

The JETS Challenge

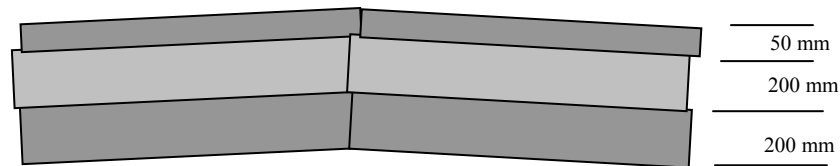
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Challenge 47 – The National Road Challenge

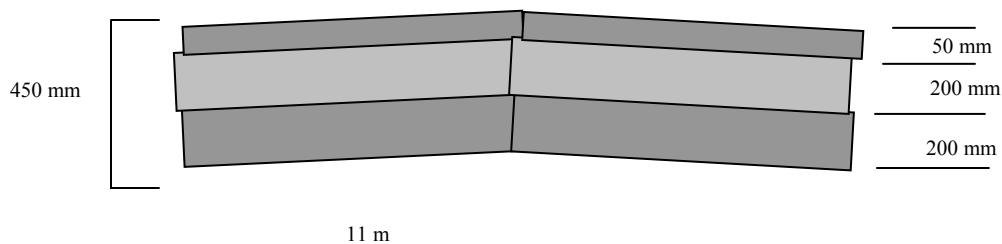
Problem:

Construction of the National Road (today's Rt 40 through Fayette County) began two centuries ago in March, 1806. The approximately 620-mile (1000 km) road provided a portage between the Potomac and Ohio Rivers and a gateway to the West for thousands of settlers. It was the first road in the U.S. to use the new Macadam road surfacing. Macadam is a type of road construction pioneered by John Loudon McAdam in the late 1700s. This design consists of three layers of stones laid on a sloped subgrade, with side ditches for drainage. The first two layers consisted of angular aggregate hand-broken to a maximum diameter of 75 mm for a total depth of about 200 mm each. The third layer was about 50 mm thick with a maximum aggregate size of 25 mm. The width of the road was 11 meters. The layers would be compacted with a heavy roller. A cubic meter of rock weighs an average of 2.40 Tons/m³.

How many metric tons of rock was required to complete the total length of the National Road?



Solution:



$$\text{Total Volume} = 1,000,000 \text{ m (length)} \times 11 \text{ m (width)} \times .45 \text{ (height)}$$

$$= 4,950,000 \text{ m}^3$$

$$\text{Weight} = 2.40 \text{ tons/ m}^3 \times 4,950,000 \text{ m}^3$$

$$= 11,880,000 \text{ tons}$$

$$= 11.88 \text{ million tons}$$