The elastic limit of the steel forming a piece of wire is equal to 2.70 ×108 Pa. What is the maximum speed at which transverse wave pulses can propagate along this wire without exceeding this stress?(The density of steel is 7.86 × 103 Kg/m3)

Propagation speed in the wire:

$$c = \sqrt{\frac{T}{\delta}}$$

where T – wire tension, δ – linear density.

$$c = \sqrt{\frac{T}{\frac{m}{l}}} = \sqrt{\frac{T}{\frac{\rho V}{l}}} = \sqrt{\frac{T}{\frac{\rho S l}{l}}} = \sqrt{\frac{T}{\rho S}} = \sqrt{\frac{P}{\rho}}$$

$$c_{max} = \sqrt{\frac{2.7 * 10^8 Pa}{7.86 * 10^3 kg/m^3}} = 185.34 m/s$$

Answer: $c_{max} = 185.34 m/s$