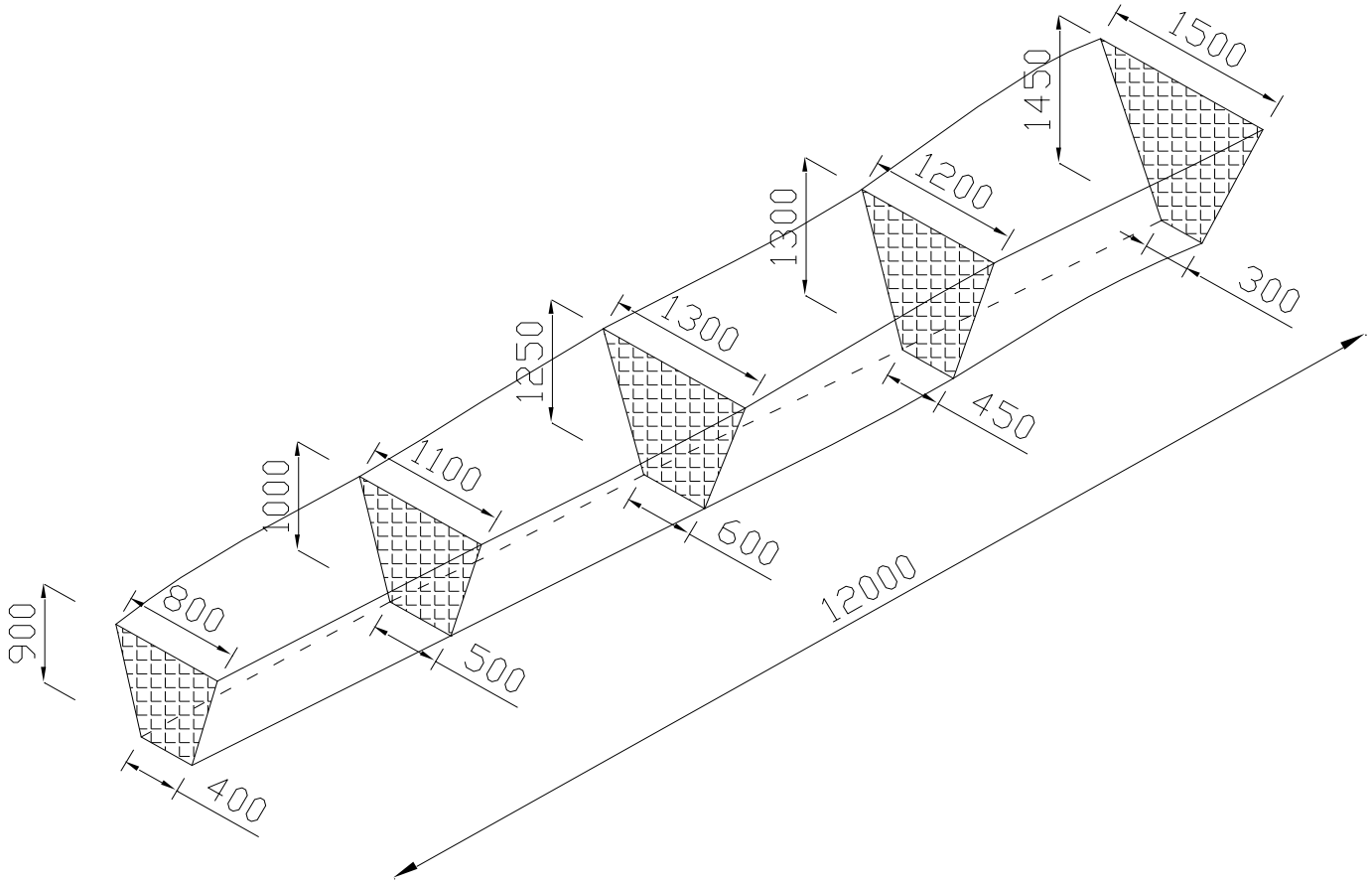
Simpson's Rule for Volume

Q 1. Calculate the volume of soil required to backfill the excavated trench shown, by calculating each of the cross sectional areas and then using Simpson's rule for volume.

Before being compacted into the trench, the loose soil required is 35% more than the actual volume of the trench due to bulking. What is the actual bulked volume of soil required?



All measurements are in mm

Simpson's Rule for Volume Q 1 (Answer)

Ans. Q 1 First calculate cross sectional areas
using the trapezoid formula: $\{ \frac{a + b}{2} \}$ x height

Cross sectional area (1) $\{ \frac{0.8 + 0.4}{2} \} * 0.9 = 0.54\ m^2$

Cross sectional area (2) $\{ \frac{1.1 + 0.5}{2} \} * 1.0 = 0.80\ m^2$

Cross sectional area (3) $\{ \frac{1.3 + 0.6}{2} \} * 1.25 = 1.1875\ m^2$

Cross sectional area (4) $\{ \frac{1.2 + 0.45}{2} \} * 1.3 = 1.0725 m^2$

Cross sectional area (5) $\{ \frac{1.5 + 0.3}{2} \} * 1.45 = 1.305\ m^2$

Simpsons Rule $= \frac{W}{3} \{ (\text{first} + \text{last}) + 4\ (\text{evens}) + 2\ (\text{odds}) \}$

$= \frac{3}{3} \{ (0.54 + 1.305) + 4(0.8+1.0725) + 2(1.1875) \}$

$= 1 \{ (1.845) + 4(1.8725) + 2(1.1875) \}$
$= 1 \{ 1.845 + 7.49 + 2.375 \}$
$= 1 \times 11.71$
$= 11.71\ m^3$

Bulking: $11.71 \times 1.35 =$ **$15.8085\ m^3$**

Simpson's Rule for Volume

Q 1. Calculate the volume of soil required to backfill the excavated trench shown, by calculating each of the cross sectional areas and then using Simpson's rule for volume.

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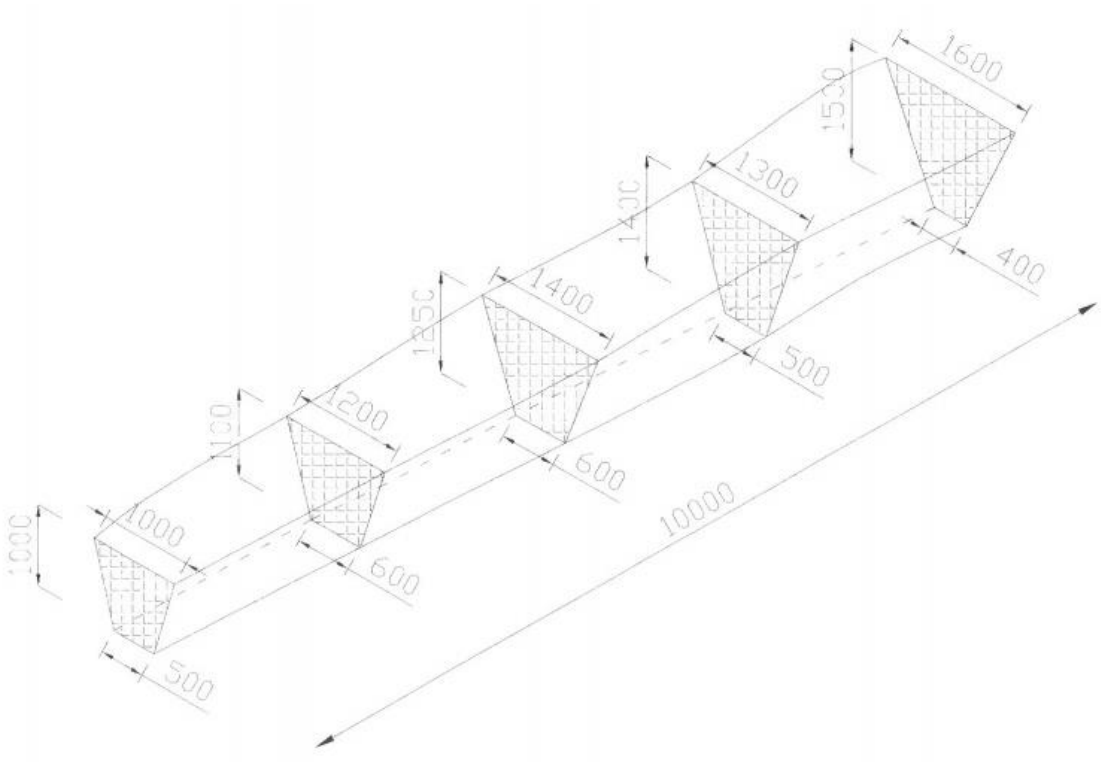

All measurements are in mm

Simpson's Rule for Volume Q 2 (Answer)

Ans. Q 2 First calculate cross sectional areas
using the trapezoid formula: $\{ \frac{a + b}{2} \}$ x height

Cross sectional area (1) $\{ \frac{1.0 + 0.5}{2} \}$ x 1 = 0.75 m²

Cross sectional area (2) $\{ \frac{1.2 + 0.6}{2} \}$ x 1.1 = 0.99 m²

Cross sectional area (3) $\{ \frac{1.4 + 0.6}{2} \}$ x 1.25 = 1.25 m²

Cross sectional area (4) $\{ \frac{1.3 + 0.5}{2} \}$ x 1.4 = 1.26m²

Cross sectional area (5) $\{ \frac{1.6 + 0.4}{2} \}$ x 1.5 = 1.50 m²

Simpsons Rule $= \frac{W}{3} \{ (\text{first} + \text{last}) + 4 (\text{evens}) + 2 (\text{odds}) \}$

$= \frac{2.5}{3} \{ (0.75 + 1.5) + 4(0.99 + 1.26) + 2(1.25) \}$

$= 0.883 \{ (2.25) + 4(2.25) + 2(1.25) \}$
$= 0.883 \{2.25 + 9 + 2.5 \}$
$= 0.883 \times 13.715$
$= 11.454 \text{ m}^3$

Bulking: $11.454 \times 1.35 =$ **15.463 m³**