SkillsUSA 2020 – Additive Manufacturing State Challenge – Power Up!

Overview

The goal of the 2020 SkillsUSA Additive Manufacturing State Competition is to challenge competitors at that state level and send the best prepared students to compete at the National Competition in June. Each year's suggested state competition focuses on an additive manufacturing design with strict requirements on form, fit, and function of compact and intricate designs like nationals.

The below contest has been designed with the upcoming National Competition in mind and is designed to challenge the understanding of students and their skills in Additive Manufacturing.

This year's contest challenges students to redesign an outdoor 3D-printed outlet enclose to be a USB outlet cover that leans into the needs of today's power user.

Competitors will need to use their 3D printing knowledge to design a part that prints within the specified build volume, materials and times specified. The designed enclosure will need to screw into the testing rig and meets the specified requirements on the score sheet.

Contest state chairs need to fill in blanks or modify contest to meet their contests needs or specs.

The contest descriptions have been written so that you can distribute directly to competitors. If you'd like to make modifications to fit your state's needs, please do.

If you have questions about the contest, please email:
michael@ttaweb.com

Materials & Supplies Needed

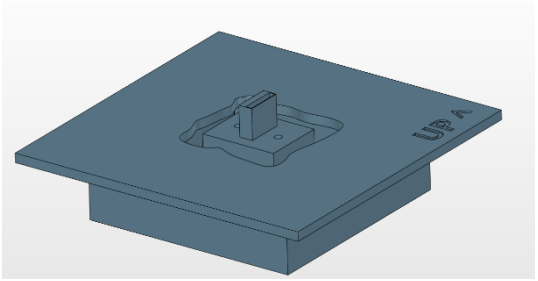
Materials to be Provided by Student Competitor:

- 3D design submitted by 3/6/2020
- Thumb drive loaded with 3D design
- Engineering notebook
- PowerPoint Presentation

Materials to be Provided by State Competition Host:

- 3D printed testing rig
- Lumber (least 12”x12” to secure rig to)
- USB cord (such as iPhone charging cable)
- “Standard” screws
- *Student designs 3D printed
  * TTA will print the designs and bring them to the contest completed.

About the Testing Rig



- The Challenge Rig is a single 3D-printed bracket consisting of 2x ¼-inch “mounting holes”. The rig will be printed in the orientation as shown in ABS+ plastic, 0.10” slice height in low density infill. User printed practice files should be printed as given via GrabCAD Print (www.grabcad.com/print) on a uPrint or larger Stratasys machine to accommodate the design requirements. GrabCAD Print does show simulated print times, material usage etc. if a Stratasys machine is unavailable.
  - The overall dimensions of the rig are as follows: 2” (long) x 2.75” (wide) x 0.625” (tall).
  - The host will have the rig printed and attached to a flat surface. The surface will be at least 12”x12”.
  - The file to print the rig can be found on GrabCAD here: https://grabcad.com/library/skillsusa-2020-state-challenge-1

Judging Suggestions:

Students will be judged on:

1) Engineering notebooks
    a) Did the students follow the guidelines provided?
    b) Did students show their design process?

2) Following all requirements outlined in contest criteria
    a) Dimensions
    b) Build time
    c) Build volume
    d) Material usage
    e) Support material usage
    f) Did the students consider additive manufacturing when creating their design? Are they able to explain the role that additive manufacturing played in their design?

3) Presentation
    a) Does the presentation include:
        i) Explanation of the design process through examples in their engineering notebook
        ii) Understanding of form, fit, and function

4) Quality of final 3D printed part
    a) Does it perform the function in the manner it was designed to do?
    b) Does it meet all requirements in contest guidelines?
    c) Does the printed part include a moving assembly?
    d) Did the students design the part with additive manufacturing in mind?

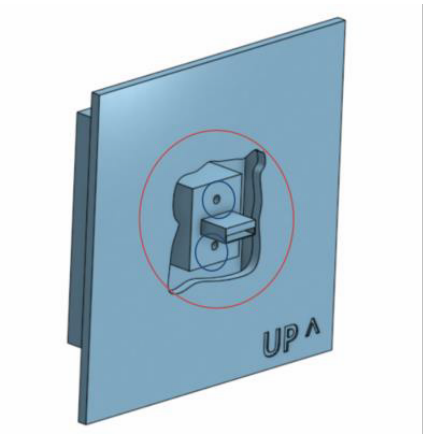
SkillsUSA 2020 Additive Manufacturing
State Challenge

Power Up! - USB Outlet Redesign

Welcome to the “Power Up!” challenge! The task at hand is to design a hinged, covered enclosure (like the one pictured above) for a wall-mounted standard USB port.
“What’s the catch?” you say. Well, there are five, and here they are:

1. The enclosure must affix securely to the provided USB port (see illustrated CAD below) using the screw holes (screws will be provided at the testing location).

2. The enclosure must completely close the “hole in the wall” (see illustrated CAD below by red circle)



3. The enclosure must have a mechanically hinged lid (printed in place) that does not use external parts or hardware. This enclosure lid must open at least 180 degrees and stay open at 90 degrees when placed in that position.

4. Device should have some uniqueness in design – such as shape, 3D printed texture, text… the options are endless – you are the product designer – flex your creative muscle.

5. The device must follow these 3D printing specs measured in GrabCAD Print (when measured using 0.010” solid ASA standard build settings):
   - Prints in less than 2 hours
   - With a build volume of no greater than 3X3X3in.
   - Using no more than 3 in³ of build material
   - Using no more than 2 in³ amount* of support material
   - Contestants **MUST USE GrabCAD Print** for all file estimations and submit either a .CMB file type from **GrabCAD Print ONLY**. Any files not submitted as such will be printed at the judge’s discretion. Files will be printed on a Stratasys 3D Printer.

Contest Criteria

Prior to contest day:
Students should submit designs by 11:59:59

EST 3/6/2020 to: Michael Kazsmer

(michael@ttaweb.com)

CC:(abrown@skillsusageorgia.org)

On contest day, students must submit:

1. Engineering Notebook (Engineering notebook guidelines below)
2. 3D printed design files
3. Printed part (Provided by contest chair day of contest)
4. Presentation of design

1. 3D Printed Design - Students must create a design that:
   - Prints in less than 2 hours
   - With a build volume of no greater than 3X3X3in.
   - Using no more than 3 in^3 of build material
   - Using no more than 2 in^3 amount* of support material

2. Presentation Criteria
   - The competitor clearly describes their understanding of the problem to be solved.
   - Design Process: good design logic is used for key design choices was intentional and well-communicated
   - The presentation is professional and well-rehearsed
   - Practical evaluation: Part functions way team intended 100% of time.

3. Engineering Design Notebook Guidelines:

1. On the front of the notebook enter the project title, your name and other information needed to have the notebook returned to you in case it is lost.
2. Keep a table of contents at the front of the notebook.
3. All entries must be done in ink.
4. Design notebooks should be neat and legible.
   a. Do not crowd the materials on the pages.
   b. The material should “flow” on a page.
5. Make your entries at the time you do the work.

a. Include all results and learned information whether favorable or unfavorable.

6. If you make errors, just cross them out with an X or a single line. Do not mark through anything so that it cannot be read.

7. Do not erase anything.

8. Never tear a page out of the notebook.

9. All data must be in their original form (calculations, charts, pictures, sketches on scrap paper, etc.), not after recalculation or transformation.

10. Rough drawings should be done directly in the notebook. More careful drawings such as machine drawings or computer-generated plots can also be made and entered in the book.

11. Information on loose sheets of paper should be entered into the notebook by:

a. Taping the loose paper to the next available blank page in the notebook.

b. Taping each “corner” of the loose paper to the notebook.

c. Use a tape that will accept ink permanently

d. Place your signature on the loose paper, continue across the tape and end on the design notebook page. Sign across each piece of tape. Date the signature.

12. Information that can be retrieved easily (such as research articles from journals) should not be entered into the notebook. Enter only the needed information and the location and the location of the information in case you must retrieve it again.

13. Title each page of the notebook and enter the information on the Table of Contents.

14. Sign and date the notebook page at the space provided at the bottom.

15. Have your design entries witnessed and have the witness sign and date at the space provided. a. The witness needs to have the technical ability to understand the entry. The work can be witnessed periodically.

16. Every page of the notebook must be numbered.

17. No pages should be skipped. This is a chronological record of your work.

A good engineering design notebook is one that can be used to reconstruct your work even years after you have completed the original project. Other engineers should be able to use the notebook to reconstruct your work. The notebook will be used to determine the rightful owner of patents and other proprietary ideas.