Wood/Panel - Wood
1 shear plane

Project 26014 Essve Academy (11) practical sample
Laterally loaded connection 1

SCREWED CONNECTION

1 pcs Screws 6.5 x 190 mm

Double thread - Tip Standard

EN 1995-1-1

Head	Steel	Drive	Packaging	Manuf-No	EAN-No
Cylinder head	CorrSeal	- T 30	50 pcs	118108	7317761827481

PROJECT

Name
Project 26014 Essve Academy (11) practical sample
Address

Postcode City

Country

CUSTOMER

Name
ESSVE AB (EAST & NORDIC)
Customer ID

Address

Postcode City

Country

Phone Fax

Email

DESIGN CODE

EN 1995-1-1+A1+A2

MEMBERS

	[1] Side member	[2] Main member	
Width	200	80	mm
Depth	45	160	mm
Distance from axis to left member end	200	200	mm
Material	Timber	Timber	
Grade	C24	C24	
Predrilling	Without predrilling	Without predrilling	
Drilling depth	80	-	mm
k_{mod}	0.80	0.80	
γ_M	1.30	1.30	

LOADS

Angle of load to grain of member [1]	0	°
Angle of load to grain of member [2]	90	°
Angle of load to axis of member [1]	180	°
Shear load / Axial load	2.0 / 2.0	kN
Duration of load	Medium term	
Service class	2	

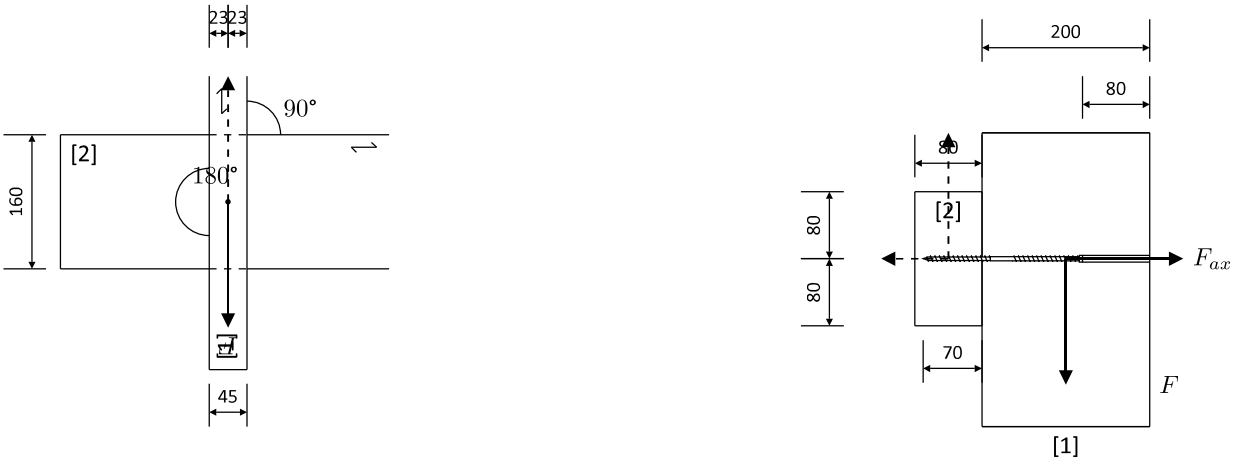
SCREW PROPERTIES

d_1	6.5	mm
L	190	mm
d_{head}	8.0	mm
d_2	3.9	mm
$f_{ax,k}$	15.70	N/mm^2
$f_{tens,k}$	14.80	kN
$f_{head,k}$	0.00	N/mm^2
$M_{y,k}$	13.00	$N \cdot m$
lg_T	80.00	mm

NOTES

1. Design according to EN 1995-1-1+A1+A2 and its National Annex, and to EN 1995-1-1
2. The characteristic values of the timber materials correspond to EN 338:2009 (softwood / solid wood), EN 14080:2013 (glued-laminated timber) and EN 12369-1:2001 or EN 12369-2:2011 (wood-based panels), and reflect additional national regulations where applicable.
3. CLT panel individual layer properties are based on their strength class in accordance with EN 338:2009.
4. The screws shall be driven without predrilling unless stated otherwise.
5. A minimum of two screws or threaded rods should be used for connections in load bearing timber structures. This does not apply for reinforcements or other situations specified in National Annexes to EN 1995-1-1.
6. Additional stresses such as those induced by eccentricities within connections over large areas shall be verified separately, and handled through additional screws or other appropriate details.
7. The design, arrangement, amount of screws and further indicated details are valid exclusively for the use of screws, as indicated by the ESSWOOD Software.
8. The screws may only be used for predominantly stationary loads.
9. All calculations must be verified and signed off by the designer in charge of the works before installation.
10. Reductions in the cross-sectional area caused by screws or threaded rods with a diameter d1 ≥ 10mm shall be taken into account in the member strength verification, both in the tensile and compressive area of members. For screws in pre-drilled holes, the drill hole diameter should be considered in the member strength verification ; for screws driven without pre-drilling, the inner thread diameter d2 should be considered. For further information see EN 1995-1-1.

IMPORTANT
The dimensions given in the ESSWOOD Software must be checked again for accuracy in the result output report.
In addition, the recommended values, type and number of screws form an assistance for the design, which must be checked for accuracy by an authorised architect or designer. The latest version of the user agreement, privacy policy and general terms and conditions apply, and have been accepted by the user prior to the use of the ESSWOOD Software.



[mm]

MINIMUM DISTANCES AND SPACINGS

	Member [1]			Member [2]		
Distance	**Min.**		**Actual**	**Min.**		**Actual**
$a_{3,t}$	80 mm			80 mm		
$a_{3,c}$	26 mm	$\leq$	200 mm	46 mm		
$a_{4,t}$	20 mm			26 mm	$\leq$	80 mm
$a_{4,c}$	20 mm	$\leq$	22 mm	20 mm	$\leq$	80 mm

DESIGN

Withdrawal resistance of threaded length in member [1] (headside)

d_{ef}	6.50	mm
$f_{ax,k,[1]}$	15.70	N/mm^2
$l_{ef,[1]}$	80.00	mm
$F_{ax,\alpha,Rk,[1]} = f_{ax,k,[1]} \cdot d_{ef} \cdot l_{ef,[1]} \cdot \left(\frac{\rho_{k,[1]}}{350}\right)^{0.8}$	8,164.00	N
$k_{mod,[1]}$	0.80	
γ_M	1.30	
$F_{ax,\alpha,Rd,[1]} = F_{ax,\alpha,Rk,[1]} \cdot \frac{k_{mod,[1]}}{\gamma_M}$	**5.02**	kN

Withdrawal resistance of threaded length in member [2] (pointside)

d_{ef}	6.50	mm
$f_{ax,k,[2]}$	15.70	N/mm^2
$l_{ef,[2]}$	70.00	mm
$F_{ax,\alpha,Rk,[2]} = f_{ax,k,[2]} \cdot d_{ef} \cdot l_{ef,[2]} \cdot \left(\frac{\rho_{k,[2]}}{350}\right)^{0.8}$	7,143.50	N
$k_{mod,[2]}$	0.80	
γ_M	1.30	
$F_{ax,\alpha,Rd,[2]} = F_{ax,\alpha,Rk,[2]} \cdot \frac{k_{mod,[2]}}{\gamma_M}$	**4.40**	kN

Head pullthrough resistance in member [1]

d_h	8.00	mm
$f_{head,k,[1]}$	0.00	N/mm^2
$\rho_{k,[1]}$	350.00	kg/m^3
$F_{ax,\alpha,Rhead,k,[1]} = f_{head,k,[1]} \cdot d_h^2 \cdot \left(\frac{\rho_{k,[1]}}{350}\right)^{0.8}$	0.00	N
$k_{mod,[1]}$	0.80	
γ_M	1.30	
$F_{ax,\alpha,Rhead,d,[1]} = F_{ax,\alpha,Rhead,k,[1]} \cdot \frac{k_{mod,[1]}}{\gamma_M}$	**0.00**	kN

Tension strength of fastener

$f_{tens,k}$	14,800.00	N
γ_M	1.30	
$f_{tens,d}$	**11.38**	kN

Axial resistance

$F_{ax,\alpha,Rk} = min\left(max\left(F_{ax,\alpha,Rk,[1]}; F_{ax,\alpha,Rhead,k,[1]}\right); F_{ax,\alpha,Rk,[2]}; f_{tens,k}\right)$	7,143.50	N
$F_{ax,Rd} = min\left(max\left(F_{ax,\alpha,Rd,[1]}; F_{ax,\alpha,Rhead,d,[1]}\right); F_{ax,\alpha,Rd,[2]}; f_{tens,d}\right)$	**4.40**	kN

Characteristic dowel bearing strength in member [1]

d_{ef}	6.50	mm
$\rho_{k,1}$	350.00	kg/m^3
α	90.00	°
k_{90}	1.45	N/mm^2
$f_{h,\alpha,k,1} = frac0.082(1 - 0.01d)\rho_k k_{90} sin^2\alpha + cos^2\alpha$	26.83	N/mm^2

Characteristic dowel bearing strength in member [2]

d_{ef}	6.50	mm
$\rho_{k,2}$	350.00	kg/m^3
α	90.00	°
k_{90}	1.45	N/mm^2
$f_{h,\alpha,k,2} = frac0.082(1 - 0.01d)\rho_k k_{90} sin^2\alpha + cos^2\alpha$	18.54	N/mm^2

Shear resistance of shear plane [1/2]

d_1	6.50	mm
t_1	120.00	mm
t_2	70.00	mm
$f_{h,\alpha,k,1}$	26.83	N/mm^2
$f_{h,\alpha,k,2}$	18.54	N/mm^2
$M_{y,Rk}$	13,000	$N \cdot mm$
$F_{ax,\alpha,Rk,[1/2]}$	7,143.50	N
Δ_{Rk} is limited to 100% of shear resistance	1.79	kN
$\beta_1 = \frac{f_{h,\alpha,k,2}}{f_{h,\alpha,k,1}}$	0.69	
$k_{mod,1}$	0.80	
$k_{mod,2}$	0.80	
$k_{mod,[1/2]}$	0.80	
γ_M	1.30	
$F_{v,Rk}$ (8.6.a)	20.93	kN
$F_{v,Rk}$ (8.6.b)	8.44	kN
$F_{v,Rk}$ (8.6.c) $= 6.57 + 1.79 =$	8.36	kN
$F_{v,Rk}$ (8.6.d) $= 6.94 + 1.79 =$	8.73	kN
$F_{v,Rk}$ (8.6.e) $= 3.33 + 1.79 =$	5.11	kN
$F_{v,Rk}$ (8.6.f) $= 2.21 + 1.79 =$	4.00	kN
$F_{v,Rd,[1/2]}$	2.46	kN

Loads on connection

Angle of load to grain

Member 1 : α_1	0.00 °
Member 2 : α_2	90.00 °

Design value of loads

Design value of shear load: $F_{v,Ed}$	2.00

Effective numbers of fasteners		[1]	[2]
Total number of screws:	$n = n_0 \cdot n_{90} = 1$		
Design situation	n_{90}	1	1
	n_0	1	1
	n_{ef}	1.00	1.00

Screws aligned (not staggered)

Verification

Shear

$F_{v,Ed}$	2.00
$n_{ef} = min(n_{ef,[1]}, n_{ef,[2]})$	1.00
$F_{v,Rd,[1][2]}$	2.46
$\eta_v = \frac{F_{v,Ed}}{n_{ef} \cdot F_{v,Rd,[1/2]}}$	**0.81** ≤ 1

Axial

$F_{ax,Ed}$	2.00
$n_{ef,ax}$	1.00
$F_{ax,Rd}$	4.40
$\eta_{ax} = \frac{F_{ax,Ed}}{n_{ef,ax} \cdot F_{ax,Rd}}$	**0.46** ≤ 1

Combined

$\eta = \left(\frac{F_{ax,Ed}}{n_{ef,ax} \cdot F_{ax,Rd}}\right)^2 + \left(\frac{F_{v,Ed}}{n_\alpha \cdot n_{ef,\alpha} \cdot F_{v,Rd,\alpha}}\right)^2$	**0.87** ≤ 1

Tension perp. to grain in member [2]

$F_{v,Ed,\perp,2}$	2.00	kN
h_2	160	mm
b_2	80	mm
$h_{e,2}$	160	mm
$F_{90,Rk,2} = 14 \cdot b_2 \cdot w \cdot \sqrt{\frac{h_{e,2}}{1-\frac{h_{e,2}}{h_2}}}$	0.00	kN
$k_{mod,2}$	0.80	
$\gamma_{M,2}$	1.30	
$F_{90,Rd,2} = F_{90,Rk,2} \cdot \frac{k_{mod,2}}{\gamma_{M,2}}$	0.00	kN
$\eta_{90,2} = \frac{F_{v,Ed,\perp,2}}{F_{90,Rd,2}}$	**0.00**	≤ 1