

## NASLOVNA STRAN NAČRTA

## PODATKI O GRADNJI

naziv gradnje

LOKARJEVA HIŠA – GALERIJA

kratek opis gradnje

Na obstoječi stavbi se bo izvedla manjša rekonstrukcija in vzdrževalna dela, vezana na ureditev podstrešja.

VRSTE GRADNJE

označiti vse ustrezne vrste gradnje

☐

NOVOGRADNJA - NOVOZGRAJEN OBJEKT

☐

NOVOGRADNJA - PRIZIDAVA

☐

REKONSTRUKCIJA

☐

SPREMEMBA NAMEMBNOSTI

☐

ODSTRANITEV CELOTNEGA OBJEKTA

☐

LEGALIZACIJA

☒

MANJŠA REKONSTRUKCIJA

## PODATKI O PROJEKTNi DOKUMENTACIJI

vrsta dokumentacije

PZI projektna dokumentacija za izvedbo manjše rekonstrukcije

številka projekta

36/2025

## PODATKI O NAČRTU

strokovno področje načrta

2 načrt gradbeništva

naziv načrta

številka načrta

1218/2025

datum izdelave

julij 2025

datum spremembe

## PODATKI O PROJEKTANTU NAČRTA

projektant načrta (naziv družbe)

Stacion IB d.o.o.

naslov

Lokarjev drevored 1, 5270 Ajdovščina

odgovorna oseba projektanta načrta

Bogomir Ipavec

podpis odgovorne osebe

projektanta načrta

**STACION IB**  
Družba za projektiranje, inženiring in svetovanje, d.o.o.  
Lokarjev drevored 1, 5270 Ajdovščina

## PODATKI O IZDELOVALCU NAČRTA

ime in priimek pooblaščenega arhitekta, pooblaščenega inženirja

Bogomir Ipavec univ.dipl.inž.grad.

identifikacijska številka

IZS G-0250

podpis pooblaščenega arhitekta, pooblaščenega inženirja

**BOGOMIR IPAVEC**  
univ. dipl. inž. grad.  
IZS G-0250

# TEHNČNO POROČILO

## 1.0 SPLOŠNO

Investitor Občina Ajdovščina bo izvedla manjšo rekonstrukcijo obstoječega objekta Lokarjeve hiše – Galerije. Predmet manjše rekonstrukcije bo pridobitev dodatnih prostorov na podstrešju.

V konstrukcijskem smislu manjša rekonstrukcija obsega naslednje zamenjave in ojačitve na konstrukciji:

- Ojačitev obstoječega stropa proti podstrešju
- Ojačitev elementov strešne kostrukcije z zamenjavo nekaterih kritičnih delov
- Zamenjavo stopnišča. Ki vodi iz nadstropja na podstrešje.

## 2.0 OJAČITEV KONSTRUKCIJE STROPA

Strop proti podstrešju je izveden kot lesen tramovni strop. Sestavljajo ga stropniki dimenzije 10/20cm. Za obstoječe stanje smo izvedli meritve konstrukcije in izvedli računske analize, ki pokažejo naslednje: glede namena uporabe nosilci – tramovi poda ne ustrezajo nosilnosti in deformacijam.

Stropno konstrukcijo ojačamo v skladu z naslednjimi navodili:

Kot prvi ukrep je potrebno obstoječo konstrukcijo zaščititi z premazom za preprečevanje pojava lesnih gliv in lesnih insektov. Kot sredstvo se lahko uporabi preparat Silvanolin.

Konstrukcijo poda ojačamo z dodajanjem novih nosilcev, ki jih spojnimo z obstoječimi. Kjer je mogoče, se uporabi obojestransko ojačitev, pri krajinih, ki pa imajo manjšo obtežbo, pa se uporabi enostranska varianta.

Stropno konstrukcijo smo dimenzionirali skladno s pravili EUROCODE-a. V računu so bile upoštevane sledeče obtežbe:

### LASTNA IN STALNA OBTEŽBA:

- Na konstrukcijo poda smo poleg lastne teže konstrukcije upoštevali še težo tlaka (OSB plošče in talna obloga) v vrednosti 0.50kN/m<sup>2</sup>.

### KORISTNA OBTEŽBA:

- Na konstrukcijo poda smo kot koristno obtežbo upoštevali koristno obtežbo kategorije C3 v vrednosti 3.0kN/2.

## 3.0 OJAČITEV STREŠNE KONSTRUKCIJE

Pri zasnovi ojačitve strešne konstrukcije smo kot izhodišča upoštevali dve zahtevi. Prva je nosilnost in druga je želja investitorja, da poveča funkcionalnost prostora z odstranitvijo razpirala v sredini prostora. Obstoječa konstrukcija je izvedena v „obrnjeni izvedbi“, to je da so glavni elementi razpirala na osnem razmaku 245cm, špirovci pa potekajo vzporedno s kapom. Pri preverjanju razpirala je bilo ugotovljeno, da ne ustrezajo glede nosilnosti in uporabnosti. Zato je predvideno ojačitev z obojestranskim dodajanjem in vijačenjem lesenih plohov. Odstranjena razpora v sredini razpona pa se nadomesti z novim stebrom. Zaradi dodatne varnosti pa se obstoječa dva stebra in nov steber dodajo ojačata na nivoju nadstropja z dodajanjem jeklenih stebrov, ki se jih podpre na nosilni zid pritličja.

## 4.0 ZAMENJAVA STOPNIŠČA

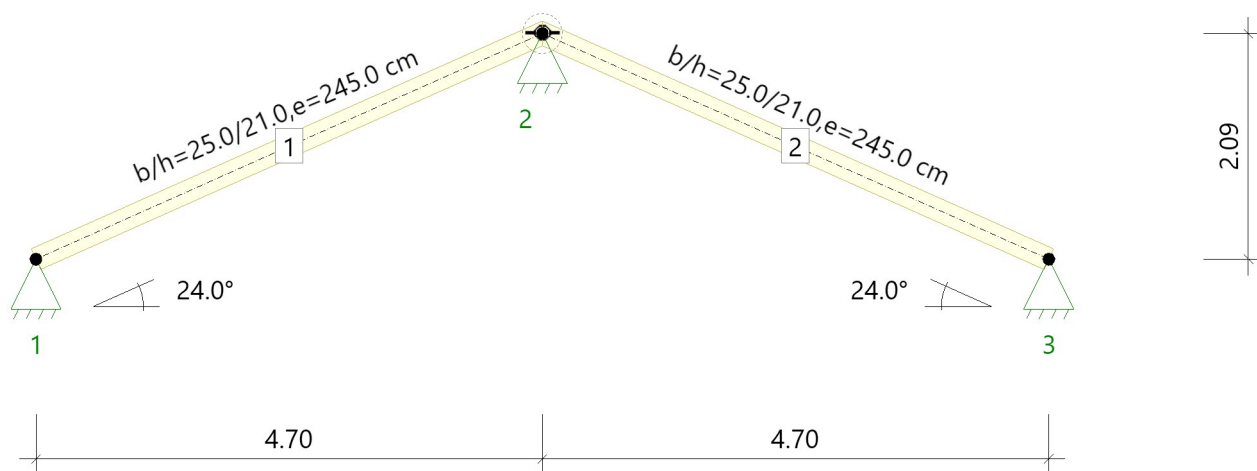
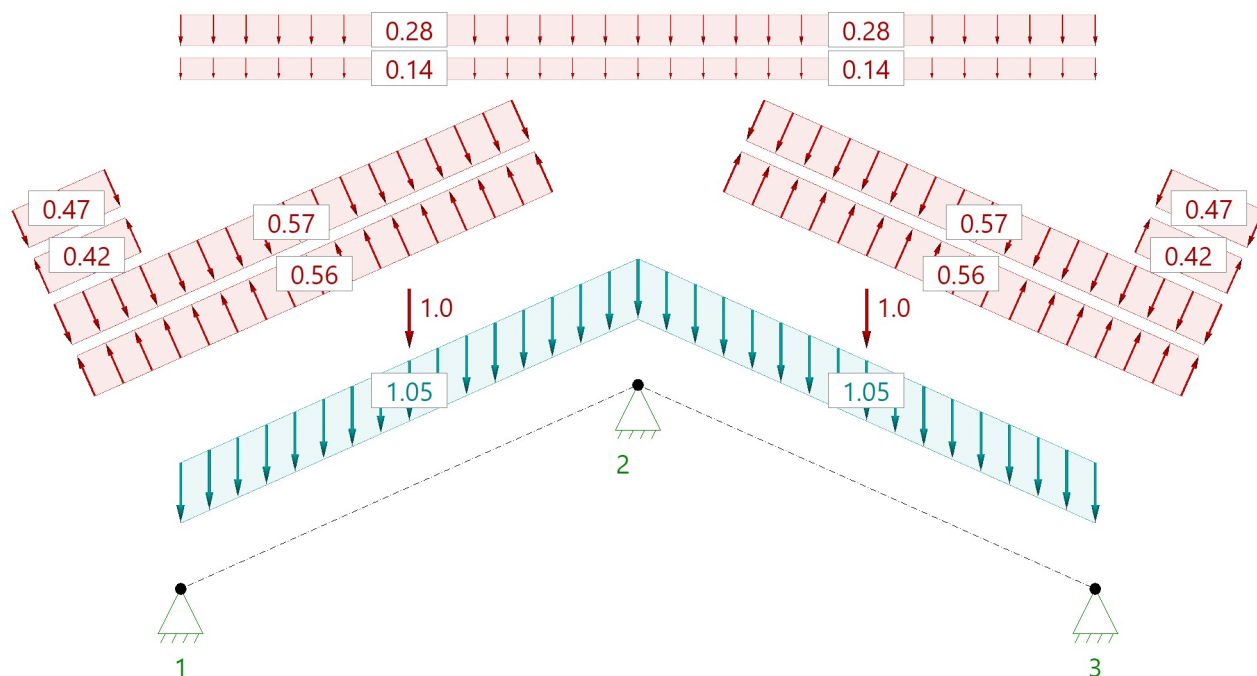
Namesto obstoječega stopnišča, ki vodi iz nadstropja v podstrešje, se izvede novo jekleno stopnišče. Stopnišče bo izvedeno kot jeklena konstrukcija iz profilov UNP 160.

**Item: spirovci**

Purlin and Rafter Roof (x64) DPD+ 02/25B (FRILO R-2025-2/P04)

**System**
**Common**

Softwood C24, Service class roofed, open; AH&lt;85%; BMC&lt;20%, CC 2

**System Graphics**

**Load graphics**

**Material**
**Material values Timber**

Softwood C24 acc.to EN 338:2016

 $E_{0,mean} = 11000 \text{ N/mm}^2$   
 $G_{mean} = 690 \text{ N/mm}^2$ 
 $\rho_k = 350 \text{ kg/m}^3$

### Material Characteristics

$f_{m,k}$ $f_{v,k}$ N/mm <sup>2</sup>	$f_{t,0,k}$ $f_{c,0,k}$ N/mm <sup>2</sup>	$f_{t,90,k}$ $f_{c,90,k}$ N/mm <sup>2</sup>	$E_{0,mean}$ $E_{0,05}$ N/mm <sup>2</sup>	$E_{90,mean}$ $E_{90,05}$ N/mm <sup>2</sup>	$G_{mean}$ $G_{05}$ N/mm <sup>2</sup>	$\rho_k$ $\rho_m$ kg/m <sup>3</sup>	$\gamma$ kN/m <sup>3</sup>
24.00 4.00	14.50 21.00	0.40 2.50	11000 7400	370 247	690 460	350 420	6.00

### Geometry

#### Duopitched canopy roof rafter

Rafter spacing  $e = 245.0$  cm      Total ridge height  $h = 6.00$  m  
Length of Roof  $b_{Roof} = 20.00$  m      Building length  $b_{Wall} = 20.00$  m

#### Rafter

Span	Length BAR [m]	Length RAR [m]	Page	Slope [°]	Cross-section [cm]
1	4.70	5.14	left	24.0	25.0/21.0
1	4.70	5.14	right	24.0	25.0/21.0
with ridge					

### Support

No.	Member	$C_x$ [kN/m]	$C_z$ [kN/m]	Depth of birdsmouth joints $t$ [cm]
1	Rafter left	Rigid	Rigid	0.0
2	Rafter left, Rafter right	Rigid	Rigid	0.0
3	Rafter right	Rigid	Rigid	0.0

### Tilt-/ Buckling-Lengths

#### Rafter left

Buckling in plane: from eigenvalue limited to...0.90\*L  
Buckling out of plane: kept continuously  
Tilting: kept continuously

#### Rafter right

Buckling in plane: from eigenvalue limited to...0.90\*L  
Buckling out of plane: kept continuously  
Tilting: kept continuously

### Calculation Rules

Deflections are always taken into account on the cantilever.  
The rod length is always used as the reference length for the total deflection verification.  
Caution! If bars are connected without a support, their bar lengths are added up.  
Wind loads from undergrate blast are assumed to be dependent.  
Wind loads from internal wind pressure are assumed to be dependent.  
Load cases with loads whose expected deformations are opposite are not included.  
Combinations of load cases whose expected deformations are opposite are not used.  
The stiffness should be reduced as a result of creep from permanent and quasi-permanent load components.  
With wind,  $k_{mod}$  is set as the mean value of short and very short.  
Wind loads for lateral flow in Inconvenient area  
Roof live loads of the category H are only considered as individual loads.  
Roof live loads of the category H are not considered in reaction forces.

### Loads

#### Load Pre-settings

##### Rafter

Roofing  $g_1 = 1.05$  kN/m<sup>2</sup>      Act = 99  
Construction  $g_2 = 0.00$  kN/m<sup>2</sup>  
Loft conversion  $g_3 = 0.00$  kN/m<sup>2</sup>  
Loft Conversion bottom  $g_b = 0.00$  kN/m<sup>2</sup>  
With dead weight of members,  $\gamma = 6.00$  kN/m<sup>3</sup>  
Roofload Cat.H  $Q = 1.0$  kN      Act = 8

#### Boundary conditions

Total ridge height  $h = 6.00$  m  
Length of Roof  $b_{Roof} = 20.00$  m  
Building length  $b_{Wall} = 20.00$  m

### Snow / wind loads for the calculation - User-defined value

EN 1991-1-3:2010, EN 1991-1-4:2010

Terrain elevation Altitude = 100.00 m

Ground Snow Load  $s_k = 0.35 \text{ kN/m}^2$ 

Wind pressure  $q_{p,0}(h) = 0.30 \text{ kN/m}^2$ 

Wind pressure  $q_{p,90}(h) = 0.30 \text{ kN/m}^2$ 

### Auxiliary values

Wind pressure reference area  $A_{ref} = 10.00 \text{ m}^2$ 

Wind reference length (Roof)  $e_0 = 12.00 \text{ m}$   $e_{90} = 9.40 \text{ m}$ 

Wind reference length (Wall)  $e_0 = 12.00 \text{ m}$   $e_{90} = 9.40 \text{ m}$ 
 $h/d = 0.638$   $h/b = 0.300$   $d/b = 0.470$ 

for gable-side flow:

 $h/d = 0.300$ 
 $h/b = 0.638$ 
 $d/b = 2.128$ 

### Classification of Actions

No.	Name	$\gamma_{sup}$	$\gamma_{inf}$	$\psi_0$	$\psi_1$	$\psi_2$	KLED
99	Permanent loads	1.35	1.00	1.00	1.00	1.00	permanent
8	Cat. H: roofs	1.50	0.00	0.00	0.00	0.00	short-term
9	Wind loads	1.50	0.00	0.60	0.20	0.00	short/instant
10	Snow loads $H < 1000 \text{ m}$	1.50	0.00	0.50	0.20	0.00	short-term

### Load values

#### Snow load

Name	Page	$\mu$			Load value	(according to standard)	
Roof load	left	0.80	0.00	0.00	0.28	0.28	$\text{kN/m}^2$
Non-blown portion (for blown load cases)	left	0.80	0.00	0.00	0.28	0.28	$\text{kN/m}^2$
Blown portion (for blown load cases)	left	0.80	0.00	0.00	0.14	0.14	$\text{kN/m}^2$
Roof load	right	0.80	0.00	0.00	0.28	0.28	$\text{kN/m}^2$
Non-blown portion (for blown load cases)	right	0.80	0.00	0.00	0.28	0.28	$\text{kN/m}^2$
Blown portion (for blown load cases)	right	0.80	0.00	0.00	0.14	0.14	$\text{kN/m}^2$

#### Wind loads

Name	Page	$c_{p+}$	$c_{p-}$	Pressure [ $\text{kN/m}^2$ ]	Suction [ $\text{kN/m}^2$ ]	Pressure (Standard) [ $\text{kN/m}^2$ ]	Suction (Standard) [ $\text{kN/m}^2$ ]
A	from left	1.18	-1.36	0.35	-0.41	0.35	-0.41
B	from left	1.90	-1.88	0.57	-0.56	0.57	-0.56
C	from left	1.58	-1.40	0.47	-0.42	0.47	-0.42
D	from left	0.48	-2.00	0.14	-0.60	0.14	-0.60

### Combinations

#### LC Combinations

No.	Name		Sit	KLED
1	$1.35 \cdot g$	ULS <sup>1</sup>	$p/t^2$	1 <sup>3</sup>
4	$1.35 \cdot g + 1.50 \cdot (w_{Luv+}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
5	$1.35 \cdot g + 1.50 \cdot (w_{Luv-}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
9	$1.35 \cdot g + 1.50 \cdot s + 0.90 \cdot (w_{Luv+}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
10	$1.35 \cdot g + 0.75 \cdot s + 1.50 \cdot (w_{Luv+}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
19	$1.35 \cdot g + 0.75 \cdot s_{DI} + 1.50 \cdot (w_{Luv+}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
21	$1.35 \cdot g + 0.75 \cdot s_{DI} + 1.50 \cdot (w_{Luv-}) + (w_{Lee+})$	ULS <sup>1</sup>	$p/t^2$	6 <sup>4</sup>
31	$1.00 \cdot g$	SLS <sup>5</sup>	char <sup>6</sup>	1 <sup>3</sup>
32	$1.00 \cdot g + 1.00 \cdot (w_{Luv+}) + (w_{Lee+})$	SLS <sup>5</sup>	char <sup>6</sup>	6 <sup>4</sup>
38	$1.00 \cdot g + 0.50 \cdot s + 1.00 \cdot (w_{Luv+}) + (w_{Lee+})$	SLS <sup>5</sup>	char <sup>6</sup>	6 <sup>4</sup>

The assignment of the short case names can be found in the table of load cases.

Es wurden nicht alle Kombinationen gebildet. Siehe dazu Einstellungen unter Berechnungsregeln.

- 1 : ULS=Structural failure
- 2 : p/t=persistent/transient (Persistent/Transient Situation)
- 3 : Load duration class:1=permanent
- 4 : Load duration class:6=short/instant
- 5 : SLS=Serviceability
- 6 : char=characteristic (Characteristic Situation)



## Results

### Rafter left 25.0/21.0 e = 245.0 cm

ULS acc.to DIN EN 1995:2013, based on EN 1995:2014, Consequence class 2

#### Checks in Persistent/Transient Situation

Combi	Sit	Check	N <sub>x,d</sub> [kN]	M <sub>y,d</sub> [kNm]	V <sub>z,d</sub> [kN]	σ <sub>n,d</sub> [N/mm <sup>2</sup> ]	σ <sub>m,y,d</sub> [N/mm <sup>2</sup> ]	τ <sub>d</sub> [N/mm <sup>2</sup> ]	η	Sk <sub>y</sub> [m]	Sk <sub>z</sub> [m]	S <sub>b</sub> [m]
10	p/t <sup>1</sup>	Stress (Span)	0.0	20.59	-0.2	0.00	11.21		<b>0.61</b>			
1	p/t <sup>1</sup>	Stress (Column)	4.1	0.00	-9.2	0.08	0.00		<b>0.01</b>			
10	p/t <sup>1</sup>	Stability	-4.6	20.59	0.0	-0.09	11.21		<b>0.61</b> <sup>2</sup>	2.41	0.00	0.00
10	p/t <sup>1</sup>	Shear	-4.6	0.00	17.3			0.49	<b>0.32</b>			

The composition of the load case combinations can be found in the table of load case combinations.

- 1 : p/t=persistent/transient (Persistent/Transient Situation)  
2 : Sk<sub>y</sub>=2.41 m, Sk<sub>z</sub>=0.00 m, S<sub>b</sub>=0.00 m

SLS checks acc.to DIN EN 1995:2013, based on EN 1995:2014, Consequence class 2

Combi	Check		Beam	x [m]	W <sub>G,inst</sub> [cm]	W <sub>G,fin</sub> [cm]	W <sub>Q,inst,char</sub> [cm]	W <sub>Q,inst,qprm</sub> [cm]	W <sub>Q,fin</sub> [cm]	W <sub>tot</sub> [cm]		W <sub>lim</sub> [cm]	L/..	η
38	W <sub>inst</sub> <sup>1</sup>	local	1	2.57	1.1		0.7			1.8	<	2.1	250	<b>0.90</b>
38	W <sub>inst</sub> <sup>1</sup>	total	1	2.57	1.1		0.7			1.8	<	2.1	250	<b>0.90</b>
31	W <sub>net</sub> <sup>2</sup>	local	1	2.57	(1.1)	2.0		(0.0)	0.0	2.0	<	2.1	250	<b>0.99</b>
31	W <sub>net</sub> <sup>2</sup>	total	1	2.57	(1.1)	2.0		(0.0)	0.0	2.0	<	2.1	250	<b>0.99</b>
38	W <sub>fin</sub> <sup>3</sup>	local	1	2.57	(1.1)	2.0	(0.7)		0.7	2.7	<	3.4	150	<b>0.80</b>
38	W <sub>fin</sub> <sup>3</sup>	total	1	2.57	(1.1)	2.0	(0.7)		0.7	2.7	<	3.4	150	<b>0.80</b>

Values in () are only informative.

The rod length is always used as the reference length for the total deflection verification.

For the local deflection verification, the member length is always used as the reference length.

Member lengths of members that are connected to each other without support are added up.

- 1 : W<sub>inst</sub> = W<sub>G,inst</sub> + W<sub>Q,inst,char</sub>  
2 : W<sub>net</sub> = W<sub>G,fin</sub> + W<sub>Q,fin,qprm</sub> - W<sub>c</sub>  
3 : W<sub>fin</sub> = W<sub>G,fin</sub> + W<sub>Q,fin,char</sub>

### Rafter right 25.0/21.0 e = 245.0 cm

ULS acc.to DIN EN 1995:2013, based on EN 1995:2014, Consequence class 2

#### Checks in Persistent/Transient Situation

Combi	Sit	Check	N <sub>x,d</sub> [kN]	M <sub>y,d</sub> [kNm]	V <sub>z,d</sub> [kN]	σ <sub>n,d</sub> [N/mm <sup>2</sup> ]	σ <sub>m,y,d</sub> [N/mm <sup>2</sup> ]	τ <sub>d</sub> [N/mm <sup>2</sup> ]	η	Sk <sub>y</sub> [m]	Sk <sub>z</sub> [m]	S <sub>b</sub> [m]
10	p/t <sup>1</sup>	Stress (Span)	0.0	20.59	0.2	0.00	11.21		<b>0.61</b>			
1	p/t <sup>1</sup>	Stress (Column)	4.1	0.00	9.2	0.08	0.00		<b>0.01</b>			
19	p/t <sup>1</sup>	Stability	-4.6	20.59	0.0	-0.09	11.21		<b>0.61</b> <sup>2</sup>	2.41	0.00	0.00
10	p/t <sup>1</sup>	Shear	-4.6	0.00	-17.3			-0.49	<b>0.32</b>			

The composition of the load case combinations can be found in the table of load case combinations.

- 1 : p/t=persistent/transient (Persistent/Transient Situation)  
2 : Sk<sub>y</sub>=2.41 m, Sk<sub>z</sub>=0.00 m, S<sub>b</sub>=0.00 m

SLS checks acc.to DIN EN 1995:2013, based on EN 1995:2014, Consequence class 2

Combi	Check		Beam	x [m]	W <sub>G,inst</sub> [cm]	W <sub>G,fin</sub> [cm]	W <sub>Q,inst,char</sub> [cm]	W <sub>Q,inst,qprm</sub> [cm]	W <sub>Q,fin</sub> [cm]	W <sub>tot</sub> [cm]		W <sub>lim</sub> [cm]	L/..	η
38	W <sub>inst</sub> <sup>1</sup>	local	2	2.57	1.1		0.7			1.8	<	2.1	250	<b>0.90</b>
38	W <sub>inst</sub> <sup>1</sup>	total	2	2.57	1.1		0.7			1.8	<	2.1	250	<b>0.90</b>
31	W <sub>net</sub> <sup>2</sup>	local	2	2.57	(1.1)	2.0		(0.0)	0.0	2.0	<	2.1	250	<b>0.99</b>
31	W <sub>net</sub> <sup>2</sup>	total	2	2.57	(1.1)	2.0		(0.0)	0.0	2.0	<	2.1	250	<b>0.99</b>
38	W <sub>fin</sub> <sup>3</sup>	local	2	2.57	(1.1)	2.0	(0.7)		0.7	2.7	<	3.4	150	<b>0.80</b>
38	W <sub>fin</sub> <sup>3</sup>	total	2	2.57	(1.1)	2.0	(0.7)		0.7	2.7	<	3.4	150	<b>0.80</b>

Values in () are only informative.

The rod length is always used as the reference length for the total deflection verification.

For the local deflection verification, the member length is always used as the reference length.

Member lengths of members that are connected to each other without support are added up.

- 1 : W<sub>inst</sub> = W<sub>G,inst</sub> + W<sub>Q,inst,char</sub>  
2 : W<sub>net</sub> = W<sub>G,fin</sub> + W<sub>Q,fin,qprm</sub> - W<sub>c</sub>  
3 : W<sub>fin</sub> = W<sub>G,fin</sub> + W<sub>Q,fin,char</sub>

## Support

### Support Reactions per Act

Act		Support 1		Support 2		Support 3	
		max [kN/m]	min [kN/m]	max [kN/m]	min [kN/m]	max [kN/m]	min [kN/m]
99	vertical	3.03 <sup>1</sup>	3.03 <sup>1</sup>	6.06 <sup>1</sup>	6.06 <sup>1</sup>	3.03 <sup>1</sup>	3.03 <sup>1</sup>
	horizontal	0.00 <sup>1</sup>	0.00 <sup>1</sup>	0.00 <sup>1</sup>	0.00 <sup>1</sup>	0.00 <sup>1</sup>	0.00 <sup>1</sup>
9	vertical	1.74 <sup>2</sup>	-1.68 <sup>3</sup>	2.77 <sup>2</sup>	-2.73 <sup>3</sup>	1.74 <sup>2</sup>	-1.68 <sup>3</sup>
	horizontal	0.75 <sup>3</sup>	-0.77 <sup>2</sup>	0.00 <sup>3</sup>	0.00 <sup>2</sup>	0.77 <sup>2</sup>	-0.75 <sup>3</sup>
10	vertical	0.66 <sup>4</sup>	0.33 <sup>5</sup>	1.32 <sup>4</sup>	0.99 <sup>5</sup>	0.66 <sup>4</sup>	0.33 <sup>7</sup>
	horizontal	0.00 <sup>6</sup>	0.00 <sup>6</sup>	0.00 <sup>6</sup>	0.00 <sup>6</sup>	0.00 <sup>6</sup>	0.00 <sup>6</sup>

all values are characteristic values

Support forces are always positive in the direction of the global and local axes.

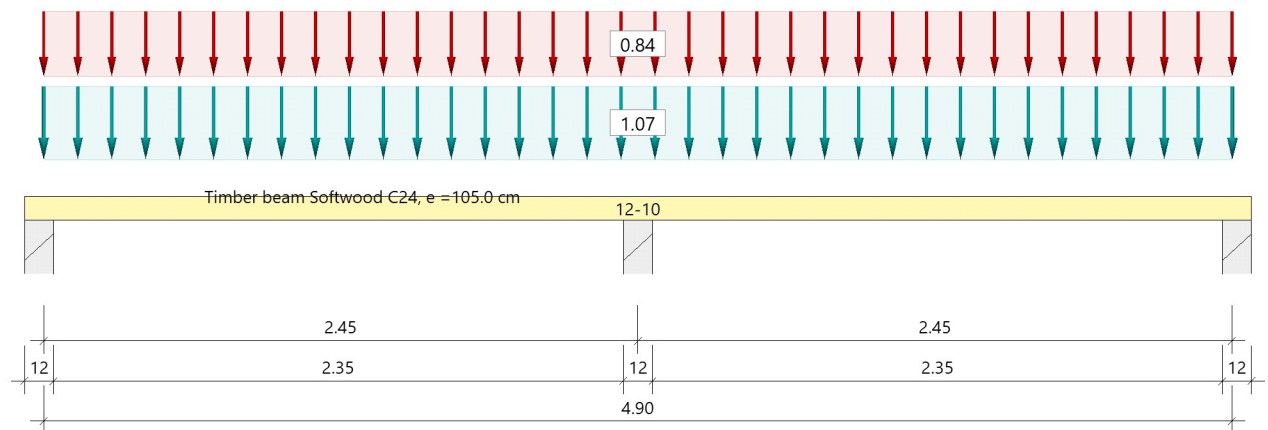
- 1 : Load Cases:g
- 2 : Load Cases:(wLuv+)+(wLee+)
- 3 : Load Cases:(wLuv-)+(wLee+)
- 4 : Load Cases:s
- 5 : Load Cases:sDI
- 6 : Load Cases:
- 7 : Load Cases:sDr

**Item: sekundarci**

Continuous Beam Timber (x64) HTM+ 02/25 (FRILO R-2025-2/P04)

**Basic parameters**

Timber beam by 2 Spans (e = 105.0 cm) Softwood C24 DIN EN 1995-1-1/NA:2013-08

**System**
**System image**

**Material**
**Softwood C24, acc.to EN 338:2016**

	$f_{m,k}$ $f_{v,k}$ [N/mm <sup>2</sup> ]	$f_{t,0,k}$ $f_{c,0,k}$ [N/mm <sup>2</sup> ]	$f_{t,90,k}$ $f_{c,90,k}$ [N/mm <sup>2</sup> ]	$E_{0,mean}$ $E_{0,05}$ [N/mm <sup>2</sup> ]	$E_{90,mean}$ $E_{90,05}$ [N/mm <sup>2</sup> ]	$G_{mean}$ $G_{05}$ [N/mm <sup>2</sup> ]	$\rho_k$ $\rho_m$ [kg/m <sup>3</sup> ]
	24.00 4.00	14.50 21.00	0.40 2.50	11000 7400	370 247	690 460	350 420
$f_{m,k}$ : characteristic value of bending strength $f_{t,0,k}$ : characteristic value of tensile strength parallel to grain $f_{t,90,k}$ : characteristic value of tensile strength perpendicular to the grain $E_{0,mean}$ : Average value of modulus of elasticity parallel to the fiber $E_{90,mean}$ : Average value of the modulus of elasticity perpendicular to the grain $G_{mean}$ : Average value of the shear modulus $\rho_k$ : Characteristic value of gross density $f_{v,k}$ : characteristic value of shear strength $f_{c,0,k}$ : characteristic value of compressive strength parallel to grain $f_{c,90,k}$ : characteristic value of compressive strength perpendicular to the grain $E_{0,05}$ : 5% fractile value of the modulus of elasticity parallel to grain $E_{90,05}$ : 5% fractile value of the modulus of elasticity perpendicular to the grain $G_{05}$ : 5% fractile value of the shear modulus $\rho_m$ : Average value of the density							

**Geometry**
**Cross-sections**

Name	$I_y$ [cm <sup>4</sup> ]	$I_z$ [cm <sup>4</sup> ]	$W_y$ [cm <sup>3</sup> ]	$W_z$ [cm <sup>3</sup> ]	$A$ [cm <sup>2</sup> ]
12-10	1000	1440	200	240	120.0

Cross-section is constant over the entire length of the beam.

**Support ( Bearing conditions)**

No	x [m]	Width [cm]	Depth [cm]	$k_{c90}$	$u_y$ [kN/m]	$u_z$ [kN/m]	Rotations*)		
							$\Phi_x$ [kNm/rad]	$\Phi_y$ [kNm/rad]	$\Phi_z$ [kNm/rad]
1	0.00	12.0	12.0	1.00	-1	-1	-1	0.0	0.0
2	2.45	12.0	12.0	1.00	-1	-1	0.0	0.0	0.0
3	4.90	12.0	12.0	1.00	-1	-1	0.0	0.0	0.0

\*) -1 = fixed, 0 = free, &gt; 0 = elastically restraint



## Loads

### Line loads from distributed loads

Reference	No.	Type	A [m]	L1 [m]	L2 [m]	W1 [kN/m <sup>2</sup> ]	W2 [kN/m <sup>2</sup> ]	acting Span by span	GF	Sim	Alt
System	1	UDL		4.90		1.02		No	Permanent		
	2	UDL		4.90		0.80		Yes	Cat. A		
Reference : System-related (front edge of beam) or span load Type : 1 - uniformly distributed load (GL), 4 - trapezoidal load (TL), 5 - triangular load (DL) A : Distance to the load from the beginning of the span or the front edge of the beam GF : Load effect Sim : Combined group Alt : Alternate group											

### Lastbezeichnungen

Nr	Bezeichnung
1	Distance 1.05 m
2	Distance 1.05 m
The load values are multiplied internally by the girder spacing $e = 1.05$ m.	

### Self-weight

Total weight = 25 kg taken into account with  $\gamma = 4.20$  kN/m<sup>3</sup>..

### Overview of the actions used

#### Actions

Description	$\psi_0$	$\psi_1$	$\psi_2$	$\gamma_{F,inf}$	$\gamma_{F,sup}$	KLED
Permanent loads Cat. A: domestic, residential areas	0.70	0.50	0.30	1.00	1.35 1.50	middle
Consequences class CC 2 according to EN 1990 Tab. B1 -> $K_{Fi} = 1.0$ Tab. B3						

## Results

### Design parameter

Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Safety concept / load combinatorics	:	DIN EN 1990/NA:2010-12
Consequence class	:	CC 2
$\psi_2 = 0.5$ for snow (AE)	:	not considered
Permanent loads	:	all equal $\gamma_F$ ( $\gamma_{G,sup}$ or $\gamma_{G,inf}$ )
CLED at wind	:	Average of short and very short

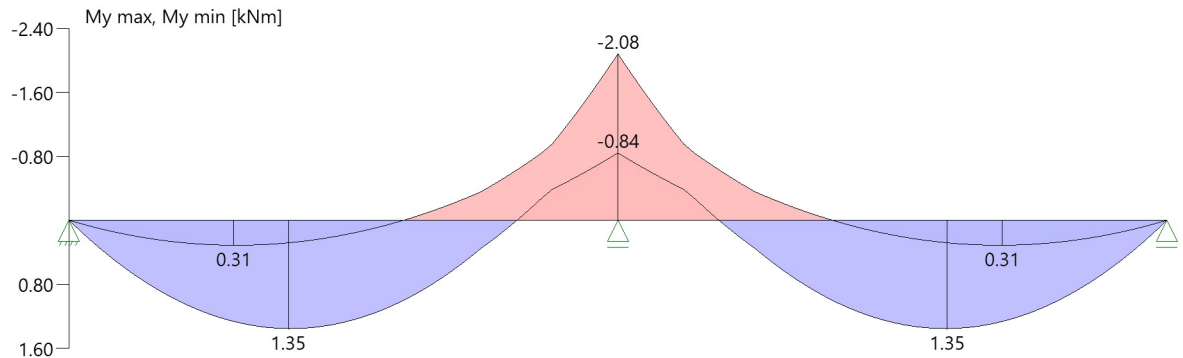
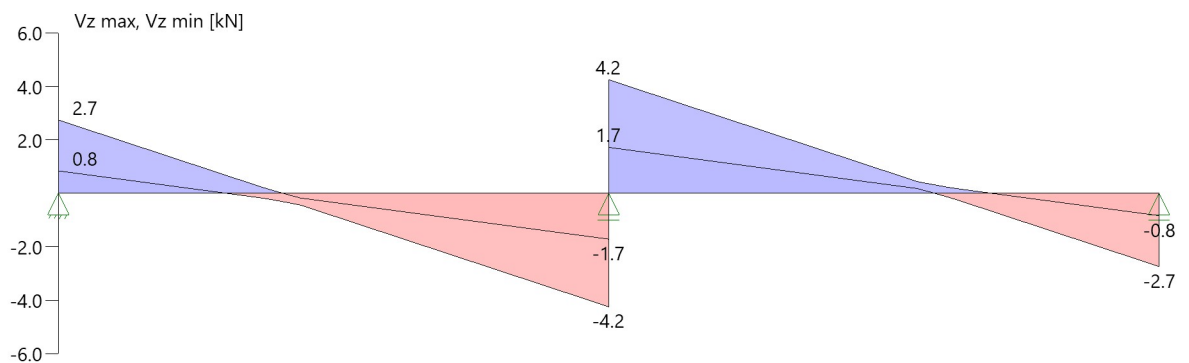
Service class	2	:	roofed, open
Shear stresses	=		Tau with red. Q
Initial deflection	$w_{inst}$	=	$l/300$
Final deflection	$w_{net,fin}$	=	$l/300$
	$w_{fin}$	=	$l/200$

### Summary

Verification	Design situation	$\eta_{Bending}$	$\eta_{Shear}$	$\eta_{c,90}$	$\eta_{Stabi}$	$\eta_{Deformation}$
Bearing capacity Serviceability	persistent/transient characteristic	0.65	0.30	0.26	1)	0.60
1) Stability check was not carried out because the upper chord is held continuously.						

### Structural safety per cross-section (compact)

Design situation	Cross-section	$V_{z,Ed}$ [kN]	$M_{y,Ed}$ [kNm]	$\eta_{Shear}$	$\eta_{Bending}$	$\eta_{Stabi}$
persistent/transient	12-10	3.8	-2.08	0.30	0.65	

**Structural safety - Load combination persistent/transient**
**Internal forces**
**Envelope of the moments**

**Envelope of the transverse forces**

**Support reactions**
**Support reactions pro [m] - characteristic of each action**

No.	x [m]	Action	$R_{z,min}$ [kN/m]	$R_{z,max}$ [kN/m]	$M_{y,min}$ [kNm/m]	$M_{y,max}$ [kNm/m]
1	0.00	Permanent loads Cat. A: domestic, residential areas	0.98 -0.12	0.98 0.86		
2	2.45	Permanent loads Cat. A: domestic, residential areas	3.27	3.27 2.45		
3	4.90	Permanent loads Cat. A: domestic, residential areas	0.98 -0.12	0.98 0.86		

## Item: sleme

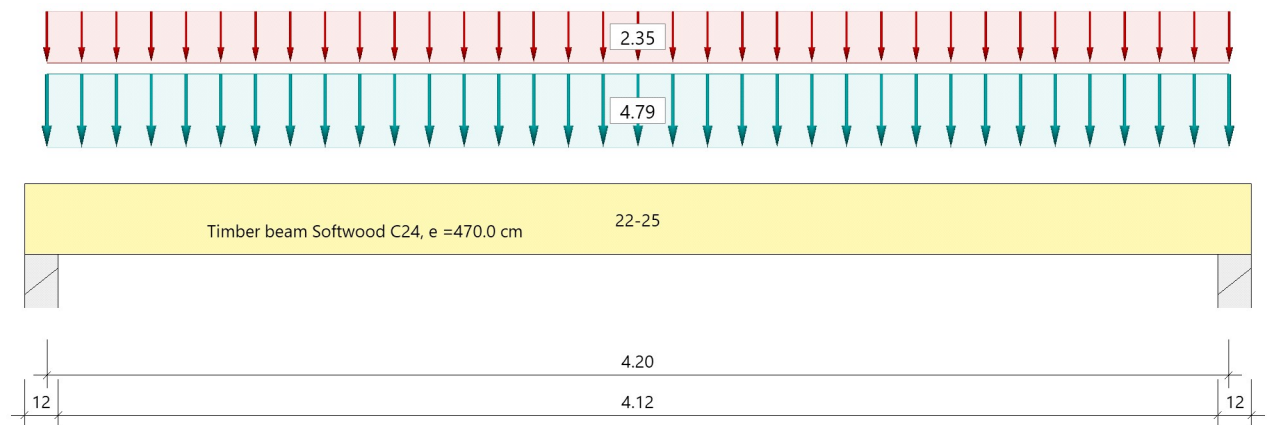
Continuous Beam Timber (x64) HTM+ 02/25 (FRIL0 R-2025-2/P04)

## Basic parameters

Timber beam (e = 470.0 cm) Softwood C24 DIN EN 1995-1-1/NA:2013-08

## System

### System image



## Material

### Softwood C24, acc.to EN 338:2016

$f_{m,k}$ $f_{v,k}$ [N/mm <sup>2</sup> ]	$f_{t,0,k}$ $f_{c,0,k}$ [N/mm <sup>2</sup> ]	$f_{t,90,k}$ $f_{c,90,k}$ [N/mm <sup>2</sup> ]	$E_{0,mean}$ $E_{0,05}$ [N/mm <sup>2</sup> ]	$E_{90,mean}$ $E_{90,05}$ [N/mm <sup>2</sup> ]	$G_{mean}$ $G_{05}$ [N/mm <sup>2</sup> ]	$\rho_k$ $\rho_m$ [kg/m <sup>3</sup> ]
24.00 4.00	14.50 21.00	0.40 2.50	11000 7400	370 247	690 460	350 420

$f_{m,k}$  : characteristic value of bending strength  
 $f_{t,0,k}$  : characteristic value of tensile strength parallel to grain  
 $f_{t,90,k}$  : characteristic value of tensile strength perpendicular to the grain  
 $E_{0,mean}$  : Average value of modulus of elasticity parallel to the fiber  
 $E_{90,mean}$  : Average value of the modulus of elasticity perpendicular to the grain  
 $G_{mean}$  : Average value of the shear modulus  
 $\rho_k$  : Characteristic value of gross density  
 $f_{v,k}$  : characteristic value of shear strength  
 $f_{c,0,k}$  : characteristic value of compressive strength parallel to grain  
 $f_{c,90,k}$  : characteristic value of compressive strength perpendicular to the grain  
 $E_{0,05}$  : 5% fractile value of the modulus of elasticity parallel to grain  
 $E_{90,05}$  : 5% fractile value of the modulus of elasticity perpendicular to the grain  
 $G_{05}$  : 5% fractile value of the shear modulus  
 $\rho_m$  : Average value of the density

## Geometry

### Cross-sections

Name	$I_y$ [cm <sup>4</sup> ]	$I_z$ [cm <sup>4</sup> ]	$W_y$ [cm <sup>3</sup> ]	$W_z$ [cm <sup>3</sup> ]	$A$ [cm <sup>2</sup> ]
22-25	28646	22183	2292	2017	550.0

Cross-section is constant over the entire length of the beam.

### Support ( Bearing conditions)

No	x [m]	Width [cm]	Depth [cm]	$k_{c90}$	$u_y$ [kN/m]	$u_z$ [kN/m]	Rotations*)		
							$\Phi_x$ [kNm/rad]	$\Phi_y$ [kNm/rad]	$\Phi_z$ [kNm/rad]
1	0.00	12.0	12.0	1.00	-1	-1	-1	0.0	0.0
2	4.20	12.0	12.0	1.00	-1	-1	0.0	0.0	0.0

\*) -1 = fixed, 0 = free, &gt; 0 = elastically restraint

## Loads

### Line loads from distributed loads

Reference	No.	Type	A [m]	L1 [m]	L2 [m]	W1 [kN/m <sup>2</sup> ]	W2 [kN/m <sup>2</sup> ]	acting Span by span	GF	Sim	Alt
System	1	UDL		4.20		1.02		No	Permanent		
	2	UDL		4.20		0.50		Yes	Snow		
Reference : System-related (front edge of beam) or span load Type : 1 - uniformly distributed load (GL), 4 - trapezoidal load (TL), 5 - triangular load (DL) A : Distance to the load from the beginning of the span or the front edge of the beam GF : Load effect Sim : Combined group Alt : Alternate group											

### Lastbezeichnungen

Nr	Bezeichnung
1	Distance 4.70 m
2	Distance 4.70 m
The load values are multiplied internally by the girder spacing $e = 4.70$ m.	

### Self-weight

Total weight = 97 kg taken into account with  $\gamma = 4.20$  kN/m<sup>3</sup>..

### Overview of the actions used

#### Actions

Description	$\psi_0$	$\psi_1$	$\psi_2$	$\gamma_{F,inf}$	$\gamma_{F,sup}$	KLED
Permanent loads				1.00	1.35	
Snow loads $H < 1000$ m	0.50	0.20	0.00		1.50	short
Consequences class CC 2 according to EN 1990 Tab. B1 -> $K_{Fi} = 1.0$ Tab. B3						

## Results

### Design parameter

Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Safety concept / load combinatorics	:	DIN EN 1990/NA:2010-12
Consequence class	:	CC 2
$\psi_2 = 0.5$ for snow (AE)	:	not considered
Permanent loads	:	all equal $\gamma_F$ ( $\gamma_{G,sup}$ or $\gamma_{G,inf}$ )
CLED at wind	:	Average of short and very short

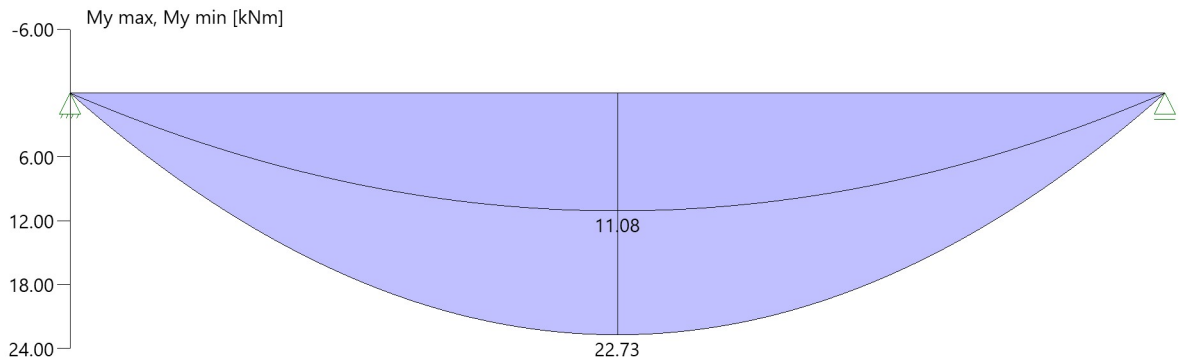
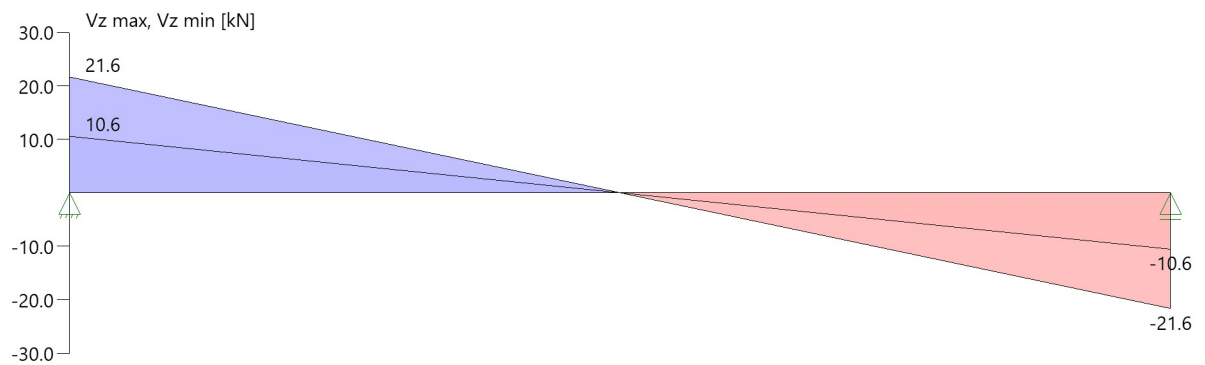
Service class	2	:	roofed, open
Shear stresses	=		Tau with red. Q
Initial deflection	$w_{inst}$	=	$l/300$
Final deflection	$w_{net,fin}$	=	$l/300$
	$w_{fin}$	=	$l/200$

### Summary

Verification	Design situation	$\eta_{Bending}$	$\eta_{Shear}$	$\eta_{c,90}$	$\eta_{Stabi}$	$\eta_{Deformation}$
Bearing capacity Serviceability	persistent/transient characteristic	0.60	0.37	0.69	1)	0.83
1) Stability check was not carried out because the upper chord is held continuously.						

### Structural safety per cross-section (compact)

Design situation	Cross-section	$V_{z,Ed}$ [kN]	$M_{y,Ed}$ [kNm]	$\eta_{Shear}$	$\eta_{Bending}$	$\eta_{Stabi}$
persistent/transient	22-25	18.7	22.73	0.37	0.60	

**Structural safety - Load combination persistent/transient**
**Internal forces**
**Envelope of the moments**

**Envelope of the transverse forces**

**Support reactions**
**Support reactions pro [m] - characteristic of each action**

No.	x [m]	Action	$R_{z,min}$ [kN/m]	$R_{z,max}$ [kN/m]	$M_{y,min}$ [kNm/m]	$M_{y,max}$ [kNm/m]
1	0.00	Permanent loads Snow loads H < 1000 m	2.25	2.25 1.05		
2	4.20	Permanent loads Snow loads H < 1000 m	2.25	2.25 1.05		

## Item: stropniki

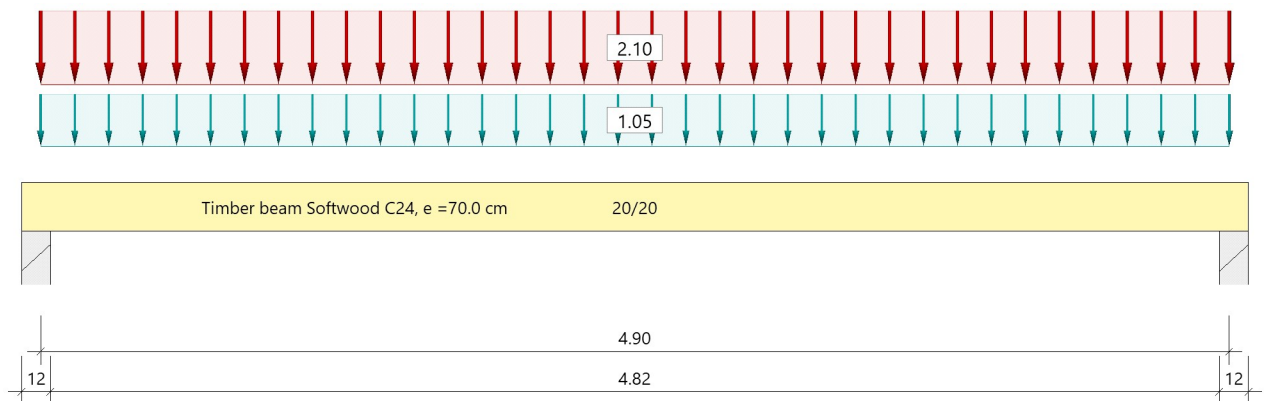
Continuous Beam Timber (x64) HTM+ 02/25 (FRILO R-2025-2/P04)

### Basic parameters

Timber beam (e = 70.0 cm) Softwood C24 DIN EN 1995-1-1/NA:2013-08

### System

#### System image



### Material

#### Softwood C24, acc.to EN 338:2016

$f_{m,k}$ $f_{v,k}$ [N/mm <sup>2</sup> ]	$f_{t,0,k}$ $f_{c,0,k}$ [N/mm <sup>2</sup> ]	$f_{t,90,k}$ $f_{c,90,k}$ [N/mm <sup>2</sup> ]	$E_{0,mean}$ $E_{0,05}$ [N/mm <sup>2</sup> ]	$E_{90,mean}$ $E_{90,05}$ [N/mm <sup>2</sup> ]	$G_{mean}$ $G_{05}$ [N/mm <sup>2</sup> ]	$\rho_k$ $\rho_m$ [kg/m <sup>3</sup> ]
24.00 4.00	14.50 21.00	0.40 2.50	11000 7400	370 247	690 460	350 420

$f_{m,k}$  : characteristic value of bending strength  
 $f_{t,0,k}$  : characteristic value of tensile strength parallel to grain  
 $f_{t,90,k}$  : characteristic value of tensile strength perpendicular to the grain  
 $E_{0,mean}$  : Average value of modulus of elasticity parallel to the fiber  
 $E_{90,mean}$  : Average value of the modulus of elasticity perpendicular to the grain  
 $G_{mean}$  : Average value of the shear modulus  
 $\rho_k$  : Characteristic value of gross density  
 $f_{v,k}$  : characteristic value of shear strength  
 $f_{c,0,k}$  : characteristic value of compressive strength parallel to grain  
 $f_{c,90,k}$  : characteristic value of compressive strength perpendicular to the grain  
 $E_{0,05}$  : 5% fractile value of the modulus of elasticity parallel to grain  
 $E_{90,05}$  : 5% fractile value of the modulus of elasticity perpendicular to the grain  
 $G_{05}$  : 5% fractile value of the shear modulus  
 $\rho_m$  : Average value of the density

### Geometry

#### Cross-sections

Name	$I_y$ [cm <sup>4</sup> ]	$I_z$ [cm <sup>4</sup> ]	$W_y$ [cm <sup>3</sup> ]	$W_z$ [cm <sup>3</sup> ]	A [cm <sup>2</sup> ]
20/20	13333	13333	1333	1333	400.0

Cross-section is constant over the entire length of the beam.

#### Support ( Bearing conditions)

No	x [m]	Width [cm]	Depth [cm]	$k_{c90}$	$u_y$ [kN/m]	$u_z$ [kN/m]	Rotations <sup>*)</sup>		
							$\Phi_x$ [kNm/rad]	$\Phi_y$ [kNm/rad]	$\Phi_z$ [kNm/rad]
1	0.00	12.0	12.0	1.00	-1	-1	-1	0.0	0.0
2	4.90	12.0	12.0	1.00	-1	-1	0.0	0.0	0.0

<sup>\*)</sup> -1 = fixed, 0 = free, > 0 = elastically restraint



## Loads

### Line loads from distributed loads

Reference	No.	Type	A [m]	L1 [m]	L2 [m]	W1 [kN/m <sup>2</sup> ]	W2 [kN/m <sup>2</sup> ]	acting Span by span	GF	Sim	Alt
System	1	UDL		4.90		1.50		No	Permanent		
	2	UDL		4.90		3.00		Yes	Cat. A		
Reference : System-related (front edge of beam) or span load Type : 1 - uniformly distributed load (GL), 4 - trapezoidal load (TL), 5 - triangular load (DL) A : Distance to the load from the beginning of the span or the front edge of the beam GF : Load effect Sim : Combined group Alt : Alternate group											

### Lastbezeichnungen

Nr	Bezeichnung
1	Distance 0.70 m
2	Distance 0.70 m
The load values are multiplied internally by the girder spacing $e = 0.70$ m.	

### Self-weight

Total weight = 82 kg taken into account with  $\gamma = 4.20$  kN/m<sup>3</sup>..

### Overview of the actions used

#### Actions

Description	$\psi_0$	$\psi_1$	$\psi_2$	$\gamma_{F,inf}$	$\gamma_{F,sup}$	KLED
Permanent loads Cat. A: domestic, residential areas	0.70	0.50	0.30	1.00	1.35 1.50	middle
Consequences class CC 2 according to EN 1990 Tab. B1 -> $K_{Fi} = 1.0$ Tab. B3						

## Results

### Design parameter

Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Safety concept / load combinatorics	:	DIN EN 1990/NA:2010-12
Consequence class	:	CC 2
$\psi_2 = 0.5$ for snow (AE)	:	not considered
Permanent loads	:	all equal $\gamma_F$ ( $\gamma_{G,sup}$ or $\gamma_{G,inf}$ )
CLED at wind	:	Average of short and very short

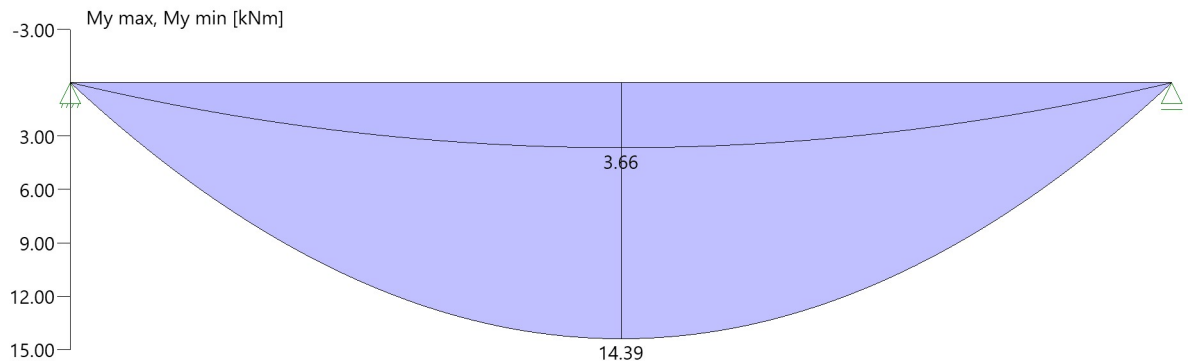
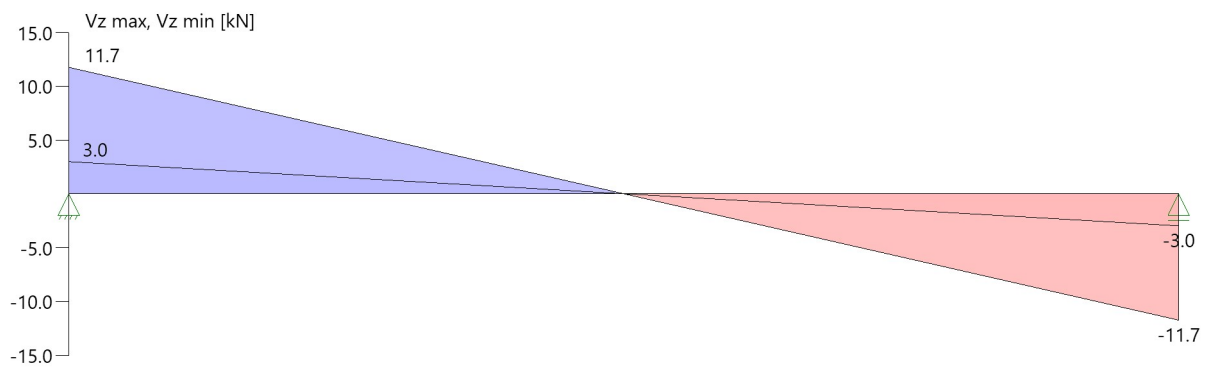
Service class	2	:	roofed, open
Shear stresses	=		Tau with red. Q
Initial deflection	$w_{inst}$	=	$l/280$
Final deflection	$w_{net,fin}$	=	$l/280$
	$w_{fin}$	=	$l/180$

### Summary


Verification	Design situation	$\eta_{Bending}$	$\eta_{Shear}$	$\eta_{c,90}$	$\eta_{Stabi}$	$\eta_{Deformation}$
Bearing capacity Serviceability	persistent/transient characteristic	0.73	0.32	0.42	1)	0.97
1) Stability check was not carried out because the upper chord is held continuously.						

### Structural safety per cross-section (compact)

Design situation	Cross-section	$V_{z,Ed}$ [kN]	$M_{y,Ed}$ [kNm]	$\eta_{Shear}$	$\eta_{Bending}$	$\eta_{Stabi}$
persistent/transient	20/20	10.6	14.39	0.32	0.73	

**Structural safety - Load combination persistent/transient**
**Internal forces**
**Envelope of the moments**

**Envelope of the transverse forces**

**Support reactions**
**Support reactions pro [m] - characteristic of each action**

No.	x [m]	Action	R <sub>z,min</sub> [kN/m]	R <sub>z,max</sub> [kN/m]	M <sub>y,min</sub> [kNm/m]	M <sub>y,max</sub> [kNm/m]
1	0.00	Permanent loads Cat. A: domestic, residential areas	4.26	4.26 7.35		
2	4.90	Permanent loads Cat. A: domestic, residential areas	4.26	4.26 7.35		

	Objekt: LOKARJEVA HIŠA - GALERIJA	
	Pozicija: STOPNIŠČE	Št. načrta: <b>1218/2025</b>

**Osnovni podatki o modelu**

Datoteka: stopnice.twp  
Datum preračuna: 1.8.2025

Način preračuna: 3D model

- ☒ Teorija I-ga reda    
 ☐ Modalna analiza    
 ☐ Stabilnost  
☐ Teorija II-ga reda    
 ☐ Seizmični preračun    
 ☐ Faze gradnje  
☐ Nelinearen preračun

**Velikost modela**

Število vozlišč: 11  
 Število ploskovnih elementov: 0  
 Število grednih elementov: 14  
 Število robnih elementov: 21  
 Število osnovnih obtežnih primerov: 2  
 Število kombinacij obtežb: 4

**Enote mer**

Dolžina: m [cm,mm]  
 Sila: kN  
 Temperatura: Celsius

### Vhodni podatki - Konstrukcija

#### Shema nivojev

Naziv	z [m]	h [m]
	1.75	1.75

Naziv	z [m]	h [m]
	0.00	

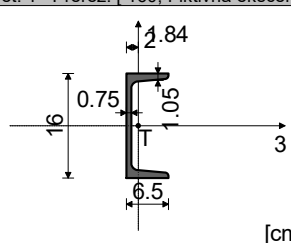
#### Tabele materialov

No	Naziv materiala	E[kN/m <sup>2</sup> ]	$\mu$	$\gamma$ [kN/m <sup>3</sup> ]	$\alpha_t[1/^\circ\text{C}]$	Em[kN/m <sup>2</sup> ]	$\mu_m$
1	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

#### Seti gred

##### Set: 1 Prerez: [ 160, Fiktivna ekscentričnost

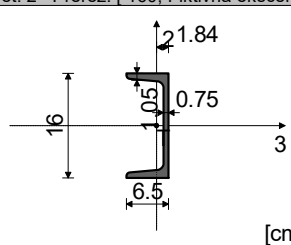
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.400e-3	1.172e-3	1.229e-3	7.390e-8	8.530e-7	9.250e-6



[cm]

##### Set: 2 Prerez: [ 160, Fiktivna ekscentričnost

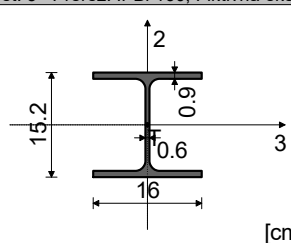
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.400e-3	1.172e-3	1.229e-3	7.390e-8	8.530e-7	9.250e-6



[cm]

##### Set: 3 Prerez: IPBI 160, Fiktivna ekscentričnost

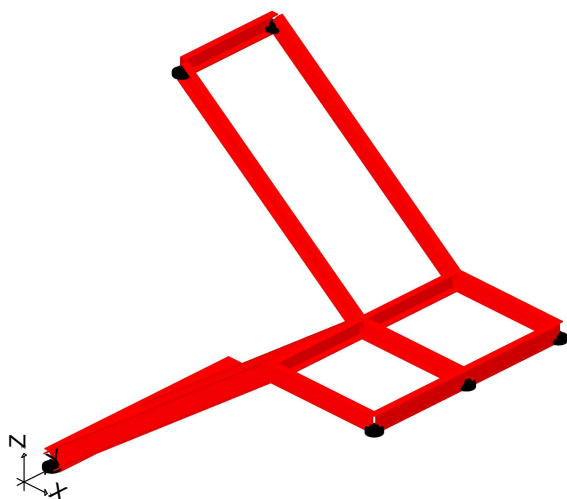
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.880e-3	1.324e-3	2.556e-3	1.230e-7	6.160e-6	1.670e-5



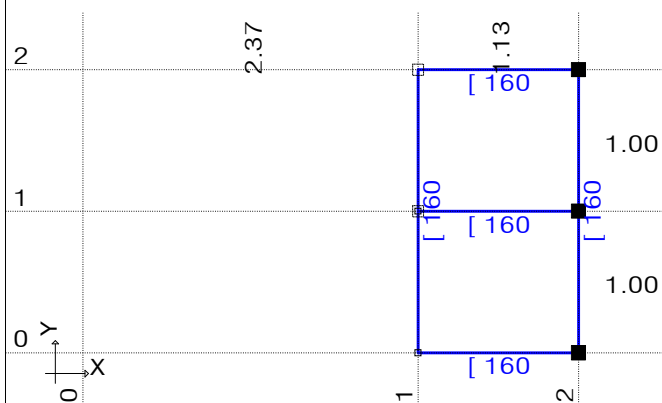
[cm]

#### Seti točkovnih podpor

Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			



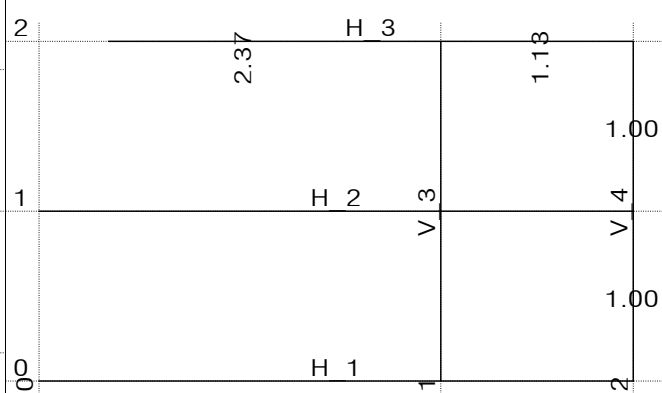
Izometrija



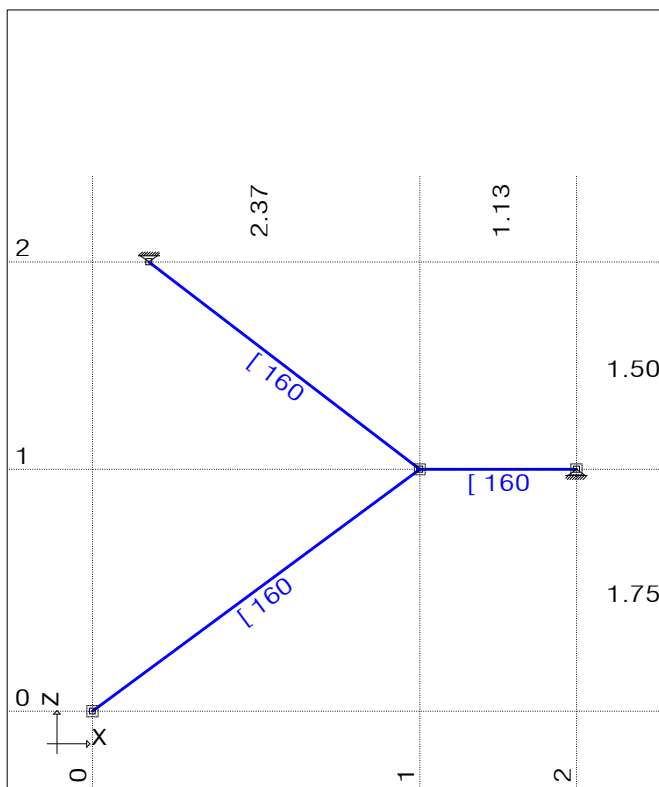
Nivo: [1.75 m]



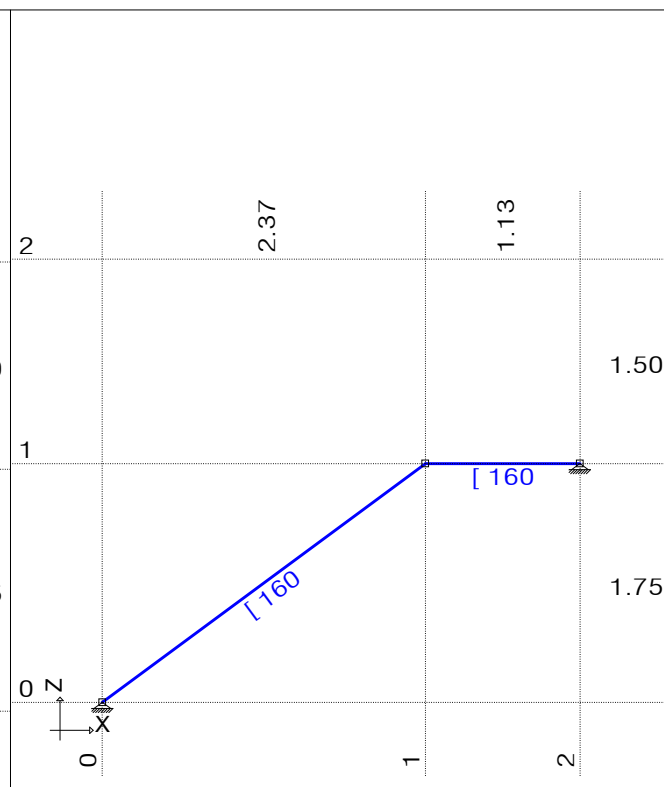
Nivo: [0.00 m]



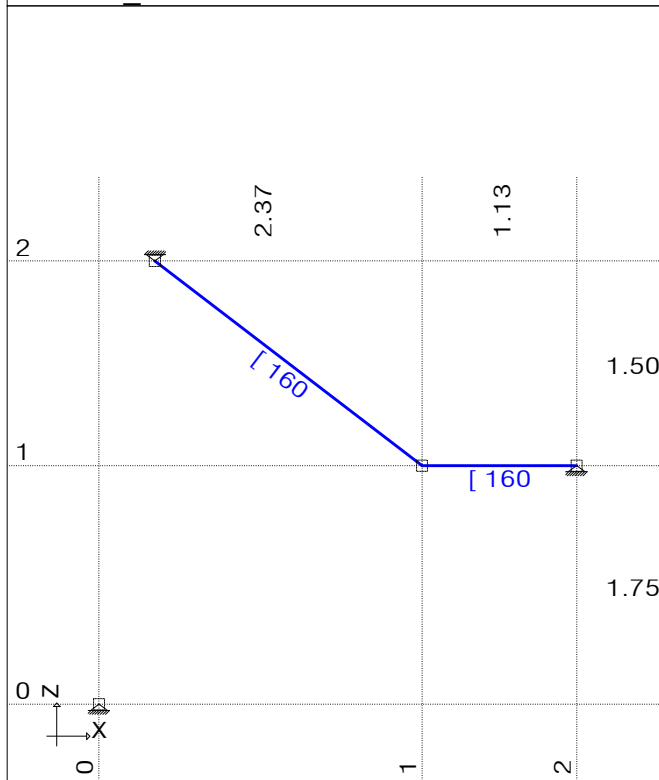
Dispozicija okvirjev



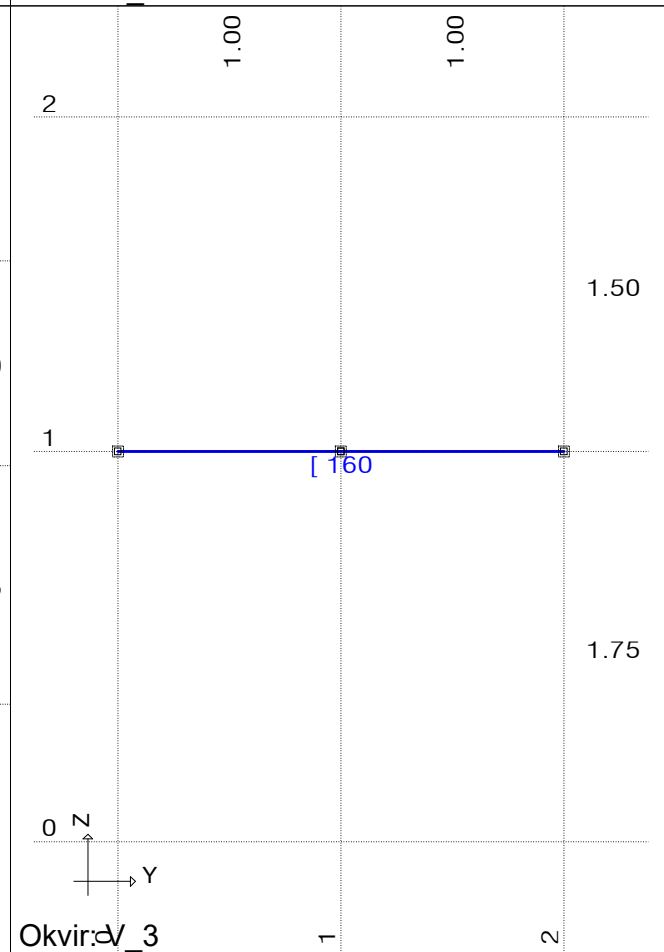
Okvir: H\_2



Okvir: H\_1

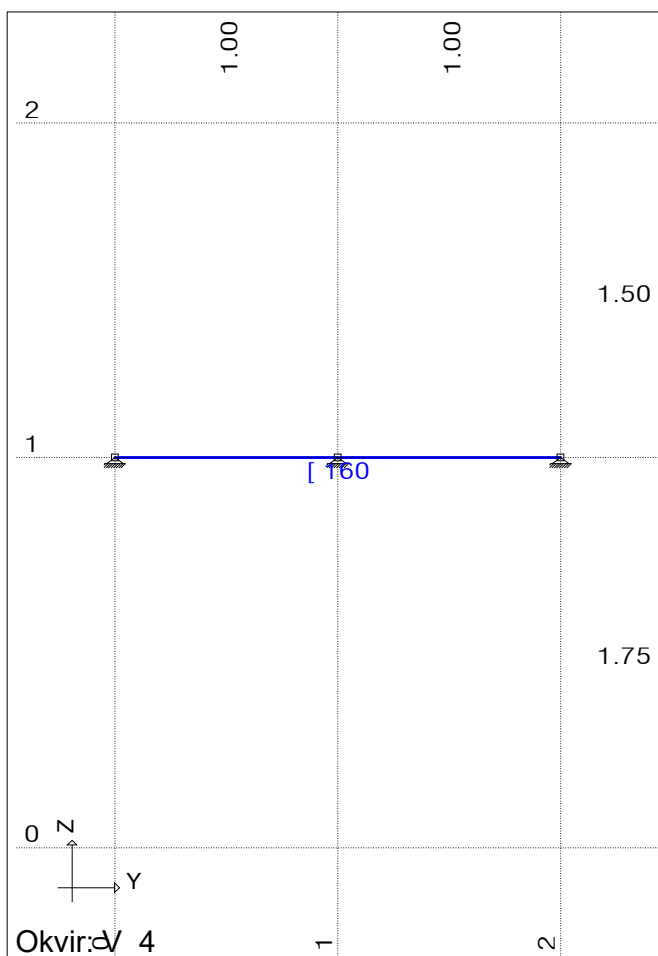


Okvir: H\_3

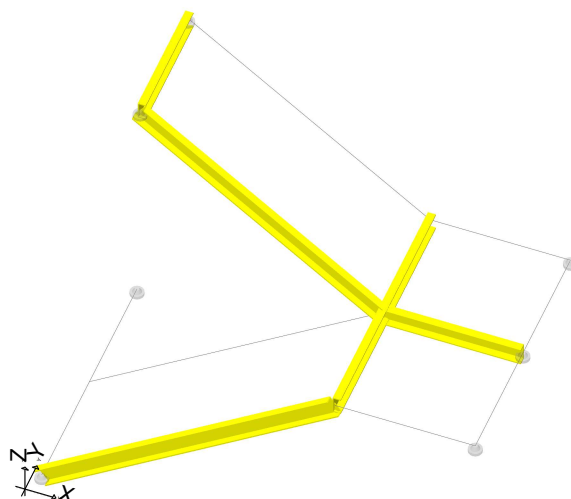


Okvir: V\_3

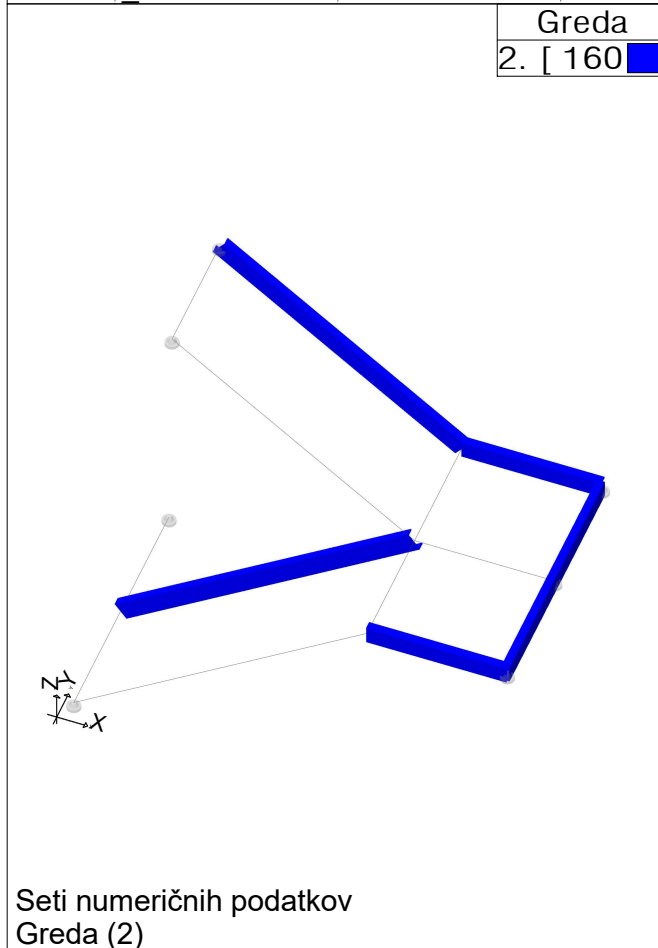




Greda  
1. [ 160 ]



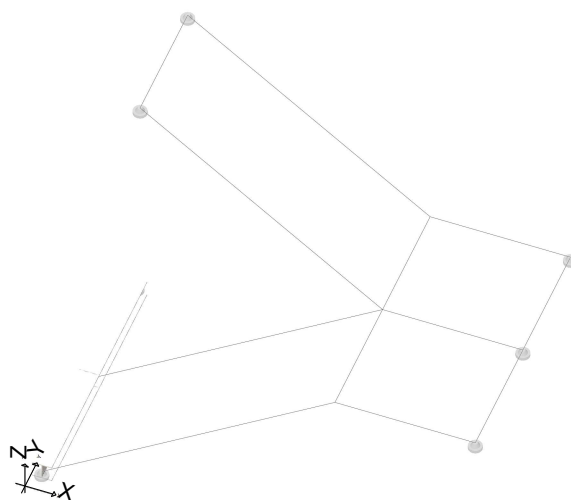
Seti numeričnih podatkov  
Greda (1)



Greda  
2. [ 160 ]

Seti numeričnih podatkov  
Greda (2)

Greda  
3. IPBI 160



Seti numeričnih podatkov  
Greda (3)

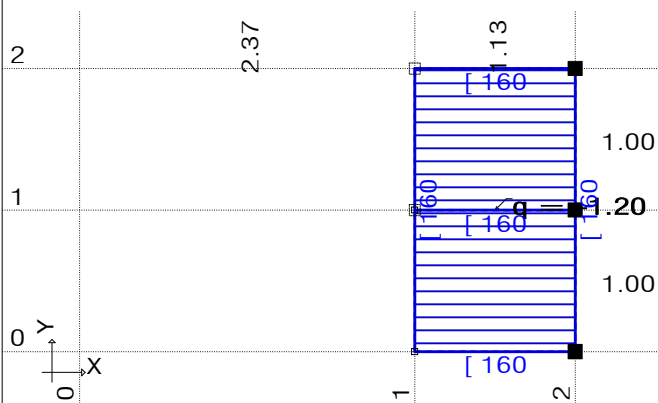
**Vhodni podatki - Obtežba**

**Lista obtežnih primerov**

LC	Naziv
1	lastna + stalna (g)
2	koristna
3	Komb.: 1.35xl+1.5xll

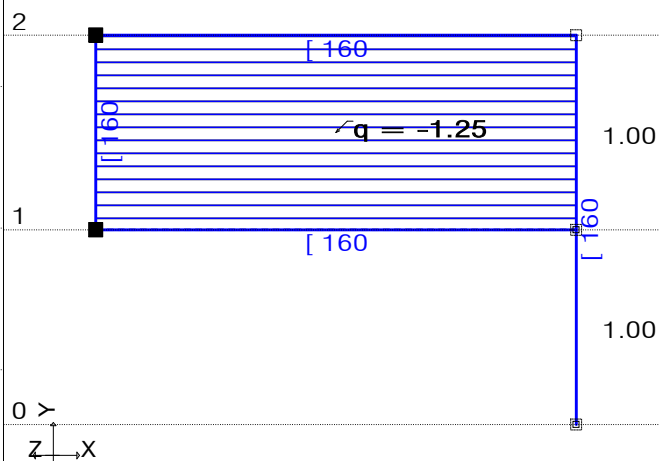
LC	Naziv
4	Komb.: l+1.5xll
5	Komb.: 1.35xl
6	Komb.: l

Obt. 1: lastna + stalna (g)



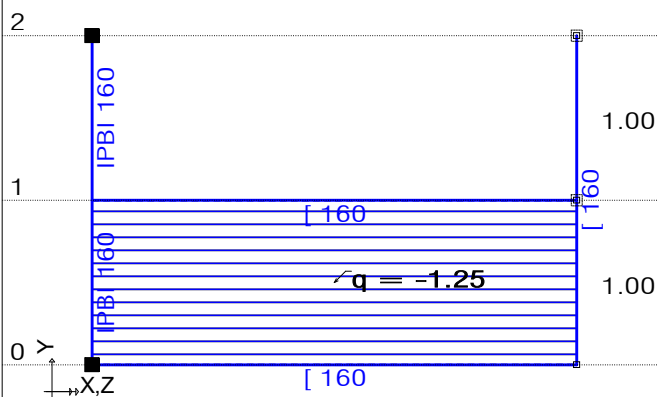
Nivo: [1.75 m]

Obt. 1: lastna + stalna (g)

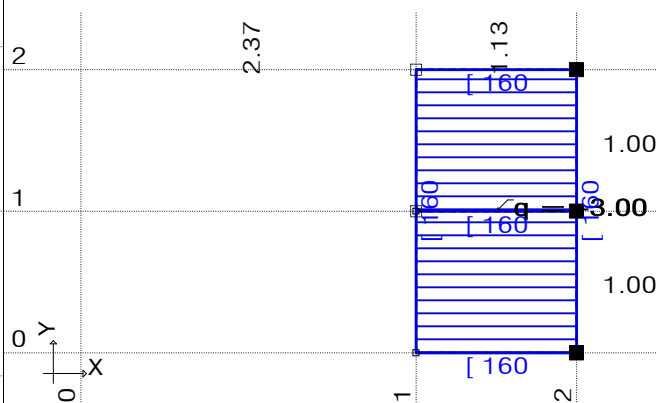


<brez imen>

Obt. 1: lastna + stalna (g)

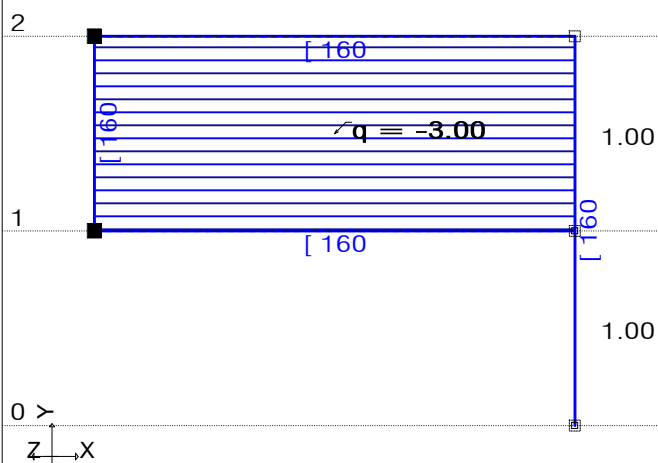


Obt. 2: koristna



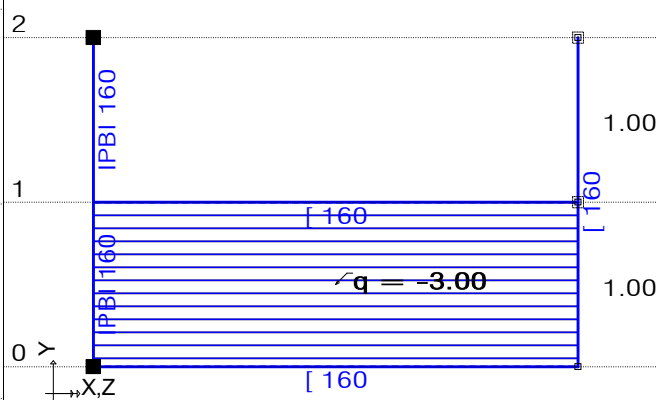
<brez imen>

Obt. 2: koristna



Nivo: [1.75 m]


Obt. 2: koristna

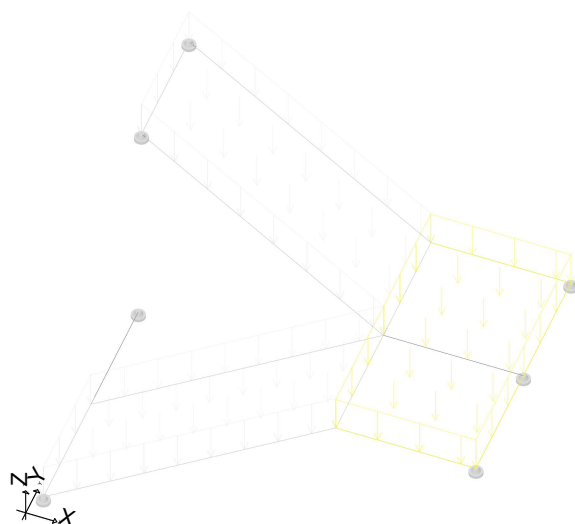


<brez imen>

<brez imen>


Obt. 1: lastna + stalna (g) Površinska obtežba

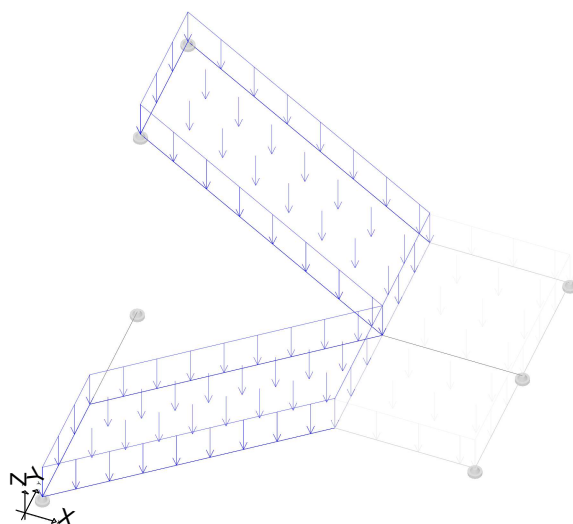
1.  $p = -1.20 \text{ kN/m}^2$  



Seti numeričnih podatkov  
Površinska obtežba (1)


Obt. 1: lastna + stalna (g) Površinska obtežba

2.  $p = -1.25 \text{ kN/m}^2$  



Seti numeričnih podatkov  
Površinska obtežba (2)

Obt. 2: koristna

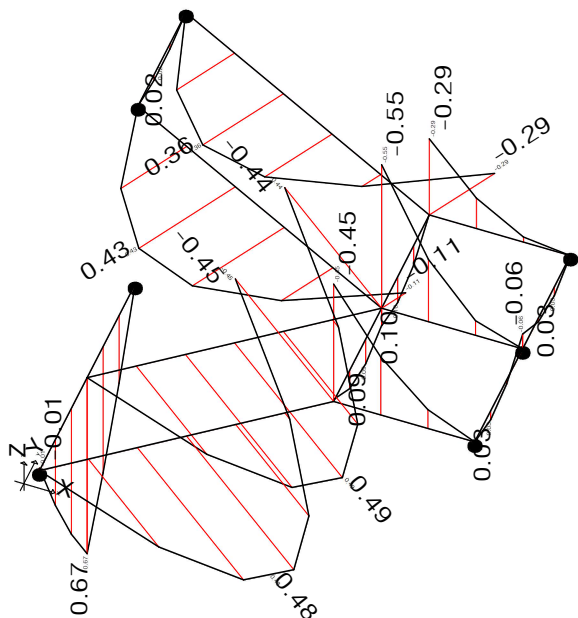
Površinska obtežba  
3.  $p = -3.00 \text{ kN/m}^2$  



Seti numeričnih podatkov  
Površinska obtežba (3)

## Statični preračun

Obt. 1: lastna + stalna (g)
-----------------------------

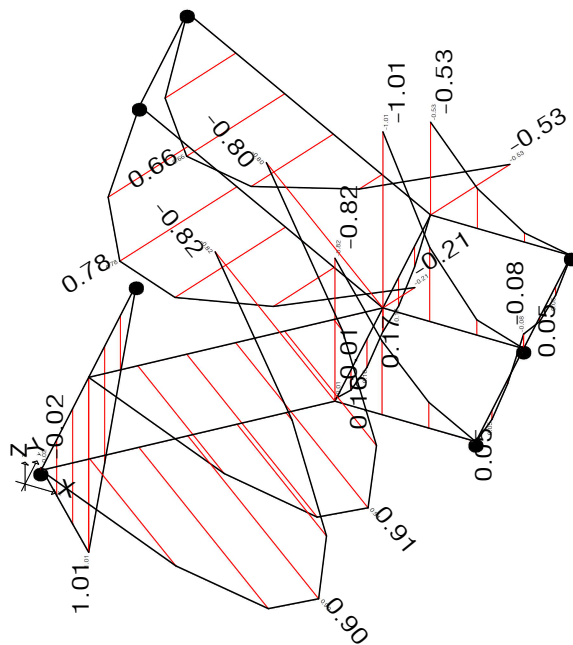


## Izometrija

Vplivi v gredi: max  $M_3 = 0.67$  / min  $M_3 = -0.55$ ...

Obt. 2: koristna	
------------------	--

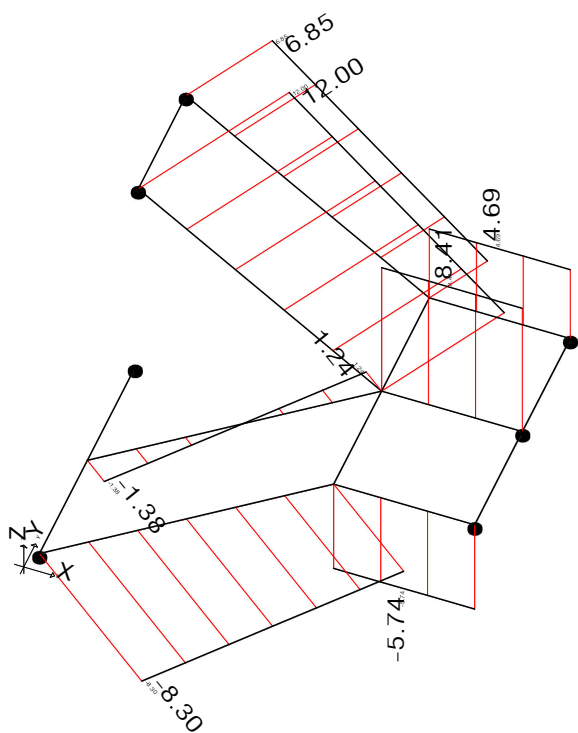
Obt. 2: koristna
------------------



## Izometrija

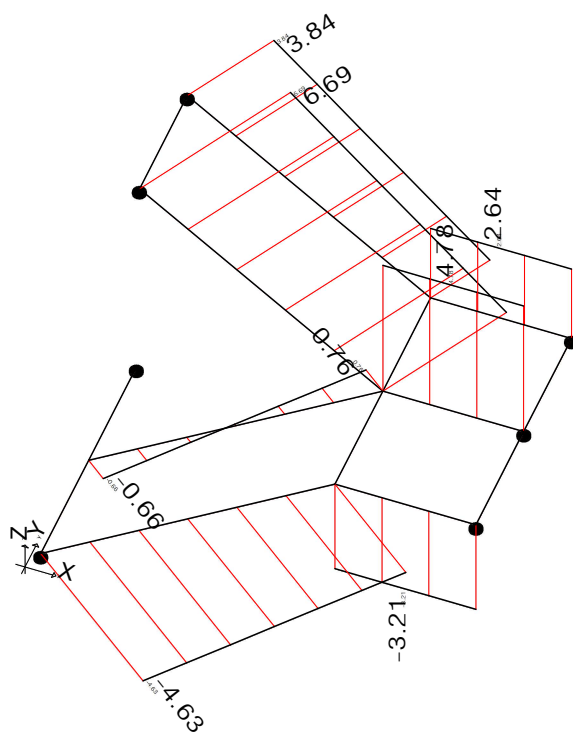
Vplivi v gredi:  $\max M3 = 1.01$  /  $\min M3 = -1.01...$

Obt. 1: lastna + stalna (g)
-----------------------------



## Izometrija

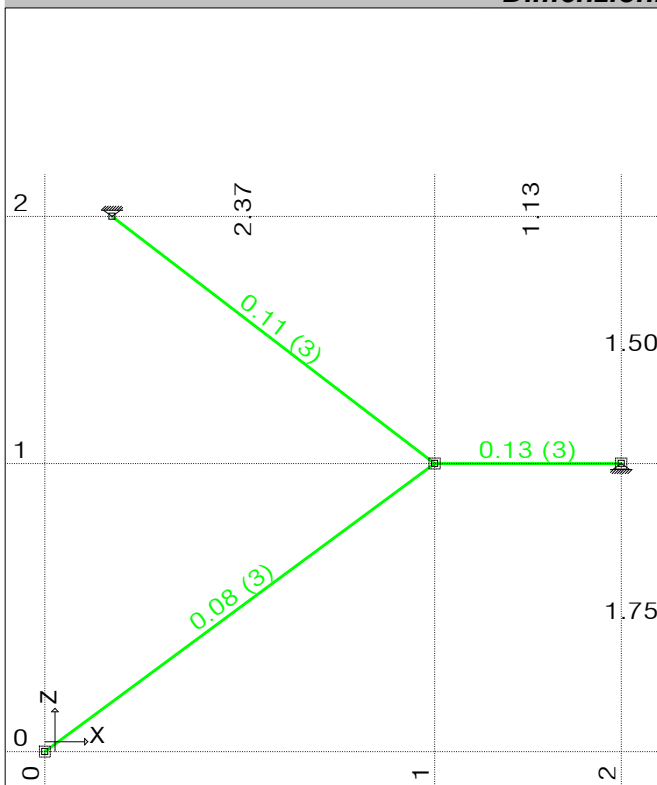
Vplivi v gredi: max N1= 12.00 / min N1= -8.30 kN



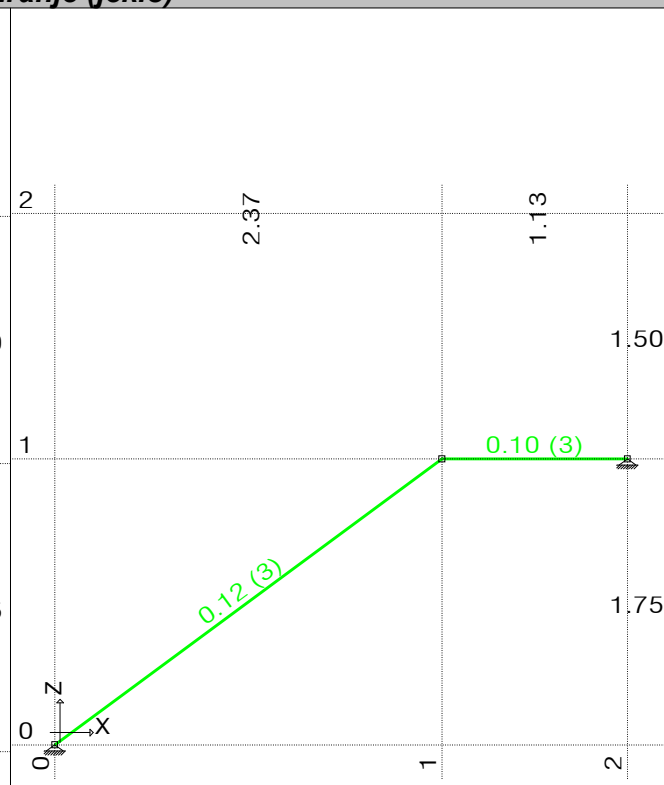
## Izometrija

Vplivi v gredi:  $\max N_1 = 6.69$  /  $\min N_1 = -4.63$  kN

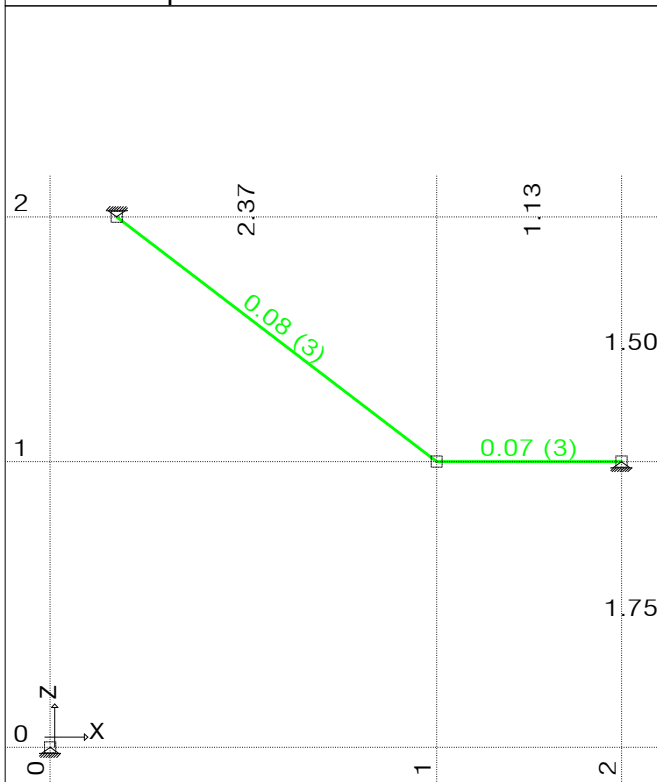
**Dimenzioniranje (jeklo)**



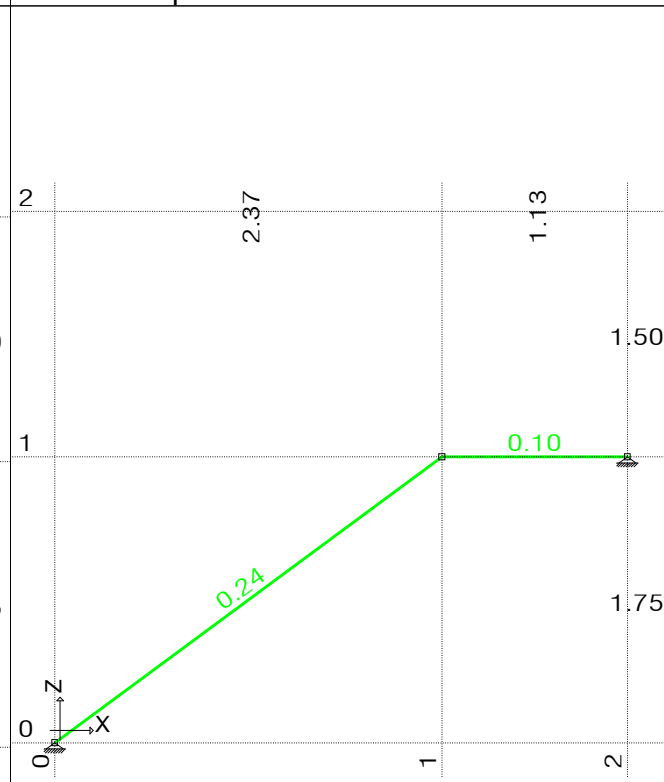
Okvir: H\_2  
Kontrola napetosti



Okvir: H\_1  
Kontrola napetosti

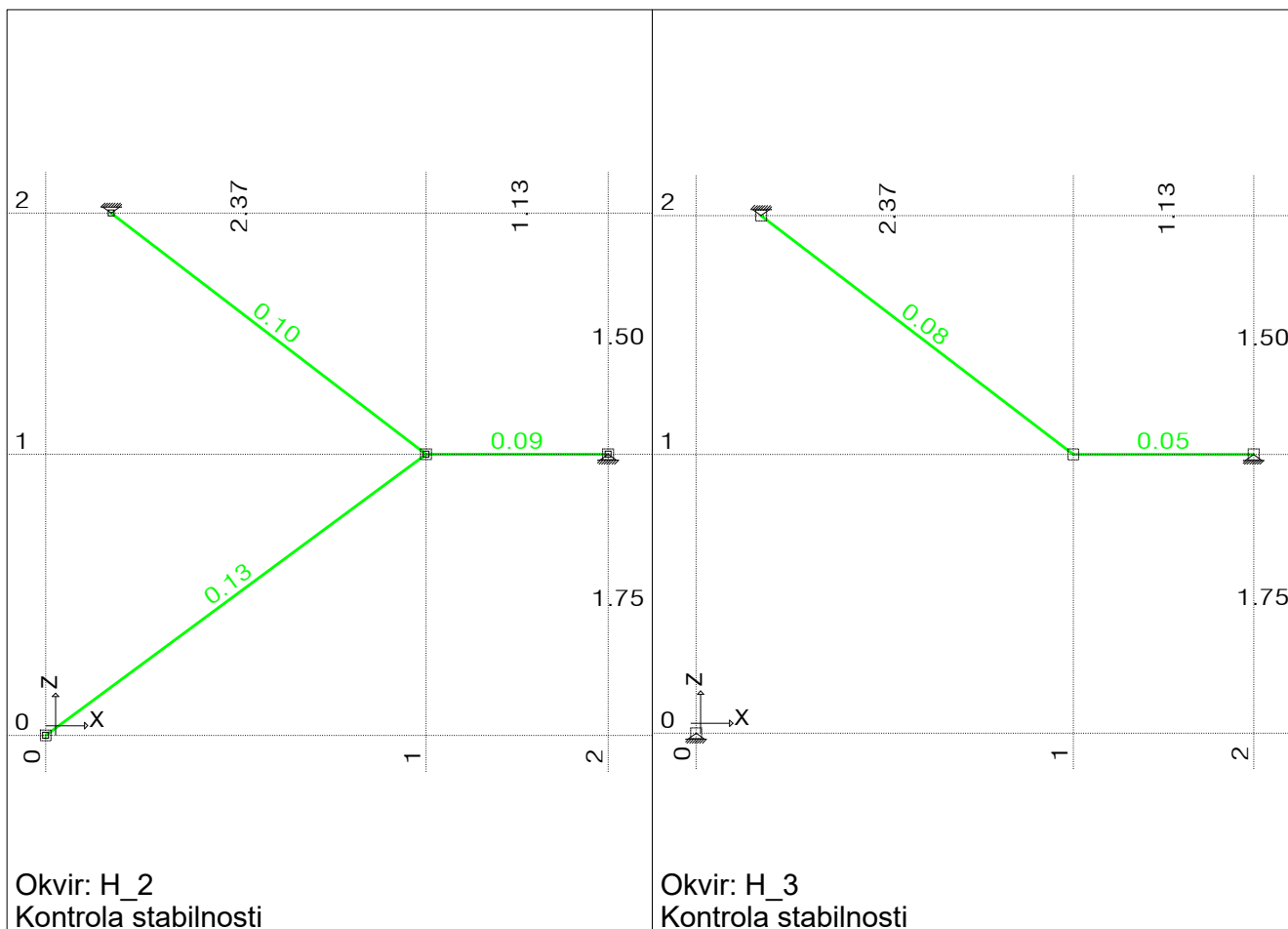


Okvir: H\_3  
Kontrola napetosti



Okvir: H\_1  
Kontrola stabilnosti

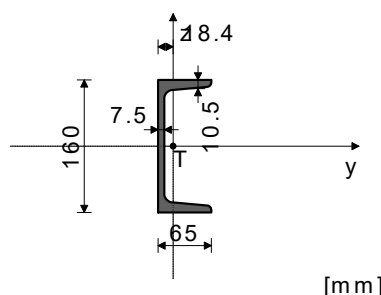




#### PALICA 6-2

PREČNI PREREZ: [ 160 [S 235] [Set: 2]  
EUROCODE 3 (EN 1993-1-1:2005)

#### GEOMETRIJSKE KARAKTERISTIKE prereza



( $f_y = 23.5 \text{ kN/cm}^2$ ,  $f_u = 36.0 \text{ kN/cm}^2$ )

$A_x =$	24.000 cm <sup>2</sup>
$A_y =$	12.285 cm <sup>2</sup>
$A_z =$	11.715 cm <sup>2</sup>
$I_x =$	7.390 cm <sup>4</sup>
$I_y =$	925.00 cm <sup>4</sup>
$I_z =$	85.300 cm <sup>4</sup>
$W_y =$	115.62 cm <sup>3</sup>
$W_z =$	18.305 cm <sup>3</sup>
$W_{y,pl} =$	138.26 cm <sup>3</sup>
$W_{z,pl} =$	39.215 cm <sup>3</sup>
$\gamma_{M0} =$	1.100
$\gamma_{M1} =$	1.100
$\gamma_{M2} =$	1.250
$A_{net}/A =$	0.900

#### FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

3.  $\gamma = 0.13$  4.  $\gamma = 0.12$  5.  $\gamma = 0.04$   
6.  $\gamma = 0.03$

#### PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU (obtežni primer 3, na 98.1 cm od začetka palice)

Računska osna sila	$N_{Ed} =$	-1.009 kN
Prečna sila v z smeri	$V_{Ed,z} =$	-0.713 kN
Upogibni moment okoli y osi	$M_{Ed,y} =$	1.997 kNm
Sistemska dolžina palice	$L =$	294.42 cm

#### 5.5 KLASIFIKACIJA PREČNIH PREREZOV Razred prereza 1

#### 6.2 NOSILNOST PREČNIH PREREZOV

##### 6.2.4 Tlak

Računska nosilnost na tlak

**Pogoj 6.9:**  $N_{Ed} \leq N_{c,Rd}$  (1.01  $\leq$  512.73)

$N_{c,Rd} =$  512.73 kN

##### 6.2.5 Upogib y-y

Plastični odpornostni moment

Računska nosilnost na upogib

**Pogoj 6.12:**  $M_{Ed,y} \leq M_{c,Rd,y}$  (2.00  $\leq$  29.54)

$W_{y,pl} =$  138.26 cm<sup>3</sup>

$M_{c,Rd} =$  29.537 kNm

##### 6.2.6 Strig

Računska strižna nosilnost

Računska strižna nosilnost

**Pogoj 6.17:**  $V_{Ed,z} \leq V_{c,Rd,z}$  (0.71  $\leq$  144.50)

$V_{pl,Rd,z} =$  144.50 kN

$V_{c,Rd,z} =$  144.50 kN

##### 6.2.10 Upogib z osno in prečno silo

Ni potrebno zmanjšanje upogibne nosilnosti

Pogoj:  $V_{Ed,z} \leq 50\% V_{pl,Rd,z}$

##### 6.2.9 Upogib in osna sila

Razmerje  $N_{Ed} / N_{pl,Rd}$

Zmanjšana strižna upogibna nosilnost

Razmerje  $M_{Ed,y} / M_{N,y,Rd}$

**Pogoj 6.41:** (0.07  $\leq$  1)

$M_{N,y,Rd} =$  0.002

29.537 kNm

0.068

#### 6.3 NOSILNOST ELEMENTA NA UKLON

##### 6.3.1.1 Nosilnost na uklon

Uklonska dolžina y-y

Relativna vitkost y-y

Uklonska krivulja za os y-y: C

Elastična kritična sila

Koeficient nepopolnosti

Računska uklonska nosilnost

**Pogoj 6.46:**  $N_{Ed} \leq N_{b,Rd,y}$  (1.01  $\leq$  430.79)

$l_y =$  294.42 cm

$\lambda_y =$  0.505

$\alpha =$  0.490

$N_{cr,y} =$  2211.7 kN

$\chi_y =$  0.840

$N_{b,Rd,y} =$  430.79 kN

Uklonska dolžina z-z

Relativna vitkost z-z

Uklonska krivulja za os z-z: C

Koeficient nepopolnosti

Računska uklonska nosilnost

**Pogoj 6.46:**  $N_{Ed} \leq N_{b,Rd,z}$  (1.01  $\leq$  136.97)

$l_z =$  294.42 cm

$\lambda_z =$  1.663

$\alpha =$  0.490

$\chi_z =$  0.267

$N_{b,Rd,z} =$  136.97 kN

##### 6.3.2.1 Nosilnost na bočno-torzijski uklon

Koeficient

Koeficient

Koeficient

Koef. ukl. dolžine za uklon

Koef. ukl. dolžine za vbočenje

Koordinata

Koordinata

$C1 =$  1.285

$C2 =$  1.562

$C3 =$  0.753

$k =$  1.000

$k_w =$  1.000

$z_g =$  0.000 cm

$z_j =$  0.000 cm

Razmak med bočnimi podporami

Sektorski vztrajnostni moment

Krit.moment bočne zvrnitve

Ustrezni odpornostni moment

Koeficient imperf.

Brezdimenz.vitkost

Koeficient zmanjšanja (6.3.2.2.)

Računska uklonska nosilnost

**Pogoj 6.54:  $M_{Ed,y} \leq M_{b,Rd}$  (2.00 <= 16.82)**

L = 294.42 cm

I<sub>w</sub> = 4456.7 cm<sup>6</sup>

M<sub>cr</sub> = 48.673 kNm

W<sub>y</sub> = 138.26 cm<sup>3</sup>

α<sub>LT</sub> = 0.760

λ<sub>LT</sub> = 0.817

χ<sub>LT</sub> = 0.569

M<sub>b,Rd</sub> = 16.817 kNm

 $k_{yy} * (M_{yEd} + \Delta M_{yEd}) / \dots$ 
**Pogoj 6.61: (0.11 <= 1)**

0.107

Koeficient nepopolnosti

N<sub>Ed</sub> / (χ<sub>z</sub> N<sub>Rk</sub> / γ<sub>M1</sub>)

 $k_{zy} * (M_{yEd} + \Delta M_{yEd}) / \dots$ 
**Pogoj 6.62: (0.13 <= 1)**

χ<sub>z</sub> = 0.267

0.007

0.119

6.3.3. Elementi konstantnega prečnega prereza obremenjeni z

upogibom in osnim tlakom

Preračun koeficienta interakcije je izvršen z alternativno

metodo št.2 (Aneks B)

Koeficient oblike momenta

Koeficient oblike momenta

Koeficient oblike momenta

Koeficient interakcije

Koeficient interakcije

Koeficient interakcije

Koeficient interakcije

Koeficient interakcije

Koeficient nepopolnosti

N<sub>Ed</sub> / (χ<sub>y</sub> N<sub>Rk</sub> / γ<sub>M1</sub>)

C<sub>my</sub> = 0.900

C<sub>mz</sub> = 1.000

C<sub>mLT</sub> = 0.900

k<sub>yy</sub> = 0.901

k<sub>yz</sub> = 0.604

k<sub>zy</sub> = 0.999

k<sub>zz</sub> = 1.006

χ<sub>y</sub> = 0.840

0.002

KONTROLA STRIŽNE NOSILNOSTI

(obtežni primer 3, konec palice)

Računska osna sila

Prečna sila v z smeri

Upogibni moment okoli y osi

Sistemska dolžina palice

N<sub>Ed</sub> = 2.897 kN

V<sub>Ed,z</sub> = 4.572 kN

M<sub>Ed,y</sub> = -1.791 kNm

L = 294.42 cm

6.2 NOSILNOST PREČNIH PREREZOV

6.2.6 Strig

Računska strižna nosilnost

Računska strižna nosilnost

**Pogoj 6.17:  $V_{Ed,z} \leq V_{c,Rd,z}$  (4.57 <= 144.50)**

V<sub>pl,Rd,z</sub> = 144.50 kN

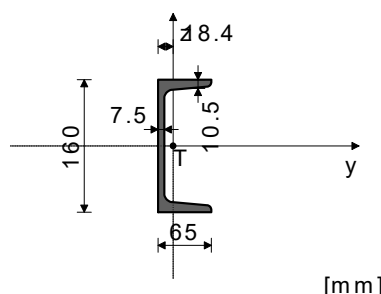
V<sub>c,Rd,z</sub> = 144.50 kN

### PALICA 6-5

PREČNI PREREZ: [ 160 [S 235] [Set: 1]

EUROCODE 3 (EN 1993-1-1:2005)

GEOMETRIJSKE KARAKTERISTIKE prereza


(f<sub>y</sub> = 23.5 kN/cm<sup>2</sup>, f<sub>u</sub> = 36.0 kN/cm<sup>2</sup>)

A<sub>x</sub> = 24.000 cm<sup>2</sup>

A<sub>y</sub> = 12.285 cm<sup>2</sup>

A<sub>z</sub> = 11.715 cm<sup>2</sup>

I<sub>x</sub> = 7.390 cm<sup>4</sup>

I<sub>y</sub> = 925.00 cm<sup>4</sup>

I<sub>z</sub> = 85.300 cm<sup>4</sup>

W<sub>y</sub> = 115.62 cm<sup>3</sup>

W<sub>z</sub> = 18.305 cm<sup>3</sup>

W<sub>y,pl</sub> = 138.26 cm<sup>3</sup>

W<sub>z,pl</sub> = 39.215 cm<sup>3</sup>

γ<sub>M0</sub> = 1.100

γ<sub>M1</sub> = 1.100

γ<sub>M2</sub> = 1.250

A<sub>net</sub>/A = 0.900

6.2.6 Strig

Računska strižna nosilnost

Računska strižna nosilnost

**Pogoj 6.17:  $V_{Ed,z} \leq V_{c,Rd,z}$  (0.36 <= 144.50)**

V<sub>pl,Rd,z</sub> = 144.50 kN

V<sub>c,Rd,z</sub> = 144.50 kN

6.2.10 Upogib z osno in prečno silo

Ni potrebno zmanjšanje upogibne nosilnosti

Pogoj: V<sub>Ed,z</sub> <= 50%V<sub>pl,Rd,z</sub>

6.2.9 Upogib in osna sila

Razmerje N<sub>Ed</sub> / N<sub>pl,Rd</sub>

Zmanjšana plast.upogibna nosilnost

Razmerje M<sub>Ed,y</sub> / M<sub>N,y,Rd</sub>
**Pogoj 6.41: (0.06 <= 1)**

M<sub>N,y,Rd</sub> = 0.049

29.468 kNm

0.059

6.3 NOSILNOST ELEMENTA NA UKLON

6.3.2.1 Nosilnost na bočno-torzijski uklon

Koeficient

Koeficient

Koeficient

Koef.ukl.dolžine za uklon

Koef.ukl.dolžine za vbočenje

Koordinata

Koordinata

Razmak med bočnimi podporami

Sektorski vztrajnostni moment

Krit.moment bočne zvrnitve

Ustrezni odpornostni moment

Koeficient imperf.

Brezdimenz.vitkost

Koeficient zmanjšanja (6.3.2.2.)

Računska uklonska nosilnost

**Pogoj 6.54:  $M_{Ed,y} \leq M_{b,Rd}$  (1.75 <= 18.30)**

C1 = 1.285

C2 = 1.562

C3 = 0.753

k = 1.000

kw = 1.000

zg = 0.000 cm

zj = 0.000 cm

L = 246.70 cm

I<sub>w</sub> = 4456.7 cm<sup>6</sup>

M<sub>cr</sub> = 59.926 kNm

W<sub>y</sub> = 138.26 cm<sup>3</sup>

α<sub>LT</sub> = 0.760

λ<sub>LT</sub> = 0.736

χ<sub>LT</sub> = 0.620

M<sub>b,Rd</sub> = 18.303 kNm

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

3. γ=0.10

4. γ=0.09

5. γ=0.03

6. γ=0.02

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU

(obtežni primer 3, na 102.8 cm od začetka palice)

Računska osna sila

Prečna sila v z smeri

Upogibni moment okoli y osi

Sistemska dolžina palice

N<sub>Ed</sub> = 24.936 kN

V<sub>Ed,z</sub> = -0.358 kN

M<sub>Ed,y</sub> = 1.746 kNm

L = 246.70 cm

5.5 KLASIFIKACIJA PREČNIH PREREZOV

Razred prereza 1

6.2 NOSILNOST PREČNIH PREREZOV

6.2.3 Nateg

Plast.rač.nosilnost bruto prereza

Mejna rač.nosilnost neto prereza

Računska nos. na nateg

**Pogoj 6.5:  $N_{Ed} \leq N_{t,Rd}$  (24.94 <= 512.73)**

N<sub>pl,Rd</sub> = 512.73 kN

N<sub>u,Rd</sub> = 559.87 kN

N<sub>t,Rd</sub> = 512.73 kN

6.2.5 Upogib y-y

Plastični odpornostni moment

Računska nosilnost na upogib

**Pogoj 6.12:  $M_{Ed,y} \leq M_{c,Rd,y}$  (1.75 <= 29.54)**

W<sub>y,pl</sub> = 138.26 cm<sup>3</sup>

M<sub>c,Rd</sub> = 29.537 kNm

KONTROLA STRIŽNE NOSILNOSTI

(obtežni primer 3, konec palice)

Računska osna sila

Prečna sila v z smeri

Upogibni moment okoli y osi

Sistemska dolžina palice

N<sub>Ed</sub> = 22.006 kN

V<sub>Ed,z</sub> = 3.468 kN

M<sub>Ed,y</sub> = -0.467 kNm

L = 246.70 cm

6.2 NOSILNOST PREČNIH PREREZOV

6.2.6 Strig

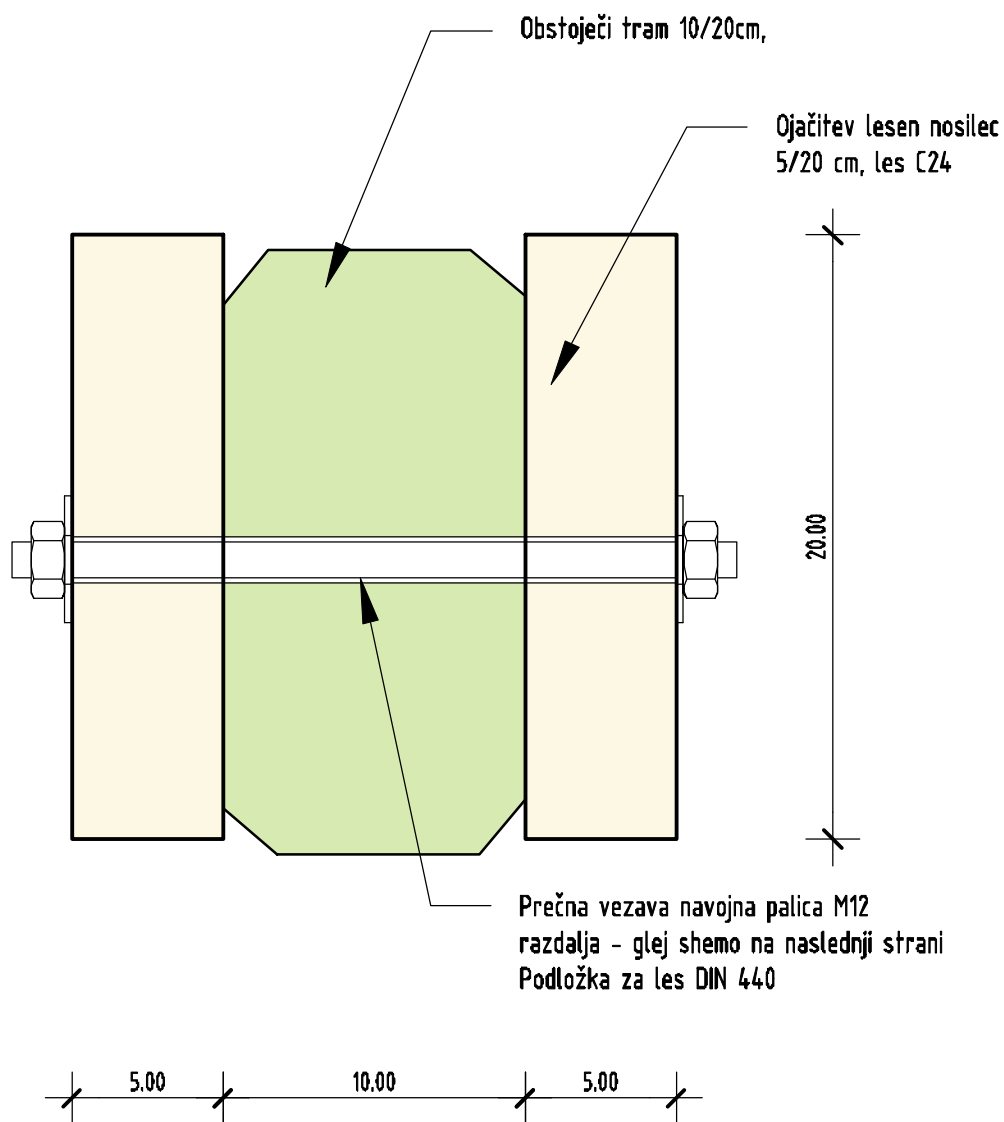
Računska strižna nosilnost

Računska strižna nosilnost

**Pogoj 6.17:  $V_{Ed,z} \leq V_{c,Rd,z}$  (3.47 <= 144.50)**

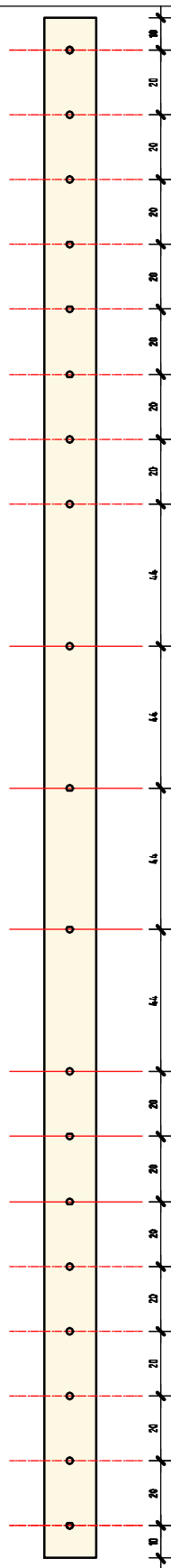
V<sub>pl,Rd,z</sub> = 144.50 kN

V<sub>c,Rd,z</sub> = 144.50 kN



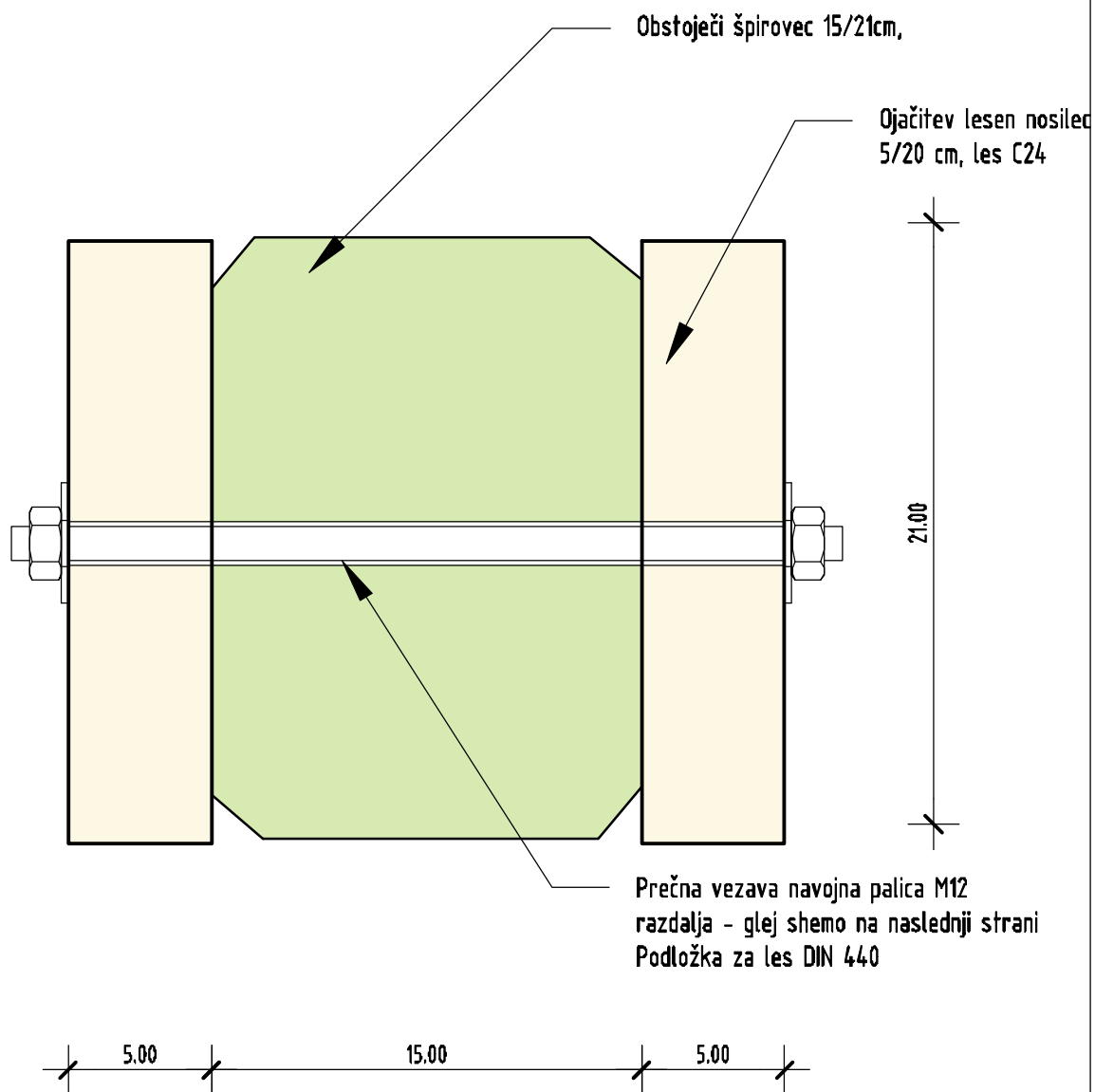
Pred pričetkom izvedbe preveriti stanje ležišča  
na srednjem zidu in s tem seznaniti projektanta

<b>OBJEKT:</b>	Lokarjeva hiša – galerija	<b>POZICIJA:</b> dvostranska ojačitev stropnih nosilcev
<b>INVESTITOR:</b>	Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina	
<b>ST. NAČRTA</b>	<b>1218/2025</b>	

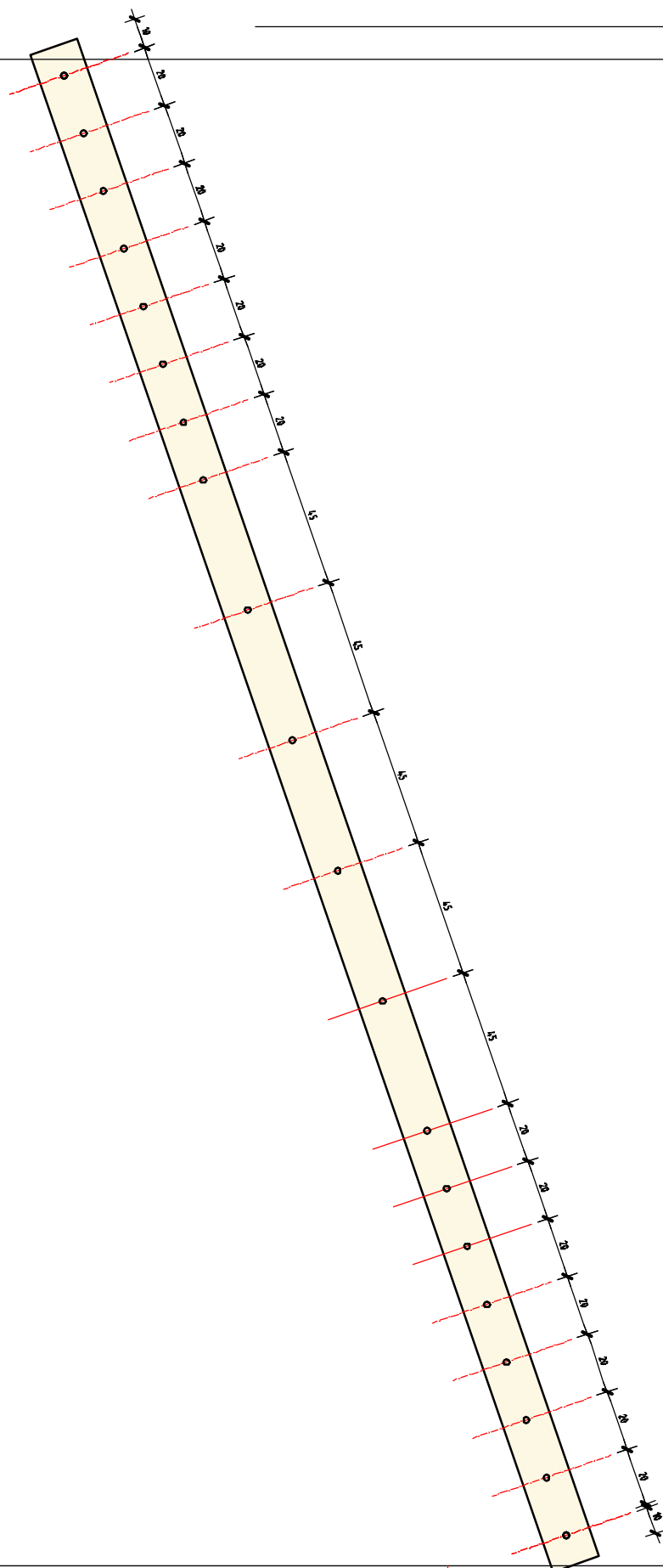


**Pred pričetkom izvedbe preveriti stanje ležišča na srednjem zidu in s tem seznaniti projektanta**

<b>OBJEKT:</b>	Lokarjeva hiša – galerija	<b>POZICIJA:</b>  <b>razdalje spojnih sredstev na ojačitvah</b>
<b>INVESTITOR:</b>	Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina	
<b>ST. NAČRTA</b>	<b>1218/2025</b>	

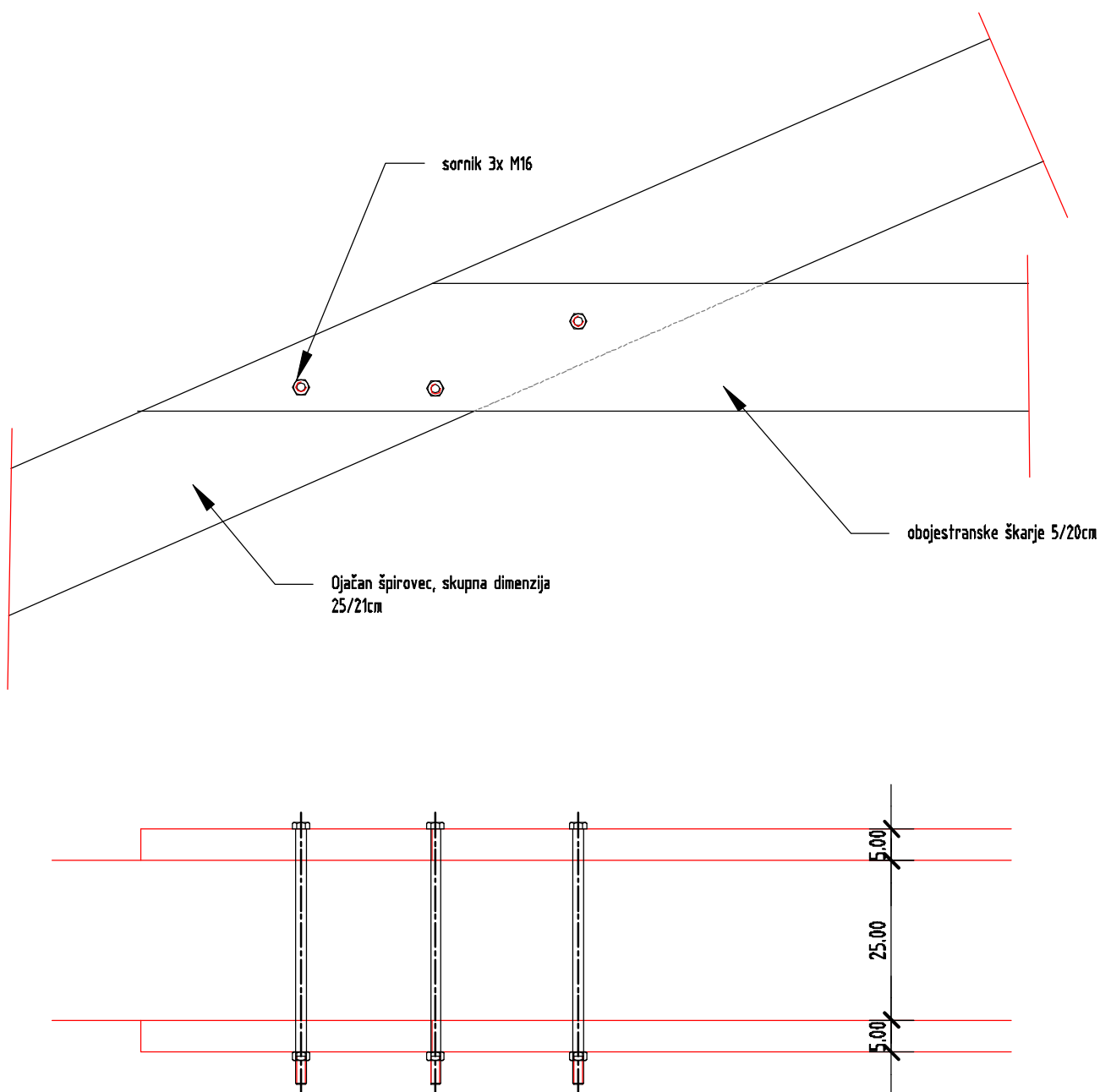


<b>OBJEKT:</b>	Lokarjeva hiša – galerija	<b>POZICIJA:</b> ojačitev špirovca
<b>INVESTITOR:</b>	Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina	
<b>ST. NAČRTA</b>	<b>1218/2025</b>	



<b>OBJEKT:</b>	Lokarjeva hiša – galerija	<b>POZICIJA:</b> razdalje spojin sredstev na ojačitvah
<b>INVESTITOR:</b>	Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina	
<b>ST. NAČRTA</b>	<b>1218/2025</b>	





<b>OBJEKT:</b>	Lokarjeva hiša – galerija	<b>POZICIJA:</b> ojačitev špirovca
<b>INVESTITOR:</b>	Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina	
<b>ST. NAČRTA</b>	<b>1218/2025</b>	