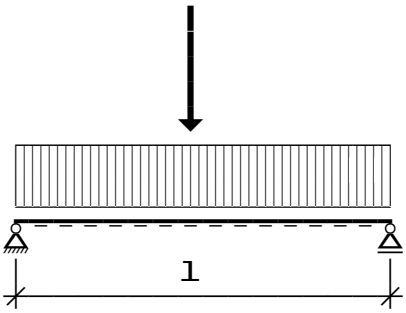
Toetsing houten balklaag

Schema



De overspanning is:

l =		4,60 m

Afmetingen balken:

Balk	=	59 x 246
Breedte balk b	=	59 mm
Hoogte balk h	=	246 mm
I_y	=	$7319*10^4$ mm^4
W	=	$595*10^3$ mm³
hoh balken s =		600 mm

Houteigenschappen

Sterkteklasse K	=	C18
Buigsterkte $f_{m,0,k}$	=	18 N/mm²
Schuifsterkte $f_{v,k}$	=	3,40 N/mm²
E-modulus BGT $E_{0,mean}$	=	9000 N/mm²
Klimaatklasse KK	=	1
Belastingduurklasse BK	=	Lang
Modificatiefactor k_{mod}	=	0,70
Kruipfactor k_{def}	=	0,60
Hoogtefactor k_h =		1,00

Belastingen

Permanent p_G:	0,50 kN/m²
Veranderlijk p_Q:	1,75 kN/m²
ψ_2 =	0,30
Puntlast F_Q:	1,50 kN

per balk is de belasting:

Permanent q_G:	$p_G * s * 10^{-3}$	=	0,30 kN/m
Veranderlijk q_Q:	$p_Q * s * 10^{-3}$	=	1,05 kN/m
Puntlast $F_{Q,balk}$:	$MIN(F_Q;F_Q*\frac{s}{500}*1,1)$	=	1,50 kN

Krachtwerking

$$M_{y,1,d} = \frac{1}{8}*(1,2*q_G+1,5*q_Q)*l^2 = 5,12 \text{ kNm}$$

$M_{y,2,d} = \frac{1}{8}*(1{,}2*q_G)*l^2 + \frac{1}{4}*(1{,}5*F_{Q,balk})*l = 3{,}54$ kNm

$M_{y,d} = MAX(M_{y,1,d}; M_{y,2,d}) = 5{,}12$ kNm

$V_{1,d} = \frac{1}{2}*(1{,}2*q_G + 1{,}5*q_Q)*l = 4{,}45$ kN

$V_{2,d} = \frac{1}{2}*(1{,}2*q_G)*l + 1{,}5*F_{Q,balk} = 3{,}08$ kN

$V_d = MAX(V_{1,d}; V_{2,d}) = 4{,}45$ kN

Toeting buiging

$\sigma_{m,d} = \frac{M_{y,d}*10^6}{W} = 8{,}6$ N/mm²

$f_{m,o,d} = f_{m,0,k}*\frac{k_{mod}}{1{,}3}*k_h = 18*\frac{0{,}70}{1{,}3}*1{,}00 = 9{,}7$ N/mm²

$\frac{\sigma_{m,d}}{f_{m,o,d}} = \frac{8{,}6}{9{,}7} = 0{,}89 \le 1{,}00$

Toetsing afschuiving

$\sigma_{v,d} = \frac{3}{2}*\frac{V_d*10^3}{b*h} = 0{,}46$ N/mm²

$f_{v,d} = f_{v,k}*\frac{k_{mod}}{1{,}3} = 1{,}83$ N/mm²

$\frac{\sigma_{v,d}}{f_{v,d}} = \frac{0{,}46}{1{,}83} = 0{,}25 \le 1{,}00$

Controle doorbuiging

$l = l*10^3 = 4600$ mm

$w_1 = 0{,}004*l = 18{,}4$ mm

$w_2 = 0{,}003*l = 13{,}8$ mm

$w_{inst,G} = \frac{5}{384}*\frac{q_G*l^4}{E_{0,mean}*I_y} = 2{,}7$ mm

$w_{fin,G} = w_{inst,G}*(1 + k_{def}) = 4{,}3$ mm

$w_{inst,Q,1} = \frac{5}{384}*\frac{q_Q*l^4}{E_{0,mean}*I_y} = 9{,}3$ mm vervorming tgv verdeelde belasting

$w_{inst,Q,2} = \frac{1}{48}*\frac{F_{Q,balk}*10^3*l^3}{E_{0,mean}*I_y} = 4{,}6$ mm vervorming tgv puntlast

$w_{inst,Q} = MAX(w_{inst,Q,1}; w_{inst,Q,2}) = 9{,}3$ mm

$w_{fin,Q} = w_{inst,Q}*(1 + \psi_2*k_{def}) = 11{,}0$ mm

$w_{fin} = w_{fin,G} + w_{fin,Q} = 15{,}3$ mm $< w_1$

$w_{fin} - w_{inst,G} = 12{,}6$ mm $< w_2$