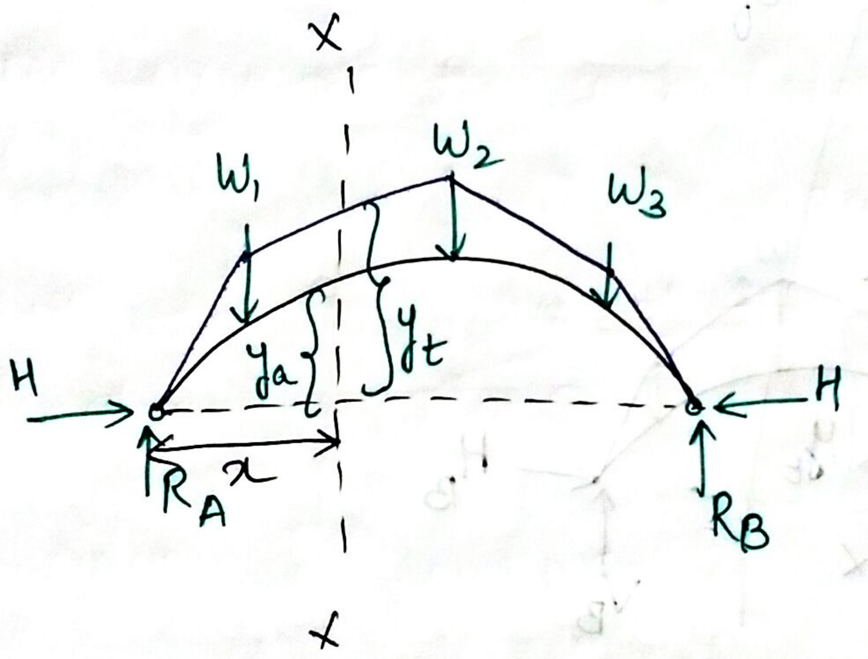
EDDY'S THEOREM

According to Eddy's theorem, the bending moment at any section of the arch is ~~the vertical~~ equal to the vertical intercept between the linear arch ~~and~~ ~~theoric~~ and actual arch.

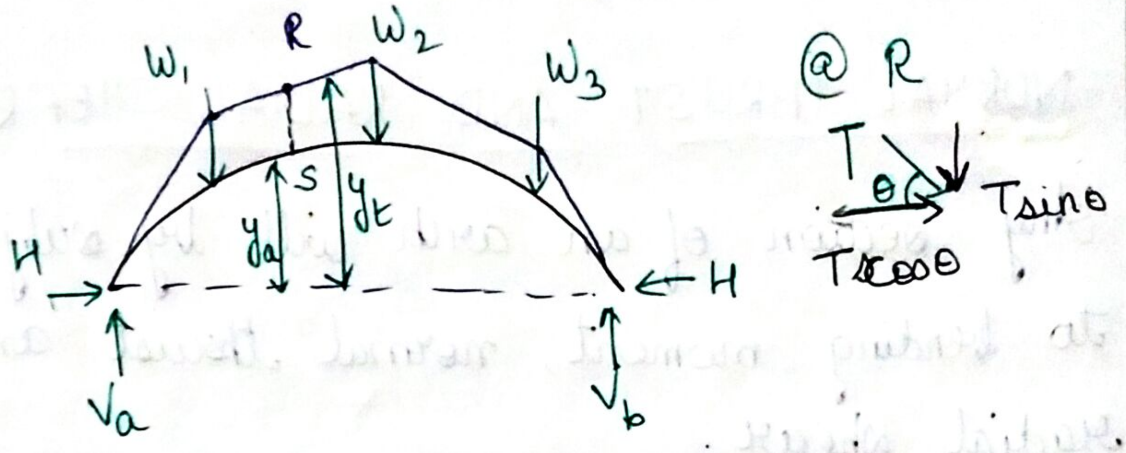


Let y_t be the vertical intercept of theoritical or linear arch.

Let y_a be the vertical intercept of actual arch.

$$\therefore \; M_x = (y_t - y_a)$$

PROOF:-



Consider a point P on the arch.

Now draw a vertical line through R meeting the actual arch at S.

There will be axial compression at R which makes an angle θ with the horizontal. Let the axial compression be denoted by T. The axial compression has two components horizontal and vertical components which are $T_H = T\cos\theta$

$T_V = T\sin\theta$

Now, Bending moment @S $= M_x = T_H (RS)$

$= T_H [y_t - y_a]$

$\Rightarrow T\cos\theta [y_t - y_a] = H[y_t - y_a]$

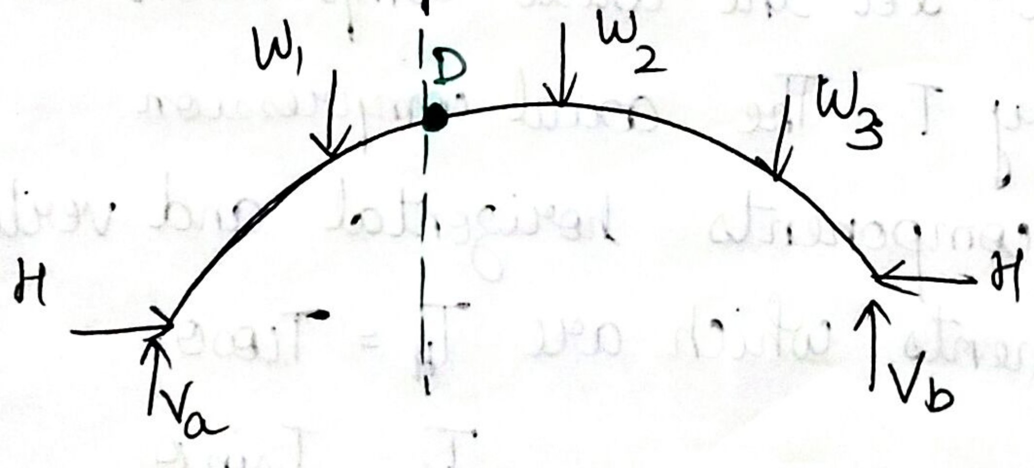
NORMAL THRUST AND RADIAL SHEAR

Any section of an arch will by subjected to bending moment, normal thrust and radial shear.

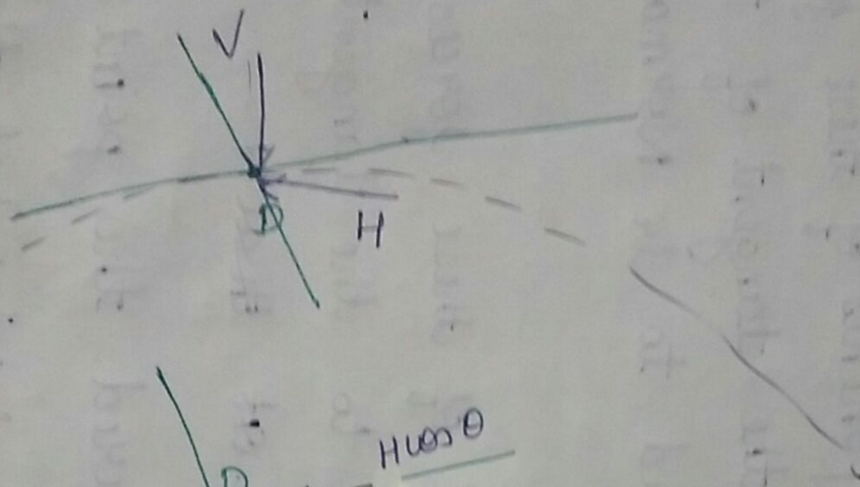
Normal thrust will be acting along the axis of the arch. (N or P)

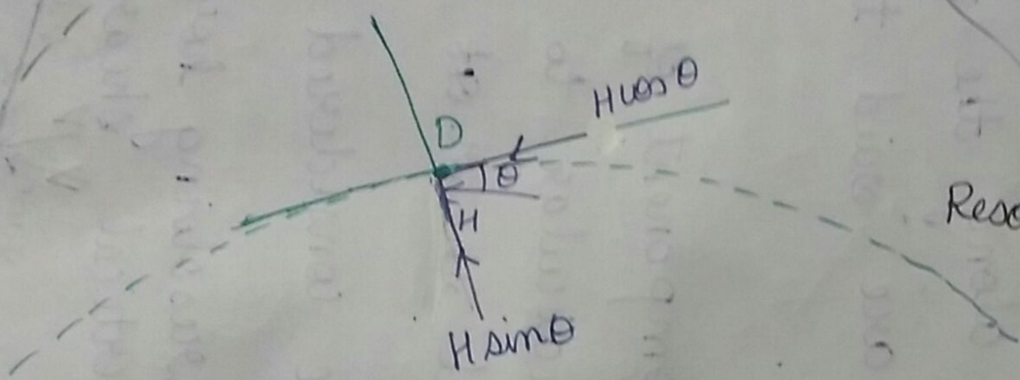
Radial shear will be acting perpendicular to the axis of the arch. It is denoted by (F or S)

Consider a point D on the arch.



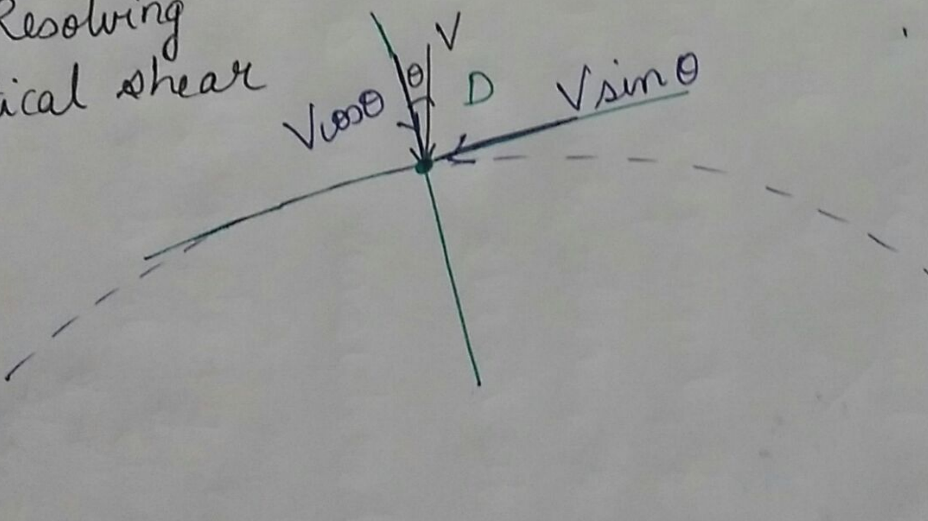
At that point horizontal thrust, H and Net vertical shear, V will be acting





Resolving Horizontal thrust

Resolving Vertical shear



$\therefore$ Normal thrust

$= H\cos\theta + V\sin\theta$

$\therefore$ Radial shear

$= H\sin\theta - V\cos\theta$

The horizontal thrust H and Net Vertical shear V will be having horizontal and vertical components.

Now, the components of these forces acting along the tangent of the arch are said to be Normal thrust.

The component of these forces acting perpendicular to the tangent are Radial shear ~~at~~ ~~that~~