1. Input parameters

1.1. ribs, flanges
service class 1
panel width/height = 187.5 / 300.0 cm
ribs (vertical) 6.0 / 22.0 cm from solid coniferous timber, C24 (S10) with $p_k = 350$ kg/m$^3$, $a_r = 62.5$ cm
flanges (horizontal) 6.0 / 22.0 cm from solid coniferous timber, C24 (S10) with $p_k = 350$ kg/m$^3$

1.2. sheathing on one side
OSB 3 with $p_k = 550$ kg/m$^3$, service class 1, $t = 15.0$ mm
staple, 2.15 x 64 mm, $b_r = 5.5$ mm, resined, timber at fibre saturation point
detailed verification acc. to DIN EN 1995, 8.2.2, distance $a_v = 100$ mm, 1-row
$F_v, F_{ck}$ increased acc. to DIN EN 1995, 8.2.2(2)
vertical loads are transmitted by ribs and sheathing

1.3. Combinations of internal forces for verifications at ultimate limit state

<table>
<thead>
<tr>
<th>Nr</th>
<th>$F_{v,d}$ kN</th>
<th>$E_{d1}$ kN/m</th>
<th>$E_{d2}$ kN/m</th>
<th>$F_{c,d}$ kN</th>
<th>$F_{z,d}$ kN</th>
<th>$K_{mod,r}$</th>
<th>$K_{mod,b1}$ A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.70</td>
<td>0.00</td>
<td>2.00</td>
<td>10.15</td>
<td>20.30</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>

1.4. Combinations of internal forces for verifications at serviceability limit state

<table>
<thead>
<tr>
<th>Nr</th>
<th>$F_{v,k}$ kN</th>
<th>$E_{k1}$ kN/m</th>
<th>$E_{k2}$ kN/m</th>
<th>$F_{c,k}$ kN</th>
<th>$F_{z,k}$ kN</th>
<th>$K_{mod,r}$</th>
<th>$K_{mod,b1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.60</td>
<td>0.40</td>
</tr>
</tbody>
</table>

elevation scale 1:30
2. verifications acc. to DIN EN 1995, Germany

2.1. Fasteners sheathing 1
fastener ends in rib, penetration depth t = 49 mm
\( f_{sk} \) Tab. 14 = 2.45 N/mm², \( f_{vk} = 17.50 \) N/mm², \( F_{sk, rk} = 361.35 \) N, \( \Delta F_{v, R} = 90.34 \) N
\( f_{uk} = 600 \) N/mm², \( M_{yk} = 1317 \) Nmm, \( f_{hk} = 49.87 \) N/mm², \( \beta = 0.46 \)
decisive is Eq. (f), \( \gamma_M = 1.30 \), \( F_{v, RK} = 813.5 \) N + \( \Delta F_{v, RK} \) (90.3 N) = 903.8 N, \( F_{v, Rd} = 625.7 \) N per staple

2.2. Verification of diaphragm loading
sheathing
\( \gamma = 1.30 \), \( f_{vk} = 6.8 \) N/mm², \( f_{ck} = 12.7 \) N/mm², \( k_{y1} = 0.66 \), \( k_{y2} = 0.33 \)

2.2.1. Load combination 1
wall panel in horizontal diaphragm loading
sheathing 1
\( F_{v, Rd} = 626 \) N, \( f_{vd} = 4.71 \) N/mm², \( f_{cd} = 8.79 \) N/mm²
\( f_{v0d} = 4.13 \) N/mm² (fastener), \( f_{v90d} = 6.26 \) N/mm² (fastener)
\( \Rightarrow \) utilization: \( U_{ld} = 0.87 \), \( U_{90d} = -1.00 \) \( \Rightarrow \) \( U = 0.87 \) verification successful

2.3. Verification of compression of bottom edge beam
\( A_{ef, 11} = 19800 \) mm², \( A_{ef, inside} = 26400 \) mm², \( A_{ef, re} = 19800 \) mm², \( x_1 = 1.00 \) DIN 1052, 8.7.5, \( k_{c90} = 1.25 \)
2.3.1. Load combination 1

\[ f_{\text{eqd}} = 6.26 \text{ N/mm}^2, \quad f_{\text{cd}} = 1.73 \text{ N/mm}^2, \quad f_{\text{rb}} = 1.00 \]

\[ F_{c,d \text{ edge}} = 21328 \text{ N}, \quad F_{c,d \text{ inside}} = 21299 \text{ N}, \quad \sigma_{c,d \text{ hi}} = 1.08 \text{ mm}^2, \quad \sigma_{c,d \text{ li}} = 0.81 \text{ mm}^2, \quad \sigma_{c,d \text{ re}} = 1.08 \text{ mm}^2 \]

\[ \Rightarrow \text{utilization: } U = 0.50 \text{ verification successful} \]

2.4. Verification of compression flange

\[ E_0 = 7333 \text{ N/mm}^2, \quad f_{\text{cdk}} = 21.0 \text{ N/mm}^2, \quad l = 1875 \text{ cm}, \quad l_r = 63.6 \text{ mm}, \quad A = 13200 \text{ mm}^2 \]

flanges secured against buckling perpendicular to the wall surface

2.4.1. Load combination 1

\[ f_{\text{cd}} = 14.54 \text{ N/mm}^2, \quad F_{c,d} = 6700 \text{ N}, \quad \sigma_{c,d} = 0.51 \text{ N/mm}^2 \]

\[ \Rightarrow \text{utilization: } U = 0.03 \text{ verification successful} \]

2.5. Verification of vertical ribs

\[ f_{\text{cdk}} = 21.0 \text{ N/mm}^2, \quad h = 3000 \text{ cm}, \quad l_r = 63.6 \text{ mm}, \quad A = 13200 \text{ mm}^2 \]

\[ k = 0.873, \quad k_c = 0.823, \quad \beta_c = 0.200, \quad \lambda_{rel,c} = 0.8037, \quad \lambda = 47.18 \]

2.5.1. Load combination 1

\[ f_{\text{cd}} = 14.54 \text{ N/mm}^2, \quad f_{\text{rb}} = 1.00, \quad F_{c,d \text{ edge}} = 21328 \text{ N}, \quad F_{c,d \text{ inside}} = 21299 \text{ N} \]

\[ \sigma_{c,d} = 1.62 \text{ N/mm}^2, \quad \sigma_{c,d \text{ inside}} = 1.61 \text{ N/mm}^2 \]

\[ \Rightarrow \text{utilization: } U = 0.14 \text{ verification successful} \]

2.6. Verification of deformation at ultimate limit state

\[ k_{\text{surf}} = 142.9 \text{ N/mm}, \quad k_{\text{cd}} = 1.25, \quad A_r = 13200.0 \text{ mm}^2, \quad l_1 = 565 \text{ mm}, \quad u_{zul} = 30.0 \text{ mm} \]

\[ G_{\text{mean}} = 830.8 \text{ N/mm}^2, \quad E_0 = 8461.5 \text{ N/mm}^2, \quad f_{\text{cd}} = 1.92 \text{ N/mm}^2 \]

2.6.1. Load combination 1

\[ \sigma_{\text{cd}} = 1.08 \text{ N/mm}^2, \quad u_k = 13.01 \text{ mm}, \quad u_6 = 0.86 \text{ mm}, \quad u_8 = 0.38 \text{ mm}, \quad u_9 = 1.19 \text{ mm}, \quad K_d = 433.84 \text{ N/mm} \]

\[ \Sigma u = 15.44 \text{ mm} \]

\[ \Rightarrow \text{utilization: } U = 0.51 \text{ verification successful} \]

2.7. Verification of deformation at serviceability limit state

\[ k_{\text{surf}} = 278.6 \text{ N/mm}, \quad k_{\text{cd}} = 1.25, \quad A_r = 13200.0 \text{ mm}^2, \quad l_1 = 565 \text{ mm}, \quad u_{zul} = 20.0 \text{ mm} \]

\[ G_{\text{mean}} = 1080.0 \text{ N/mm}^2, \quad E_0 = 11000.0 \text{ N/mm}^2, \quad f_{\text{cd}} = 2.50 \text{ N/mm}^2 \]

2.7.1. Load combination 1

\[ \sigma_{\text{cd}} = 0.40 \text{ N/mm}^2, \quad u_k = 4.98 \text{ mm}, \quad u_6 = 0.49 \text{ mm}, \quad u_8 = 0.22 \text{ mm}, \quad u_9 = 0.57 \text{ mm}, \quad K_d = 798.04 \text{ N/mm} \]

\[ \Sigma u = 6.27 \text{ mm} \]

\[ \Rightarrow \text{utilization: } U = 0.31 \text{ verification successful} \]