

Stationary waves :— When two identical waves either transverse or longitudinal, travel through a medium along the same line in opposite directions, they superimpose to produce a new type of waves, which appear stationary in space. These waves are called stationary waves.

Equation of stationary waves :— Let us consider a plane progressive wave of amplitude 'a' travelling with velocity 'v' along the +ve direction. Its equation may be written as — $y_1 = a \sin \frac{2\pi}{\lambda} (vt - x)$ —→ ①
 where y_1 is the displacement at a point x at an instant t . The length of the wave is λ .

Let this wave be reflected from a rigid boundary wall situated at $x=0$. The displacement at the point x at the instant t due to the reflected wave moving along x -direction will be given by

$$y_2 = a' \sin \frac{2\pi}{\lambda} (vt + x) \rightarrow ②$$

where 'a' is the reflected amplitude. By the principle of superposition the resultant displacement at the point x at the instant t would be given by —

$$y = y_1 + y_2 = a \sin \frac{2\pi}{\lambda} (vt - x) + a' \sin \frac{2\pi}{\lambda} (vt + x) \rightarrow ③$$

The displacement y at the rigid wall $x=0$ will always be zero. Thus putting $y=0$ and $x=0$ in the above equation ③ we have, —

— Dr. Bhurrit Singh (P.T.O)