

MODULUS OF RIGIDITY OF SANDWICH PANELS WITH HEXAGONAL CELL CORES

1. NOTATION

a_c	length of cell walls that are parallel to the x -axis	m	in
b_c	length of cell walls that are not parallel to the x -axis	m	in
G	modulus of rigidity of core material	N/m ²	lbf/in ²
G_{cx}	modulus of rigidity of core in xz -plane	N/m ²	lbf/in ²
G_{cy}	modulus of rigidity of core in yz -plane	N/m ²	lbf/in ²
h	depth of core	m	in
t_c	thickness of cell walls	m	in
θ	acute angle between cell walls of length b_c and the x -axis	degree	degree

Both SI and British units are quoted but any coherent system of units may be used.

2. NOTES

Figures 1, 2 and 3 show G_{cx}/G_{cy} plotted against a_c/b_c for various values of h/a_c . Each figure relates to a different value of θ . For values of $\theta \leq 50^\circ$ the ratio G_{cx}/G_{cy} is given approximately by

$$\frac{G_{cx}}{G_{cy}} = \frac{(a_c/b_c + \cos \theta)^2}{\sin^2 \theta (1 + a_c/b_c)}.$$

For all values of θ the value of G_{cy} is independent of h/a_c and is given by

$$G_{cy} = \frac{G t_c \sin \theta}{(a_c + b_c \cos \theta)}.$$

The curves are calculated assuming that no out-of-plane bending of the face plates occurs. This condition will normally apply when t_c is small compared with b_c and the thickness of the face plates. If, however, t_c is not small in comparison with the thickness of the face plates the ratio G_{cx}/G_{cy} will not fall below the value obtained if h/a_c is taken to be infinite.

Further information on sandwich panels may be located by reference to the Engineering Sciences Data Index.

3. DERIVATION

1. KELSEY, S.
GELLATLY, R.A.
CLARK, B.W. The shear modulus of foil honeycomb cores. *Aircr. Engng*, Vol. 30, pp. 294-302, October 1958.
2. PENZIEN, J.
DIDRIKSSON, T. Effective shear modulus of honeycomb cellular structure. *AIAA Journal*, Vol. 2, No. 3, pp. 531-535, March 1964.