CASSSC volume

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1 Given Dimensions

Cargo Accommodation in Standard Space Shipping Container (CASSSC)[1] units are 30 feet long with nearly- square 15−foot cross-sections(corners of the cross-section are rounded with a 1−foot radius).

2 Bounding box

Given that the area single cross-section of a CASSSC is less than a square bounding box (i.e without rounded edges) therefore $A_{\text{CASSSC}} < A_{\text{box}}$ (use to check calculations for area). The height and of the box (a) can be determine via the application of the Pythagoras theorem as seen below:

$$15^2 = 2a^2 \Longrightarrow a = \frac{15\sqrt{2}}{2}$$

$$A_{\text{box}} = a^2 = 112.5\text{ft}.$$

3 Corners

The summation of the area of the CASSSC cross-sectional corners is equal to that of a single circle with $r = 1$ft let this area be denoted by α.

$$\alpha = \pi \cdot r^2 = \pi$$

4 Internal Area

The height of the bounding box is equal to that of the vertical height and width of the cross-sectional height and width of the CASSSC. Let b denote the distance between the radius of each corner.

$$b = \underbrace{a}_{\text{total width}} - \underbrace{2}_{\text{width of the corners}} = \frac{15\sqrt{2}}{2} - 2$$

Enclosing the area defined by the corners radius, creates a square with side length b. Let this area be denoted by β.

$$\beta = b^2 = \frac{233}{2} - 30\sqrt{2} \approx 74.07359 \text{ ft}^2$$

[1]As defined by Aerospace Education Competitions

5 Sides

Comprising the remainder of the CASSSC cross-sectional area denoted by γ are four rectangles with width of 1ft and height of b.

$$\gamma = 4 \times \underbrace{b}_{\text{area of a rectangle}} = 30\sqrt{2} - 8 \approx 34.4264 \text{ ft}^2$$

6 Total Area

The total area of a CASSSC cross section is equal to the following:

$$A_{\text{cross}} = \alpha + \beta + \gamma = b^2 + \pi + 4b = \pi + \frac{217}{2} \approx 111.64159 \text{ ft}^2$$

Comparing this derivation with the equality $A_{\text{CASSSC}} < A_{\text{box}}$ this calculation is evaluated as accurate.

7 Total volume

The total volume of a CASSSC is defined as:

$$V_{\text{CASSSC}} = A_{\text{cross}} \cdot l$$

Given that $l = 30$ ft

$$V_{\text{CASSSC}} = 30\pi + 3255 \approx \boxed{3349.24777961 \text{ ft}^3} = \boxed{94.8401356315 \text{ m}^3}$$

Comparing V_{CASSSC} to a bounding cuboid with cross-sectional area A_{box} the following equality is true $V_{box} > V_{\text{CASSSC}}$. Evaluating this derivation is true.