

# Additive Manufacturing Technology

**CHAIR:** Cameron Collins

**CO-CHAIR:** Rod Murphy

**CONTEST DATE:** April 30, 2020

**CONTEST LOCATION:** Hutchinson Fairgrounds, Encampment Building: Dillon Hall

**CONTEST TIME:** 8:00 am

**PURPOSE:** To evaluate each team's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Digital and Additive Manufacturing. Additive Manufacturing embraces a wide range of materials and derivative processes building parts suitable for end-use service. The virtually unlimited design freedom enabled by additive manufacturing allows the creation of shapes and the integration of feature and function that previously required subassemblies.

Employment opportunities for creative individuals are growing while industry adopts AM methods. Ready access to workstations and service providers make the Internet a growing marketplace for public AM gadgets.

**ELIGIBILITY:** Team of two. Open to a team of two active SkillsUSA members enrolled in programs using 3-D imaging and animation as an occupational objective.

**CLOTHING REQUIREMENT:** Unless the contest chair says otherwise, students are required to wear the Official SkillsUSA Kansas T-shirt and blue jeans (no tears, holes, or bagginess) clean and neat with appropriate shoes for contest or Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes.

Official SkillsUSA white polo attire



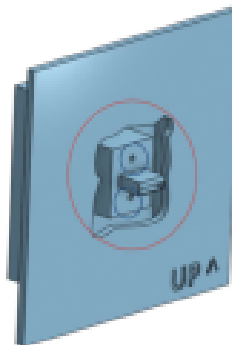


### SkillsUSA 2020 Additive Manufacturing State Challenge

#### 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 "3 hours"
  - With a build volume of no greater than "3X3X3in".
  - Using no more than 5 in<sup>3</sup> of build material
  - Using no more than 2 in<sup>3</sup> amount<sup>1</sup> of support material



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### Materials & Supplies Needed

#### Materials to be Provided by Student Competitor:

- 3D design submitted by 04/17/2020
- Thumb drive loaded with 3D design
- Engineering notebook
- Presentation

#### Materials to be Provided by State Competition Host:

- 3D printed testing rig
- Lumber (something to attach the rig to)
- USB cord (such as iPhone charging cable)
- Screws (must fit through a 2.5mm diameter hole)
- \*Student designs 3D printed

### About the Testing Rig

- The Challenge Rig simulates a piece of drywall with the mounting plate protruding out of it.
- The overall dimensions of the rig are as follows: 100mm (long) x 100mm (wide) x 33mm (tall).
- It is recommended that competition host have the rig printed and attached to a flat surface (a piece of lumber or plywood is sufficient).
- The files to print can be found on GrabCAD here: <https://grabcad.com/library/skillsusa-2020-state-challenge-1>



### Contest Criteria

Prior to contest day:

Students should submit designs by 04/17/2020 to:

DEPCO Support – support@depcolic.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 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 in<sup>3</sup> of build material
- Using no more than 2 in<sup>3</sup> amount<sup>3</sup> of support material

Students must submit .print files to be printed via GrabCAD Workbench and an .STL file, that opens error free, no later than 11:50 "CST" on 04/17/2020. 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.