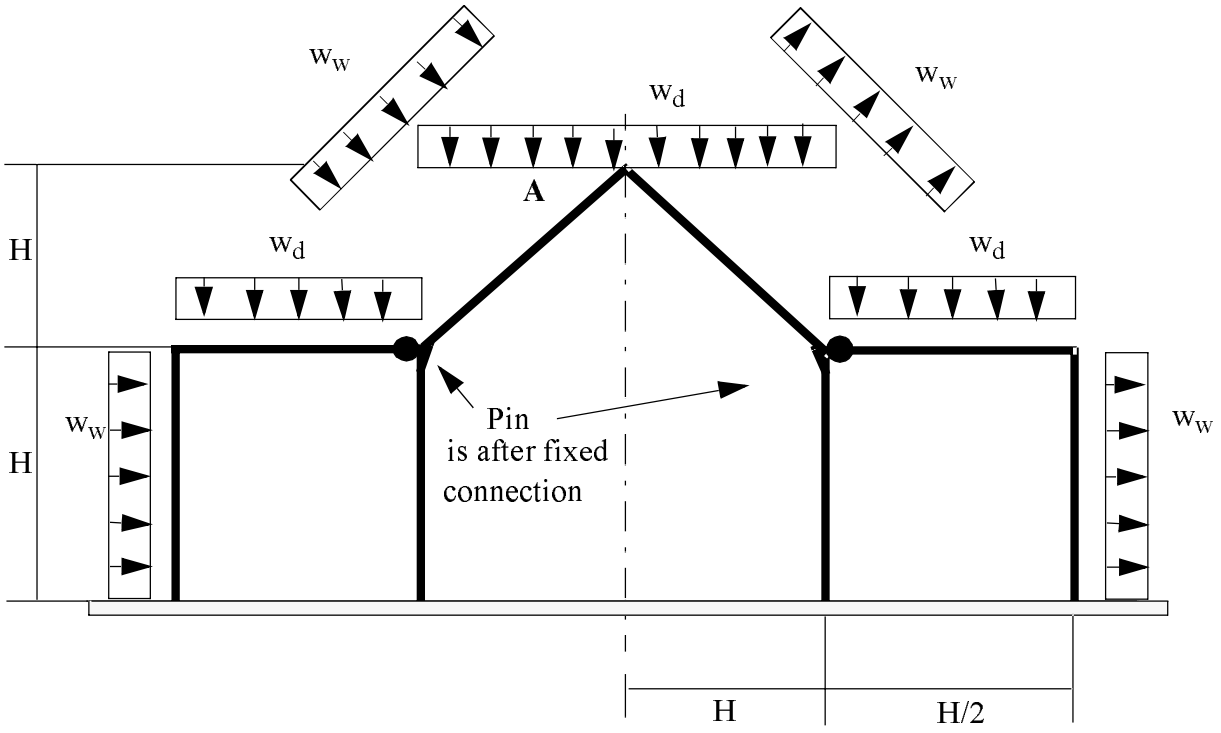
# Problem Set 2

**Problem 2.1**

The following are the drawings for a cathedral and as part of the consultant team you are asked to determine the horizontal displacements at the top of the structure (point A). The drawing includes both wind and dead load ($w_w$ = 10 x $10^3$ N/m and $w_d$ = 50 x $10^3$ N/m), assume all element's properties are the same for all members:

$D_B = 25 \times 10^6$ Nm$^2$ $D_T = 5 \times 10^6$ N.

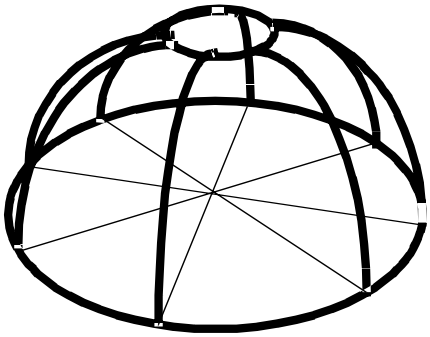


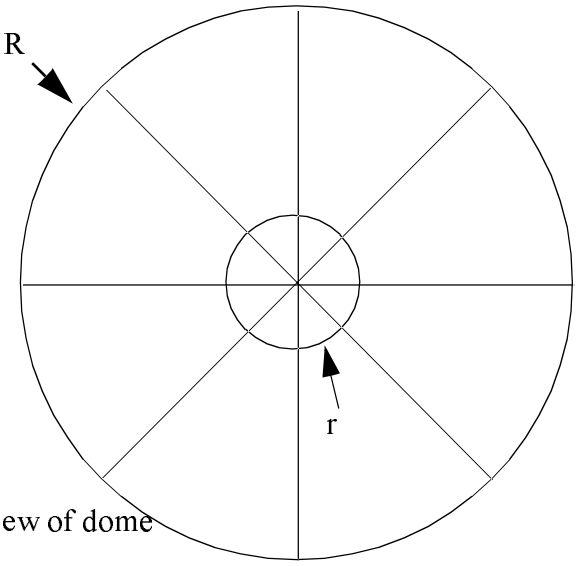

**Problem 2.2**

Also as part of the cathedral design, you are asked to analyze the proposed dome. It consists of two rings connected by a series of 'ribs'. The outside ring is an 'extension-ring' and the smaller one is a 'compression' ring ... why ?

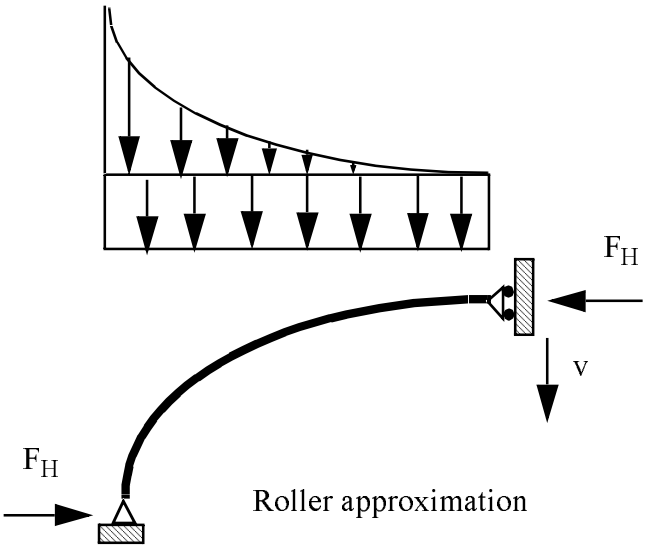
First, you must explain why the roller approximation is accurate to model each 'rib', then you must determine the load on each 'rib' (tributary area), the horizontal force ($F_H$) and the vertical displacement (v).

As a second task you must determine the changes in radius for both the 'extension' and 'compression' rings (i.e. find $\Delta R$, and $\Delta r$.)

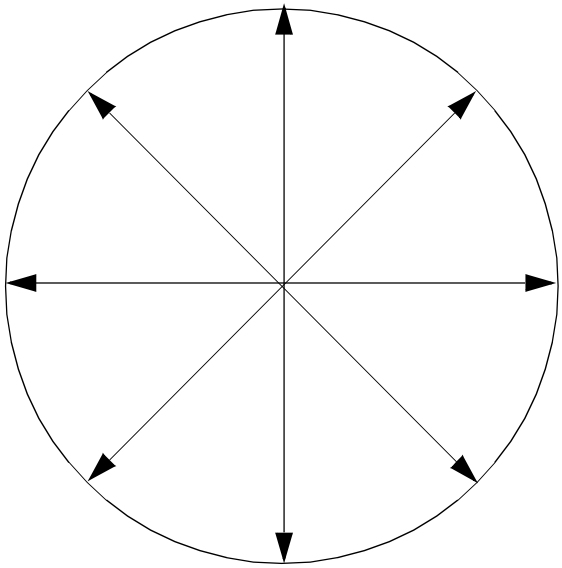




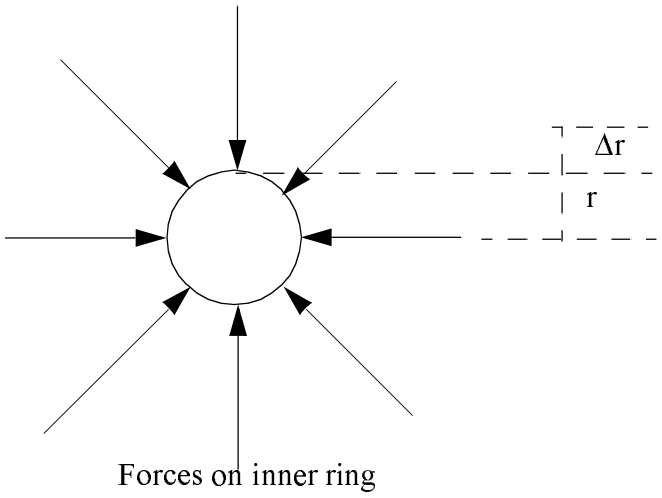

Plan view of dome




Roller approximation

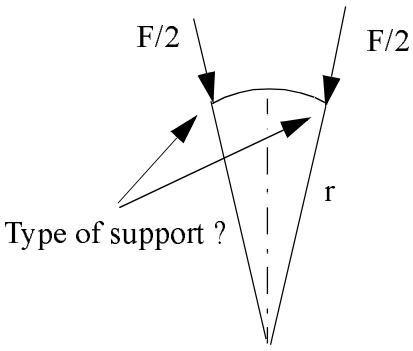


Forces on outer ring




Forces on inner ring

Hint: Symmetry




Type of support ?