# SAMPE Additive Manufacturing Competition Design Summary

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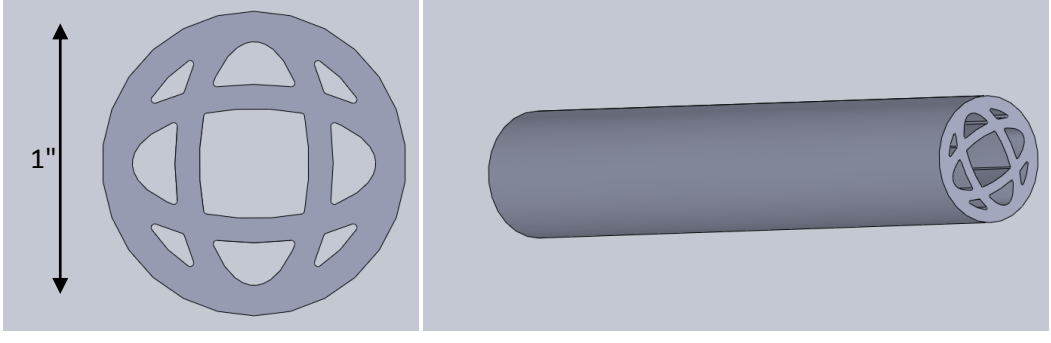
## Visual depiction of your design:




## Written description of your design:

This is a 7.75" long circular (1") column with internal stabilizing structures. The design utilizes a circular cross sectional profile with internal structuring that connects the opposing sides of the profile. The design implements a 7.75:1 height to width ratio and is expected to print vertically with no support material needed. The walls of the column should be 3 layers and be printed with 100% infill. The expected failure mode is buckling at 2514 lb.

## Calculation of your design's structural capability.

It will most likely fail in compression as shown by the following analysis.

Taken from Solidworks, the moment of inertia is 0.04 $in^4$ for this column.

**Column Information:**

$$Cross\ Sectional\ Area = 0.81\ in^2$$
$$E = 0.3825\ Msi$$
$$Weight = 0.04\ lbs$$
$$I = .04\ in^4$$

**Compression Failure:**

$$P_{cr} = \frac{\delta}{A} = \frac{5220psi}{.81\ in^2} = \mathbf{2923\ lbs}$$

**Buckling Failure (Assuming pinned-pinned):**

Euler column formula:

$$P_{cr} = \frac{C\pi^2 EI}{l^2}$$

C=1 for this loading case.

$$P_{cr} = \frac{\pi^2(0.3825 * 10^6 psi)(0.04in^4)}{(7.75\ in)^2} = \mathbf{2514\ lbs}$$

## Estimated print time:

2.5 hrs using MakerBot Desktop software