

Bridging the gaps

An engineer is designing a bridge that is to stretch 2.434 km. She wants the bridge to be constructed from aluminium or from steel. Metals expand or contract with a change in temperature.

The rule to find the total length a metal will expand by is the product:

original length x change in temperature x expansion constant

The expansion constant for aluminium is 2.22×10^{-5} per $^{\circ}\text{C}$

The expansion constant for steel is 1.30×10^{-5} per $^{\circ}\text{C}$.

While she would prefer to use Aluminium because it is much lighter, her design can only allow for up to 2.8 m of expansion for the full length of the bridge. If the local climate experiences temperatures that range from an average of -10°C (winter nights) to mid 30's of $^{\circ}\text{C}$ (midday summer), which material should the engineer choose for the bridge? Comment on any rounding decisions you made.

