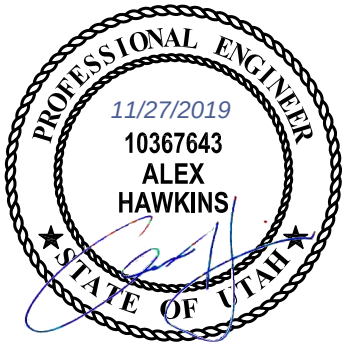
# STRUCTURAL CALCULATIONS

*Project:*
**Powder Mountain Lot 80**
8483 E. Spring Park
Summit Powder Mountain Resort
Weber County, UT
*Project Number:* 9085A

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

*Date:*
November 2019




*Prepared By:*
**Alex Hawkins, PE**

*Project Manager:*
**David A. Jenkins, PE, SE**

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| | | | |
|---|---|---|---|
| Project: | Powder Mountain Lot 80 | Project No.: | 9085A |
| By: | Alex Hawkins, PE | Checked By: | DAJ |
| Date: | November 2019 | | |

## GENERAL PROJECT INFORMATION

Client: **Scandinavian**

Project: **Powder Mountain Lot 80**

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

| | | |
|---|---|---|
| Latitude: | 41.363 | North (Approximate) |
| Longitude: | -111.747 | West (Approximate) |
| Elevation above Sea Level: | 8,557 | ft |

## PROJECT DESCRIPTION

Provide structural calculations for Scandinavian Log Home

## GENERAL DESIGN CRITERIA

| | | | |
|---|---|---|---|
| Structure Type: | Structure Type | Building Height, $h_n$ (ft) | 28 |
| Design Code: | 2018 IBC | Number of Stories | 2 |
| Risk Category: | II | Light-frame Construction? | No |

## DESIGN LOADS & SERVICEABILITY REQUIREMENTS

### Dead Loads:

*-Roof DL:*

| | | |
|---|---|---|
| Total Roof DL: | 15 | psf |

*-Floor DL:*

| | | |
|---|---|---|
| Total Floor DL: | 20 | psf |

*-Wall DL:*

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

### Snow Loads:

| | | |
|---|---|---|
| Surface Roughness Category: | C | |
| Roof Exposure: | Partially Exposed | |
| Thermal Condition: | All other structures | |
| Roof Surface: | Non-Slippery (Rough) | |
| Obstructed? | No | |
| Roof Pitch | 1 | /12 |
| Roof Angle, θ | 4.8 | |
| Ground Snow Load, $p_g$: | 384 | 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, $p_f$:** | **269** | **psf (Balanced)** |
| **Sloped Roof Snow Load, $p_s$:** | **269** | **psf (Balanced)** |
| **Seismic Snow Load, $p_{f,seismic}$:** | **54** | **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 | |

### Live Loads:

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

### Deflection Limits:

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

### Rain Loads:

| | | |
|---|---|---|
| Rain Intensity, I (in/hr): | 1.5 | |

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## FOUNDATION CRITERIA & SPECIFICATIONS

Geotechnical Report:
Company: AGEC
Date: July 12, 2019
Report / Project Number: 03092-001
Contact: David A. Glass, P.E.

Allowable Bearing Pressure: 2,800 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: 0.48

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 |

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## SNOW DRIFT ANALYSIS - DRIFTS DUE TO ADJACENT STRUCTURES
## RAMP

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

*Design Parameters*

| | |
|---|---|
| Surface Roughness Category | C |
| Roof Exposure | Partially Exposed |
| Thermal Conditions | All other structures |
| Roof Surface | Non-Slippery (Rough) |
| Obstructed? | No |
| Roof Pitch | 1 /12 |
| Roof Angle, θ | 4.8 |
| Snow Drift Analysis Required? | Yes |

| | | | | | |
|---|---|---|---|---|---|
| Ground Snow Load, $p_g$ (psf) | 384 | *Utah Snow Load Study* | Snow Density, γ (pcf) | 30.0 | *Equation 7.7-1* |
| Exposure Factor, $C_e$ | 1.00 | *Table 7.3-1* | Balanced Snow Load Height, $h_b$ (ft) | 8.96 | $p_f / \gamma$ |
| Thermal Factor, $C_t$ | 1.00 | *Table 7.3-2* | Horizontal Separation, s (ft) | 0.0 | |
| Importance Factor, $I_s$ | 1.00 | *Table 1.5-2* | Vertical Separation, h (ft) | 9.0 | |
| Slope Factor, $C_s$: | 1.00 | *Figure 7.4-1* | Length of Upper Roof, $L_u$ (ft) | 27.5 | |
| Flat Roof Snow Load, $p_f$ (psf) | 269 | *Equation 7.3-1* | Length of Lower Roof, $L_L$ (ft) | 27.0 | |
| Sloped Snow Load, $p_s$ (psf): | 269 | *Equation 7.4-1* | | | |

*Snow Drift Analysis*

| | | |
|---|---|---|
| Full Windward Drift Height, $h_{d,full\ windward}$ (ft) | 3.19 | *Section 7.7.1* |
| runcated Windward Drift Height, $h_{d,windward}$ (ft) | 3.19 | *Figure C7.7-3* |
| Full Leeward Drift Height, $h_{d,full\ leeward}$ (ft) | 4.28 | *Section 7.7.1* |
| Leeward Drift Height, $h_{d,leeward}$ (ft) | 4.28 | *Figure C7.7-3* |
| $h_c$ (ft) | 0.04 | $h_r - h_b$ |
| Design Drift Height, $h_d$ (ft) | **0.04** | *Section 7.7.1* |
| Design Drift Width, w (ft) | **25.70** | *Section 7.7.1* |
| Maximum Drift Surcharge Load, $p_d$ (psf) | **1.20** | *Section 7.7.1* |

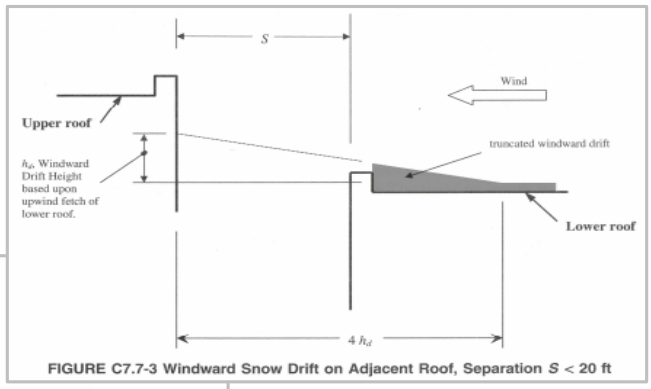


FIGURE C7.7-3 Windward Snow Drift on Adjacent Roof, Separation $S$ < 20 ft

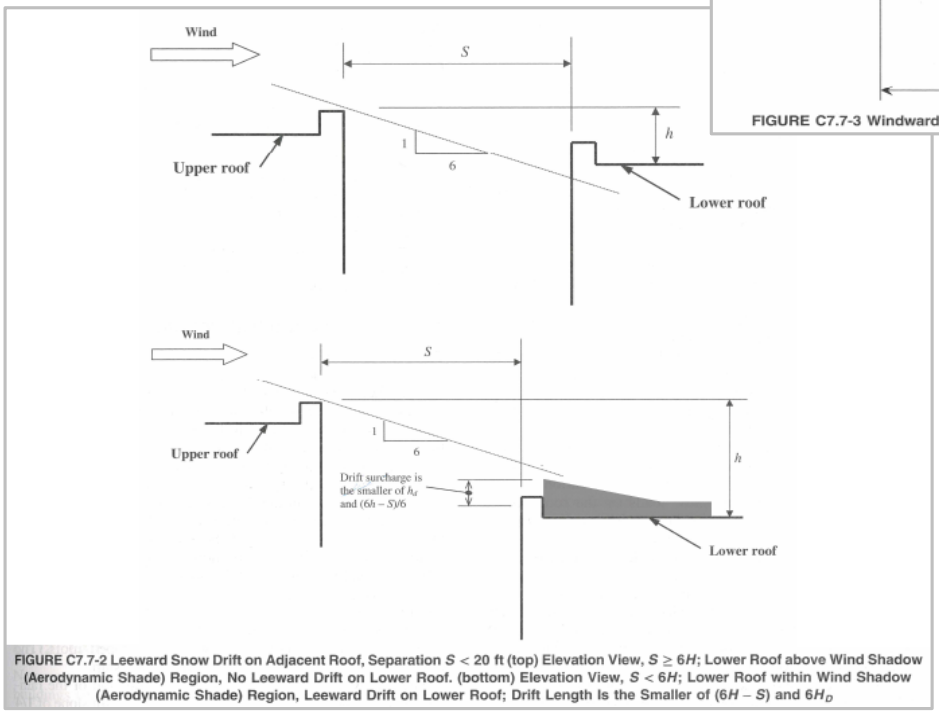


FIGURE C7.7-2 Leeward Snow Drift on Adjacent Roof, Separation $S$ < 20 ft (top) Elevation View, $S \geq 6H$; Lower Roof above Wind Shadow (Aerodynamic Shade) Region, No Leeward Drift on Lower Roof. (bottom) Elevation View, $S < 6H$; Lower Roof within Wind Shadow (Aerodynamic Shade) Region, Leeward Drift on Lower Roof; Drift Length Is the Smaller of $(6H - S)$ and $6H_D$

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## SNOW DRIFT ANALYSIS - DRIFTS DUE TO ADJACENT STRUCTURES
## RAMP

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

*Design Parameters*

| | |
|---|---|
| Surface Roughness Category | C |
| Roof Exposure | Partially Exposed |
| Thermal Conditions | All other structures |
| Roof Surface | Non-Slippery (Rough) |
| Obstructed? | No |
| Roof Pitch | 1 /12 |
| Roof Angle, θ | 4.8 |
| Snow Drift Analysis Required? | Yes |

| | | | | | |
|---|---|---|---|---|---|
| Ground Snow Load, $p_g$ (psf) | 384 | *Utah Snow Load Study* | Snow Density, γ (pcf) | 30.0 | *Equation 7.7-1* |
| Exposure Factor, $C_e$ | 1.00 | *Table 7.3-1* | Balanced Snow Load Height, $h_b$ (ft) | 8.96 | $p_f / \gamma$ |
| Thermal Factor, $C_t$ | 1.00 | *Table 7.3-2* | Horizontal Separation, s (ft) | 0.0 | |
| Importance Factor, $I_s$ | 1.00 | *Table 1.5-2* | Vertical Separation, h (ft) | 13.0 | |
| Slope Factor, $C_s$: | 1.00 | *Figure 7.4-1* | Length of Upper Roof, $L_u$ (ft) | 45.0 | |
| Flat Roof Snow Load, $p_f$ (psf) | 269 | *Equation 7.3-1* | Length of Lower Roof, $L_L$ (ft) | 6.5 | |
| Sloped Snow Load, $p_s$ (psf): | 269 | *Equation 7.4-1* | | | |

*Snow Drift Analysis*

| | | |
|---|---|---|
| Full Windward Drift Height, $h_{d,full\ windward}$ (ft) | 2.78 | *Section 7.7.1* |
| runcated Windward Drift Height, $h_{d,windward}$ (ft) | 2.78 | *Figure C7.7-3* |
| Full Leeward Drift Height, $h_{d,full\ leeward}$ (ft) | 3.90 | *Section 7.7.1* |
| Leeward Drift Height, $h_{d,leeward}$ (ft) | 3.90 | *Figure C7.7-3* |
| $h_c$ (ft) | 4.04 | $h_r - h_b$ |
| Design Drift Height, $h_d$ (ft) | **3.90** | *Section 7.7.1* |
| Design Drift Width, w (ft) | **23.40** | *Section 7.7.1* |
| Maximum Drift Surcharge Load, $p_d$ (psf) | **117.00** | *Section 7.7.1* |

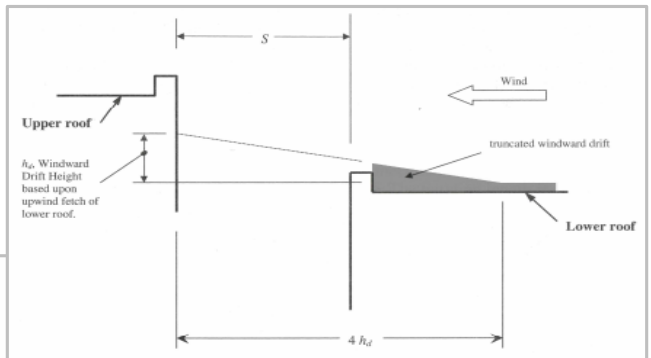


FIGURE C7.7-3 Windward Snow Drift on Adjacent Roof, Separation $S$ < 20 ft

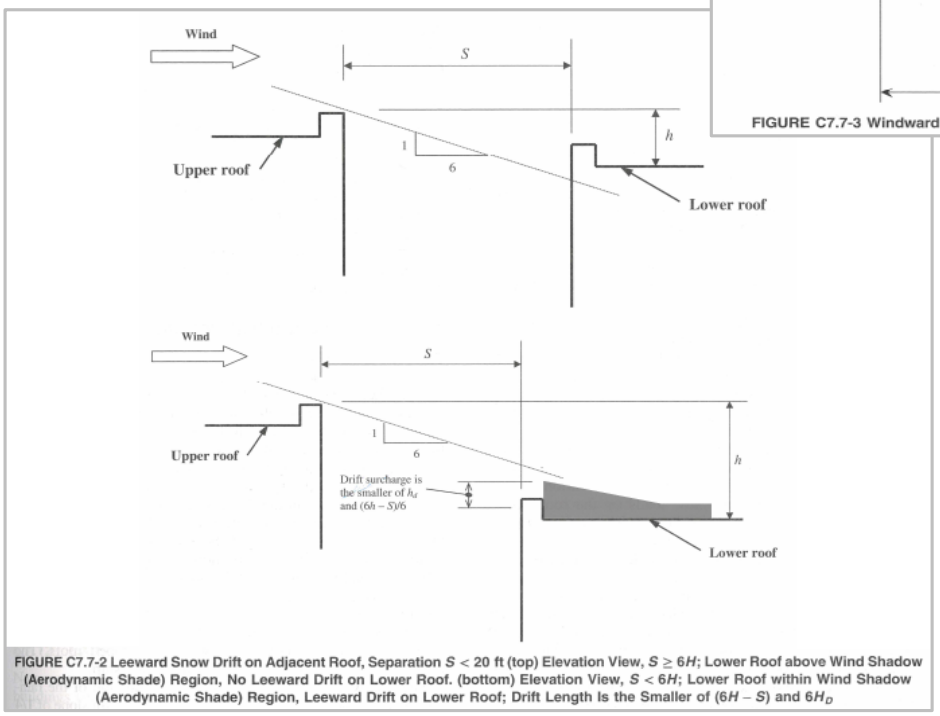


FIGURE C7.7-2 Leeward Snow Drift on Adjacent Roof, Separation $S$ < 20 ft (top) Elevation View, $S \geq 6H$; Lower Roof above Wind Shadow (Aerodynamic Shade) Region, No Leeward Drift on Lower Roof. (bottom) Elevation View, $S < 6H$; Lower Roof within Wind Shadow (Aerodynamic Shade) Region, Leeward Drift on Lower Roof; Drift Length Is the Smaller of $(6H - S)$ and $6H_D$

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## SEISMIC FORCE ANALYSIS - EQUIVALENT LATERAL FORCE PROCEDURE

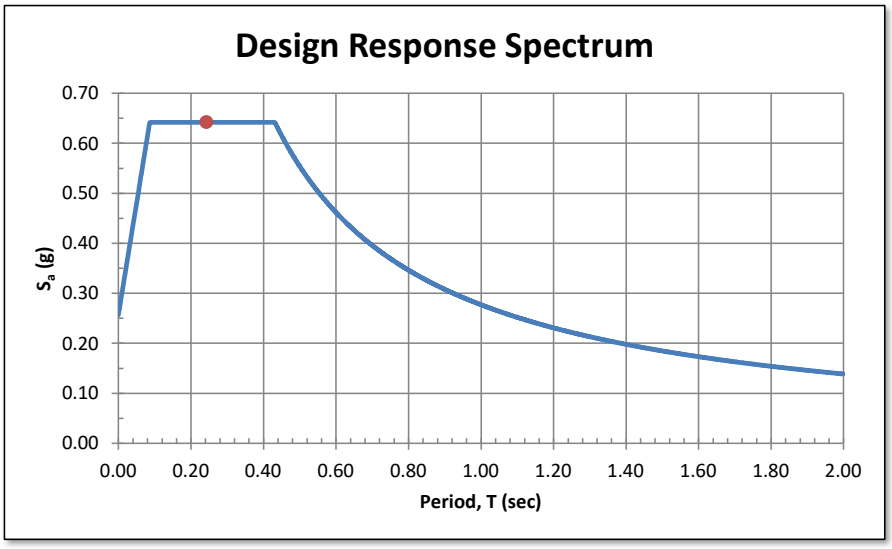
*CHAPTER 12, ASCE 7-16* — *IBC 2018 / ASCE 7-16*

*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) | 0.243 | *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, $\Omega_0$ | 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) | 28 | | $C_{S\ MAX}$ | 0.683 | *Equation 12.8-3 & 12.8-4* |
| Number of Stories | 2 | | $C_{S\ MIN}$ | 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 | 69 | 2,878 | 197.89 | 24 | 4,749.39 | 58.79 | 41.16 |
| Loft Roof + Seismic Snow | 69 | 674 | 46.34 | 26 | 1,204.95 | 14.92 | 10.44 |
| Walls | 30 | 2,257 | 67.70 | 24 | 1,624.68 | 20.11 | 14.08 |
| | | | - | | - | - | - |
| | | | - | | - | - | - |
| *Main Level:* | | | - | | - | - | - |
| Level 3 Floor | 20 | 2,992 | 59.84 | 10 | 598.40 | 7.41 | 5.19 |
| Walls | 30 | 1,460 | 43.80 | 10 | 438.00 | 5.42 | 3.80 |
| | | | - | | - | - | - |
| | | | - | | - | - | - |
| | | | - | | - | - | - |
| | | $\Sigma w_i$ | 416 | $\Sigma w_i h_i^k$ | 8,615 | **$V_x$ (kips)** | **106.65** |
| *Notes:* | | | | k | 1 | $0.7V_x$ (kips) | 74.66 |



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## 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*

| 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 | 97.71 | 97.7 | 311.93 | 311.9 | 97.7 | 40.0 | 80.1 | **80.1** | 1.00 |
| Main | 12.83 | 110.5 | 103.64 | 415.6 | 27.6 | 13.3 | 26.6 | **26.6** | 2.07 |
| | | - | | - | - | - | - | **-** | - |
| | | - | | - | - | - | - | **-** | - |
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## 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) | 28 | |
| Number of Stories | 2 | |
| 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** | 45 | 10 | 2 | 1.45 | **223** |
| | | - | | | | - | - |
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## 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) | 8,557 | | $L_h$ (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) | 24 | | Height Attenuation, γ | N/A | *Table 26.8-1* |
| Building Length, L (ft) | 70 | | $K_1$ / (H / $L_h$) | N/A | *Table 26.8-1* |
| Building Width, B (ft) | 70 | | $K_1$ | 0.00 | *Table 26.8-1* |
| L/B | 1.00 | | $K_2$ | 0.00 | *Table 26.8-1* |
| h/L | 0.34 | | $K_3$ | 0.00 | *Table 26.8-1* |
| Roof Pitch | 1 | /12 | Topographic Factor, $K_{zt}$ at h | 1.00 | *Section 26.8* |
| Roof Angle, θ | 4.8 | | Wind Directionality Factor, $K_d$ | 0.85 | *Section 26.6* |
| Terrain Constant, α | 9.5 | *Table 26.11-1* | Ground Elevation Factor, $K_e$ | 0.73 | *Section 26.9* |
| Terrain Constant, $z_g$ (ft) | 900 | *Table 26.11-1* | Gust Effect Factor, G | 0.85 | *Section 26.11* |
| Exposure Coefficient, $K_h$ | 0.937 | *Table 26.10-1* | **Velocity Pressure, $q_h$ (psf)** | **16.18** | *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) | | | | |
| Gable | Wall | 24 | 0.937 | 16.2 | 8.09 | -9.79 | -12.54 | - | - |
| Upper Wall | Wall | 15 | 0.849 | 14.7 | 7.05 | -9.79 | -12.54 | - | - |
| Main Wall | Wall | 5 | 0.849 | 14.7 | 7.05 | -9.79 | -12.54 | - | - |
| | | | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - |

| Roof Type | Pressure Coefficients, $C_p$ | *Roof* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 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 | |
| | | -0.77 | -0.37 | -0.90 | -0.90 | -0.50 | -0.30 | |
| | | -0.18 | -0.37 | -0.18 | -0.18 | -0.18 | -0.18 | 0.80 |
| Surface Mark | Surface Type | Wind Pressure, p (psf) | | | | | | |
| Gable | Wall | - | - | - | - | - | - | - |
| Upper Wall | Wall | - | - | - | - | - | - | - |
| Main Wall | 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) | |
|---|---|---|---|---|---|---|---|---|
| Gable | Wall | Both | 17.88 | 3 | 53.6 | 42 | 2.3 | |
| Upper Wall | Wall | Both | 16.84 | 8 | 134.8 | 70 | 9.4 | Total Design Base Shear |
| Main Wall | Wall | Both | 16.84 | 10 | 168.4 | 70 | 11.8 | |
| - | | Both | - | | - | | - | LRFD / ASD |
| - | | Both | - | | - | | - | $V_x$ (kips) / $0.6V_x$ (kips) |
| - | | Both | - | | - | | - | **23.5** / **14.1** |

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80 | Project No.: 9085A
By: Alex Hawkins, PE | Checked By: DAJ
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) | 8,557 | | $L_h$ (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) | 24 | | Height Attenuation, γ | N/A | *Table 26.8-1* |
| Building Length, L (ft) | 70 | | $K_1$ / (H / $L_h$) | N/A | *Table 26.8-1* |
| Building Width, B (ft) | 70 | | $K_1$ | 0.00 | *Table 26.8-1* |
| L/B | 1.00 | | $K_2$ | 0.00 | *Table 26.8-1* |
| h/L | 0.34 | | $K_3$ | 0.00 | *Table 26.8-1* |
| Roof Pitch | 1 | /12 | Topographic Factor, $K_{zt}$ at h | 1.00 | *Section 26.8* |
| Roof Angle, θ | 4.8 | | Wind Directionality Factor, $K_d$ | 0.85 | *Section 26.6* |
| Terrain Constant, α | 9.5 | *Table 26.11-1* | Ground Elevation Factor, $K_e$ | 0.73 | *Section 26.9* |
| Terrain Constant, $z_g$ (ft) | 900 | *Table 26.11-1* | Gust Effect Factor, G | 0.85 | *Section 26.11* |
| Exposure Coefficient, $K_h$ | 0.937 | *Table 26.10-1* | **Velocity Pressure, $q_h$ (psf)** | **16.18** | *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 | 15 | 0.849 | 14.7 | 7.05 | -9.79 | -12.54 | - | - |
| Main Wall | Wall | 5 | 0.849 | 14.7 | 7.05 | -9.79 | -12.54 | - | - |
| | | | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - |

| 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 | |
| | | -0.77 | -0.37 | -0.90 | -0.90 | -0.50 | -0.30 | |
| | | -0.18 | -0.37 | -0.18 | -0.18 | -0.18 | -0.18 | 0.80 |
| Surface Mark | Surface Type | Wind Pressure, p (psf) | | | | | | |
| Upper Wall | Wall | - | - | - | - | - | - | - |
| Main Wall | 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 | 16.84 | 8 | 134.8 | 78 | 10.5 | |
| Main Wall | Wall | Both | 16.84 | 10 | 168.4 | 78 | 13.1 | Total Design Base Shear |
| - | | Both | - | | - | | - | |
| - | | Both | - | | - | | - | LRFD / ASD |
| - | | Both | - | | - | | - | $V_x$ (kips) / $0.6V_x$ (kips) |
| - | | Both | - | | - | | - | **23.6** / **14.2** |

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80 | Project No.: 9085A
By: Alex Hawkins, PE | Checked By: DAJ
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? | No | |
| Exposure Category | C | *Section 26.7* | Height of Hill or Ridge, H (ft) | N/A | *Table 26.8-1* |
| Ground Elevation (ft) | 8,557 | | $L_h$ (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) | 24 | | Height Attenuation, γ | N/A | *Table 26.8-1* |
| Building Length, L (ft) | 78 | | $K_1 / (H / L_h)$ | N/A | *Table 26.8-1* |
| Building Width, B (ft) | 70 | | $K_1$ | 0.00 | *Table 26.8-1* |
| h/B | 0.34 | | $K_2$ | 0.00 | *Table 26.8-1* |
| Roof Type | Monoslope | | $K_3$ | 0.00 | *Table 26.8-1* |
| Roof Pitch | 1 | /12 | Topographic Factor, $K_{zt}$ at h | 1.00 | *Section 26.8* |
| Roof Angle, θ | 4.8 | | Wind Directionality Factor, $K_d$ | 0.85 | *Section 26.6* |
| Is there a Parapet? | No | | Ground Elevation Factor, $K_e$ | 0.73 | *Section 26.9* |
| Parapet Height, $h_p$ (ft) | N/A | | **Velocity Pressure, $q_h$ (psf)** | **16.18** | *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, $K_h$ | 0.937 | *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 7-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 14-ft of upper roof ridge & within 28-ft of roof sid | -2.6 | -2.3 | -1.9 | -1.6 | -1.6 |
| | Zone 3: Within 14-ft of lower roof corners | -1.8 | -1.7 | -1.4 | -1.2 | -1.2 |
| | Zone 2': Within 14-ft of upper roof edge & side edges | -1.6 | -1.6 | -1.6 | -1.5 | -1.5 |
| | Zone 2: Within 7-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 7-ft of building corner | | -23.3 | -21.8 | -19.7 | -18.2 | -16.0 |
| | Zone 4: All other areas | | -18.9 | -18.2 | -17.5 | -16.4 | -16.0 |
| | Zone 4 & 5: Positive Pressures | | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 |
| Roof | Zone 3': Within 14-ft of upper roof ridge & within 28-ft of roof sid | | -45.0 | -40.1 | -33.7 | -28.8 | -28.8 |
| | Zone 3: Within 14-ft of lower roof corners | | -32.0 | -29.6 | -25.6 | -22.3 | -22.3 |
| | Zone 2': Within 14-ft of upper roof edge & side edges | | -28.8 | -28.8 | -28.0 | -27.2 | -27.2 |
| | Zone 2: Within 7-ft of lower roof edge | | -23.9 | -25.2 | -23.1 | -22.3 | -22.3 |
| | Zone 1: Roof field | | -20.7 | -20.7 | -20.7 | -20.7 | -20.7 |
| | All Zones: Positive Pressures | | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 |
| Parapets | N/A | A | - | - | - | - | - |
| | | B | - | - | - | - | - |
| | N/A | A | - | - | - | - | - |
| | | B | - | - | - | - | - |

# Hazards by Location

## Search Information

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

**Coordinates:** 41.378963, -111.780685

**Elevation:** ft

**Timestamp:** 2019-10-01T22:27:52.542Z

**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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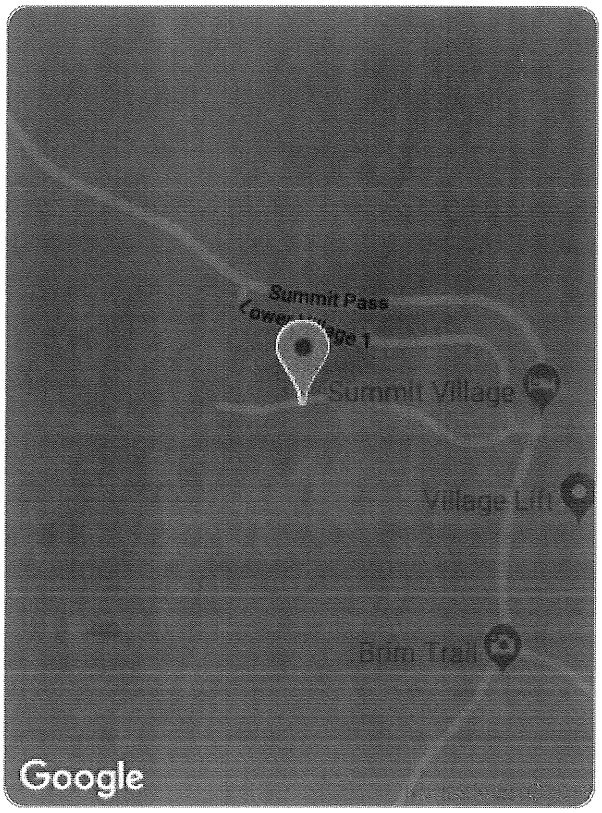
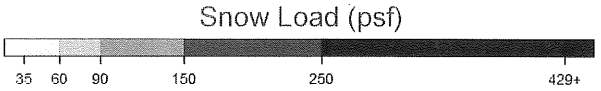
this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

# 2018 Utah Ground Snow Load Map

**Latitude:** 41.363
**Longitude:** -111.747
**Elevation:** 8,557 ft

**Ground Snow Load:**
384 psf / 18.43 kPa
269 psf ROOF SNOW LOAD




*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.*

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80
By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

## SHEAR WALL SCHEDULE

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

| Mark | Nailing Requirements (in) | | Notes | $V_{allow}$ (8) Seismic (plf) | $V_{allow}$ (8) Wind (plf) | Sole Plate Nailing (10 & 13) (Sole Plate to 2x blocking or rim) |
|---|---|---|---|---|---|---|
| | Edge | Field | | | | |
| SW1 | 6 | 12 | 1,2,3 | 260 | 365 | 16d common @ 6" o.c. |
| SW2 | 4 | 12 | 1,2,3 | 350 | 490 | 16d common @ 4" o.c. |
| SW3 | 4 | 12 | 1,2,3,4 | 380 | 532 | 16d common @ 4" o.c. |
| SW4 | 3 | 12 | 1,2,3,4 | 490 | 685 | (2) 16d common @ 6" o.c. |
| SW5 | 2 | 12 | 1,2,3,4 | 640 | 895 | (2) 16d common @ 6" o.c. |
| SW6 | 2 | 12 | 1,3,4,6 | 770 | 1078 | (2) 16d common @ 4" o.c. |
| SW7 | 3 | 12 | 1,2,3,4,5 | 980 | 1370 | (2) SDS screws @ 6" o.c. |
| SW8 | 2 | 12 | 1,2,3,4,5,11 | 1280 | 1790 | (2) SDS screws @ 4" o.c. |
| SW9 | 2 | 12 | 1,3,4,5,6,11 | 1540 | 2155 | (2) SDS screws @ 4" o.c. |
| SW10 | 2 | 12 | 1,3,4,5,7,11 | 1740 | 2435 | (2) SDS screws @ 3" o.c. |

Notes:

1. 16 inch o.c. max stud spacing or panels applied with the long dimension across the studs per AF&PA SDPWS table 4.3A note 2.
2. 7/16" APA rated sheathing panel with 8d common or galvanized box nails.
3. Block all edges.
4. 3" nominal framing at abutting panel edges (AF&PA SDPWS 4.3.7.1.5.c)
5. Sheathing applied to both sides of wall
6. 15/32" APA rated sheathing with 10d common or galvanized box nails
7. 15/32" APA Structural I rated sheathing with 10d common or galvanized box nails
8. Allowable shear values per AF&PA SDPWS table 4.3A.
9. For all walls, provide hot dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper nails at preservative-treated and fire-retardant-treated wood locations.
10. SDS screws to be 4.5" minimum length and penetrate 2" into rim board or blocking
11. SDS screws must be into 2x DFL blocking or 2x DFL rim board (not LVL or LSL)
12. Where panels are applied to both faces of the wall and nail spacing is less than 6" on center on either side offset panel joints to different framing members.
13. If (2) SDS screws are required on the sole plate nailing 2x blocking must be provided adjacent to rimboard or (2) 2x blocks must be provided. SDS screws require 5/8" edge and 3" end distance.

### STAPLE EQUIVALENCY CHART

| Staple Type | Stapling Requirements | | $V_{allow}$ (8) Seismic (plf) | Equivalent to Nailed Shearwall designated above: | $V_{allow}$ (8) Wind (plf) | Equivalent to Nailed Shearwall designated above: |
|---|---|---|---|---|---|---|
| | Edge | Field | | | | |
| 16 Gage 1 1/2" Staples | 6" | 6" | 155 | NONE | 215 | NONE |
| | 4" | 6" | 230 | NONE | 320 | NONE |
| | 3" | 6" | 310 | SW1 | 435 | SW1 |
| | 2" | 6" | 395 | SW2 and SW3 | 555 | SW2 and SW3 |

Notes:

1. Minimum staple penetration into main member is 1".
2. Staples shall have a minimum crown width of 7/16".
3. Install staple crown parallel to the long dimension of the framing member.
4. Where staple spacing is 2" or less, framing at adjoining panel edges shall be 3" nominal.
5. Provide 3/8" distance from panel edge to staple.
6. Table valid for shearwalls only.
7. Provide hot dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper staples at perservative-treated and fire-retardant- treated wood locations.
8. Allowable shear values per ICC-ES Evaluation Report ESR-1539 and IBC 2018 Table 2306.3(1).
9. Allowable shear values shown are based on 7/16" nominal sheathing thickness.

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80
By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

## 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 |

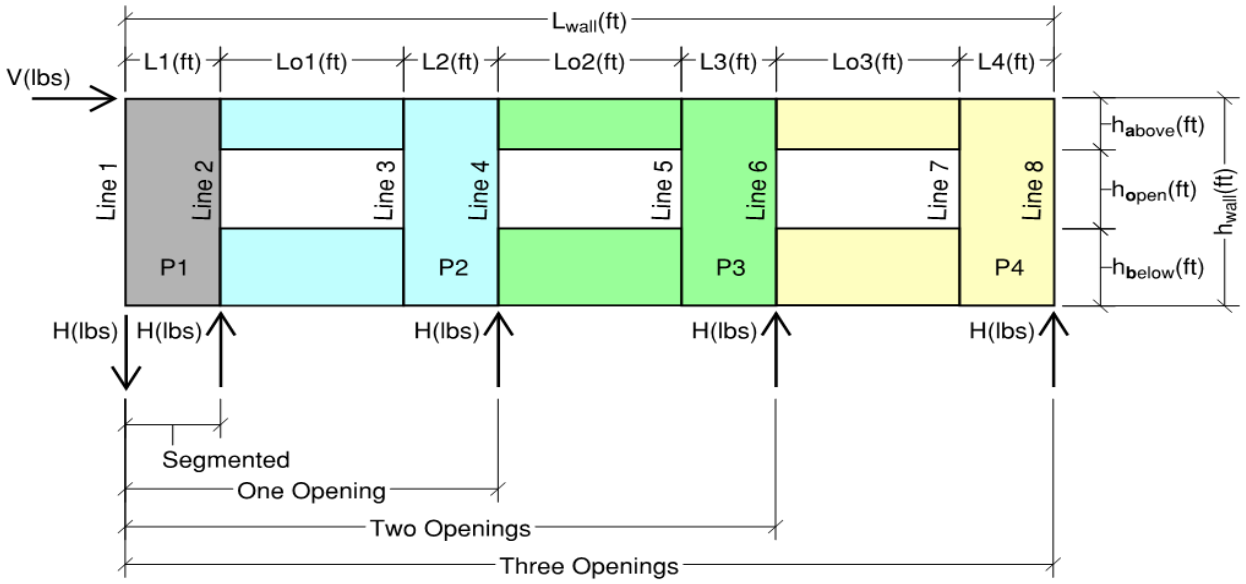
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Loft** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **8,250** | lbs |
| **East Wall** | Seismic Force on Wall Line: | 5,221 | lbs | # of Dowels | 3 | | **OK** | |
| **Loft** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **5,500** | lbs |
| **West Wall** | Seismic Force on Wall Line: | 5,221 | lbs | # of Dowels: | 2 | | **OK** | |
| **Loft** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **8,250** | lbs |
| **North Wall** | Seismic Force on Wall Line: | 5,221 | lbs | # of Dowels | 3 | | **OK** | |
| **Loft** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **5,500** | lbs |
| **South Wall** | Seismic Force on Wall Line: | 5,221 | lbs | # of Dowels: | 2 | | **OK** | |
| **Grid 1** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **16,500** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 16,424 | lbs | # of Dowels | 6 | | **OK** | |
| | | | | Length (ft): | 37 | Anchor Bolts: | **AB32** | |
| **Grid 2** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **16,500** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 16,500 | lbs | # of Dowels: | 6 | | **OK** | |
| | SW-10 | 28,294 | | Length (ft): | 17 | Anchor Bolts: | **AB16** | |
| **Grid 3** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **11,688** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 13,438 | lbs | # of Dowels | 4 | | **NG** | |
| | Concrete Shear Walls | | | Length (ft): | 37 | Anchor Bolts: | **AB32** | |
| **Grid A** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **13,750** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 13,065 | lbs | # of Dowels | 5 | | **OK** | |
| | | | | Length (ft): | 15 | Anchor Bolts: | **AB16** | |
| **Grid B** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **22,000** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 21,650 | lbs | # of Dowels: | 8 | | **OK** | |
| | | | | Length (ft): | 10 | Anchor Bolts: | **AB8** | |
| **Grid C** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **24,750** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 24,263 | lbs | # of Dowels | 9 | | **OK** | |
| | | | | Length (ft): | 24 | Anchor Bolts: | **AB16** | |
| **Grid D** | Wind Force on Wall Line: | | lbs | lbs / Dowel: | 2,750 | Total: | **16,500** | lbs |
| **Main Floor** | Seismic Force on Wall Line: | 15,678 | lbs | # of Dowels: | 6 | | **OK** | |
| | | | | Length (ft): | 13 | Anchor Bolts: | **AB8** | |

ENSIGN
THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80
By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

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




444

1000

363

871

2165

1032

1206

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THE STANDARD IN ENGINEERING

Project: Powder Mountain Lot 80
By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

**Grid 2**
**1st Floor**

Wind Force on Wall Line: lbs
Seismic Force on Wall Line: 28,294 lbs

| Wall ID | # of Walls | SEG or PSW or FTAO | Wall Segment and Opening Lengths | | | | | | | Length (ft) | Wall Height (ft) | Proportions of Wall Height | | | H:W Ratio | Aspect Ratio Reduct. | Effective Length ($2b_s/h$)*L | Co, PSW Reduct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L1 (ft) | Lo1 (ft) | L2 (ft) | Lo2 (ft) | L3 (ft) | Lo3 (ft) | L4 (ft) | | | ha (ft) | ho (ft) | hb (ft) | | | | |
| 1 | 1 | SEG | 17.00 | | | | | | | 17.00 | 11.00 | | | 11.0 | 0.65 | 1.00 | 17.00 | 1.00 |

**Grid 2.4**
**Basement**

Wind Force on Wall Line: lbs
Seismic Force on Wall Line: 2,680 lbs

| Wall ID | # of Walls | SEG or PSW or FTAO | Wall Segment and Opening Lengths | | | | | | | Length (ft) | Wall Height (ft) | Proportions of Wall Height | | | H:W Ratio | Aspect Ratio Reduct. | Effective Length ($2b_s/h$)*L | Co, PSW Reduct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L1 (ft) | Lo1 (ft) | L2 (ft) | Lo2 (ft) | L3 (ft) | Lo3 (ft) | L4 (ft) | | | ha (ft) | ho (ft) | hb (ft) | | | | |
| 1 | 1 | SEG | 3.00 | | | | | | | 3.00 | 9.50 | | | 9.5 | 3.17 | 0.63 | 1.89 | 1.00 |
| 2 | 1 | SEG | 5.50 | | | | | | | 5.50 | 9.50 | | | 9.5 | 1.73 | 1.00 | 5.50 | 1.00 |

**Grid B (3 Dowels)**
**Basement**

Wind Force on Wall Line: lbs
Seismic Force on Wall Line: 8,119 lbs

| Wall ID | # of Walls | SEG or PSW or FTAO | Wall Segment and Opening Lengths | | | | | | | Length (ft) | Wall Height (ft) | Proportions of Wall Height | | | H:W Ratio | Aspect Ratio Reduct. | Effective Length ($2b_s/h$)*L | Co, PSW Reduct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L1 (ft) | Lo1 (ft) | L2 (ft) | Lo2 (ft) | L3 (ft) | Lo3 (ft) | L4 (ft) | | | ha (ft) | ho (ft) | hb (ft) | | | | |
| 1 | 1 | SEG | 5.00 | | | | | | | 5.00 | 9.50 | | | 9.5 | 1.90 | 1.00 | 5.00 | 1.00 |

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By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

**Grid 2**
**1st Floor**

| Wall ID | Total Length (ft) | Uniform DL (plf) | Wind Uplift (lb) | Seismic Uplift (lb) | FTAO Strap Force | Req'd FTAO Strap | Wind Shear (plf) | Seismic Shear (plf) | Use Shear Wall | Holdown Type | Holdown Required | Allowable Story Drift Seismic (in) | Shear Wall Drift Seismic (in) | Wind Deflection Limit (in) | Shear Wall Deflection Wind (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17.00 | 1032 | 0 | 14109 | NA | NA | 0 | 1664 | **SW10** | Concrete Rod | **H-7** | 2.640 | 1.587 | 0.733 | 0.000 |

Anchor Bolt Size (inches): 5/8
Anchor Bolt Designation: **AB8**

**Grid 2.4**
**Basement**

| Wall ID | Total Length (ft) | Uniform DL (plf) | Wind Uplift (lb) | Seismic Uplift (lb) | FTAO Strap Force | Req'd FTAO Strap | Wind Shear (plf) | Seismic Shear (plf) | Use Shear Wall | Holdown Type | Holdown Required | Allowable Story Drift Seismic (in) | Shear Wall Drift Seismic (in) | Wind Deflection Limit (in) | Shear Wall Deflection Wind (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.89 | 390 | 0 | 3605 | NA | NA | 0 | 362 | **SW3** | STHD MID | **H-13** | 2.280 | 2.654 | 0.633 | 0.000 |
| 2 | 5.50 | 390 | 0 | 3083 | NA | NA | 0 | 362 | **SW3** | STHD MID | **H-12** | 2.280 | 1.866 | 0.633 | 0.000 |

Anchor Bolt Size (inches): 5/8
Anchor Bolt Designation: **AB32**

**Grid B (3 Dowels)**
**Basement**

| Wall ID | Total Length (ft) | Uniform DL (plf) | Wind Uplift (lb) | Seismic Uplift (lb) | FTAO Strap Force | Req'd FTAO Strap | Wind Shear (plf) | Seismic Shear (plf) | Use Shear Wall | Holdown Type | Holdown Required | Allowable Story Drift Seismic (in) | Shear Wall Drift Seismic (in) | Wind Deflection Limit (in) | Shear Wall Deflection Wind (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 743.9 | 0 | 15511 | NA | NA | 0 | 1624 | **SW10** | Concrete Rod | **H-9** | 2.280 | 2.509 | 0.633 | 0.000 |

Anchor Bolt Size (inches): 5/8
Anchor Bolt Designation: **AB8**

ENSIGN
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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.

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## 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 |

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By: Alex Hawkins, PE
Date: November 2019

Project No.: 9085A
Checked By: DAJ

## 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.

**Current Date:** 11/14/2019 12:42 PM
**Units system:** English
**File name:** P:\9085A Pow Mow Lot 80 Scandinavian\Structural Calcs\Concrete Wall.cwd\

# Design Results

## Concrete Wall

**GENERAL INFORMATION:**

**Global status : Warnings in design**

| | | |
|---|---|---|
| Design code | : | ACI 318-14 |

**Geometry:**

| | | |
|---|---|---|
| Total height | : | 28.00 [ft] |
| Total length | : | 2.33 [ft] |
| Base support type | : | Continuous |
| Wall bottom restraint | : | Fixed |
| Column bottom restraint | : | Fixed |
| Rigidity elements | : | None |

**Materials:**

| | | |
|---|---|---|
| Material | : | C 4-60 |
| Steel tension strength (Fy) | : | 60 [Kip/in2] |
| Concrete compressive strength (fc) | : | 4 [Kip/in2] |
| Steel elasticity modulus (Es) | : | 29000 [Kip/in2] |
| Concrete modulus of elasticity (E) | : | 3605 [Kip/in2] |
| Concrete unit weight | : | 0.149818 [Kip/ft3] |

**Number of stories:** 2

| Story | Story height [ft] | Wall thickness [in] |
|---|---|---|
| 1 | 10.50 | 8.00 |
| 2 | 14.50 | 8.00 |

**Load conditions:**

| ID | Comb. | Category | Description |
|---|---|---|---|
| DL | No | DL | Dead Load |
| SL | No | SNOW | Snow Load |
| LL | No | LL | Live Load |
| EQ | No | EQ | Earthquake Load |
| SC1 | Yes | | DL |
| DC1 | Yes | | 1.4DL |
| D1 | Yes | | 1.4DL |
| D2 | Yes | | 1.2DL+1.6LL |
| D3 | Yes | | 1.2DL+0.5SL |
| D4 | Yes | | 1.2DL+1.6LL+0.5SL |
| D5 | Yes | | 1.2DL+1.6SL |
| D6 | Yes | | 1.2DL+1.6SL+LL |
| D7 | Yes | | 1.2DL+0.2SL |
| D8 | Yes | | 1.2DL+EQ |
| D9 | Yes | | 1.2DL+LL+0.2SL |
| D10 | Yes | | 1.2DL+EQ+0.2SL |
| D11 | Yes | | 1.2DL+EQ+LL |
| D12 | Yes | | 1.2DL+EQ+LL+0.2SL |

D13 Yes 0.9DL+EQ

**Concentrated loads:**

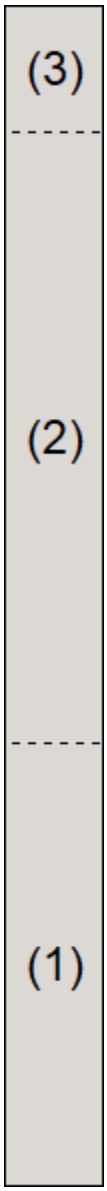
| Story | Condition | Direction | Magnitude [Kip] | Eccentricity [in] | Distance [ft] |
|---|---|---|---|---|---|
| 2 | DL | Vertical | 2.00 | 0.00 | 1.17 |
| 1 | DL | Vertical | 2.67 | 0.00 | 1.17 |
| 2 | SL | Vertical | 35.85 | 0.00 | 1.17 |
| 1 | LL | Vertical | 5.33 | 0.00 | 1.17 |
| 2 | EQ | Horizontal | 7.10 | 0.00 | 0.00 |
| 1 | EQ | Horizontal | 1.20 | 0.00 | 0.00 |

**Distributed loads:**

Consider self weight : DL

**BEARING WALL DESIGN:**

**Status** : OK




**Geometry:**

| Segment | X Coordinate [ft] | Y Coordinate [ft] | Width [ft] | Height [ft] |
|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 2.33 | 10.50 |
| 2 | 0.00 | 10.50 | 2.33 | 14.50 |
| 3 | 0.00 | 25.00 | 2.33 | 3.00 |

**Vertical reinforcement:**

Reinforcement layers : 2

| Segment | Bars | Spacing [in] | Ld [in] |
|---|---|---|---|
| 1 | 5-#6 | 6.00 | 28.46 |
| 2 | 5-#6 | 6.00 | 28.46 |
| 3 | 5-#6 | 6.00 | 28.46 |

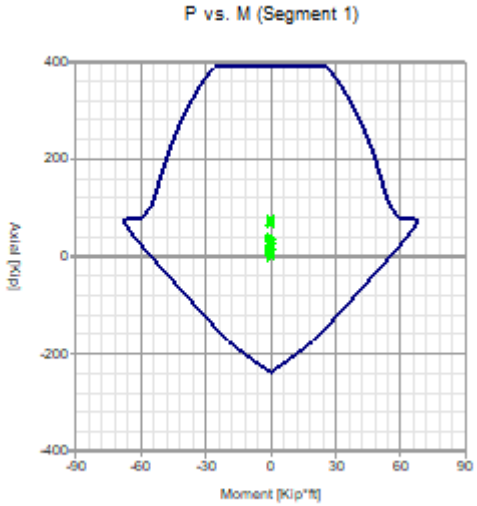
**Intermediate results for axial-bending**

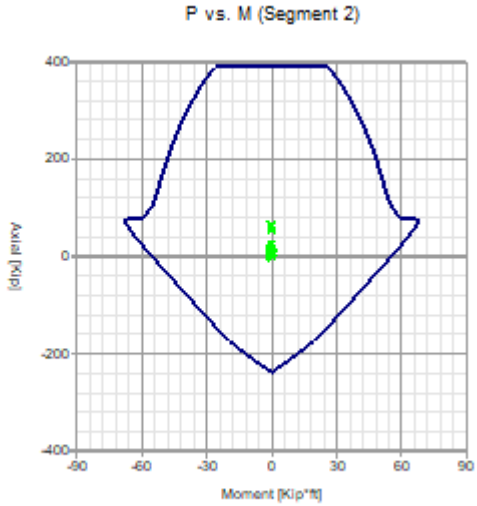
| Segment | Condition | c [in] | d [in] |
|---|---|---|---|
| 1 | DC1 (Top) | 1.81 | 6.25 |
| 2 | DC1 (Top) | 1.75 | 6.25 |
| 3 | DC1 (Top) | 1.73 | 6.25 |

**Combined axial flexure**

| Segment | Condition | Pu [Kip] | Mu [Kip*ft] | ϕ*Mn [Kip*ft] | Mu/ϕ*Mn |
|---|---|---|---|---|---|
| 1 | DC1 (Top) | 12.08 | 0.00 | 57.58 | 0.00 |
| 2 | DC1 (Top) | 3.67 | 0.00 | 55.90 | 0.00 |
| 3 | DC1 (Top) | 0.10 | 0.00 | 55.19 | 0.00 |

**Interaction diagrams, P vs. M:**




**Axial compression**

| Segment | Condition | Pu [Kip] | ϕ*Pn [Kip] | Pu/ϕ*Pn |
|---|---|---|---|---|
| 1 | D6 (Bottom) | 75.87 | 388.25 | 0.20 |
| 2 | D6 (Bottom) | 65.26 | 388.25 | 0.17 |
| 3 | D5 (Bottom) | 5.45 | 388.25 | 0.01 |

**Axial tension**

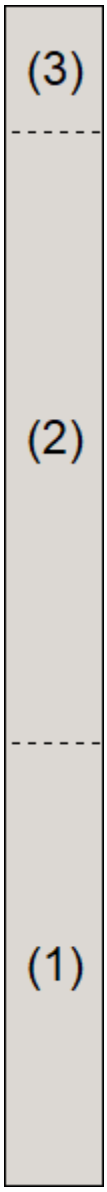
| Segment | Condition | Pu [Kip] | ϕ*Pn [Kip] | Pu/ϕ*Pn | |
|---|---|---|---|---|---|
| 1 | DC1 (Top) | 0.00 | 237.60 | 0.00 | |
| 2 | DC1 (Top) | 0.00 | 237.60 | 0.00 | |
| 3 | D5 (Top) | 0.30 | 237.60 | 0.00 | |

**Shear**

| Segment | Condition | Vu [Kip] | ϕ*Vn [Kip] | Vu/ϕ*Vn | |
|---|---|---|---|---|---|
| 1 | DC1 (Top) | 0.000 | 16.602 | 0.00 | |
| 2 | DC1 (Top) | 0.000 | 16.602 | 0.00 | |
| 3 | DC1 (Top) | 0.000 | 16.602 | 0.00 | |

**SHEAR WALL DESIGN:**

**Status : Warnings in design**
**- Hoops required, Section 11.7.4.1, 18.10.6.5 (Segment 1)**




**Geometry:**

| Segment | X Coordinate [ft] | Y Coordinate [ft] | Width [ft] | Height [ft] |
|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 2.33 | 10.50 |
| 2 | 0.00 | 10.50 | 2.33 | 14.50 |
| 3 | 0.00 | 25.00 | 2.33 | 3.00 |

**Reinforcement:**

Reinforcement layers : 2

| Segment | Vertical reinforcement Bars | Spacing [in] | Ld [in] | Horizontal reinforcement Bars | Spacing [in] | Ld [in] |
|---|---|---|---|---|---|---|
| 1 | 5-#6 | 6.00 | 28.46 | 31-#5 | 4.00 | 30.83 |
| 2 | 5-#6 | 6.00 | 28.46 | 22-#5 | 8.00 | 30.83 |
| 3 | 5-#6 | 6.00 | 28.46 | 5-#5 | 8.00 | 30.83 |

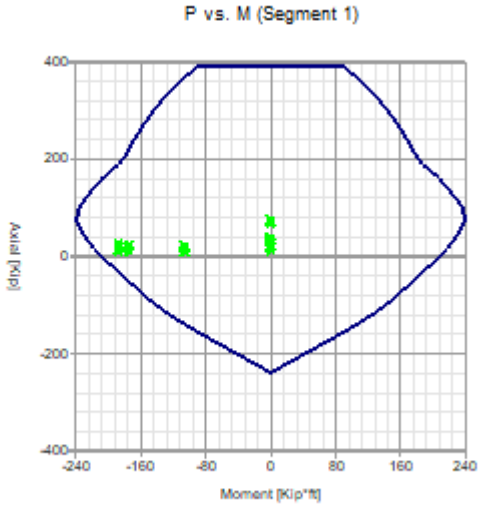
**Intermediate results for axial-bending**

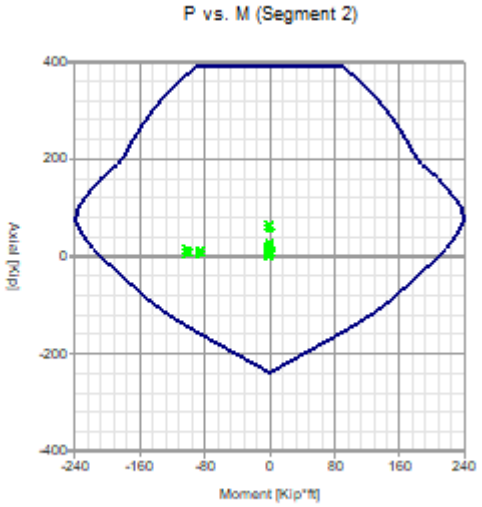
| Segment | Condition | c [in] | d [in] |
|---|---|---|---|
| 1 | D13 (Bottom) | 7.54 | 22.40 |
| 2 | D13 (Bottom) | 7.39 | 22.40 |
| 3 | D13 (Bottom) | 7.21 | 22.40 |

**Combined axial flexure**

| Segment | Condition | Pu [Kip] | Mu [Kip*ft] | ϕ*Mn [Kip*ft] | Mu/ϕ*Mn |
|---|---|---|---|---|---|
| 1 | D13 (Bottom) | 9.98 | -187.25 | 213.69 | 0.88 |
| 2 | D13 (Bottom) | 5.49 | -100.90 | 210.92 | 0.48 |
| 3 | D13 (Bottom) | 0.14 | -0.57 | 207.61 | 0.00 |

**Interaction diagrams, P vs. M:**




**Axial compression**

| Segment | Condition | Pu [Kip] | ϕ*Pn [Kip] | Pu/ϕ*Pn |
|---|---|---|---|---|
| 1 | D6 (Bottom) | 75.87 | 388.25 | 0.20 |
| 2 | D6 (Bottom) | 65.26 | 388.25 | 0.17 |
| 3 | D6 (Bottom) | 5.42 | 388.25 | 0.01 |

**Axial tension**

| Segment | Condition | Pu [Kip] | ϕ*Pn [Kip] | Pu/ϕ*Pn |
|---|---|---|---|---|
| 1 | DC1 (Top) | 0.00 | 237.60 | 0.00 |
| 2 | DC1 (Top) | 0.00 | 237.60 | 0.00 |
| 3 | D6 (Top) | 0.30 | 237.60 | 0.00 |

**Shear**

| Segment | Condition | Vu [Kip] | ϕ*Vn [Kip] | Vu/ϕ*Vn |
|---|---|---|---|---|
| 1 | D13 (Max) | 10.072 | 85.001 | 0.12 |
| 2 | D8 (Max) | 7.869 | 85.001 | 0.09 |
| 3 | D13 (Bottom) | 0.285 | 85.001 | 0.00 |

**Notes:**

* Pu = Axial load
* Pn = Nominal axial load
* Mu = Section moment
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force
* ld = Embedment length
* As = Effective cross sectional area of reinforcement

Beam Id: Lot#80 - MB /

Date 02-09-2019

Structural Engineer:

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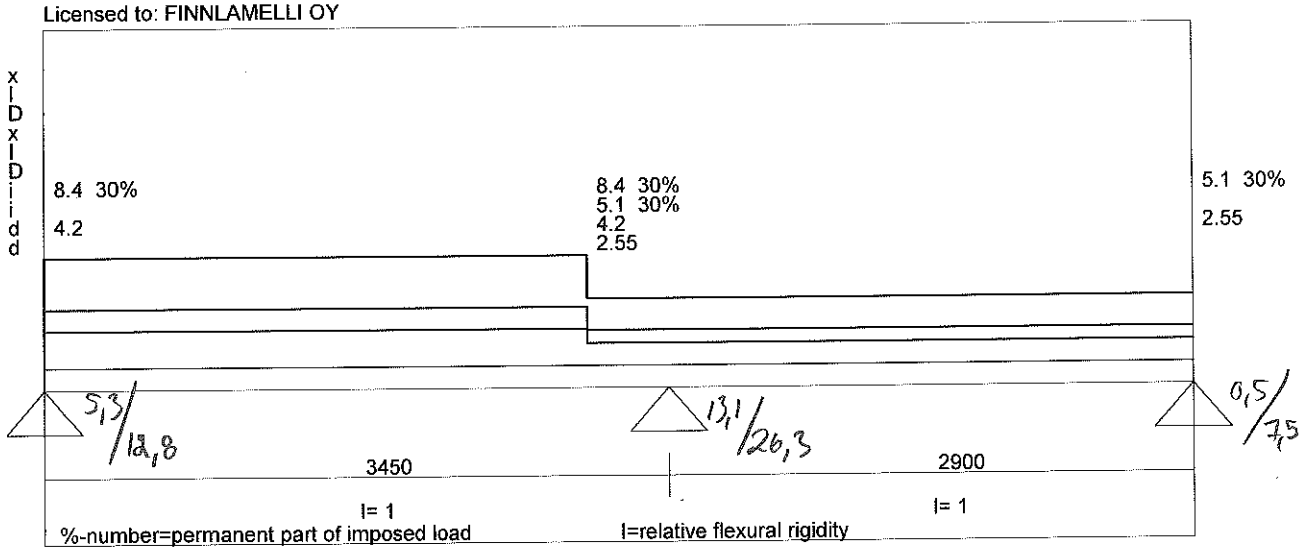


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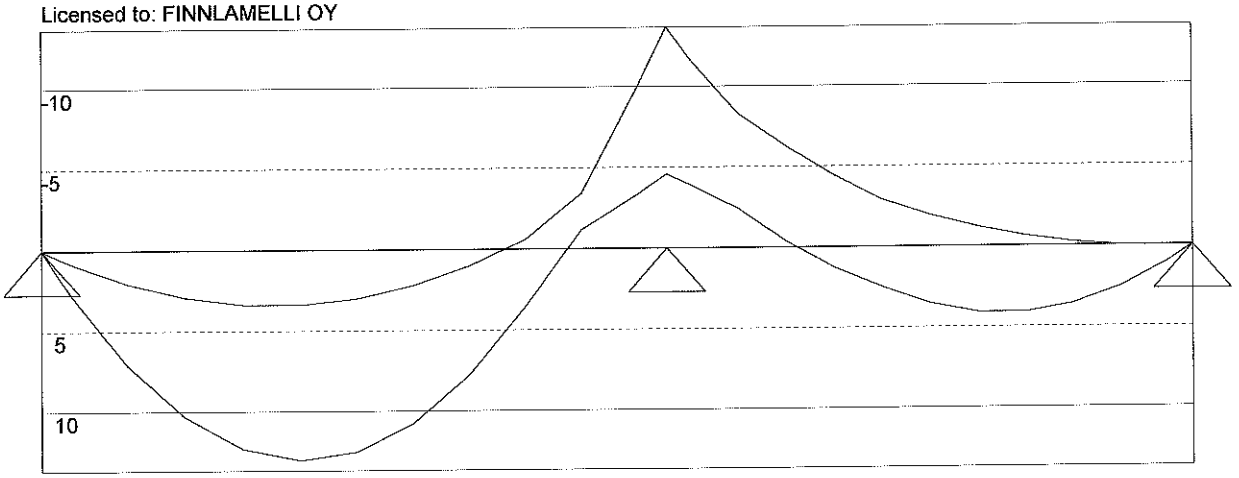


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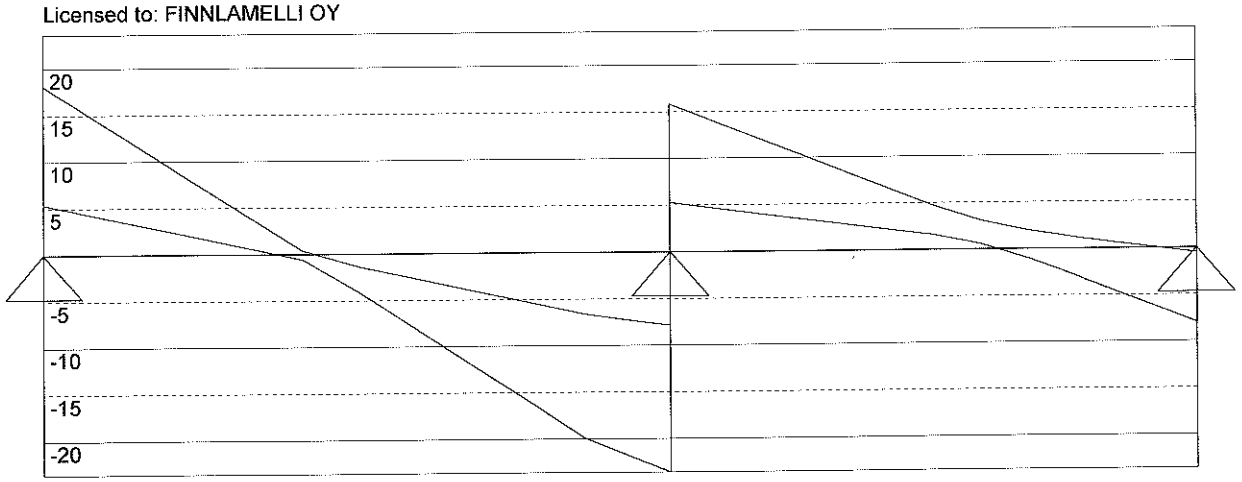


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
18,122 39,417 7,985
5,376 13,139 0,520

L40 140 x 260 B 2 Cf=1,00 Design method: Allowable stress design (1) GL 5 1/2 x 10 1/4
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 13,666 25,639 53 %
Factored shear force/shear capacity [kN] 23,613 30,444 78 %

Deflection due to unfactored load (Deflection limit L/360)
8,1 mm (84 %) 1,4 mm (17 %)

Beam Id: Lot#80 - MB 2

Date 02-09-2019

Structural Engineer:

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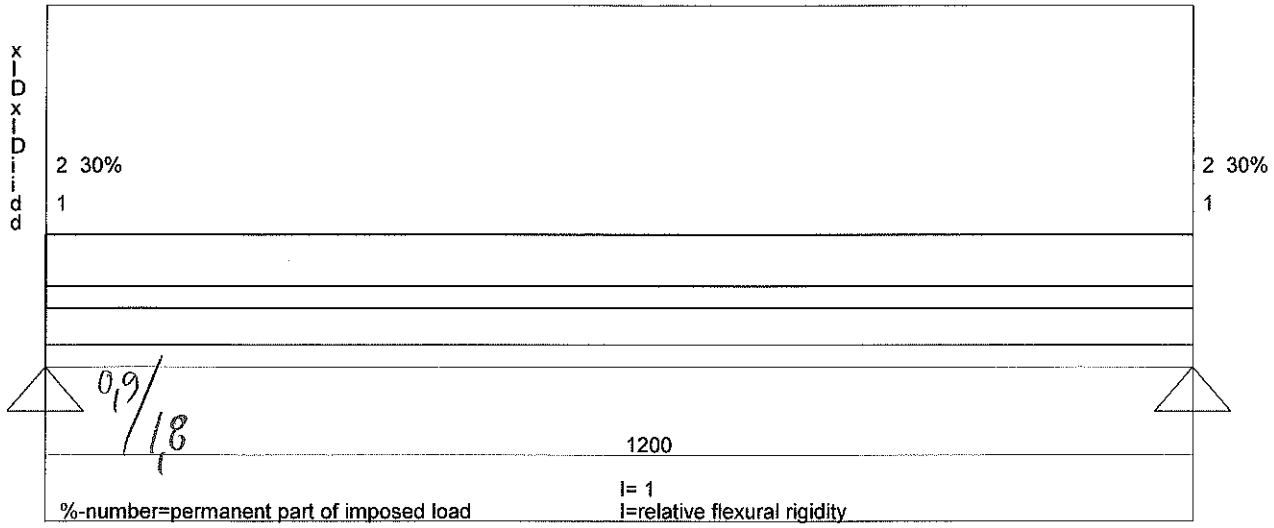


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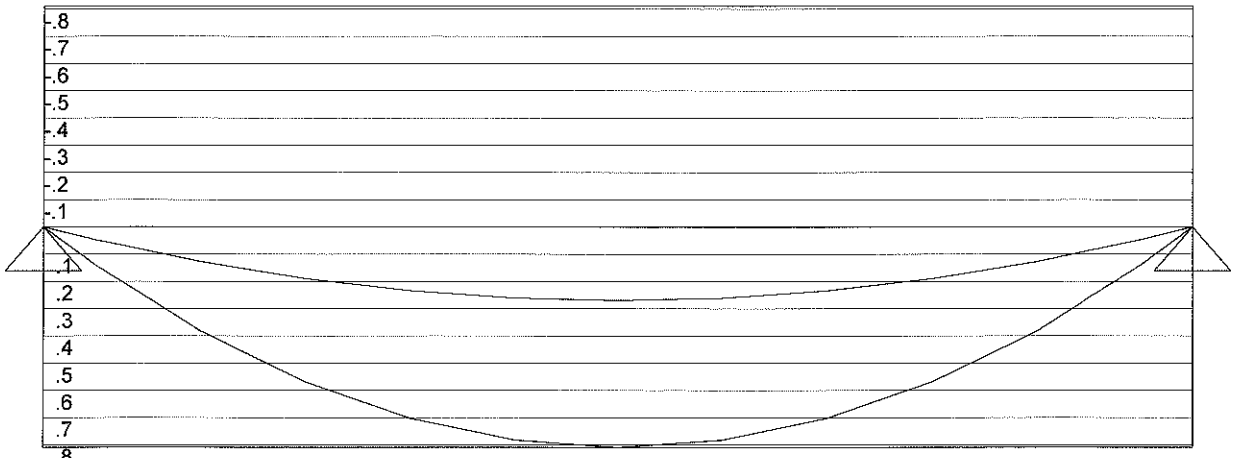


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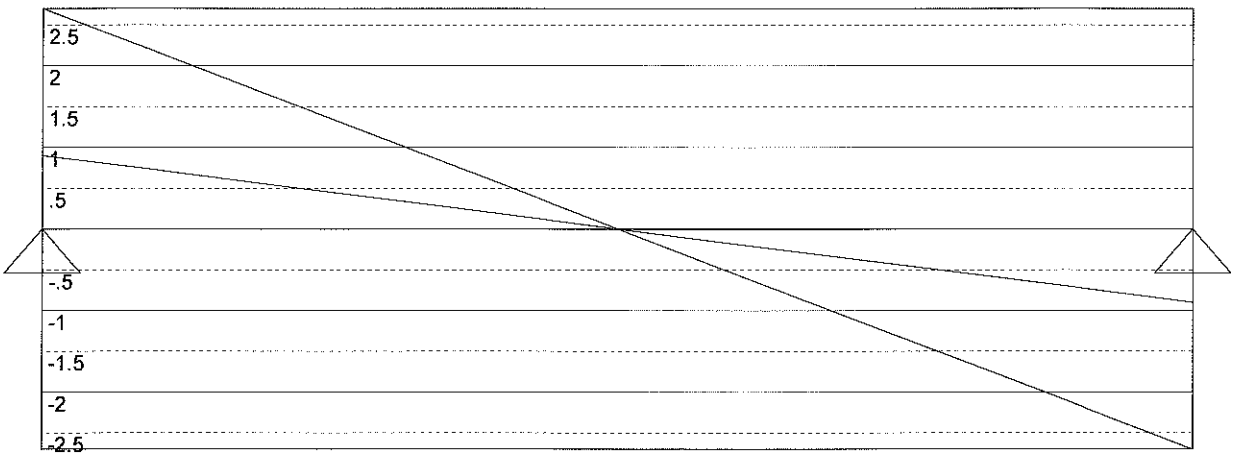


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1.5 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
2,699 2,700
0,900 0,900

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] 0,810 11,193 7 %
Factored shear force/shear capacity [kN] 2,699 14,095 19 %

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

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

Beam Id: Lot#80 - MB 3

Date 02-09-2019

Structural Engineer:

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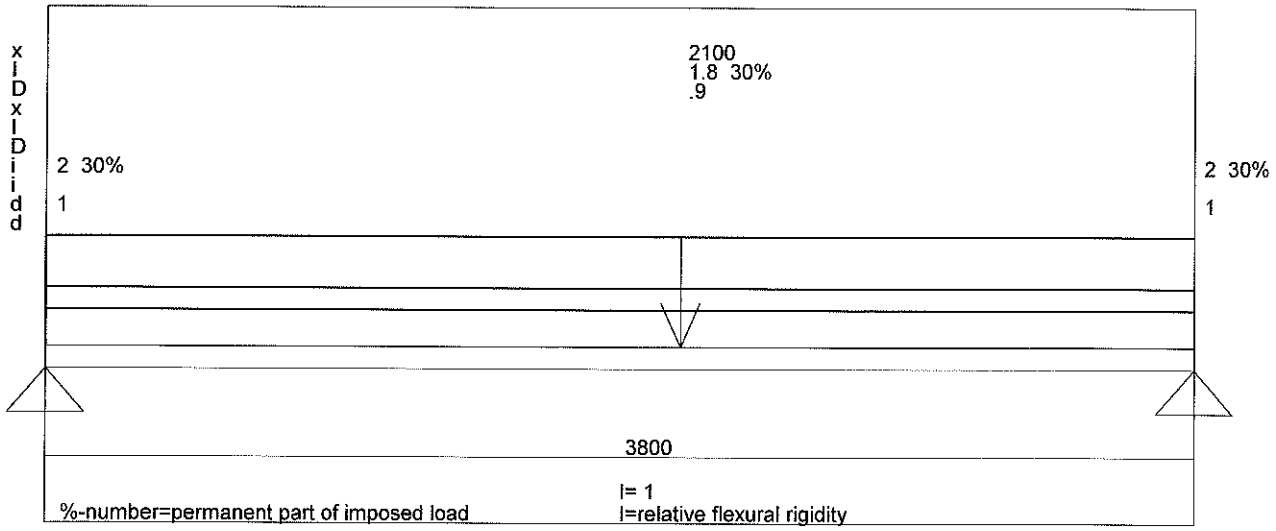


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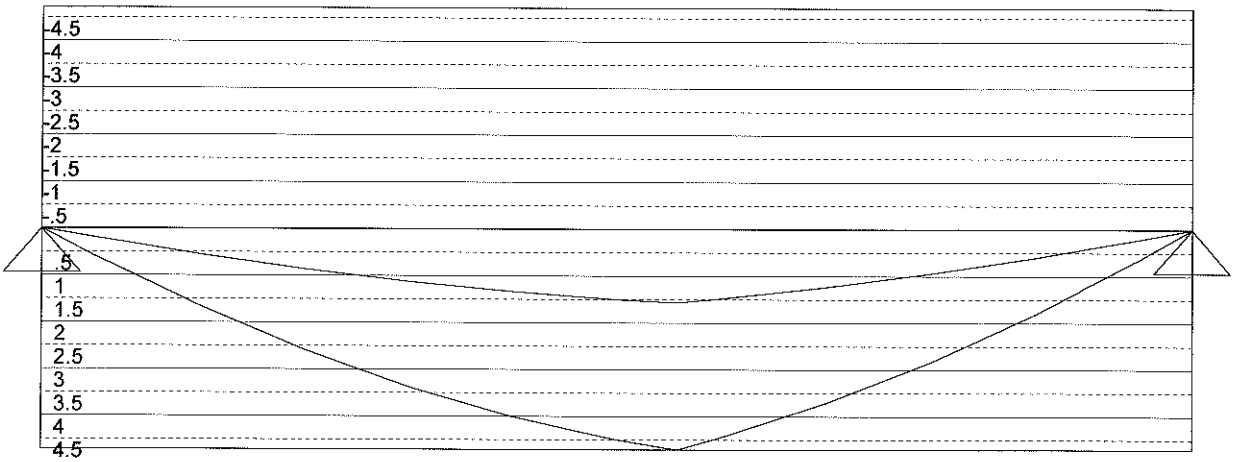


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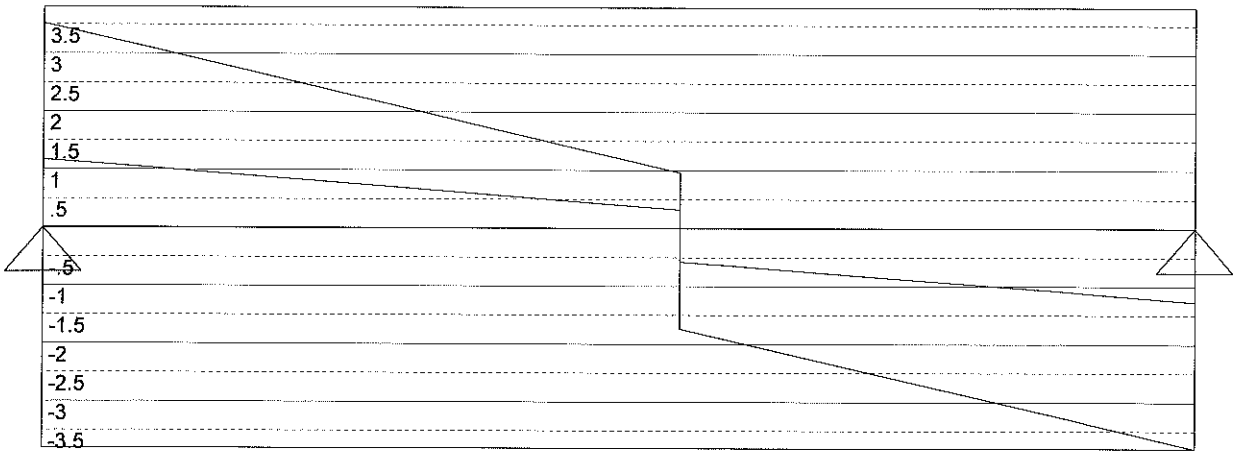


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .406 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
3,522 3,806
1,174 1,269

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] 4,710 11,193 42 %
Factored shear force/shear capacity [kN] 3,806 14,095 27 %

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

Deflection due to unfactored load (Deflection limit L/360)
7,1 mm (68 %)

Beam Id: Lot#80 - MB 4

Date 03-09-2019

Structural Engineer:

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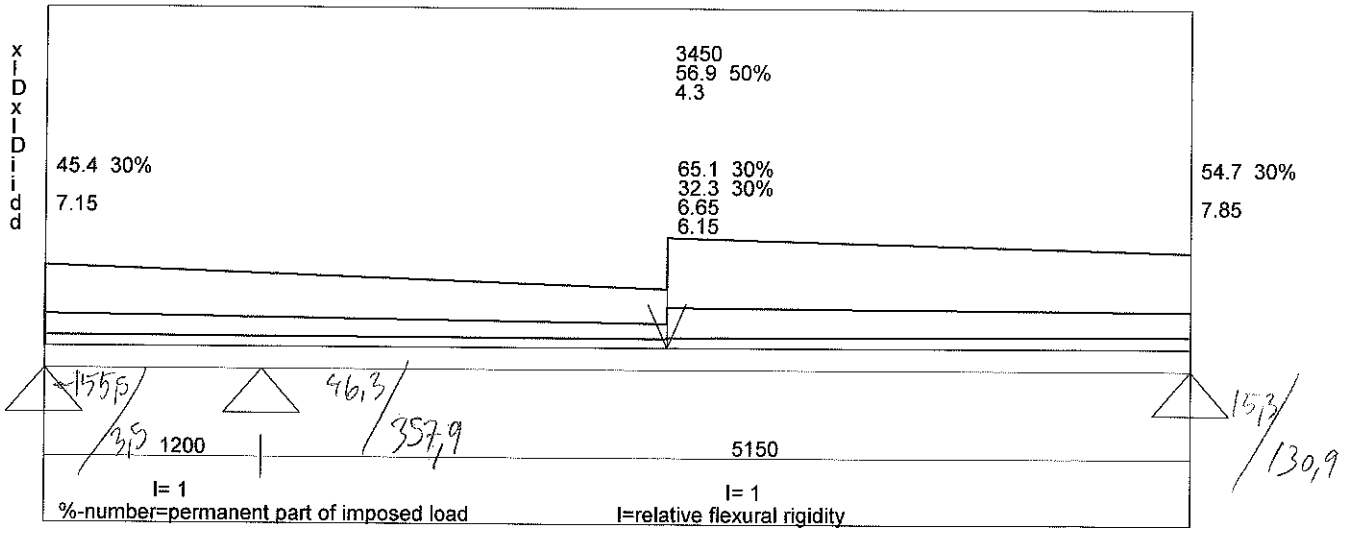


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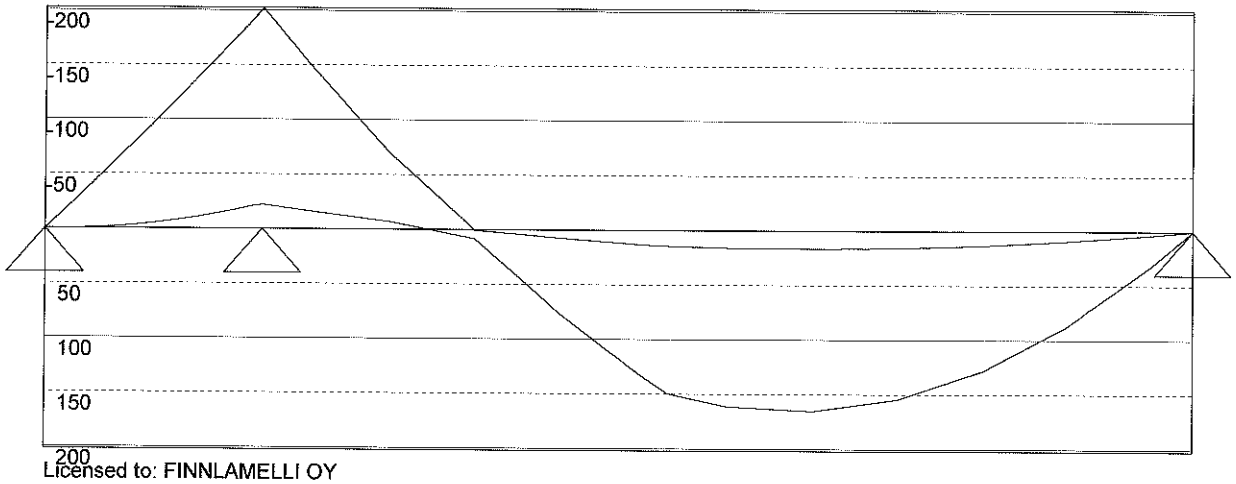


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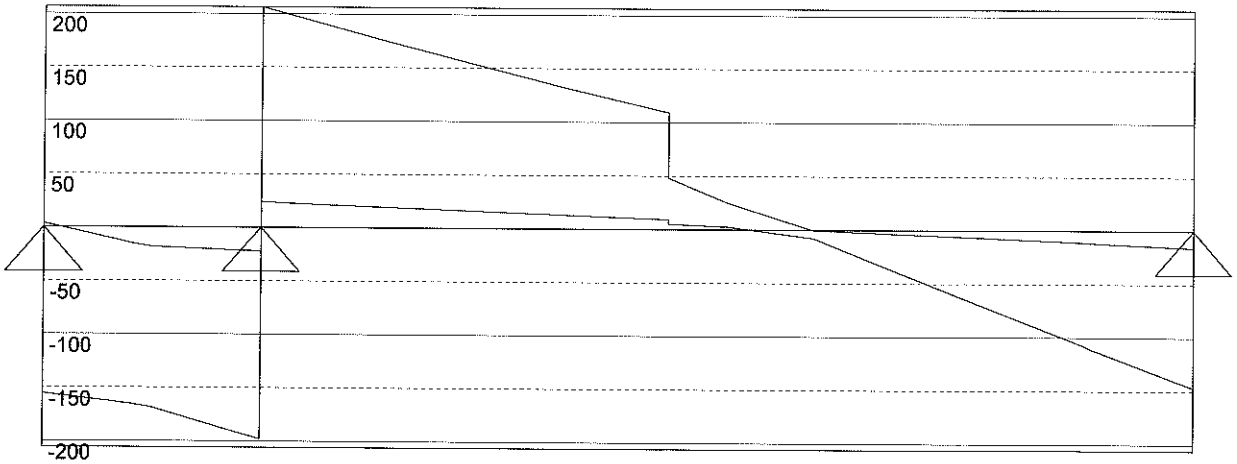


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
3,508 404,280 146,735
-155,518 46,307 15,817

L40 570 x 475 B 2 Cf=0,95 Design method: Allowable stress design
Increasing factor of the allowable stress 1,03
Factored Moment/Moment capacity [kNm] 202,165 311,936 65 %
Factored shear force/shear capacity [kN] 206,227 213,363 97 %

(3) GL $7\frac{1}{2} \times 18\frac{3}{4}$

Deflection due to unfactored load (Deflection limit L/360)
0,0 mm (1 %) 8,5 mm (59 %)

Beam Id: Lot#80 - MB 11

Date 05-09-2019

Structural Engineer:

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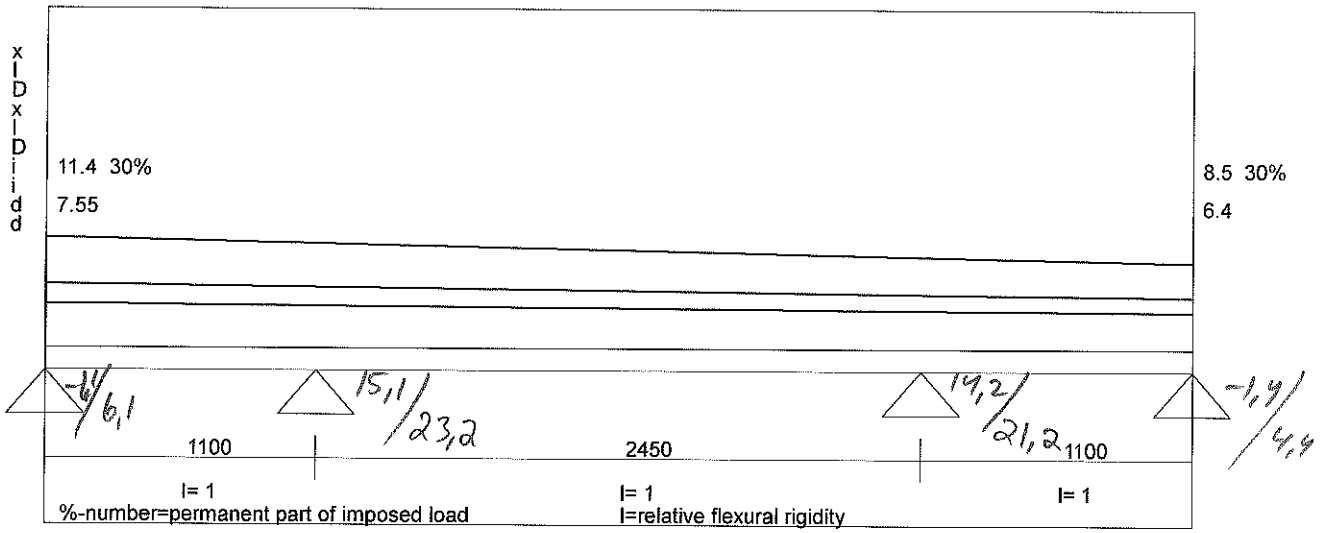


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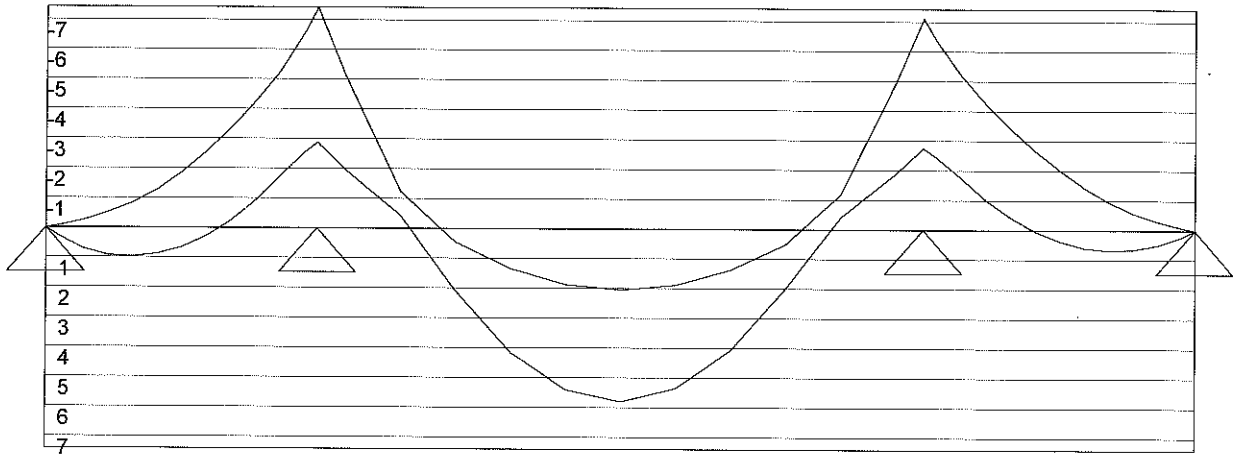


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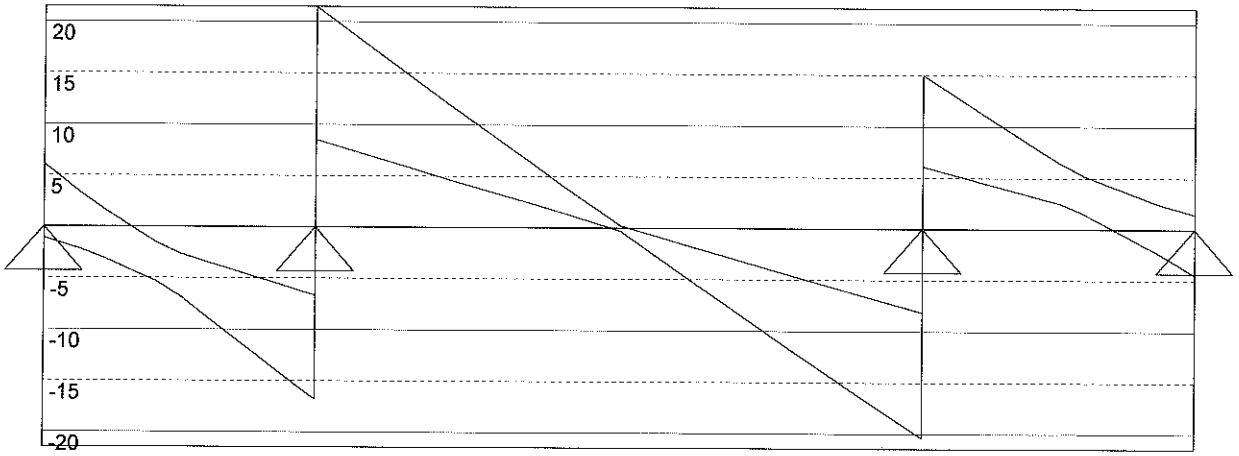


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
6,082 38,291 35,392 4,458
-1,087 15,186 14,273 -1,480

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,11
Factored Moment/Moment capacity [kNm] 7,412 14,627 51 %
Factored shear force/shear capacity [kN] 21,482 23,024 93 %

LVL (2) 1½ × 9½

Deflection due to unfactored load (Deflection limit L/360)
0,0 mm (1 %) 3,1 mm (45 %) 0,0 mm (0 %)

Beam Id: Lot#80 - MB // W

Date 05-09-2019

Structural Engineer:

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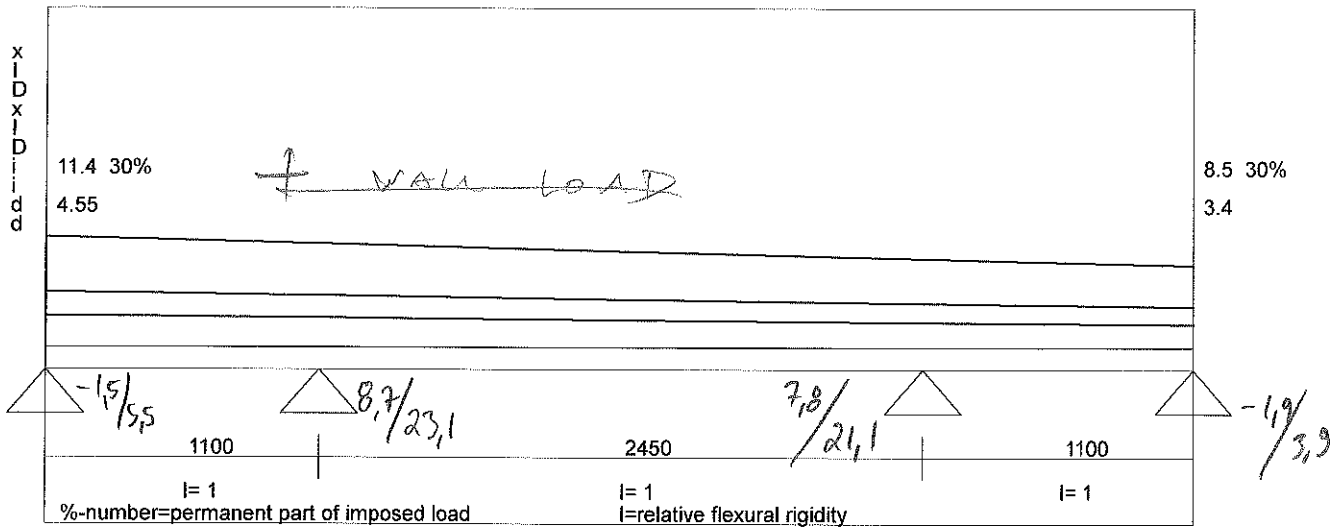


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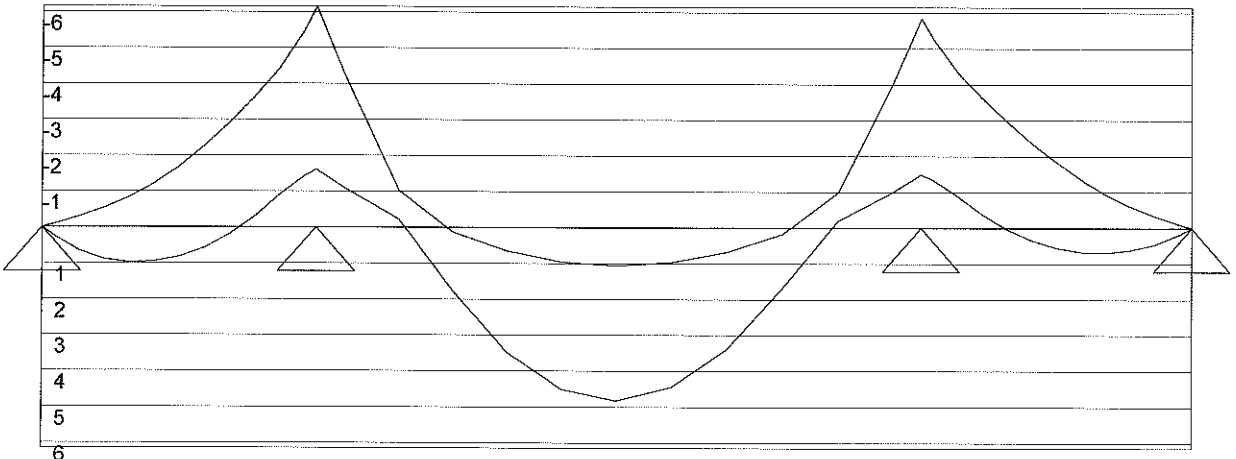


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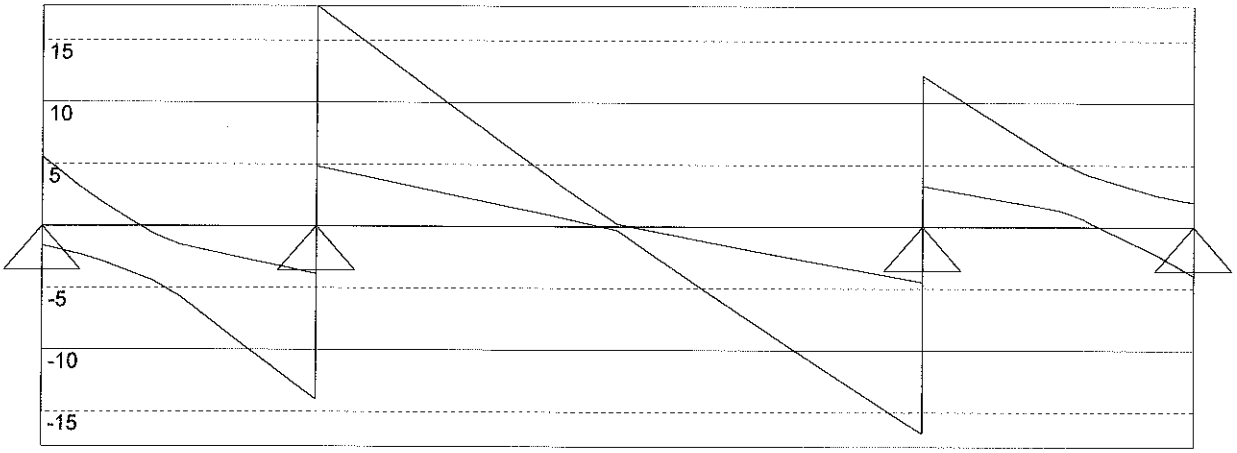


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
5,582 31,818 28,918 3,957
-1,587 8,713 7,800 -1,981

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,08
Factored Moment/Moment capacity [kNm] 6,148 14,142 43 %
Factored shear force/shear capacity [kN] 17,808 22,260 80 %

LVL (2) 1 1/2 x 9 1/2

Deflection due to unfactored load (Deflection limit L/360)
0,1 mm (3 %) 2,6 mm (38 %) 0,1 mm (2 %)

Beam Id: Lot#80 - MB 12

Date 05-09-2019

Structural Engineer:

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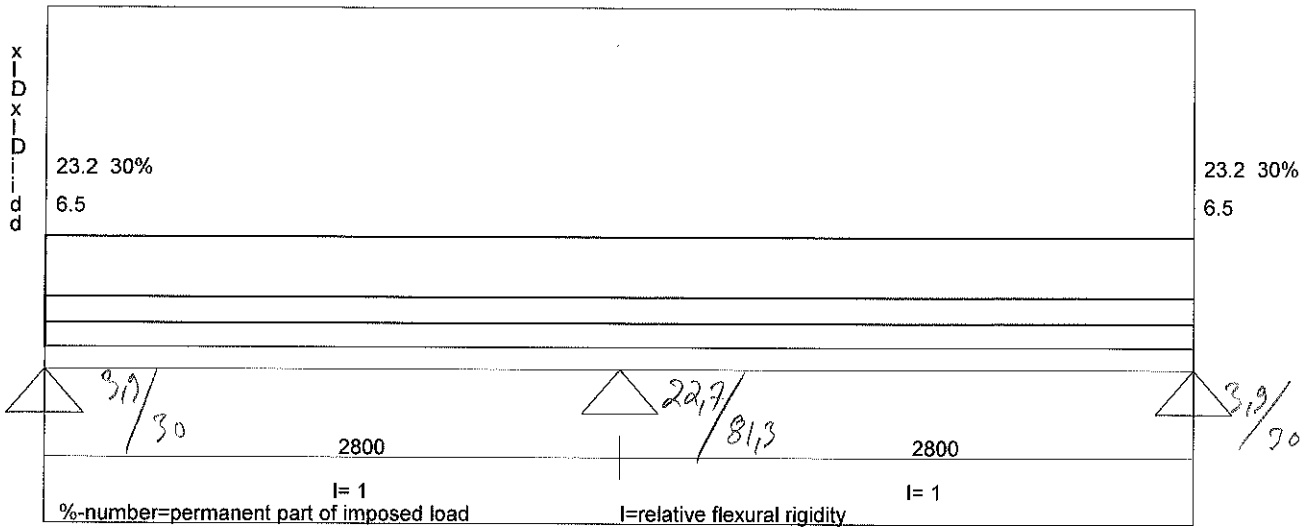


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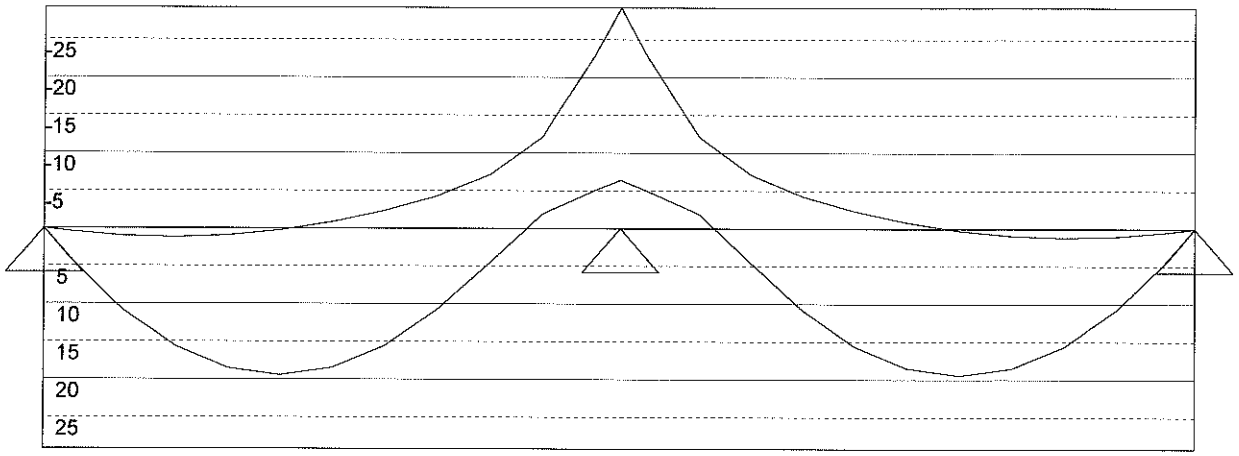


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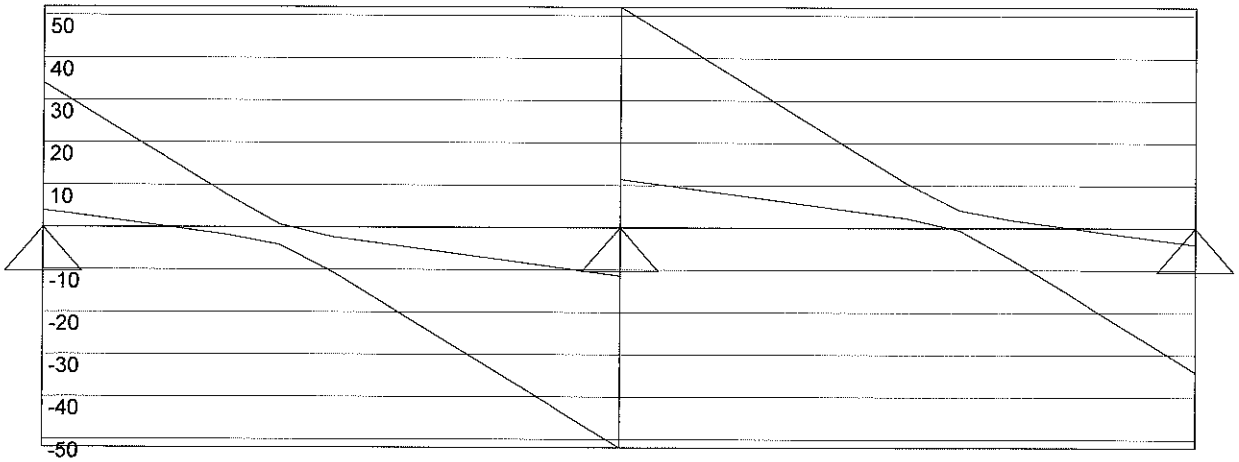


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
33,990 104,013 33,998
3,961 22,764 3,963

KER 132 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,06
Factored Moment/Moment capacity [kNm] 29,203 51,816 56 %
Factored shear force/shear capacity [kN] 52,007 56,182 93 %

UL (3) 1 3/4 x 14

Deflection due to unfactored load (Deflection limit L/360)
2,6 mm (34 %) 2,6 mm (34 %)

Beam Id: Lot#80 - MB 13

Date 05-09-2019

Structural Engineer:

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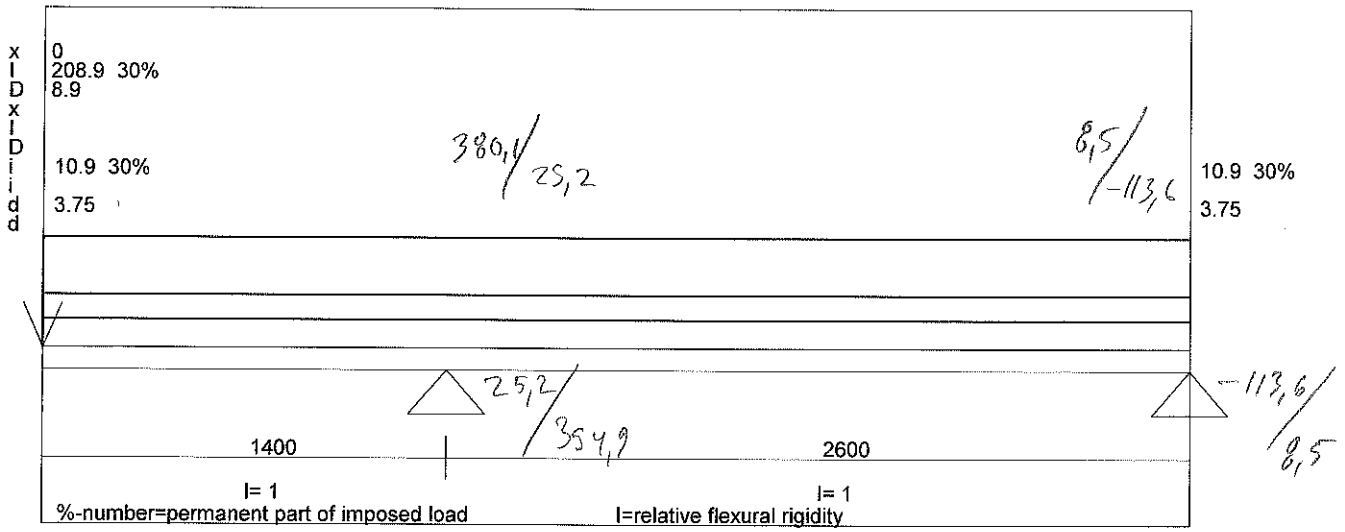


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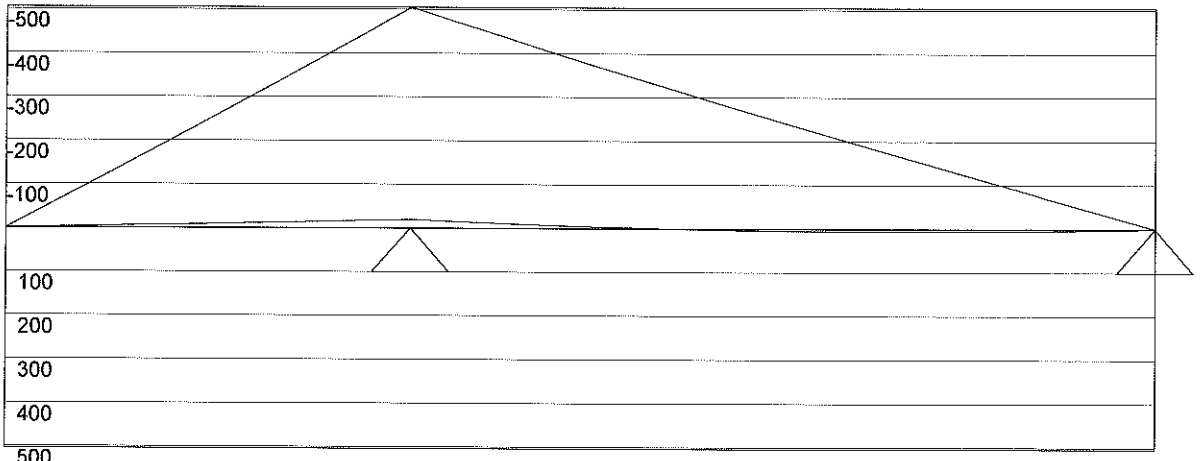


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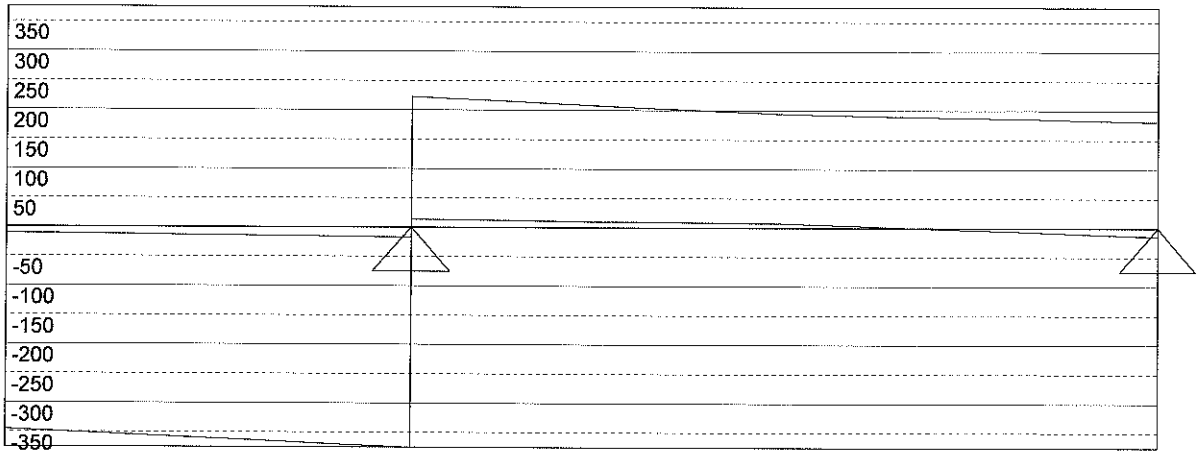


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
598,131 14,274
30,274 -181,333

HEB 340 (Class of section=1/1) G= 134 I(cm4)=36656 W(cm3)=2160 fy=235
Factored Moment/Moment capacity [kNm] 504,308 564,000 89 %
Factored shear force/shear capacity [kN] 375,630 538,902 70 %

W 12x 106

Sum infl M+S 0,91 (must be<=1) x= 1399 M=504,31 S=375,63
Deflection due to unfactored load (Deflection limit L/360)/L/180)!
7,6 mm (98 %) 0,0 mm (0 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - MB 14

Date 05-09-2019

Structural Engineer:

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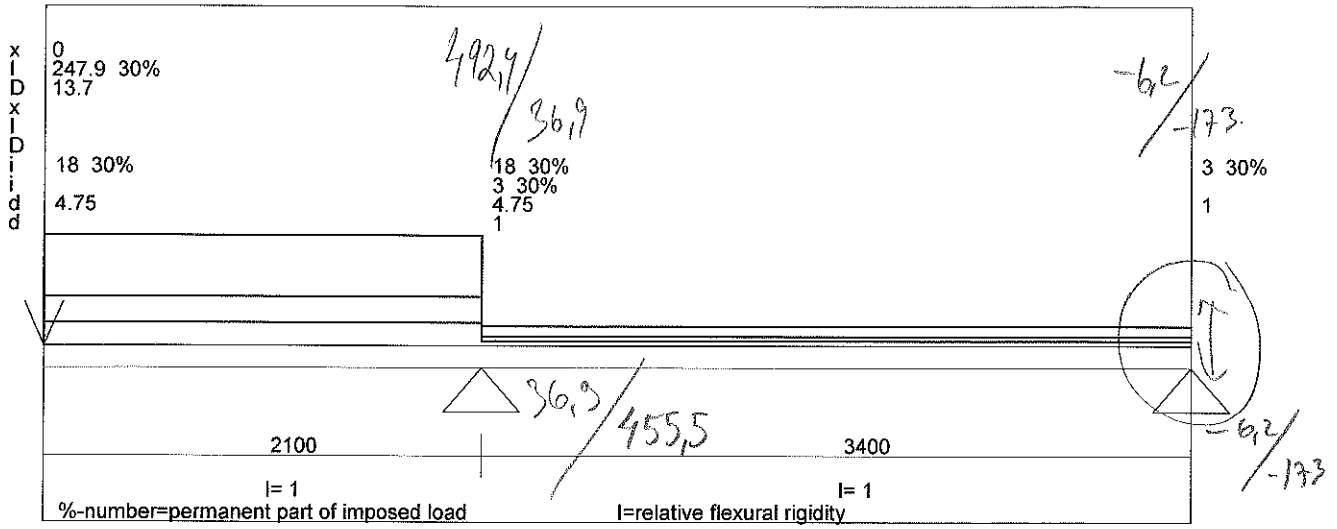


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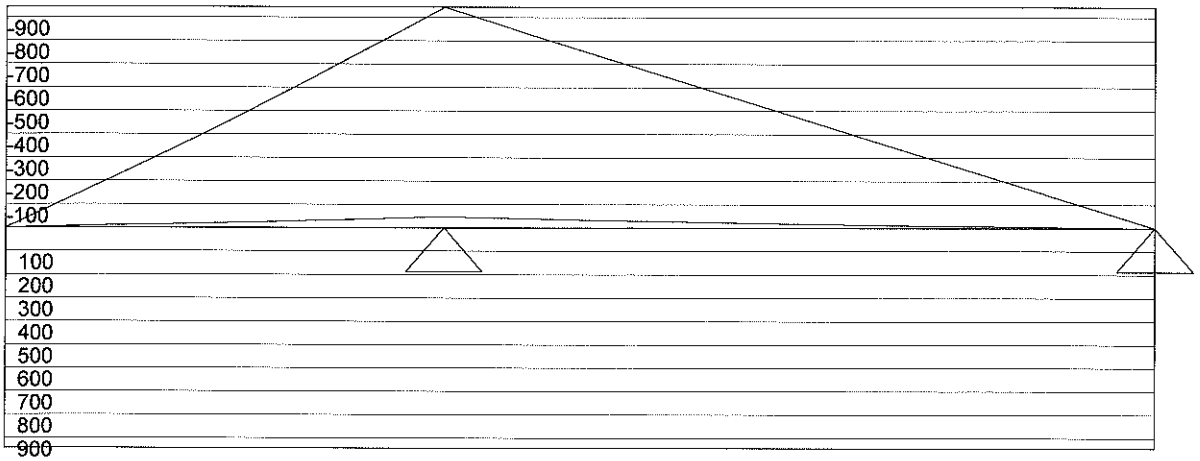


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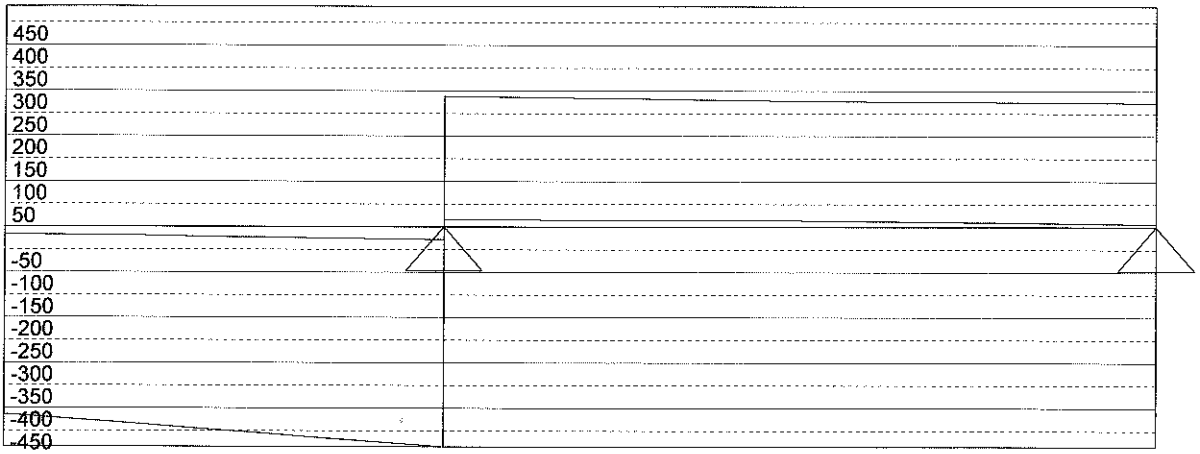


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
773,208 -6,097
44,297 -273,007

HEB 500 (Class of section=1/1) G= 187 I(cm4)=107176 W(cm3)=4290 fy=235
Factored Moment/Moment capacity [kNm] 943,386 1132,700 83 %
Factored shear force/shear capacity [kN] 485,516 965,004 50 %

W 12 x 252 or

W 14 x 211

Sum infl M+S 0,85 (must be<=1) x= 2099 M=943,38 S=485,52
Deflection due to unfactored load (Deflection limit L/360)/L/180)!
10,1 mm (87 %) -0,1 mm (1 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - MB 15

Date 05-09-2019

Structural Engineer:

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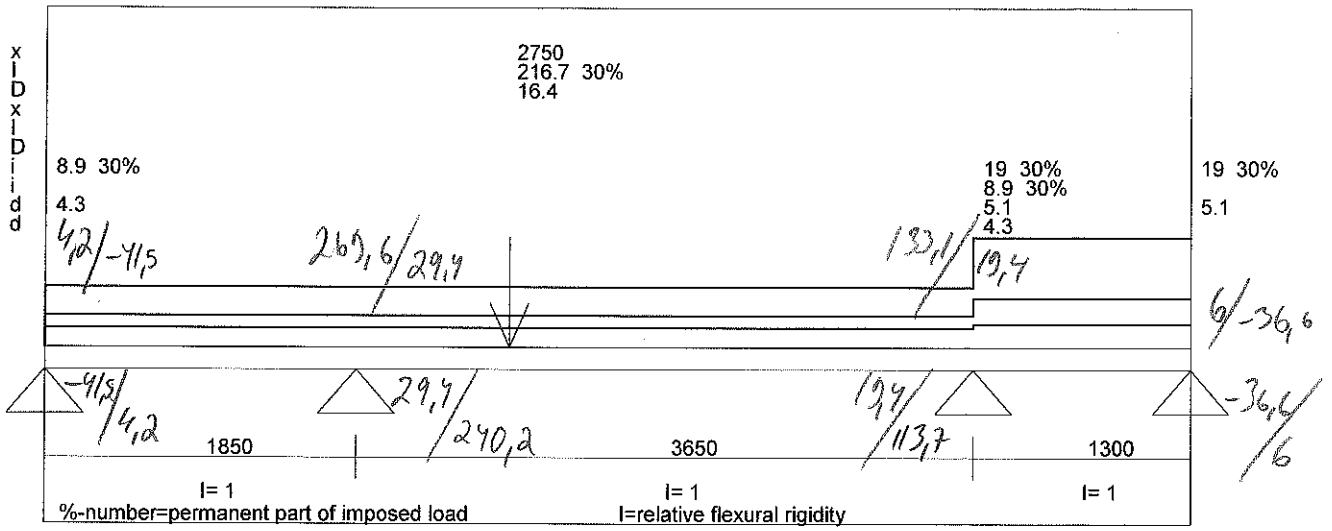


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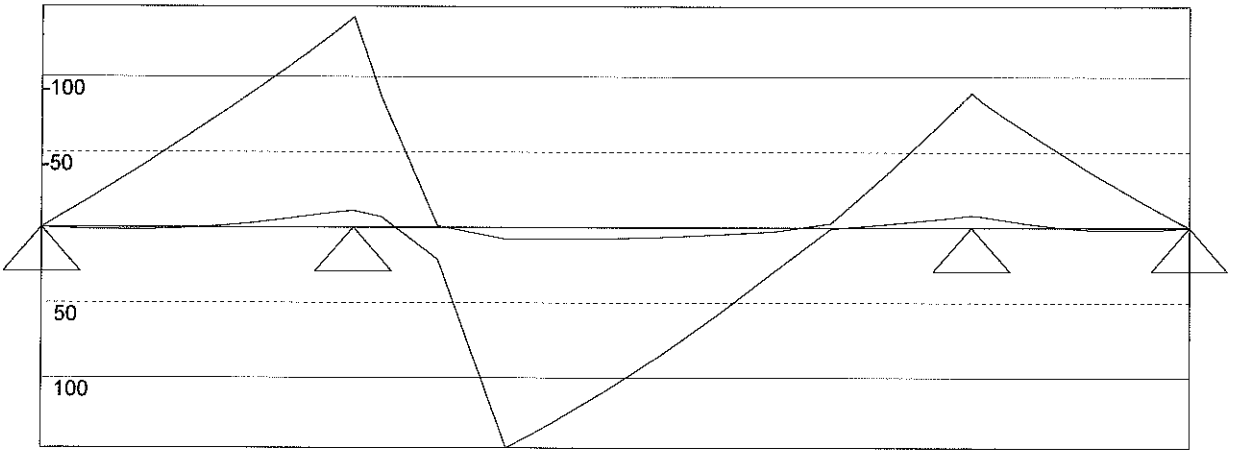


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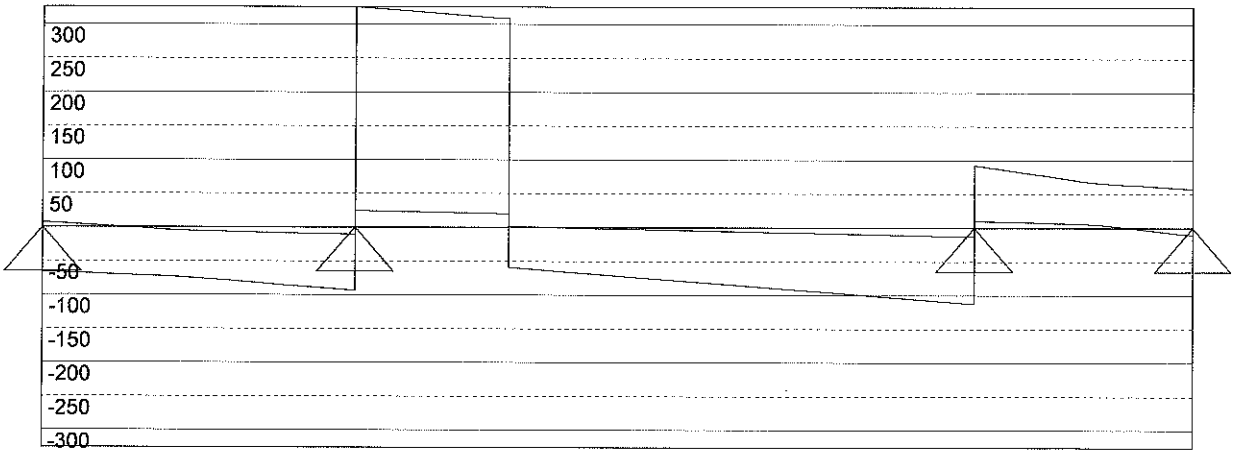


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
7,203 419,395 204,910 10,587
-66,004 35,168 23,068 -57,769

HEB 260 (Class of section=1/1) G= 93 I(cm4)=14919 W(cm3)=1150 fy=235 W10 × 68
Factored Moment/Moment capacity [kNm] 146,610 301,270 49 %
Factored shear force/shear capacity [kN] 325,839 341,925 95 %

Deflection due to unfactored load (Deflection limit L/360)
0,0 mm (0 %) 2,2 mm (22 %) 0,0 mm (0 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - MB 16

Date 05-09-2019

Structural Engineer:

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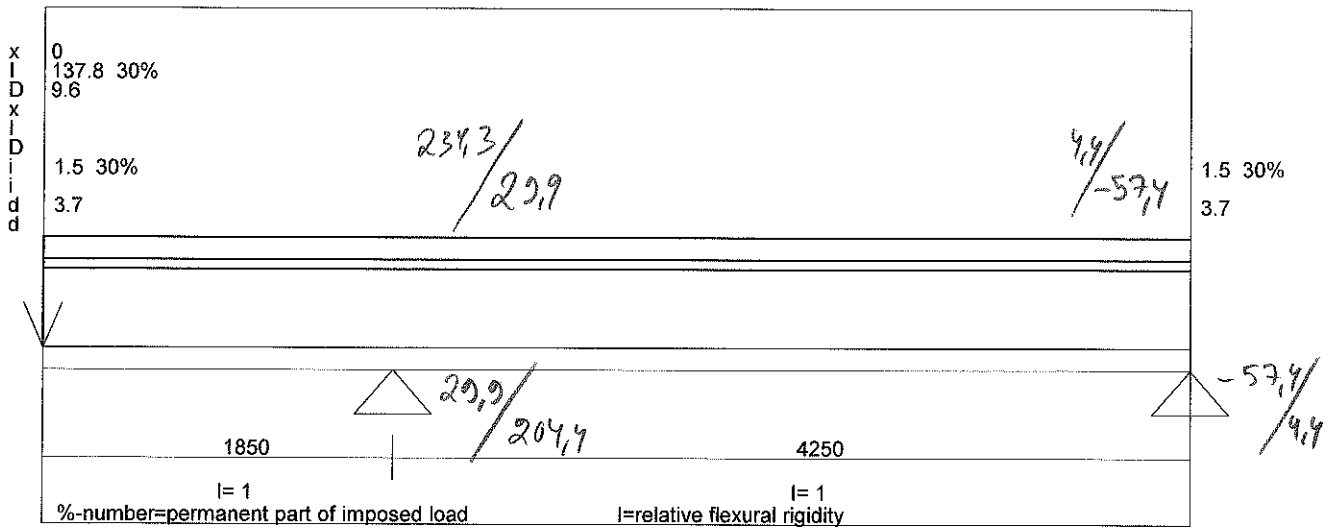


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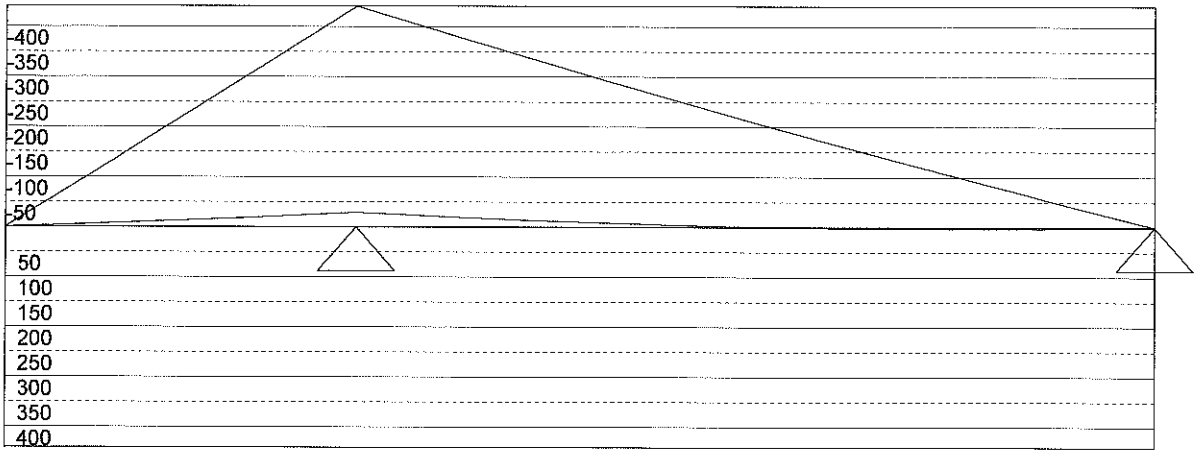


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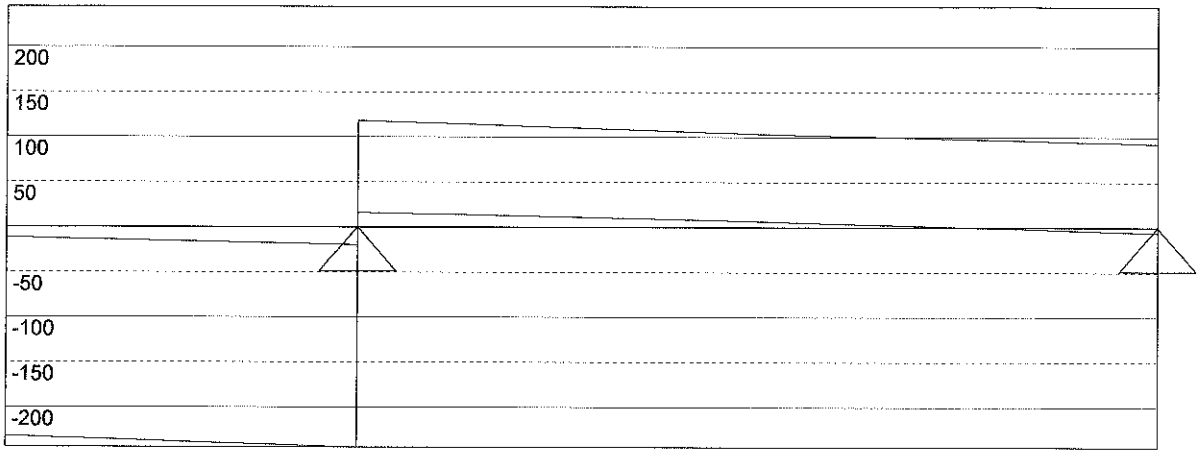


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
362,920 6,203
35,967 -92,772

HEB 400 (Class of section=1/1) G= 155 I(cm4)=57680 W(cm3)=2880 fy=235
Factored Moment/Moment capacity [kNm] 440,836 761,400 58 %
Factored shear force/shear capacity [kN] 244,651 715,716 34 %

W 12 x 152 or
W 14 x 132

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
8,5 mm (83 %) -0,1 mm (0 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - MB 17

Date 09-09-2019

Structural Engineer:

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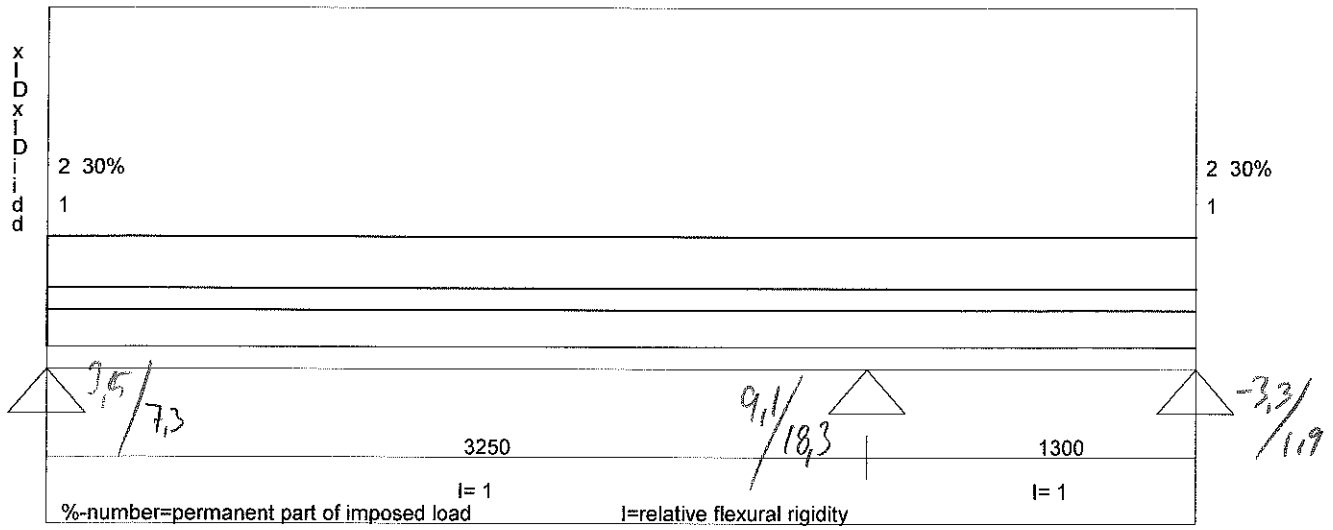


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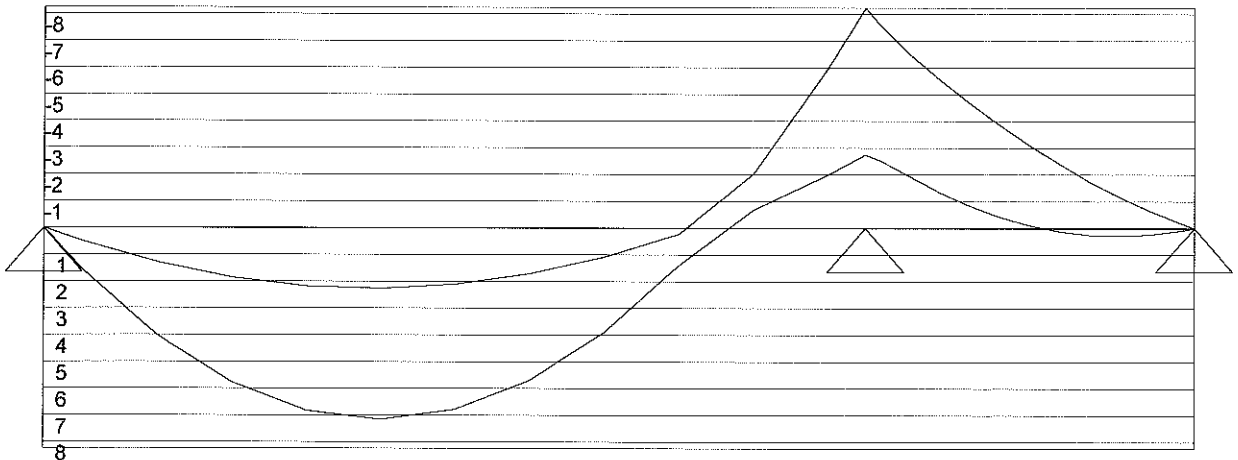


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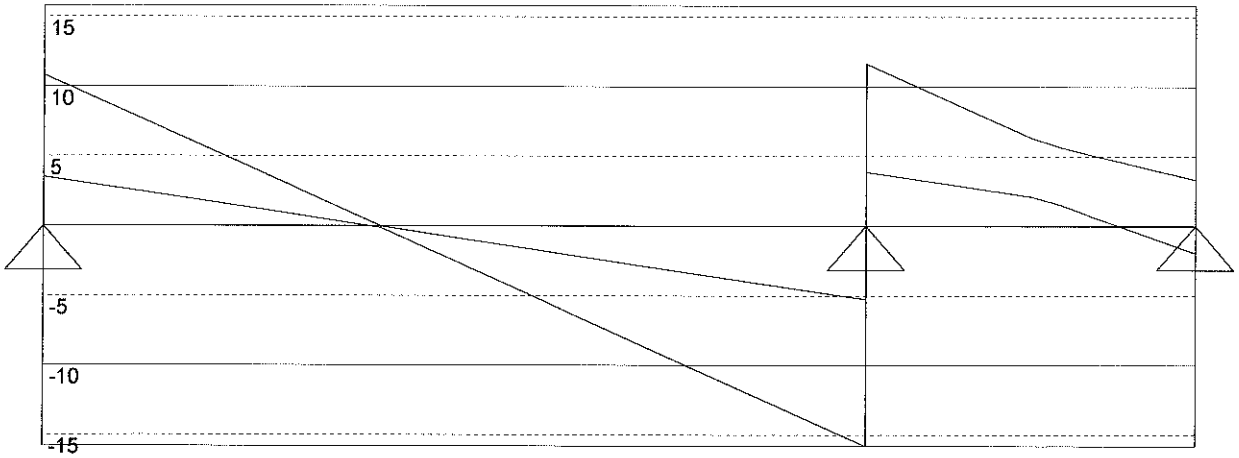


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.725 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
10,819 27,463 1,962
3,512 9,154 -3,323

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] 8,233 22,385 37 %
Factored shear force/shear capacity [kN] 15,815 28,189 56 %

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

Deflection due to unfactored load (Deflection limit L/360)
3,7 mm (41 %) 0,0 mm (1 %)

Beam Id: Lot#80 - MB 18

Date 09-09-2019

Structural Engineer:

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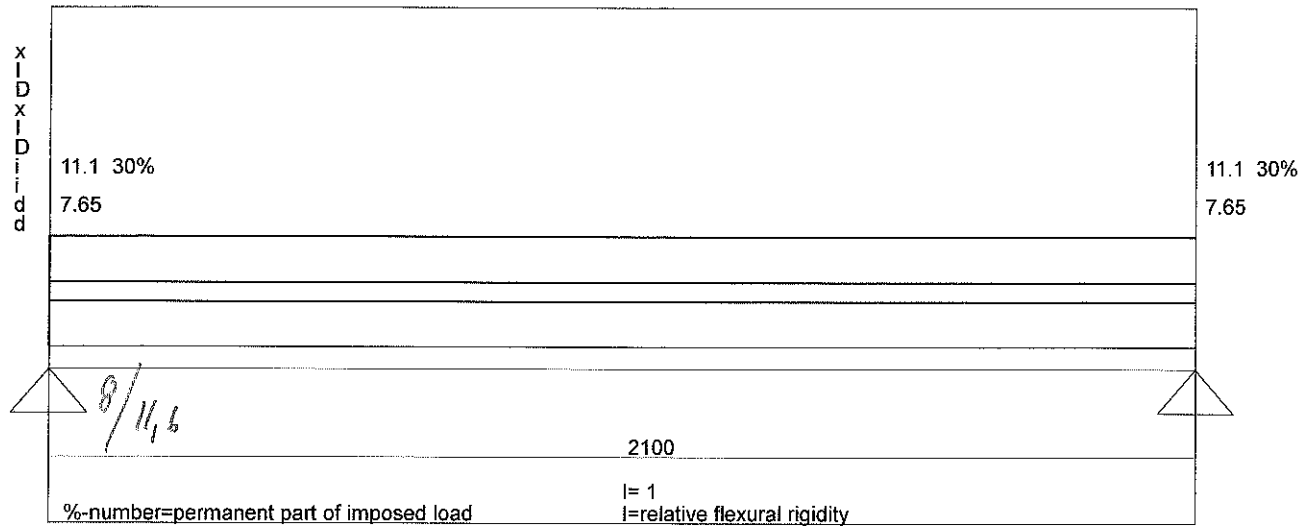


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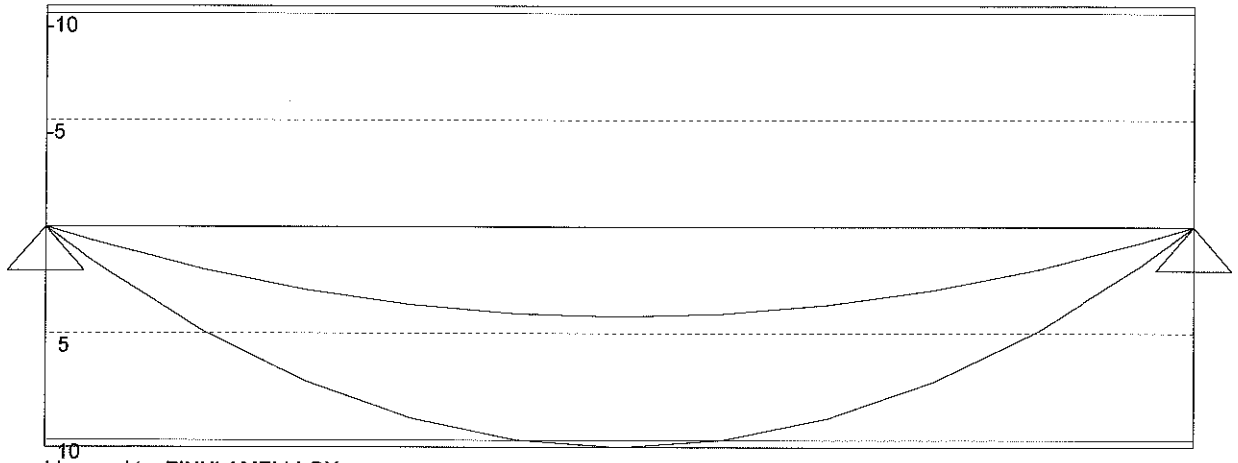


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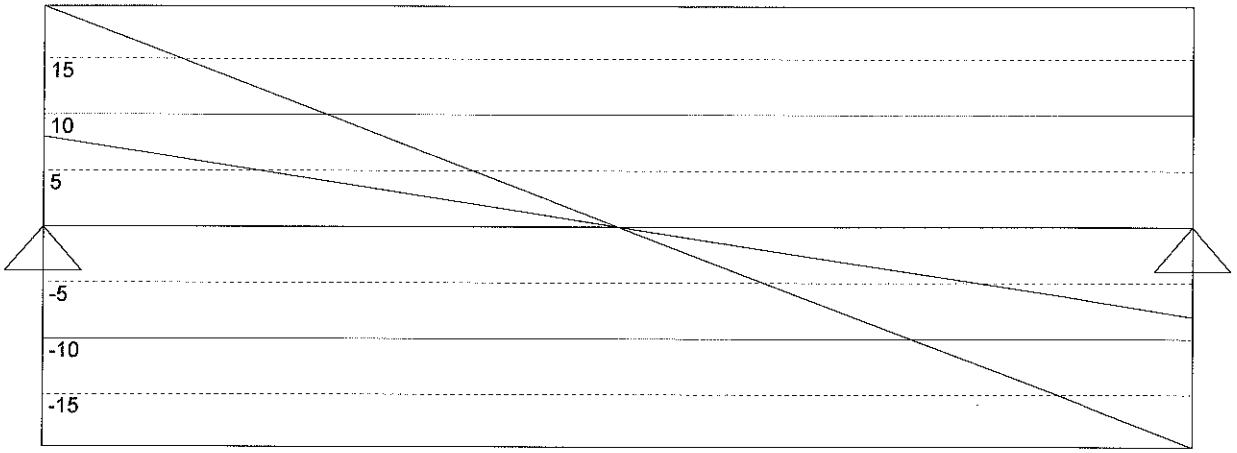


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
19,684 19,688
8,031 8,033

KER 76 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,11
Factored Moment/Moment capacity [kNm] 10,336 22,851 45 %
Factored shear force/shear capacity [kN] 19,684 28,775 68 %

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

Deflection due to unfactored load (Deflection limit L/360)
2,7 mm (46 %)

Beam Id: Lot#80 - MB (19)

Date 09-09-2019

Structural Engineer:

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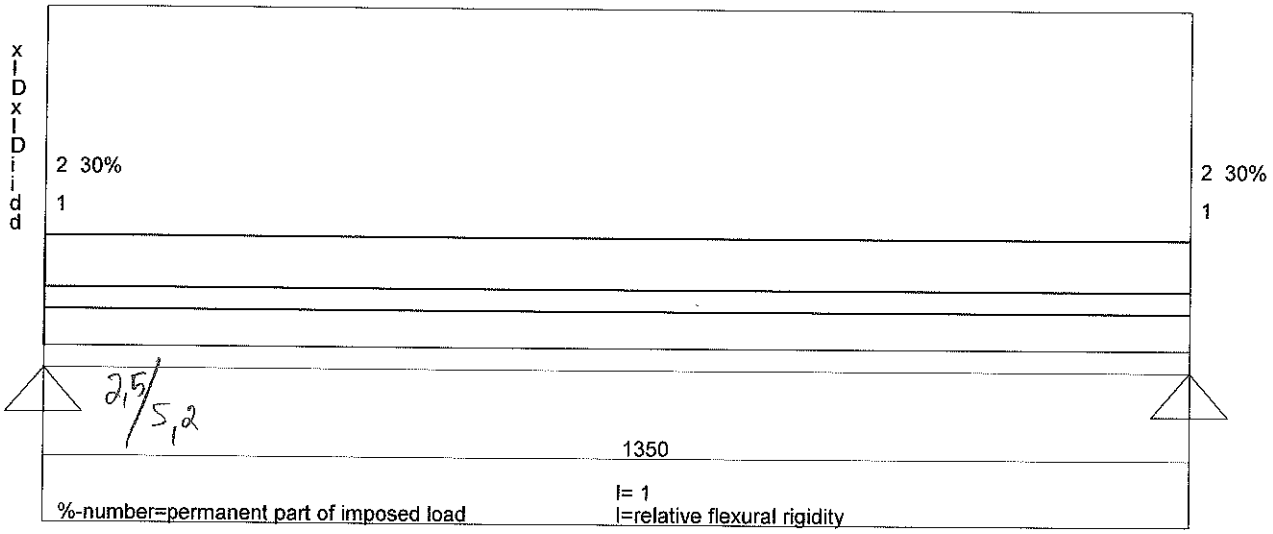


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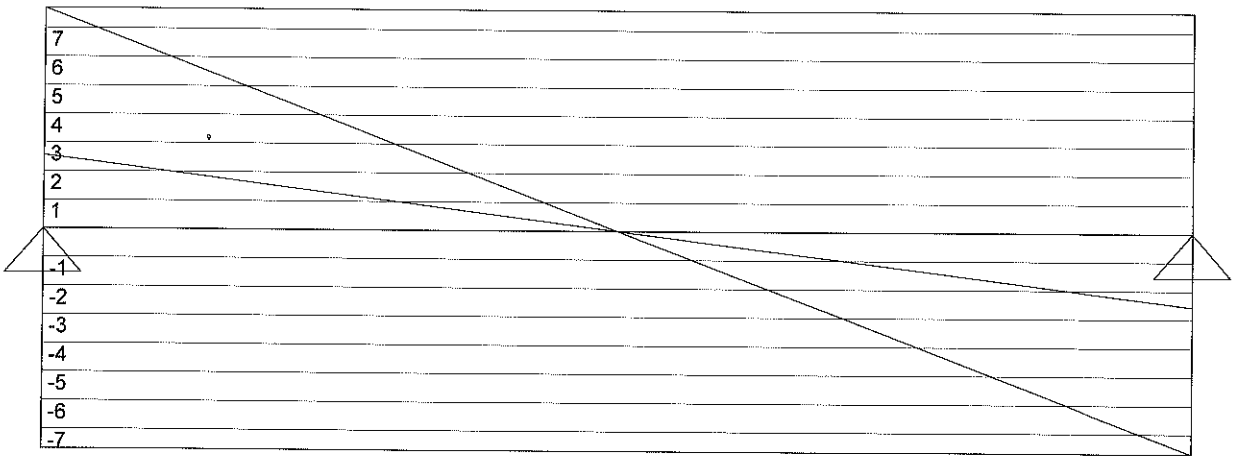


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 3.8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
7,693 7,695
2,564 2,565

T24 76 x 285 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,09
Factored Moment/Moment capacity [kNm] 2,597 10,775 24 %
Factored shear force/shear capacity [kN] 7,693 15,123 51 %

(2) 2x8

Deflection due to unfactored load (Deflection limit L/360)
0,5 mm (14 %)

Beam Id: Lot#80 - MB 20

Date 09-09-2019

Structural Engineer:

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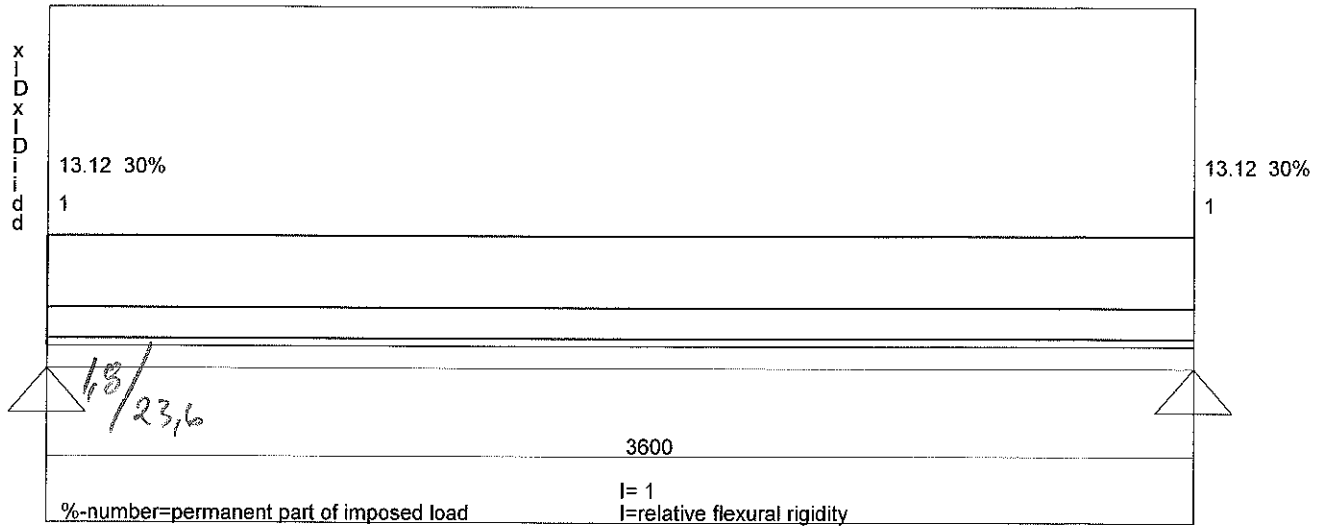


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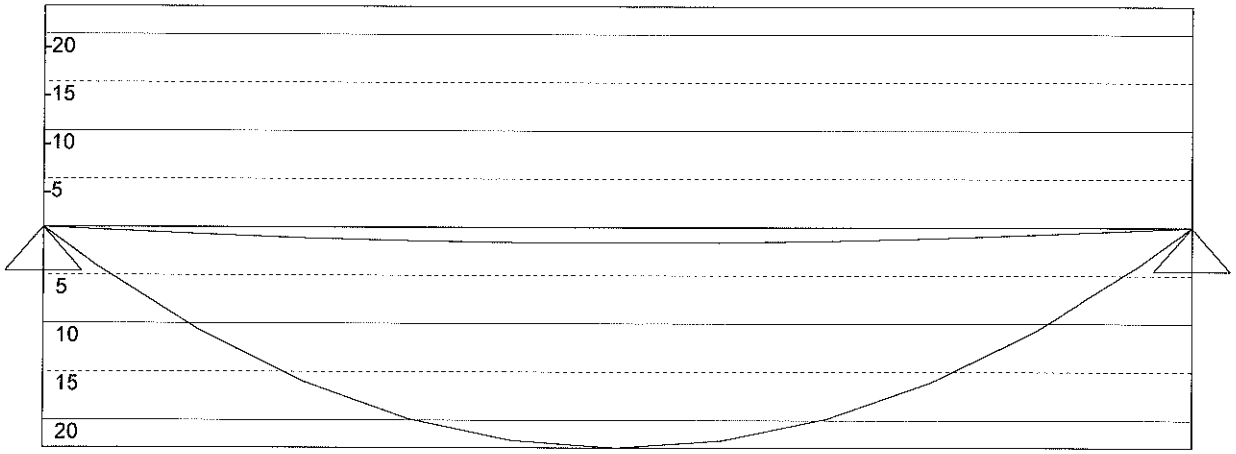


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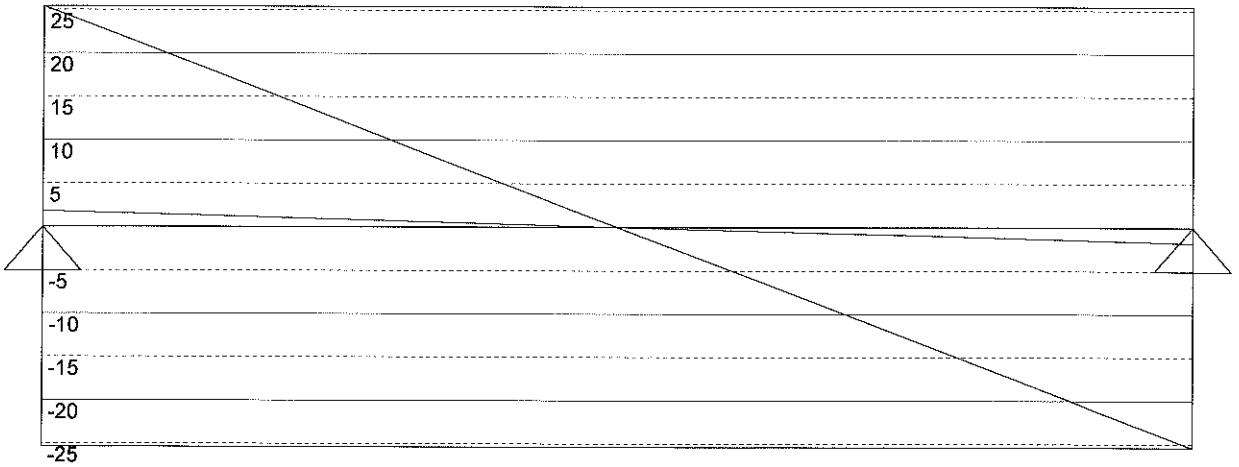


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
25,411 25,416
1,800 1,800

KER 88 x 355 B 2 Cf=0,98 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 22,874 33,243 69 %
Factored shear force/shear capacity [kN] 25,411 36,043 71 %

LVL (2) 1 3/4 x 14

Deflection due to unfactored load (Deflection limit L/360)
9,1 mm (91 %)

Beam Id: Lot#80 - MB 21

Date 09-09-2019

Structural Engineer:

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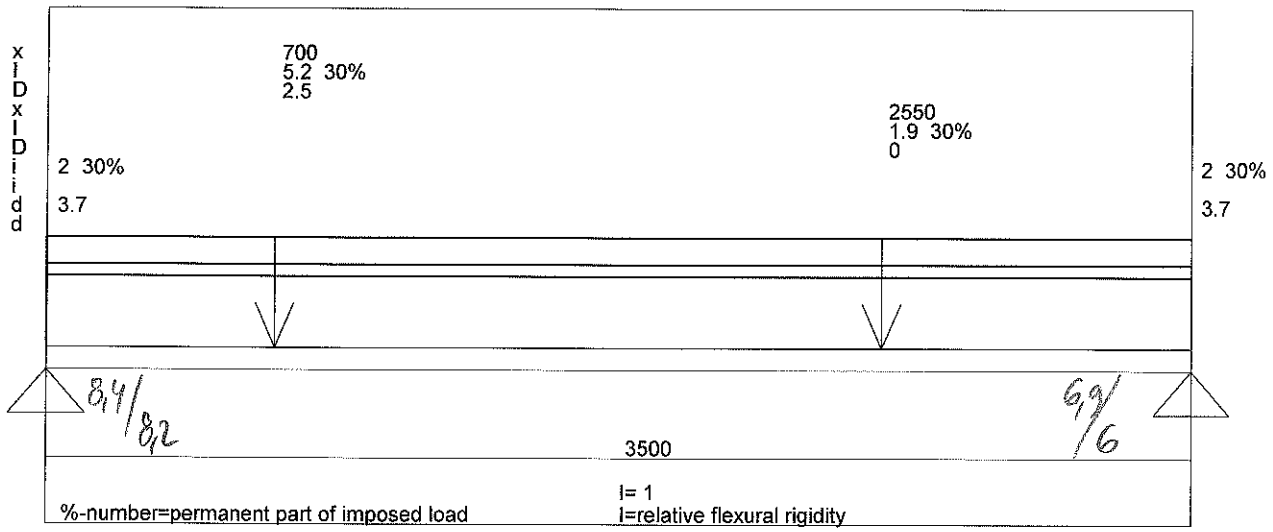


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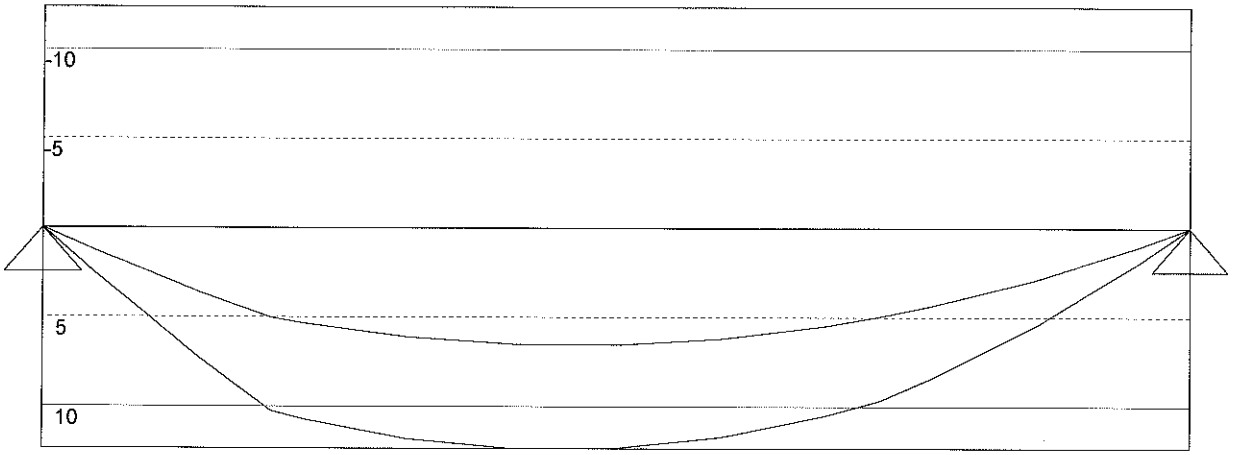


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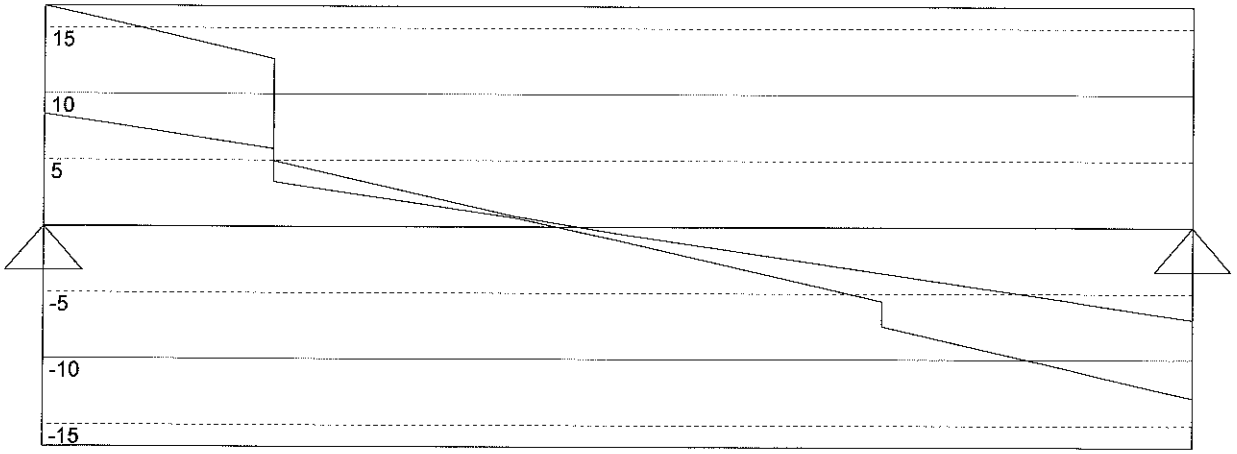


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
16,647 12,898
8,473 6,974

KER 76 x 300 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,15
Factored Moment/Moment capacity [kNm] 12,362 23,512 53 %
Factored shear force/shear capacity [kN] 16,647 29,607 56 %

LVL (2) 1½×11⅞

Deflection due to unfactored load (Deflection limit L/360)
9,2 mm (94 %)

Beam Id: Lot#80 - MB 22

Date 09-09-2019

Structural Engineer:

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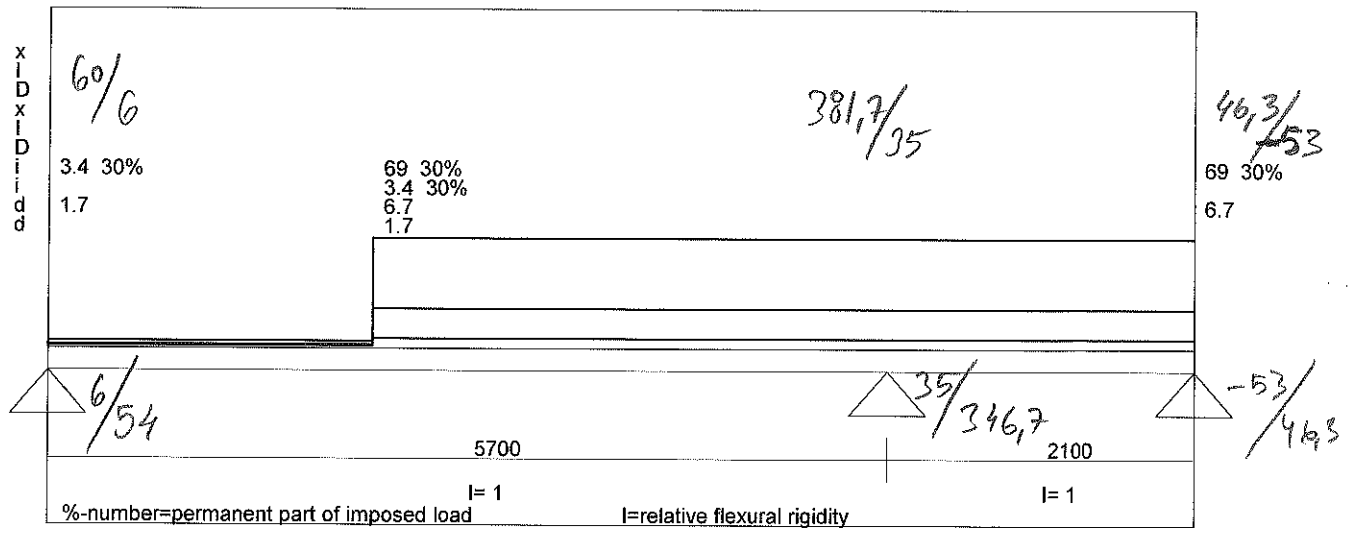


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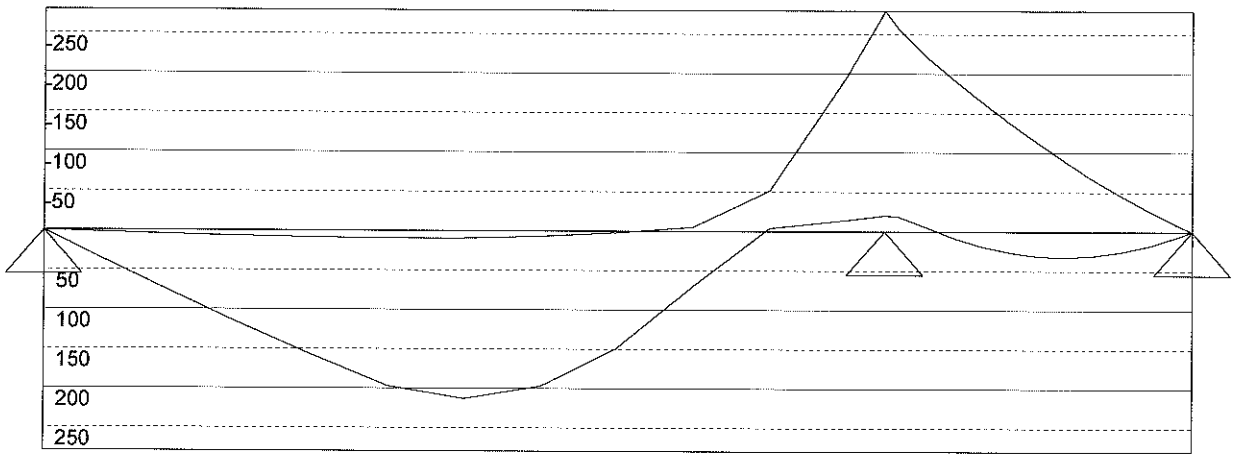


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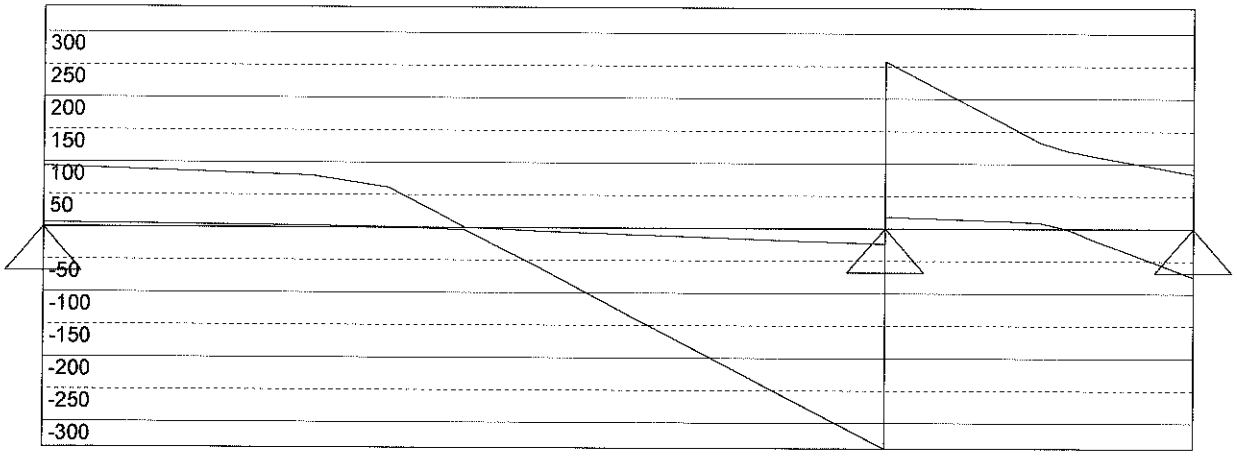


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
93,534 596,836 74,470
6,691 41,985 -84,388

HEB 280 (Class of section=1/1) G= 103 I(cm4)=19270 W(cm3)=1380 fy=235 W10 x 88
Factored Moment/Moment capacity [kNm] 279,433 360,490 78 %
Factored shear force/shear capacity [kN] 339,410 387,891 88 %

Sum infl M+S 0,82 (must be<=1) x= 5699 M=279,29 S=339,41
Deflection due to unfactored load (Deflection limit L/360)
9,4 mm (60 %) 0,2 mm (3 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - MB23

Date 10-09-2019

Structural Engineer:

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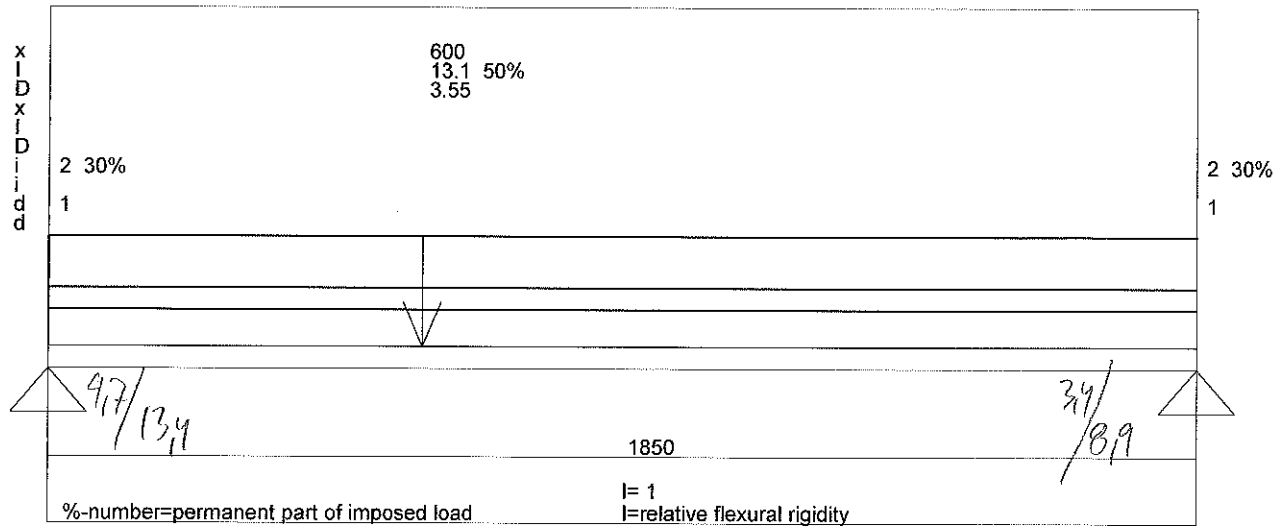


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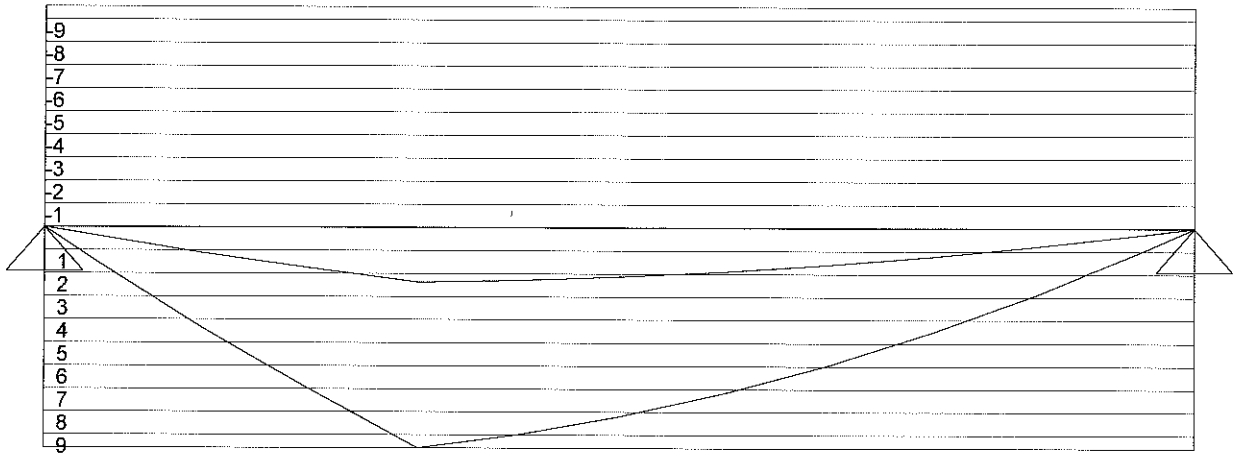


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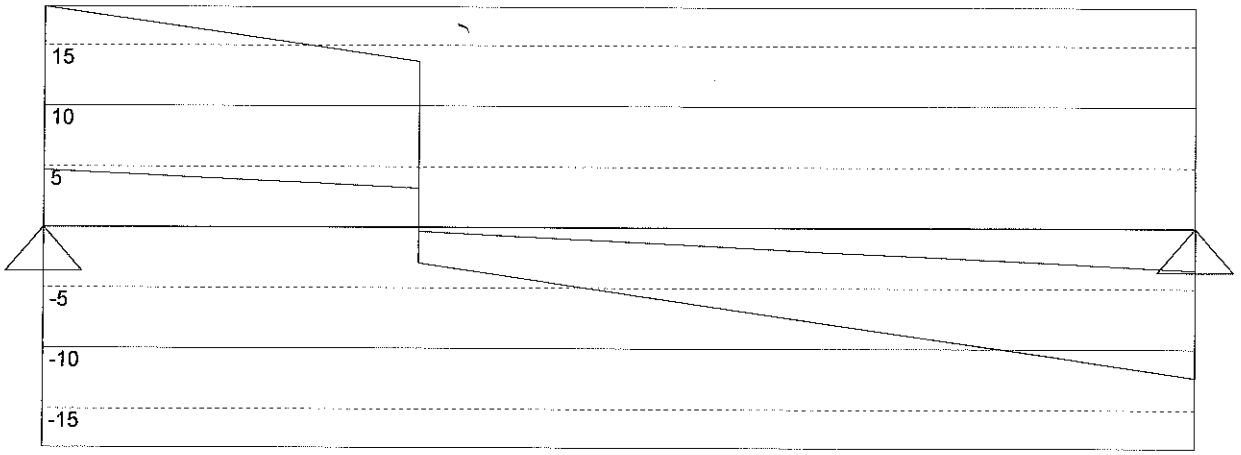


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.5 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
18,186 12,337
4,711 3,464

KER 76 x 240 B 2 Cf=1,00 Design method: Allowable stress design
Increasing factor of the allowable stress 1,07
Factored Moment/Moment capacity [kNm] 9,562 14,003 68 %
Factored shear force/shear capacity [kN] 18,186 22,042 83 %

LVL (2) 1½ x 9½

Deflection due to unfactored load (Deflection limit L/360)
3,3 mm (64 %)

Beam Id: Lot#80 - ~~MB~~ FLOOR JOIST

Date 04-09-2019

Structural Engineer:

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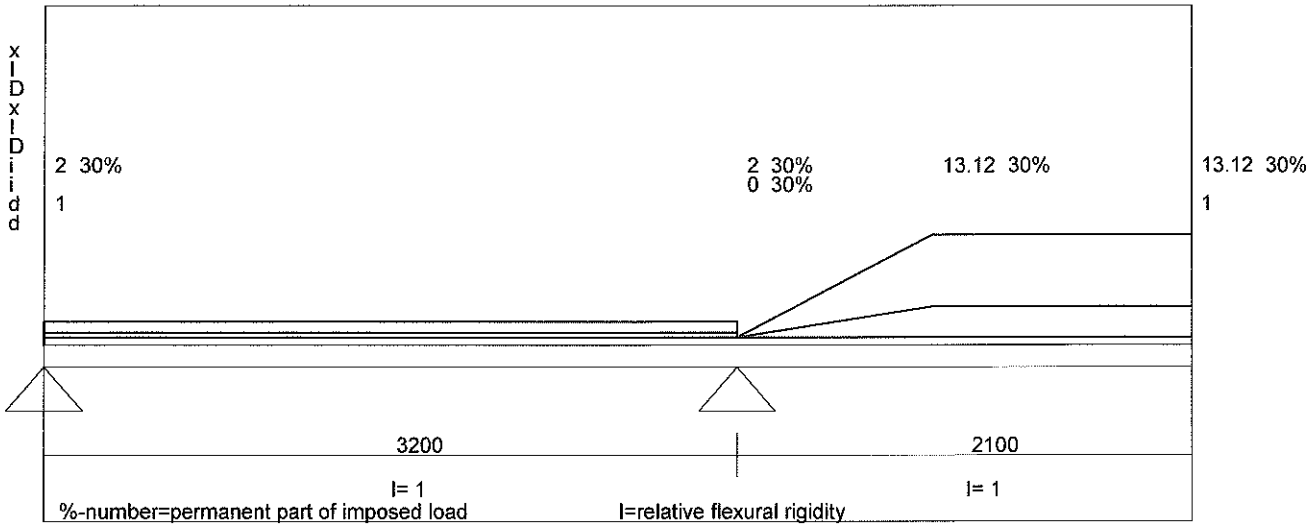


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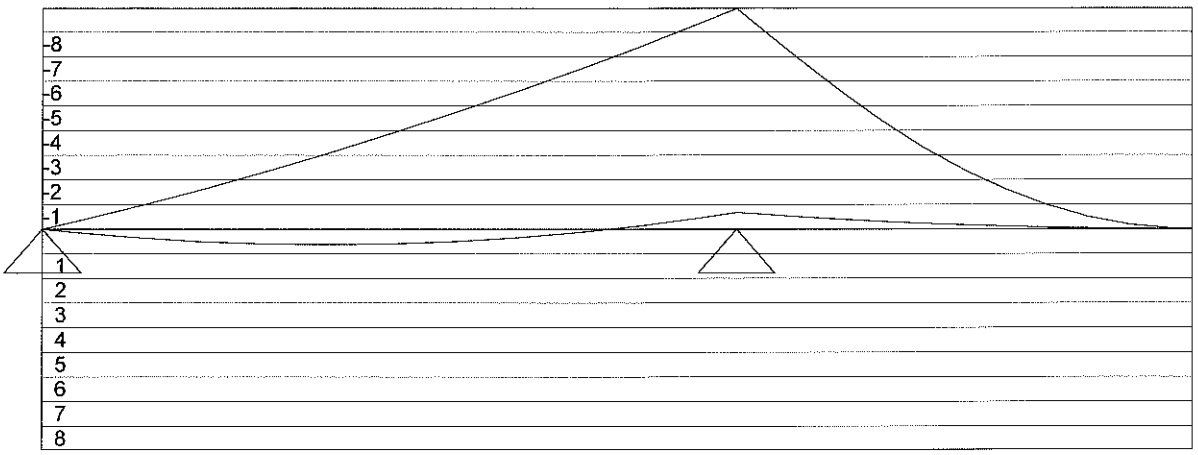


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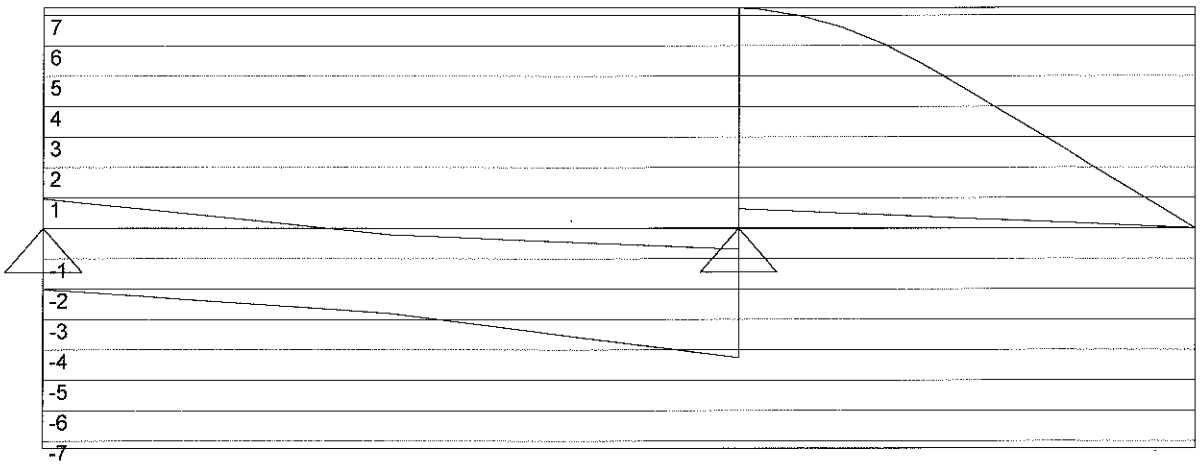


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .305 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
0,961 11,505
-2,018 1,339

KER 44 x 406 B 2 Cf=0,97 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 8,955 21,441 42 %
Factored shear force/shear capacity [kN] 7,243 20,633 35 %

Use 1 3/4" x 16" @ 12"

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
0,2 mm (3 %) 11,3 mm ( 97 %)

Beam Id: Lot#80 - ~~MB~~ FLOOR JOIST

Date 04-09-2019

Structural Engineer:

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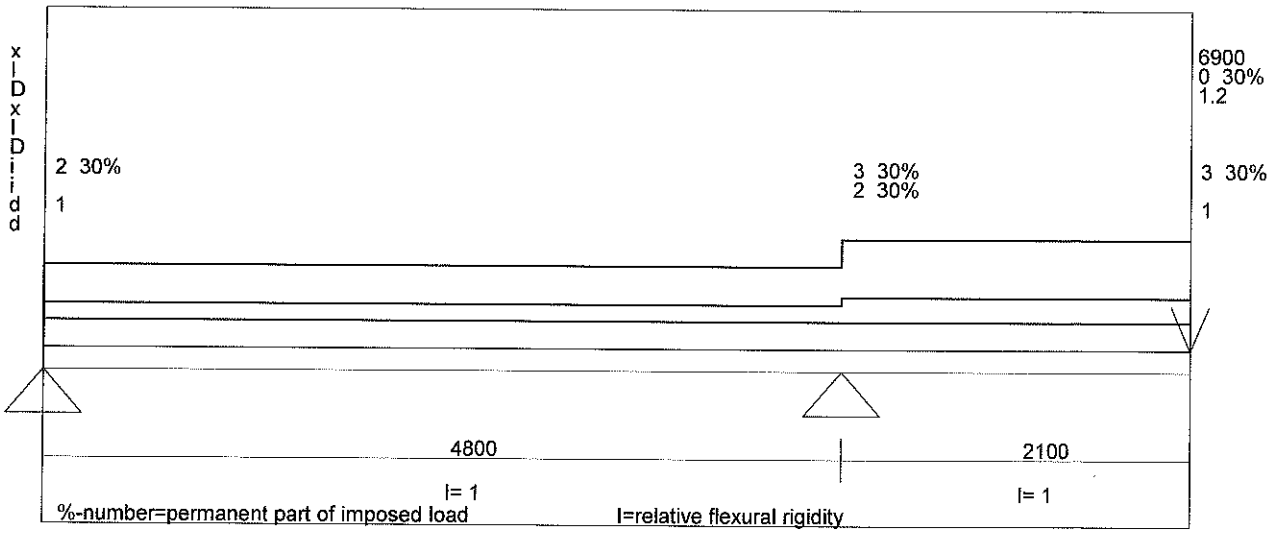


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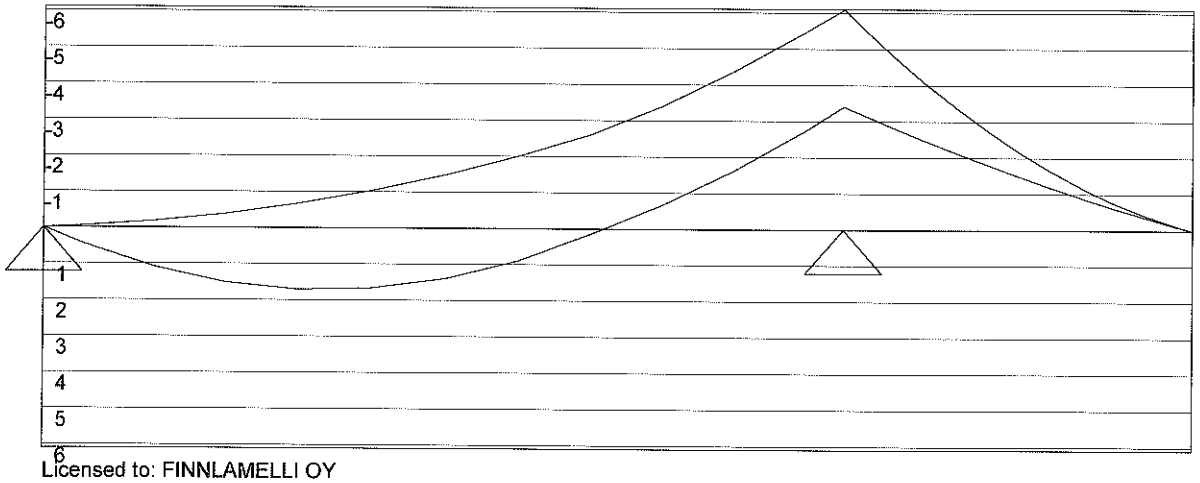


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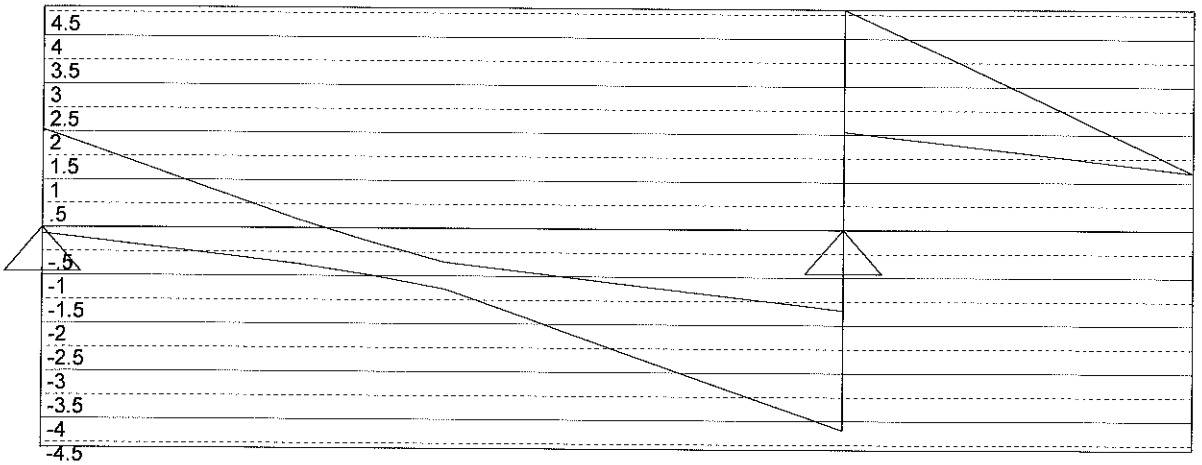



Load factor of dead load= 1 Load factor of imposed load= 1
Load width .406 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
2,043 8,803
-0,129 3,738

LVL 1 3/4 x 16" @ 16"

KER 44 x 406 B 2 Cf=0,97 Design method: Allowable stress design
Increasing factor of the allowable stress 1,11
Factored Moment/Moment capacity [kNm] 6,099 23,265 26 %
Factored shear force/shear capacity [kN] 4,610 22,388 21 %

Deflection due to unfactored load (Deflection limit L/360)/L/180)!
0,9 mm (7 %) 8,6 mm ( 73 %)

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

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 15 NOV 2019, 9:40AM

# Steel Beam



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

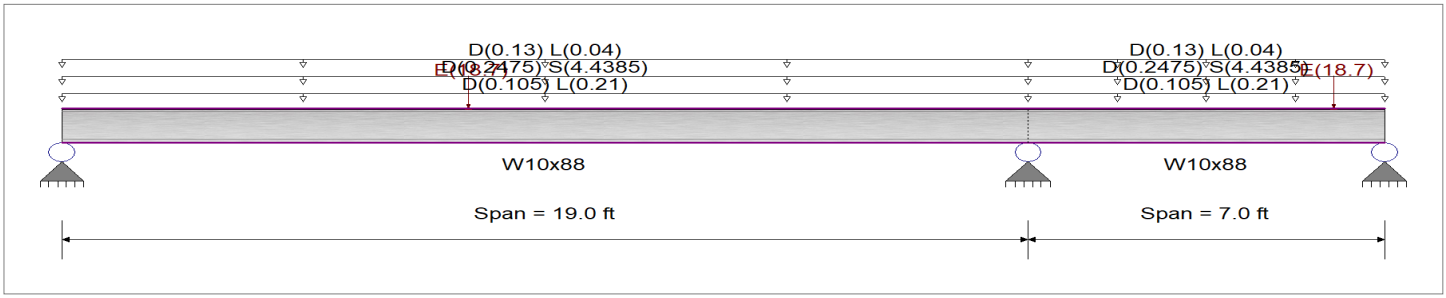
Description : MB22

## CODE REFERENCES

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

## Material Properties

| | | | |
|---|---|---|---|
| Analysis Method : | Allowable Strength Design | Fy : Steel Yield : | 50.0 ksi |
| Beam Bracing : | Beam is Fully Braced against lateral-torsional buckling | E: Modulus : | 29,000.0 ksi |
| Bending Axis : | Major Axis Bending | | |




## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.020, L = 0.040 ksf, Tributary Width = 5.250 ft, (Floor)

Uniform Load : D = 0.0150, S = 0.2690 ksf, Tributary Width = 16.50 ft, (Roof)

Uniform Load : D = 0.130, L = 0.040 ksf, Tributary Width = 1.0 ft, (Garage)

Point Load : E = 18.70 k @ 8.0 ft

Load for Span Number 2

Uniform Load : D = 0.020, L = 0.040 ksf, Tributary Width = 5.250 ft, (Floor)

Uniform Load : D = 0.0150, S = 0.2690 ksf, Tributary Width = 16.50 ft, (Roof)

Uniform Load : D = 0.130, L = 0.040 ksf, Tributary Width = 1.0 ft, (Garage)

Point Load : E = 18.70 k @ 6.0 ft, (Hold Down)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.604 : 1 | Maximum Shear Stress Ratio = | 0.426 : 1 |
| Section used for this span | W10x88 | Section used for this span | W10x88 |
| Ma : Applied | 170.390 k-ft | Va : Applied | 55.717 k |
| Mn / Omega : Allowable | 281.936 k-ft | Vn/Omega : Allowable | 130.680 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 19.000 ft | Location of maximum on span | 19.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.463 in | Ratio = | 492 >=480 |
| Max Upward Transient Deflection | -0.040 in | Ratio = | 2,125 >=480 |
| Max Downward Total Deflection | 0.514 in | Ratio = | 444 >=360 |
| Max Upward Total Deflection | -0.044 in | Ratio = | 1918 >=360 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.059 | 0.042 | 14.22 | -16.71 | 16.71 | 470.83 | 281.94 | 1.00 | 1.00 | 5.46 | 196.02 | 130.68 |

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# Steel Beam



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

Description : MB22

| Load Combination / Segment Length | Span # | Max Stress Ratios M | Max Stress Ratios V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dsgn. L = 7.00 ft | 2 | 0.059 | 0.031 | | -16.71 | 16.71 | 470.83 | 281.94 | 1.00 | 1.00 | 4.08 | 196.02 | 130.68 |
| +D+L | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.090 | 0.063 | 21.59 | -25.36 | 25.36 | 470.83 | 281.94 | 1.00 | 1.00 | 8.29 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.090 | 0.047 | | -25.36 | 25.36 | 470.83 | 281.94 | 1.00 | 1.00 | 6.19 | 196.02 | 130.68 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.604 | 0.426 | 145.04 | -170.39 | 170.39 | 470.83 | 281.94 | 1.00 | 1.00 | 55.72 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.604 | 0.318 | | -170.39 | 170.39 | 470.83 | 281.94 | 1.00 | 1.00 | 41.56 | 196.02 | 130.68 |
| +D+0.750L | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.082 | 0.058 | 19.75 | -23.20 | 23.20 | 470.83 | 281.94 | 1.00 | 1.00 | 7.59 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.082 | 0.043 | | -23.20 | 23.20 | 470.83 | 281.94 | 1.00 | 1.00 | 5.66 | 196.02 | 130.68 |
| +D+0.750L+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.491 | 0.346 | 117.86 | -138.46 | 138.46 | 470.83 | 281.94 | 1.00 | 1.00 | 45.28 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.491 | 0.258 | | -138.46 | 138.46 | 470.83 | 281.94 | 1.00 | 1.00 | 33.78 | 196.02 | 130.68 |
| +D+0.70E | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.215 | 0.097 | 60.73 | -49.91 | 60.73 | 470.83 | 281.94 | 1.00 | 1.00 | 12.72 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.177 | 0.082 | 5.47 | -49.91 | 49.91 | 470.83 | 281.94 | 1.00 | 1.00 | 10.69 | 196.02 | 130.68 |
| +D+0.750L+0.750S+0.5250E | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.579 | 0.388 | 152.57 | -163.37 | 163.37 | 470.83 | 281.94 | 1.00 | 1.00 | 50.72 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.579 | 0.296 | | -163.37 | 163.37 | 470.83 | 281.94 | 1.00 | 1.00 | 38.74 | 196.02 | 130.68 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.036 | 0.025 | 8.53 | -10.02 | 10.02 | 470.83 | 281.94 | 1.00 | 1.00 | 3.28 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.036 | 0.019 | | -10.02 | 10.02 | 470.83 | 281.94 | 1.00 | 1.00 | 2.45 | 196.02 | 130.68 |
| +0.60D+0.70E | | | | | | | | | | | | | |
| Dsgn. L = 19.00 ft | 1 | 0.195 | 0.081 | 55.05 | -43.23 | 55.05 | 470.83 | 281.94 | 1.00 | 1.00 | 10.54 | 196.02 | 130.68 |
| Dsgn. L = 7.00 ft | 2 | 0.153 | 0.069 | 5.85 | -43.23 | 43.23 | 470.83 | 281.94 | 1.00 | 1.00 | 9.06 | 196.02 | 130.68 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.5138 | 8.588 | | 0.0000 | 0.000 |
| | 2 | 0.0000 | 8.588 | +D+S | -0.0438 | 2.744 |

## Vertical Reactions

Support notation : Far left is #1 — Values in KIPS

| Load Combination | Support 1 | Support 2 | Support 3 |
|---|---|---|---|
| Overall MAXimum | 37.782 | 97.282 | 9.252 |
| Overall MINimum | 1.919 | 4.942 | -0.362 |
| D Only | 3.704 | 9.538 | -0.698 |
| +D+L | 5.624 | 14.481 | -1.060 |
| +D+S | 37.782 | 97.282 | -7.118 |
| +D+0.750L | 5.144 | 13.245 | -0.969 |
| +D+0.750L+0.750S | 30.702 | 79.053 | -5.784 |
| +D+0.70E | 9.535 | 23.411 | 5.778 |
| +D+0.750L+0.750S+0.5250E | 35.075 | 89.458 | -0.927 |
| +0.60D | 2.223 | 5.723 | -0.419 |
| +0.60D+0.70E | 8.053 | 19.596 | 6.058 |
| L Only | 1.919 | 4.942 | -0.362 |
| S Only | 34.077 | 87.744 | -6.420 |
| E Only | 8.330 | 19.818 | 9.252 |

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# Steel Column



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Description : TS Column

## Code References

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

## General Information

Steel Section Name : **HSS5x5x3/8**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 9.5 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for X-X Axis buckling = 9.5 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 9.5 ft, K = 1.0

## Applied Loads

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

Column self weight included : 211.865 lbs * Dead Load Factor
AXIAL LOADS . . .
MB22: Axial Load at 9.50 ft, D = 9.540, L = 4.940, S = 87.740, H = 19.820 k

## DESIGN SUMMARY

### Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8849** : 1
Load Combination +D+S+H
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 117.312 k
Pn / Omega : Allowable 132.574 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 24.331 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 24.331 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 | 0.223 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 0.000 | PASS | 0.00 ft |
| +D+L+H | 0.260 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 0.000 | PASS | 0.00 ft |
| +D+S+H | 0.885 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 0.000 | PASS | 0.00 ft |
| +D+0.750L+H | 0.251 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 0.000 | PASS | 0.00 ft |
| +D+0.750L+0.750S+H | 0.747 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 0.000 | PASS | 0.00 ft |
| +0.60D+0.60H | 0.134 | PASS | 0.00 ft | 1.00 | 1.00 | 60.96 | 60.96 | 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 | 29.572 | | | | | | | | |
| +D+L+H | 34.512 | | | | | | | | |
| +D+S+H | 117.312 | | | | | | | | |
| +D+0.750L+H | 33.277 | | | | | | | | |
| +D+0.750L+0.750S+H | 99.082 | | | | | | | | |
| +0.60D+0.60H | 17.743 | | | | | | | | |
| D Only | 9.752 | | | | | | | | |
| L Only | 4.940 | | | | | | | | |
| S Only | 87.740 | | | | | | | | |

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# Steel Column



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Description : TS Column

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H Only | 19.820 | | | | | | | | | | |

## 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 | 117.312 | | | | | | | | | | |
| " | Minimum | 4.940 | | | | | | | | | | |
| Reaction, X-X Axis Base | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Reaction, Y-Y Axis Base | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Reaction, X-X Axis Top | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Reaction, Y-Y Axis Top | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Moment, X-X Axis Base | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Moment, Y-Y Axis Base | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Moment, X-X Axis Top | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |
| Moment, Y-Y Axis Top | Maximum | 29.572 | | | | | | | | | | |
| " | Minimum | 29.572 | | | | | | | | | | |

## 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+S+H | 0.0000 | in | 0.000 | ft | 0.000 | in | 0.000 | ft |
| +D+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 |
| +0.60D+0.60H | 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 |
| L Only | 0.0000 | in | 0.000 | ft | 0.000 | in | 0.000 | ft |
| S 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 : HSS5x5x3/8

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | = | 5.000 | in | I xx | = | 21.70 | in^4 | J | = | 36.100 in^4 |
| Design Thick | = | 0.349 | in | S xx | = | 8.68 | in^3 | | | |
| Width | = | 5.000 | in | R xx | = | 1.870 | in | | | |
| Wall Thick | = | 0.375 | in | Zx | = | 10.600 | in^3 | | | |
| Area | = | 6.180 | in^2 | I yy | = | 21.700 | in^4 | C | = | 14.900 in^3 |
| Weight | = | 22.302 | plf | S yy | = | 8.680 | in^3 | | | |
| | | | | R yy | = | 1.870 | in | | | |

Ycg = 0.000 in

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# Steel Column



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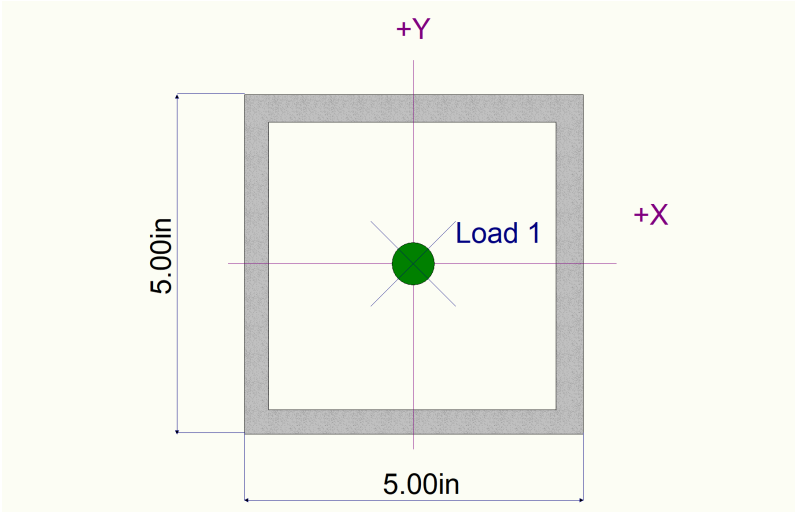
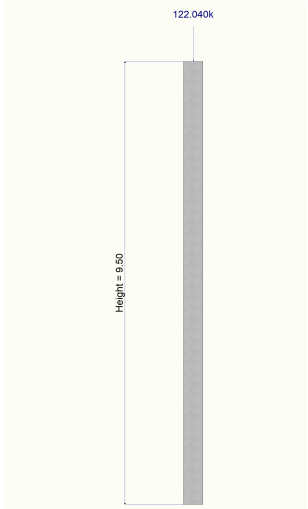
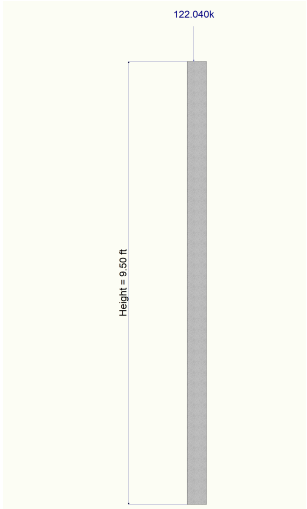
Description : TS Column

## Sketches



Beam Id: Lot#80 - RB

Date 03-09-2019

Structural Engineer:

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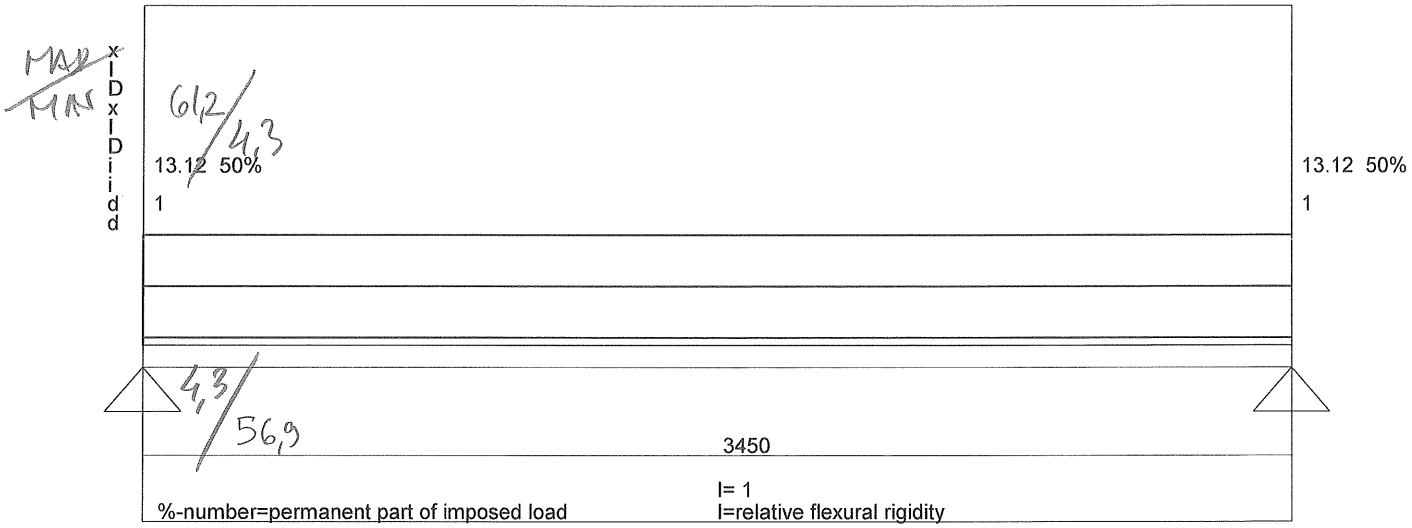


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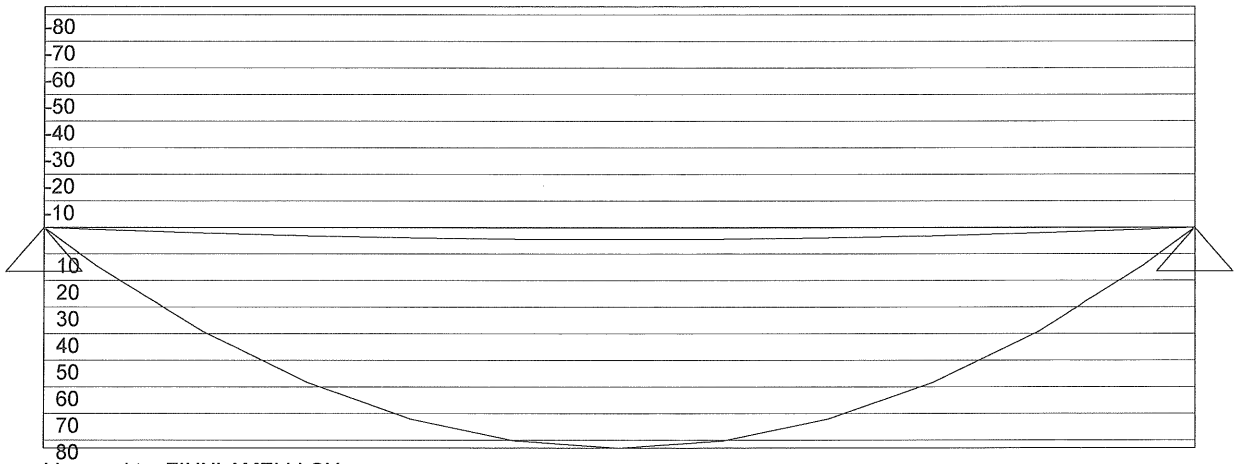


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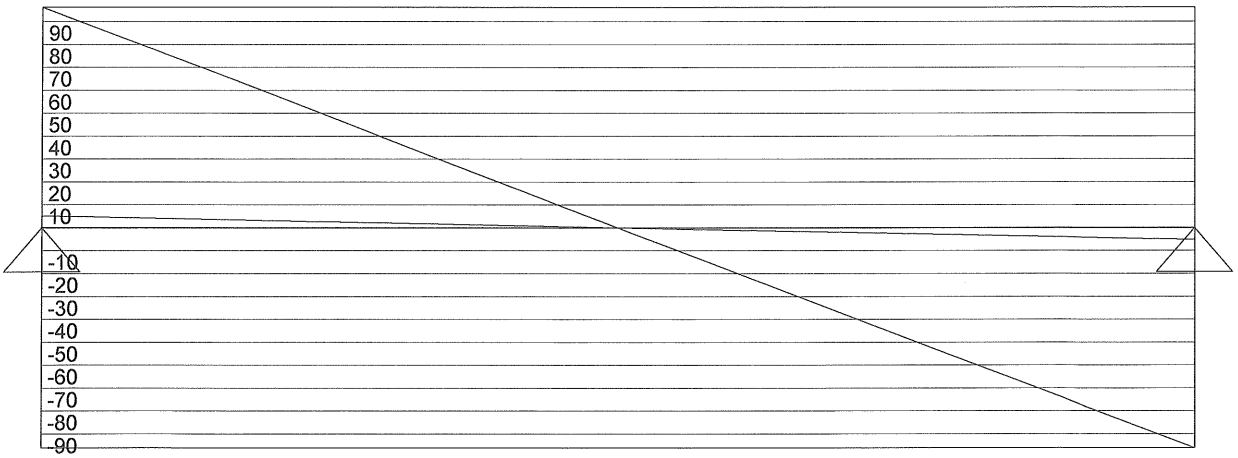


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 2.514 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
96,220 96,239
5,203 5,204

HEB 160 (Class of section=1/1) G= 42,6 I(cm4)=2492 W(cm3)=311 fy=235
Factored Moment/Moment capacity [kNm] 83,006 83,190 100 %
Factored shear force/shear capacity [kN] 96,220 165,816 58 %

W8x21 OR (W6x25)

Sum infl M+S 0,99 (must be<=1) x= 1725 M=83,01 S=0
Deflection due to unfactored load (Deflection limit L/240)
12,6 mm (87 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB 2

Date 03-09-2019

Structural Engineer:

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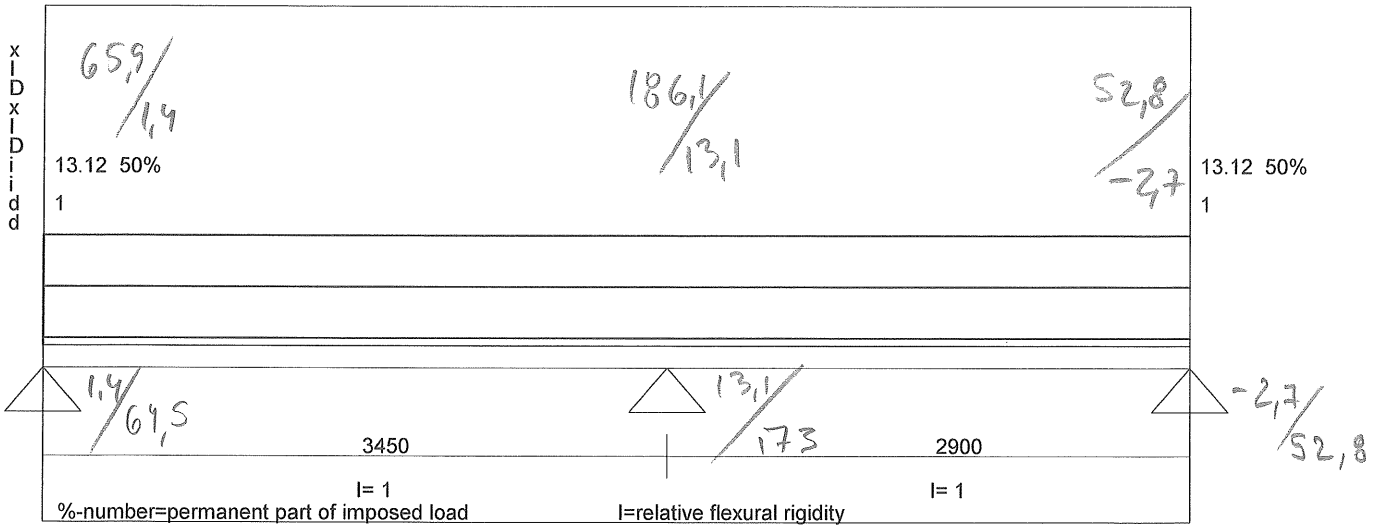


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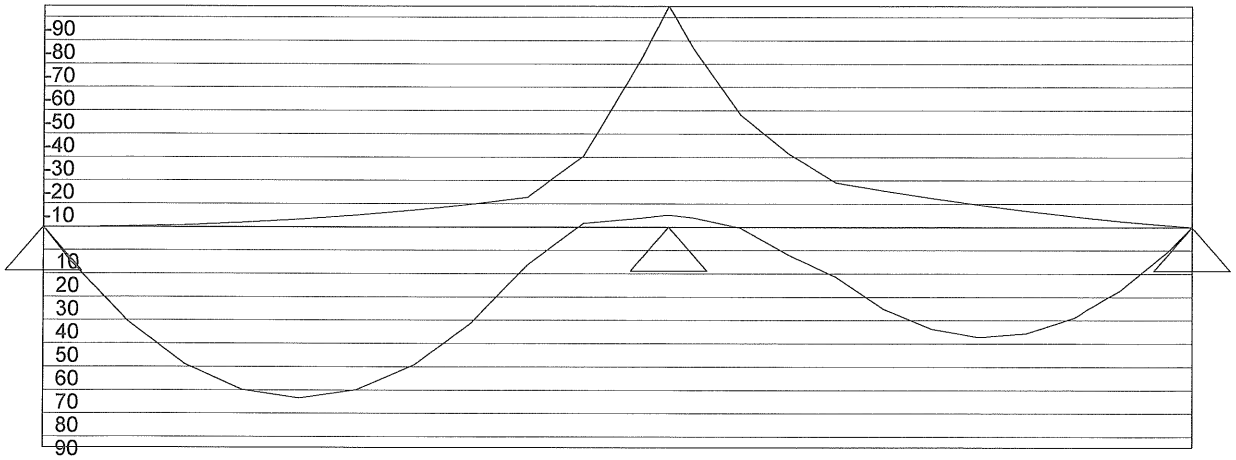


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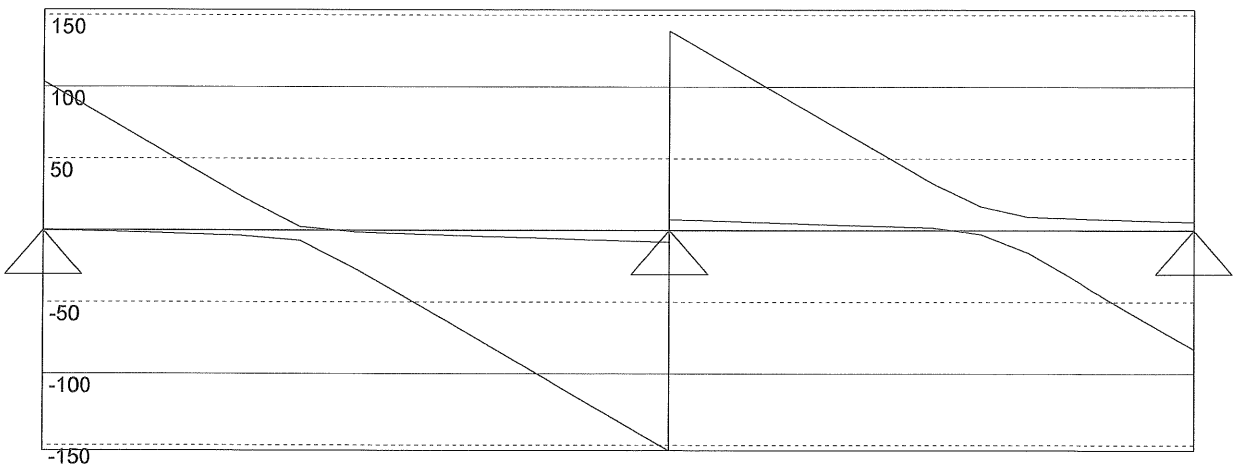


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.3 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
103,686 292,587 83,218
0,506 15,821 -5,716

HEB 180 (Class of section=1/1) G= 51,2 I(cm4)=3831 W(cm3)=426 fy=235
Factored Moment/Moment capacity [kNm] 94,680 113,270 84 %
Factored shear force/shear capacity [kN] 153,758 198,951 77 %

W8×28

Sum infl M+S 0,87 (must be<=1) x= 3449 M=94,67 S=153,76
Deflection due to unfactored load (Deflection limit L/240)
6,1 mm (43 %) 2,6 mm (21 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB 3

Date 30-08-2019

Structural Engineer:

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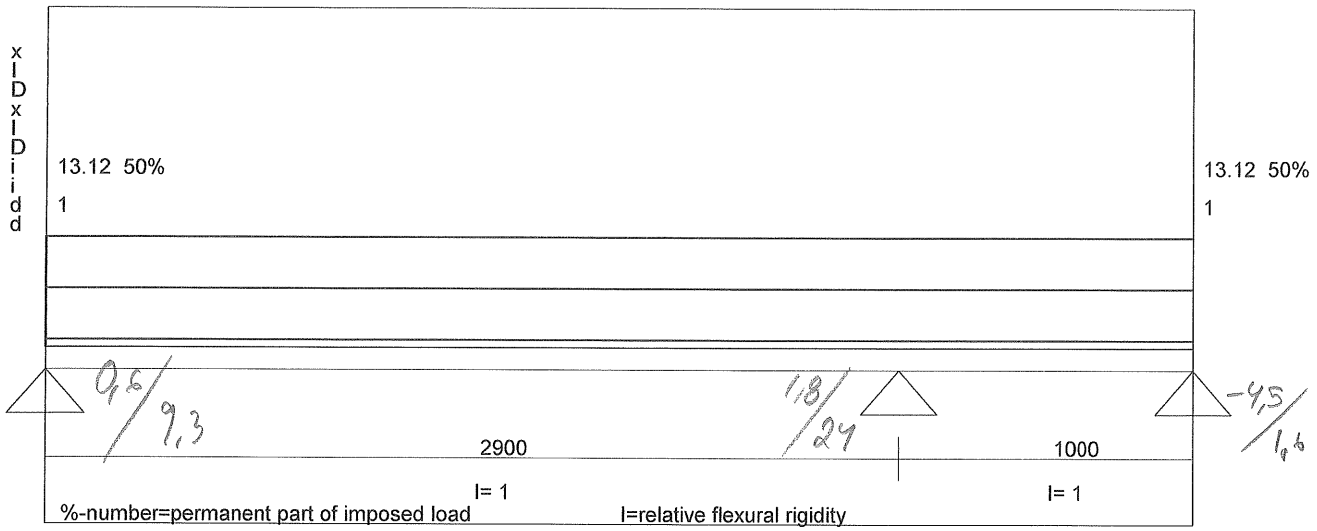


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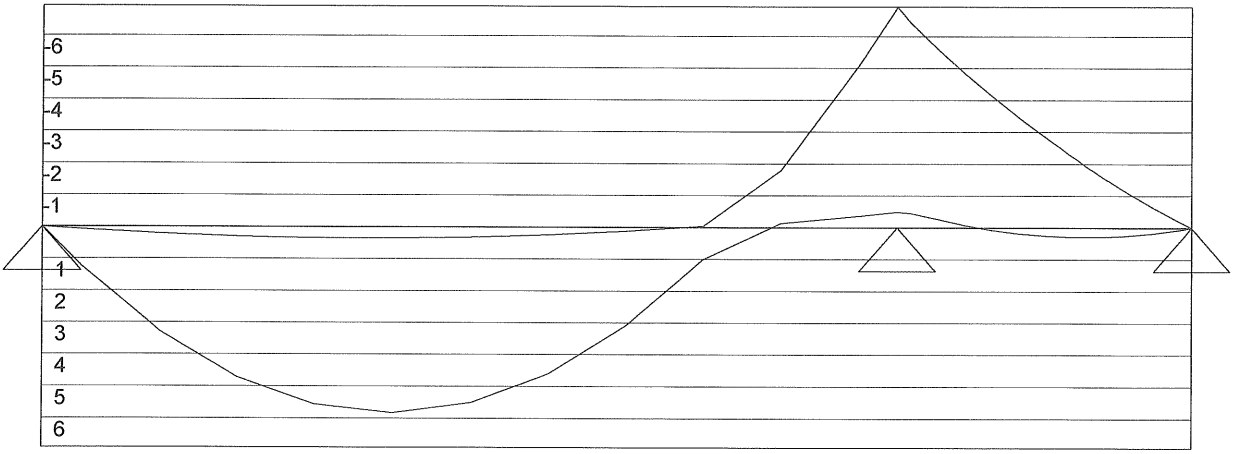


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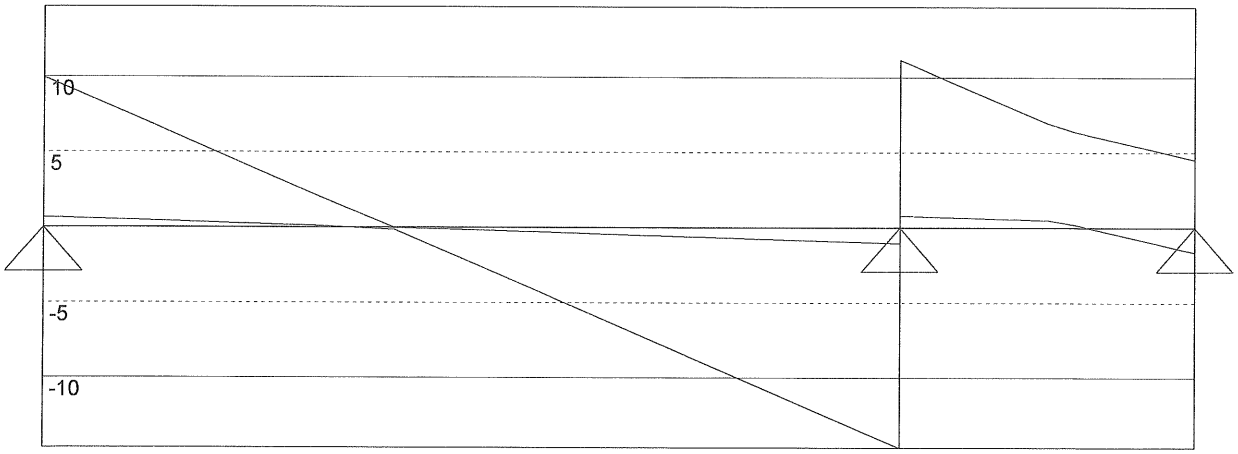


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .6 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
9,939 25,824 1,651
0,657 1,829 -4,526

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] 6,920 18,058 38 %
Factored shear force/shear capacity [kN] 14,668 27,781 53 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/240)
2,7 mm (23 %) 0,0 mm (0 %)

Beam Id: Lot#80 - RB 4

Date 30-08-2019

Structural Engineer:

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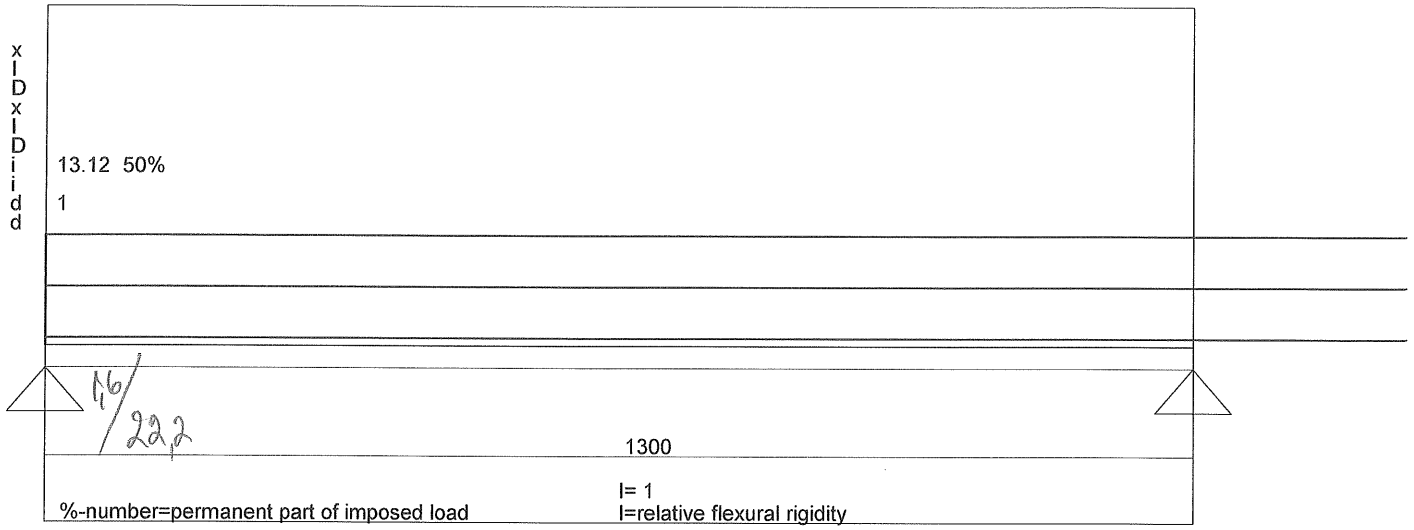


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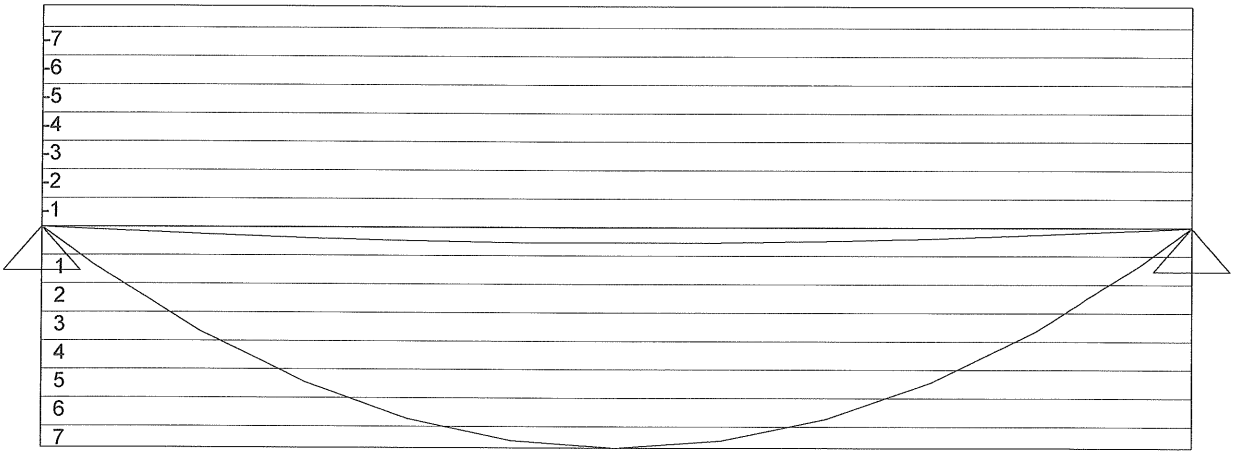


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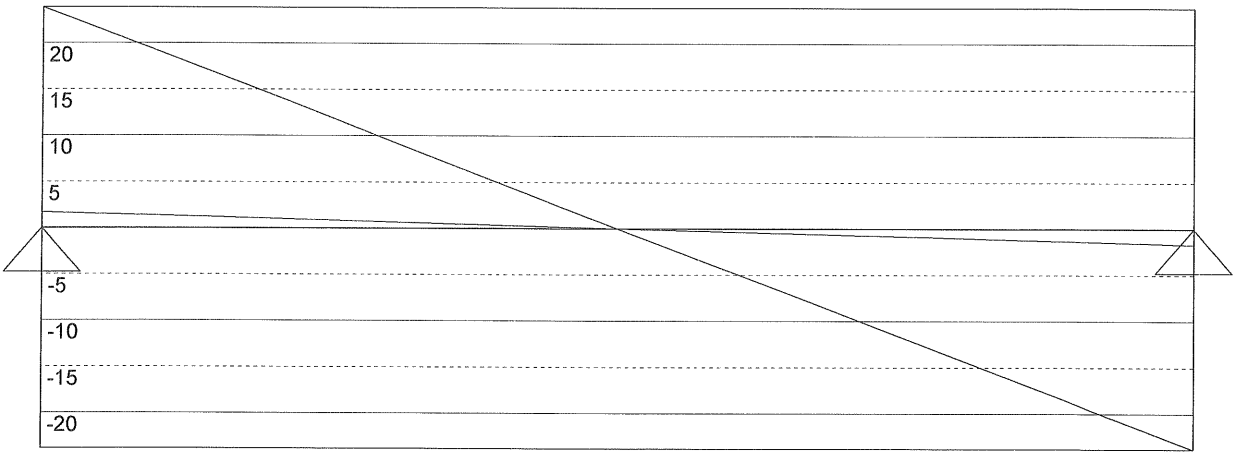


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.6 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
23,858 23,863
1,690 1,690

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] 7,755 18,058 43 %
Factored shear force/shear capacity [kN] 23,858 27,781 86 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/240)
0,9 mm (16 %)

Beam Id: Lot#80 - RB 16

Date 02-09-2019

Structural Engineer:

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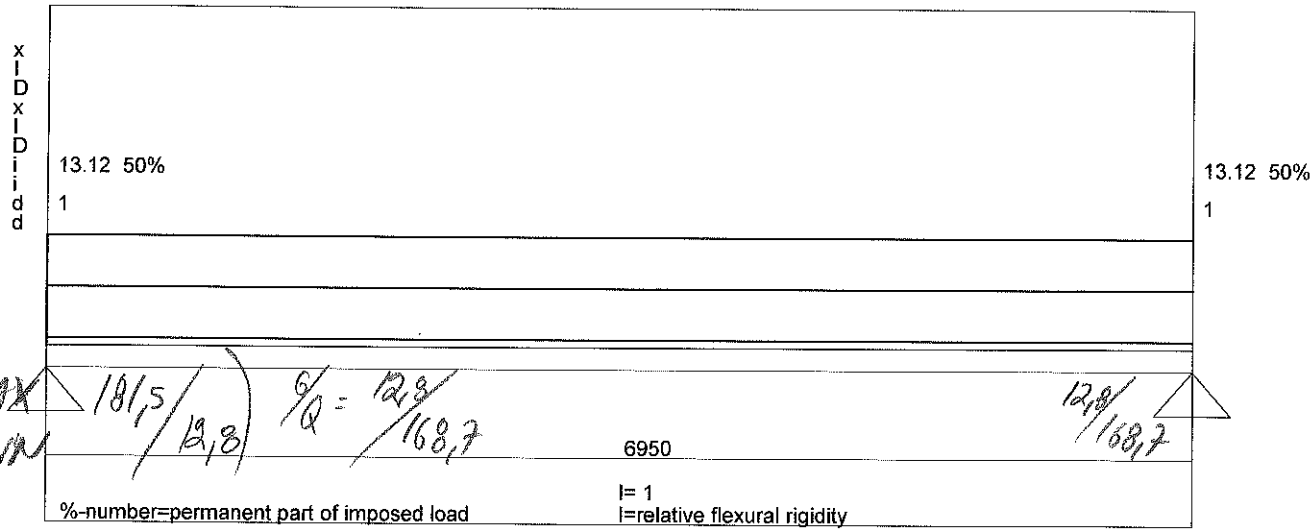


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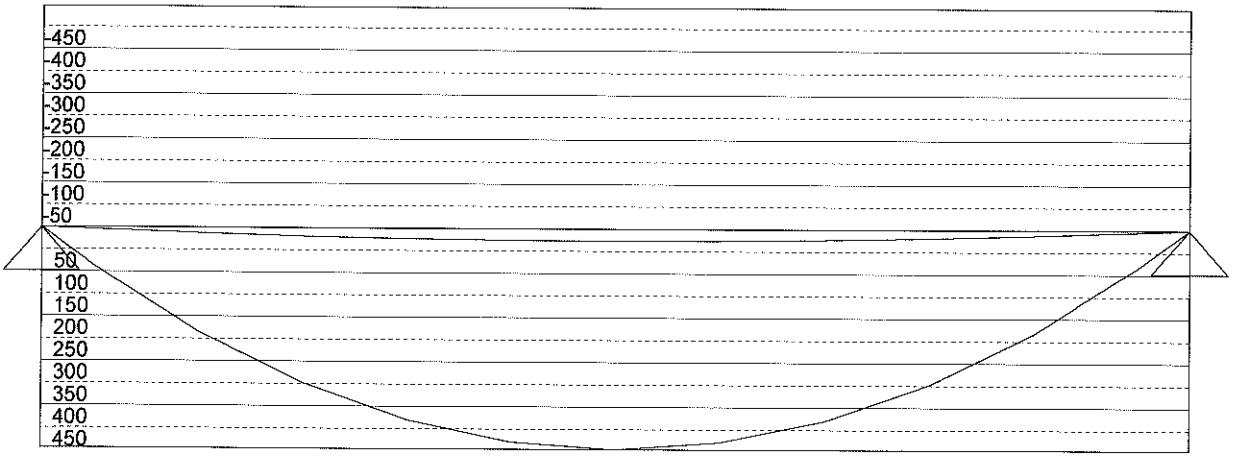


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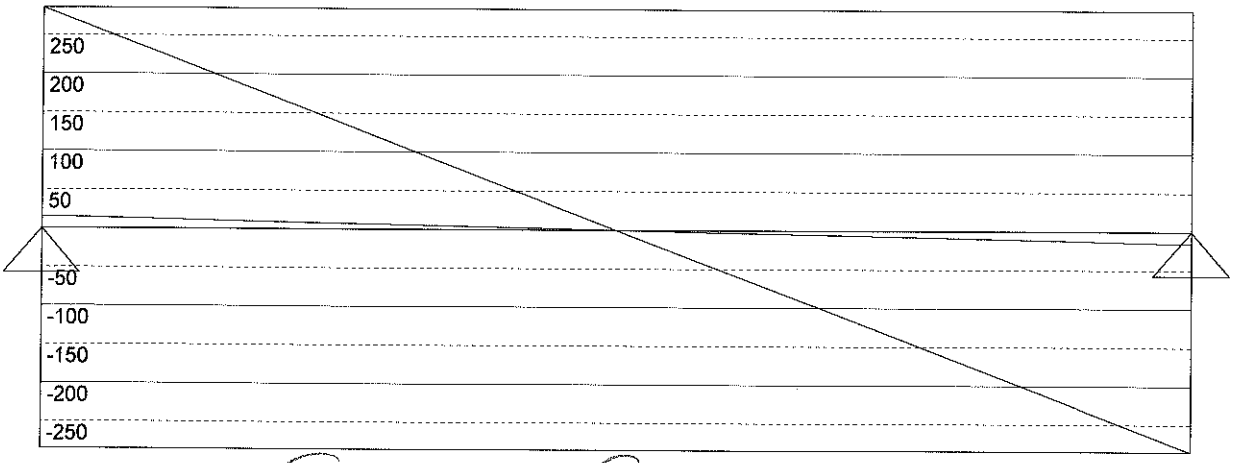


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.7 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
285,277 285,334
15,426 15,429

HEB 320 (Class of section=1/1) G= 127 I(cm4)=30823 W(cm3)=1930 fy=235
Factored Moment/Moment capacity [kNm] 495,767 502,900 99 %
Factored shear force/shear capacity [kN] 285,277 485,604 59 %

HEB 320 = W 12 × 87

Sum infl M+S 0,97 (must be<=1) x= 3475 M=495,77 S=0
Deflection due to unfactored load (Deflection limit L/240)
24,6 mm (85 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB //

Date 02-09-2019

Structural Engineer:

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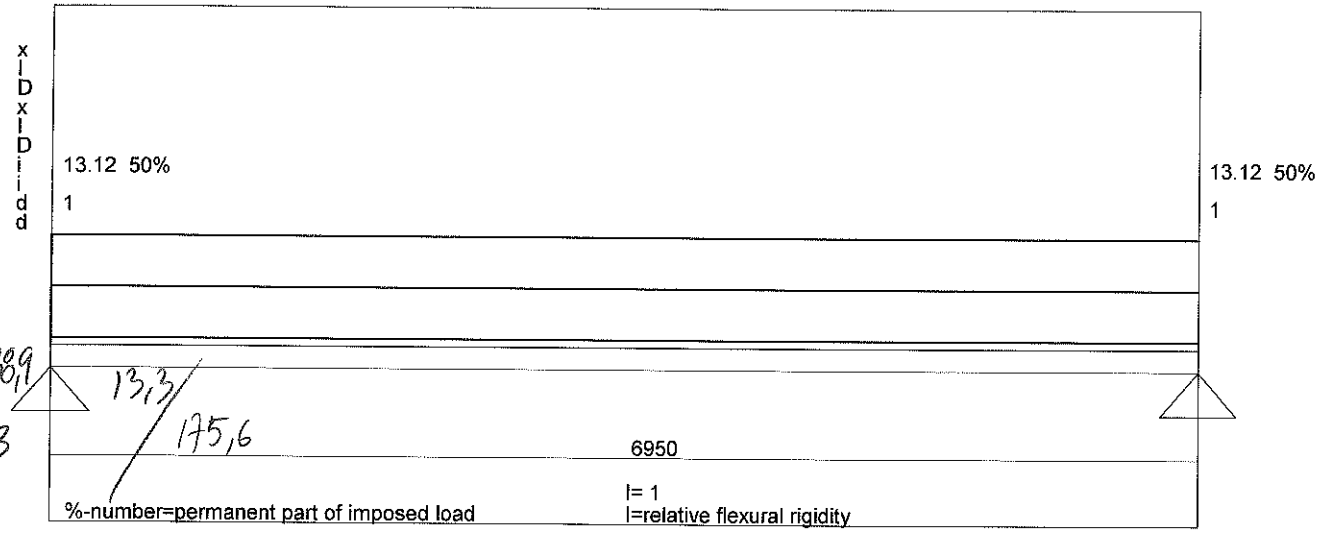


MAX 18899 13,3 / 175,6

MIN 13,3

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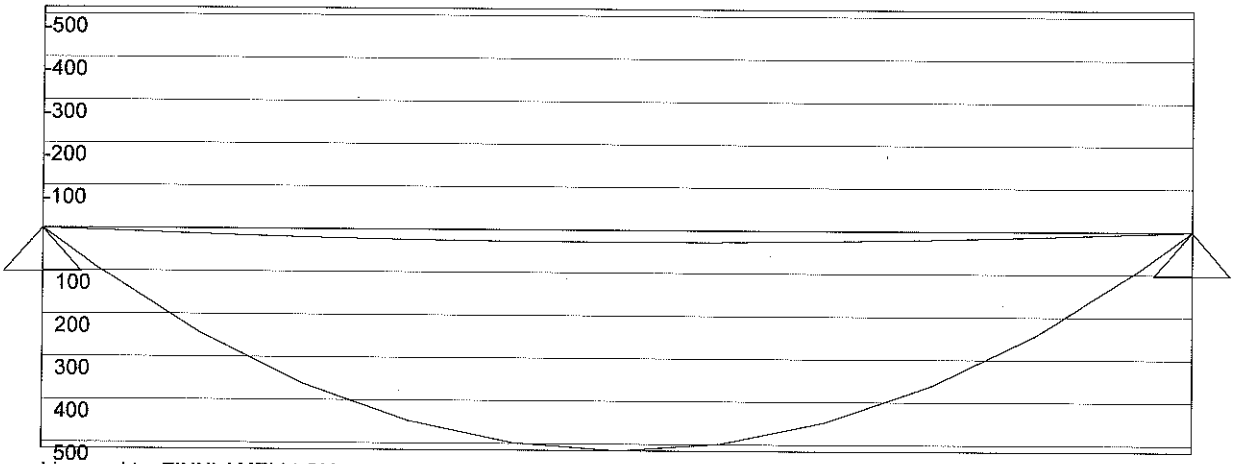


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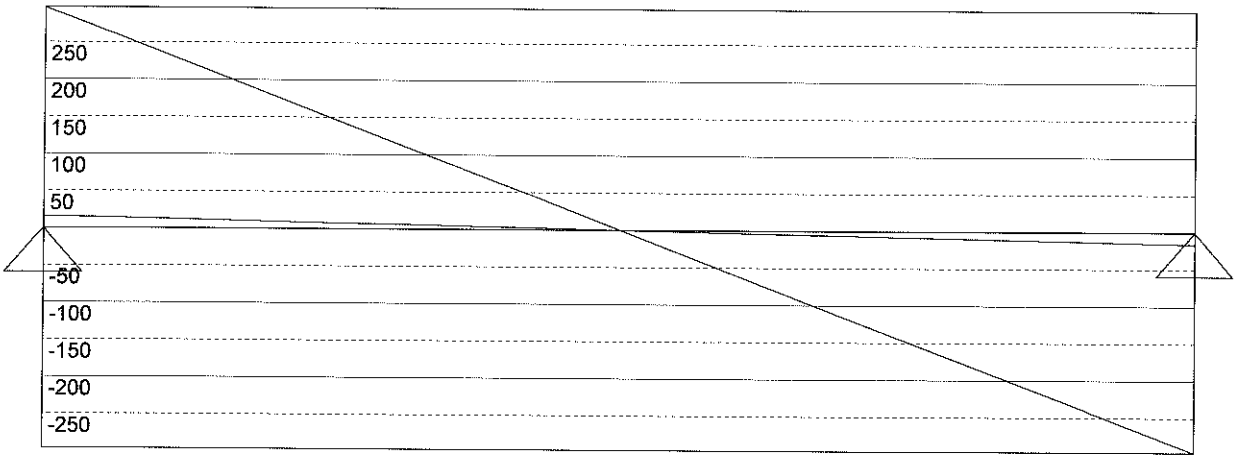


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.85 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
296,842 296,901
16,051 16,055

HEB 340 (Class of section=1/1) G= 134 I(cm4)=36656 W(cm3)=2160 fy=235 HEB 340 ≈ W 12x106
Factored Moment/Moment capacity [kNm] 515,866 564,000 91 %
Factored shear force/shear capacity [kN] 296,842 538,902 55 %

Sum infl M+S 0,90 (must be<=1) x= 3475 M=515,87 S=0
Deflection due to unfactored load (Deflection limit L/240)
21,5 mm (74 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB 12

Date 03-09-2019

Structural Engineer:

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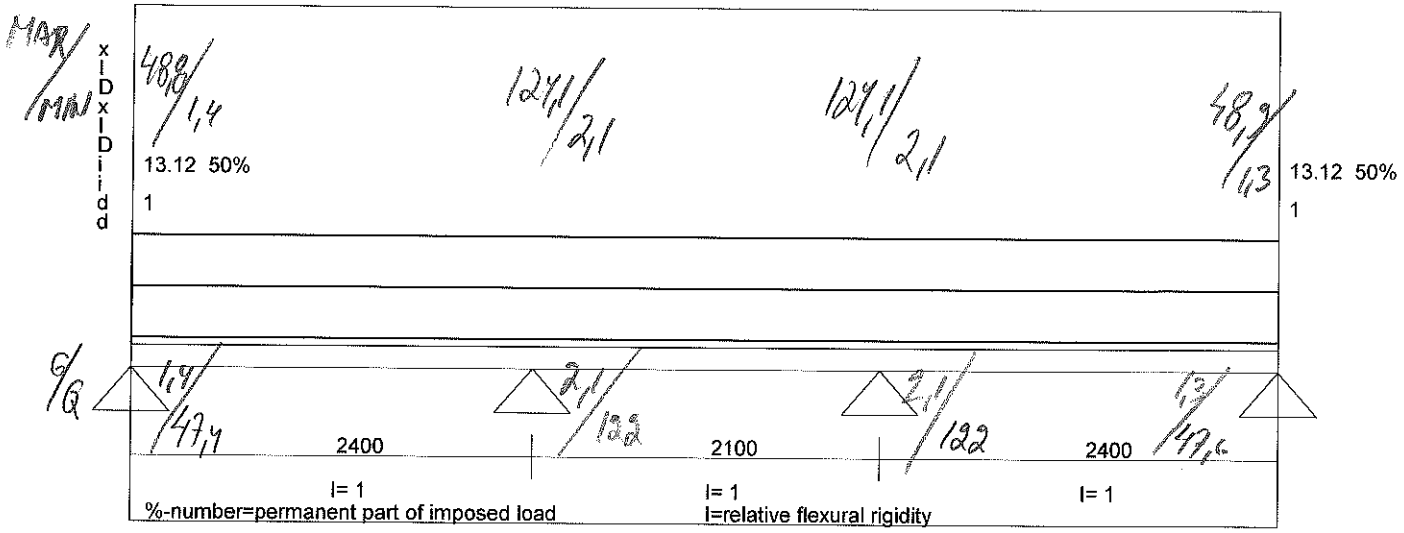


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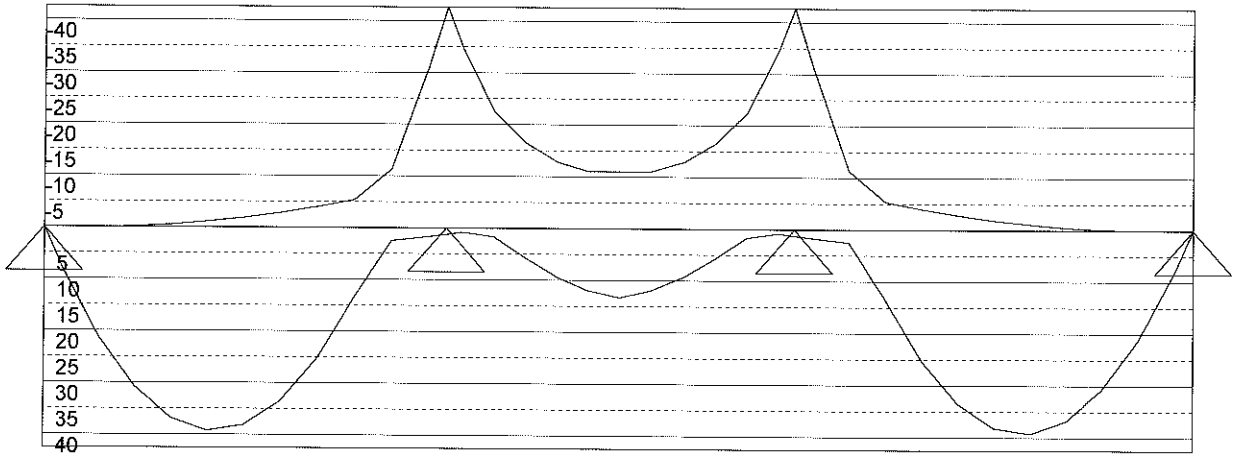


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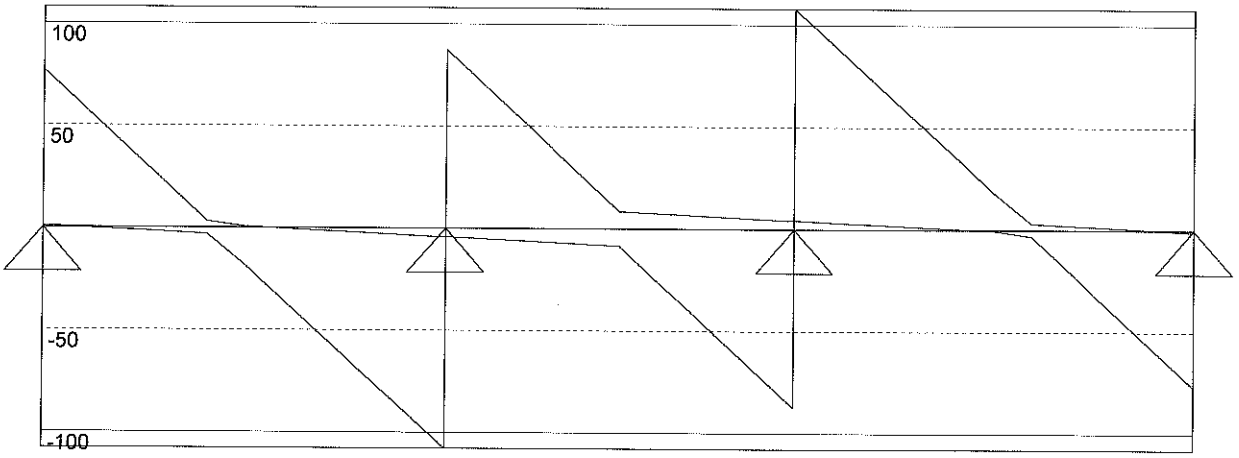


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 3.385 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
76,891 195,236 195,238 76,907
0,890 0,106 0,107 0,892

HEB 140 (Class of section=1/1) G= 33,7 I(cm4)=1509 W(cm3)=216 fy=235
Factored Moment/Moment capacity [kNm] 42,569 57,810 74 %
Factored shear force/shear capacity [kN] 107,871 126,336 85 %

HEB 140 = W6x20

Deflection due to unfactored load (Deflection limit L/240)
4,2 mm (42 %) 0,9 mm (11 %) 4,2 mm (42 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB /3

Date 03-09-2019

Structural Engineer:

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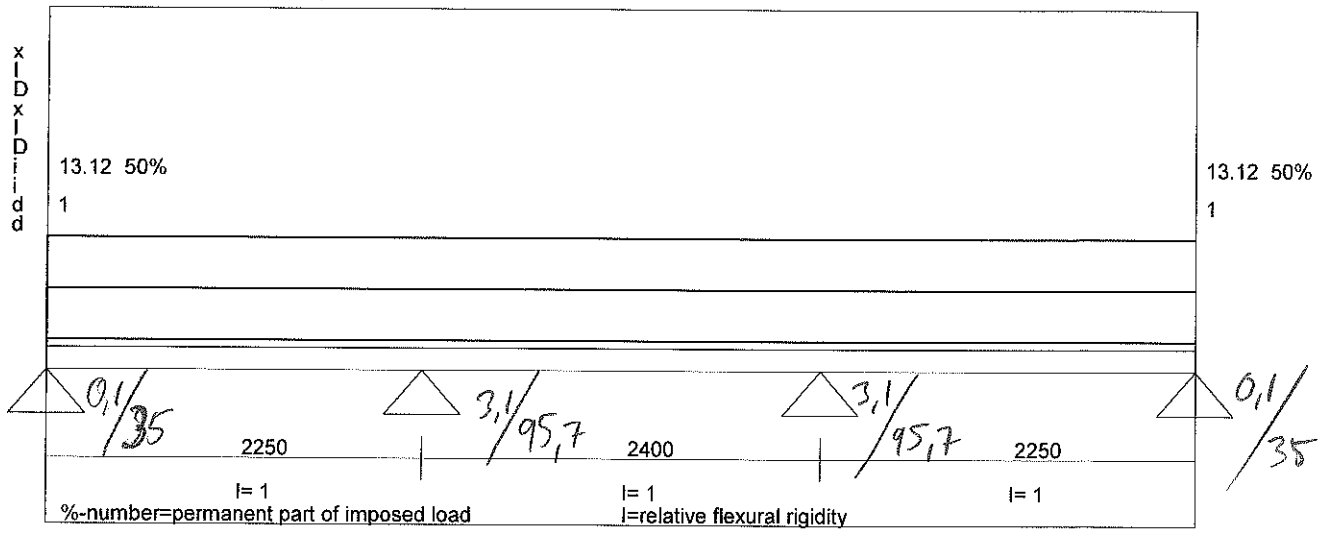


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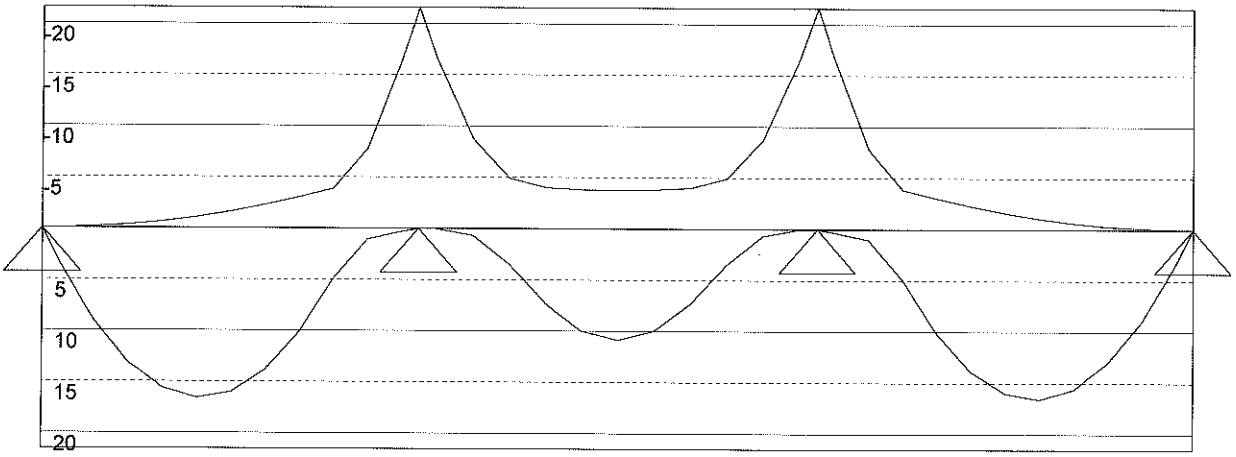


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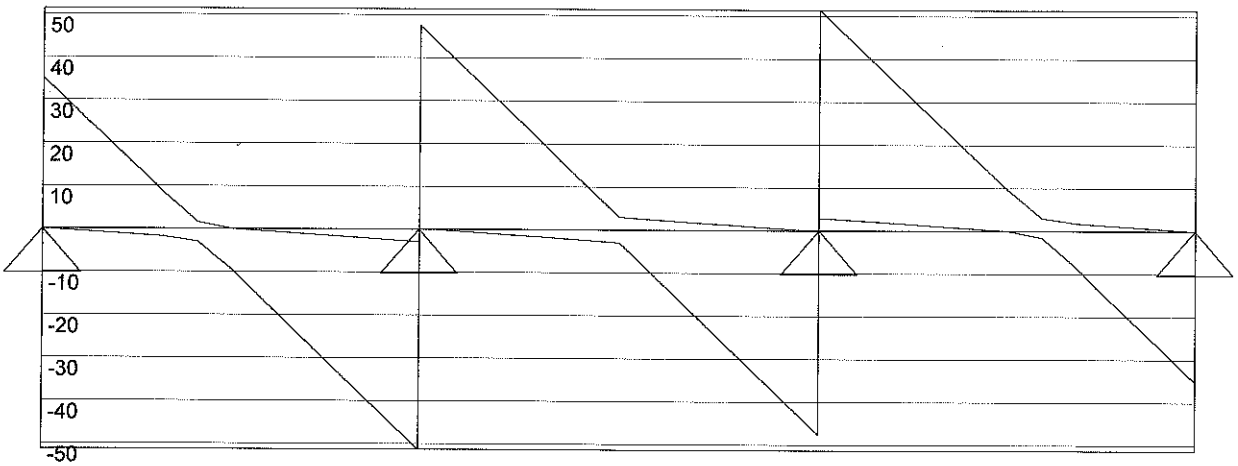


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.63 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
35,119 98,874 98,882 35,124
0,052 3,115 3,118 0,053

L40 305 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] 21,540 35,643 60 %
Factored shear force/shear capacity [kN] 51,348 51,180 100 %

GL (190 + 115) × ~~215~~ 260

Deflection due to unfactored load (Deflection limit L/240)
3,6 mm (38 %) 2,2 mm (22 %) 3,6 mm (38 %)

GL (7 1/2" + 4 1/2") × 10 1/4" OR STEEL ?

Beam Id: Lot#80 - RB 13

Date 03-09-2019

Structural Engineer:

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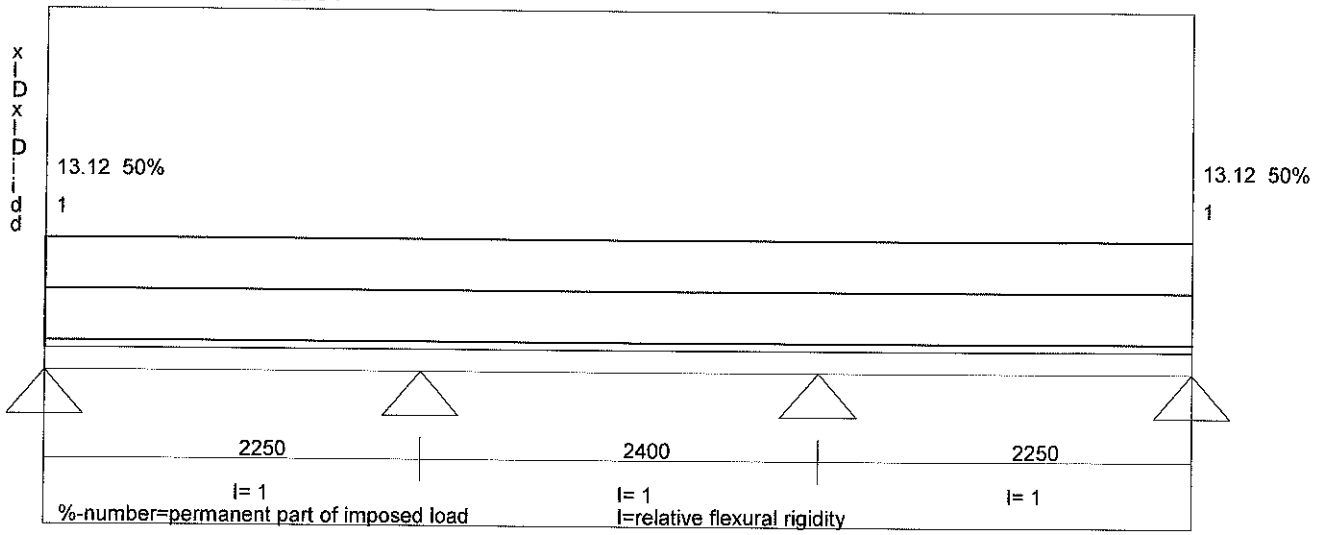


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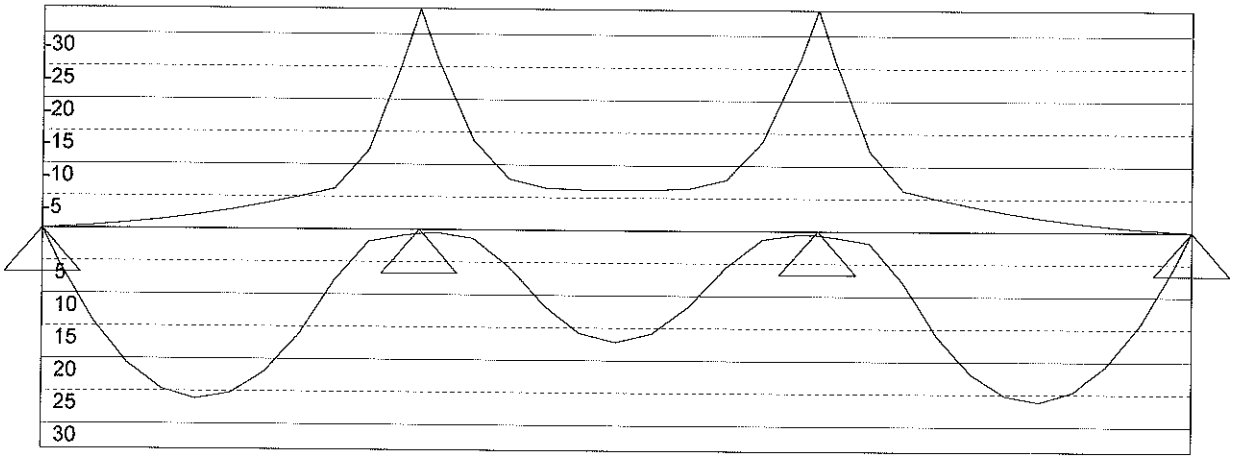


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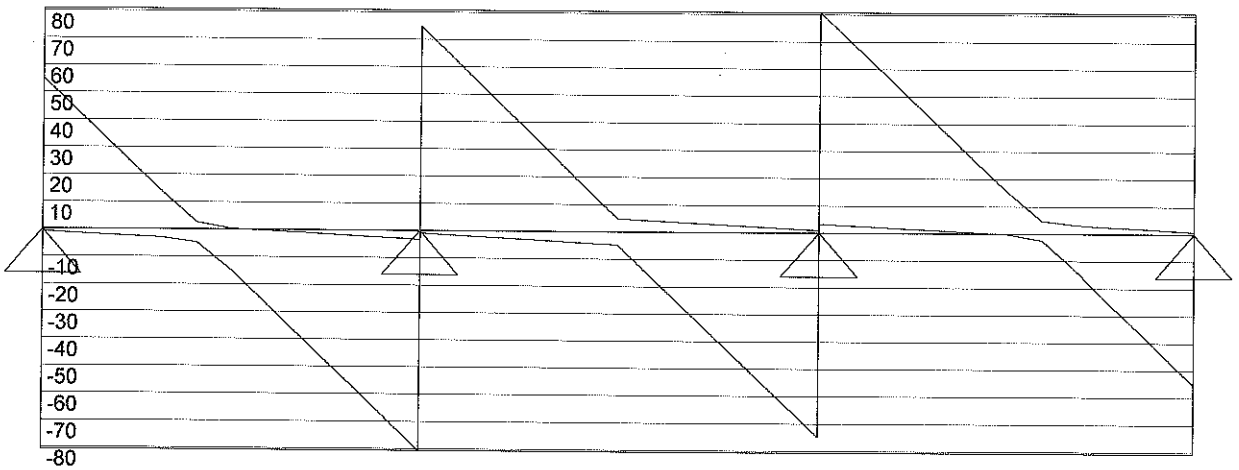


Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 2.63 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
55,260 155,501 155,512 55,268
-0,847 2,285 2,290 -0,846

HEA 140 (Class of section=1/1) G= 24,7 I(cm4)=1033 W(cm3)=155 fy=235 W 5 x 19
Factored Moment/Moment capacity [kNm] 33,896 40,749 83 %
Factored shear force/shear capacity [kN] 80,720 96,585 84 %

Sum infl M+S 0,87 (must be<=1) x= 4650 M=33,9 S=80,72
Deflection due to unfactored load (Deflection limit L/240)
3,5 mm (38 %) 2,2 mm (22 %) 3,5 mm (38 %)
Attention! Ultimate limit design! Remember the load factors!!

Beam Id: Lot#80 - RB 14

Date 03-09-2019

Structural Engineer:

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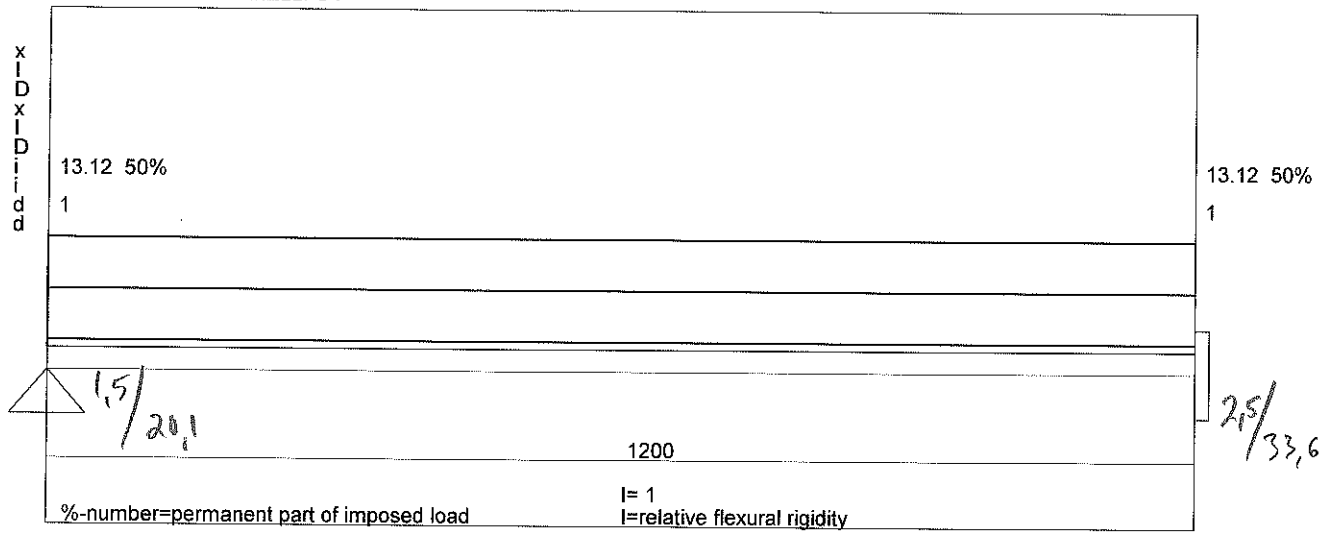


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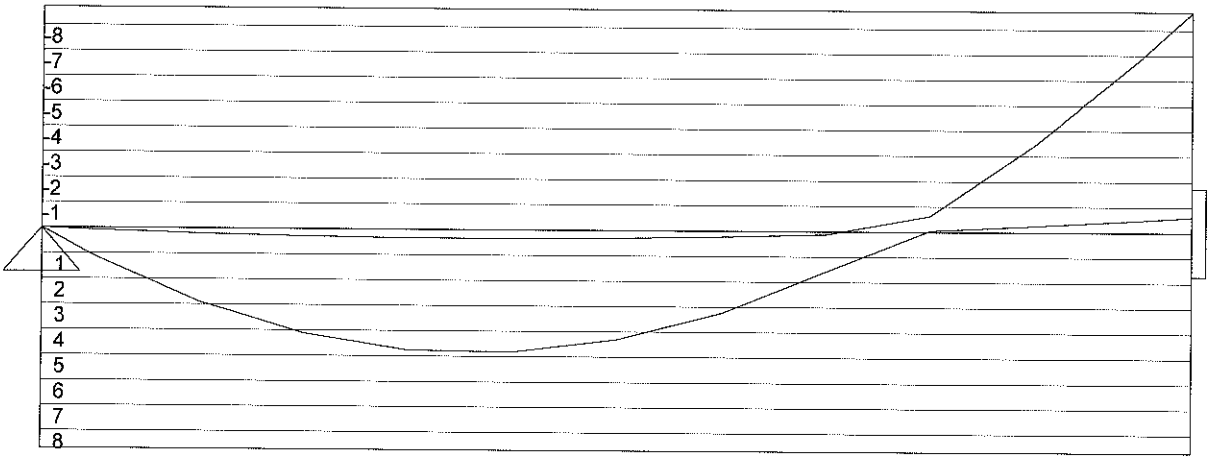


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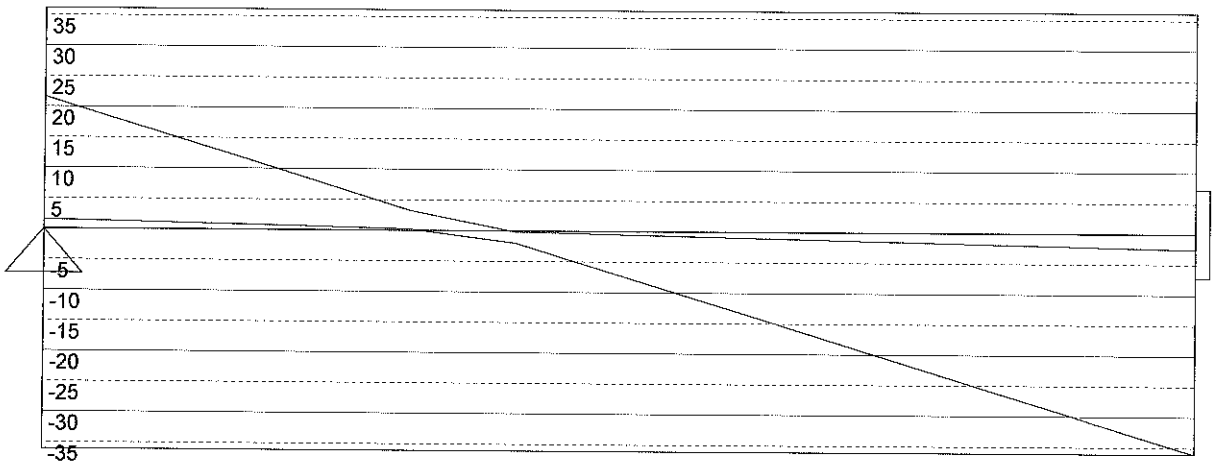


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 3.41 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
21,634 36,140
1,532 2,559

T24 328 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] 8,700 36,116 24 %
Factored shear force/shear capacity [kN] 36,134 55,563 65 %

(2) PROFILES

Deflection due to unfactored load (Deflection limit L/240)
0,2 mm (3 %)

Beam Id: Lot#80 - RB 15

Date 03-09-2019

Structural Engineer:

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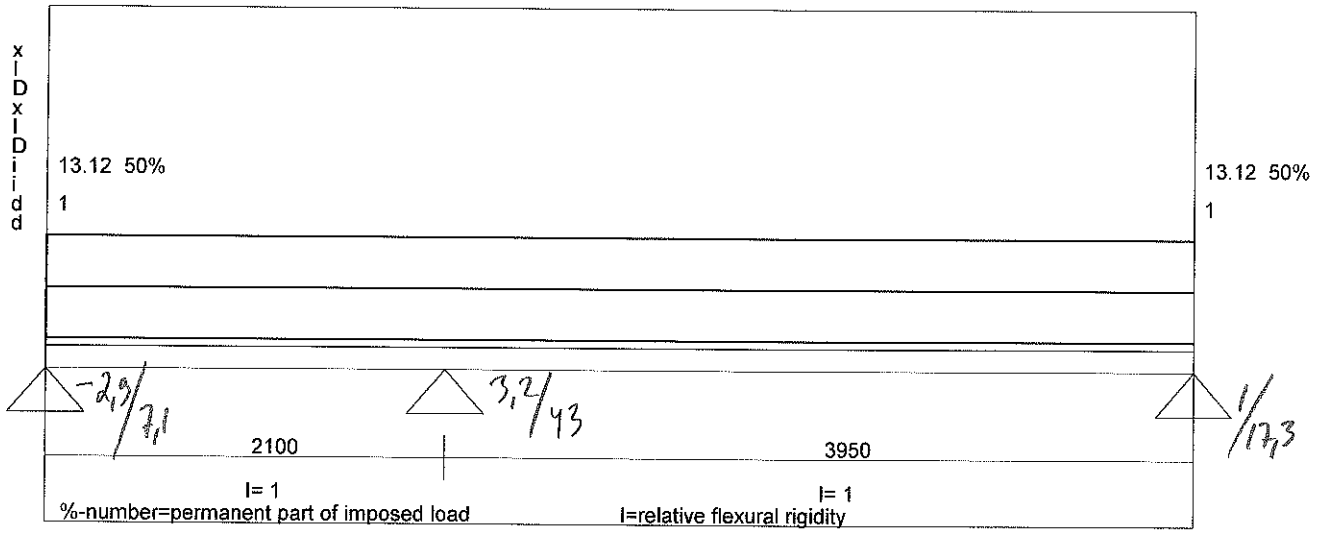


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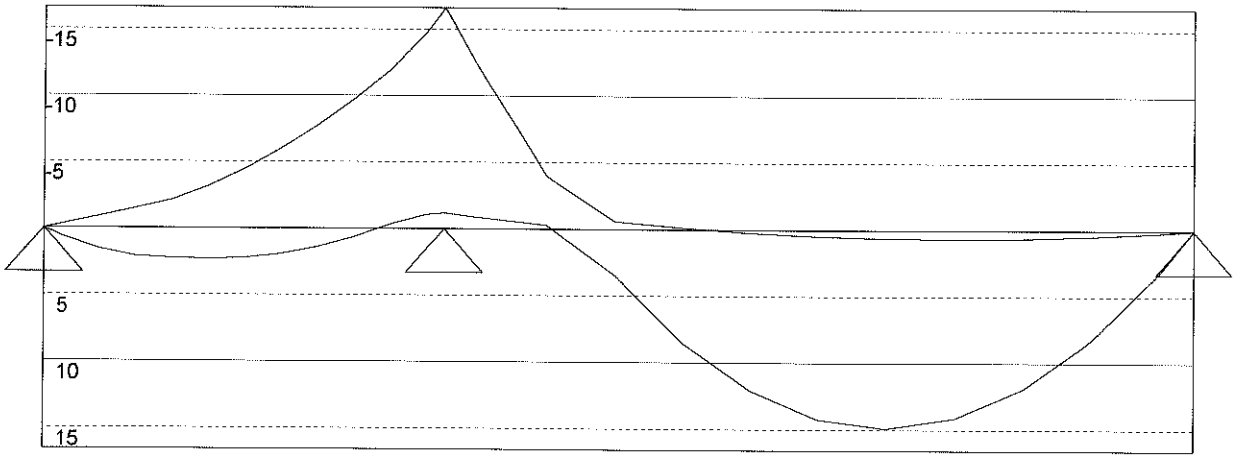


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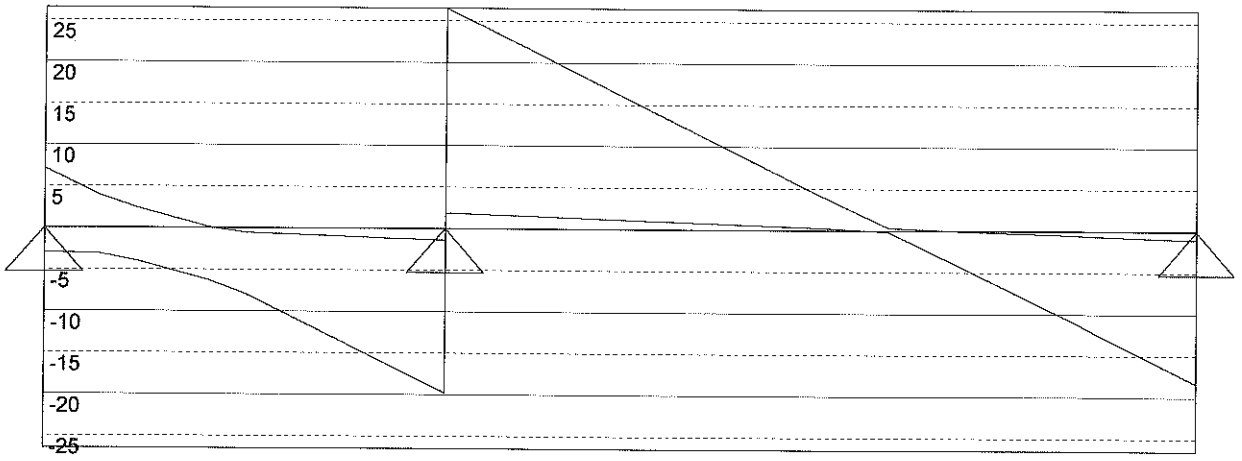


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
7,144 46,277 18,360
-2,915 3,277 1,027

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] 16,605 22,204 75 %
Factored shear force/shear capacity [kN] 26,510 31,883 83 %

=> GL (9) 7 1/2 x 10 1/4

Deflection due to unfactored load (Deflection limit L/240)
0,7 mm (8 %) 15,5 mm (94 %)

Beam Id: Lot#80 - RB 16

Date 03-09-2019

Structural Engineer:

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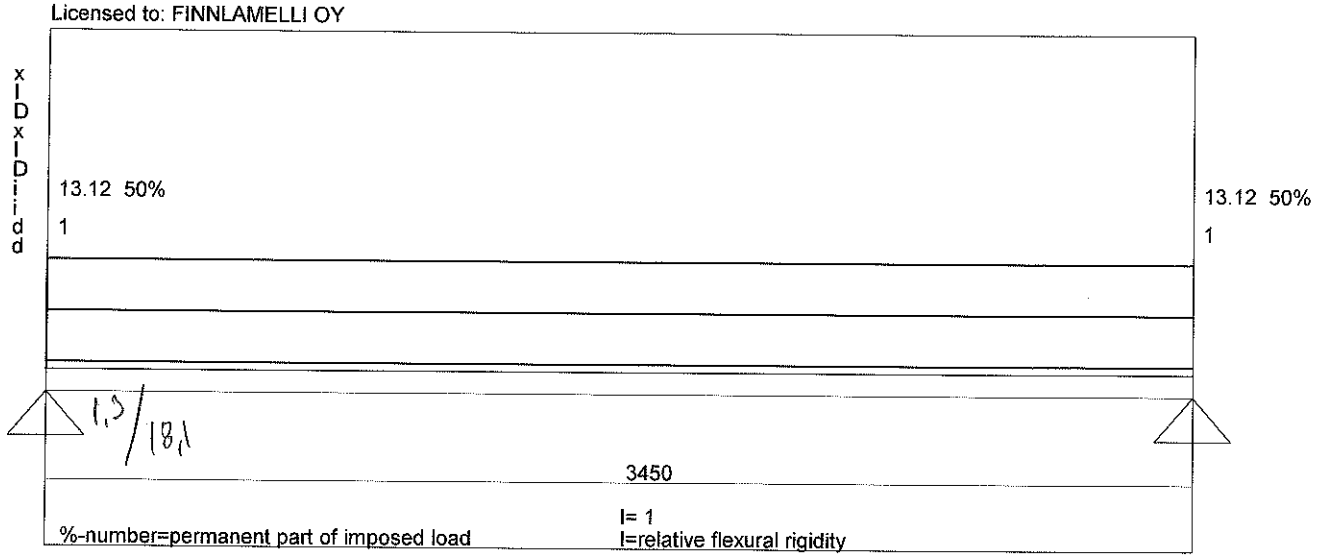


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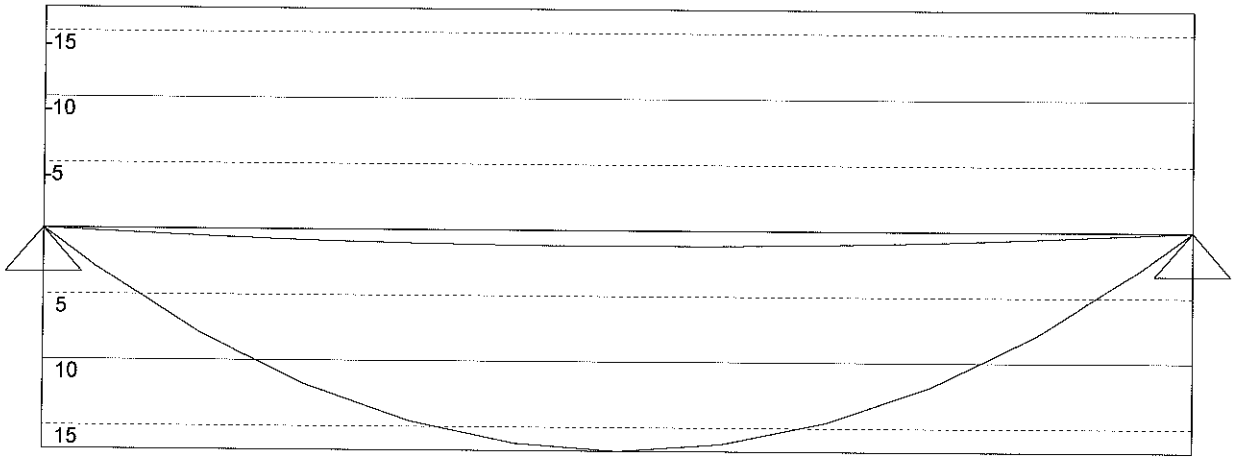


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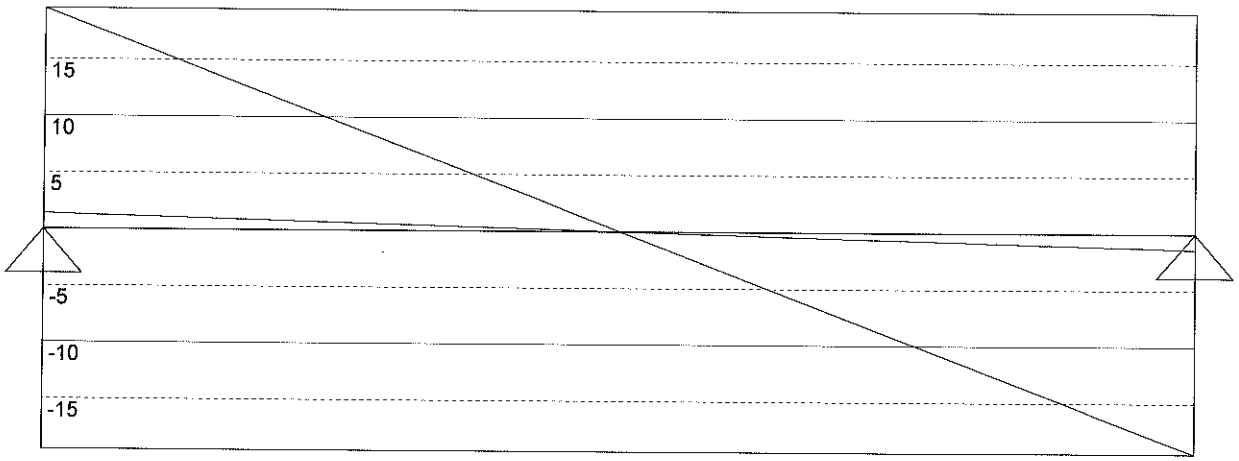


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
19,482 19,486
1,380 1,380

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] 16,806 32,471 52 %
Factored shear force/shear capacity [kN] 19,482 38,556 51 %

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

Deflection due to unfactored load (Deflection limit L/240)
8,8 mm (61 %)

Beam Id: Lot#80 - RB 17

Date 03-09-2019

Structural Engineer:

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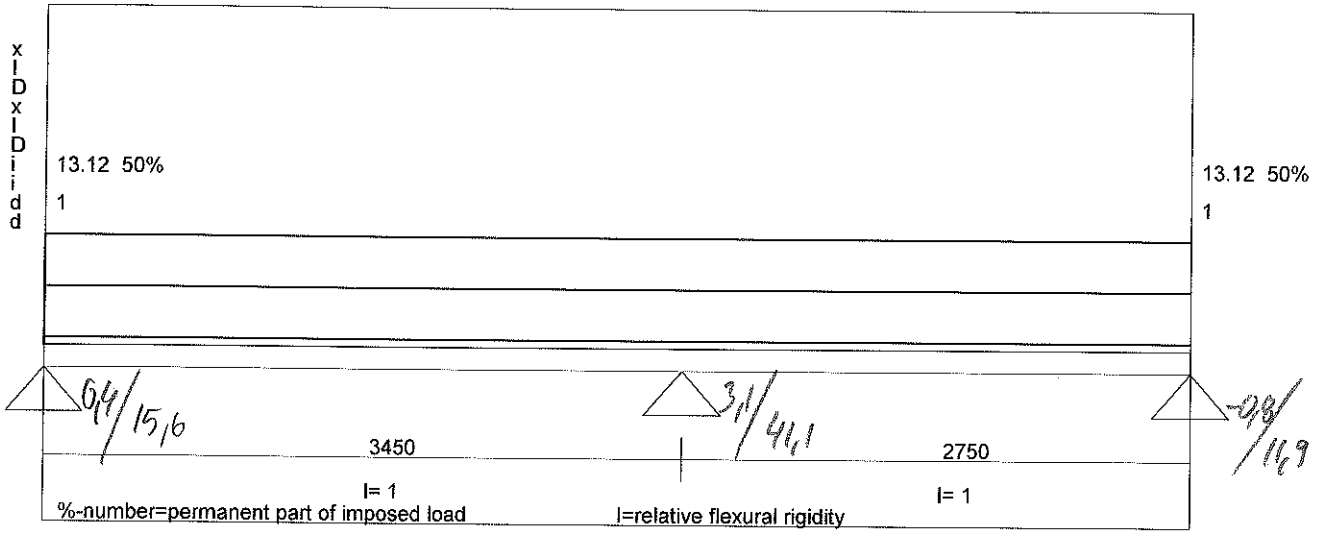


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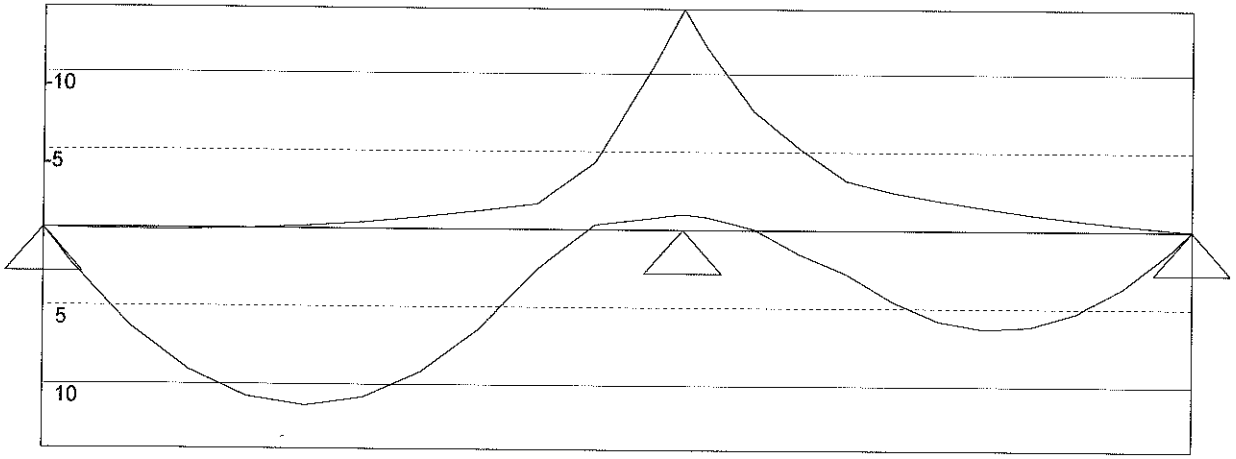


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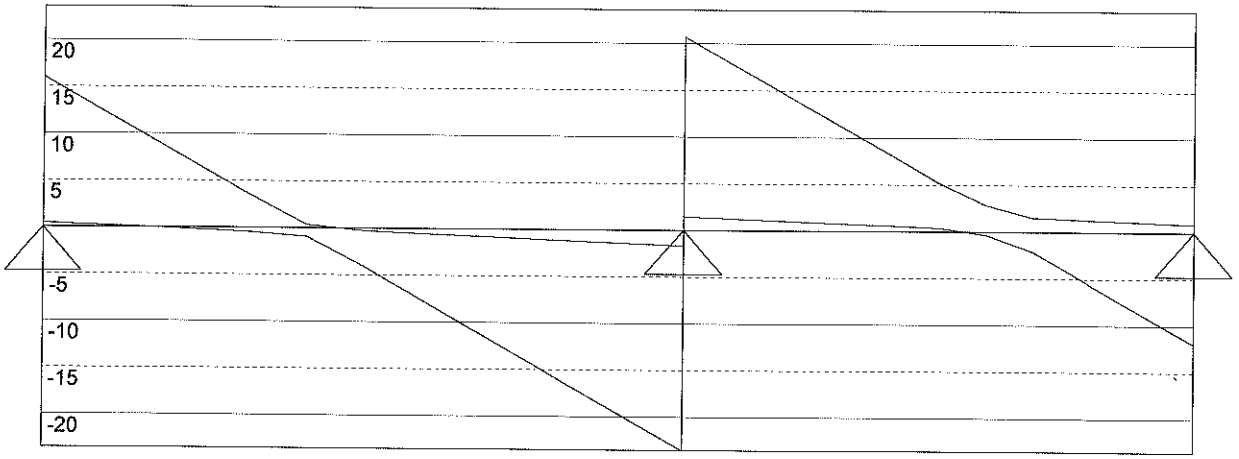


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
16,023 44,253 11,975
0,449 3,134 -0,850

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] 14,137 22,204 64 %
Factored shear force/shear capacity [kN] 23,581 31,883 74 %

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

Deflection due to unfactored load (Deflection limit L/240)
9,0 mm (63 %) 2,9 mm (25 %)

Beam Id: Lot#80 - RB 16

Date 03-09-2019

Structural Engineer:

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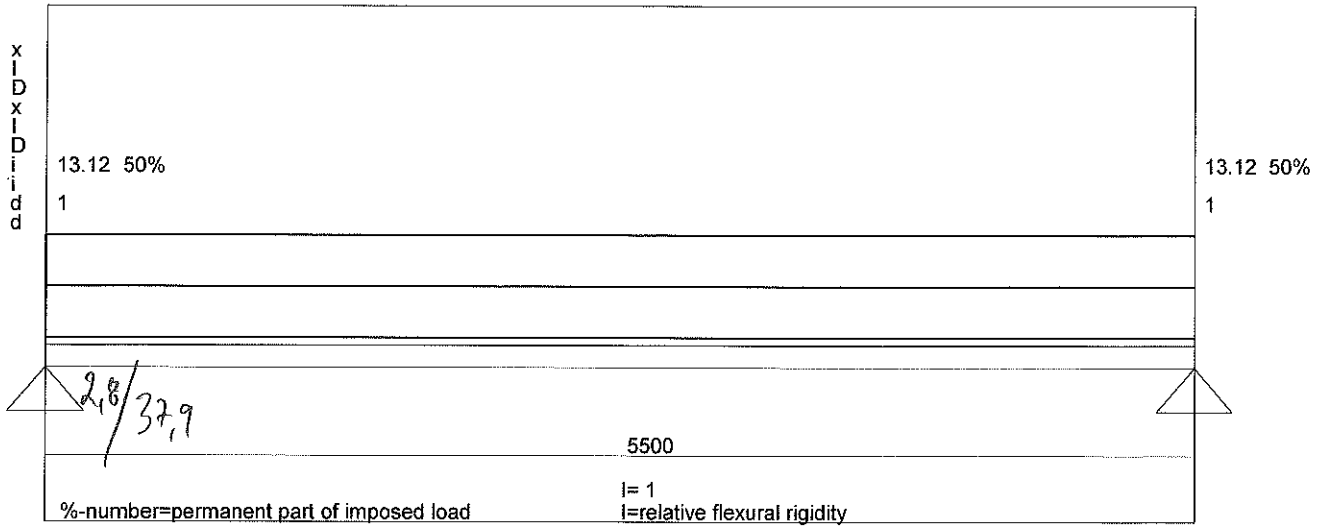


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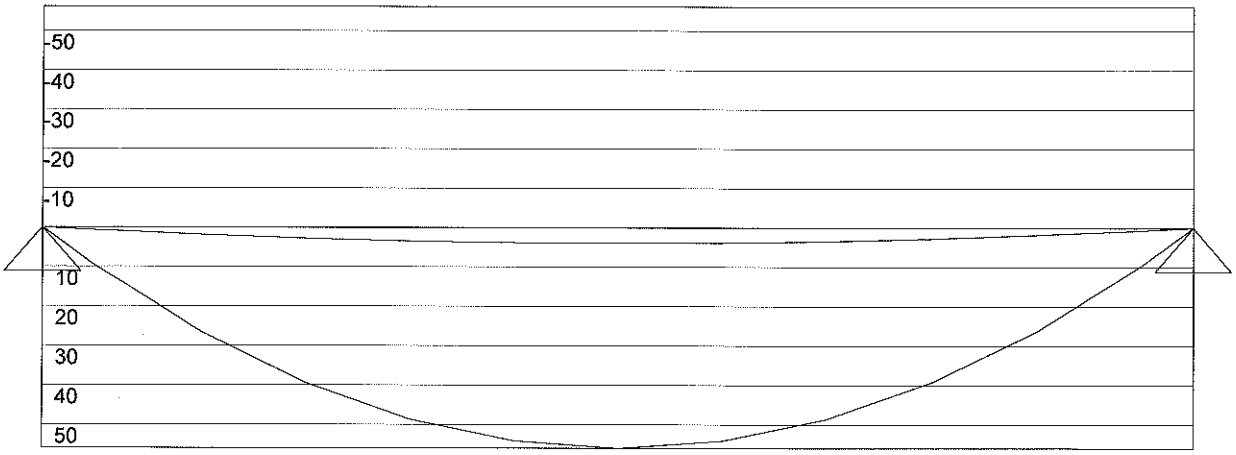


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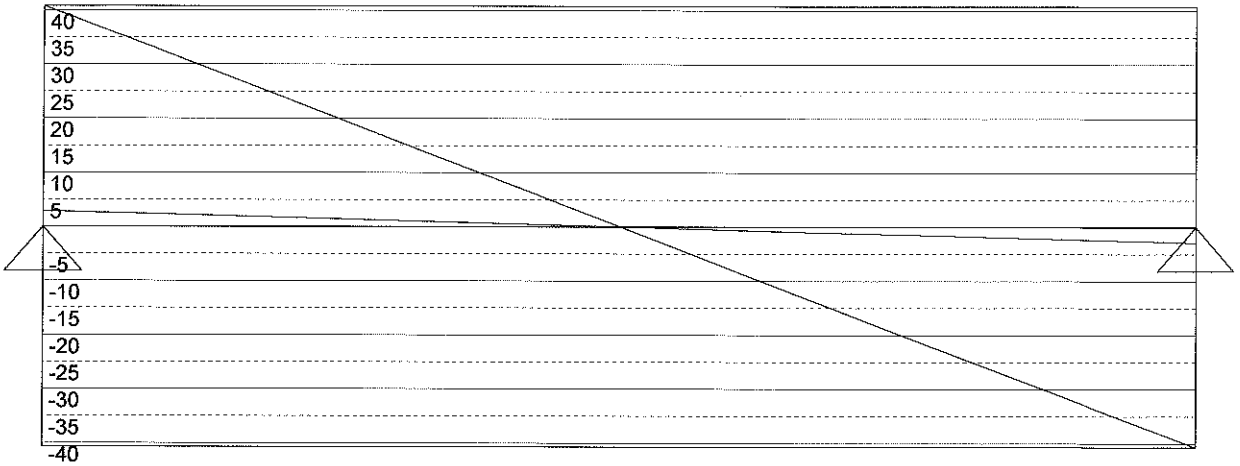


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1.05 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
40,763 40,772
2,887 2,888

L40 140 x 430 B 2 Cf=0,96 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 56,061 62,876 89 %
Factored shear force/shear capacity [kN] 40,763 46,985 87 %

(1) GL 5 1/2 × 17

Deflection due to unfactored load (Deflection limit L/240)
22,5 mm (98 %)

Beam Id: Lot#80 - RB /15

Date 03-09-2019

Structural Engineer:

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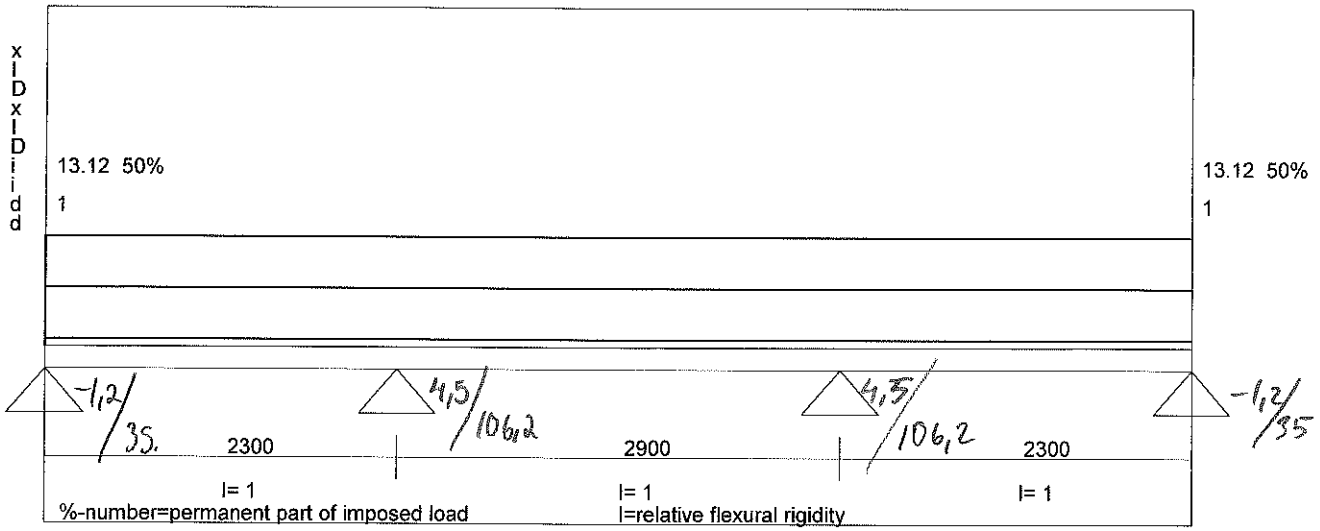


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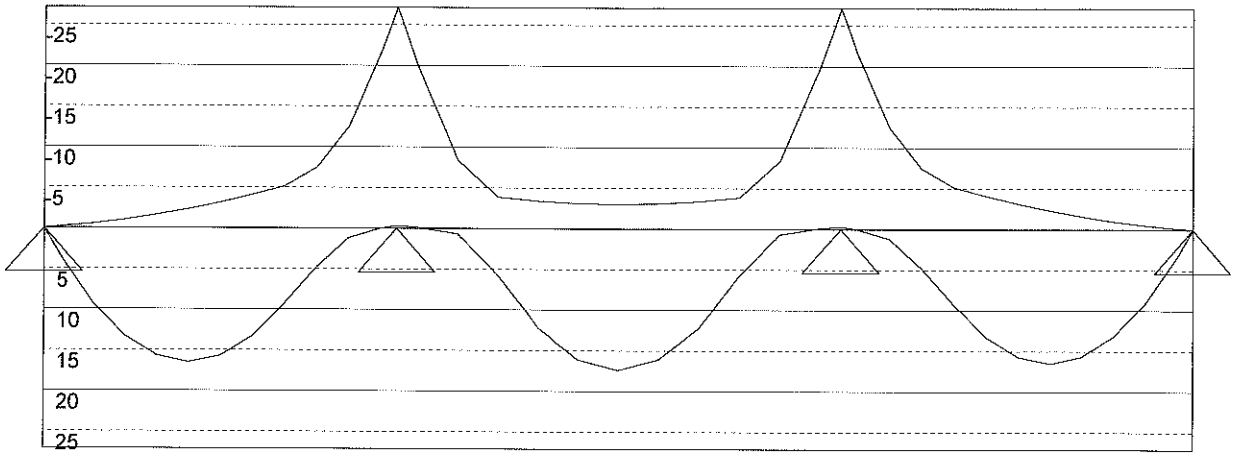


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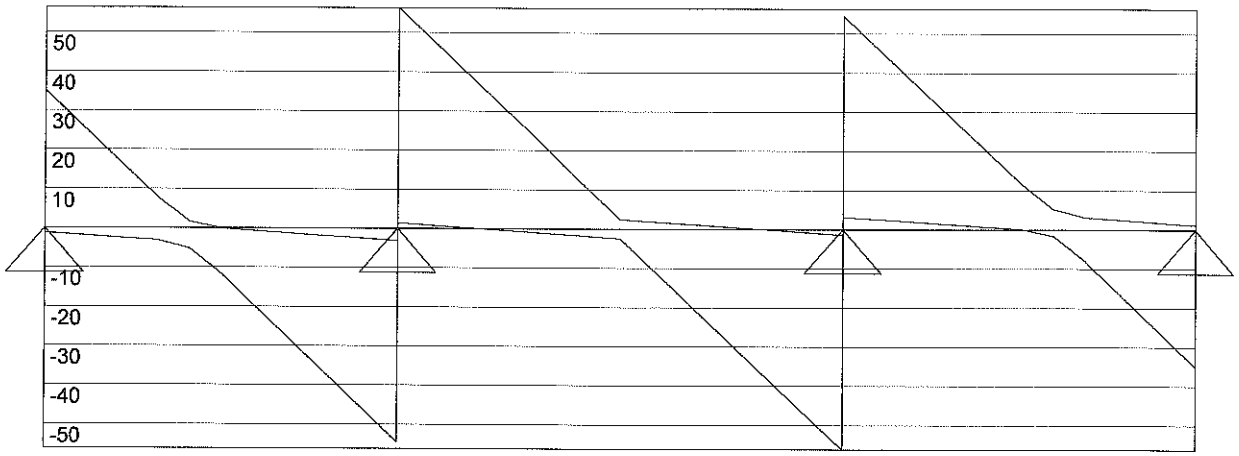


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 2.63 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
35,013 110,758 110,758 35,021
-1,217 4,537 4,538 -1,216

L40 190 x 390 B 2 Cf=0,97 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 27,135 70,960 38 %
Factored shear force/shear capacity [kN] 56,258 57,834 97 %

(1) GL 7 1/2 × 15 3/8

Deflection due to unfactored load (Deflection limit L/240)
1,0 mm (10 %) 1,4 mm (12 %) 1,0 mm (10 %)

Beam Id: Lot#80 - RB 20

Date 03-09-2019

Structural Engineer:

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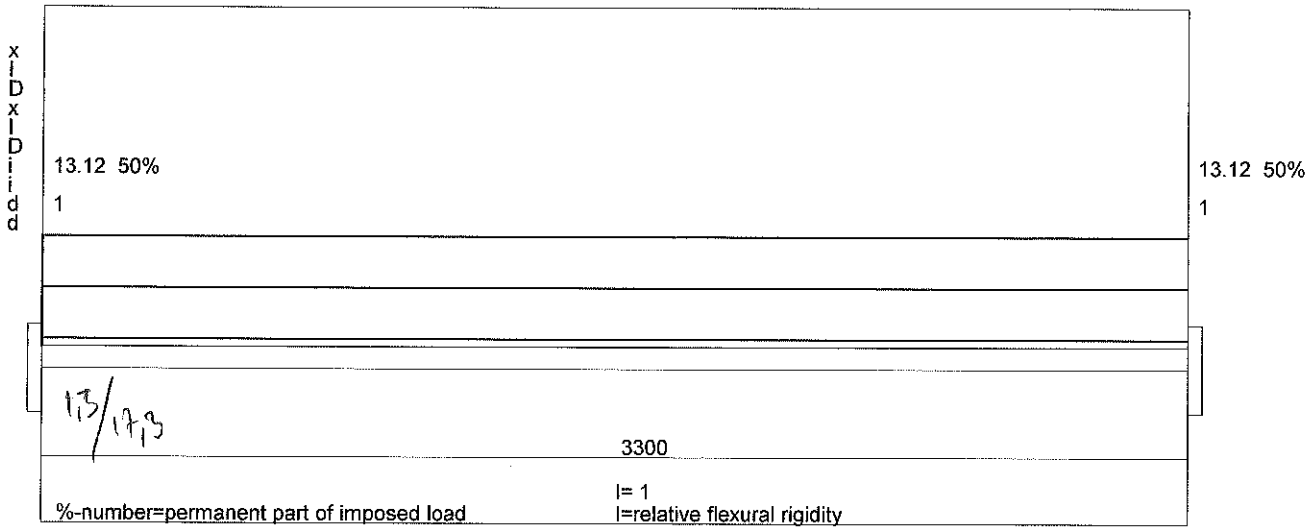


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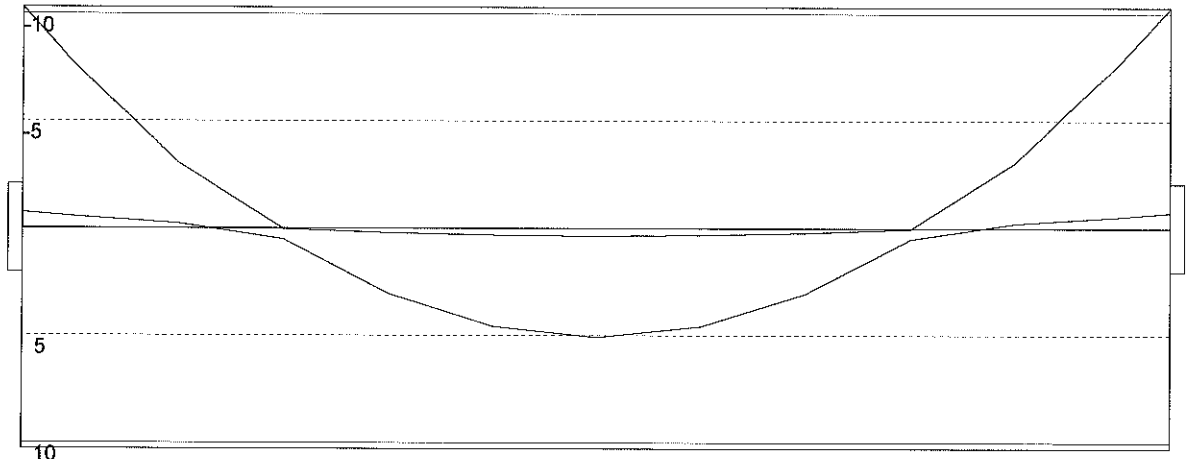


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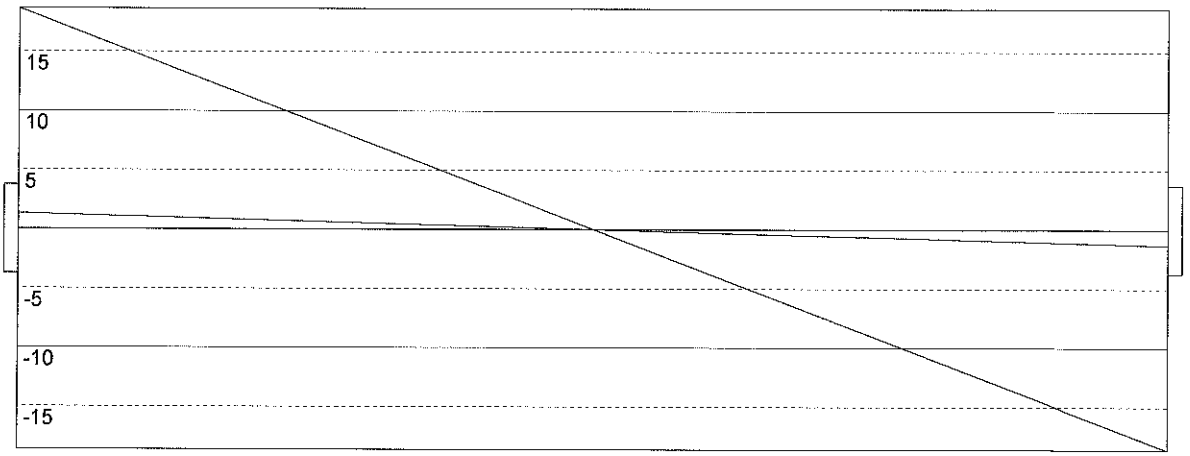


Load factor of dead load= 1 Load factor of imposed load= 1
Load width .8 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
18,635 18,638
1,320 1,320

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] 10,291 18,058 57 %
Factored shear force/shear capacity [kN] 18,635 27,781 67 %

(1) PROFILE

Deflection due to unfactored load (Deflection limit L/240)
2,2 mm (16 %)

Beam Id: Lot#80 - RB 21

Structural Engineer:

Date 04-09-2019

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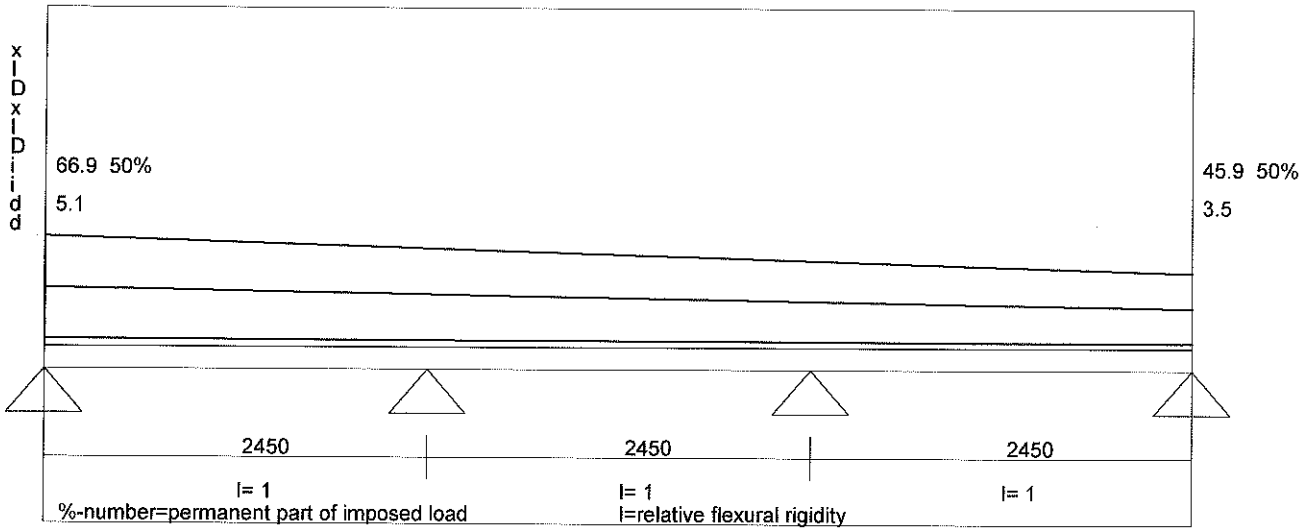


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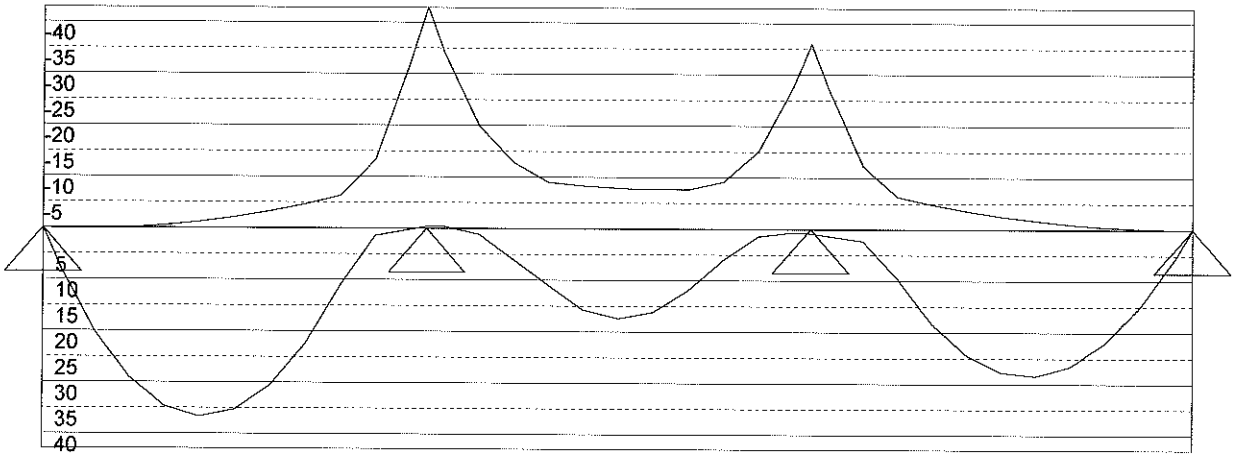


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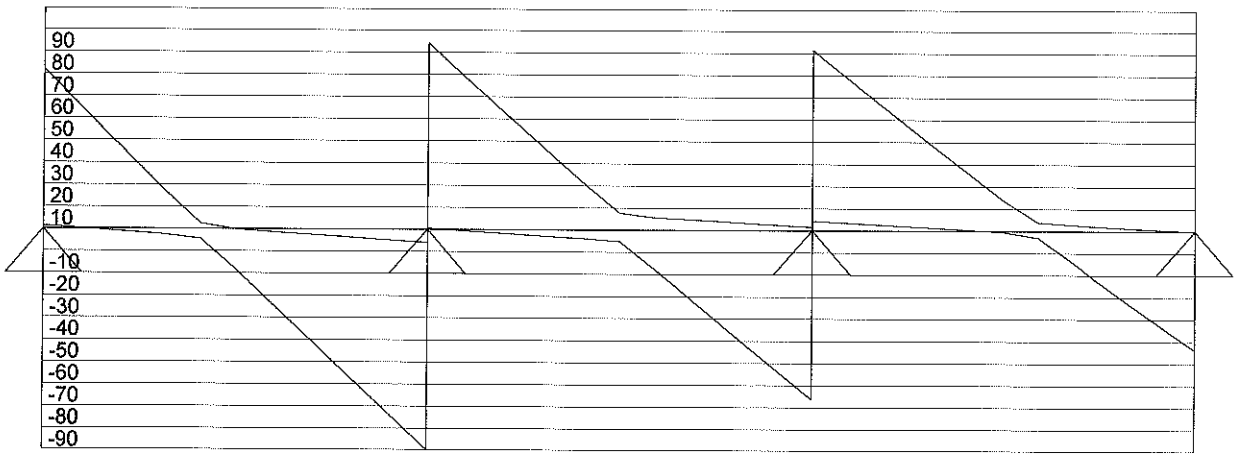


Load factor of dead load= 1 Load factor of imposed load= 1
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
72,129 183,569 157,527 53,649
1,369 6,467 2,843 0,113

L40 305 x 430 B 2 Cf=0,96 Design method: Allowable stress design
Increasing factor of the allowable stress 1,02
Factored Moment/Moment capacity [kNm] 42,822 136,980 31 %
Factored shear force/shear capacity [kN] 99,519 102,361 97 %

6L (120 + 115) x 17

Deflection due to unfactored load (Deflection limit L/240)
1,2 mm (12 %) 0,4 mm (4 %) 0,9 mm (9 %)

Beam Id: Lot#80 - RB 21

Date 03-09-2019

Structural Engineer:

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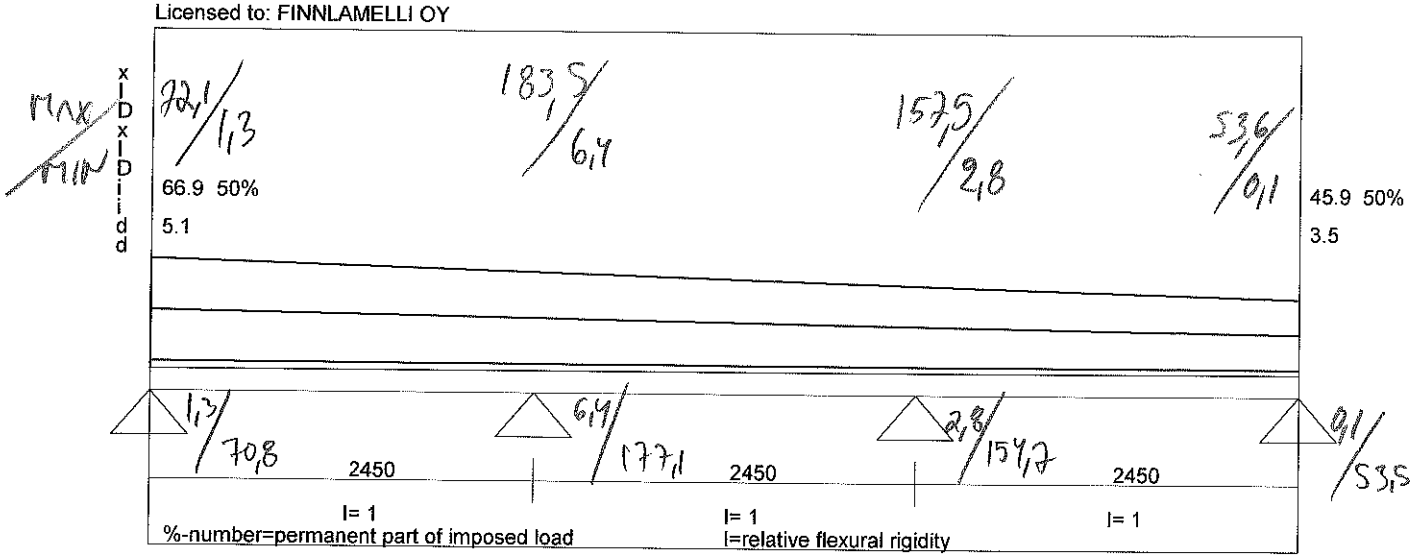


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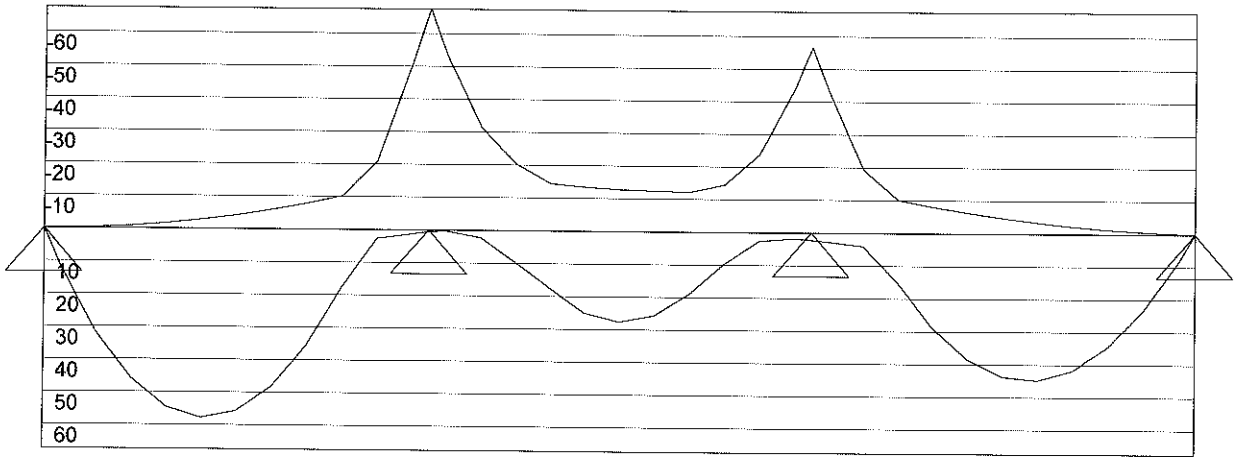


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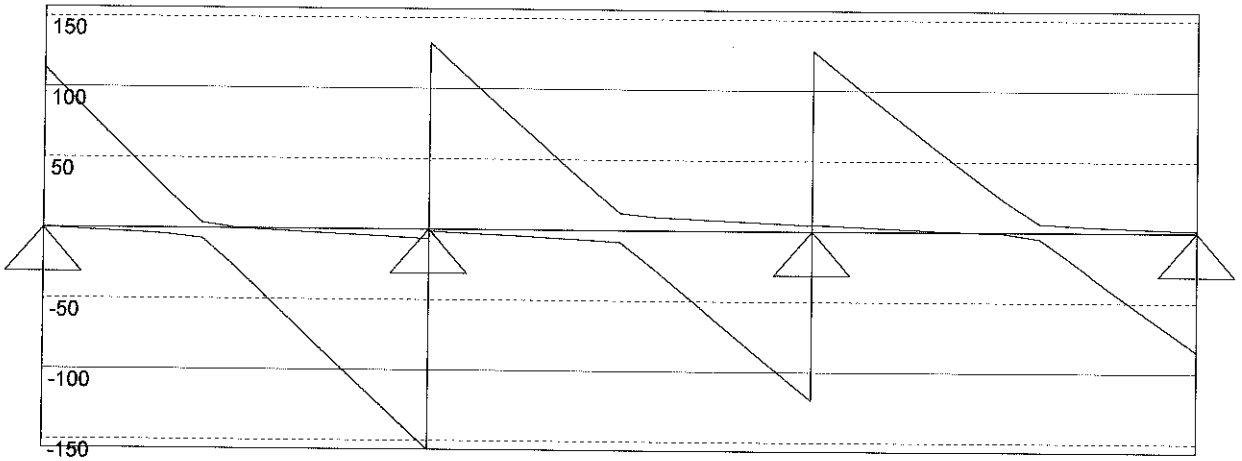



Load factor of dead load= 1.2 Load factor of imposed load= 1.6
Load width 1 (m) (by which the loads
has been multiplied during calculation)
Max/Min reactions of beam [kN]
113,462 288,682 247,800 84,416
0,246 5,318 0,305 -1,241

HEB160

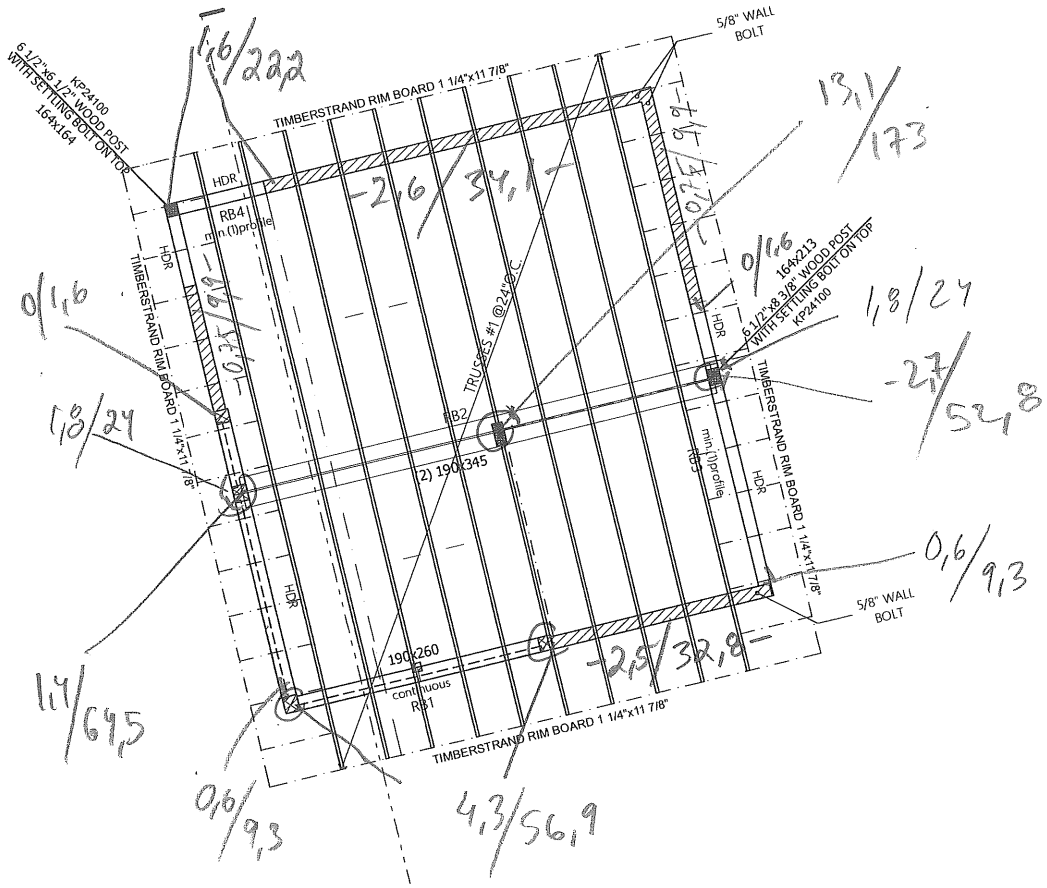
W8 × 21 on (W6 × 25) + GL

7 1/2 × 10 1/4

HEA 200 (Class of section=1/1) G= 42,3 I(cm4)=3692 W(cm3)=389 fy=235
Factored Moment/Moment capacity [kNm] 67,373 101,050 67 %
Factored shear force/shear capacity [kN] 156,439 164,970 95 %

Deflection due to unfactored load (Deflection limit L/240)
2,6 mm (26 %) 1,0 mm (9 %) 2,0 mm (20 %)
Attention! Ultimate limit design! Remember the load factors!!

LOT # 80 ROOF LOADS



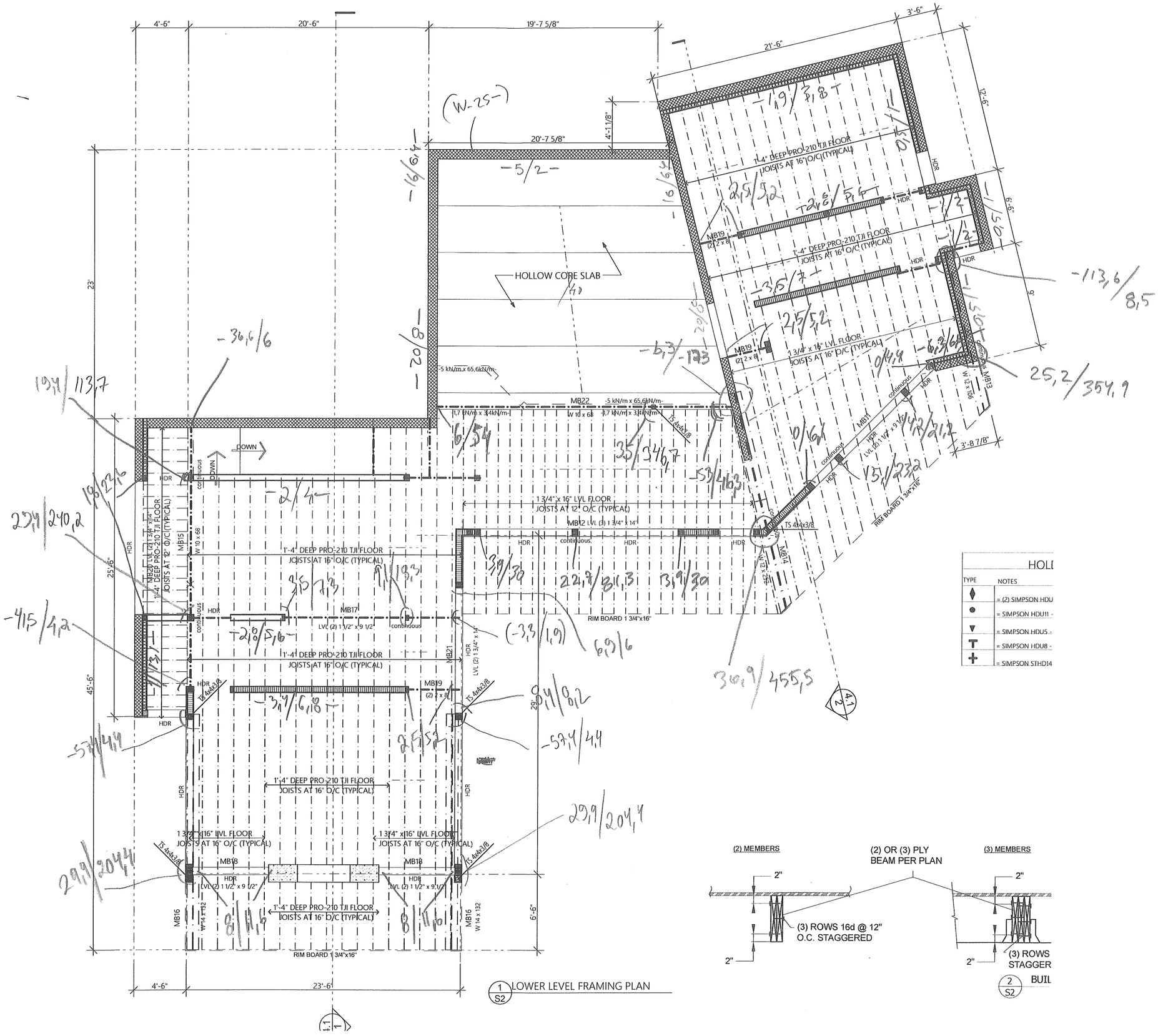
LOT # 80 ROOF LOADS + UPPER FLOOR LOADS

Main Level 8560'
Ground snow load = 384 psf
Roof snow 269 psf = 13,12kN/m2

TIMBERSTRAND RIM BOARD 1 1/4"x11 7/8"
HDR
RB18 (1) 140x430
TRUSSES #6 @24"O.C.
TRUSSES #7 @24"O.C.
e 4.1 1/31
HDR continuous
RB14 min.(2)profiles
1/31 e 4.1
TRUSSES #5 @24"O.C.
RB11 W 12 x 106
RB17 (1) 190x260
RB16 (1) 190x260
TRUSSES #4 @24"O.C.
RB10 W 12 x 87
RB15 (1) 190x260
TRUSSES #3 @24"O.C.
RB12 W 6 x 20
RB13 W 5 x 19
(1) 190x260 + 115x260
4.1 1
KP24100 5 1/2"x6 1/2" WOOD POST WITH SETTING BOLT ON TOP 164x164
5/8" WALL BOLT
LVL (1) 1 1/2" x 11 7/8" MB3
MB1 (1) 140x260
11 7/8" DEEP PRO-210 TJI FLOOR JOISTS AT 16" O/C (TYPICAL)
MB4
RB19 (1) 190x390
RB20 W 6x25 (1) 140x260
min.(1)profile
continuous
TIMBERSTRAND RIM BOARD 1 1/4"x11 7/8"

ROOF FRAMING PLAN / MAIN LEVEL FRAMING PLAN
1 S3

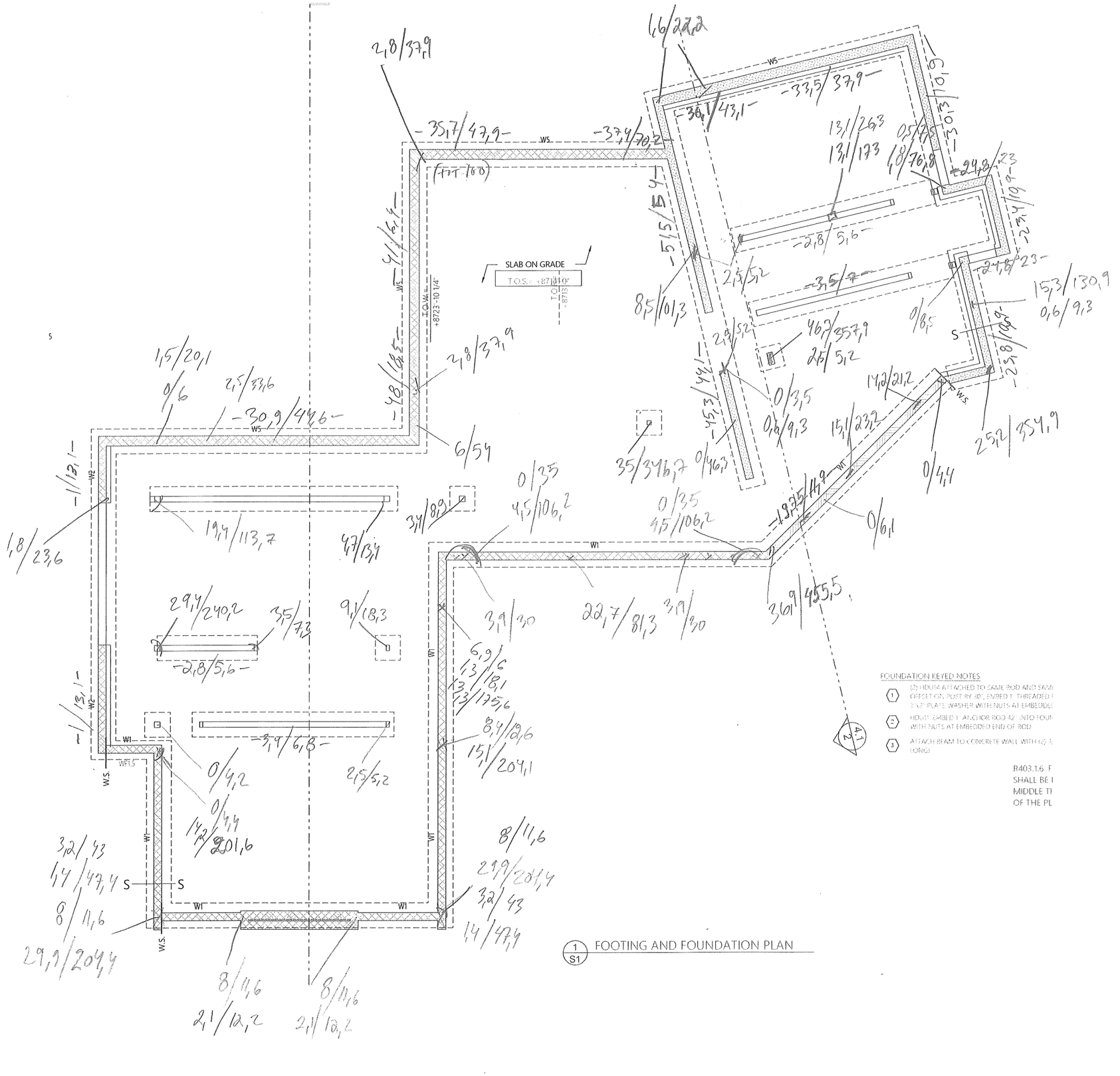
LOT #80 FLOOR LOADS




HOLI

| TYPE | NOTES |
|---|---|
| ♦ | = (2) SIMPSON HDU |
| ● | = SIMPSON HDU11 - |
| ▼ | = SIMPSON HDU5 - |
| T | = SIMPSON HDU8 - |
| + | = SIMPSON STHD14 |

# LOT #80 FOOTING LOADS




1 / S1 FOOTING AND FOUNDATION PLAN

FOUNDATION KEYED NOTES

1. (2) HOUSE ATTACHED TO SAME ROD AND SAME OFFSET ON POST BY 10", EMBED 1" THREADED END PLATE WASHER WITH NUTS AT EMBEDDED
2. HDU11 EMBED 1" ANCHOR ROD 42" INTO FOUN WITH NUTS AT EMBEDDED END OF ROD
3. ATTACH BEAM TO CONCRETE WALL WITH (2) 5 LONG

R403.1.6 F
SHALL BE I
MIDDLE TH
OF THE PL

Lot 80 => 2800 PSF
Lot 86R => 3401 PSF

SOIL PRESSURE "REDROCK"?

Lot 80 / BYRNE → 2800 PSF
136,5 KN/m²

MAX LOAD TABLE

| | | |
|---|---|---|
| WF 1-8 | = | 69,2 KN/m |
| WF 2 | = | 83,1 |
| WF 2,5 | = | 103,9 |
| WF 3 | = | 124,8 |
| WF 3,5 | = | 145,5 |
| WF 4 | = | 166,3 |
| WF 4,5 | = | 187,1 |
| WF 5 | = | 207,9 |
| WF 6 | = | 249,6 |

2800 PSF
136,5 KN/m²

MAX. LOAD TABLE

| | | |
|---|---|---|
| F3 | = | 114,2 KN |
| F3,5 | = | 155,5 |
| F4 | = | 203,1 |
| F4,5 | = | 257,0 |
| F5 | = | 317,4 |
| F5,5 | = | 384,0 |
| F6 | = | 457,1 |
| F6,5 | = | 536,3 |
| F8 | = | 812,6 |