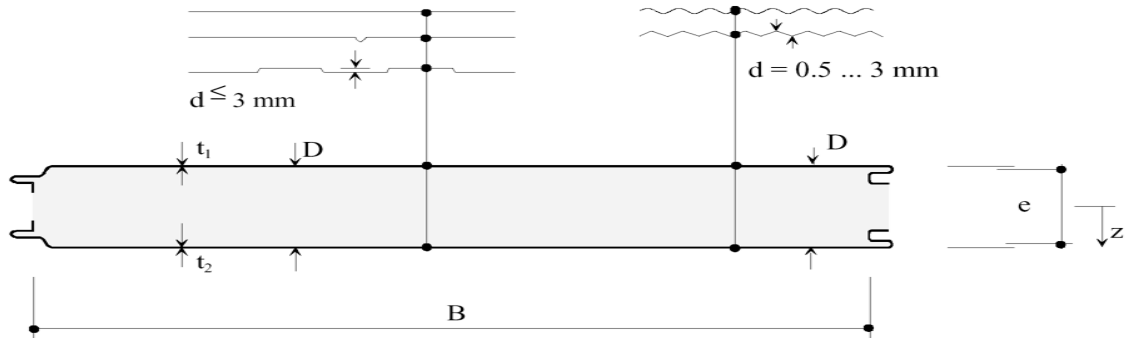


Determination of Deflection and Stress in Sandwichpanels according to ECCS



Cross section

| Name of panel | Example 1 | |
|---------------------------------|------------------|----------------|
| Thickness over all of panel | D = | 60 mm |
| Nominal thickness of outer face | t ₁ = | 0.60 mm |
| Nominal thickness of inner face | t ₂ = | 0.50 mm |
| Thickness of zinc | | 0.06 mm |

| | <i>Index face 1</i> | <i>Index face 2</i> | |
|-------------------------------|-----------------------------------|---------------------|--------------------|
| Net thickness of faces | 0.540 | 0.440 | mm |
| Cross-sectional area of faces | A _{Fi} = 5.840 | 4.690 | cm ² /m |
| Moment of inertia of faces | I _{Fi} = 0.00 | 0.00 | cm ⁴ /m |
| Upper edge distance | d _{i1} = 0.630 | 2.450 | mm |
| lower edge distance | d _{i2} = 4.370 | 0.200 | mm |
| E-Modul | E _{Fi} = 2.10E+05 | 2.10E+05 | N/mm ² |
| Thermal expansion coefficient | α _{Ti} = 1.20E-05 | 1.20E-05 | 1/° |
| Shear modulus | G _C = 3.10 | N/mm ² | |

general loading

| | | |
|----------------------------|-------------------------------|-------------------|
| Number of spans | 2 | spans |
| Single span width | L = 4.000 | m |
| Uniformly distributed load | q = 0.500 | kN/m ² |
| Temperature outer face | T ₁ = -20.0 | °C |
| Temperature inner face | T ₂ = 20.0 | °C |

Determination of Deflection and Stress in Sandwichpanels according to ECCS

panel data

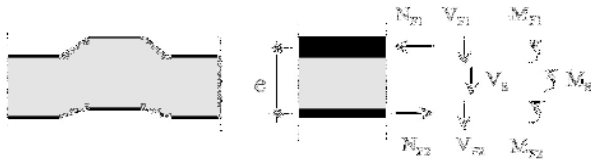
| | | | |
|-------------------------------------|------------|------------|-------------------|
| Distance between centroids of faces | $e =$ | 58.68 | mm |
| Cross section area | $A_S =$ | 586.80 | cm ² |
| B_S | $B_S =$ | 1880861.53 | kNcm ² |
| B_{F1} | $B_{F1} =$ | 0.00 | kNcm ² |
| B_{F2} | $B_{F2} =$ | 0.00 | kNcm ² |
| $G_C * A_S =$ | $S =$ | 181.90800 | kN |
| intermediate data: | $k =$ | 0.194 | |

formula

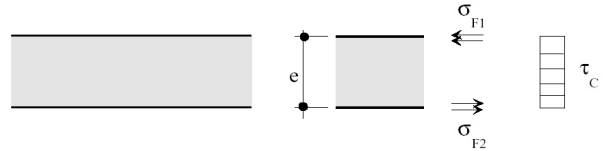
$$B_S = \frac{E_{F1} A_{F1} E_{F2} A_{F2} e^2}{E_{F1} A_{F1} + E_{F2} A_{F2} B}$$

$$\lambda = L \sqrt{\frac{B}{B_{F1} + B_{F2}} \frac{G_C A_S}{B_S}} = \sqrt{\frac{1 + \alpha}{\alpha \beta}}$$

$$k = \frac{3 B_S}{L^2 G_C A_S}$$



Internal forces in panel cross section



Stress resultants

Internal force variables for uniformly distributed load

| | | | | |
|-------------------------------------|------------------|--------|-------------------|---------------------------------------|
| | $q =$ | 0.500 | kN/m ² | |
| Bending moment (sandwich part) | $M_S =$ | -0.838 | kNm/m | at intermediate support |
| Bending moment (part of outer face) | $M_{F1} =$ | 0.000 | kNm/m | at intermediate support |
| Bending moment (part of inner face) | $M_{F2} =$ | 0.000 | kNm/m | at intermediate support |
| Shear force in the core | $V_S =$ | 1.209 | kN/m | at intermediate support") |
| Shear force in the outer face | $V_{F1} =$ | 0.000 | kN/m | |
| Shear force in the inner face | $V_{F2} =$ | 0.000 | kN/m | |
| End support reaction | $F_1 =$ | 0.791 | kN/m | |
| Reaction on intermediate support | $F_2 =$ | 2.419 | kN/m | |
| Deflection | $w =$ | 1.002 | cm | between $x = 0,375 L$ and $x = 0,5 L$ |
| Longitudinal stress in outer face | $\sigma_{1,o} =$ | 24.44 | N/mm ² | at intermediate support |
| Longitudinal stress in inner face | $\sigma_{2,o} =$ | -30.44 | N/mm ² | at intermediate support |
| Shear stress of the core | $\tau_c =$ | 0.021 | N/mm ² | beside the intermediate support |

Internal force variables for temperature difference

| | | | | |
|-------------------------------------|------------------|----------|-------------------|---|
| | $\theta =$ | 8.18E-07 | - | |
| Bending moment (sandwich part) | $M_S =$ | -1.933 | kNm/m | at intermediate support |
| Bending moment (part of outer face) | $M_{F1} =$ | 0.000 | kNm/m | at intermediate support |
| Bending moment (part of inner face) | $M_{F2} =$ | 0.000 | kNm/m | at intermediate support") |
| Shear force in the core | $V_S =$ | 0.483 | kN/m | at the intermediate support") |
| Shear force in the outer face | $V_{F1} =$ | 0.000 | kN/m | |
| Shear force in the inner face | $V_{F2} =$ | 0.000 | kN/m | |
| End support reaction | $F_1 =$ | -0.483 | kN/m | |
| Reaction on intermediate support | $F_2 =$ | 0.967 | kN/m | |
| Deflection | $w =$ | 0.636 | cm | at mid span |
| Longitudinal stress in outer face | $\sigma_{1,o} =$ | 56.41 | N/mm ² | at midspan or at intermediate support") |
| Longitudinal stress in inner face | $\sigma_{2,u} =$ | -70.24 | N/mm ² | at midspan or at intermediate support") |
| Shear stress of the core | $\tau_c =$ | 0.008 | N/mm ² | at intermediate support) |