1. Input parameters

1.1. ribs, flanges
service class 1
panel width/height = 125.0 / 220.0 cm, sheet edges transmitting shear on all sides
ribs (vertical) 6.0 / 10.0 cm from solid coniferous timber, C24 (S10) with ρk = 350 kg/m³, δr = 62.5 cm
flanges (horizontal) 6.0 / 10.0 cm from solid coniferous timber, C24 (S10) with ρk = 350 kg/m³

1.2. sheathing on one side
Fermacell 12.5 mm with ρk = 1150 kg/m³, service class 1, t = 12.5 mm
smooth nail, 2.8 x 42.5 mm, dk = 6.1 mm, predrilled
detailed verification acc. to DIN EN 1995, 8.2.2, distance av = 50 mm, 1-row
Fv,rr 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>Fv,d</th>
<th>Ed1</th>
<th>Edr</th>
<th>F1c,d</th>
<th>F2c,d</th>
<th>Kmod,r</th>
<th>Kmod,b1</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>0.90</td>
<td>0.80</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>Fv,k</th>
<th>Ek1</th>
<th>Ekr</th>
<th>F1c,k</th>
<th>F2c,k</th>
<th>Kmod,r</th>
<th>Kmod,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>0.20</td>
</tr>
</tbody>
</table>

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

2.1. Fasteners sheathing 1
Fastener ends in rib, penetration depth t = 30 mm
f_{kv, tab. 14} = 2.45 N/mm², f_{zk} = 17.50 N/mm², F_{ak, RK} = 139.65 N, \Rightarrow \Delta F_{V,R} = 34.91 N
f_{uk} = 600 N/mm², M_{uk} = 2617 Nmm, f_{nk} = 33.06 N/mm², \beta = 0.72
decisive is Eq. (d), \gamma_m = 1.30, F_{V,RK} = 543.8 N + \Delta F_{V,RK} (34.9 N) = 578.7 N, F_{V,Rd} = 377.7 N
per shear plane

2.2. Verification of diaphragm loading
sheathing
\gamma = 1.30, f_{vk} = 3.6 N/mm², f_{ck} = 8.5 N/mm², 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 N, f_{kv} = 2.22 N/mm², f_{cd} = 5.23 N/mm²
f_{v0d} = 6.09 N/mm² (shear stress), f_{v90d} = 7.55 N/mm² (shear stress)
\Rightarrow utilization: U_{v0d} = 0.66, U_{v90} = -1.00 \Rightarrow U = 0.66 verification successful
2.3. Verification of compression of bottom edge beam
\[ A_{ef} \times l_1 = 9000 \text{ mm}^2, \quad A_{ef \text{ inside}} = 12000 \text{ mm}^2, \quad A_{ef} \times A_{r} = 9000 \text{ mm}^2, \quad x_1 = 1.00, \quad \text{DIN 1052, } 8.7.5, \quad k_{e90} = 1.25 \]

2.3.1. Load combination 1
\[ f_{e90d} = 7.55 \text{ N/mm}^2, \quad f_{c90d} = 1.73 \text{ N/mm}^2, \quad f_{rib} = 1.00 \]
\[ f_{c,d \text{ edge}} = 11269 \text{ N}, \quad f_{c,d \text{ inside}} = 3563 \text{ N}, \quad \sigma_{c,d} \times l_1 = 1.25 \text{ mm}^2, \quad \sigma_{c,d} \times A_{r} = 0.30 \text{ mm}^2, \quad \sigma_{c,d} \times A_{r} = 1.25 \text{ mm}^2 \]
\[ \Rightarrow \text{ utilization: } U = 0.58, \text{ verification successful} \]

2.4. Verification of compression flange
\[ E_{0,05} = 7333 \text{ N/mm}^2, \quad f_{c0k} = 21.0 \text{ N/mm}^2, \quad l = 1250 \text{ cm}, \quad t_r = 28.9 \text{ mm}, \quad A = 6000 \text{ mm}^2 \]
Flanges secured against buckling perpendicular to the wall surface

2.4.1. Load combination 1
\[ f_{c0d} = 14.54 \text{ N/mm}^2, \quad f_{c,d} = 5000 \text{ N}, \quad \sigma_{c0,d} = 0.83 \text{ N/mm}^2 \]
\[ \Rightarrow \text{ utilization: } U = 0.06, \text{ verification successful} \]

2.5. Verification of vertical ribs
\[ f_{c0k} = 21.0 \text{ N/mm}^2, \quad h = 2200 \text{ cm}, \quad t_r = 28.9 \text{ mm}, \quad A = 6000 \text{ mm}^2 \]
\[ k = 1.440, \quad k_c = 0.484, \quad \beta_{c} = 0.200, \quad \lambda_{rel,c} = 1.2967, \quad \lambda = 76.12 \]

2.5.1. Load combination 1
\[ f_{c0d} = 14.54 \text{ N/mm}^2, \quad f_{rib} = 1.00, \quad f_{c,d \text{ edge}} = 11269 \text{ N}, \quad f_{c,d \text{ inside}} = 3563 \text{ N} \]
\[ \sigma_{c} \times A_{r} = 1.88 \text{ N/mm}^2, \quad \sigma_{c} \times A_{r} = 0.59 \text{ N/mm}^2 \]
\[ \Rightarrow \text{ utilization: } U = 0.27, \text{ verification successful} \]

2.6. Verification of deformation at ultimate limit state
\[ k_{ser} = 818.3 \text{ N/mm}, \quad k_{e90} = 1.25, \quad A_r = 6000.0 \text{ mm}^2, \quad l_1 = 565 \text{ mm}, \quad u_{2ul} = 22.0 \text{ mm} \]
\[ G_{\text{mean}} = 1230.8 \text{ N/mm}^2, \quad E_0, \text{mean} = 8461.5 \text{ N/mm}^2, \quad f_{c90} = 1.92 \text{ N/mm}^2 \]

2.6.1. Load combination 1
\[ \sigma_{e90} = 1.25 \text{ N/mm}^2, \quad u_k = 1.35 \text{ mm}, \quad u_6 = 0.57 \text{ mm}, \quad u_e = 0.53 \text{ mm}, \quad u_v = 1.53 \text{ mm}, \quad K_d = 1256.75 \text{ N/mm} \]
\[ \Sigma u = 3.98 \text{ mm} \Rightarrow \text{ utilization: } U = 0.18, \text{ verification successful} \]

2.7. Verification of deformation at serviceability limit state
\[ k_{ser} = 1595.7 \text{ N/mm}, \quad k_{e90} = 1.25, \quad A_r = 6000.0 \text{ mm}^2, \quad l_1 = 565 \text{ mm}, \quad u_{2ul} = 14.7 \text{ mm} \]
\[ G_{\text{mean}} = 1600.0 \text{ N/mm}^2, \quad E_0, \text{mean} = 11000.0 \text{ N/mm}^2, \quad f_{c90} = 2.50 \text{ N/mm}^2 \]

2.7.1. Load combination 1
\[ \sigma_{e90} = 0.98 \text{ N/mm}^2, \quad u_k = 0.69 \text{ mm}, \quad u_6 = 0.44 \text{ mm}, \quad u_e = 0.41 \text{ mm}, \quad u_v = 1.53 \text{ mm}, \quad K_d = 1629.28 \text{ N/mm} \]
\[ \Sigma u = 3.07 \text{ mm} \Rightarrow \text{ utilization: } U = 0.21, \text{ verification successful} \]