
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 design an outdoor 3D-printed outlet enclosure 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.

The contest descriptions have been written so that you can distribute directly to competitors.

Eligibility:

Open to active SkillsUSA students if they are enrolled in Computer Aided Design, Drafting Design classes, Manufacturing Engineering classes, etc.

Clothing Requirements:

2020 State conference T-shirt, Jeans, appropriate work shoes/boots.

Knowledge Performance:

This contest will include a written knowledge exam assessing general knowledge related to direct digital manufacturing technology.

All competitors must submit a one-page resume in hard copy to the technical committee chair at orientation. Failure to do so will result in a 10 point penalty.

Materials & Supplies Needed

Materials to be Provided by Student Competitor:

- 3D design submitted by **APRIL 9, 2020 via email to todd@mw3ds.com**
- Thumb drive loaded with 3D design
- Engineering notebook
- Presentation
- Hand tools, file, etc. for assembly to testing rig.

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
****At the national competition Stratasys prints on-site, at the state level you submit your design via email to be printed prior to the conference.***

About the Testing Rig

- The Testing Rig is a single 3D-printed bracket with approximate outside dimensions of 4 inches X 4 inches
- The height to the top of the USB connection on the testing rig is approximately 1.3 inches
- The competition host will have the testing rig printed and attached to a flat surface (a piece of lumber or plywood) 12"x12".
- It is to your advantage to download and print a testing rig to measure from for your design.
- The files to print 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) Please watch the video example of how to create an engineering notebook at https://youtu.be/8tz9_6aORHc
 - b) Did the students follow the guidelines provided?
 - c) 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?



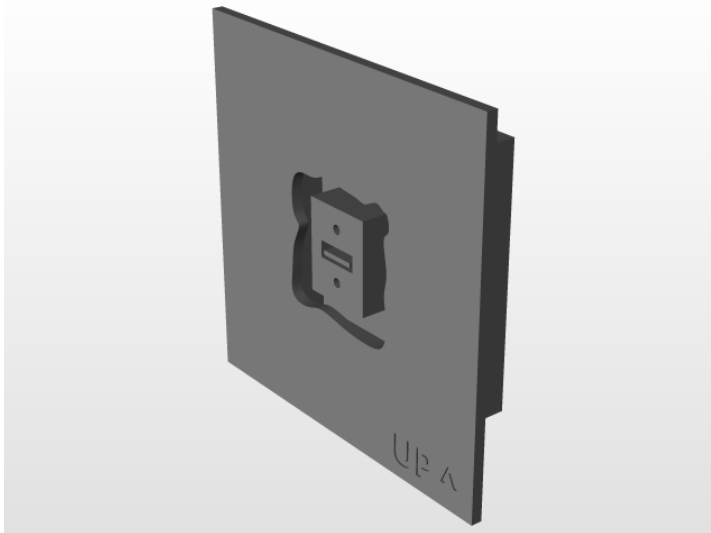
SkillsUSA 2020 Additive Manufacturing State Challenge

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 six, and here they are:

1. The enclosure must affix securely to the provided USB port on the testing rig (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)



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. The enclosure should be designed as the female end to receive a USB flash drive or USB phone cord. Some USB cords will be used to check for fit, form and function of your design at the contest.
5. 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.
6. 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 *3 hours*
- With a build volume of no greater than *3X3X3in*.
- Using no more than 5 in³ of build material
- Using no more than 2 in³ amount* of support material

Contest Criteria

Prior to contest day:

Students should submit designs by **April 9**

to: **Todd Woolston**

todd@mw3ds.com

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. Engineering Notebook should:

- ┆ Be neat and legible, written in ink
- ┆ Have a page of contents
- ┆ Be clearly labeled with contestant name(s), date and page # on each page
- ┆ Begin with a problem statement
- ┆ Include discovery and documentation of approach to solve problem
- ┆ Include sketched design concepts with critical features labeled
- ┆ Critical dimensions clearly labeled in design sketch
- ┆ Considerations for designing for FDM distinctly addressed (i.e. part strength, part orientation) especially including any expected risks during printing
- ┆ Design decisions and alternatives are documented and evaluated thoughtfully

2. 3D Printed Design - Students must create a design that:

- ┆ Prints in less than *3 hours*
- ┆ With a build volume of no greater than *3X3X3in*.
- ┆ Using no more than 5 in³ of build material
- ┆ Using no more than 2 in³ amount* of support material

Final prints will be delivered day of contest so that students can test, assemble/modify and be evaluated.

3. 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.