6.7	-0.6	**9.4**	0.3
		8	1394.0	-5.0	0.0	-5.1	-0.0	**-0.6**	0.0
23		5	614.5	**15.4**	-0.5	-6.7	-0.5	9.8	-1.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		8		**-4.2**	0.0	3.1	-0.0	14.4	0.0
		3	0.0	7.3	0.0	-2.7	-0.0	**22.6**	0.0
		2		-3.3	-0.0	1.6	0.0	**-4.8**	-0.0
24		5	614.5	**15.5**	-0.6	-5.7	-0.5	6.0	-1.3
		8	307.2	**-4.2**	0.0	2.8	-0.0	15.3	0.0
		3	0.0	7.4	0.0	-2.6	-0.0	**20.9**	0.0
		2		-3.3	-0.0	1.6	0.0	**-3.9**	-0.0
25		5	2670.0	**15.6**	-0.6	-2.1	-0.5	**-4.4**	-2.6
		8	667.5	**-4.2**	-0.0	1.7	-0.0	17.5	-0.0
		3	0.0	7.5	-0.0	-2.6	-0.0	**19.3**	0.0
26		5	2768.6	**15.6**	0.4	1.6	-0.5	-5.1	-1.2
		8	0.0	**-4.1**	0.0	-0.4	-0.0	**18.9**	-0.0
		5	1384.3	15.6	0.5	-0.3	-0.5	**-6.0**	-1.8
27			1234.3	**15.7**	1.0	3.6	-0.5	-1.9	0.0
		8	0.0	**-3.8**	-0.0	-3.3	-0.0	**14.0**	0.0
		5		15.6	1.0	1.6	-0.5	**-5.1**	-1.2
28			1394.0	**10.0**	1.1	3.6	-0.5	1.5	1.4
		2	0.0	**-8.7**	-0.0	-2.3	0.0	3.0	-0.0
		8		-5.8	-0.0	-6.2	-0.0	**9.0**	-0.0
		5		10.0	1.0	1.2	-0.5	**-1.9**	0.0
33			614.5	**15.5**	-0.5	-6.7	-0.5	10.1	-1.0
		8		**-4.2**	-0.0	3.1	0.0	14.4	-0.0
		3	0.0	7.3	-0.0	-2.7	0.0	**22.6**	-0.0
		2		-3.3	0.0	1.6	-0.0	**-4.8**	0.0
34		5	614.5	**15.6**	-0.6	-5.8	-0.5	6.3	-1.3
		8	307.2	**-4.2**	-0.0	2.8	0.0	15.3	-0.0
		3	0.0	7.4	-0.0	-2.6	0.0	**20.9**	-0.0
		2		-3.3	0.0	1.6	-0.0	**-3.9**	0.0
35		5	2670.0	**15.7**	-0.6	-2.1	-0.5	**-4.3**	-2.6
		8	667.5	**-4.2**	0.0	1.7	0.0	17.5	0.0
		3	0.0	7.5	0.0	-2.6	0.0	**19.3**	-0.0
36		5	2768.6	**15.8**	0.4	1.6	-0.5	-5.3	-1.2
		8	0.0	**-4.1**	-0.0	-0.4	0.0	**18.9**	0.0
		5	1384.3	15.7	0.5	-0.4	-0.5	**-6.0**	-1.8
37			1234.3	**15.8**	1.0	3.5	-0.5	-2.2	0.0
		8	0.0	**-3.8**	0.0	-3.3	0.0	**14.0**	-0.0
		5		15.8	1.0	1.5	-0.5	**-5.3**	-1.2
38			1394.0	**11.2**	1.1	3.8	-0.5	1.4	1.4
		2	0.0	**-8.7**	0.0	-2.3	-0.0	3.0	0.0
		8		-5.8	0.0	-6.2	0.0	**9.0**	0.0
		5		11.1	1.0	1.4	-0.5	**-2.2**	0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
43			614.5	**13.3**	-0.5	-7.3	-0.5	11.9	-1.0
		8	0.0	**-9.4**	0.0	4.6	0.0	2.5	0.0
		5		13.2	-0.5	-8.2	-0.4	**16.7**	-0.7
		2		-4.7	0.0	1.3	-0.0	**-3.4**	0.0
44		5	614.5	**13.3**	-0.6	-6.3	-0.5	7.7	-1.3
		8	0.0	**-9.4**	0.0	4.0	0.0	5.1	0.0
		5		13.3	-0.5	-7.3	-0.5	**11.9**	-1.0
		2		-4.7	0.0	1.2	-0.0	**-2.6**	0.0
45		5	2670.0	**13.4**	-0.6	-2.6	-0.5	**-4.1**	-2.6
		8	0.0	**-9.4**	0.0	3.3	0.0	7.3	0.0
			2670.0	-9.4	0.0	0.5	0.0	**12.5**	0.0
46		5	2768.6	**13.5**	0.5	1.0	-0.4	-6.5	-1.2
		8	0.0	**-9.3**	-0.0	0.4	0.0	12.4	0.0
			692.2	-9.3	-0.0	-0.3	0.0	**12.5**	0.0
		5	2076.5	13.5	0.5	0.0	-0.5	**-6.9**	-1.5
47			1234.3	**13.6**	0.9	3.0	-0.4	-4.1	-0.0
		8	0.0	**-9.2**	-0.0	-2.6	0.0	**9.6**	0.0
		5		13.6	0.9	0.9	-0.4	**-6.5**	-1.2
48		6	1394.0	**15.8**	1.1	5.3	-0.5	0.7	1.5
		7	0.0	**-7.5**	-0.0	-3.8	0.0	**5.7**	-0.0
		6		15.7	1.0	4.5	-0.5	**-6.1**	0.1
53		8	614.5	**6.0**	0.3	-4.6	-0.4	11.5	-0.1
		3	0.0	**-0.8**	0.8	-4.5	-0.9	13.1	-0.6
		8		6.0	0.3	-4.3	-0.4	**14.3**	-0.2
		5	614.5	1.1	-0.9	-0.3	1.0	**-0.5**	-1.2
54		8		**6.1**	0.3	-4.9	-0.4	8.6	0.1
		3	0.0	**-0.7**	0.8	-4.5	-1.0	10.3	-0.0
		8		6.0	0.3	-4.6	-0.4	**11.5**	-0.1
		5	614.5	1.1	-0.8	0.1	1.0	**-0.6**	-1.7
55		8	2670.0	**6.2**	0.0	-6.3	-0.4	**-6.2**	0.1
		3	0.0	**-0.7**	-0.4	-4.6	-1.0	7.6	0.5
		8		6.1	-0.1	-5.0	-0.4	**8.7**	0.1
56		6	2768.6	**4.3**	0.7	-0.0	-1.1	-0.3	-1.6
		3	0.0	**-3.1**	-0.1	1.2	-0.5	-4.7	-0.0
		5		2.3	0.3	-1.9	-1.3	**1.8**	-2.7
		8		2.6	-0.1	2.7	-0.2	**-6.2**	0.1
57		6	1234.3	**4.3**	2.2	0.2	-1.1	-0.2	1.1
		3	0.0	**-3.0**	-1.4	1.2	-0.5	**-1.5**	0.7
		2		-0.5	0.0	-0.0	-0.0	**0.2**	-0.0
58		6	697.0	**4.3**	2.3	0.4	-1.1	-0.0	2.7
		3	0.0	**-3.0**	-1.0	1.1	-0.5	-0.1	-0.8

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		5	1394.0	2.5	1.6	2.1	-1.3	**1.8**	2.6
			0.0	2.5	1.4	1.0	-1.4	**-0.3**	0.5
153		6		**-19.8**	-0.2	-0.2	0.2	-0.2	1.6
		2	614.5	-0.5	0.0	0.1	-0.0	**0.1**	0.0
		8	0.0	-8.6	0.3	4.7	-0.4	**-14.4**	-0.3
154		6		**-19.8**	-0.4	-0.1	0.2	-0.2	1.4
		2	614.5	-0.5	0.0	0.0	-0.0	**0.2**	0.0
		8	0.0	-8.6	0.3	4.8	-0.4	**-11.5**	-0.1
155		6		**-19.7**	1.2	0.1	0.2	-0.2	1.1
		3	2670.0	-7.8	0.1	6.4	-0.9	**6.3**	0.0
		8	0.0	-8.5	-0.1	4.9	-0.4	**-8.5**	0.2
156		6		**-19.3**	0.1	-0.6	2.1	0.8	3.0
		3		-4.3	-0.1	-3.0	-0.6	**6.2**	0.2
		5	2768.6	-14.6	-1.8	-0.0	1.8	**-0.9**	0.5
157		6	0.0	**-19.3**	0.8	0.0	2.1	-0.2	0.2
		8		-5.4	-0.6	-1.2	-0.2	**1.5**	0.3
		5		-14.6	0.2	-0.0	1.8	**-0.9**	0.5
158		6		**-19.2**	-0.3	0.4	2.1	0.1	0.4
		5	1394.0	-14.5	-1.1	2.1	1.7	**1.9**	-1.1
		8		-5.3	-0.3	-0.6	-0.2	**-0.9**	-0.9
160		5	614.5	**7.2**	0.5	-3.6	0.6	-0.7	1.1
		8	0.0	**-9.1**	0.0	-1.4	0.0	-8.3	0.0
		5		7.2	0.5	-4.5	0.6	**1.8**	0.8
		8	614.5	-9.1	0.0	-1.1	0.0	**-9.1**	0.0
161		5		**7.2**	0.5	-2.8	0.6	-2.7	1.4
		8	0.0	**-9.1**	0.0	-1.1	0.0	-9.1	0.0
			614.5	-9.1	0.0	-0.8	0.0	**-9.7**	0.1
162		5	2670.0	**7.3**	0.5	0.8	0.6	-5.4	2.6
		8	0.0	**-9.0**	-0.0	-0.9	0.0	-9.7	0.1
		2	2670.0	-4.5	-0.0	0.7	-0.0	**0.5**	0.0
		3		6.8	0.0	-0.5	0.0	**-12.4**	0.0
163		5	2768.6	**7.5**	-0.5	4.7	0.5	1.9	1.1
		8	0.0	**-8.9**	-0.0	0.4	0.0	-10.2	0.0
		10	2768.6	-2.3	-0.7	3.3	0.6	**5.3**	1.1
		3	692.2	6.8	0.0	0.3	0.0	**-12.4**	0.0
164		5	617.1	**7.6**	-1.0	5.6	0.6	4.9	0.5
		8	0.0	**-8.7**	-0.0	1.7	0.0	-7.3	-0.0
		10	1234.3	-2.1	-1.1	3.7	0.6	**9.4**	-0.3
		3	0.0	7.0	-0.0	3.1	0.0	**-8.9**	0.0
165		10		**-32.4**	-1.3	-6.7	0.6	**9.4**	-0.3
		4		-3.3	-0.0	3.2	0.0	**-5.1**	-0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
167		5	614.5	**15.4**	0.5	-6.7	0.5	9.8	1.0
		8	0.0	**-7.8**	0.0	0.1	0.0	**-21.5**	0.0
		5		15.4	0.5	-7.6	0.5	**14.2**	0.7
168			614.5	**15.5**	0.6	-5.7	0.5	6.0	1.3
		8	0.0	**-7.8**	0.0	0.5	0.0	**-21.3**	0.0
		5		15.4	0.5	-6.7	0.5	**9.8**	1.0
169			2670.0	**15.6**	0.6	-2.1	0.5	-4.4	2.6
		8	0.0	**-7.7**	-0.0	0.7	0.0	**-20.8**	0.0
		5		15.5	0.4	-5.8	0.5	**6.0**	1.3
170			2768.6	**15.6**	-0.4	1.6	0.5	-5.1	1.2
		8	0.0	**-7.5**	-0.0	2.1	-0.0	-17.0	-0.0
		2	2768.6	-3.0	-0.0	0.6	-0.0	**2.5**	-0.0
		7	0.0	3.9	0.0	-0.1	0.0	**-17.1**	-0.0
171		5	1234.3	**15.7**	-1.0	3.6	0.5	-1.9	-0.0
		8	0.0	**-7.3**	0.0	3.4	-0.0	-9.2	-0.0
		2	1234.3	-2.9	0.0	0.3	-0.0	**3.0**	0.0
		3	0.0	4.9	0.0	3.4	0.0	**-12.8**	0.0
172		5	1394.0	**10.0**	-1.1	3.6	0.5	1.5	-1.4
		8	0.0	**-9.4**	0.0	2.7	-0.0	-4.5	0.0
		2		-8.7	0.0	-2.3	-0.0	**3.0**	0.0
		3		4.5	0.0	4.7	0.0	**-7.4**	0.0
174		5	614.5	**15.5**	0.5	-6.7	0.5	10.1	1.0
		8	0.0	**-7.8**	-0.0	0.1	-0.0	**-21.5**	-0.0
		5		15.5	0.5	-7.7	0.5	**14.5**	0.7
175			614.5	**15.6**	0.6	-5.8	0.5	6.3	1.3
		8	0.0	**-7.8**	-0.0	0.5	-0.0	**-21.3**	-0.0
		5		15.5	0.5	-6.7	0.5	**10.1**	1.0
176			2670.0	**15.7**	0.6	-2.1	0.5	-4.3	2.6
		8	0.0	**-7.7**	0.0	0.7	-0.0	**-20.8**	-0.0
		5		15.6	0.4	-5.9	0.5	**6.2**	1.3
177			2768.6	**15.8**	-0.4	1.6	0.5	-5.3	1.2
		8	0.0	**-7.5**	0.0	2.1	0.0	-17.0	0.0
		2	2768.6	-3.0	0.0	0.6	0.0	**2.5**	0.0
		7	0.0	3.9	-0.0	-0.1	-0.0	**-17.1**	0.0
178		5	1234.3	**15.8**	-1.0	3.5	0.5	-2.2	-0.0
		8	0.0	**-7.3**	-0.0	3.4	0.0	-9.2	0.0
		2	1234.3	-2.9	-0.0	0.3	0.0	**3.0**	-0.0
		3	0.0	4.9	-0.0	3.4	-0.0	**-12.8**	-0.0
179		5	1394.0	**11.2**	-1.1	3.8	0.5	1.4	-1.4
		8	0.0	**-9.4**	-0.0	2.7	0.0	-4.5	-0.0
		2		-8.7	-0.0	-2.3	0.0	**3.0**	-0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		3		4.5	-0.0	4.7	-0.0	**-7.4**	-0.0
181		5	614.5	**13.3**	0.5	-7.3	0.5	11.9	1.0
		8	0.0	**-9.1**	-0.0	-1.4	-0.0	-8.3	-0.0
		5		13.2	0.5	-8.2	0.4	**16.7**	0.7
		8	614.5	-9.1	-0.0	-1.1	-0.0	**-9.1**	-0.0
182		5		**13.3**	0.6	-6.3	0.5	7.7	1.3
		8	0.0	**-9.1**	-0.0	-1.1	-0.0	-9.1	-0.0
		5		13.3	0.5	-7.3	0.5	**11.9**	1.0
		8	614.5	-9.1	-0.0	-0.8	-0.0	**-9.7**	-0.1
183		5	2670.0	**13.4**	0.6	-2.6	0.5	-4.1	2.6
		8	0.0	**-9.0**	0.0	-0.9	-0.0	-9.7	-0.1
		5		13.3	0.4	-6.4	0.5	**7.8**	1.3
		3	2670.0	6.8	-0.0	-0.5	-0.0	**-12.4**	-0.0
184		5	2768.6	**13.5**	-0.5	1.0	0.4	-6.5	1.2
		8	0.0	**-8.9**	0.0	0.4	-0.0	-10.2	-0.0
		2	2768.6	-4.4	0.0	0.3	0.0	**1.7**	0.0
		3	692.2	6.8	-0.0	0.3	-0.0	**-12.4**	-0.0
185		5	1234.3	**13.6**	-0.9	3.0	0.4	-4.1	0.0
		8	0.0	**-8.7**	0.0	1.7	-0.0	-7.3	0.0
		2	1234.3	-4.3	-0.0	-0.0	0.0	**1.7**	-0.0
		3	0.0	7.0	0.0	3.1	-0.0	**-8.9**	-0.0
186		6	1394.0	**15.8**	-1.1	5.3	0.5	0.7	-1.5
		2	0.0	**-6.2**	-0.0	-1.4	0.0	**1.7**	-0.0
		6		15.7	-1.0	4.5	0.5	**-6.1**	-0.1
188			614.5	**3.8**	1.6	-0.1	-1.8	-0.0	1.2
		8	0.0	**-8.6**	-0.3	4.7	0.4	**-14.4**	0.3
		2	614.5	-0.5	-0.0	0.1	0.0	**0.1**	-0.0
189		6		**3.8**	1.6	0.1	-1.8	-0.0	2.2
		8	0.0	**-8.6**	-0.3	4.8	0.4	**-11.5**	0.1
		2	614.5	-0.5	-0.0	0.0	0.0	**0.2**	-0.0
190		6	2670.0	**3.8**	-0.0	0.6	-1.8	0.7	2.2
		8	0.0	**-8.5**	0.1	4.9	0.4	**-8.5**	-0.2
		3	2670.0	-7.8	-0.1	6.4	0.9	**6.3**	-0.0
191		6	2768.6	**4.3**	-0.7	-0.0	1.1	-0.3	1.6
		8	0.0	**-5.6**	0.1	-1.7	0.2	5.4	-0.1
		3		-4.3	0.1	-3.0	0.6	**6.2**	-0.2
		5	2768.6	2.4	-1.0	0.0	1.4	**-0.9**	1.0
192		6	1234.3	**4.3**	-2.2	0.2	1.1	-0.2	-1.1
		8	0.0	**-5.4**	0.6	-1.2	0.2	**1.5**	-0.3
		5		2.4	-1.0	-0.0	1.4	**-0.9**	1.0
193		6	697.0	**4.3**	-2.3	0.4	1.1	-0.0	-2.7

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
		8	0.0	**-5.4**	0.4	-0.9	0.2	0.1	0.4
		5	1394.0	2.5	-1.6	2.1	1.3	**1.8**	-2.6
		8		-5.3	0.3	-0.6	0.2	**-0.9**	0.9

Control of the rivets: shear force in foot

Group of member(s) :2,11,21,31,41,51,141,143,145,147,149,151
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
41	2	5	1307.0	14.3	-0.1	**12.8**	-0.1	28.3	-0.4
149				14.3	-0.1	**-12.8**	0.1	-28.3	-0.4

Control of the rivets: shear force in roof

Group of member(s) :3,12,22,32,42,52,152,159,166,173,180,187
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
12	2	8	0.0	-9.5	-0.0	**5.9**	-0.0	-4.1	-0.0
42		5		13.1	-0.5	**-10.1**	-0.4	28.1	-0.0

Peak splice : internal forces

Group of member(s) :9,18,28,38,48,58,158,165,172,179,186,193
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
48	1	6	1394.0	**15.8**	1.1	**5.3**	-0.5	0.7	1.5
18		10		**-32.3**	1.1	-6.1	-0.6	0.5	2.0
28		8		-5.7	-0.0	**-7.8**	-0.0	**-0.7**	-0.0
9		5		-14.5	1.1	2.1	-1.7	**1.9**	1.1

Straight splice : internal forces

Group of member(s) :7,16,26,36,46,56,156,163,170,177,184,191
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
36	1	5	2768.6	**15.8**	0.4	1.6	-0.5	-5.3	-1.2
7		6		**-19.2**	2.4	-0.1	-2.1	-0.2	-0.2
16		9		7.0	0.5	**4.7**	-0.6	2.3	-1.1

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
26		4		-3.1	0.0	**-3.3**	-0.0	13.1	0.0
		8		-3.9	0.0	-3.2	-0.0	**13.9**	0.0
177		3		4.9	-0.0	3.5	-0.0	**-12.8**	-0.0
191		10		4.2	-0.7	-0.0	1.1	-0.2	**1.6**
56				4.2	0.7	-0.0	-1.1	-0.2	**-1.6**

Corner splice : internal forces

Group of member(s) :2,11,21,31,41,51,141,143,145,147,149,151
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
41	2	5	1307.0	**14.3**	-0.1	**12.8**	-0.1	**28.3**	-0.4
11		8		**-9.4**	-0.0	-7.0	0.0	-4.6	-0.0
149		5		14.3	-0.1	**-12.8**	0.1	**-28.3**	-0.4
151		10		-3.9	1.1	-0.4	0.0	-0.2	**2.8**
		7		-6.1	-0.3	5.5	-0.1	17.4	**-1.5**

Corner splice : connection with roof

Group of member(s) :3,12,22,32,42,52,152,159,166,173,180,187
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
173	2	5	0.0	**15.3**	0.5	-9.5	0.4	25.2	0.1
3		6		**-19.9**	0.0	-0.4	-0.2	0.2	-1.8
12		8		-9.5	-0.0	**5.9**	-0.0	-4.1	-0.0
42		5		13.1	-0.5	**-10.1**	-0.4	**28.1**	-0.0
173		8		-7.9	-0.0	-0.4	-0.0	**-21.3**	0.0

Peak and eaves purlin : normal force

Group of member(s) :1/193
Group of nonlinear combination(s) :1/10
Cross-section : 4 - Alu133/70

memb	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
65	5	5000.0	**8.8**	0.0	-0.1	0.0	-0.0	-0.0
59			**-11.2**	-0.6	-0.1	0.1	-0.0	-0.0

Normal purlin : normal force

Group of member(s) :1/193
Group of nonlinear combination(s) :1/10
Cross-section : 5 - Alu60/60/3

memb	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
81	7	0.0	**2.2**	-0.0	0.1	0.0	-0.0	0.0
79	6		**-5.0**	-0.1	-0.0	-0.1	0.0	-0.0

Gable upright N°1

Group of member(s) :104/107,122/125
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
104	11	5	0.0	**3.7**	0.1	3.8	0.0	-0.0	0.0
		8		**-10.1**	0.7	-0.6	0.0	0.0	0.0
		10	2662.0	0.8	0.0	2.2	0.0	**9.3**	0.1
		7		-6.9	0.5	-0.4	-0.0	**-2.6**	1.7
105		5	1591.2	**3.9**	-0.0	-3.5	-0.0	1.9	0.0
		8	0.0	**-9.8**	-0.5	0.7	-0.0	-1.1	0.8
		10		0.9	-0.1	-3.8	-0.0	**8.9**	0.1
		7		-6.8	-0.5	1.8	-0.0	**-2.8**	0.8
106		3	2662.0	**9.6**	0.8	-0.5	-0.0	-2.4	1.6
		2	0.0	**-1.3**	-0.0	-0.0	0.0	-0.0	0.0
		10	2662.0	0.8	-0.0	2.2	-0.0	**9.3**	-0.1
		7		9.4	0.8	-0.5	-0.0	**-2.5**	1.7
107		3	1591.2	**10.1**	-0.4	2.0	-0.0	0.3	0.0
		2	0.0	**-0.8**	-0.0	-0.0	0.0	-0.0	0.0
		10		0.9	0.1	-3.8	0.0	**8.9**	-0.1
		7		9.8	-0.6	1.7	-0.0	**-2.6**	0.8
122		5	2662.0	**3.7**	0.0	1.4	0.0	5.0	0.1
		8	0.0	**-10.1**	0.7	0.6	-0.0	-0.0	0.0
		9	2662.0	3.4	0.0	1.4	0.0	**5.0**	0.1
		7	0.0	-7.0	0.7	1.6	-0.0	**-0.0**	0.0
123		5	1591.2	**3.9**	-0.0	-1.4	-0.0	2.5	0.0
		8	0.0	**-9.8**	-0.5	-0.7	0.0	1.1	0.8
		9		3.6	0.0	-1.1	-0.0	**4.4**	0.0
		3	1591.2	-6.4	-0.5	-2.2	0.0	**-0.4**	-0.0
124			2662.0	**9.6**	0.8	0.5	0.0	2.4	1.6
		2	0.0	**-1.3**	-0.0	0.0	-0.0	0.0	0.0
		9	2662.0	3.4	-0.0	1.4	-0.0	**5.0**	-0.1
		7	0.0	9.3	0.6	1.4	-0.0	**-0.0**	0.0

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
125		3	1591.2	**10.1**	-0.4	-2.0	0.0	**-0.3**	0.0
		2	0.0	**-0.8**	-0.0	0.0	-0.0	0.0	0.0
		9		3.6	-0.0	-1.1	0.0	**4.4**	-0.0

Gable upright N°2

Group of member(s) :108/109,126/127
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
108	11	6	0.0	**13.2**	-0.0	5.8	0.0	-0.0	-0.0
		8		**-3.9**	0.7	-1.0	0.0	0.0	0.0
		10	2662.0	12.3	-0.0	3.9	-0.0	**12.5**	-0.0
		7		2.5	0.7	-1.4	-0.1	**-5.0**	1.6
109		6	3258.0	**13.2**	0.0	-6.4	-0.0	-3.7	0.0
		8	0.0	**-3.5**	-0.1	0.6	-0.0	-1.9	0.5
		10		12.3	0.0	-3.7	-0.0	**12.2**	0.0
		7		2.8	-0.2	1.5	-0.1	**-4.8**	0.5
126		3	2662.0	**3.2**	0.7	1.4	0.1	5.0	1.6
		10	0.0	**-9.8**	0.0	1.3	-0.0	0.0	0.0
		9	2662.0	-1.1	-0.0	1.6	-0.0	**5.7**	-0.0
		7	0.0	2.4	0.6	2.4	-0.0	**-0.0**	0.0
127		3	3258.0	**3.6**	-0.1	-2.8	0.1	-2.3	0.0
		10	0.0	**-9.4**	-0.0	-0.3	0.0	3.1	0.0
		9		-0.9	-0.0	-1.4	-0.0	**5.8**	0.0
		7	3258.0	3.0	-0.1	-2.8	0.1	**-2.3**	0.0

Gable horizontal

Group of member(s) :1/193
Group of nonlinear combination(s) :1/10
Cross-section : 6 - Alu130/70

memb	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
110	10	612.1	**7.5**	0.1	2.4	0.5	-0.1	0.0
	4	4897.0	**-3.3**	-0.1	0.3	0.0	-0.0	-0.4
	6	3060.6	7.0	-0.0	-0.4	0.5	**2.7**	0.0
		0.0	7.1	0.1	2.6	0.5	**-1.7**	-0.0
111	10		**7.4**	0.1	3.7	0.1	-0.0	-0.1
	4	2566.5	**-2.4**	-0.2	-0.0	-0.1	-0.9	0.0
	6		6.9	0.0	0.1	0.1	**5.5**	0.0

memb	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
	3		-1.1	-0.2	-0.0	-0.1	**-2.3**	0.0
112	10	5133.0	**7.4**	-0.1	-3.7	-0.1	-0.0	-0.1
	4		**-1.8**	-0.3	0.5	0.1	-0.0	-0.7
	6	2566.5	6.9	-0.0	-0.1	-0.1	**5.5**	0.0
	3		-0.3	-0.2	0.0	0.1	**-2.3**	0.1
113	10	4284.9	**7.5**	-0.1	-2.4	-0.5	-0.1	0.0
	4	4897.0	**-0.3**	-0.1	0.4	-0.0	0.5	-0.0
	6	1836.4	7.0	0.0	0.4	-0.5	**2.7**	0.0
		4897.0	7.1	-0.1	-2.6	-0.5	**-1.7**	-0.0
128	9	0.0	**0.9**	0.1	0.9	0.5	0.2	-0.0
	4	4897.0	**-3.3**	-0.1	-0.3	-0.0	0.0	-0.4
	9	2448.5	0.8	-0.0	0.0	0.5	**1.5**	0.1
	7	0.0	-1.8	0.1	1.2	0.0	**-1.2**	-0.0
129	9		**0.9**	0.1	1.4	-0.1	-0.0	-0.1
	10	3208.1	**-3.1**	-0.0	-0.1	-0.2	0.8	0.1
	3	2566.5	-1.1	-0.2	0.0	0.1	**2.3**	0.0
	10	0.0	-3.0	0.1	0.6	-0.2	**-0.0**	-0.1
130	9	5133.0	**0.9**	-0.1	-1.4	0.1	-0.0	-0.1
	10	1924.9	**-3.1**	0.0	0.1	0.2	0.8	0.1
	3	2566.5	-0.3	-0.2	-0.0	-0.1	**2.3**	0.1
	10	5133.0	-3.0	-0.1	-0.6	0.2	**-0.0**	-0.1
131	7	4284.9	**1.3**	-0.2	-1.1	0.0	-0.5	0.1
	10	1836.4	**-3.1**	0.1	0.4	-0.6	1.0	0.1
	9	2448.5	0.8	0.0	-0.0	-0.5	**1.5**	0.1
	7	4897.0	1.3	-0.2	-1.1	0.0	**-1.2**	-0.0

Wind bracing cables : side

Group of member(s) :114/115,118/119,132/133,136/137
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
118	12	10	4720.7	**10.6**	0.0	0.0	0.0	0.0	0.0

Wind bracing cables : roof

Group of member(s) :116/117,120/121,134/135,138/139
Group of nonlinear combination(s) :1/10

memb	cr.nr	non. c.	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
116	12	5	10701.4	**20.5**	0.0	0.0	0.0	0.0	0.0

Reactions in support(s) - nodal values. Global extreme

Nonlinear calculation, local nonlinearities, II. order
Group of node(s) :1/126
Group of nonlinear combination(s) :1/10

support	node	non. c.	Rx [kN]	Ry [kN]	Rz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
10	85	5	**8.8**	-8.6	-18.3	0.0	0.0	0.0
5	35	3	**-14.3**	0.0	-3.5	0.0	0.0	0.0
13	103		-0.7	**2.5**	-3.1	0.0	0.0	0.0
1	1	10	0.3	**-10.1**	-2.0	0.0	0.0	0.0
14	104	8	-0.4	0.6	**10.1**	0.0	0.0	0.0
9	69	5	-8.8	-8.6	**-18.3**	0.0	0.0	0.0

Foundation table (s=1) baseplate at bracings.

Group of node(s) :1,13,18,34,69,85/86,102
Group of load case(s) :1,4/9
Foundation table:

Loadcase/Node		1	13	18	34	69	85
Permanent loads							
LC: 1,4,5	Rx [kN]	0.1	-0.1	2.0	-2.0	2.0	-2.0
	Ry [kN]	-0.4	-0.4	0.4	0.4	-0.4	-0.4
	Rz [kN]	0.9	0.9	2.8	2.8	2.8	2.8
Variable loads - exclusive - 6: wind side over							
	Rx [kN]	-3.2	-2.3	-10.8	-0.0	-10.8	-0.0
	Ry [kN]	0.5	0.5	0.0	0.0	-0.0	-0.0
	Rz [kN]	-1.9	0.7	-4.4	-7.0	-4.4	-7.0
Variable loads - exclusive - 7: wind side under							
	Rx [kN]	-3.4	-2.1	-6.7	-4.1	-6.7	-4.1
	Ry [kN]	0.2	0.2	0.0	0.0	-0.0	-0.0
	Rz [kN]	-1.0	1.6	2.2	-0.4	2.2	-0.4
Variable loads - exclusive - 8: wind gable over							
	Rx [kN]	0.3	-0.3	-6.1	6.1	-6.9	6.9
	Ry [kN]	-1.5	-1.5	-4.1	-4.1	-4.1	-4.1
	Rz [kN]	-6.9	-6.9	-4.8	-4.8	-16.3	-16.3
Variable loads - exclusive - 9: wind gable under							
	Rx [kN]	0.1	-0.1	-2.0	2.0	-2.8	2.8
	Ry [kN]	-1.8	-1.8	-4.1	-4.1	-4.1	-4.1
	Rz [kN]	-6.0	-6.0	1.8	1.8	-9.7	-9.7
Extremes							
	Max Rz [kN]	0.9	2.6	5.0	4.6	5.0	2.8
	Min Rz [kN]	-6.0	-6.0	-2.0	-4.1	-13.5	-13.5
	Max Rx [kN]	0.4	-0.1	2.0	4.1	2.0	4.9
	Min Rx [kN]	-3.3	-2.3	-8.8	-6.0	-8.8	-6.0

Loadcase/Node		1	13	18	34	69	85
	Max Ry [kN]	0.2	0.2	0.4	0.4	-0.4	-0.4
	Min Ry [kN]	-2.2	-2.2	-3.8	-3.8	-4.5	-4.5

Loadcase/Node		86	102
Permanent loads			
LC: 1,4,5	Rx [kN]	0.1	-0.1
	Ry [kN]	0.4	0.4
	Rz [kN]	0.9	0.9
Variable loads - exclusive - 6: wind side over			
	Rx [kN]	-3.2	-2.3
	Ry [kN]	-0.5	-0.5
	Rz [kN]	-1.9	0.7
Variable loads - exclusive - 7: wind side under			
	Rx [kN]	-3.4	-2.1
	Ry [kN]	-0.2	-0.2
	Rz [kN]	-1.0	1.6
Variable loads - exclusive - 8: wind gable over			
	Rx [kN]	0.3	-0.3
	Ry [kN]	-1.0	-1.0
	Rz [kN]	4.0	4.0
Variable loads - exclusive - 9: wind gable under			
	Rx [kN]	0.1	-0.1
	Ry [kN]	-0.6	-0.6
	Rz [kN]	4.9	4.9
Extremes			
	Max Rz [kN]	5.9	5.9
	Min Rz [kN]	-1.0	0.9
	Max Rx [kN]	0.4	-0.1
	Min Rx [kN]	-3.3	-2.3
	Max Ry [kN]	0.4	0.4
	Min Ry [kN]	-0.6	-0.6

Foundation table (s=1) baseplate at side.

Group of node(s) :35,51/52,68
Group of load case(s) :1,4/9
Foundation table:

Loadcase/Node		35	51	52	68
Permanent loads					
LC: 1,4,5	Rx [kN]	1.9	-1.9	1.9	-1.9
	Ry [kN]	0.0	0.0	-0.0	-0.0
	Rz [kN]	2.8	2.8	2.8	2.8

Loadcase/Node		35	51	52	68
Variable loads - exclusive - 6: wind side over					
	Rx [kN]	-11.0	-0.2	-11.0	-0.2
	Ry [kN]	0.0	0.0	-0.0	-0.0
	Rz [kN]	-4.5	-6.8	-4.5	-6.8
Variable loads - exclusive - 7: wind side under					
	Rx [kN]	-6.9	-4.3	-6.9	-4.3
	Ry [kN]	0.0	0.0	-0.0	-0.0
	Rz [kN]	2.1	-0.2	2.1	-0.2
Variable loads - exclusive - 8: wind gable over					
	Rx [kN]	-6.5	6.5	-6.5	6.5
	Ry [kN]	0.9	0.9	0.9	0.9
	Rz [kN]	-10.6	-10.6	-10.6	-10.6
Variable loads - exclusive - 9: wind gable under					
	Rx [kN]	-2.4	2.4	-2.4	2.4
	Ry [kN]	0.9	0.9	0.9	0.9
	Rz [kN]	-4.0	-4.0	-4.0	-4.0
Extremes					
	Max Rz [kN]	4.8	2.8	4.8	2.8
	Min Rz [kN]	-7.8	-7.8	-7.8	-7.8
	Max Rx [kN]	1.9	4.6	1.9	4.6
	Min Rx [kN]	-9.0	-6.2	-9.0	-6.2
	Max Ry [kN]	0.9	0.9	0.9	0.9
	Min Ry [kN]	0.0	0.0	-0.0	-0.0