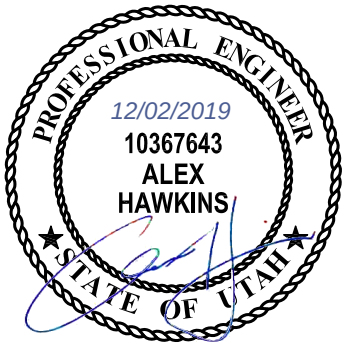
STRUCTURAL CALCULATIONS

Revised to Comments

Project:
Powder Mountain Lot 86
8483 E. Spring Park
Summit Powder Mountain Resort
Weber County, UT
Project Number: 9084C

Prepared For:
Scandinavian
6410 N. Business Park Loop Rd. Unit E
Park City, Utah 84098

Date:
November 2019



Prepared By:
Tye M. Carlile, EIT

Project Manager:
Alex S. Hawkins, PE

Ensign Engineering
45 West 10000 South, Suite 500
Sandy, Utah 84070
P: (801) 255-0529
F: (801) 255-4449
ensigneng.com

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Project:	Powder Mountain Lot 86	Project No.:	9084C
By:	Tye M. Carlile, EIT	Checked By:	ASH
Date:	November 2019		

GENERAL PROJECT INFORMATION

Client: **Scandinavian**

Project: **Powder Mountain Lot 86**

Project Address: **8483 E. Spring Park**
Summit Powder Mountain Resort

Latitude:	41.379	North (Approximate)
Longitude:	-111.780	West (Approximate)
Elevation above Sea Level:	8,300	ft

PROJECT DESCRIPTION

Provide structural calculations for Scandinavian Log Home

GENERAL DESIGN CRITERIA

Structure Type:	Structure Type	Building Height, h_n (ft)	33.5
Design Code:	2018 IBC	Number of Stories	3
Risk Category:	II	Light-frame Construction?	No

DESIGN LOADS & SERVICEABILITY REQUIREMENTS

Dead Loads:

-Roof DL:

Total Roof DL:	20	psf

-Floor DL:

Total Floor DL:	20	psf

-Wall DL:

Exterior Walls:	20	psf
Interior Bearing Walls:	15	psf
Log Walls:	30	psf

Live Loads:

Roof Live:	20	psf
Floor Live:	40	psf
Main Floor Corridor / Stair:	40	psf
Balconies:	60	psf

Rain Loads:

Rain Intensity, I (in/hr):	1.5	

Snow Loads:

Surface Roughness Category:	C	
Roof Exposure:	Partially Exposed	
Thermal Condition:	All other structures	
Roof Surface:	Non-Slippery (Rough)	
Obstructed?	No	
Roof Pitch	2	/12
Roof Angle, θ	9.5	
Ground Snow Load, p_g:	379	psf
Exposure Factor, C_e:	1.00	
Thermal Factor, C_t:	1.00	
Importance Factor, I_s:	1.00	
Slope Factor, C_s:	1.00	
Minimum Roof Snow Load, p_m:	20	psf
Flat Roof Snow Load, p_f:	**265**	**psf (Balanced)**
Sloped Roof Snow Load, p_s:	**265**	**psf (Balanced)**
Seismic Snow Load, $p_{f,seismic}$:	**53**	**psf**

Wind Loads:

Basic Wind Speed, V:	104	mph (3-second gust)
ASD Wind Speed, V_{asd}:	81	mph (3-second gust)
Exposure:	C	

Seismic Loads:

S_S:	0.802	g
S_1:	0.277	g
Site Soil Class:	C	
	--	
Importance Factor, I_E:	1.00	

Deflection Limits:

		Total Load	Live Load
Roof:	L /	240	360
Floor:	L /	360	480
Horizontal:	L /	--	240

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Date: November 2019

FOUNDATION CRITERIA & SPECIFICATIONS

Geotechnical Report:
Company: IGES
Date: July 1, 2019
Report / Project Number: 03091-001
Contact: David A. Glass, P.E.

Allowable Bearing Pressure: 3,400 psf
Allowable Bearing Increase for Wind & Seismic Loads: 1.33

	Static Loading	Increase for Dynamic Loading	
Passive Pressure:	375	-40.8	pcf
Active Pressure:	41.7	15.1	pcf
At Rest Pressure:	55	22.5	pcf

Coefficient of Friction, μ: 0.47

Foundation Type:
Footing Type: Concrete Spread Footing
Min. Depth to Frost: 42 in

MATERIAL SPECIFICATIONS

CONCRETE & REINFORCING STEEL SPECIFICATIONS:

Concrete Strength, f'_c:

Footings:	3,000	psi (As allowed by Utah State Code Amendment)
Concrete Walls:	4,500	psi (Buried foundation walls can be 3000 psi as allowed by Utah State Code Amendment)
Grade Beams:	4,000	psi
Slab on Grade:	4,000	psi
Bearing/Shear Walls:	4,000	psi

Deformed Reinforcing Bars: ASTM A615 Grade 60
ASTM A706 Grade 60 Weldable Rebar is to be used where welds are specified on contract documents

Welded Wire Fabric: ASTM A185 - Flat sheets, not rolls

STEEL FRAMING SPECIFICATIONS

Structural Steel:
W-Shape: ASTM A992, F_y = 50 ksi
Tubing: ASTM A500, Grade B, F_y = 46 ksi
Channels, Plates and Angles: ASTM A36, F_y = 36 ksi
Pipe: ASTM A53, Grade B, F_y = 35 ksi
Machine Bolts: ASTM A307
High-strength Bolts: ASTM A325 or A490

Welds: E70XX Electrodes, Comply with AWS D1.1

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WOOD FRAMING SPECIFICATIONS

Unless noted otherwise, the following species and grades of lumber shall be used.

Sawn Lumber:	Species:	Douglas Fir-Larch (North)
	2x4 studs up to 8'-0" long:	Stud Grade
	2x4 studs over 8'-0" long:	Grade #2
	Other studs:	Grade #2
	Posts:	Grade #1
	Joists:	Grade #2
	Beams:	Grade #2
	Headers:	Grade #2
	Subpurlins:	Grade #2
	Purlins:	Grade #2
Glue Laminated Beams:	Species:	Douglas Fir-Larch (North)
	Simple Spans:	24F-V4
	Continuous Spans:	24F-V8
Sheathing:		APA Rated OSB
Framing Hardware:		Simpson Strong-Tie Connectors
Structural Nails:		Common Wire Type (unless noted otherwise)
Bolts in Wood:		ASTM A307

Hazards by Location

Search Information

Coordinates: 41.362283, -111.745037

Elevation: ft

Timestamp: 2019-11-04T21:53:21.884Z

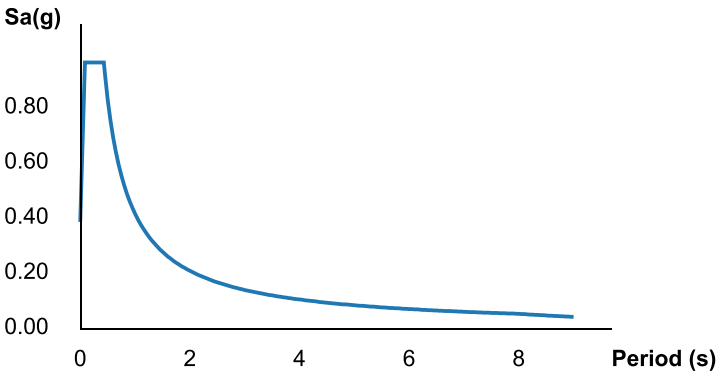
Hazard Type: Seismic

Reference Document: ASCE7-16

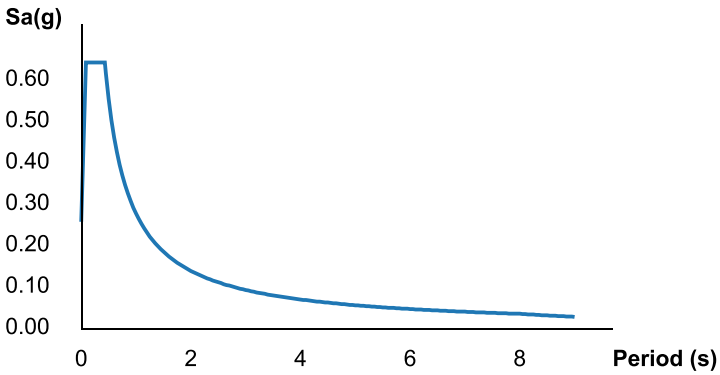
Risk Category: II

Site Class: C

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.802	MCE_R ground motion (period=0.2s)
S_1	0.277	MCE_R ground motion (period=1.0s)
S_{MS}	0.963	Site-modified spectral acceleration value
S_{M1}	0.415	Site-modified spectral acceleration value
S_{DS}	0.642	Numeric seismic design value at 0.2s SA
S_{D1}	0.277	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.9	Coefficient of risk (0.2s)

CR_1	0.899	Coefficient of risk (1.0s)
PGA	0.349	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.419	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)
SsRT	0.802	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.891	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.671	Factored deterministic acceleration value (0.2s)
S1RT	0.277	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.308	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.728	Factored deterministic acceleration value (1.0s)
PGAd	0.656	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Hazards by Location

Search Information

Coordinates: 41.362283, -111.745037

Elevation: ft

Timestamp: 2019-11-04T21:34:36.599Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	74 mph
MRI 25-Year	80 mph
MRI 50-Year	85 mph
MRI 100-Year	90 mph
Risk Category I	98 mph
Risk Category II	104 mph
Risk Category III	110 mph
Risk Category IV	114 mph

ASCE 7-10

MRI 10-Year	76 mph
MRI 25-Year	84 mph
MRI 50-Year	90 mph
MRI 100-Year	96 mph
Risk Category I	105 mph
Risk Category II	115 mph
Risk Category III-IV	120 mph

ASCE 7-05

ASCE 7-05 Wind Speed	90 mph

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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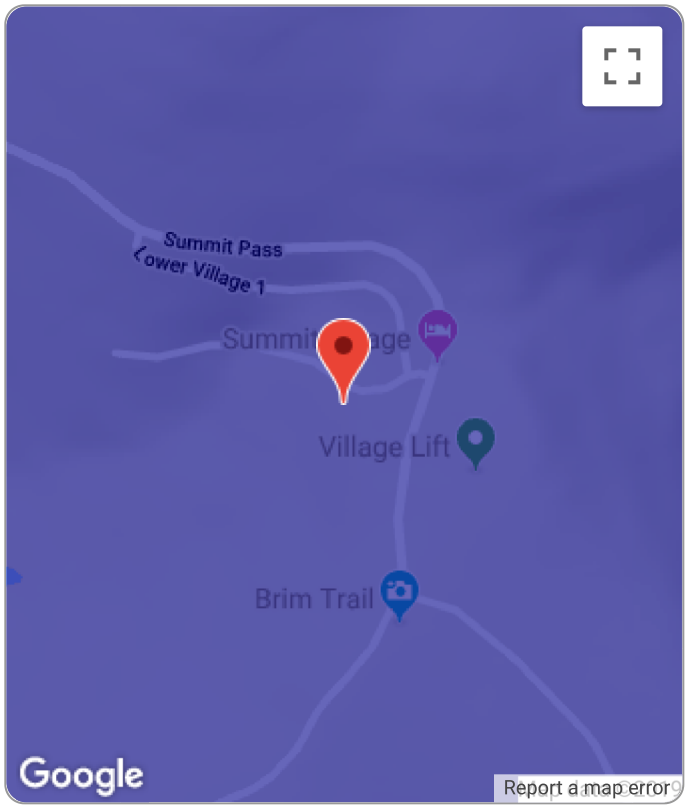
2018 Utah Ground Snow Load Map

Scandinavian Lot #86

Latitude: 41.362
Longitude: -111.745
Elevation: 8,529 ft

Ground Snow Load:
379 psf / 18.17 kPa



Snow Load (psf)

35 60 90 150 250 429+

*This document is not legally binding. The user is urged to verify ground snow load values with the local authority having jurisdiction.

These ground snow load values represent 50-year ground snow load estimated value at a 2% probability of exceedance for the location given. The grid used in the map is 3350ft by 3350ft. Elevations for these grid cells were estimated by aggregating data from 100ft by 100ft USGS digital elevation models and may not coincide with the actual site elevation. These predictions are calculated using the process outlined in The Utah Snow Load Study.1

Final predictions given are bounded at a lower limit for a minimum ground snow load of 21 psf to meet ASCE 7. Estimated values for snow loads at elevations significantly higher than all nearby stations lead to unreasonably high snow load estimates, therefore, the predictions in the map are not allowed to extend beyond the highest 50-year station ground snow load of 429 psf. Elevations over 9,000 ft are also considered less accurate due to the limited number of stations at these elevations. The results shown in this report have included a warning if the results have reached or exceeded the upper limit.

While great efforts have been made to ensure these predictions are as accurate as possible, designers must use expert judgement to ensure that such predictions are appropriate for their particular project. The SEAU and the authors cannot accept responsibility for prediction errors or any consequences resulting therefrom.

1 Bean, Brennan; Maguire, Marc; and Sun, Yan, "The Utah Snow Load Study" (2018). Civil and Environmental Engineering Faculty Publications. Paper 3589.

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Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

SEISMIC FORCE ANALYSIS - EQUIVALENT LATERAL FORCE PROCEDURE

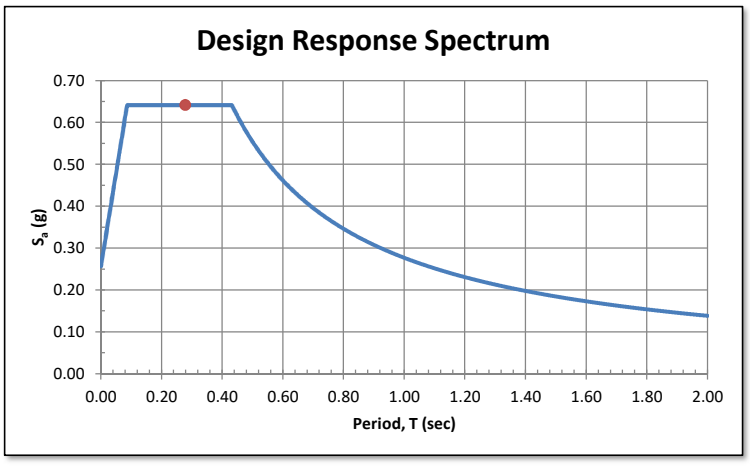
CHAPTER 12, ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Risk Category	II	*Table 1604.5*	Structure Type	All other structural systems	
Importance Factor, I_E	1.00	*Table 1.5-2*	T_0 (sec)	0.086	*Section 11.4.6*
	--		T_S (sec)	0.432	*Section 11.4.6*
S_S (g)	0.802	*Mapped*	T_L (sec)	8	*Section 11.4.6*
S_1 (g)	0.277	*Mapped*	S_a (g)	N/A	*if $T<T_0$ (Equation 11.4-5)*
Site Class	C	*Geotech Report*	S_a (g)	0.642	*$T_0<T<T_S$ (Section 11.4-6)*
F_a	1.20	*Table 1613.2.3(1)*	S_a (g)	N/A	*$T_S<T<T_L$ (Equation 11.4-7)*
F_v	1.50	*Table 1613.2.3(2)*	C_t	0.02	*Table 12.8-2*
S_{MS} (g)	0.962	*$F_a S_S$*	x	0.75	*Table 12.8-2*
S_{M1} (g)	0.416	*$F_v S_1$*	T_a (sec)	0.278	*Equation 12.8-7*
S_{DS} (g)	0.642	*$2/3(S_{MS})$*	Response Modification Factor, R	2.5	*Table 12.2-1*
S_{D1} (g)	0.277	*$2/3(S_{M1})$*	Overstrength Factor, Ω_0	2.5	*Table 12.2-1*
Seismic Design Category	D	*Table 1613.2.5(1,2)*	$C_{S,Calculated}$	0.257	*Equation 12.8-2*
Building Height, h_n (ft)	33.5		$C_{S\ MAX}$	0.597	*Equation 12.8-3 & 12.8-4*
Number of Stories	3		$C_{S\ MIN}$	0.028	*Equation 12.8-5 & 12.8-6*
Light-frame Construction?	No		**C_S**	**0.257**	*Section 12.8.1.1*

Vertical Distribution of Seismic Forces

Component	Unit Weight (psf)	Area (ft^2)	Weight, w_i (kips)	Elevation, h_i (ft)	$w_i h_i^k$ (kip-ft)	F_i (kips)	$0.7F_i$ (kips)
Roof Level:			-		-	-	-
Roof + Seismic Snow	73	2,051	149.85	33.5	5,019.84	50.73	35.51
N & S Elevation Walls	30	468	14.05	33.5	470.67	4.76	3.33
E & W Elevation Walls	30	292	8.75	33.5	293.13	2.96	2.07
			-		-	-	-
Upper Level			-		-	-	-
Upper Level Floor	20	2,022	40.44	20.5	829.02	8.38	5.86
N & S Elevation Walls	30	1,017	30.51	20.5	625.46	6.32	4.42
E & W Elevation Walls	30	1,304	39.13	20.5	802.12	8.11	5.67
			-		-	-	-
Main Level			-		-	-	-
Main Level Floor	20	1,737	34.74	10.25	356.09	3.60	2.52
N & S Elevation Walls	30	320	9.60	10.25	98.40	0.99	0.70
E & W Elevation Walls	30	417	12.50	10.25	128.13	1.29	0.91
			-		-	-	-
		Σw_i	340	$\Sigma w_i h_i^k$	8,623	**V_x (kips)**	**87.15**
Notes:				k	1	$0.7V_x$ (kips)	61.00



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Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

SEISMIC FORCE ANALYSIS - DIAPHRAGM FORCES

CHAPTER 12, ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Risk Category	II	*Table 1604.5*	S_{DS} (g)	0.642	*2/3(S_{MS})*
S_S (g)	0.802	*Mapped*	S_{D1} (g)	0.277	*2/3(S_{M1})*
S_1 (g)	0.277	*Mapped*	Seismic Design Category	D	*Table 1613.2.5(1,2)*
Site Class	C	*Geotech Report*	Importance Factor, I_E	1.00	*Table 1.5-2*

Diaphragm Design Forces - North-South Direction

Level	Strength Level F_i (k)	Sum F_i (k)	w_{px} (k)	Sum w_i (k)	F_{px} (k) *Eq. 12.10-1*	$F_{px,min}$ (k) *Eq. 12.10-2*	$F_{px,max}$ (k) *Eq. 12.10-3*	**LRFD: $F_{px,design}$ (k)**	Scale Factor F_{px} / F_x
Roof	55.49	55.5	163.90	163.9	55.5	21.0	42.1	**42.1**	1.00
Upper	14.70	70.2	70.95	234.8	21.2	9.1	18.2	**18.2**	1.24
Lower	4.59	74.8	44.34	279.2	11.9	5.7	11.4	**11.4**	2.48
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		-		-	-	-	-	-	-

Diaphragm Design Forces - East-West Direction

Level	Strength Level F_i (k)	Sum F_i (k)	w_{px} (k)	Sum w_i (k)	F_{px} (k) *Eq. 12.10-1*	$F_{px,min}$ (k) *Eq. 12.10-2*	$F_{px,max}$ (k) *Eq. 12.10-3*	**LRFD: $F_{px,design}$ (k)**	Scale Factor F_{px} / F_x
Roof	53.69	53.7	158.60	158.6	53.7	20.4	40.7	**40.7**	1.00
Upper	16.48	70.2	79.57	238.2	23.4	10.2	20.4	**20.4**	1.24
Lower	4.89	75.1	47.24	285.4	12.4	6.1	12.1	**12.1**	2.48
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Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

SEISMIC FORCE ANALYSIS - STRUCTURAL WALLS AND THEIR ANCHORAGE

CHAPTER 12, ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Risk Category	II	*Table 1604.5*
Importance Factor, I_E	1.00	*Table 1.5-2*
	--	
S_S (g)	0.802	*Mapped*
S_1 (g)	0.277	*Mapped*
Site Class	C	*Geotech Report*
F_a	1.20	*Table 1613.2.3(1)*
F_v	1.50	*Table 1613.2.3(2)*
S_{MS} (g)	0.962	$F_a S_S$
S_{M1} (g)	0.416	$F_v S_1$
S_{DS} (g)	0.642	$2/3(S_{MS})$
S_{D1} (g)	0.277	$2/3(S_{M1})$
Seismic Design Category	D	*Table 1613.2.5(1,2)*
Building Height, h_n (ft)	33.5	
Number of Stories	3	
Light-frame Construction?	No	

Calculation Comments:

Out-of-Plane Forces on Structural Walls and their Anchorage

Component	*12.11.1 - Wall Forces*		*12.11.2 - Anchorage Forces*				
	Unit Weight (psf)	**Unit Force, f_p (psf)**	Diaphragm Length, L_f (ft)	Trib. Wall Height (ft)	Trib. Wall Width (ft)	Amplification Factor, k_a	**Wall Anchor Force, F_p (lb)**
		-				-	-
Log Wall	30	**7.7**	62	10	2	1.62	**249**
		-				-	-
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Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

WIND FORCE ANALYSIS - DIRECTIONAL PROCEDURE

CHAPTER 27 (PART 1), ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Basic Wind Speed, V (mph)	104	*Section 26.5*	K_{zt} Factor Applicable?	No	
Exposure Category	C	*Section 26.7*	Height of Hill or Ridge, H (ft)	N/A	*Table 26.8-1*
Ground Elevation (ft)	8,300		L_h (ft)	N/A	*Table 26.8-1*
Enclosure Classification	Enclosed	*Section 26.2*	H / L_h	0.00	
Positive / Negative?	Positive		x (ft)	N/A	*Table 26.8-1*
Internal Press. Coef., GC_{pi}	0.18	*Table 26.13-1*	Horizontal Attenuation, μ	N/A	*Table 26.8-1*
Mean Roof Height, h (ft)	33.5		Height Attenuation, γ	N/A	*Table 26.8-1*
Building Length, L (ft)	66.5		K_1 / (H / L_h)	N/A	*Table 26.8-1*
Building Width, B (ft)	58		K_1	0.00	*Table 26.8-1*
L/B	1.15		K_2	0.00	*Table 26.8-1*
h/L	0.50		K_3	0.00	*Table 26.8-1*
Roof Pitch	2	/12	Topographic Factor, K_{zt} at h	1.00	*Section 26.8*
Roof Angle, θ	9.5		Wind Directionality Factor, K_d	0.85	*Section 26.6*
Terrain Constant, α	9.5	*Table 26.11-1*	Ground Elevation Factor, K_e	0.74	*Section 26.9*
Terrain Constant, z_g (ft)	900	*Table 26.11-1*	Gust Effect Factor, G	0.85	*Section 26.11*
Exposure Coefficient, K_h	1.005	*Table 26.10-1*	**Velocity Pressure, q_h (psf)**	**17.52**	*Equation 26.10-1*

MWFRS Wind Pressure Analysis

				Pressure Coefficients, C_p	*Walls*			*Parapets*	
					Windward	Leeward	Side	Windward	Leeward
					0.80	-0.47	-0.70	1.50	-1.00
Surface Mark	Surface Type	z (ft)	K_z	q_z (psf)	Wind Pressure, p (psf)				
Roof	Roof	33.5	1.005	17.5	-	-	-	-	-
Upper Wall	Wall	24	0.937	16.3	7.95	-10.16	-13.58	-	-
Main Wall	Wall	14	0.849	14.8	6.91	-10.16	-13.58	-	-
Walkout	Wall	5	0.849	14.8	6.91	-10.16	-13.58	-	-
			-	-	-	-	-	-	-
			-	-	-	-	-	-	-

Roof Type		*Roof*						
	Pressure Coefficients, C_p	Not Applicable for Roof Angle		Normal to Ridge for θ < 10° and Parallel to Ridge for all θ				Windward Overhang
Monoslope		Windward	Leeward	0 to h/2	h/2 to h	h to 2h	> 2h	
		-0.90	-0.50	-0.90	-0.90	-0.50	-0.30	
		-0.18	-0.50	-0.18	-0.18	-0.18	-0.18	0.80
Surface Mark	Surface Type	Wind Pressure, p (psf)						
Roof	Roof	N/A	N/A	-16.60	-16.53	-10.62	-7.67	11.91
Upper Wall	Wall	-	-	-	-	-	-	-
Main Wall	Wall	-	-	-	-	-	-	-
Walkout	Wall	-	-	-	-	-	-	-
-		-	-	-	-	-	-	-
-		-	-	-	-	-	-	-

Surface Forces

North-South, Positive Internal Pressure

Surface Mark	Surface Type	Windward or Leeward Surface?	Projected Horizontal Pressure, p (psf)	Tributary Height (ft)	Unit Force (plf)	Surface Width, W (ft)	Force (kips)		
Roof	Roof	Both	16.60	8	124.5	44	5.5		
Upper Wall	Wall	Both	18.12	5	90.6	58	5.3	Total Design Base Shear	
Main Wall	Wall	Both	17.07	10	170.7	58	9.9		
Walkout	Wall	Both	17.07	5	85.3	42	3.6	LRFD	ASD
-		Both	-		-		-	V_x (kips)	$0.6V_x$ (kips)
-		Both	-		-		-	**24.2**	**14.5**

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THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

WIND FORCE ANALYSIS - DIRECTIONAL PROCEDURE

CHAPTER 27 (PART 1), ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Basic Wind Speed, V (mph)	104	*Section 26.5*	K_{zt} Factor Applicable?	Yes	
Exposure Category	C	*Section 26.7*	Height of Hill or Ridge, H (ft)	30	*Table 26.8-1*
Ground Elevation (ft)	8,300		L_h (ft)	48	*Table 26.8-1*
Enclosure Classification	Enclosed	*Section 26.2*	H / L_h	0.63	
Positive / Negative?	Positive		x (ft)	0	*Table 26.8-1*
Internal Press. Coef., GC_{pi}	0.18	*Table 26.13-1*	Horizontal Attenuation, μ	1.5	*Table 26.8-1*
Mean Roof Height, h (ft)	33.5		Height Attenuation, γ	2.5	*Table 26.8-1*
Building Length, L (ft)	58		K_1 / (H / L_h)	0.85	*Table 26.8-1*
Building Width, B (ft)	66.5		K_1	0.53	*Table 26.8-1*
L/B	0.87		K_2	1.00	*Table 26.8-1*
h/L	0.58		K_3	0.17	*Table 26.8-1*
Roof Pitch	2	/12	Topographic Factor, K_{zt} at h	1.19	*Section 26.8*
Roof Angle, θ	9.5		Wind Directionality Factor, K_d	0.85	*Section 26.6*
Terrain Constant, α	9.5	*Table 26.11-1*	Ground Elevation Factor, K_e	0.74	*Section 26.9*
Terrain Constant, z_g (ft)	900	*Table 26.11-1*	Gust Effect Factor, G	0.85	*Section 26.11*
Exposure Coefficient, K_h	1.005	*Table 26.10-1*	**Velocity Pressure, q_h (psf)**	**20.92**	*Equation 26.10-1*

MWFRS Wind Pressure Analysis

				Pressure Coefficients, C_p	*Walls*			*Parapets*	
					Windward	Leeward	Side	Windward	Leeward
					0.80	-0.50	-0.70	1.50	-1.00
Surface Mark	Surface Type	z (ft)	K_z	q_z (psf)	Wind Pressure, p (psf)				
Upper Wall	Wall	24	0.937	21.7	10.98	-12.66	-16.22	-	-
Main Wall	Wall	15	0.849	22.9	11.78	-12.66	-16.22	-	-
Walkout	Wall	5	0.849	29.4	16.22	-12.66	-16.22	-	-
Roof	Wall	33.5	1.005	20.9	10.46	-12.66	-16.22	-	-
			-	-	-	-	-	-	-
			-	-	-	-	-	-	-

Roof Type		*Roof*						
	Pressure Coefficients, C_p	Not Applicable for Roof Angle		Normal to Ridge for θ < 10° and Parallel to Ridge for all θ				Windward Overhang
Monoslope		Windward	Leeward	0 to h/2	h/2 to h	h to 2h	> 2h	
		-0.96	-0.53	-0.96	-0.87	-0.53	-0.36	
		-0.18	-0.53	-0.18	-0.18	-0.18	-0.18	0.80
Surface Mark	Surface Type	Wind Pressure, p (psf)						
Upper Wall	Wall	-	-	-	-	-	-	-
Main Wall	Wall	-	-	-	-	-	-	-
Walkout	Wall	-	-	-	-	-	-	-
Roof	Wall	-	-	-	-	-	-	-
-		-	-	-	-	-	-	-
-		-	-	-	-	-	-	-

Surface Forces

East-West, Positive Internal Pressure

Surface Mark	Surface Type	Windward or Leeward Surface?	Projected Horizontal Pressure, p (psf)	Tributary Height (ft)	Unit Force (plf)	Surface Width, W (ft)	Force (kips)		
Upper Wall	Wall	Both	23.64	9	212.7	67	14.1		
Main Wall	Wall	Both	24.44	10	244.4	67	16.3	Total Design Base Shear	
Walkout	Wall	Both	28.88	5	144.4	32	4.6		
Roof	Wall	Both	23.12	4	92.5	67	6.1	LRFD	ASD
-		Both	-		-		-	V_x (kips)	$0.6V_x$ (kips)
-		Both	-		-		-	**41.2**	**24.7**

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Project: Powder Mountain Lot 86 | Project No.: 9084C
By: Tye M. Carlile, EIT | Checked By: ASH
Date: November 2019

WIND FORCE ANALYSIS - COMPONENTS & CLADDING

CHAPTER 30, ASCE 7-16 — *IBC 2018 / ASCE 7-16*

Design Parameters

Basic Wind Speed, V (mph)	104	*Section 26.5*	K_{zt} Factor Applicable?	Yes	
Exposure Category	C	*Section 26.7*	Height of Hill or Ridge, H (ft)	30	*Table 26.8-1*
Ground Elevation (ft)	8,300		L_h (ft)	48	*Table 26.8-1*
Enclosure Classification	Enclosed	*Section 26.2*	H / L_h	0.63	
Positive / Negative?	Positive		x (ft)	0	*Table 26.8-1*
Internal Press. Coef., GC_{pi}	0.18	*Table 26.13-1*	Horizontal Attenuation, μ	1.5	*Table 26.8-1*
Mean Roof Height, h (ft)	33.5		Height Attenuation, γ	2.5	*Table 26.8-1*
Building Length, L (ft)	66.5		$K_1 / (H / L_h)$	0.85	*Table 26.8-1*
Building Width, B (ft)	58		K_1	0.53	*Table 26.8-1*
h/B	0.58		K_2	1.00	*Table 26.8-1*
Roof Type	Monoslope		K_3	0.17	*Table 26.8-1*
Roof Pitch	2	/12	Topographic Factor, K_{zt} at h	1.19	*Section 26.8*
Roof Angle, θ	9.5		Wind Directionality Factor, K_d	0.85	*Section 26.6*
Is there a Parapet?	No		Ground Elevation Factor, K_e	0.74	*Section 26.9*
Parapet Height, h_p (ft)	N/A		**Velocity Pressure, q_h (psf)**	**20.92**	*Equation 26.10-1*
Terrain Constant, α	9.5	*Table 26.11-1*	Exposure Coefficient, K_p	N/A	*Table 26.10-1*
Terrain Constant, z_g (ft)	900	*Table 26.11-1*	Topographic Factor, K_{zt} at h_p	N/A	*Section 26.8*
Exposure Coefficient, K_h	1.005	*Table 26.10-1*	**Velocity Pressure, q_p (psf)**	**N/A**	*Equation 26.10-1*

External Pressure Coefficients, GC_p

Location		TRIBUTARY AREA (ft^2)				
		< 10	20	50	100	>500
Walls	Zone 5: Within 6-ft of building corner	-1.3	-1.2	-1.0	-0.9	-0.7
	Zone 4: All other areas	-1.0	-0.9	-0.9	-0.8	-0.7
	Zone 4 & 5: Positive Pressures	0.9	0.9	0.8	0.7	0.6
Roof	Zone 3': Within 12-ft of upper roof ridge & within 24-ft of roof sid	-2.6	-2.3	-1.9	-1.6	-1.6
	Zone 3: Within 12-ft of lower roof corners	-1.8	-1.7	-1.4	-1.2	-1.2
	Zone 2': Within 12-ft of upper roof edge & side edges	-1.6	-1.6	-1.6	-1.5	-1.5
	Zone 2: Within 6-ft of lower roof edge	-1.3	-1.4	-1.3	-1.2	-1.2
	Zone 1: Roof field	-1.1	-1.1	-1.1	-1.1	-1.1
	All Zones: Positive Pressures	0.3	0.3	0.2	0.2	0.2

Component & Cladding Design Wind Pressure

Location			Tributary Area (ft^2)				
			< 10	20	50	100	>500
Walls	Zone 5: Within 6-ft of building corner		-30.1	-28.2	-25.4	-23.5	-18.8
	Zone 4: All other areas		-24.5	-23.5	-22.6	-21.2	-18.8
	Zone 4 & 5: Positive Pressures		16.0	16.0	16.0	16.0	16.0
Roof	Zone 3': Within 12-ft of upper roof ridge & within 24-ft of roof sid		-58.2	-51.9	-43.5	-37.2	-37.2
	Zone 3: Within 12-ft of lower roof corners		-41.4	-38.3	-33.1	-28.9	-28.9
	Zone 2': Within 12-ft of upper roof edge & side edges		-37.2	-37.2	-36.2	-35.2	-35.2
	Zone 2: Within 6-ft of lower roof edge		-31.0	-32.5	-29.9	-28.9	-28.9
	Zone 1: Roof field		-26.8	-26.8	-26.8	-26.8	-26.8
	All Zones: Positive Pressures		16.0	16.0	16.0	16.0	16.0
Parapets	N/A	A	-	-	-	-	-
		B	-	-	-	-	-
	N/A	A	-	-	-	-	-
		B	-	-	-	-	-

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Project: Powder Mountain Lot 86
By: Tye M. Carlile, EIT
Date: November 2019

Project No.: 9084C
Checked By: ASH

STORY SHEAR COMPARISON

IBC 2018 / ASCE 7-16

Level	LRFD				Governing Load Case	
	North-South Direction		East-West Direction		North-South Direction	East-West Direction
	Seismic	Wind	Seismic	Wind		
	F_i (k)	F_i (k)	F_i (k)	F_i (k)		
Roof	55.49	5.48	53.69	6.15	Seismic	Seismic
Upper	14.70	5.25	16.48	14.15	Seismic	Seismic
Main	4.59	9.90	4.89	16.25	Wind	Wind

Level	ASD				Governing Load Case	
	North-South Direction		East-West Direction		North-South Direction	East-West Direction
	Seismic	Wind	Seismic	Wind		
	F_i (k)	F_i (k)	F_i (k)	F_i (k)		
Roof	38.84	3.29	37.59	3.69	Seismic	Seismic
Upper	10.29	3.15	11.54	8.49	Seismic	Seismic
Main	3.22	5.94	3.43	9.75	Wind	Wind

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SINGLE-STORY WOOD SHEAR WALLS

CHAPTER 4.3, AWC SDPWS-2015 *IBC 2018 / ASCE 7-16*

NOTES: 1. Typically when seismic is found to govern wind loads will not be checked here. However, if wind loads are found to govern both wind and seismic need to be checked in order to account for the difference in shearwall capacities.
2. ASD loads are to be entered here.

S_{DS}=	0.64
I_e=	1.00
C_d=	4

Grid 1	Wind Force on Wall Line:	525	lbs	lbs / Dowel:	2,750	Total:	**2,750**	lbs
1st Floor	Seismic Force on Wall Line:	1,715	lbs	# of Dowels:	1		**OK**	
Grid 1	Wind Force on Wall Line:	2,010	lbs	lbs / Dowel:	2,750	Total:	**2,750**	lbs
Walkout	Seismic Force on Wall Line:	2,519	lbs	# of Dowels	1		**OK**	
				Length (ft):	32	Anchor Bolts:	**AB32**	
Grid 2	Wind Force on Wall Line:	1,644	lbs	lbs / Dowel:	2,750	Total:	**22,000**	lbs
2nd Floor	Seismic Force on Wall Line:	19,421	lbs	# of Dowels	8		**OK**	
				Length (ft):	56	Anchor Bolts:	**AB32**	
Grid 2	Wind Force on Wall Line:	1,873	lbs	lbs / Dowel:	2,750	Total:	**13,750**	lbs
1st Floor	Seismic Force on Wall Line:	13,140	lbs	# of Dowels:	5		**OK**	
Grid 2	Wind Force on Wall Line:	3,358	lbs	lbs / Dowel:	2,750	Total:	**16,500**	lbs
Walkout	Seismic Force on Wall Line:	13,944	lbs	# of Dowels	6		**OK**	
				Length (ft):	32	Anchor Bolts:	**AB32**	
Grid 3	Wind Force on Wall Line:	1,644	lbs	lbs / Dowel:	2,750	Total:	**22,000**	lbs
2nd Floor	Seismic Force on Wall Line:	19,421	lbs	# of Dowels	8		**OK**	
				Length (ft):	52	Anchor Bolts:	**AB32**	
Grid 3	Wind Force on Wall Line:	1,884	lbs	lbs / Dowel:	2,750	Total:	**16,500**	lbs
1st Floor	Seismic Force on Wall Line:	15,520	lbs	# of Dowels:	6		**OK**	
Grid 3	Wind Force on Wall Line:	2,874	lbs	lbs / Dowel:	2,750	Total:	**16,500**	lbs
Walkout	Seismic Force on Wall Line:	16,056	lbs	# of Dowels	6		**OK**	
				Length (ft):	32	Anchor Bolts:	**AB32**	
Grid A	Wind Force on Wall Line:	615	lbs	lbs / Dowel:	2,750	Total:	**8,250**	lbs
2nd Floor	Seismic Force on Wall Line:	6,264	lbs	# of Dowels	3		**OK**	
				Length (ft):	32	Anchor Bolts:	**AB32**	
Grid B	Wind Force on Wall Line:	1,845	lbs	lbs / Dowel:	2,750	Total:	**19,250**	lbs
2nd Floor	Seismic Force on Wall Line:	18,793	lbs	# of Dowels	7		**OK**	
Grid B	Wind Force on Wall Line:	6,089	lbs	lbs / Dowel:	2,750	Total:	**24,750**	lbs
1st Floor	Seismic Force on Wall Line:	24,563	lbs	# of Dowels:	9		**OK**	
Grid B	Wind Force on Wall Line:	10,965	lbs	lbs / Dowel:	2,750	Total:	**27,500**	lbs
Walkout	Seismic Force on Wall Line:	26,276	lbs	# of Dowels	10		**OK**	
				Length (ft):	42	Anchor Bolts:	**AB24**	
Grid C	Wind Force on Wall Line:	922	lbs	lbs / Dowel:	2,750	Total:	**11,000**	lbs
2nd Floor	Seismic Force on Wall Line:	9,397	lbs	# of Dowels	4		**OK**	
Grid C	Wind Force on Wall Line:	5,166	lbs	lbs / Dowel:	2,750	Total:	**16,500**	lbs
1st Floor	Seismic Force on Wall Line:	15,166	lbs	# of Dowels:	6		**OK**	
Grid C	Wind Force on Wall Line:	10,042	lbs	lbs / Dowel:	2,750	Total:	**19,250**	lbs
Walkout	Seismic Force on Wall Line:	16,879	lbs	# of Dowels	7		**OK**	
				Length (ft):	42	Anchor Bolts:	**AB32**	

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HOLDOWN & VERTICAL STRAP SCHEDULE

IBC 2018 / ASCE 7-16

HOLDOWN INTO CONCRETE							
Mark	Anchor	Wind or Seismic Capacity (LBS)	Rod Diameter	Min. Post Size	Minimum Embed Depth in Footing	Edge Distance	Post Grade
H-1	HTT4 w/ (18) 10dx1½ nails	3610	5/8"	3" x 3 1/2"	6 1/2"	10"	DF #2
H-2	HTT5 w/ (26) 10d nails	4670	5/8"	3" x 3 1/2"	6 1/2"	10"	DF #2
H-3	HDU5 - SDS2.5 (14)	5645	5/8"	4 1/2" x 3 1/2"	6 1/2"	10"	DF #2
H-4	HDU8 - SDS2.5 (20)	7870	7/8"	4 1/2" x 3 1/2"	9"	13 1/2"	DF #2
H-5	HDU11 - SDS2.5 (30)	9335	1"	5 1/2" x 3 1/2"	11"	16 1/2"	DF #2
H-6	HDU11 - SDS2.5 (30)	11175	1"	7 1/4" x 3 1/2"	11"	16 1/2"	DF #2
H-7	HDU14 - SDS2.5 (36)	14390	1"	5.5"sq or 9.25"	11"	16 1/2"	DF #2
H-8	HD12 (4) 1" Bolts	15435	1 1/8"	5.5"sq or 9.25"	12 1/2"	19"	DF #2
H-9	HD19 (1 1/8") & (5) 1" Bolts	16735	1 1/8"	5 1/2" x 5 1/2"	12 1/2"	19"	DF #1
H-10	HD19 (1 1/4") & (5) 1" Bolts	19070	1 1/4"	5 1/2" x 5 1/2"	14 1/2"	22"	DF #1

HOLDOWN INTO CONCRETE (Single Family Residential ONLY)								
		Wind Capacity (LBS) - Cracked			Seismic Capacity (LBS) - Cracked			
Mark	Anchor	Midwall	Corner	Endwall	Midwall	Corner	Endwall	Min. Post Size
H-11	LSTHD8	2675	2320	1915	2250	1950	1610	3" x 3 1/2"
H-12	STHD10	4195	3500	2585	3400	2940	2175	3" x 3 1/2"
H-13	STHD14	5345	5345	4210	3815	3815	3500	3" x 3 1/2"

FLOOR TO FLOOR TIES (STRAPS OR RODS)					
Mark	Anchor	Wind or Seismic Capacity (LBS)	Rod Diameter	Min. Post Size	Post Grade
	Strap Type				
T-1	CS16 - (20) - 11"	1705	NA	1 1/2" x 3 1/2"	DF #2
T-2	CS14 - (26) - 15"	2490	NA	3" x 3 1/2"	DF #2
T-3	CMSTC16 - (50) - 20"	4585	NA	3" x 3 1/2"	DF #2
T-4	CMST14 - (66) - 30"	6490	NA	4 1/2" x 3 1/2"	DF #2
T-5	CMST12 - (86) - 39"	9215	NA	5 1/2" x 3 1/2"	DF #2
	Rod Type				
T-6	HDU2-SDS2.5 (6)	3075	5/8"	3" x 3 1/2"	DF #2
T-7	HTT4 w/ (18) 10dx1½ nails	3610	5/8"	3" x 3 1/2"	DF #2
T-8	HTT5 w/ (26) 10d nails	4670	5/8"	3" x 3 1/2"	DF #2
T-9	HDU5 - SDS2.5 (14)	5645	5/8"	4 1/2" x 3 1/2"	DF #2
T-10	HDU8 - SDS2.5 (20)	7870	7/8"	4 1/2" x 3 1/2"	DF #2
T-11	HDU11 - SDS2.5 (30)	9335	1"	5 1/2" x 3 1/2"	DF #2
T-12	HDU11 - SDS2.5 (30)	11175	1"	7 1/4" x 3 1/2"	DF #2
T-13	HDU14 - SDS2.5 (36)	14390	1"	5.5"sq or 9.25"	DF #2
T-14	HD12 (4) 1" Bolts	15435	1 1/8"	5.5"sq or 9.25"	DF #2
T-15	HD19 (1 1/8") & (5) 1" Bolts	16735	1 1/8"	5 1/2" x 5 1/2"	DF #1
T-16	HD19 (1 1/4") & (5) 1" Bolts	19070	1 1/4"	5 1/2" x 5 1/2"	DF #1
T-17	(2) HDU4-SDS2.5 (20)	9130	5/8"	5 1/2" x 3 1/2"	DF #2

Notes:

All anchors are Simpson Strong-Tie. Install per manufacturer's specifications.

All capacities shown are ASD. All min. post sizes are based on 9 ft max nominal top plate heights. For 8ft use 7.25" for H-7&8, T-13&14 and 4x10 for H-9&10, T-15&16.

Use 4" end distance at foundation blockouts.

CS and CMST straps are specified with: strap type - total # of of 10d nails required - end length required onto the studs. CMSTC16 Strap uses 16d Sinker Nails.

Provide 1/2" X 1 3/4" X 1 3/4" plate washer for 5/8" dia. anchors, 1/2" X 2 1/2" X 2 1/2" plate washer for 7/8" dia. anchors, 5/8" X 3" X 2 3/4" plate washer for 1" dia. anchors, 5/8" X 3 1/2" X 3 1/4" plate washer for 1 1/8" dia. anchors, and 3/4" X 3 1/2" X 3 1/2" plate washer for 1 1/4" dia. anchors. Provide nut top & bot.

For stem wall applications use simspon SB 5/8" x 24" embed 18" min. in wall for HTT4, HTT5, HDU5 holdowns. HDU8 may use SB 7/8" x 24" at midwall.

Ensure that the Min. Edge distances are met for all anchors in concrete.

Min. anchor bolt strength is ASTM F-1554 GRADE 36 U.N.O.

LSTHD's and STHD's assume 8" stemwalls minimum.

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ANCHOR BOLTS

2018 NDS Table 12E

1/2" Diameter Anchor Bolts		
Mark	Bolt Spacing	Capacifty (plf)
AB32	32"	384
AB24	24"	512
AB16	16"	768
AB12	12"	1024
AB8	8"	1536

5/8" Diameter Anchor Bolts		
Mark	Bolt Spacing	Capacifty (plf)
AB32	32"	552
AB24	24"	736
AB16	16"	1104
AB12	12"	1472
AB8	8"	2208

Notes:
7" minimum embedment depth on all anchor bolts.
3" x 3" x 0.229" plate washers on all anchor bolts. 1/2" away from sheathing.
(2) anchor bolts min. per shear wall.
Anchors are located a minimum of 1 3/4" away from the edge of concrete
Anchor bolts are to be located 15 anchor diameters away from a concrete edge that is perpendicular to the sill plate.
Sill plate is 2x or 3x minimum. (Capacities shown here are based on a 2x sill plate)

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ROOF FRAMING

NDS 2018 EDITION *IBC 2018 / ASCE 7-16*

Roof Trusses:

Use pre-engineered trusses @ 24" o.c.
Provide truss blocking as shown on plans and per manufacturer's specifications.
All truss connection hardware to be designed by the truss manufacturer.
Provide full depth blocking at all bearing locations with (1) A35 clip to top plate per block U.N.O.
Nail through sheathing with 8d common @ 4" o.c. into blocking U.N.O.
Provide "H1" clips at both ends of every truss U.N.O.

Roof Stick Frame:

Use roof joists per span chart.
Provide full depth blocking at all bearing locations with (1) A35 clip to top plate per block UNO.
Nail through sheathing with 8d common @ 4" o.c. into blocking U.N.O.
Provide "H1" clips at both ends of every joist UNO.

Roof Overbuild:

Frame roof overbuild areas with 2x6 DF#2 @ 24" o.c.
Brace joists at 6' 0" o.c.
Use 2x8 DF#2 ridge board braced at 4' 0" o.c.
Use 2x8 DF#2 valley members laid flat and nailed to trusses with (2) 16d per truss.
Brace ridge and joists such that load is distributed uniformly to trusses below.
Sheath under all overbuild areas.
Provide access and ventilation to overbuild areas as necessary.

Roof Beams:

See attached beam calculations.

Roof Sheathing:

Provide 5/8" or thicker 24/16 APA rated panel.
Nail with 8d common at 6" o.c. at panel edge and 12" o.c. in the field.
Provide 'H' clips at all unsupported edges.
Provide 1/8" gap between panels at time of installation.

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 86
By: Tye M. Carlile, EIT
Date: November 2019

Project No.: 9084C
Checked By: ASH

STUD COLUMN DESIGN

NDS 2018 EDITION *IBC 2018 / ASCE 7-16*

Species =	DFLN Stud	
Height =	8.0	ft
Fc =	900	psi
E =	1400	ksi
Kce =	0.3	psi
c =	0.8	psi

Size =	2x4	2x6	
d =	3.50	5.25	in
Fce =	558.27	1256.10	psi
Cp =	0.51	0.79	
F'c =	461.27	712.89	psi

Height	(2) 2x4	(3) 2x4	(4) 2x4	(5) 2x4	(6) 2x4	(7) 2x4	
8 ft	4.8	7.3	9.7	12.1	14.5	17.0	kips
9 ft	4.0	6.0	8.1	10.1	12.1	14.1	kips
10 ft	3.4	5.1	6.8	8.4	10.1	11.8	kips
12 ft	2.4	3.7	4.9	6.1	7.3	8.5	kips
18 ft	1.1	1.7	2.3	2.8	3.4	3.9	kips

Height	(2) 2x6	(3) 2x6	(4) 2x6	(5) 2x6	(6) 2x6	(7) 2x6	
8 ft	11.2	16.8	22.5	28.1	33.7	39.3	kips
9 ft	10.3	15.4	20.5	25.6	30.8	35.9	kips
10 ft	9.2	13.8	18.4	23.1	27.7	32.3	kips
12 ft	7.3	10.9	14.5	18.2	21.8	25.4	kips
18 ft	3.7	5.5	7.3	9.1	11.0	12.8	kips

SOLID POSTS

Species =	DFLN #1	
Height =	8.0	ft
Fc =	925	psi
E =	1600	ksi
Kce =	0.3	psi
c =	0.8	psi

Size =	4x4	4X6	6x6	
d =	3.5	3.5	5.5	in
Fce =	638.02	638.02	1575.52	psi
Cp =	0.553	0.553	0.838	
F'c =	511.49	511.49	774.96	psi

Height	4x4	4X6	6x6	
8 ft	6.3	9.8	23.4	kips
9 ft	5.6	8.8	21.9	kips
10 ft	4.7	7.3	20.1	kips
12 ft	3.3	5.2	16.5	kips
18 ft	1.5	2.4	8.6	kips

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 86
By: Tye M. Carlile, EIT
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WALK OUT FOUNDATION WALLS CALCULATION

ACI 318-14 *IBC 2018 / ASCE 7-16*

S. Timoshenko "Theory of Plates and Shells"

Mark =	W7	W8	W9		
Length (a) =	12.667	17.333	12.667		ft
Height (b) =	9	9	19		ft
Horiz. Bars:	#5	#5	#6		
Horiz. Spacing:	18	10	10		in o.c.
Vert. Bars:	#5	#5	#6		
Vert. Spacing:	18	10	10		in o.c.
Wall Thickness:	12	12	16		in
d =	9.5	9.5	13.5		in
Soil Weight =	125	125	125	125	pcf
Soil Factor =	1.6	1.6	1.6	1.6	
fy =	60000	60000	60000	60000	ksi
f'c =	4000	4000	4000	4000	psi
Rebar Area =	0.21	0.37	0.53	#N/A	in^2/ft
Height/Width =	0.711	0.519	1.500	#DIV/0!	lb/ft
Base force =	1800.0	1800.0	3800.0	0.0	lb/ft
a =	0.30	0.55	0.78	#N/A	in
$M_{X,1}$ =	2.70	4.81	3.96	0.00	kip-ft
$M_{X,2}$ =	2.37	3.24	11.65	0.00	kip-ft
$M_{Y,2}$ =	2.16	3.35	4.57	0.00	kip-ft
$M_{X,3}$ =	-4.94	-9.68	-5.30	0.00	kip-ft
$V_{X,3}$ =	1.82	2.90	-0.29	0.00	kip/unit height of wall
$M_{X,4}$ =	-5.02	-7.08	-22.19	0.00	kip-ft
$V_{X,4}$ =	3.65	4.24	11.79	0.00	kip/unit height of wall
$M_{Y,5}$ =	-7.59	-13.09	-17.74	0.00	kip-ft
$V_{Y,5}$ =	6.00	7.74	14.97	0.00	kip/unit length of wall
$M_{X,6}$ =	7.88	11.08	18.78	#DIV/0!	kip-ft
$M_{X,7}$ =	6.78	8.31	27.62	#DIV/0!	kip-ft
$M_{Y,7}$ =	4.73	6.71	14.08	#DIV/0!	kip-ft
Mx,max =	7.88	11.08	27.62	#DIV/0!	kip-ft
f(Mn)x =	8.69	15.45	31.15	#N/A	kip-ft
H steel unity =	0.91	0.72	0.89	#DIV/0!	
	Reinf. OK	Reinf. OK	Reinf. OK	#N/A	
My,max =	7.59	13.09	17.74	#DIV/0!	kip-ft
f(Mn)y =	8.69	15.45	31.15	#N/A	kip-ft
V steel unity =	0.87	0.85	0.57	#DIV/0!	
	Reinf. OK	Reinf. OK	Reinf. OK	#N/A	
Vmax =	6.00	7.74	14.97	0.00	kip/unit height of wall
fVc =	10.81	10.81	15.37	0.00	kip/unit height of wall
	0.56	*0.72*	*0.97*	*#DIV/0!*	
	Shear OK	Shear OK	Shear OK	OVERSTRESSED	

Location Legend

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 86
By: Tye M. Carlile, EIT
Date: November 2019

Project No.: 9084C
Checked By: ASH

STANDARD FOUNDATION WALLS

ACI 318-14 *IBC 2018 / ASCE 7-16*

Foundation Schedule			Horizontal Reinforcement		Vertical Reinforcement	
Mark	Wall Height	Thickness	Size	Spacing	Size	Spacing
Typ.	4'	8"	#4	18"	#4	24"
Typ.	8'	8"	#4	18"	#4	24"
Typ.	9'	8"	#4	18"	#4	16"
Typ.	10'	8"	#4	18"	#5	12"

Notes: Wall height refers to final grade difference through the wall. Total height of wall may be higher due to footing drop for frost protection or native soil bearing as long as wall is backfilled such that the grade difference does not exceed the wall height at any time during construction.
ALL REBAR TO BE GRADE 60.
Place vertical bars in the center of wall.
Extend vertical bars from the footing to within 3" of the top of wall.
Provide #4 dowel with standard hook in the footing to match the vertical rebar.
Extend vertical leg of dowel 24" min. into wall.
Place (1) #4 horizontally within 4" of top and bottom of wall.
Provide corner reinforcing so as to lap 24" min.
Provide (2) #4 above, (1) #4 each side, and (1) #4 below all openings.
Place steel within 2" of openings & extend 24" min. beyond edge of opening.
Vertical bars around openings may terminate 3" from top of wall.

ENSIGN
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Project: Powder Mountain Lot 86
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FOOTINGS

ACI 318-14 *IBC 2018 / ASCE 7-16*

Assumed Bearing Capacity: 3,400 psf

Location =	SIDE	FRONT	
Roof =	1537	2415	plf
Floor =	375	600	plf
Wall =	600	840	plf
Fdtn =	500	500	plf
Total =	3012	4355	plf
Width =	10.6	15.4	in
Mark =	**F1.7**	**F1.7**	

Max Load =	13600	21250	30600	41650	54400	68850	lbs
Area =	4.0	6.3	9.0	12.3	16.0	20.3	ft^2
Side =	24.0	30.0	36.0	42.0	48.0	54.0	in
Mark =	**SF2.0**	**SF2.5**	**SF3.0**	**SF3.5**	**SF4.0**	**SF4.5**	

Footing Schedule

Mark	Type	Dimensions (Inches)			Reinforcement	
		Thickness	Length	Width	Longitudinal	Transverse
F1.7	Cont.	10	cont.	20	(2) #5	-
F2.0	Cont.	12	cont.	24	(2) #5	-
F2.5	Cont.	12	cont.	30	(3) #5	-
F3.0	Cont.	12	cont.	36	(4) #5	-
SF2.0	Spot	12	24	24	(3) #5	(3) #5
SF2.5	Spot	12	30	30	(3) #5	(3) #5
SF3.0	Spot	12	36	36	(4) #5	(4) #5
SF3.5	Spot	12	42	42	(4) #5	(4) #5
SF4.0	Spot	12	48	48	(5) #5	(5) #5
SF4.5	Spot	12	54	54	(5) #5	(5) #5
SF5.0	Spot	12	60	60	(6) #5	(6) #5
SF5.5	Spot	12	66	66	(6) #5	(6) #5

Notes: Use grade 60 rebar.
All footings must be placed below frost depth unless otherwise noted on plans

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 86
By: Tye Carlile, EIT
Date: November 2018

Project No.: 9084C
Checked By: ASH

Diaphragm Checks

Diaphragm Shear

Unfactored Loads

Seismic - N-S (ROOF)

$F_{px} := 42.1\ kip$ *Total Loading*

Diaphram Dimensions

$l_t := 61.75\ ft$ $d_t := 32\ ft$ *Diaphragm Dimensions (total)*

$l_d := 36\ ft$ $d_d := 32\ ft$ *Diaphragm Dimensions (between shear lines)*

$\Omega := 2.0$

$$v_{px} := \frac{0.7 \cdot F_{px}}{l_t} \cdot \frac{l_d}{2} \cdot \frac{1}{d_d} = 268.45\ plf$$

$v_{se} := 570\ plf$

$$v_{ne} := \frac{v_{se}}{\Omega} = 285.00\ plf$$

$$\frac{v_{px}}{v_{ne}} = 0.94$$

Seismic - E-W (ROOF)

$F_{px} := 40.7\ kip$ *Total Loading*

Diaphram Dimensions

$l_t := 36\ ft$ $d_t := 61.75\ ft$ *Diaphragm Dimensions (total)*

$l_d := 36\ ft$ $d_d := 61.75\ ft$ *Diaphragm Dimensions (between shear lines)*

$\Omega := 2.0$

$$v_{px} := \frac{0.7 \cdot F_{px}}{l_t} \cdot \frac{l_d}{2} \cdot \frac{1}{d_d} = 230.69\ plf$$

$v_{se} := 570\ plf$

$$v_{ne} := \frac{v_{se}}{\Omega} = 285.00\ plf$$

$$\frac{v_{px}}{v_{ne}} = 0.81$$

ENSIGN
THE STANDARD IN ENGINEERING

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Date: November 2018

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Checked By: ASH

Diaphragm Shear

Unfactored Loads

Seismic - N-S (FLOOR)

$F_{px} := 18.2\ kip$ *Total Loading*

Diaphram Dimensions

$l_t := 56\ ft$ $d_t := 32\ ft$ *Diaphragm Dimensions (total)*

$l_d := 56\ ft$ $d_d := 32\ ft$ *Diaphragm Dimensions (between shear lines)*

$\Omega := 2.0$

$$v_{px} := \frac{0.7 \cdot F_{px}}{l_t} \cdot \frac{l_d}{2} \cdot \frac{1}{d_d} = 199.06\ plf$$

$v_{se} := 570\ plf$

$$v_{ne} := \frac{v_{se}}{\Omega} = 285.00\ plf$$

$$\frac{v_{px}}{v_{ne}} = 0.70$$

Seismic - E-W (FLOOR)

$F_{px} := 20.4\ kip$ *Total Loading*

Diaphram Dimensions

$l_t := 32\ ft$ $d_t := 56\ ft$ *Diaphragm Dimensions (total)*

$l_d := 32\ ft$ $d_d := 56\ ft$ *Diaphragm Dimensions (between shear lines)*

$\Omega := 2.0$

$$v_{px} := \frac{0.7 \cdot F_{px}}{l_t} \cdot \frac{l_d}{2} \cdot \frac{1}{d_d} = 127.50\ plf$$

$v_{se} := 570\ plf$

$$v_{ne} := \frac{v_{se}}{\Omega} = 285.00\ plf$$

$$\frac{v_{px}}{v_{ne}} = 0.45$$

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Diaphragm Shear

Unfactored Loads

Seismic - N-S (ROOF TO LOWER LEVEL FLOOR BEAM)

$F_{px} := 42.1 \cdot \frac{1}{3}\ kip + 18.2\ kip \cdot \frac{1}{4}$ *Total Loading (roof above and floor)*

Diaphram Dimensions

$l_t := 16\ ft$ $d_t := 22\ ft$ *Diaphragm Dimensions (total)*

$l_d := 16\ ft$ $d_d := 22\ ft$ *Diaphragm Dimensions (between shear lines)*

$\Omega := 2.0$

$v_{px} := \frac{0.7 \cdot F_{px}}{l_t} \cdot \frac{l_d}{2} \cdot \frac{1}{d_d} = 295.64\ plf$

$v_{se} := 850\ plf$ *Blocked diaphragm strength (Table 4.2A NDS)*
10d @ 4" boundary 6" all other edge

$v_{ne} := \frac{v_{se}}{\Omega} = 425.00\ plf$

$\frac{v_{px}}{v_{ne}} = 0.70$

Ensign Engineering
45 West 10000 South, Suite 500
Sandy, UT 84070
(801) 255-0529

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Lic. # : KW-06004069 — Licensee : ENSIGN ENGINEERING

Description : TS4x4x1/4 @ MB2B

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-10
Load Combinations Used : ASCE 7-16

General Information

Steel Section Name : **HSS4x4x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 36.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 10.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 10.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 10.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 122.10 lbs * Dead Load Factor
AXIAL LOADS . . .
Load from MB2B: Axial Load at 10.0 ft, D = 6.925, L = 3.718, S = 24.442 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.0** : 1
Load Combination
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 0.0 k
Pn / Omega : Allowable 0.0 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 0.0 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 101,102 k-ft

PASS Maximum Shear Stress Ratio = **0.0** : 1
Load Combination
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

Maximum Load Reactions . .
Top along X-X 0.0 k
Bottom along X-X 0.0 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location
+D+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+L+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+Lr+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+S+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.750L+0.750S+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.60W+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.750Lr+0.450W+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.750S+0.450W+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+0.60D+0.60W+0.60H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.70E+0.60H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+D+0.750L+0.750S+0.5250E+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft
+0.60D+0.70E+H	0.000	PASS	0.00 ft	0.00	0.00	0.00	0.00	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
+D+H	7.047								
+D+L+H	10.765								

Ensign Engineering
45 West 10000 South, Suite 500
Sandy, UT 84070
(801) 255-0529

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Lic. # : KW-06004069 — Licensee : ENSIGN ENGINEERING

Description : TS4x4x1/4 @ MB2B

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top	k-ft	My - End Moments @ Base	My - End Moments @ Top
+D+Lr+H	7.047										
+D+S+H	31.489										
+D+0.750Lr+0.750L+H	9.836										
+D+0.750L+0.750S+H	28.167										
+D+0.60W+H	7.047										
+D+0.750Lr+0.450W+H	7.047										
+D+0.750S+0.450W+H	25.379										
+0.60D+0.60W+0.60H	4.228										
+D+0.70E+0.60H	7.047										
+D+0.750L+0.750S+0.5250E+H	28.167										
+0.60D+0.70E+H	4.228										
D Only	7.047										
Lr Only											
L Only	3.718										
S Only	24.442										
W Only											
E Only											
H Only											

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top	k-ft	My - End Moments @ Base	My - End Moments @ Top
Axial @ Base	Maximum	31.489										
"	Minimum											
Reaction, X-X Axis Base	Maximum	7.047										
"	Minimum	7.047										
Reaction, Y-Y Axis Base	Maximum	7.047										
"	Minimum	7.047										
Reaction, X-X Axis Top	Maximum	7.047										
"	Minimum	7.047										
Reaction, Y-Y Axis Top	Maximum	7.047										
"	Minimum	7.047										
Moment, X-X Axis Base	Maximum	7.047										
"	Minimum	7.047										
Moment, Y-Y Axis Base	Maximum	7.047										
"	Minimum	7.047										
Moment, X-X Axis Top	Maximum	7.047										
"	Minimum	7.047										
Moment, Y-Y Axis Top	Maximum	7.047										
"	Minimum	7.047										

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
+D+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+L+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+Lr+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+S+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750L+0.750S+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.60W+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750Lr+0.450W+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750S+0.450W+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+0.60D+0.60W+0.60H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.70E+0.60H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
+0.60D+0.70E+H	0.0000	in	0.000	ft	0.000	in	0.000	ft
D Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
Lr Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
L Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

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Steel Column

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Description : TS4x4x1/4 @ MB2B

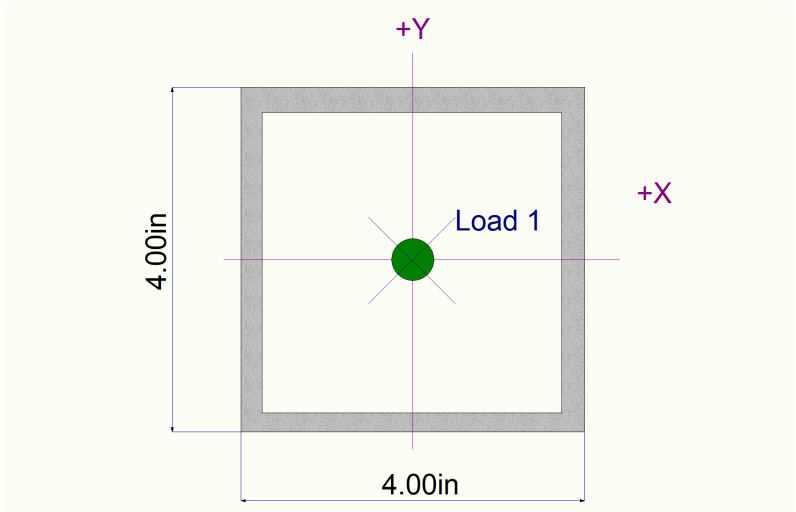
Maximum Deflections for Load Combinations

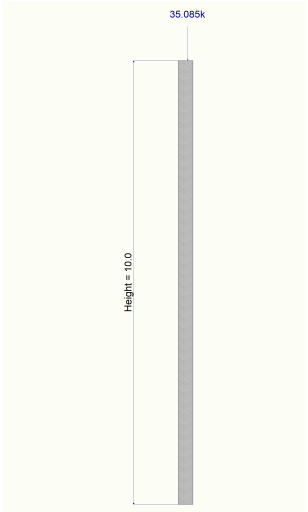
Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
S Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
W Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
H Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

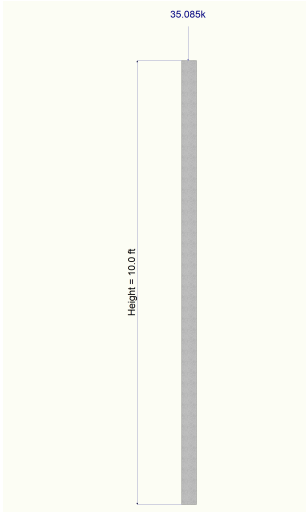
Steel Section Properties : HSS4x4x1/4

Depth	=	4.000	in	I xx	=	7.80	in^4	J	=	12.800 in^4
Design Thick	=	0.233	in	S xx	=	3.90	in^3			
Width	=	4.000	in	R xx	=	1.520	in			
Wall Thick	=	0.250	in	Zx	=	4.690	in^3			
Area	=	3.370	in^2	I yy	=	7.800	in^4	C	=	6.560 in^3
Weight	=	12.210	plf	S yy	=	3.900	in^3			
				R yy	=	1.520	in			
Ycg	=	0.000	in							

Sketches







Beam Id: Lot#86 - MB /

Date 23-09-2019

Structural Engineer:

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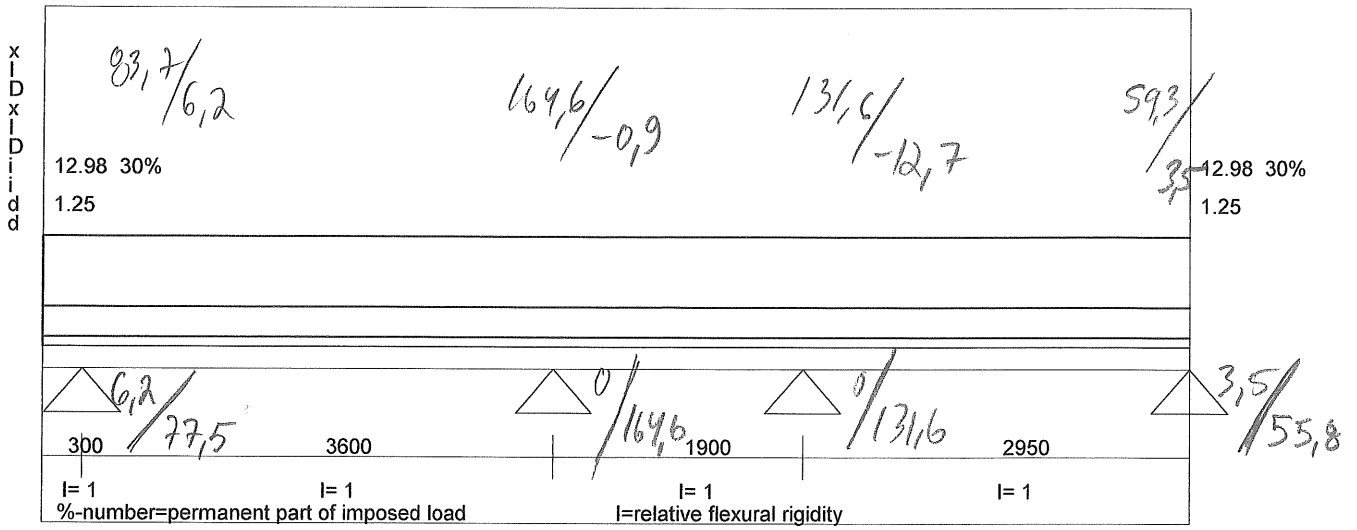
MAX
MIN



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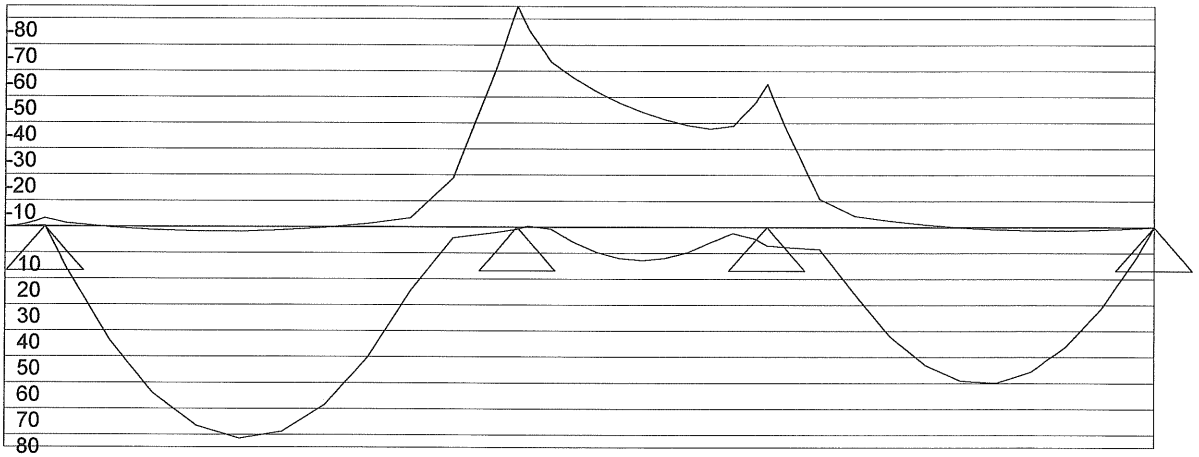

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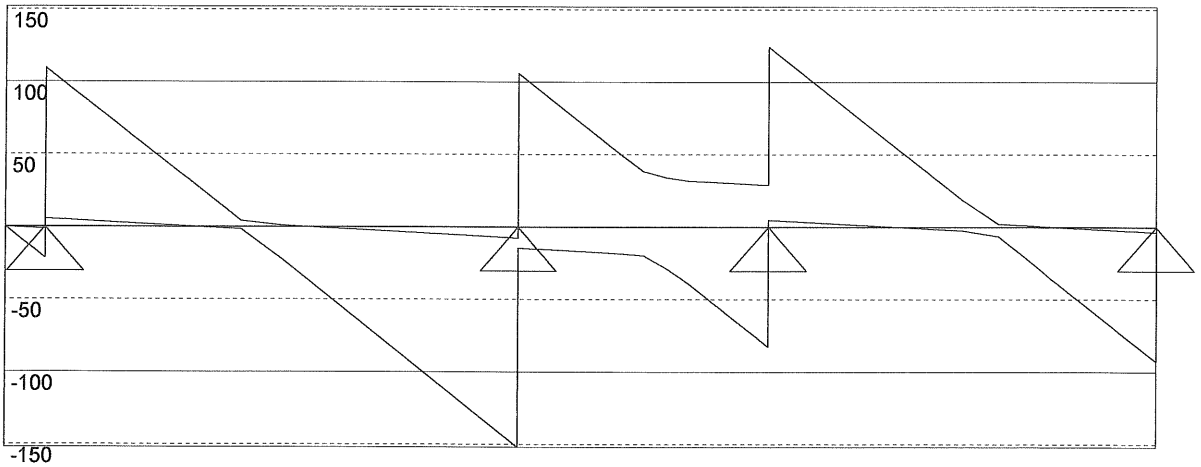

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.215 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
131,073 258,123 206,859 92,844
7,024 -6,742 -24,300 3,634

HEA 200 (Class of section=1/1) G= 42,3 I(cm4)=3692 W(cm3)=389 fy=235
Factored Moment/Moment capacity [kNm] 84,825 101,050 84 %
Factored shear force/shear capacity [kN] 152,097 164,970 92 %

W 8 x 28

Sum infl M+S 0,89 (must be<=1) x= 3899 M=84,79 S=152,1
Deflection due to unfactored load (Deflection limit L/360)/L/180)!
0,0 mm (3 %) 8,0 mm (80 %) 0,3 mm (6 %) 4,1 mm (51 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 2

Date 24-09-2019

Structural Engineer:

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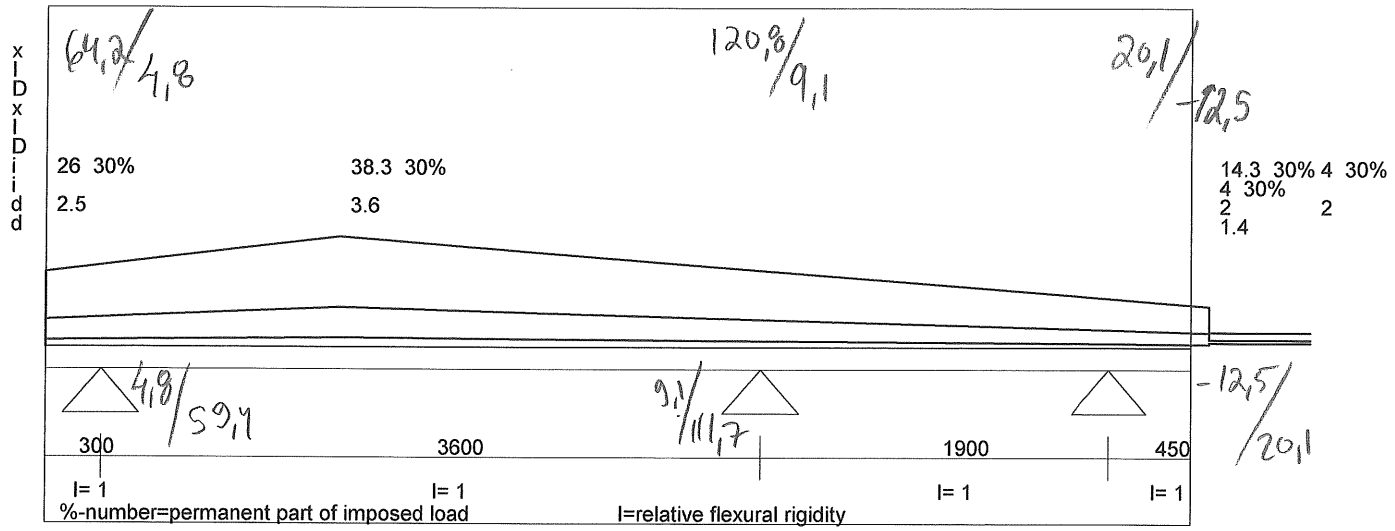
Max
Min



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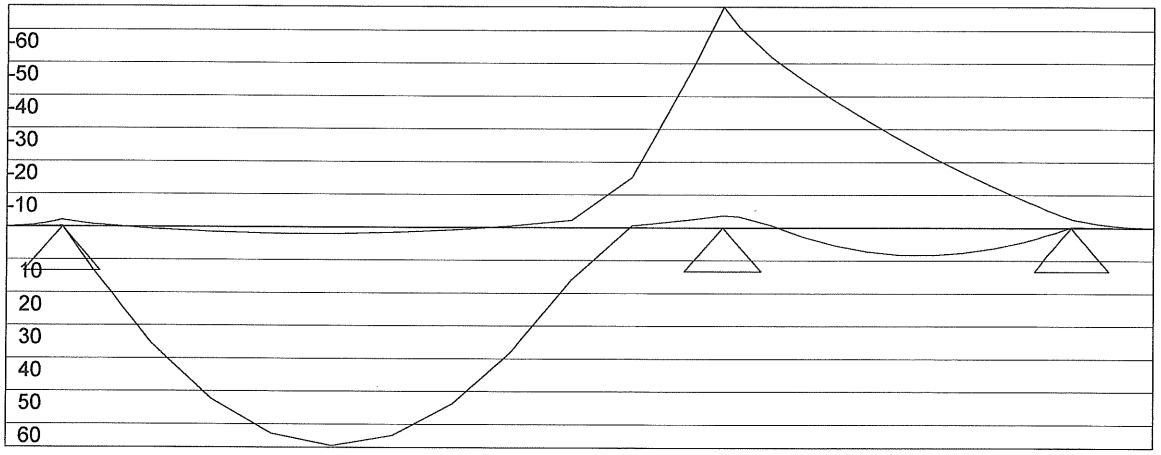

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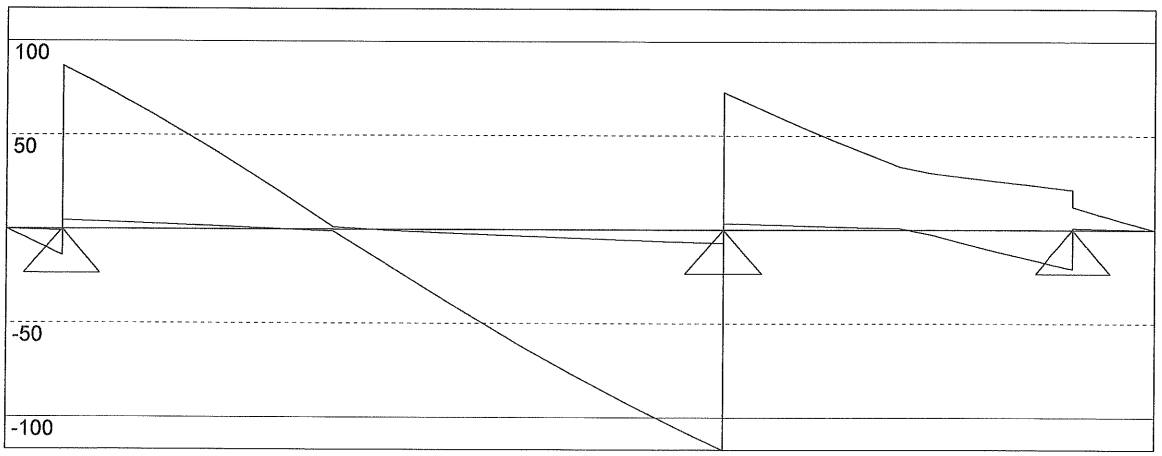

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
100,616 190,286 33,017
5,523 10,582 -20,352

W 8 x 21

HEA 180 (Class of section=1/1) G= 35,5 I(cm4)=2510 W(cm3)=294 fy=235
Factored Moment/Moment capacity [kNm] 67,147 76,140 88 %
Factored shear force/shear capacity [kN] 117,199 136,629 86 %

Sum infl M+S 0,92 (must be<=1) x= 3899 M=67,12 S=117,2
Deflection due to unfactored load (Deflection limit L/360)/L/180)!
-0,1 mm (5 %) 9,3 mm (93 %) 0,3 mm (6 %) 1,0 mm (40 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 2 B

Date 24-09-2019

Structural Engineer:

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MAX / MIN

138,9 / 19,9

550
233,5 30%
37.7

4 30%
2

4 30%
2

19,9 / 119

1100

%-number=permanent part of imposed load

I= 1
I=relative flexural rigidity

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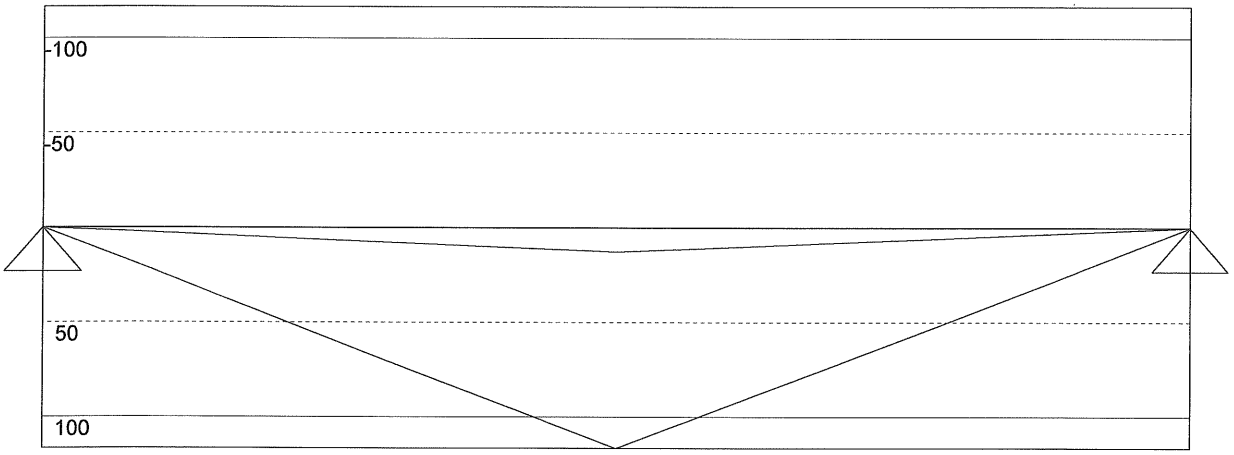
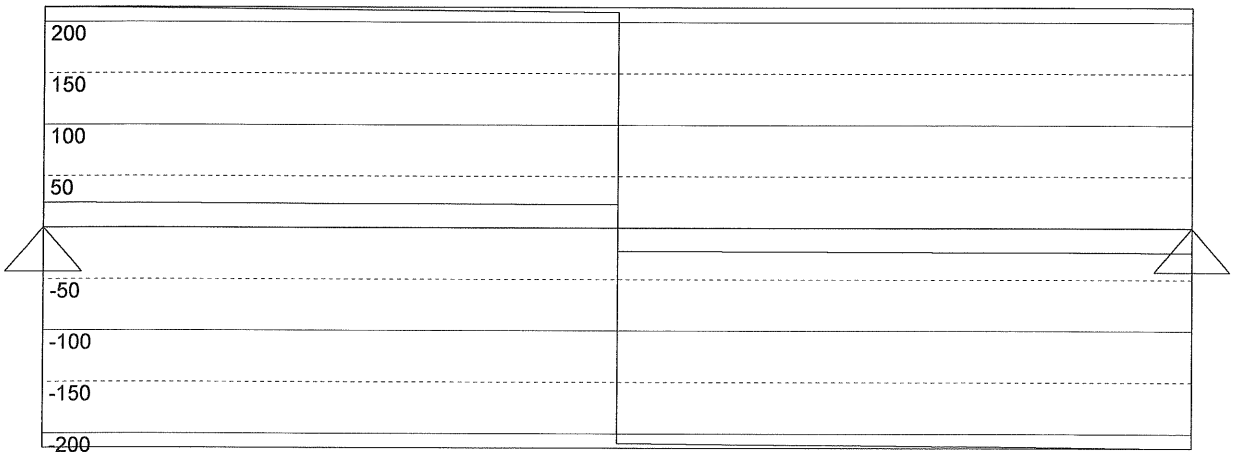


Licensed to: FINNLAMELLI OY



Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
214,259 214,260
23,940 23,940

HEB 200 (Class of section=1/1) G= 61,3 I(cm4)=5696 W(cm3)=570 fy=235
Factored Moment/Moment capacity [kNm] 116,512 150,870 77 %
Factored shear force/shear capacity [kN] 214,259 234,765 91 %

W 8x 40

Sum infl M+S 0,82 (must be<=1) x= 550 M=116,51 S=209,42
Deflection due to unfactored load (Deflection limit L/360)
0,6 mm (21 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 3

Date 24-09-2019

Structural Engineer:

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MAX MIN

x I D x I D i i d d

53/46

12.98 30%

1.25

12.98 30%

1.25

46/48

3200

%-number=permanent part of imposed load

I= 1
I=relative flexural rigidity

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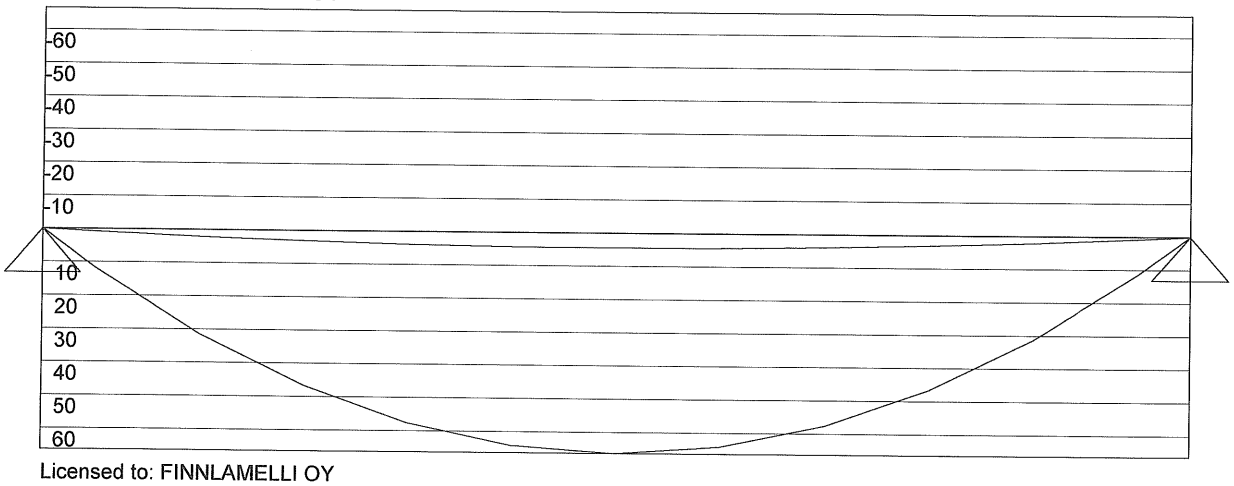

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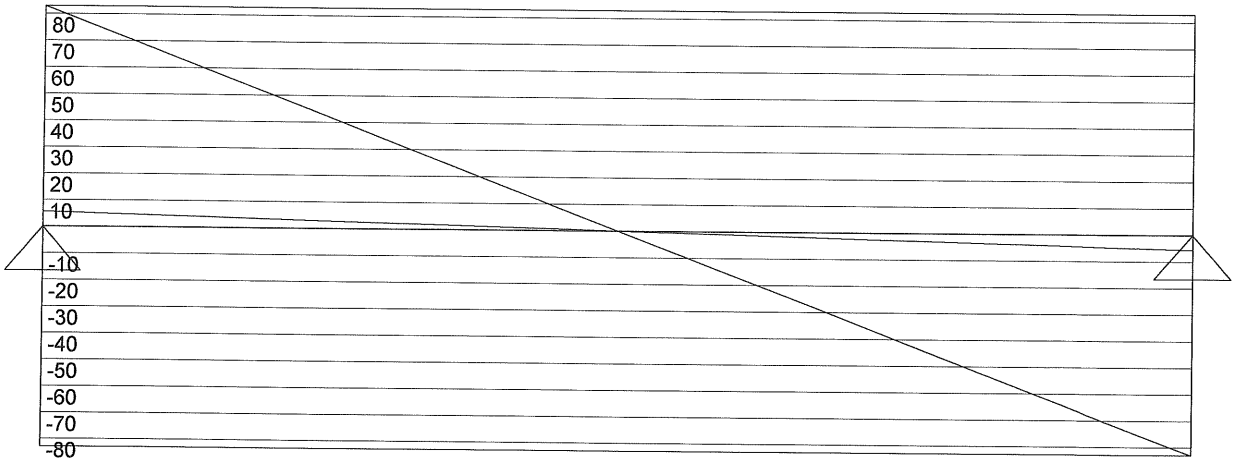


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 2.33 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
82,999 83,015
5,591 5,592

T24 164 x 520 B 2 Cf=0,94 Design method: Ultimate limit design
Factored Moment/Moment capacity [kNm] 66,412 106,965 62 %
Factored shear force/shear capacity [kN] 82,999 87,467 95 %

(2) PROFILES WITH SCREWS

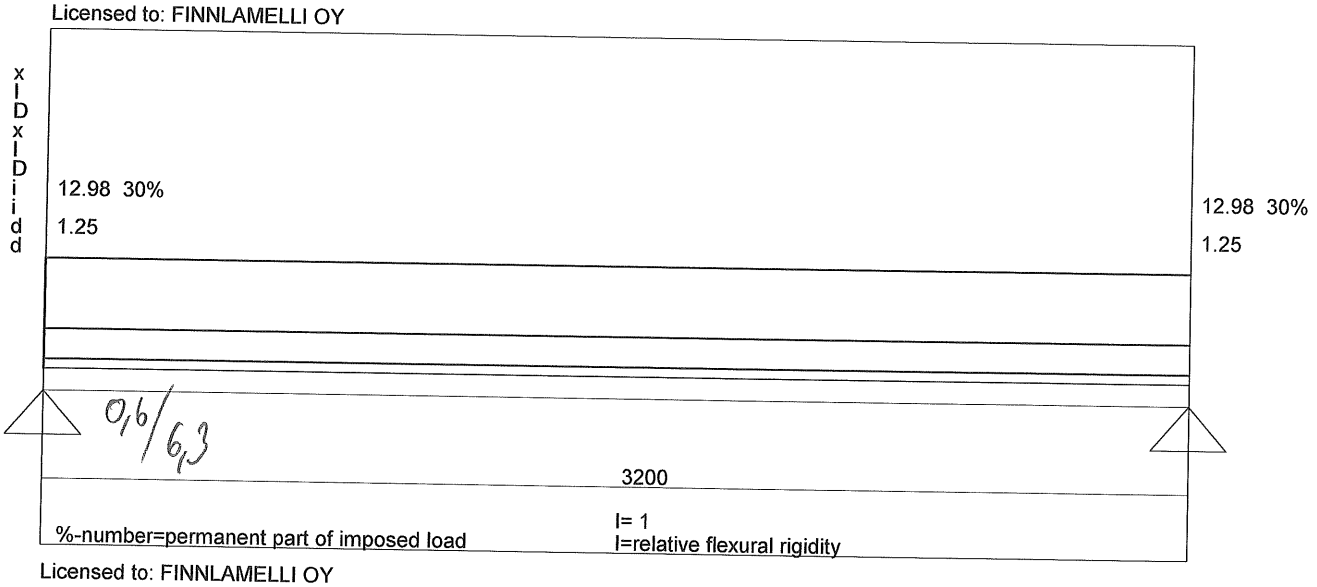
Deflection due to unfactored load (Deflection limit L/360)
3,6 mm (41 %)

Beam Id: Lot#86 - MB 4

Structural Engineer:

Date 24-09-2019

Licensed to: FINNLAMELLI OY



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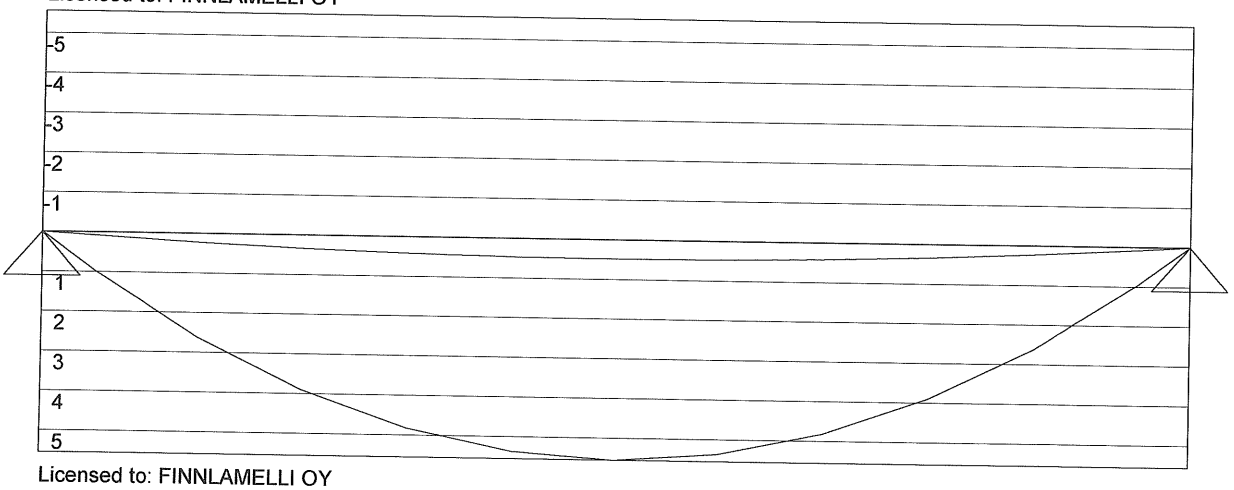
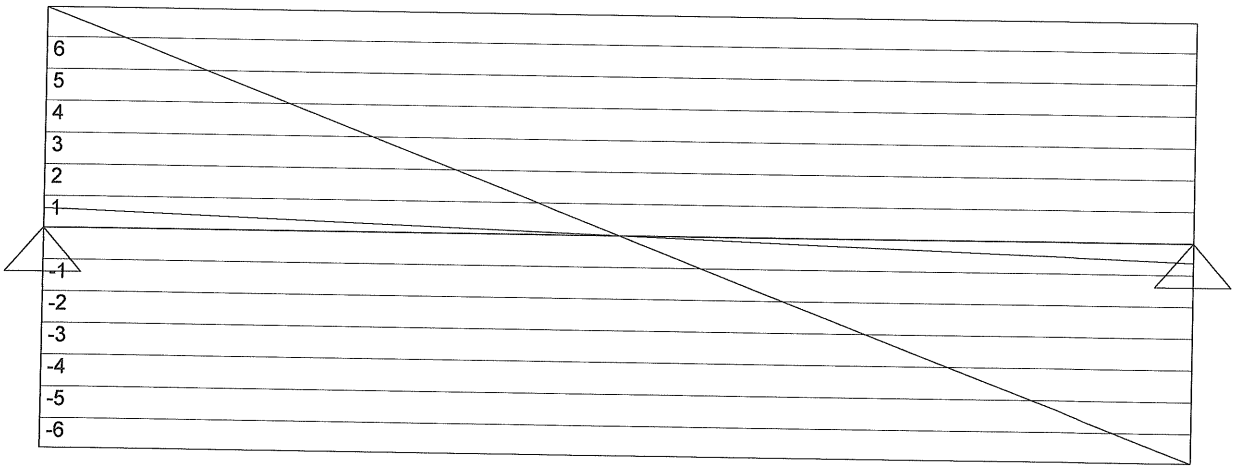


Licensed to: FINNLAMELLI OY



Load factor of dead load= 1 Load factor of imposed load= 1
Load width .305 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
6,943 6,944
0,610 0,610

T24 164 x 260 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 5,555 18,137 31 %
Factored shear force/shear capacity [kN] 6,943 27,902 25 %

(1) PROFILE

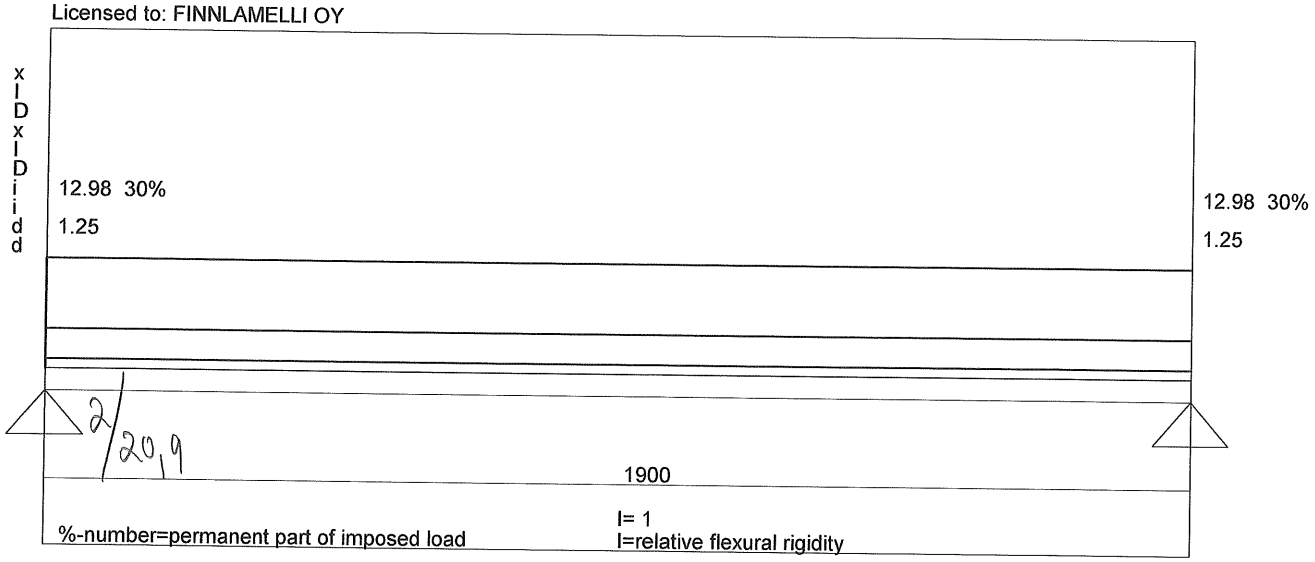
Deflection due to unfactored load (Deflection limit L/360)
3,8 mm (43 %)

Beam Id: Lot#86 - MB 5

Date 24-09-2019

Structural Engineer:

Licensed to: FINNLAMELLI OY



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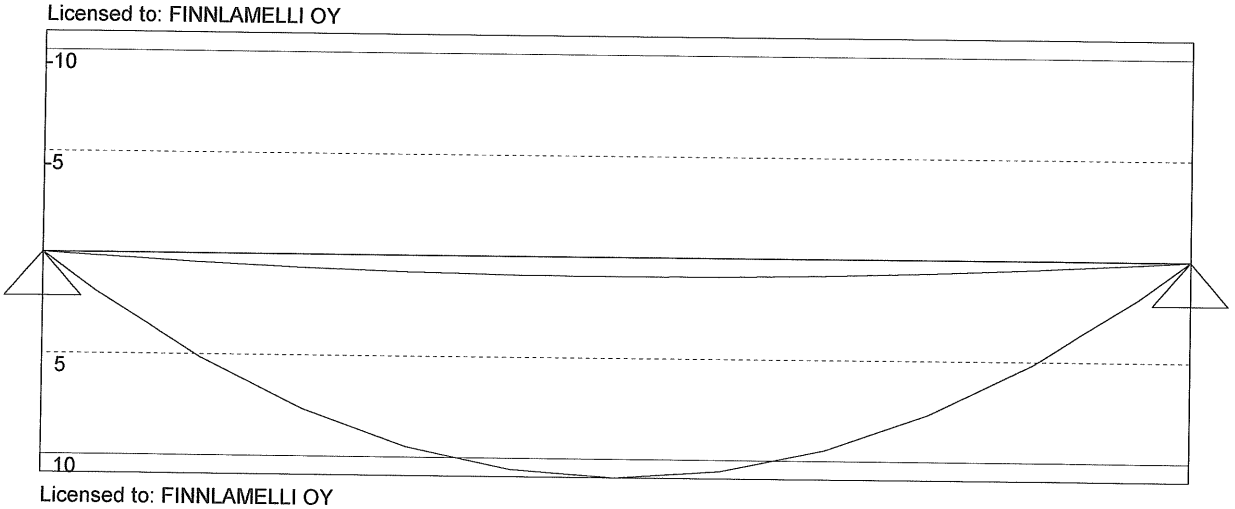

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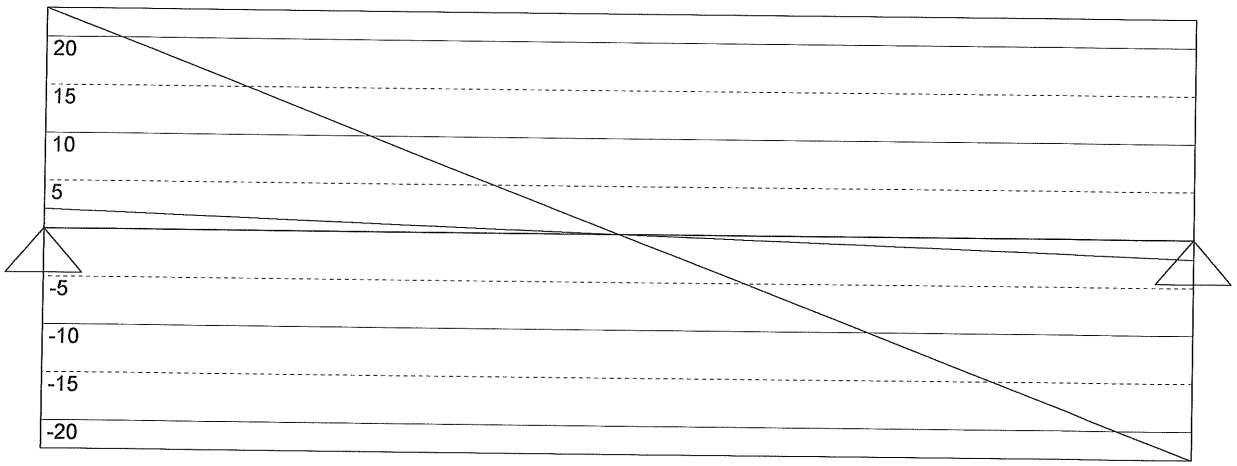

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1.7 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
22,977 22,981
2,018 2,019

T24 164 x 260 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 10,916 18,137 60 %
Factored shear force/shear capacity [kN] 22,977 27,902 82 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/360)
2,6 mm (50 %)

Beam Id: Lot#86 - MB 6

Date 24-09-2019

Structural Engineer:

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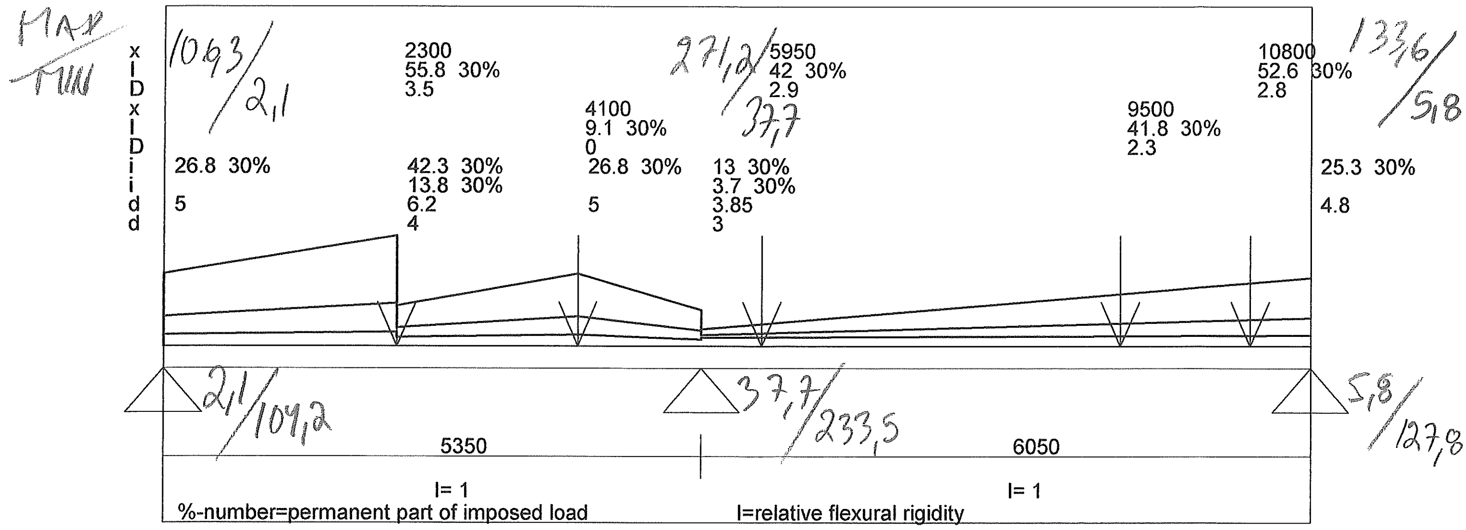

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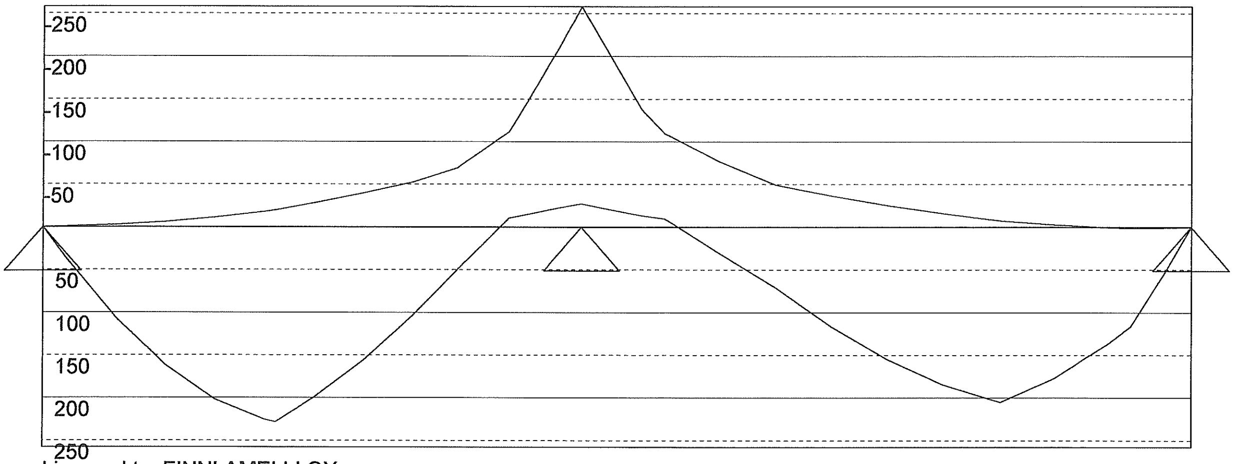

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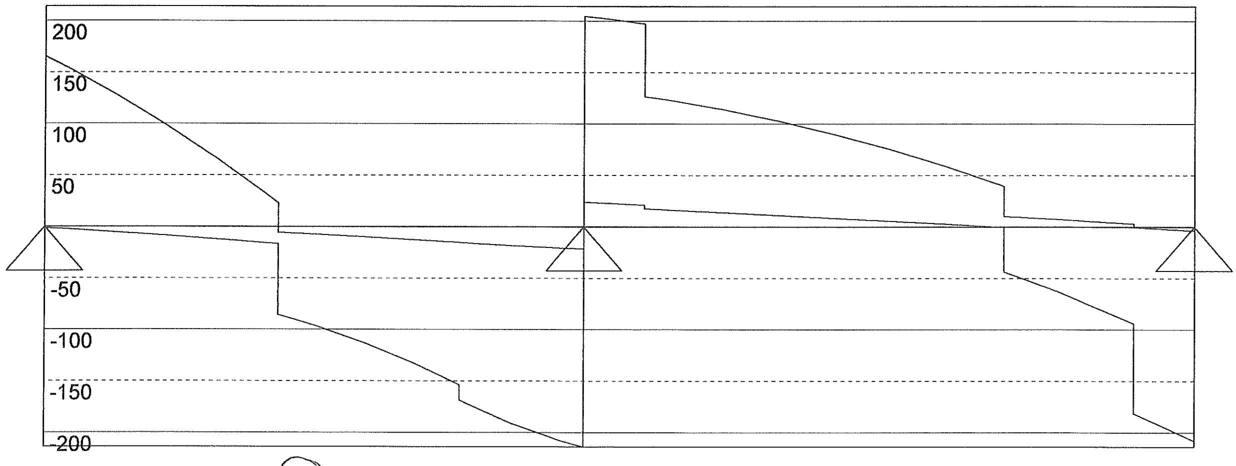

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
165,575 418,862 208,182
-1,174 45,328 3,721

HEA 300 (Class of section=1/1) G= 88,3 I(cm4)=18263 W(cm3)=1260 fy=235
Factored Moment/Moment capacity [kNm] 257,968 325,240 79 %
Factored shear force/shear capacity [kN] 214,113 330,786 65 %

→ W10 x 77

Sum infl M+S 0,81 (must be<=1) x= 5349 M=257,97 S=214,11
Deflection due to unfactored load (Deflection limit L/360)
8,7 mm (59 %) 9,5 mm (57 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 7

Date 24-09-2019

Structural Engineer:

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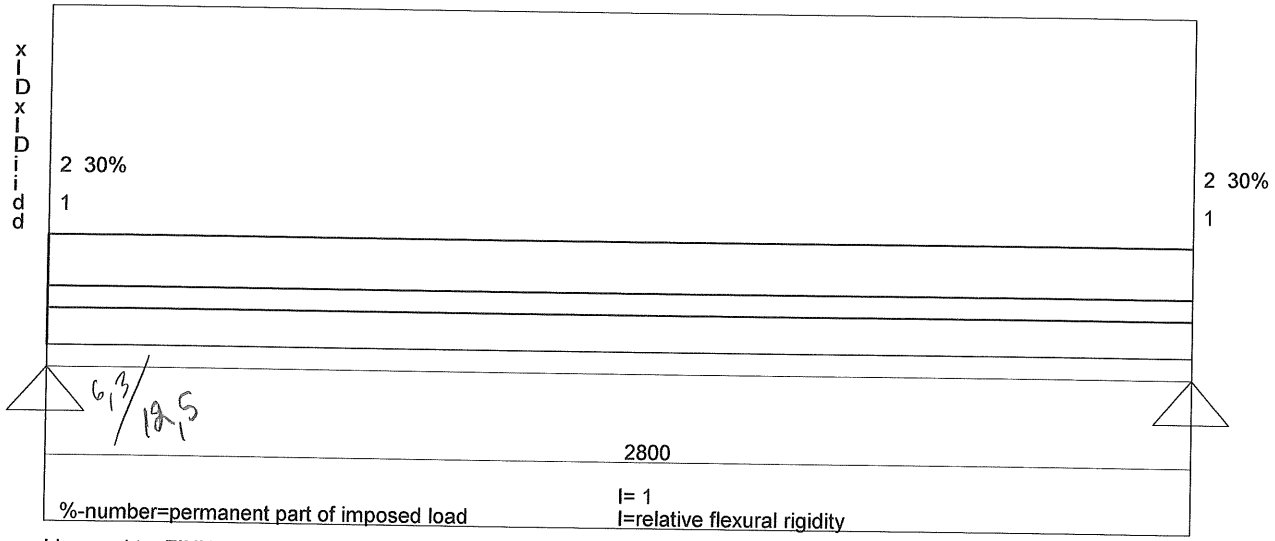

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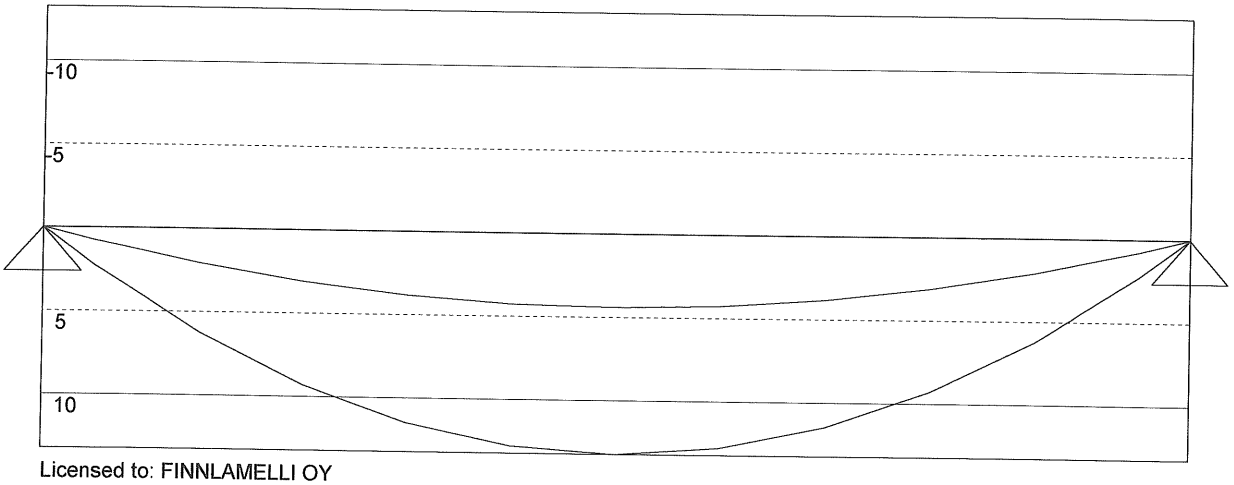

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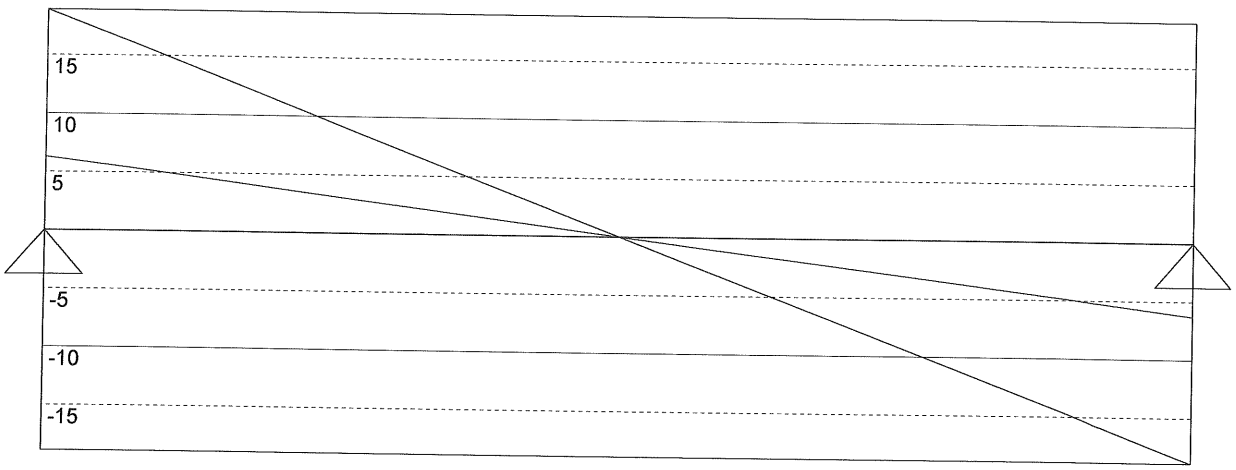

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 4.5 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
18,896 18,900
6,299 6,300

KER 76 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 13,230 22,385 59 %
Factored shear force/shear capacity [kN] 18,896 28,189 67 %

LVL (2) 1 1/2 × 11 7/8

Deflection due to unfactored load (Deflection limit L/360)
6,1 mm (78 %)

Beam Id: Lot#86 - MB 8

Date 24-09-2019

Structural Engineer:

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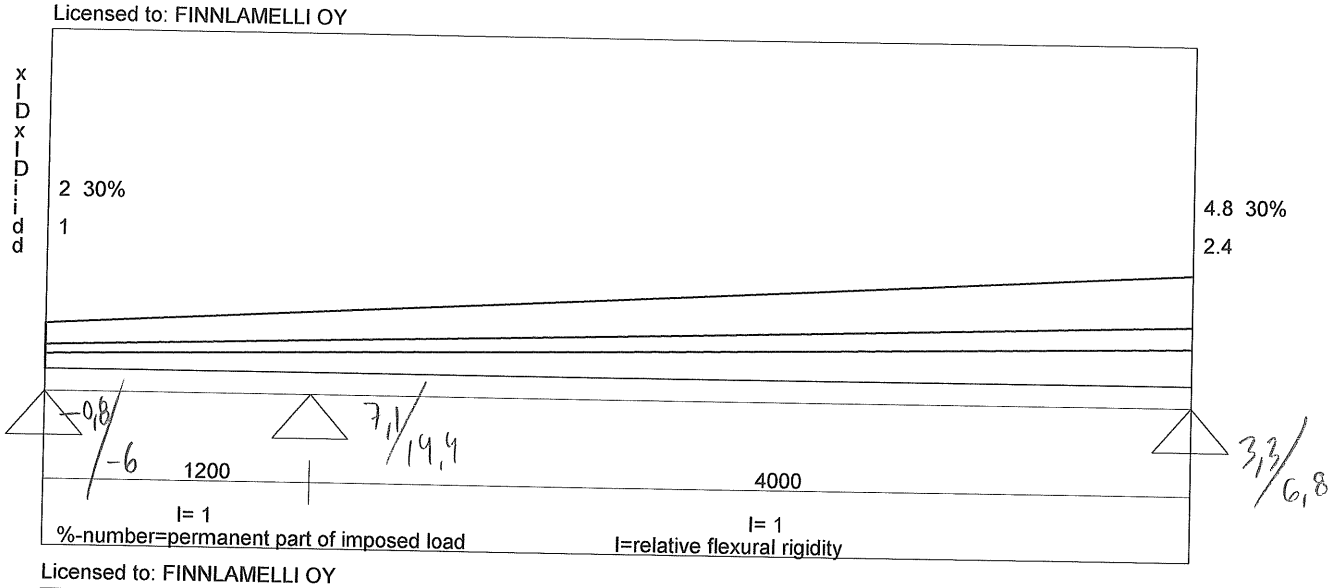

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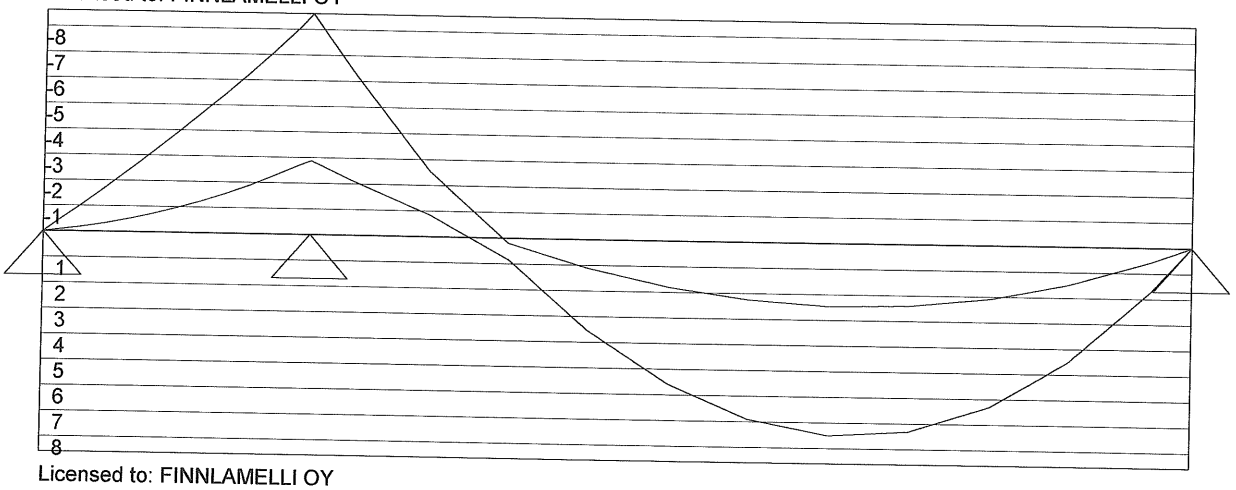

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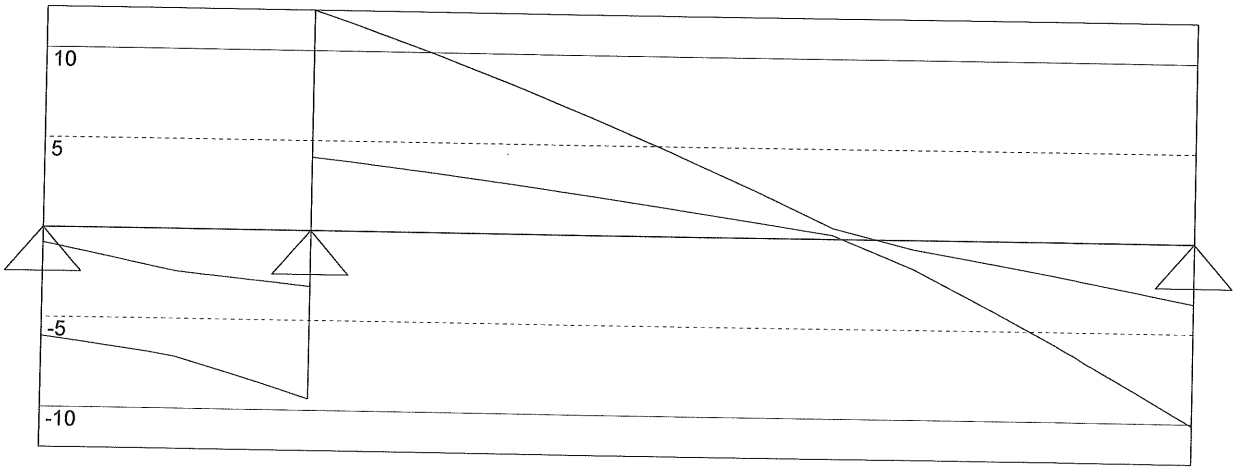

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
-0,852 21,598 10,113
-6,049 7,199 3,348

T24 164 x 260 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 8,602 19,351 44 %
Factored shear force/shear capacity [kN] 12,241 29,770 41 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/360)
-0,1 mm (4 %) 6,5 mm (58 %)

Beam Id: Lot#86 - MB 9

Date 24-09-2019

Structural Engineer:

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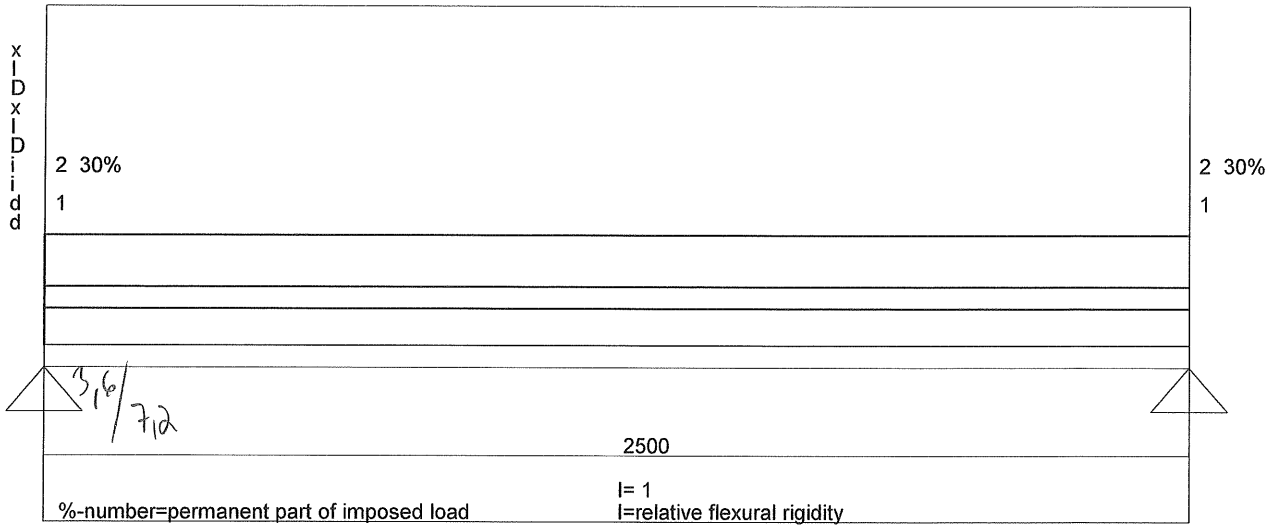

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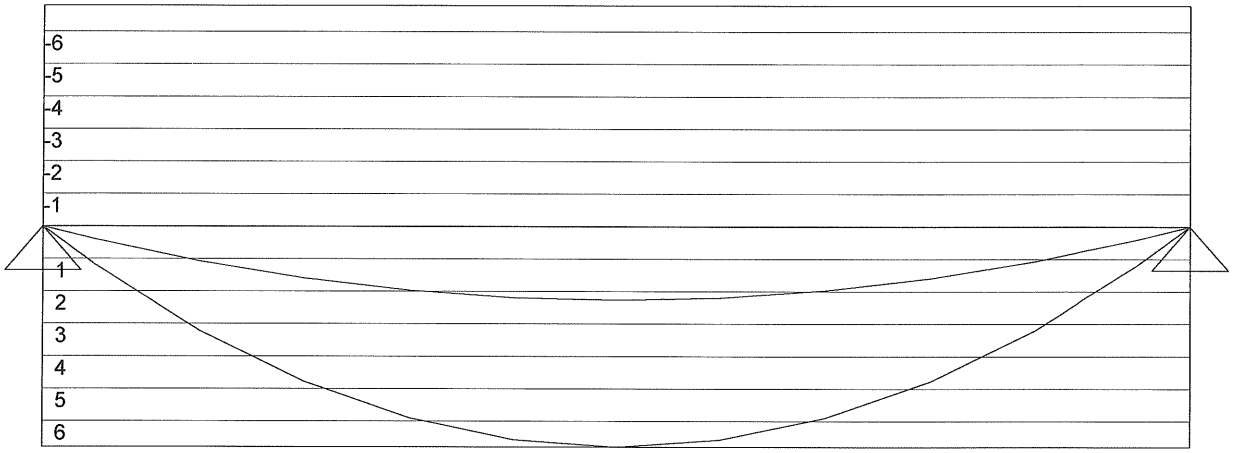

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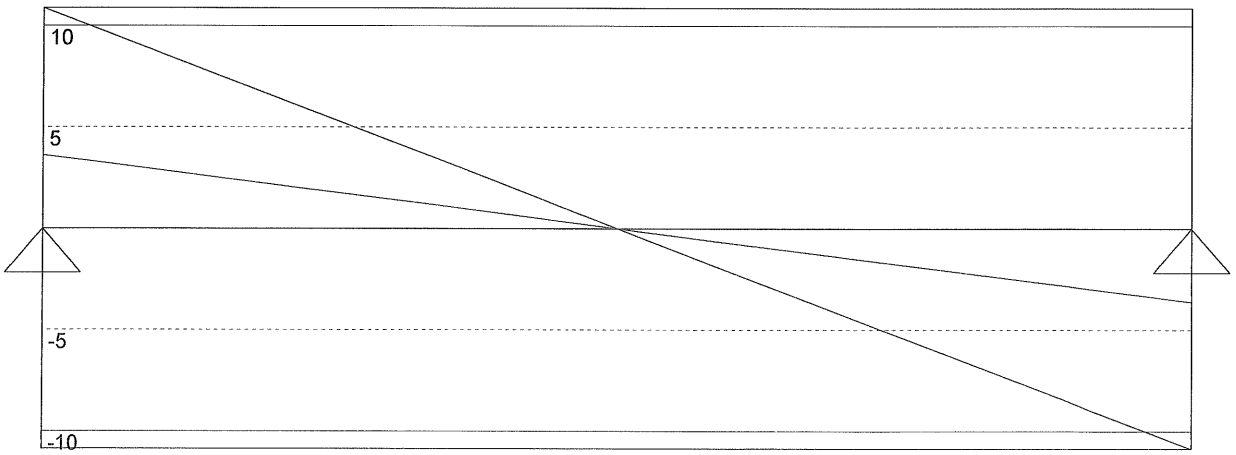

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.9 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
10,873 10,875
3,624 3,625

T24 164 x 260 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 6,797 19,351 35 %
Factored shear force/shear capacity [kN] 10,873 29,770 37 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/360)
2,8 mm (41 %)

Beam Id: Lot#86 - MB 10

Date 24-09-2019

Structural Engineer:

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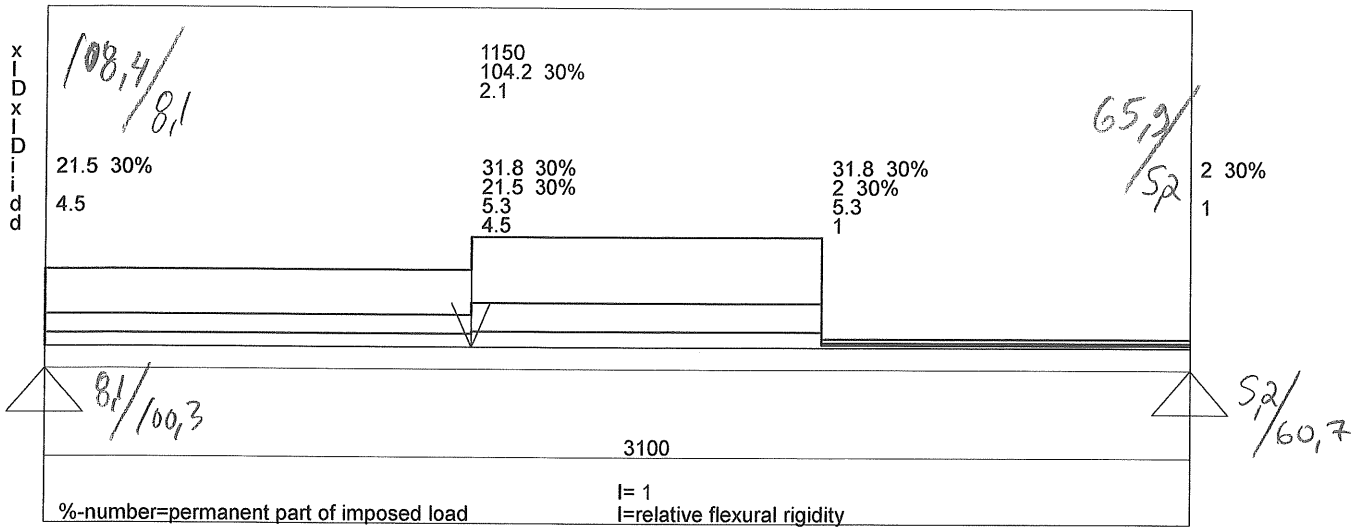

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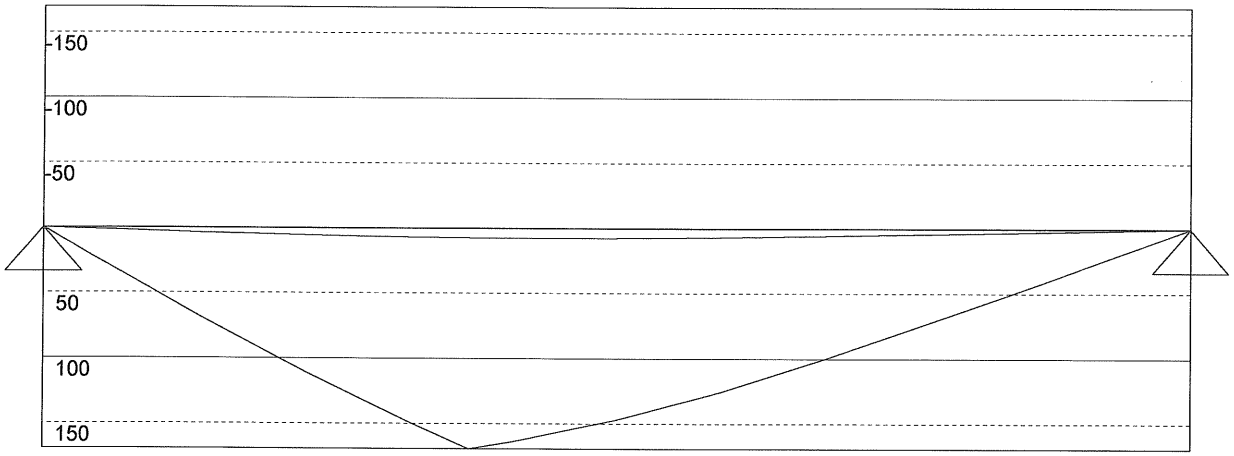

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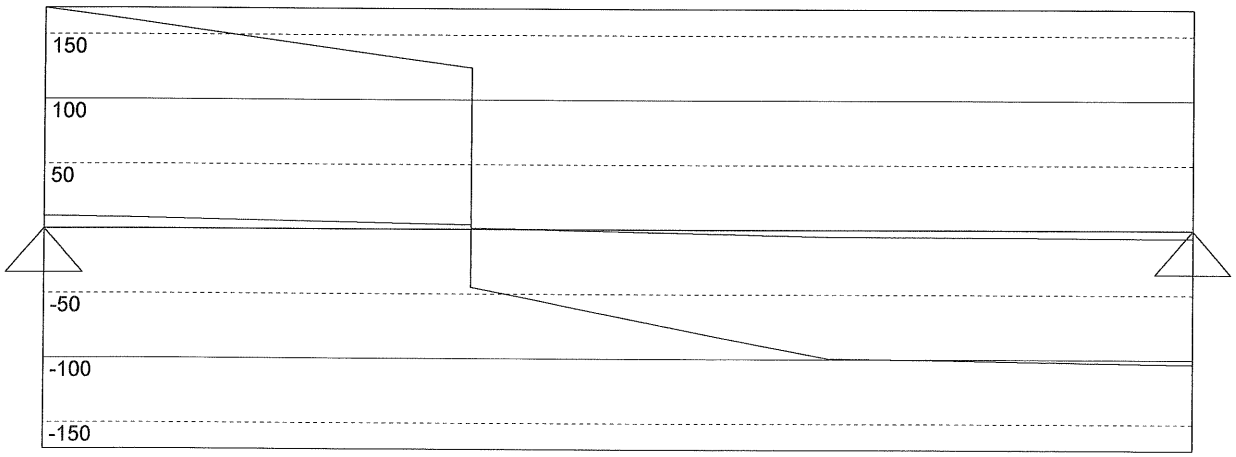

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
170,304 103,465
9,709 6,260

HEA 240 (Class of section=1/1) G= 60,3 I(cm4)=7763 W(cm3)=675 fy=235
Factored Moment/Moment capacity [kNm] 169,547 174,840 97 %
Factored shear force/shear capacity [kN] 170,304 230,535 74 %

W 8 × 58

Sum infl M+S 0,98 (must be<=1) x= 1149 M=169,53 S=124,55
Deflection due to unfactored load (Deflection limit L/360)
5,6 mm (65 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 11

Date 26-09-2019

Structural Engineer:

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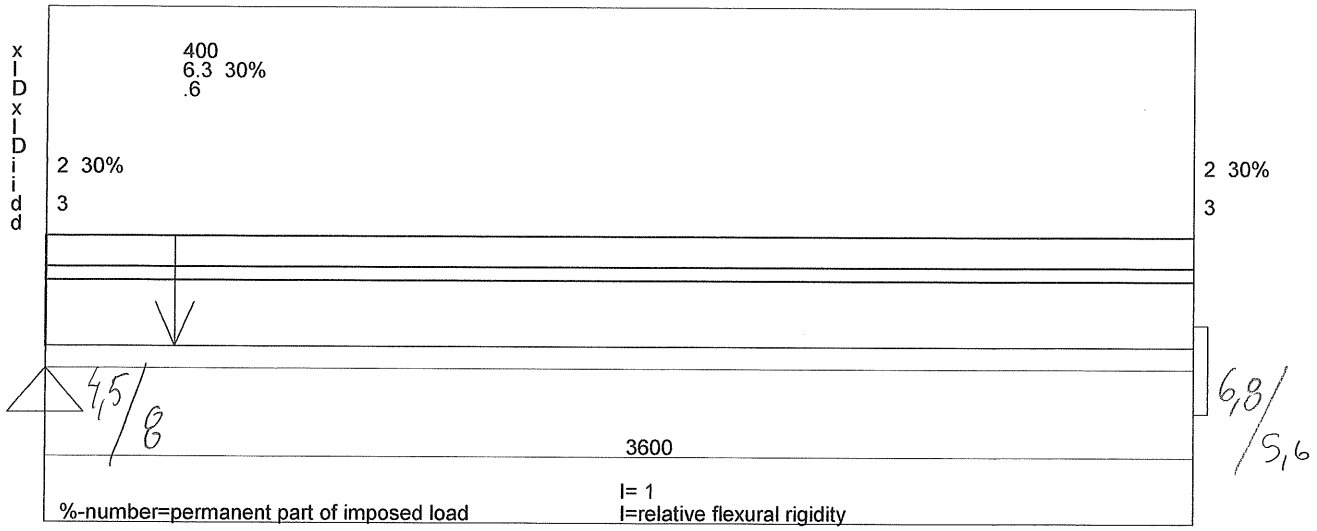

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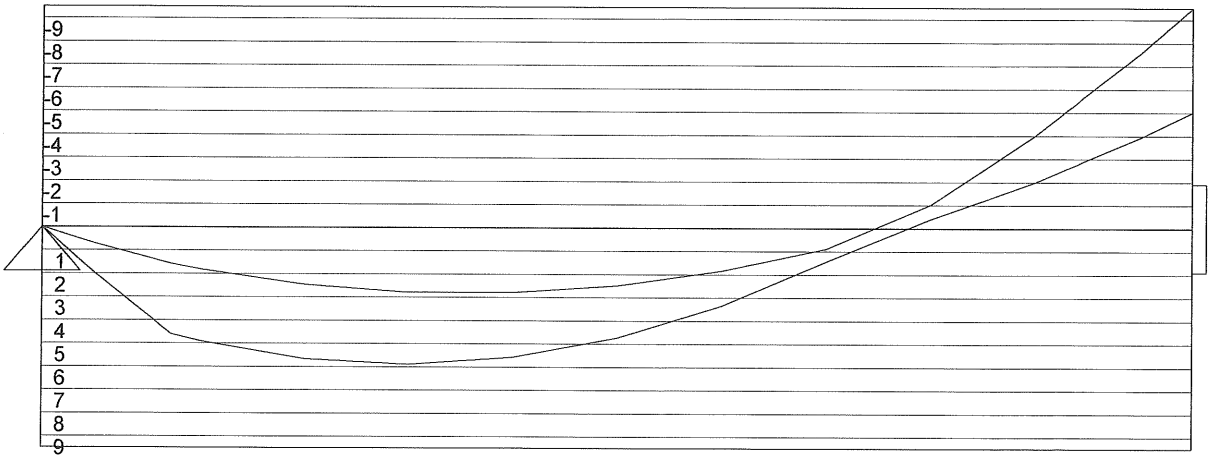

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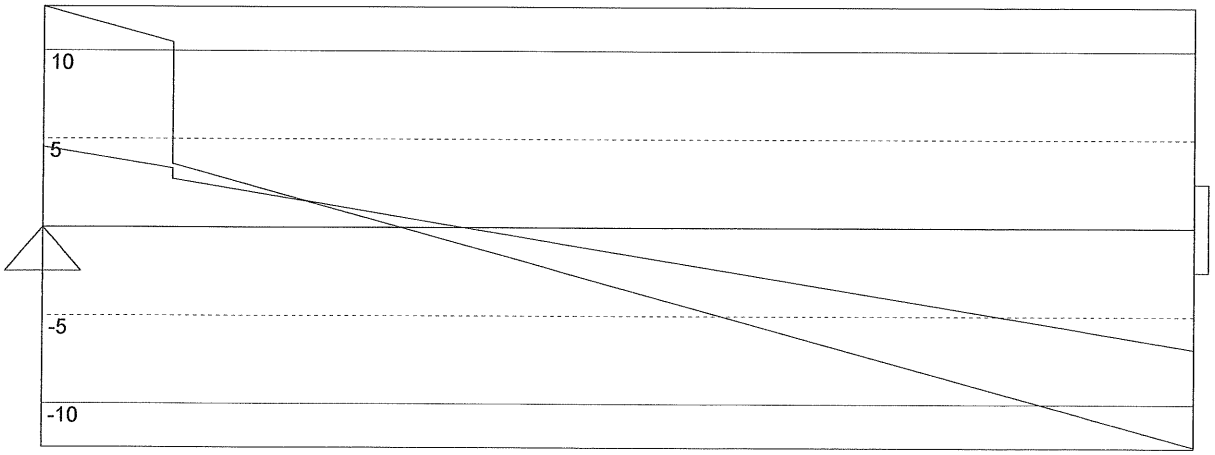

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
12,493 12,404
4,544 6,855

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,10
Factored Moment/Moment capacity [kNm] 9,494 14,446 66 %
Factored shear force/shear capacity [kN] 12,493 22,739 55 %

CVL 3" x 9 1/2"

Deflection due to unfactored load (Deflection limit L/360)
6,0 mm (60 %)

Beam Id: Lot#86 - MB 12

Date 26-09-2019

Structural Engineer:

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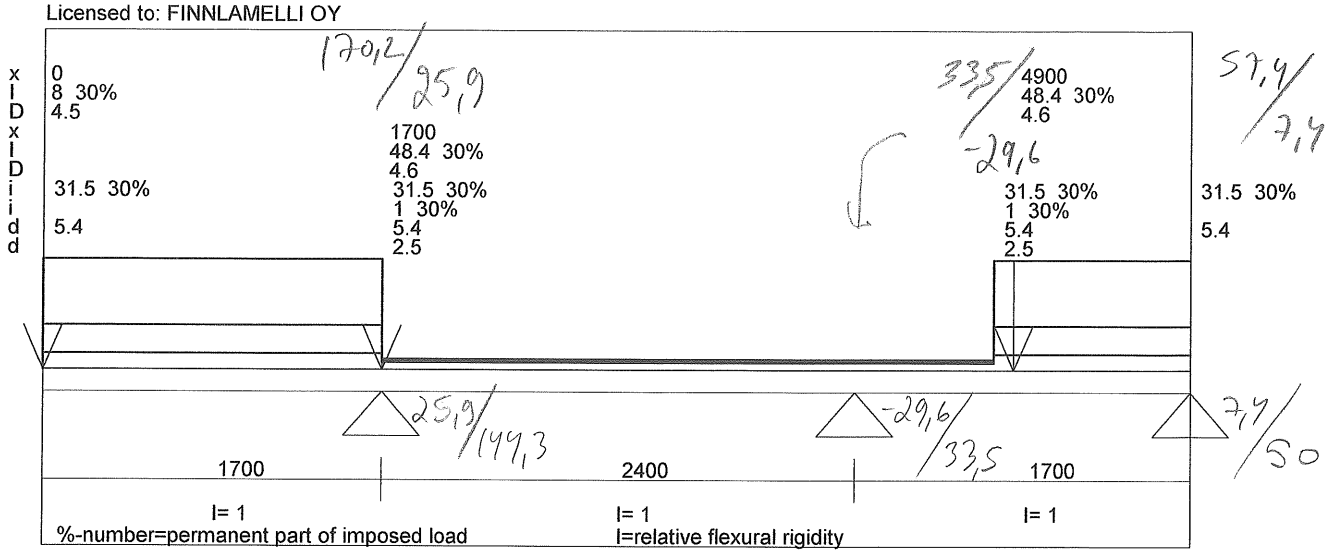

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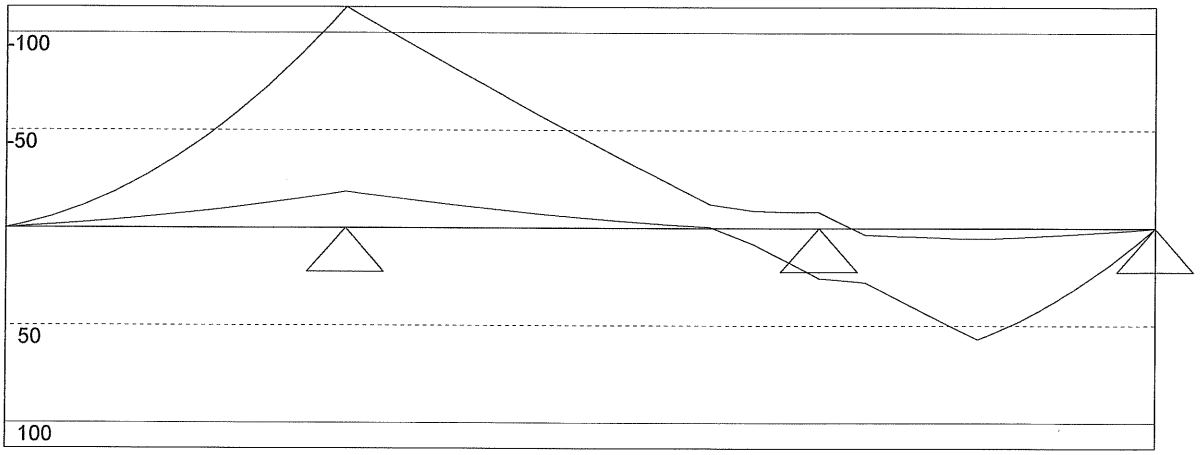

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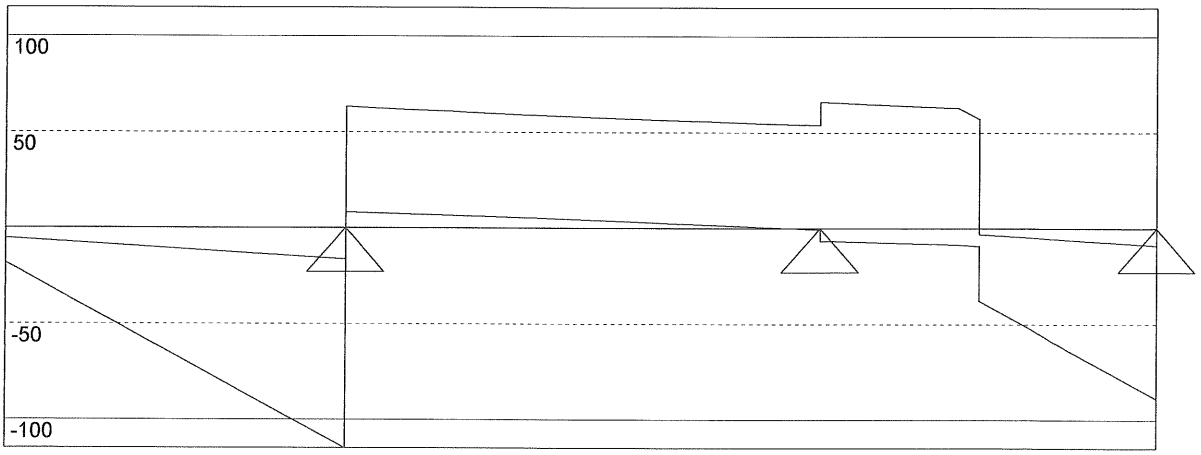

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
260,995 53,734 88,858
30,044 -47,365 8,894

HEA 240 (Class of section=1/1) G= 60,3 I(cm4)=7763 W(cm3)=675 fy=235
Factored Moment/Moment capacity [kNm] 113,100 174,840 65 %
Factored shear force/shear capacity [kN] 114,877 230,535 50 %

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
9,2 mm (98 %) -0,2 mm (3 %) 0,6 mm (13 %)
Attention! Ultimate limit design! Remember the load factors!!

W8 x 58

Beam Id: Lot#86 - MB 13

Date 27-09-2019

Structural Engineer:

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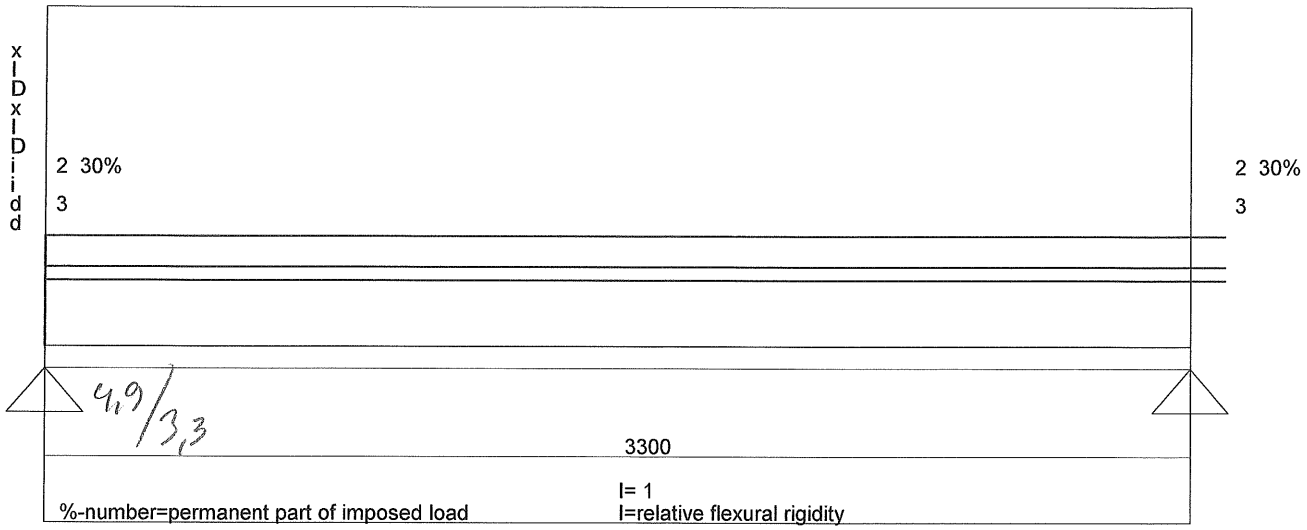

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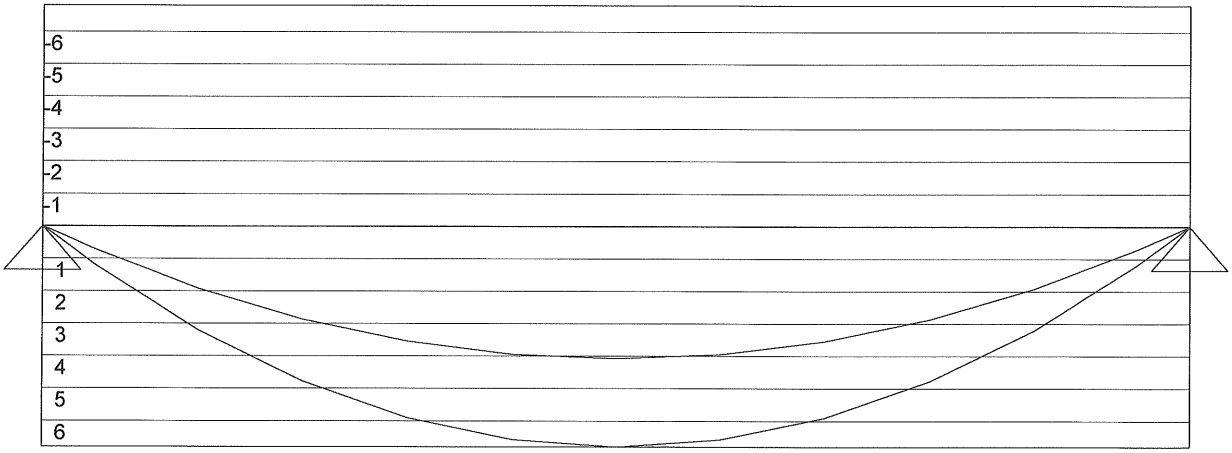

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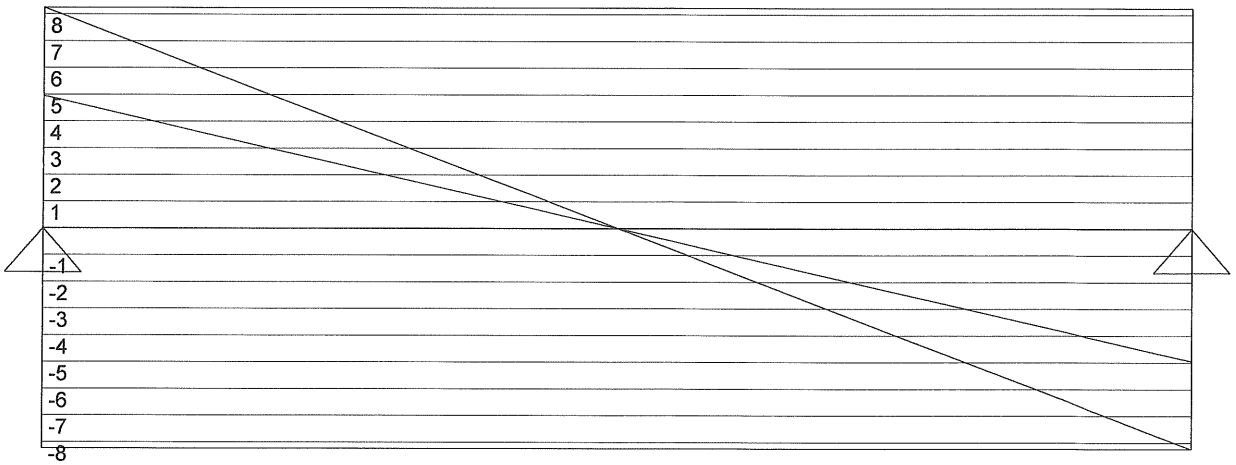

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
8,248 8,250
4,949 4,950

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,18
Factored Moment/Moment capacity [kNm] 6,806 15,450 44 %
Factored shear force/shear capacity [kN] 8,248 24,320 34 %

LVL (1) 3x 9 1/2

Deflection due to unfactored load (Deflection limit L/360)
8,5 mm (93 %)

Beam Id: Lot#86 - MB 14

Date 26-09-2019

Structural Engineer:

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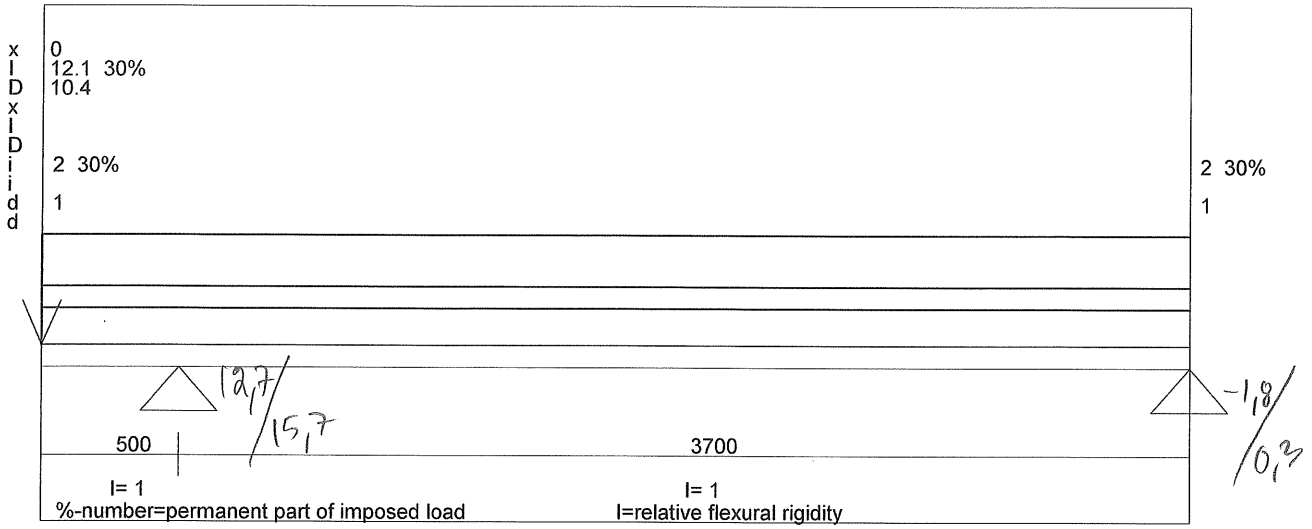

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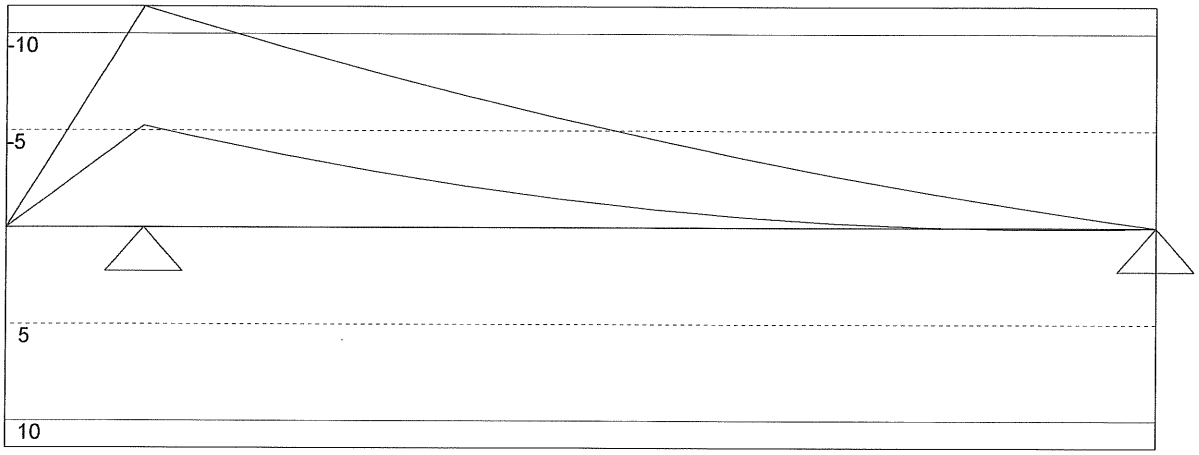

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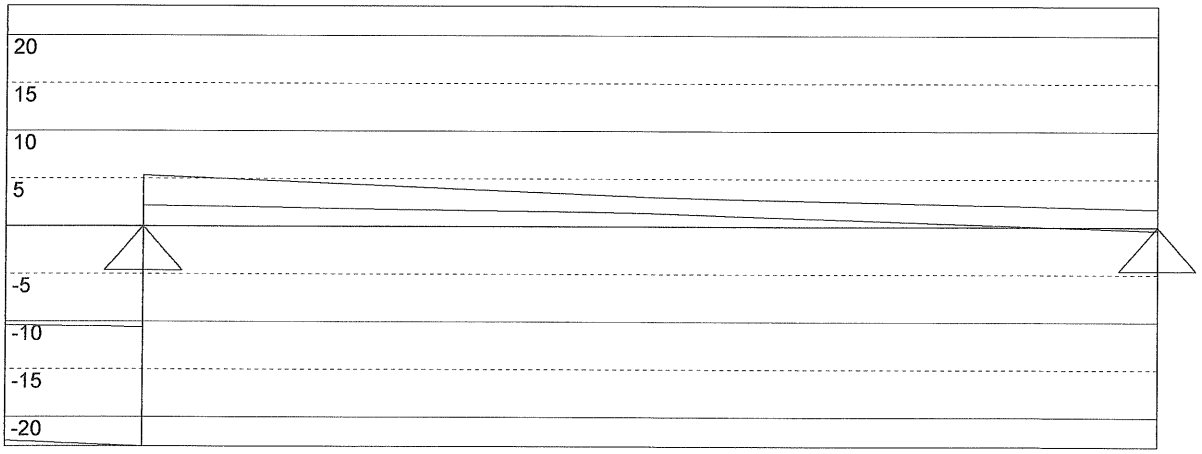

Load factor of dead load= 1 Load factor of imposed load= 1
Load width .406 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
28,443 0,384
12,773 -1,880

KER 76 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,12
Factored Moment/Moment capacity [kNm] 11,401 31,672 36 %
Factored shear force/shear capacity [kN] 23,109 34,341 67 %

(1) 3" x 14" LVL

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
2,5 mm (89 %) -0,7 mm (7 %)

Beam Id: Lot#86 - MB 15

Date 26-09-2019

Structural Engineer:

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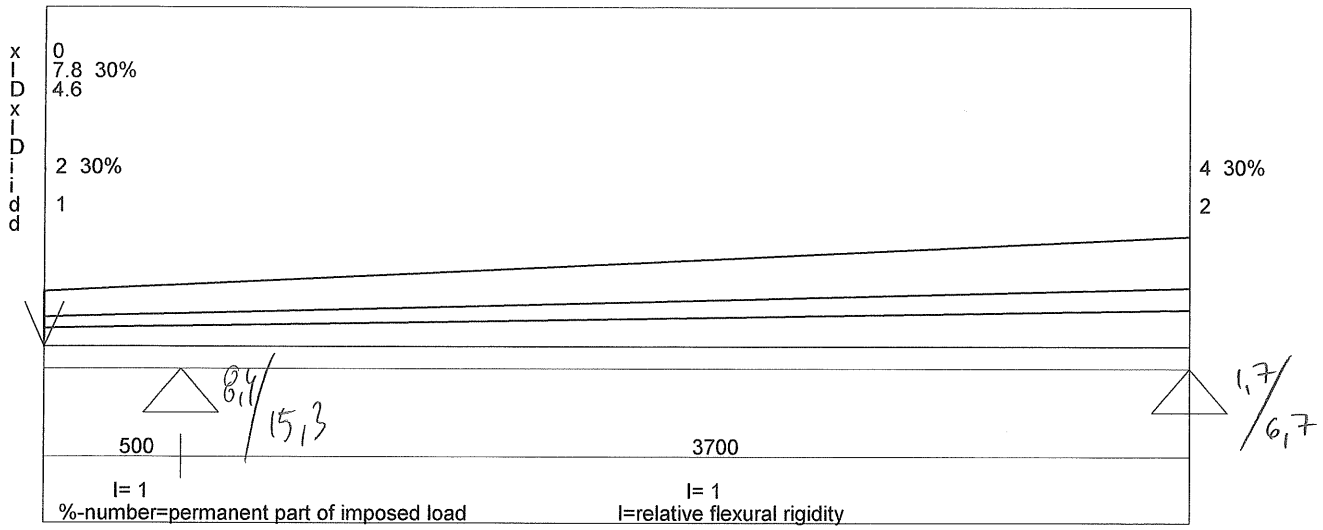

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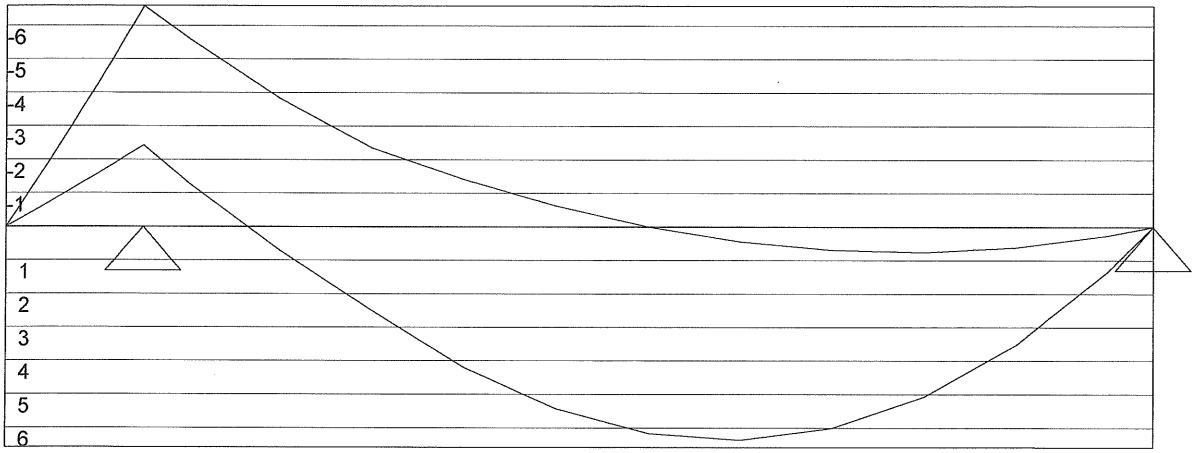

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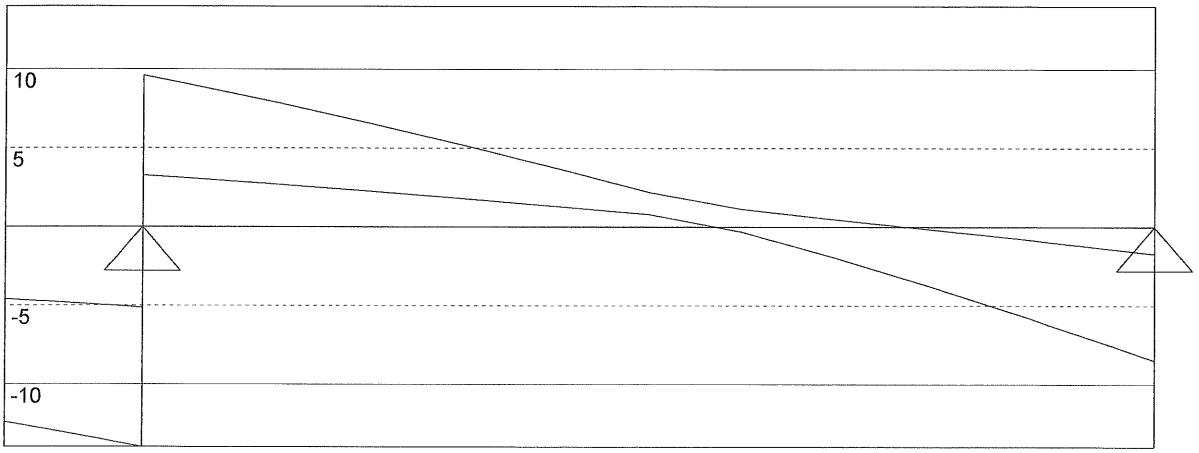

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
23,609 8,476
8,399 1,713

KER 44 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,10
Factored Moment/Moment capacity [kNm] 6,589 17,884 37 %
Factored shear force/shear capacity [kN] 13,989 19,391 72 %

LVL (1) 13 3/4" x 14"

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
1,2 mm (45 %) 4,9 mm (47 %)

Beam Id: Lot#86 - MB 16

Date 26-09-2019

Structural Engineer:

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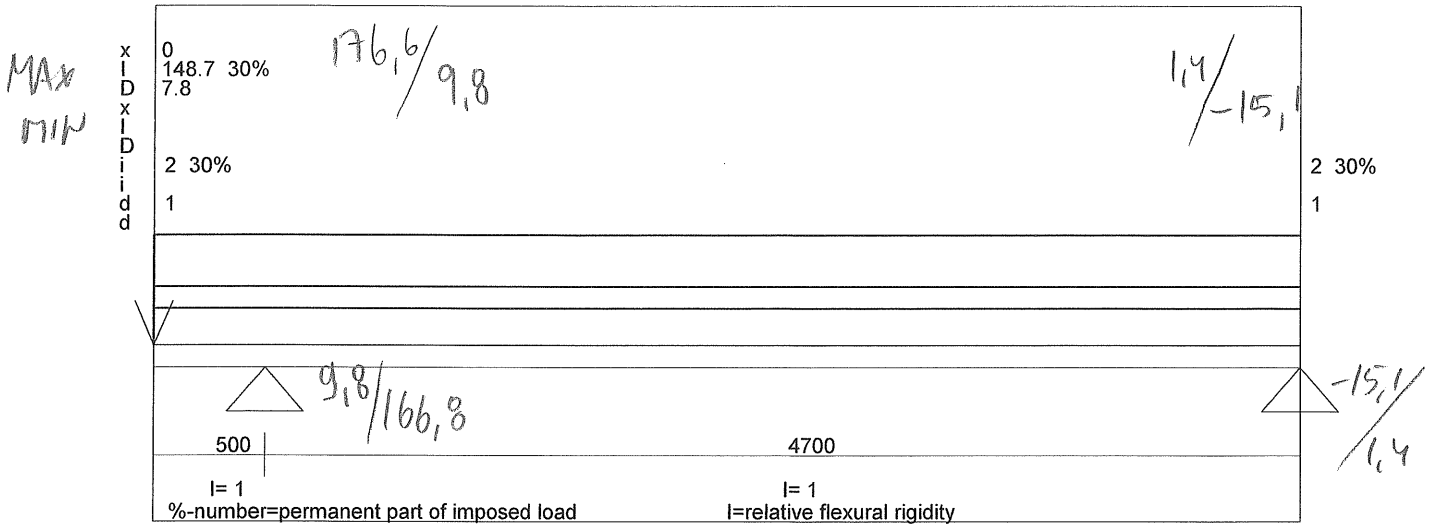

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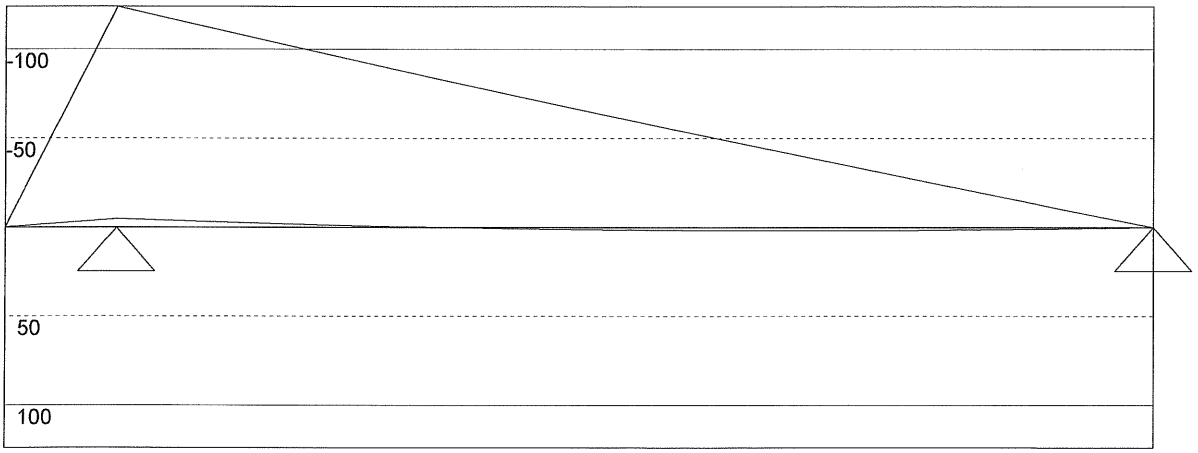

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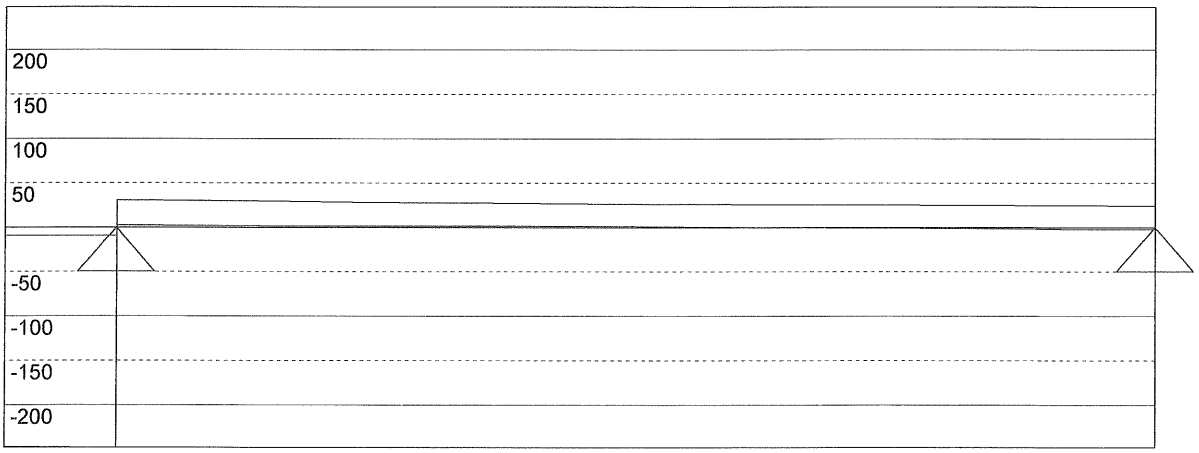

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width .406 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
278,723 2,273
11,757 -24,292

HEA 280 (Class of section=1/1) G= 76,4 I(cm4)=13673 W(cm3)=1010 fy=235 ⇒ W10 x 60
Factored Moment/Moment capacity [kNm] 123,845 261,320 47 %
Factored shear force/shear capacity [kN] 248,173 289,896 86 %

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
2,3 mm (83 %) 0,0 mm (0 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#86 - MB 17 Date 26-09-2019

Structural Engineer:

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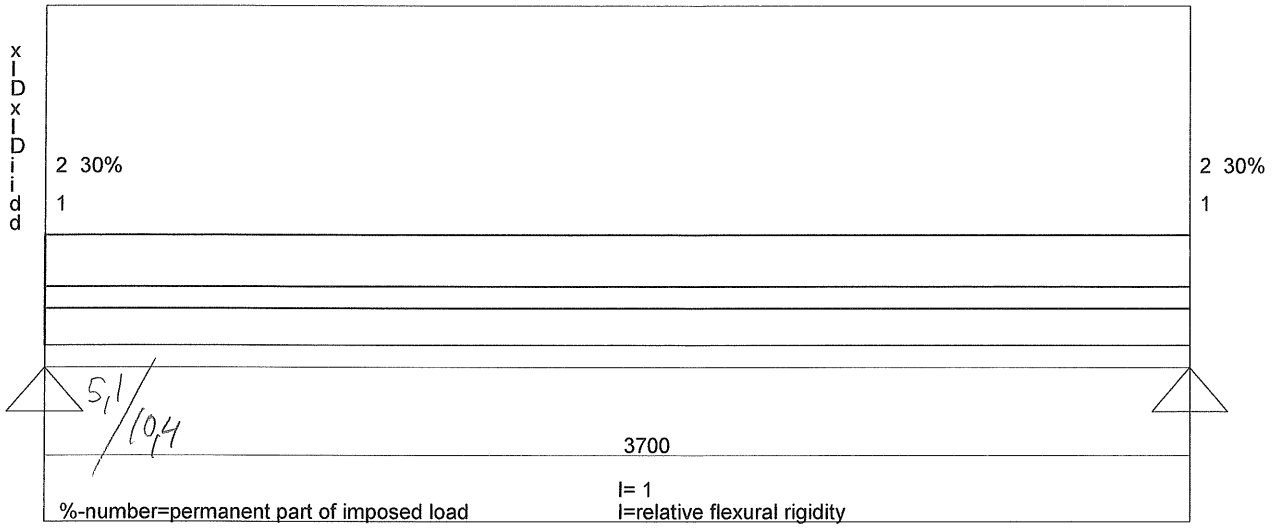

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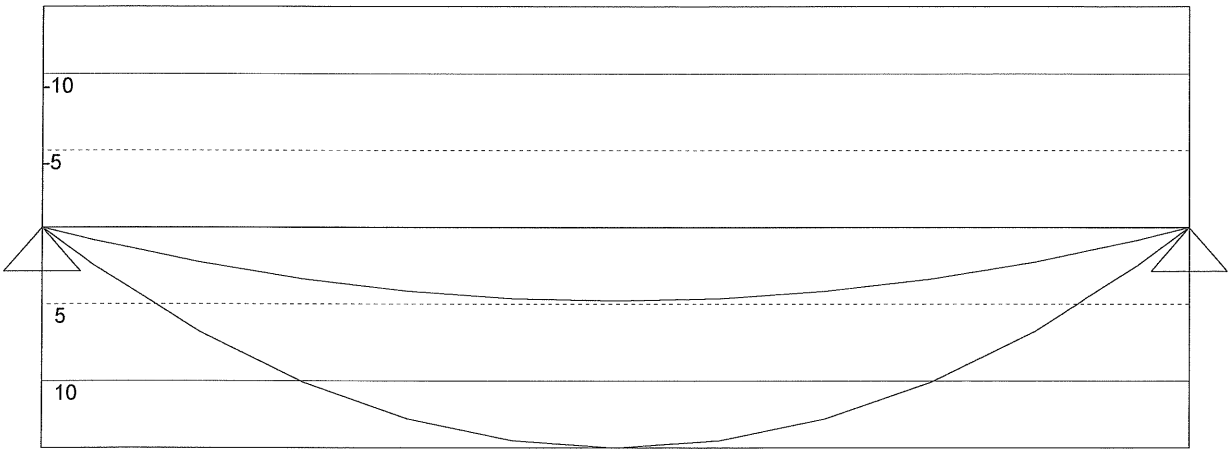

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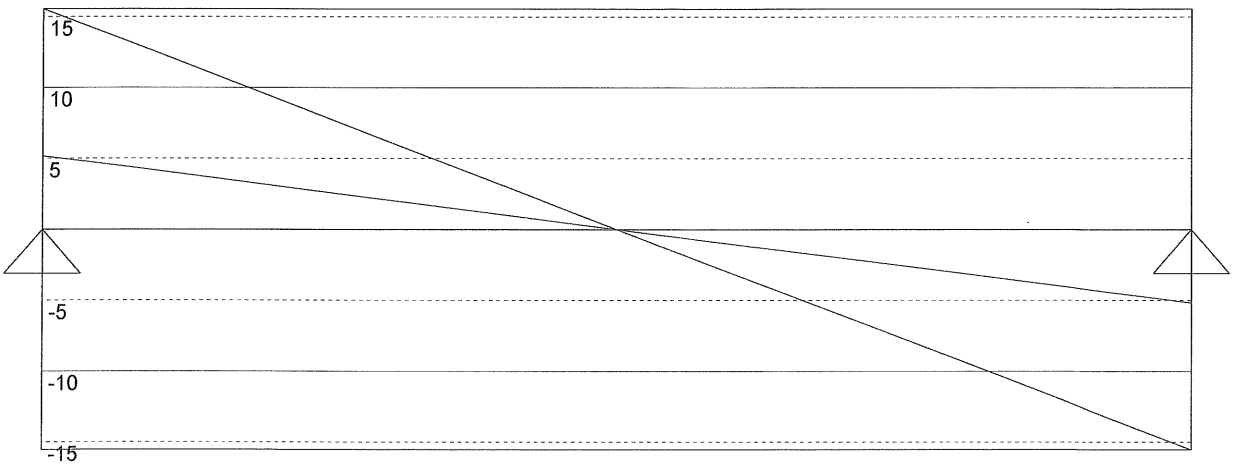

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
15,537 15,540
5,179 5,180

KER 76 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 14,374 30,765 47 %
Factored shear force/shear capacity [kN] 15,537 33,357 47 %

LVL (1) 3x 14

Deflection due to unfactored load (Deflection limit L/360)
7,0 mm (68 %)

Beam Id: Lot#86 - MB 18

Date 27-09-2019

Structural Engineer:

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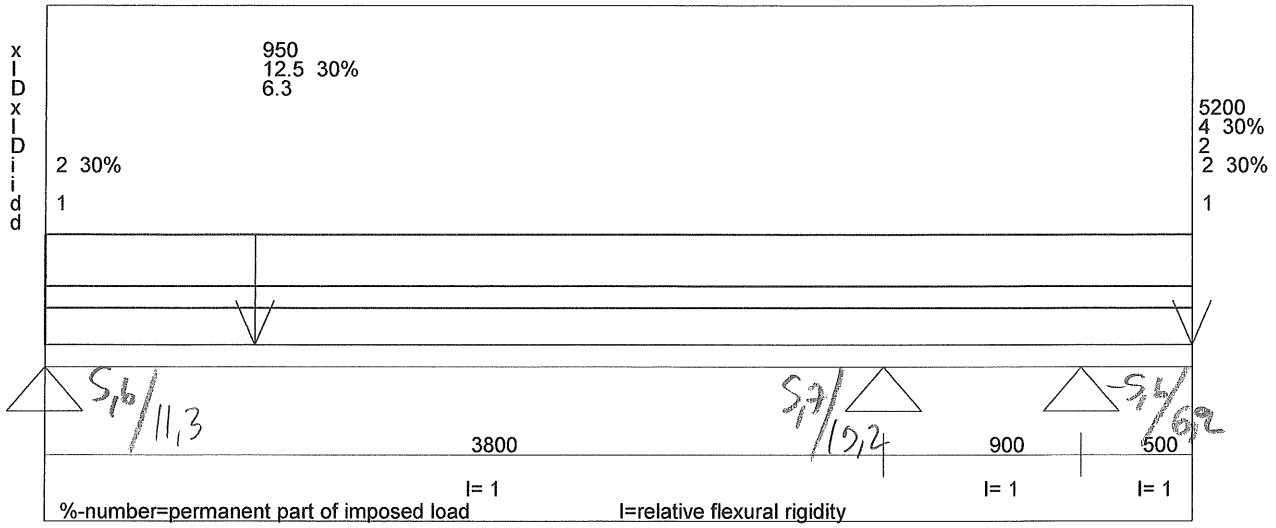

%-number=permanent part of imposed load I=relative flexural rigidity

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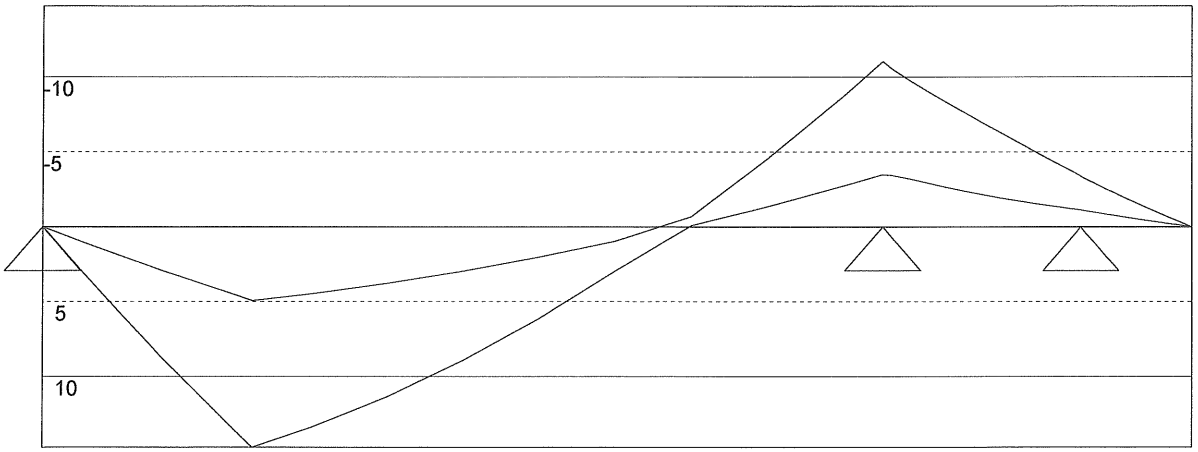

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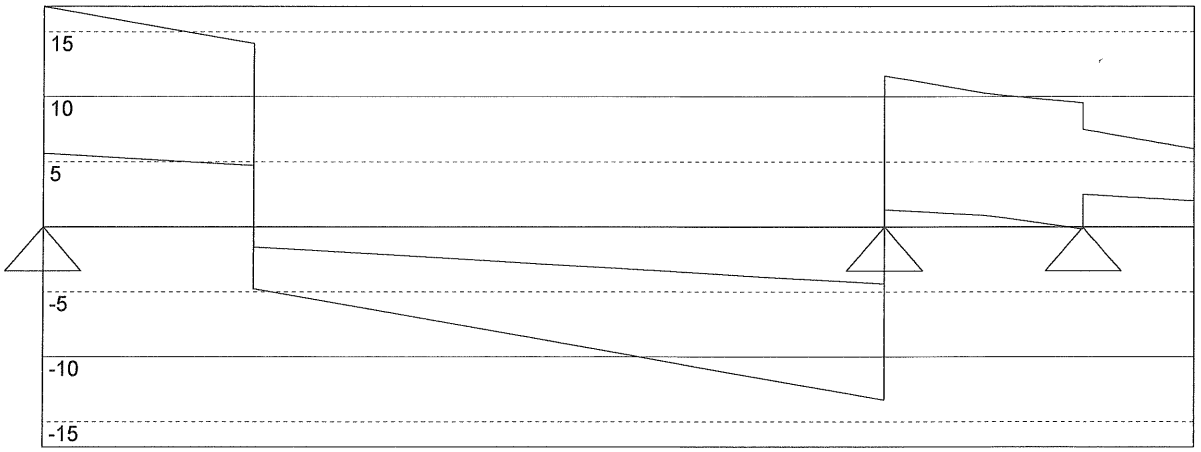

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
16,938 24,933 6,269
5,658 5,726 -5,629

KER 76 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 14,738 22,390 66 %
Factored shear force/shear capacity [kN] 16,938 28,195 60 %

LVL (1) 3 x 11 7/8

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
7,4 mm (70 %) -0,1 mm (5 %) 0,9 mm (32 %)

Beam Id: Lot#86 - MB 19

Date 26-09-2019

Structural Engineer:

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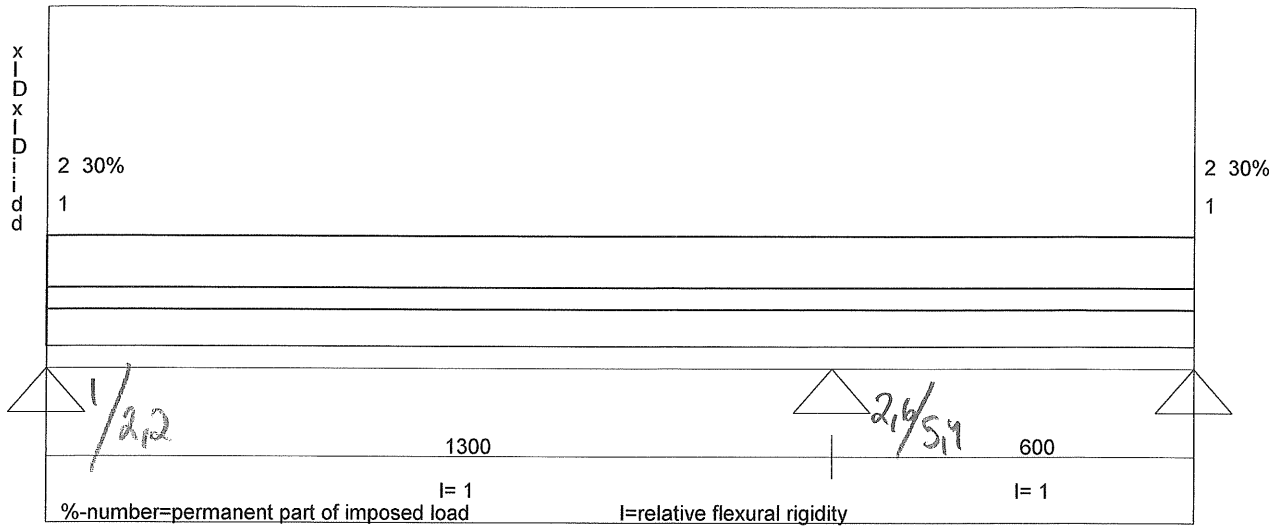

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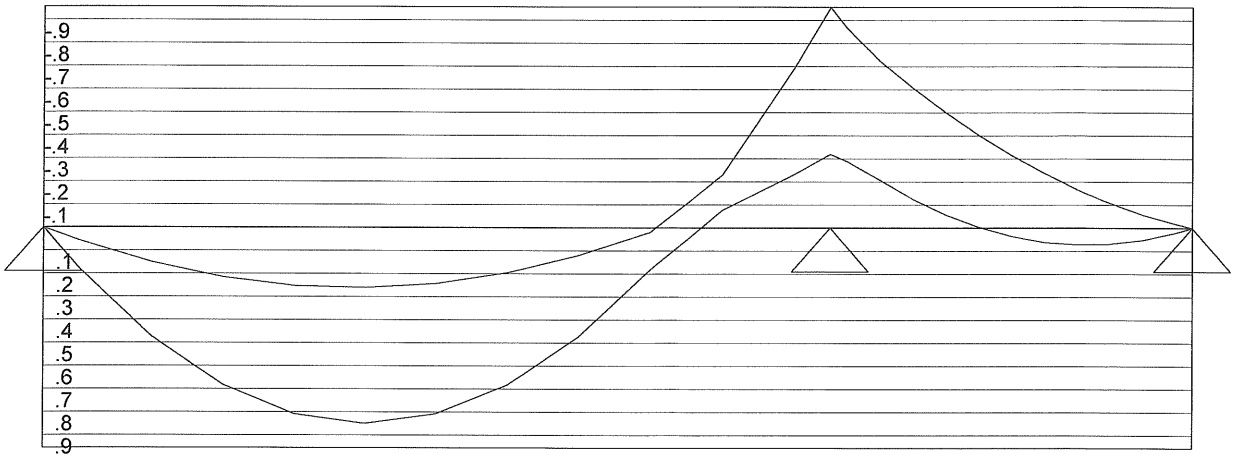

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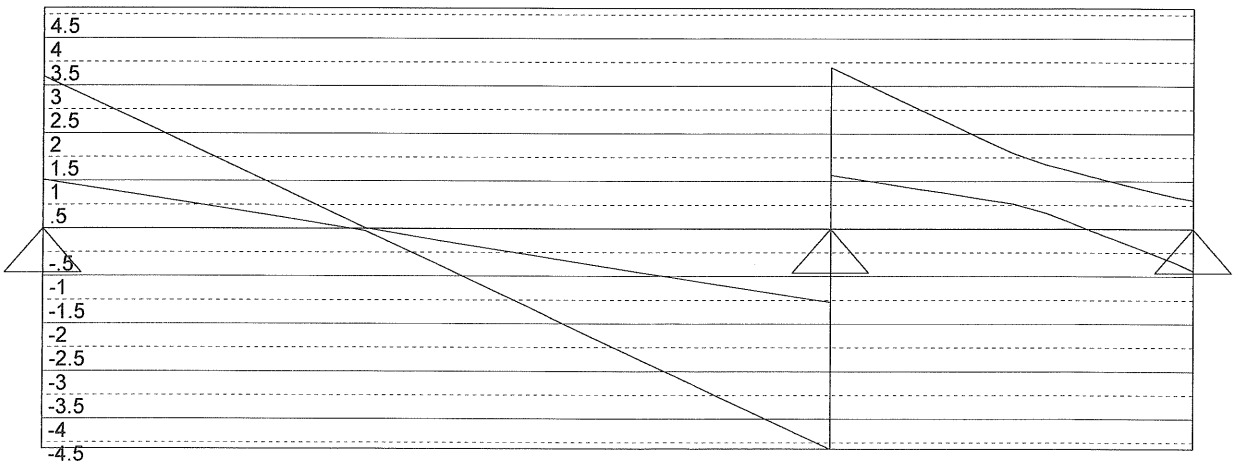

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
3,194 8,028 0,884
1,024 2,676 -0,608

KER 38 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 0,956 11,193 9 %
Factored shear force/shear capacity [kN] 4,635 14,095 33 %

LVL (1) 1½ × 11 7/8

Deflection due to unfactored load (Deflection limit L/360)
0,1 mm (4 %) 0,0 mm (0 %)

Beam Id: Lot#86 - MB 20

Date 26-09-2019

Structural Engineer:

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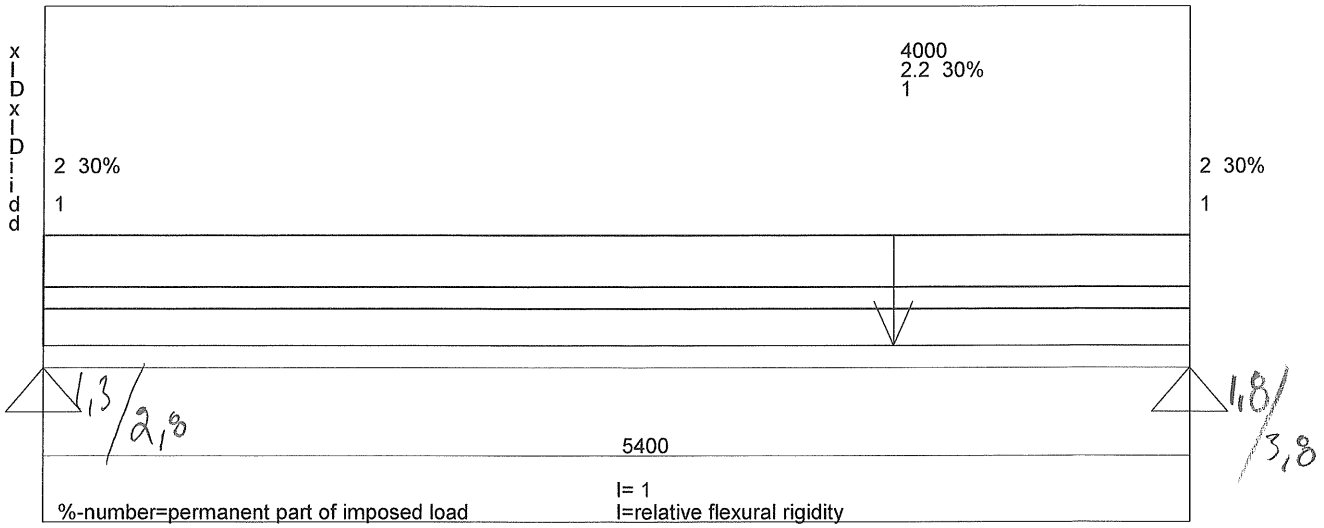

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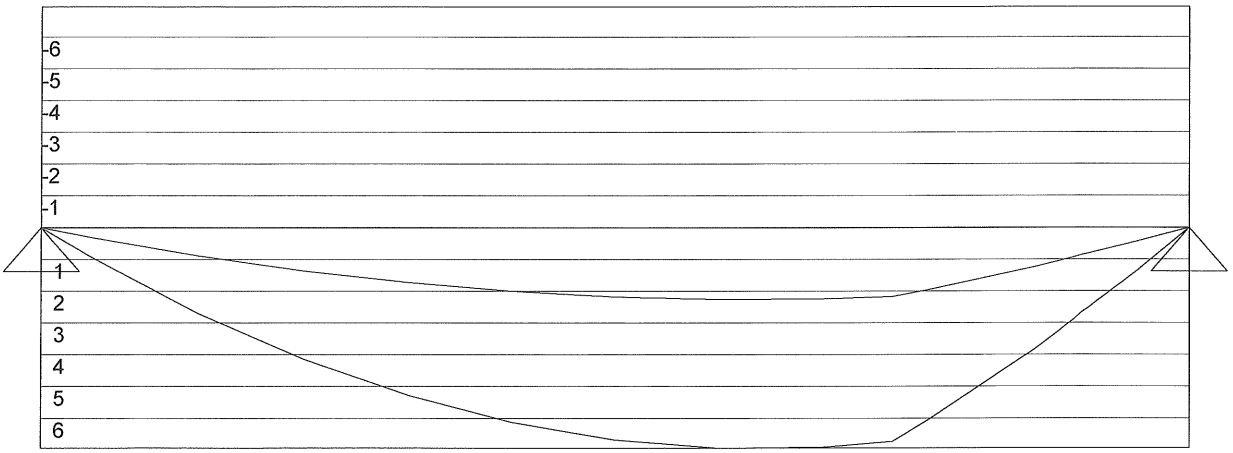

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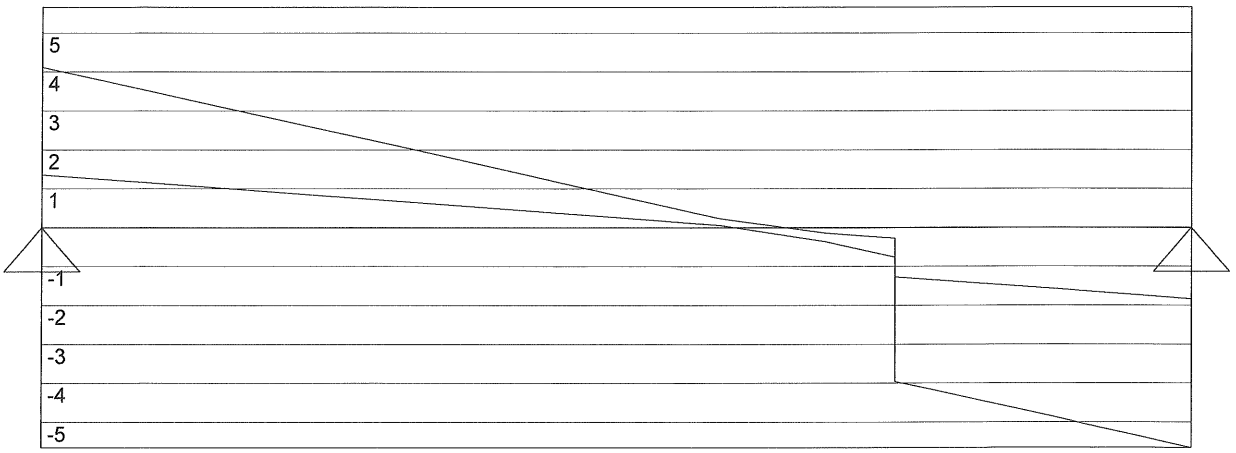

Load factor of dead load= 1 Load factor of imposed load= 1
Load width .406 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
4,117 5,659
1,355 1,837

KER 44 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 6,940 17,769 39 %
Factored shear force/shear capacity [kN] 5,658 19,266 29 %

LVL (1) 1 3/4 x 14

Deflection due to unfactored load (Deflection limit L/360)
12,3 mm (82 %)

Beam Id: Lot#86 - MB 21

Date 27-09-2019

Structural Engineer:

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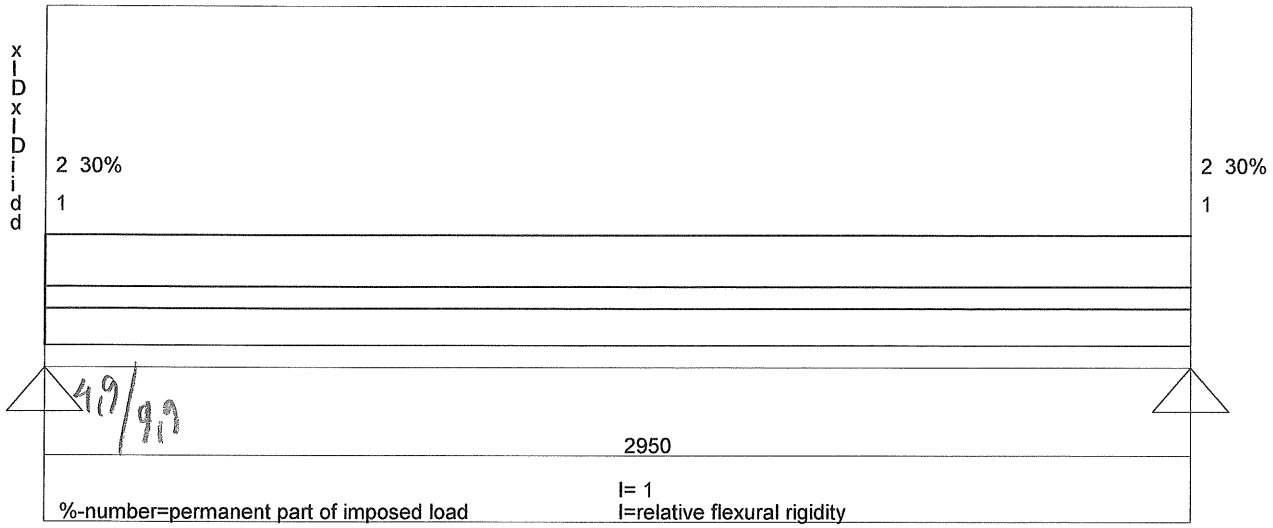

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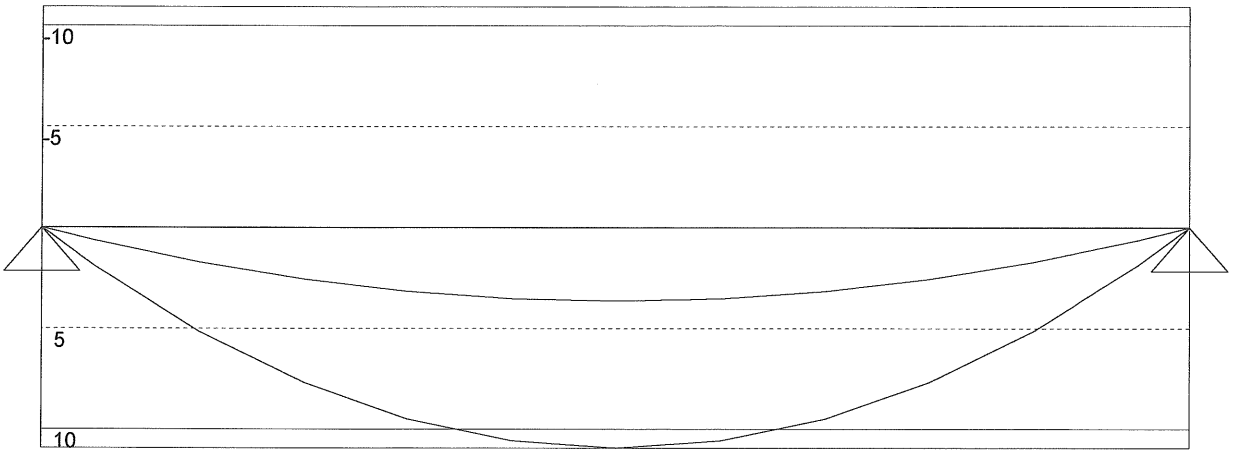

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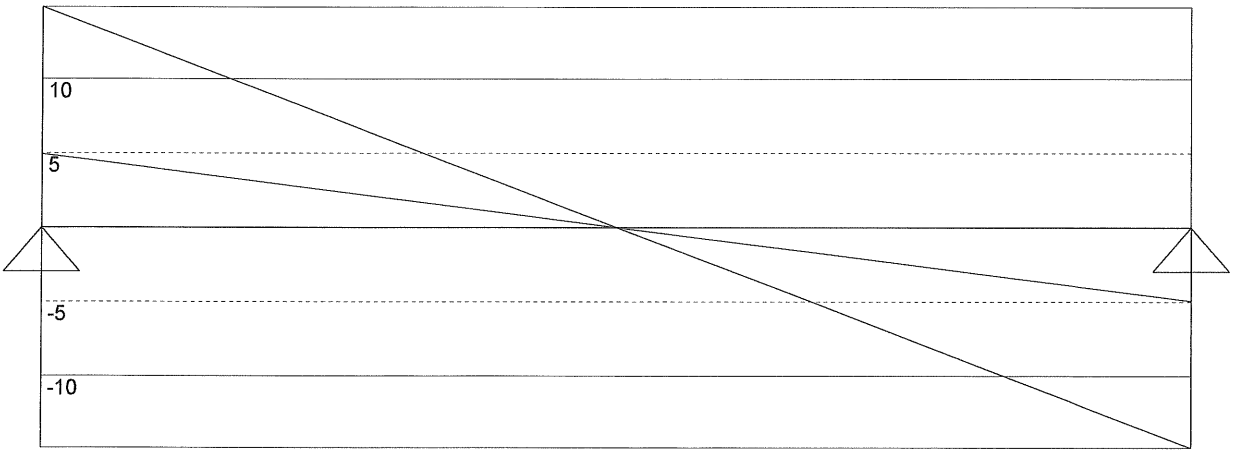

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 3.35 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
14,821 14,824
4,940 4,941

KER 76 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 10,933 22,385 49 %
Factored shear force/shear capacity [kN] 14,821 28,189 53 %

LVL (2) 1 1/2 x 11 7/8

Deflection due to unfactored load (Deflection limit L/360)
5,6 mm (68 %)

Beam Id: Lot#86 - MB 22 (HDR)

Structural Engineer:

Date 27-09-2019

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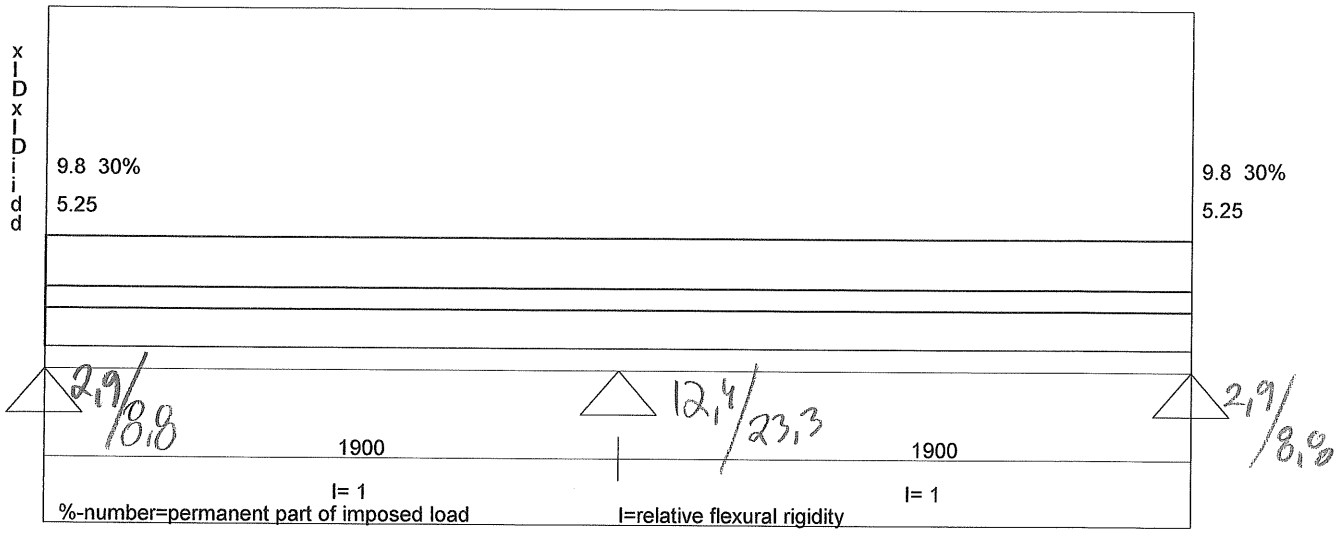

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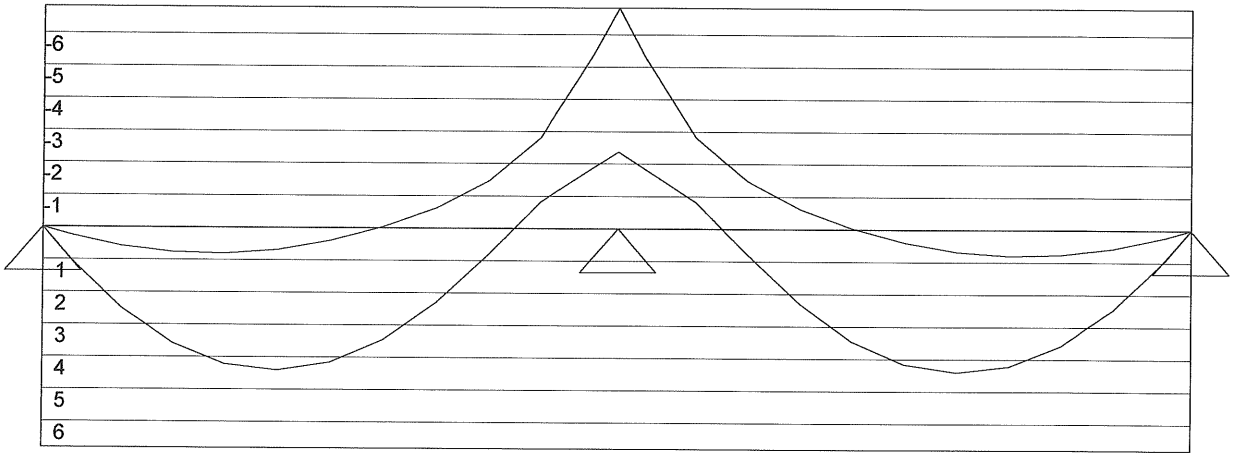

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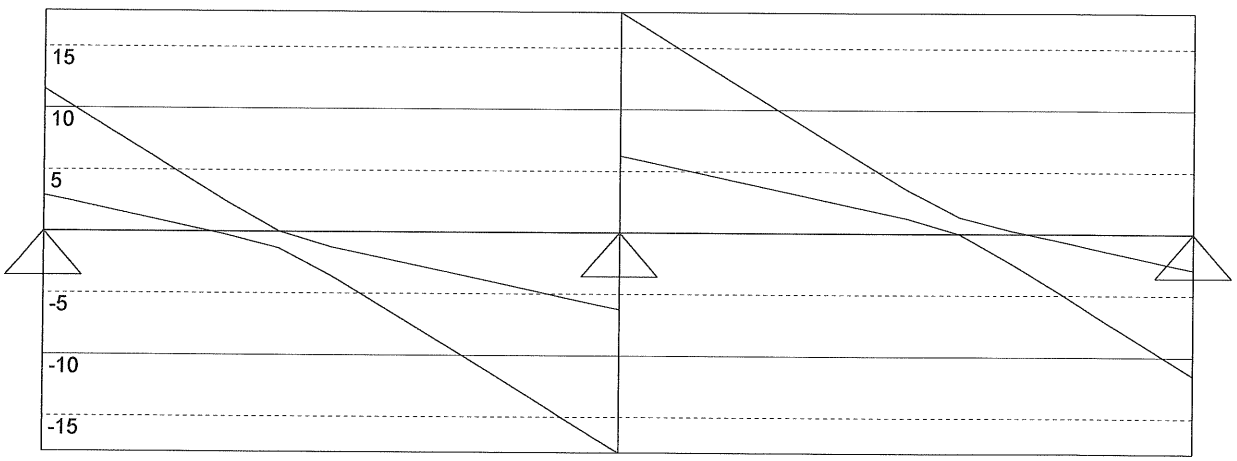

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
11,524 35,766 11,527
2,917 12,476 2,918

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,10
Factored Moment/Moment capacity [kNm] 6,814 14,388 47 %
Factored shear force/shear capacity [kN] 17,883 22,647 79 %

LVL (2) 1½ × 9½

Deflection due to unfactored load (Deflection limit L/360)
1,5 mm (29 %) 1,5 mm (29 %)

Beam Id: LOT#86 - RB /

Date 20-09-2019

Structural Engineer:

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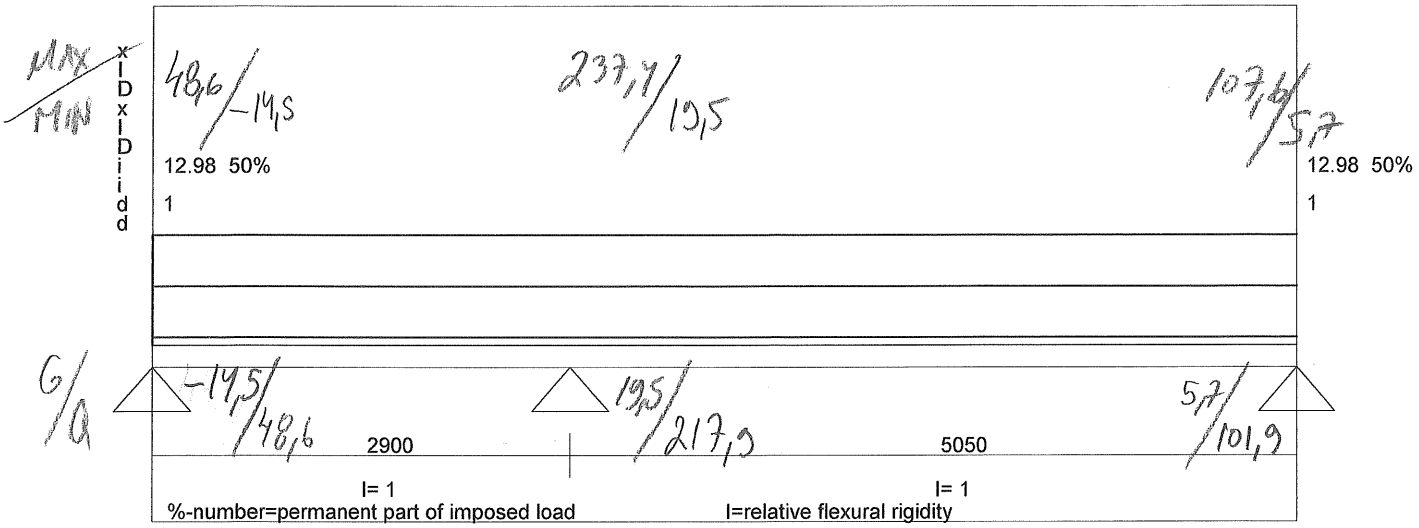

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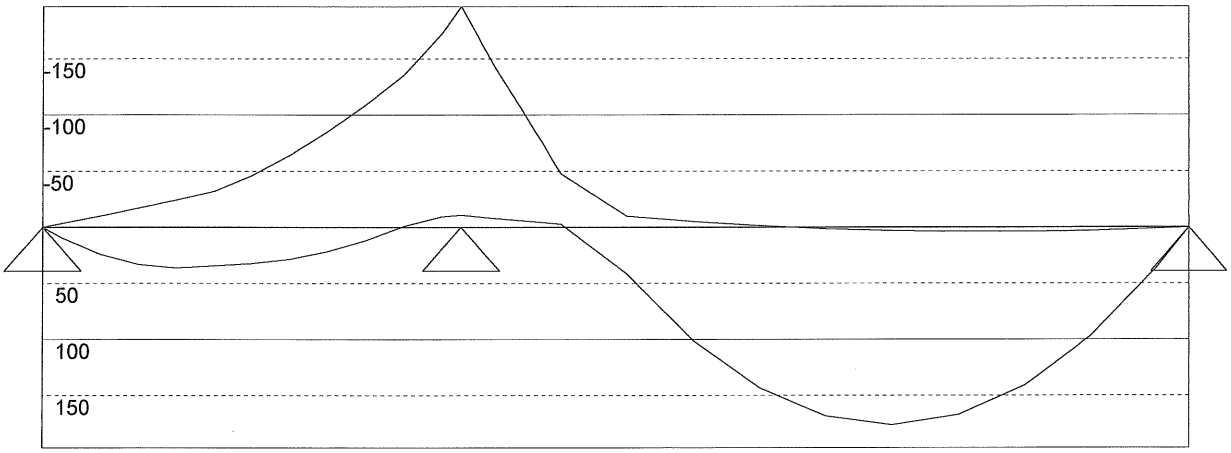

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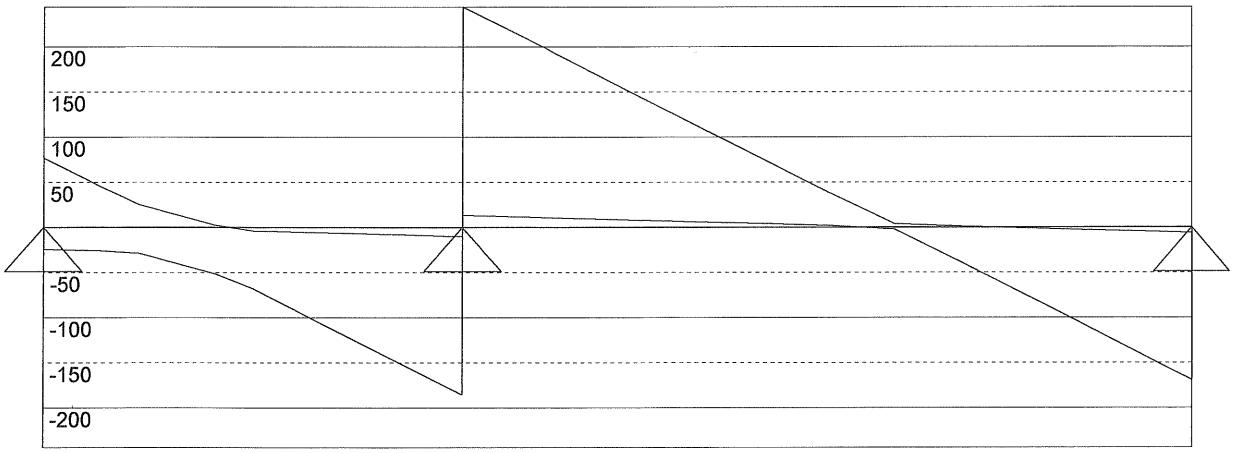

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.7 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
77,002 429,708 169,251
-24,196 23,473 6,157

HEB 240 (Class of section=1/1) G= 83,2 I(cm4)=11259 W(cm3)=938 fy=235
Factored Moment/Moment capacity [kNm] 196,461 247,690 79 %
Factored shear force/shear capacity [kN] 244,109 314,430 78 %

=) W 10 x 49 or
W 8 x 67

Sum infl M+S 0,82 (must be<=1) x= 2900 M=196,39 S=244,11
Deflection due to unfactored load (Deflection limit L/240)
0,7 mm (6 %) 10,8 mm (51 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: LOT#86 - RB 2

Date 20-09-2019

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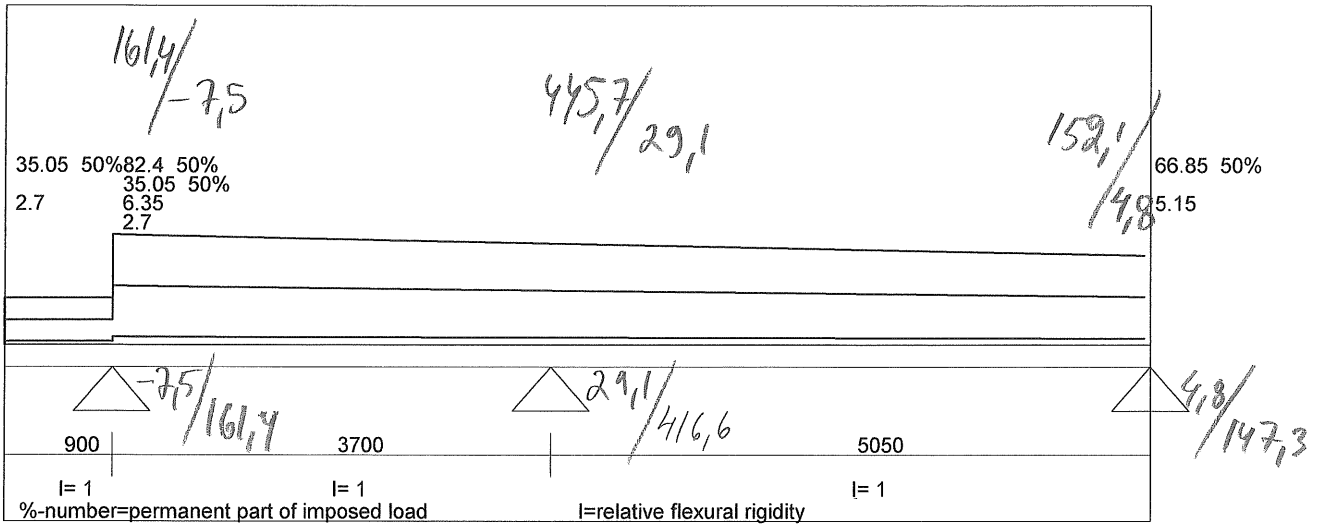
MAX / MIN x i D x i D i i d d



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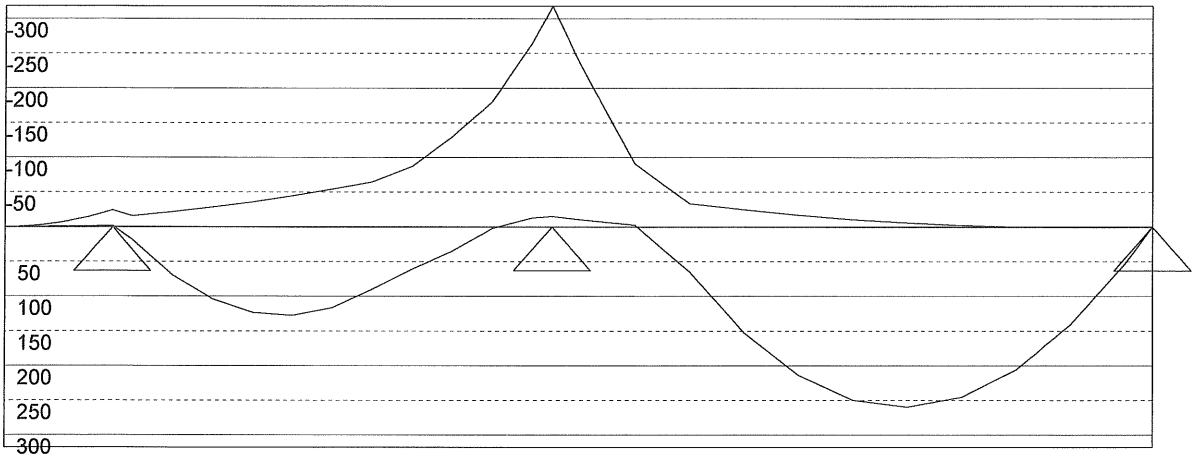

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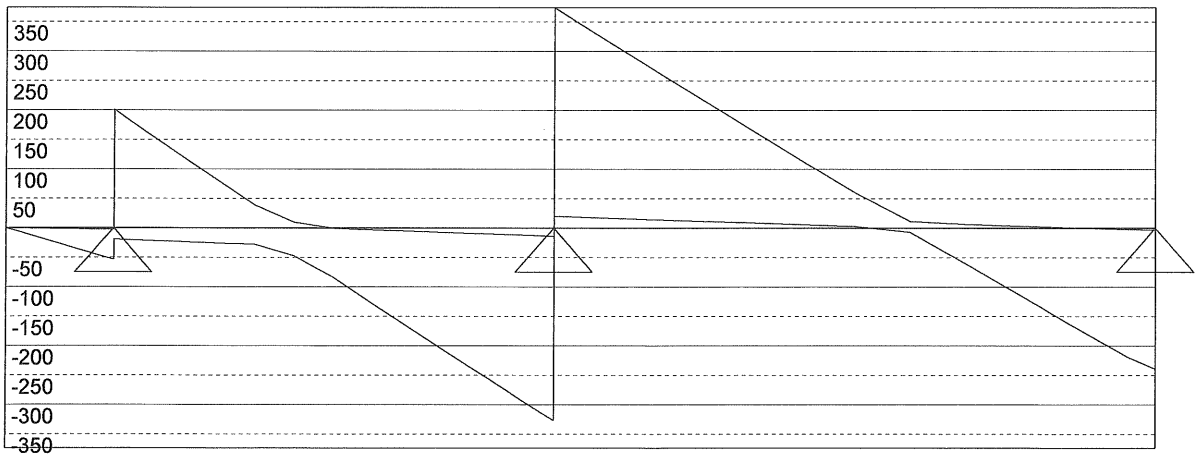

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
254,208 700,555 239,114
-16,251 33,850 3,490

HEB 280 (Class of section=1/1) G= 103 I(cm4)=19270 W(cm3)=1380 fy=235
Factored Moment/Moment capacity [kNm] 317,864 360,490 88 %
Factored shear force/shear capacity [kN] 373,889 387,891 96 % => W10 x 88

Sum infl M+S 0,95 (must be<=1) x= 4600 M=317,8 S=373,89
Deflection due to unfactored load (Deflection limit L/240)/L/120)!
1,1 mm (14 %) 2,1 mm (14 %) 9,3 mm (44 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: LOT#86 - RB 3

Date 20-09-2019

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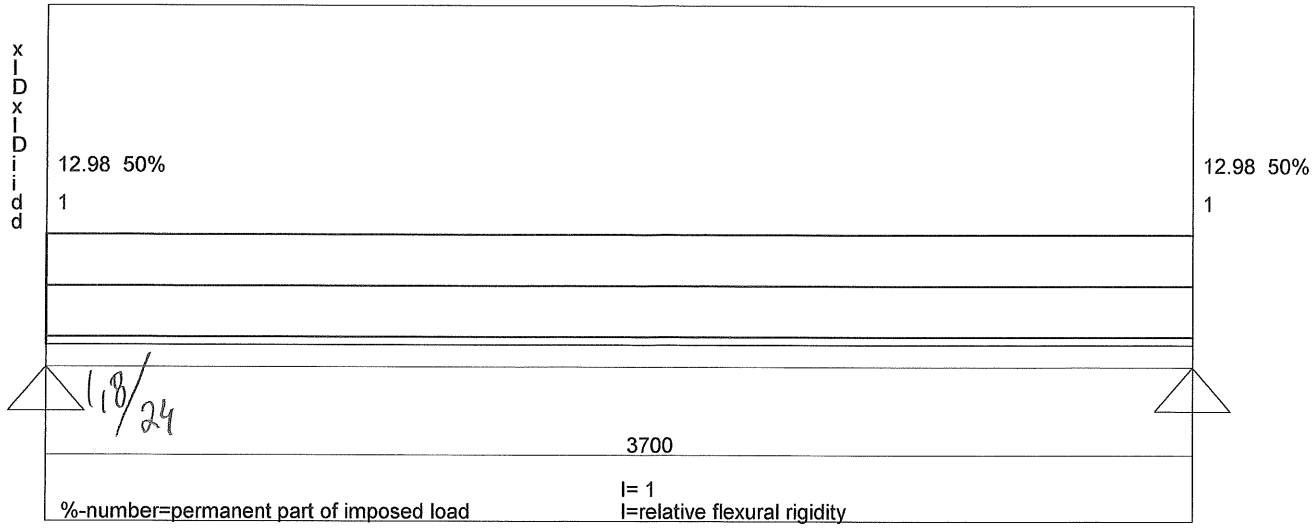

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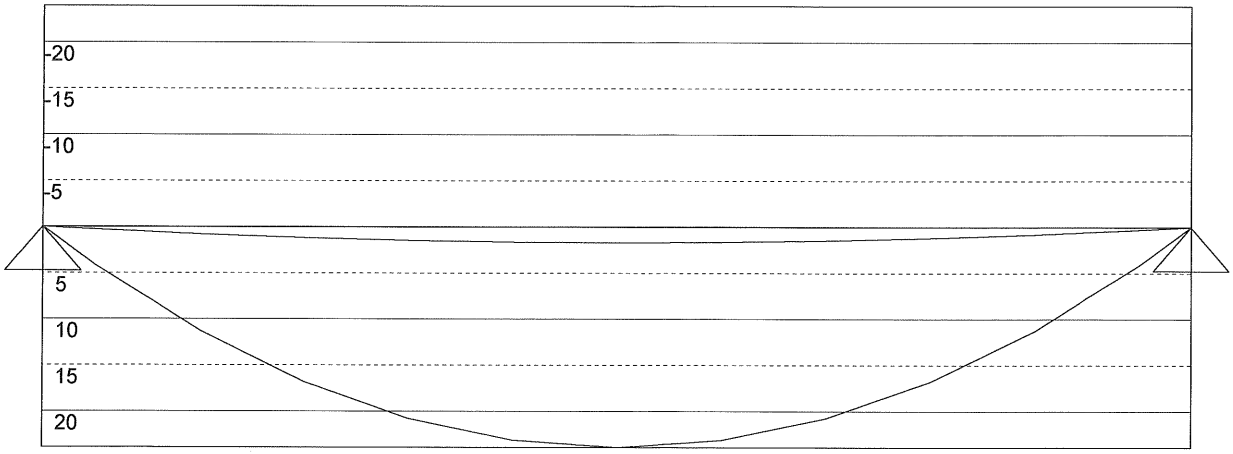

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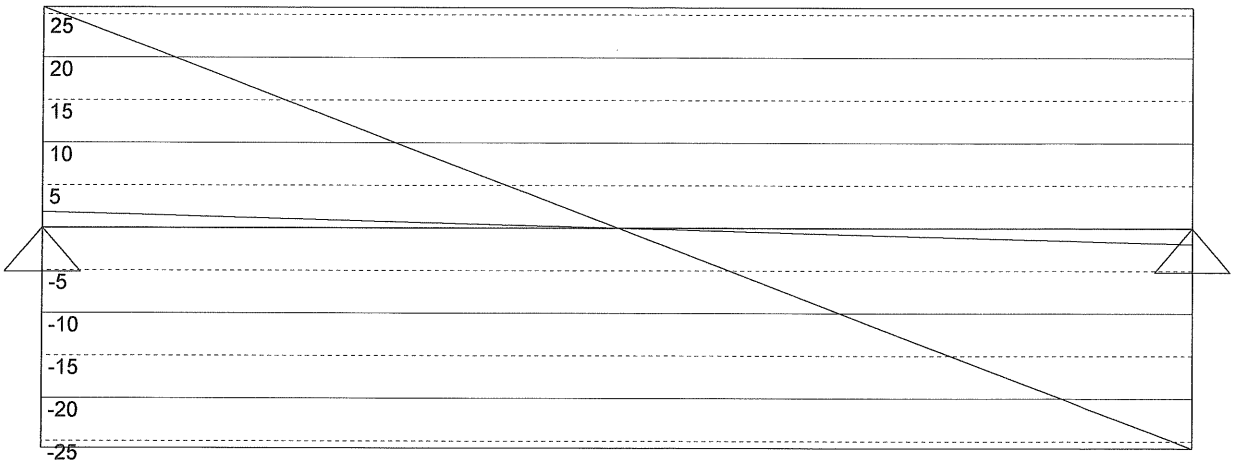

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
25,858 25,863
1,850 1,850

GL(1) 7 1/2 x 10 1/4

L40 190 x 260 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 23,923 32,477 74 %
Factored shear force/shear capacity [kN] 25,858 38,563 67 %

Deflection due to unfactored load (Deflection limit L/240)
14,5 mm (94 %)

Beam Id: LOT#86 - RB 4

Date 20-09-2019

Structural Engineer:

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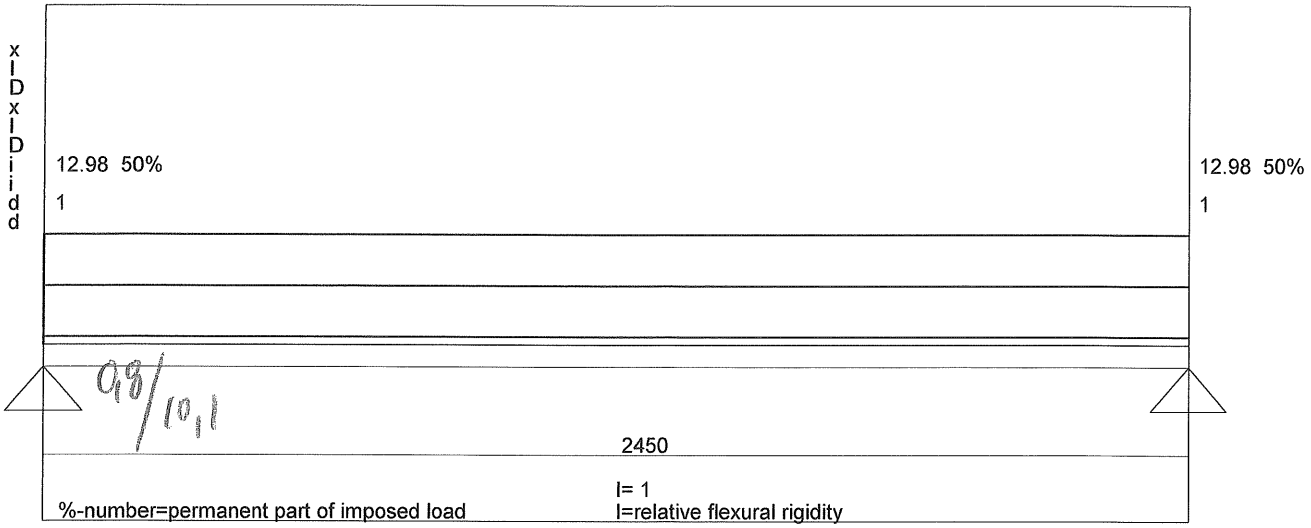

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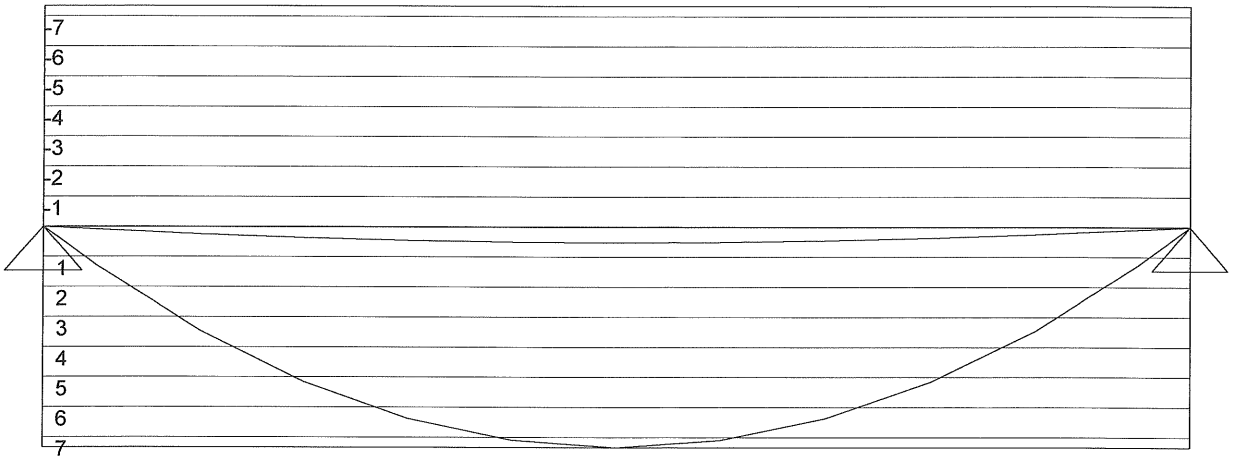

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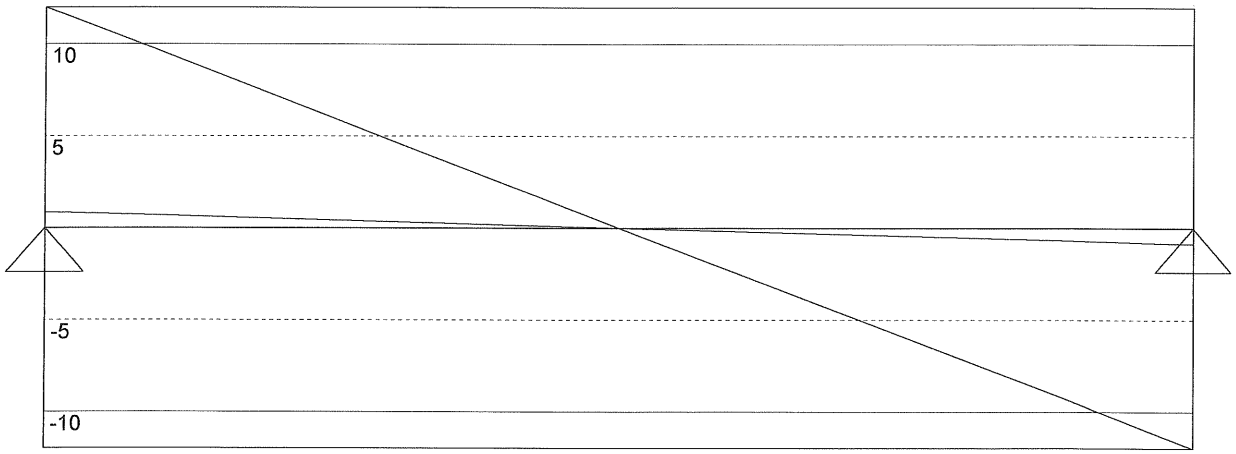

Load factor of dead load= 1 Load factor of imposed load= 1
Load width .7 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
11,985 11,988
0,857 0,858

(13,5)

L40 190 x 215 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 7,343 22,208 33 %
Factored shear force/shear capacity [kN] 11,985 31,889 38 %

Deflection due to unfactored load (Deflection limit L/240)
3,4 mm (34 %)

Beam Id: Lot#86 - RB5 UPD

Date 06-11-2019

Structural Engineer:

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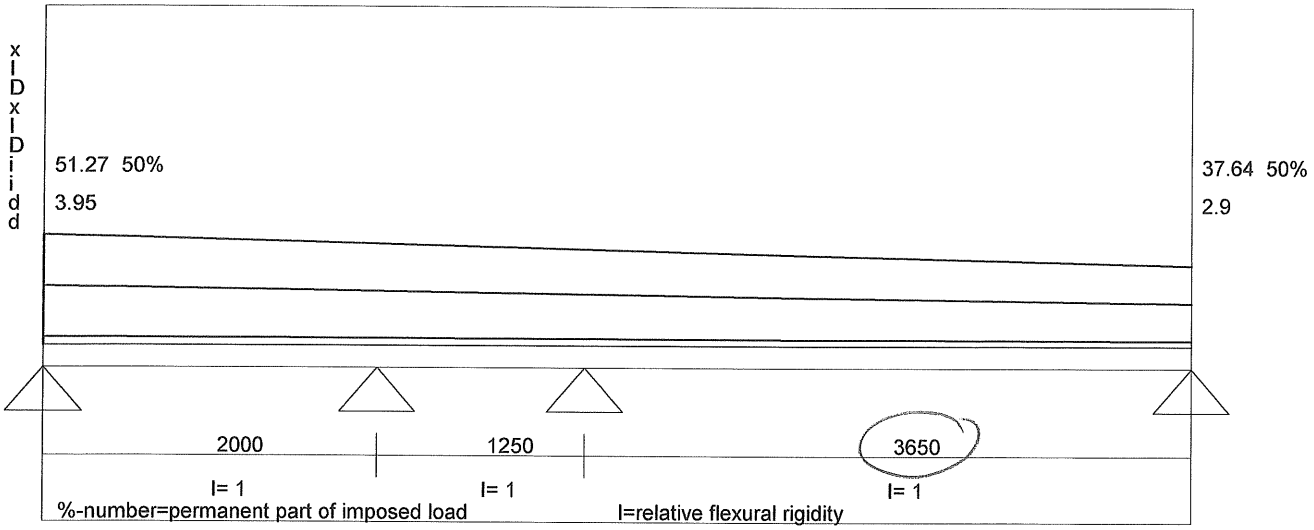

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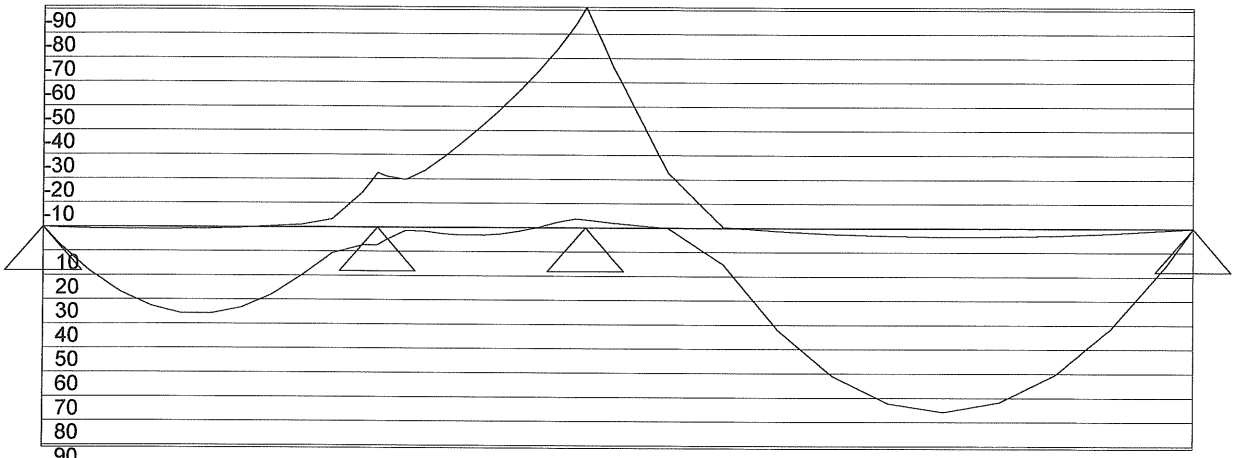

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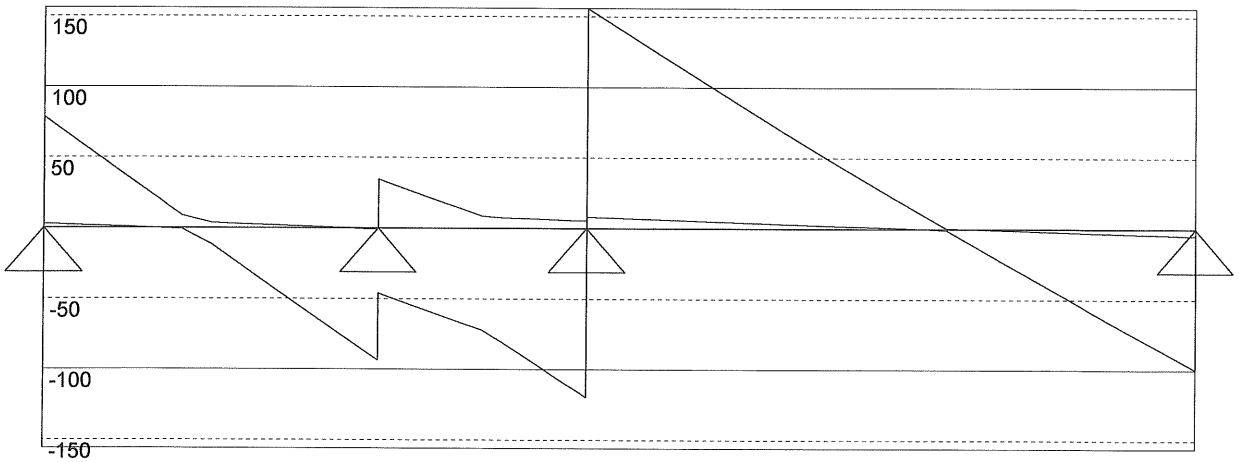

Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
78,587 123,050 275,669 99,580
2,978 -40,204 2,757 5,000

HEA 200 (Class of section=1/1) G= 42,3 I(cm4)=3692 W(cm3)=389 fy=235
Factored Moment/Moment capacity [kNm] 91,073 101,050 90 %
Factored shear force/shear capacity [kN] 156,034 164,970 95 %

⇒ W8x28

Sum infl M+S 0,97 (must be<=1) x= 3250 M=91,03 S=156,03
Deflection due to unfactored load (Deflection limit L/240)
1,2 mm (14 %) 0,0 mm (0 %) 7,3 mm (48 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: LOT#86 - RB 6

Date 20-09-2019

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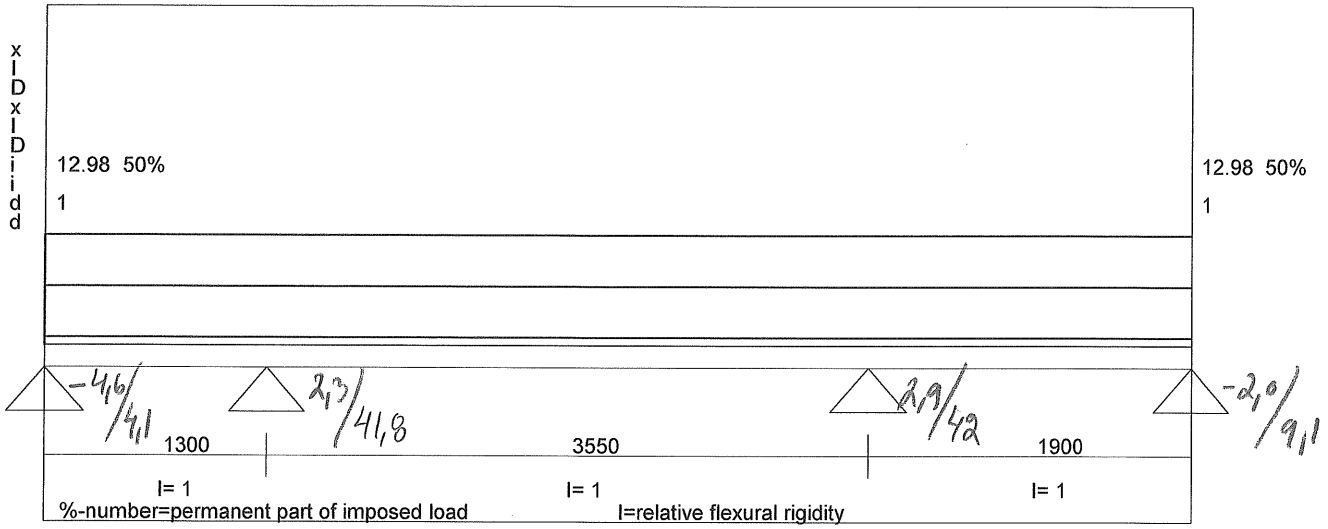

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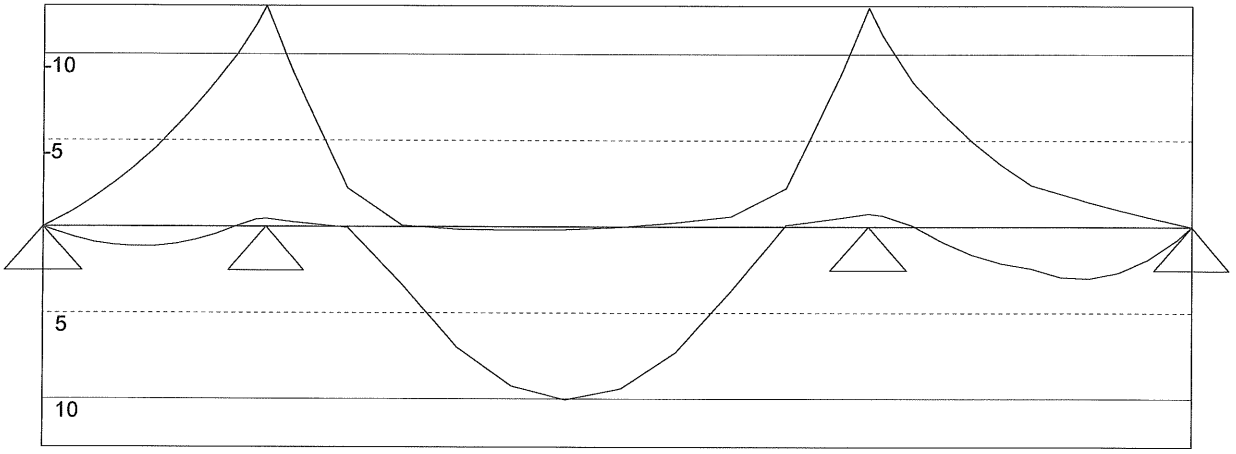

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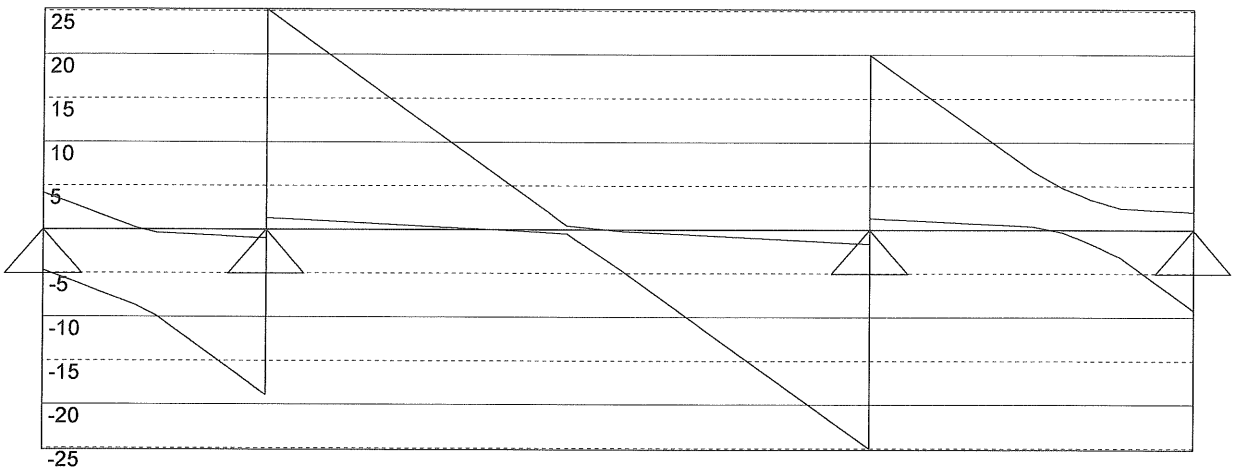

Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
4,192 44,131 44,994 9,194
-4,656 2,326 2,974 -2,056

L40 190 x 215 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 12,797 14,713 87 %
Factored shear force/shear capacity [kN] 25,200 25,956 97 %

(1) GL 7 1/2" x 8 1/2"

Deflection due to unfactored load (Deflection limit L/240)
0,3 mm (5 %) 14,1 mm (95 %) 1,2 mm (15 %)