

## 2016 SAMPE Student Additive Manufacturing (AM) Contest Rules

### Important Dates

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- April 25<sup>th</sup> - Design Summary Submissions
- May 2<sup>nd</sup> - STL Submission
- May 25<sup>th</sup> - Competition Day

### Contestant Requirements

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The contest will be for enrolled students at an accredited university, college, community college or high school only. Students attending the contest must be 16 years of age or older in accordance to SAMPE conference regulations. The following rules are to be considered an outline of the requirements and are subject to interpretation by the Governing Committee. The contest is intended to provide an opportunity for students to learn and expand their abilities in additive manufacturing and engineering design. Any design or concept which is not consistent with the spirit of these rules will be disqualified. Students are encouraged to ask for clarification of these rules. The governing committee will publish the question(s) and the committee's answer on the SAMPE AM contest web site:

<http://www.nasampe.org/?page=additivecontest>

2. Contest entries will only be accepted on an individual basis with only one entry allowed per person. Students must be SAMPE members. Students are encouraged to solicit advice, instruction, and training from faculty, peers, and industry members during the design of their structure. However, the final design entry must be the original work of the individual.

3. Each student must submit a **1-page** design summary of their entry for approval by the Governing Committee (email address: [AdditiveManufacturingContest@sampe.org](mailto:AdditiveManufacturingContest@sampe.org)).

Your summary must include the following elements or they will be returned without review or approval:

- a. Student's Name and Email Address. This email address will be used by the Governing Committee to provide feedback and/or approval for the design summary as well as confirming other contest details.
- b. Registration Number (e.g., 07-XXXX) Note: If you registered online, your Registration Number was generated and sent to you via email as part of the registration process. If you registered via mail or fax, your registration number will be emailed to the email address provided on your form once SAMPE has received it into the registration system. If you are unable to locate your number, please email [priscilla@sampe.org](mailto:priscilla@sampe.org)
- c. Name of school
- d. Faculty advisor name, email and phone number
- e. Visual depiction of your design (sketch, screenshot of CAD model etc...)
- f. Written description of your design

- g. Calculation of your design's structural capability. Should include failure mode prediction and should account for buckling.
- h. Estimated print time

The Governing Committee will approve or send instructions for required revisions to attain approval no later than April 25th. Changes may be made to a design after the proposal has been approved; however, the design may be disqualified if the changes violate the spirit of the rules.

Registration is allowed through May 16, 2016. However, entries that have not submitted their design summary for approval by May 20 must be accompanied by a completed design summary on the day of competition, and are subject to disqualification if they are not fully compliant with the competition rules.

**\*\*Students are encouraged to submit design summaries early in order to receive approval and feedback earlier.**

## Design Envelope

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Students will design a rigid vertical support (column or tower) that will be tested to failure between the platens of a typical load frame. See figure below or this [link](#) for more information. The column must have at *least* a 2:1 aspect ratio (its height must be at *least* twice its width). It must fit on a 6-in diameter platen and not be taller than 36-in. No part of the column may extend outside of this cylinder (6-in diameter by 36-in long). A thin (0.060-in) rubber sheet will cover the platen surface to help minimize point loads on the parts. Load will be limited to 10,000-lbs to protect the load frame. The design must be approved by Governing Committee so as not to put the load frame in jeopardy. Columns may not deflect more than 20% of their original height. If they do, the peak load will be determined up to the 20% deflection point. Columns must be a minimum of 2-inches tall and hold a minimum of 100-lbs to be considered for awards. The material will be ABS polymer that is compatible with the provided printers. Columns maybe assembled from multiple printed parts. Only printed parts maybe used in the assembly and no adhesives will be allowed to assist assembly. Support material may be used to create the part. Any trapped support material will be considered part of the structure. Basic hand tools (hobby knives, files and sand paper) will be available for finishing and fitting work.

## Printing Details

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The contest will employ the uPrint SE 3d printer from Stratasys. Information is available at this [link](#). This printer utilizes ABSplus material; the spec sheet for this material is available at this [link](#). Students will submit an STL file of their design for printing via email. All entries will be printed by the committee prior to the show. No entries will be printed after May 20. Students may pick up their entries beginning at 11am on Tuesday, May 24. Post-processing and assembly may be done until test time. However, entries may not leave the test area. Students need not attend the event to enter the contest. If necessary, they may submit assembly instructions via email. However, the committee cannot guarantee that the assembly will meet the student's design intent. STL files will be checked for quality and

prepared for printing by the committee. Printing parameters are intended to be consistent across all contestants and will only be adjusted if approved by the committee.

Note, there is no maximum print time requirement. Each entry must be printed in one single print envelope. That is, each entry (including all pieces) must be able to fit within an 8"x6"x6" box for printing.

## Scoring

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The structures will be ranked according to the score below, larger values being better. Please note that this means there is NO advantage to exceeding the ultimate design load. Also, taller and lighter structures will score better.

$$Score = Weight_{normalized} * (-3) + Height_{normalized} * (5) + Load_{normalized} * (3) + Number\ of\ parts * (-1)$$

Where all values marked as normalized will be done so using the following formula. This means all values will be unit less once normalized.

$$Value_{normalized} = \frac{(Value - Min)}{(Max - Min)}$$

First place, second place and third place will be awarded to the highest three scores. In the event of a tie, the entry with the shorter print time will be awarded the higher place.

## Awards

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First place will be awarded \$500. Second place will be awarded \$250 (USD). Third place will be awarded \$150 (USD). Awards will be given in the form of a check issued to the contestant and mailed to the address identified on the Registration Form.

## Questions

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When submitting a question, please reference the relevant paragraph(s) in the rules, and include any supporting pictures/images in a Microsoft Word document if needed. All questions and responses may be posted to SAMPE website:

<http://www.nasampe.org/?page=additivecontest>

Submit question(s) for review by the Governing Committee at [AdditiveManufacturingContest@sampe.org](mailto:AdditiveManufacturingContest@sampe.org)

The Governing Committee consists of the following members:

Harrison Scarborough, Electroimpact

Joseph Vanherweg, Lockheed Martin

