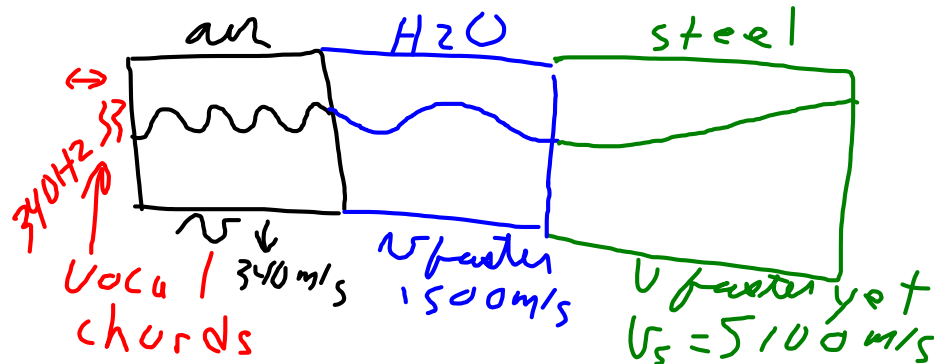


## Waves

freq. of wave determined by frequency of source and remains constant.

vel. of wave determined by medium

*My vocal chords vibrate at 340Hz and a sound wave is produced in air and then travels to water and then to steel.*



Note that the wave travels 340 m/s in air, 1500 m/s in water, and 5100 m/s in steel, and that the wavelength is shortest in air, longer in water, and longest in steel.

$$v = f\lambda$$

$$\lambda = v/f$$

$$\text{in air, } \lambda = v/f = 340 \text{ m/s} / 340 \text{ Hz} = 1 \text{ m}$$

$$\text{in water, } \lambda = v/f = 1500 \text{ m/s} / 340 \text{ Hz} = 4.4 \text{ m}$$

$$\text{in steel, } \lambda = v/f = 5100 \text{ m/s} / 340 \text{ Hz} = 15 \text{ m}$$

When a wave strikes a boundary between two mediums it is always *partially transmitted* and *partially reflected.*

<http://www.kettering.edu/~drussell/Demos/reflect/reflect.html>

# *Boundaries*

*Boundary (termination): where one medium butts up against another medium- where the molecules of the first medium touch the molecules of the 2nd medium*

*1) Fixed (closed or rigid): When the wave passes from a slower medium to a faster one*

*ex. air to water  
water to steel*



*2) Free (open): When a wave passes from a faster medium to a slower one.*

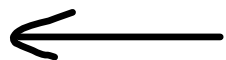
*ex. steel to water  
water to air*

## Fixed Termination

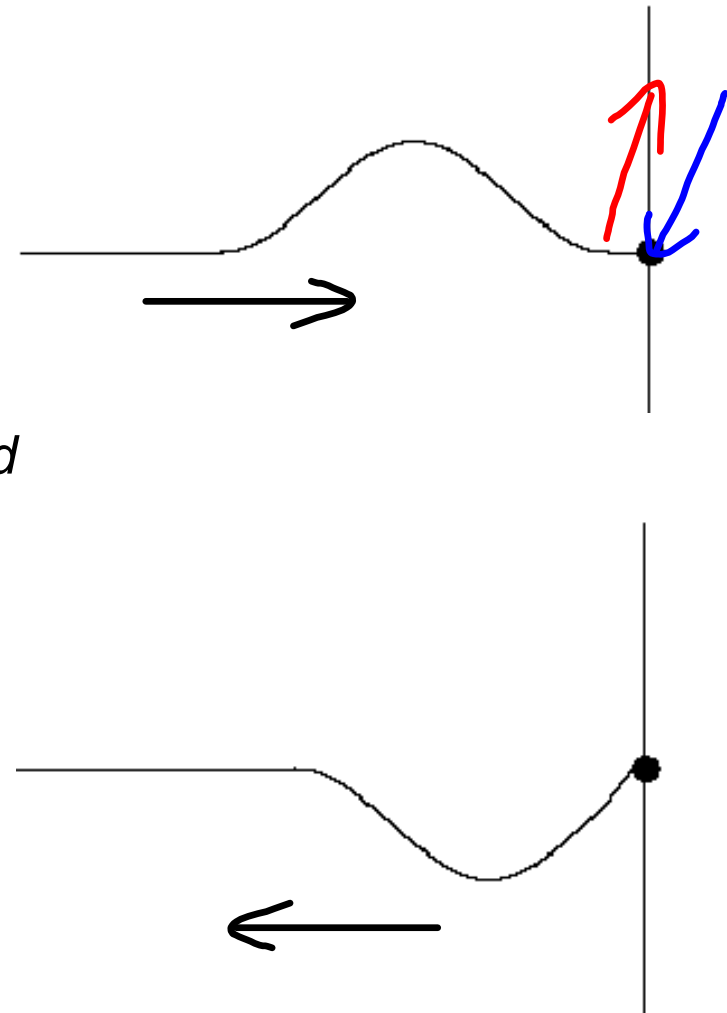


*represents direction of incident pulse*

*Incident pulse applies an upward force (  ) to the second medium, and the second medium applies an equal and opposite reactive force (  ) back to the first medium, so the the incident pulse receives a downward force that reflects the pulse inverted (180 Δ phase)*




*represents direction of incident pulse*



## Free Termination



*represents direction of incident pulse*

*Incident pulse tries to apply an upward force (  ) to the second medium, but the second medium can't apply a reactive force back to the first medium so the the incident pulse receives no force that affects it and it reflects unchanged (erect, no  $\Delta$  phase)*



*represents direction of reflected pulse*

