

Task 1

Find the surface area of the can

a) Given $h = 5.875 \text{ in}$ tolerance = 0.1 in
 $d = 2.54 \text{ in}$

Theory: $A_{\text{circle}} = \pi r^2$

$A_{\text{rectangle}} = L \times W \text{ or } h \times (\pi \cdot d)$

Solution: If tolerance = 0.1 in , $h = 5.9 \text{ in}$, $d = 2.5 \text{ in}$

$r = \frac{2.5 \text{ in}}{2} = 1.25 \text{ in}$

$A = 2(\pi r^2) + (h \times \pi \cdot d)$

$A = 2(\pi (1.25 \text{ in})^2) + (5.9 \times \pi \times 2.5 \text{ in}) = 56 \text{ in}^2$

b) Determine the lift produced by the aircraft

Given: $\rho = 1.225 \text{ kg/m}^3$

$W = 60.93 \text{ m} \rightarrow \text{tolerance} = 0.1 \text{ m}$

$V = 105.258 \text{ m/s} \rightarrow \text{tolerance} = 0.01 \text{ m/s}$

Theory: $L = \left(\frac{1}{2}\right) \cdot \rho \cdot V^2 \cdot 0.1212 \cdot W^2$

Solution: $W = 60.9 \text{ m}$, $V = 105.26 \text{ m/s}$

$L = \left(\frac{1}{2}\right) \left(1.225 \frac{\text{kg}}{\text{m}^3}\right) \cdot (105.26 \text{ m/s})^2 \cdot 0.1212 \cdot (60.9 \text{ m})^2$

$L = 3,050,000 \text{ kg}$

c.) Determine the resistance of the given set of resistors.

$1 \text{ k}\Omega \times 0.10 = 0.1 \text{ k}\Omega \rightarrow \overset{\text{measured value}}{1.054} = 1.1 \text{ k}\Omega$

$5 \text{ k}\Omega \times 0.05 = 0.25 \text{ k}\Omega \rightarrow 5.128 = 5.13 \text{ k}\Omega$

$2.9 \text{ k}\Omega \times 0.01 = 0.029 \text{ k}\Omega \rightarrow 2.892 = 2.892 \text{ k}\Omega$

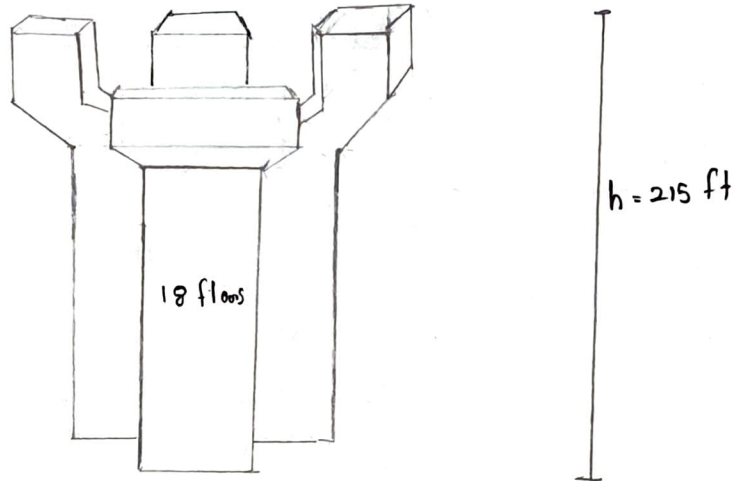
$1.1 + 5.13 + 2.892 = 9.122 \text{ k}\Omega$

$= \boxed{9.1 \text{ k}\Omega} \text{ rounded}$

Task 2

Problem. Crosley tower is to be demolished. Estimate the weight of the concrete rubble produced.

Diagram:



Theory: $\text{Area (sq ft)} \times \text{height (ft)} = \text{volume (ft}^3\text{)}$

$$\text{gross sq ft} = 163,638.78 \text{ ft}^2$$

$$\text{Net sq ft} = 140,680.45 \text{ ft}^2$$

$$\text{ft}^2_{\text{concrete}} = \text{ft}^2_{\text{gross}} - \text{ft}^2_{\text{net}}$$

$$\text{height} = 215 \text{ feet}$$

$$\text{Concrete density} = 150 \text{ lbs/ft}^3$$

- Assumptions:
- 1) No furniture was left in the building before demolition
 - 2) Elevators, HVAC, and other large building components have been removed pre-demolition

Solution:

$$163,638.78 \text{ ft}^2 - 140,680.45 \text{ ft}^2 = 22,958.33 \text{ ft}^2 \text{ concrete}$$

$$22,958.33 \text{ ft}^2 \times 215 \text{ ft} = 4,930,000 \text{ ft}^3 \text{ concrete}$$

$$4,930,000 \text{ ft}^3 \times 150 \text{ lbs/ft}^3 = \boxed{740,000,000 \text{ lbs concrete}}$$

Verification:

$$\text{Average ft}^2 \text{ concrete per floor} = 1300 \text{ ft}^2$$

$$1300 \text{ ft}^2 \times 18 \text{ floors} \times 215 \text{ ft} = 5031000 \text{ ft}^3$$

$$5031000 \text{ ft}^3 \times 150 \text{ lbs/ft}^3 = 755,000,000 \text{ lbs}$$

Solution	Verification	% difference
740,000,000 lbs	755,000,000 lbs	1.99%

Errors : 1) The concrete cubes on the top of the building were not considered during this estimation.

2) It is impossible to completely strip a building of everything but concrete.

Some insulation, wiring, pipes, ducting, etc. will be included in the rubble.

It is likely that the estimation of 740,000,000 is less than the actual amount of rubble.

Conclusion: If crosley tower is emptied of all furniture, and as much other material as possible that isn't concrete, then the amount of rubble will weigh 740,000,000 lbs.