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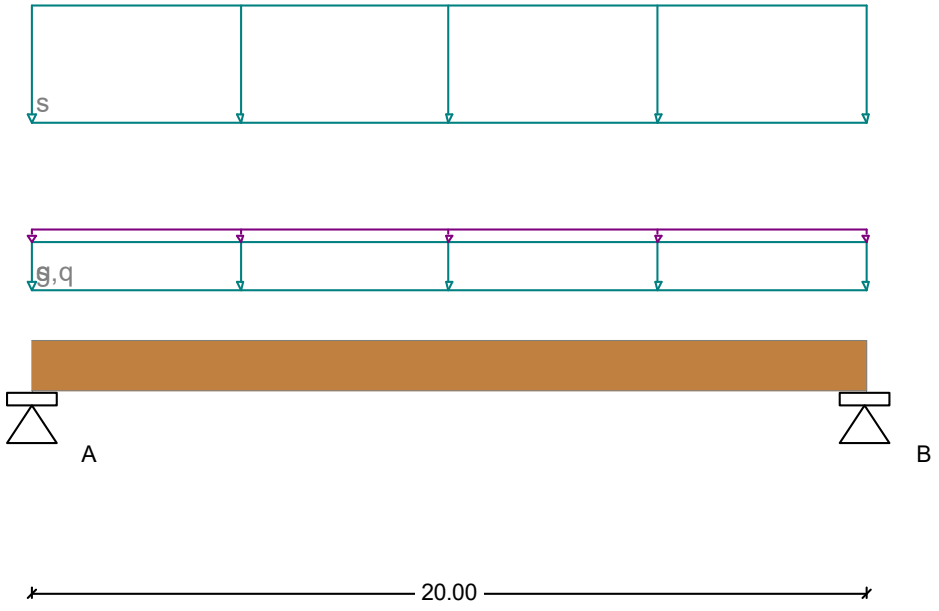
D.1 BSH-Beam (F30)




```
Design standard  : DIN EN 1995-1
Wood quality     : GL24h
Utilization class: 2
Live load category: H

Emean / Gmean = 11600 / 720 N/mm2,  gamma.M = 1.30
fm,k / fc,k / fc90,k / fv,k = 24.0 / 24.0 /  2.7 / 2.5 N/mm2
adm. Deflection   w,inst = L/300, w,fin = L/200, kdef = 0.80
Design for flame application F30-B, 4-sides

Cross-section b/h =  16 /120 cm
```

Load

```
Permanent load g1 =   2.50 kN/m (x  =   0.00 to  20.00 m)
Live load     q1 =   0.75 kN/m  (x  =   0.00 to  20.00 m) span-by-span
Snow load     s  =   5.00 kN/m  (sk =   6.25 kN/m) < 1000 m a.s.l.

Factors:  gam.sup  gam.inf  psi.0  psi.1  psi.2
Permanent   1.35     1.00    1.00   1.00   1.00
Live load   1.50     0.00    0.00   0.00   0.00
Snow        1.50     0.00    0.50   0.20   0.00
```

Characteristic stress resultants

```
Span Lc      x   max Mk     x   min Mk     x  max Vk      x  min Vk
           [m]    [kNm]   [m]    [kNm]   [m]    [kN]    [m]    [kN]

  1 sum  10.00   412.5   0.00      0.0  0.00    82.5  20.00  -82.5
```

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Characteristic deflection

Span	Lc	L' [m]	x [m]	w,inst.min [cm]	x [m]	w,inst.max [cm]
1	sum	20.00	0.00	0.00	10.00	6.73

Verification of deflections

w,inst : wG,inst + wQ,inst,s
wG,fin : wG,inst * (1 + k,def)
wQ,fin,s : wQ,inst,s * (1 + k,def * psi.2)
w,fin.s : wG,fin + wQ,fin,s
w,fin.q : wG,fin + wQ,fin,q

Span	L' [m]	x [m]	w,inst [cm]	adm L'/w [cm]	L'/w [-]	x [m]	w,fin.s [cm]	adm L'/w [cm]	L'/w [-]	x [m]	w,fin.q [cm]	L'/w [-]
Comb. maximum												
1	20.00	10.00	6.12	6.67	326	10.00	7.75	10.00	258	10.00	3.67	544
Comb. minimum												
1	20.00	0.00	0.00	6.67	0	0.00	0.00	10.00	0	0.00	0.00	0

Check of longitudinal stresses and lateral buckling

Distance of lateral buckling support a = 3.330 m
Span 1 l,ef = 3.33 m lambda,rel = 0.66 kcrit = 1.00 a1 = 1.00 a2 = 0.00
Cross-section values: A = 1920 cm2 Wy = 38400 cm3 Iy = 2304000 cm4

Span	x [m]	Md [kNm]	sig-o/zul [N/mm2]	<= 1.00	x [m]	Md [kNm]	sig-u/zul [N/mm2]	<= 1.00
Comb. maximum - max Eta								
1	0.00	0.0	0.00/11.08 =	**0.00**	10.00	543.8	14.16/16.62 =	**0.85**
Comb. minimum - max Eta								
1	10.00	543.8	-14.16/16.62 =	**0.85**	0.00	0.0	-0.00/11.08 =	**0.00**
Comb. maximum - max Md								
1	10.00	543.8	-14.16/16.62 =	**0.85**	10.00	543.8	14.16/16.62 =	**0.85**
Comb. minimum - max Md								
1	0.00	0.0	0.00/11.08 =	**0.00**	0.00	0.0	-0.00/11.08 =	**0.00**

Longitudinal stress verification (Flame design)

Remaining section: d(tf) = 2.8 cm Ar = 1190 cm2 ur = 250 cm k,fi = 1.15
Wr = 22685 cm3 kmod,m,fi = 1.00 kmod,E,fi = 1.00 km,fi = 0.82

Span	x [m]	Md [kNm]	sig-o/zul [N/mm2]	<= 1.00	x [m]	Md [kNm]	sig-u/zul [N/mm2]	<= 1.00
Comb. maximum - max Eta								
1	0.00	0.00	0.00/22.64 =	**0.00**	10.00	175.00	7.71/22.64 =	**0.34**
Comb. minimum - max Eta								
1	10.00	175.00	-7.71/22.64 =	**0.34**	0.00	0.00	-0.00/22.64 =	**0.00**

Check of shear stresses

Span	x [m]	Vd [kN]	tau/all [N/mm2]	<= 1.00	(kcr = 1.00)
max Eta					
1	0.00	108.75	0.85/ 1.73 =	**0.49**	
max tau					
1	0.00	108.75	0.85/ 1.73 =	**0.49**	

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Check of shear stresses (Flame design)

Span	x [m]	Vd [kN]	tau/all <= 1.00 [N/mm2]	(kcr = 1.00)
1	0.00	35.00	0.44/ 2.88 = **0.15**	

Support reactions

Column	Lc	max Ak [kN]	min Ak [kN]	max Myk [kNm]	min Myk [kNm]
A	sum	82.50	25.00	-0.00	-0.00
B	sum	82.50	25.00	-0.00	-0.00

Bearing stress

Column	Lc		max Ad [kN]	L-ef [cm]	kc.alfa	kmod	sig-90 [N/mm2]	/ adm [N/mm2]	<= 1.00
A	max	Eta	108.75	23.0	1.75	0.90	2.96	3.27	= **0.90**
B	max	Eta	108.75	23.0	1.75	0.90	2.96	3.27	= **0.90**
A	max	Ad	108.75	23.0	1.75	0.90	2.96	3.27	= **0.90**
B	max	Ad	108.75	23.0	1.75	0.90	2.96	3.27	= **0.90**

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Result graphic