1. Input parameters

1.1. ribs, flanges

Service class 1

Panel width/height = 250.0 / 255.0 cm, sheet edges transmitting shear on all sides

Ribs (vertical) 5.0 / 12.0 cm from solid coniferous timber, C24 (SI0) with ρk = 350 kg/m³, αr = 62.5 cm

Flanges (horizontal) 5.0 / 12.0 cm from solid coniferous timber, C24 (SI0) with ρk = 350 kg/m³

1.2. sheathing on one side

OSB 4 with ρk = 550 kg/m³, service class 1, t = 18.0 mm

Special nail 1A, 2.5 x 50.0 mm, δk = 5.0 mm, l_ef = 50.0 mm, not predrilled

Simplified verification acc. to NA.8.2.4, distance a_Y = 90 mm, 1-row

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_{EI} kN/m</th>
<th>E_{Ed} kN/m</th>
<th>F_{l1,d} kN</th>
<th>F_{l2,d} kN</th>
<th>K_{mod,r}</th>
<th>K_{mod,b1}</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.18</td>
<td>0.00</td>
<td>2.00</td>
<td>7.95</td>
<td>0.00</td>
<td>0.90</td>
<td>0.90</td>
<td></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_{EI} kN/m</th>
<th>E_{Ed} kN/m</th>
<th>F_{l1,k} kN</th>
<th>F_{l2,k} kN</th>
<th>K_{mod,r}</th>
<th>K_{mod,b1}</th>
<th>A</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>
<td></td>
</tr>
</tbody>
</table>

elevation scale 1:25
2. Verifications acc. to DIN EN 1995, Germany

2.1. Fasteners shearthing 1
fastener ends in rib, penetration depth t = 32 mm
F_{v, RK} increased acc. to DIN EN 1995, 9.2.4.2 (5) (sheet edges transmitting shear on all sides)
f_{uk} = 450 \text{ N/mm}^2, M_{y, k} = 1462 \text{ Nmm}, f_{hk} = 45.70 \text{ N/mm}^2, \beta = 0.00
F_{v, RK} = 462.4 \text{ N}, F_{v, Rd} = 378.3 \text{ N per shear plane}, \gamma_m = 1.10

2.2. Verification of diaphragm loading
sheathing
\gamma = 1.30, f_{vk} = 6.9 \text{ N/mm}^2, f_{ck} = 14.0 \text{ N/mm}^2, k_{v1} = 1.00, k_{v2} = 0.33

2.2.1. Load combination 1
wall panel in horizontal diaphragm loading
sheathing 1
F_{v, Rd} = 378 \text{ N}, f_{vd} = 4.78 \text{ N/mm}^2, f_{cd} = 9.69 \text{ N/mm}^2
f_{vd/0} = 4.20 \text{ N/mm}^2 (fastener), f_{vd/0} = 4.20 \text{ N/mm}^2 (fastener)
\Rightarrow utilization: U_{0d} = 0.87, U_{0q} = -1.00 \Rightarrow U = 0.87 \text{ verification successful}

2.3. Verification of compression of bottom edge beam
A_{ef, int} = 9600 \text{ mm}^2, A_{ef, inside} = 13200 \text{ mm}^2, A_{ef, re} = 9600 \text{ mm}^2, x_{j} = 1.00 \text{ DIN 1052, 8.7.5}, k_{c90} = 1.25
2.3.1. Load combination 1

\( f_{v0d} = 4.20 \text{ N/mm}^2, \ f_{c0d} = 1.73 \text{ N/mm}^2, \ f_{r1b} = 1.00 \)

\( f_{c,d, \text{edge}} = 17781 \text{ N}, \ f_{c,d, \text{inside}} = 1105 \text{ N}, \sigma_{c,d, \text{edge}} = 1.85 \text{ mm}^2, \sigma_{c,d, \text{inside}} = 0.08 \text{ mm}^2, \sigma_{c, \text{re}} = 1.85 \text{ mm}^2 \)

\( \Rightarrow \) utilization: \( U = 0.86 \) verification successful

2.4. Verification of compression flange

\( E_{0,05} = 7333 \text{ N/mm}^2, \ f_{C0k} = 21.0 \text{ N/mm}^2, \ l = 2500 \text{ cm}, \ t_r = 34.7 \text{ mm}, \ A = 6000 \text{ mm}^2 \)
flanges secured against buckling perpendicular to the wall surface

2.4.1. Load combination 1

\( f_{C0d} = 14.54 \text{ N/mm}^2, \ f_{c,d} = 9180 \text{ N}, \sigma_{C0,d} = 1.53 \text{ N/mm}^2 \)

\( \Rightarrow \) utilization: \( U = 0.11 \) verification successful

2.5. Verification of vertical ribs

\( f_{C0k} = 21.0 \text{ N/mm}^2, \ h = 2550 \text{ cm}, \ t_r = 34.7 \text{ mm}, \ A = 6000 \text{ mm}^2 \)

\( k = 1.380, \ k_c = 0.511, \beta_c = 0.200, \lambda_{rel,c} = 1.2525, \lambda = 73.53 \)

2.5.1. Load combination 1

\( f_{C0d} = 14.54 \text{ N/mm}^2, \ f_{r1b} = 1.00, \ f_{c,d, \text{edge}} = 17781 \text{ N}, \ f_{c,d, \text{inside}} = 1105 \text{ N} \)

\( \sigma_{c, \text{edge}} = 2.96 \text{ N/mm}^2, \sigma_{c, \text{inside}} = 0.18 \text{ N/mm}^2 \)

\( \Rightarrow \) utilization: \( u = 0.40 \) verification successful

2.6. Verification of deformation at ultimate limit state

\( k_{ser} = 429.8 \text{ N/mm}, \ k_{c0o} = 1.25, \ A_r = 6000.0 \text{ mm}^2, \ l_1 = 575 \text{ mm}, \ u_{Zy1} = 25.5 \text{ mm} \)

\( G_{mean} = 838.5 \text{ N/mm}^2, \ E_{0,\text{mean}} = 8461.5 \text{ N/mm}^2, \ f_{c0} = 1.92 \text{ N/mm}^2 \)

2.6.1. Load combination 1

\( \sigma_{c0} = 1.85 \text{ N/mm}^2, \ u_k = 3.11 \text{ mm}, \ u_5 = 0.62 \text{ mm}, \ u_6 = 0.62 \text{ mm}, \ u_7 = 1.31 \text{ mm}, \ K_d = 1622.58 \text{ N/mm} \)

\( \Sigma \ u = 5.66 \text{ mm} \)

\( \Rightarrow \) utilization: \( U = 0.22 \) verification successful

2.7. Verification of deformation at serviceability limit state

\( k_{ser} = 838.2 \text{ N/mm}, \ k_{c0o} = 1.25, \ A_r = 6000.0 \text{ mm}^2, \ l_1 = 575 \text{ mm}, \ u_{Zy1} = 17.0 \text{ mm} \)

\( G_{mean} = 1090.0 \text{ N/mm}^2, \ E_{0,\text{mean}} = 10000.0 \text{ N/mm}^2, \ f_{c0} = 2.50 \text{ N/mm}^2 \)

2.7.1. Load combination 1

\( \sigma_{c0} = 0.53 \text{ N/mm}^2, \ u_k = 0.87 \text{ mm}, \ u_5 = 0.26 \text{ mm}, \ u_6 = 0.26 \text{ mm}, \ u_7 = 0.48 \text{ mm}, \ K_d = 2674.55 \text{ N/mm} \)

\( \Sigma \ u = 1.87 \text{ mm} \)

\( \Rightarrow \) utilization: \( U = 0.11 \) verification successful