3D PLATFORM

TRAINING INSTRUCTION

PRINTING THE METAL INSERT BOX

3DPT-0008

VERSION: NOVEMBER 2017

APPROVALS			
Name	**Title**	**Signature**	**Date (YYYY-MM-DD)**
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APPLICABLE MODELS	
Legacy	**Work Series**
☒ X1000	☒ 100
☒ X1000 CE	☒ 200
☒ WorkBench	☒ 300
`	☒ 400

CONTROL STATUS
☐ Confidential
☐ Internal use only
☒ Uncontrolled

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Introduction & Purpose

The insert box is a training tool designed to show the user how to add a desired item into a print cavity. This is a great way to add nuts or bolts, tubing, electronics, etc. into a print.

This training instruction will guide the user through the steps of printing a model with a pause programmed for an insert.

Tools & Materials

- Knife or razor scraper to remove completed prints.
- Calipers or micrometer.
- Print material (PLA material is recommended for calibration prints).
- Calibration chip gcode file
- SD card or network connection to the web interface (WorkSeries and later) to load print files.

Process

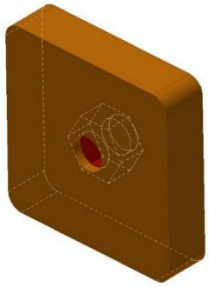
Printing the part

Prepare the printer

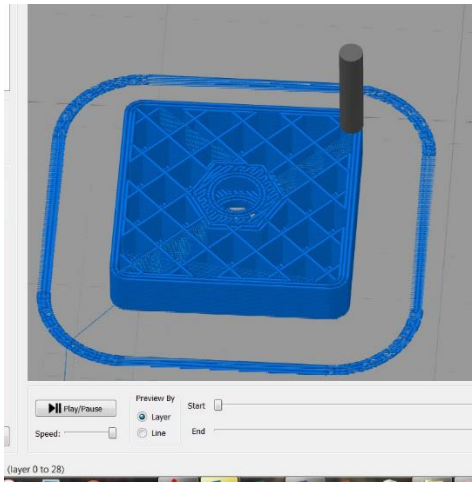
1. Prepare print bed. Clean the print area and apply adhesion agent if used.
2. Load material. Load print material and ensure extruder is extruding material properly.

Prepare the part

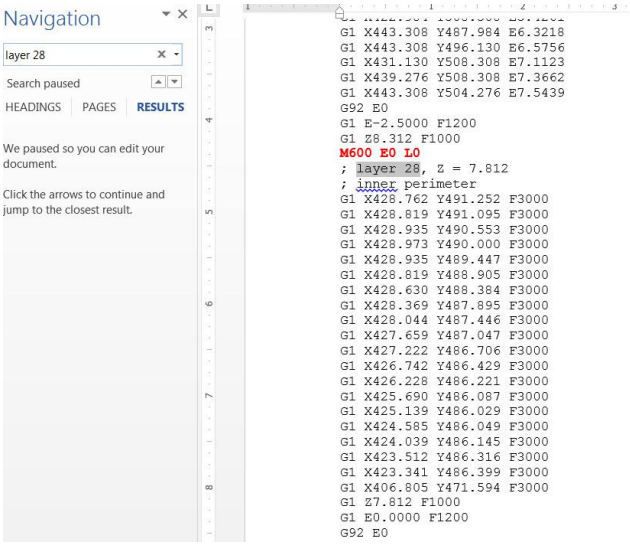
1. Prepare the solid model with a cavity for the insert. In this instance, the cavity has been sized for an M6 nut.



2. Prepare the gcode file. Import the STL file into the slicer and position the model on the build plate. Set the print parameters as desired and preview the gcode file. Find the layer or the height that the print begins bridging over the insert cavity (layer 28 in the image below)



3. Program the pause code. Save the gcode file and open with a text editor. Find the layer or the height that the cavity begins bridging. Enter the gcode command (Marlin: M600 E0 L0, Duet:) immediately before this layer begins printing. This will pause the print before the ridging layer begins to print. Save the updated gcode file.



4. Load file using SD card or web interface.

Start print

Print the gcode file and observe during the print. Ask these questions during the print.

- Is the insert placed into the cavity correctly?
- Is the pause code entered at the correct height?
- Are the top surfaces printing correctly?

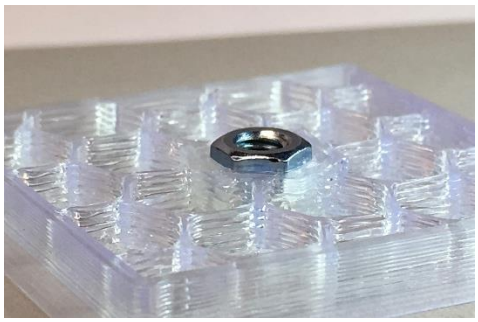
If the insert is not placed into the cavity correctly, the insert may collide with the print head. This could potentially damage the extruder or the insert. If the pause code is not entered properly, the print may not pause or pause in the wrong location. If the top layers are not printing correctly, the insert has the potential of becoming dislodged or falling out.

Inspecting the part

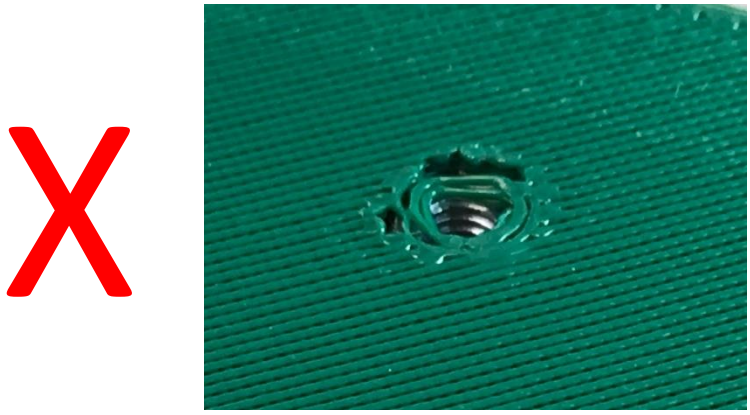
Visual inspection:

Look at the insert cube after removal. There are visual and tactile clues to indicate whether the box has been properly printed. There are three possible errors that could occur

1. The insert is placed incorrectly. If this has occurred, chances are the nozzle or extruder may be damaged. If the print finishes without damage, there may be a rounded or incomplete top surface around the insert.



2. The pause code is placed incorrectly. The print completes without pausing for the insert or the pause occurs in the wrong Z location.
3. Top surfaces printing incorrectly. The insert may be falling out of the print or the top surfaces are not holding the insert properly.



Tool inspection:

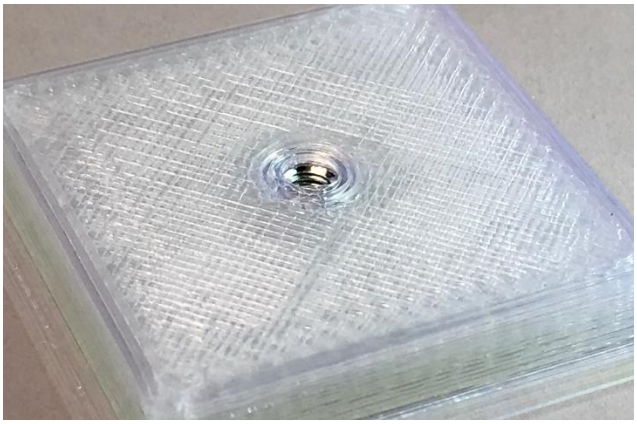
1. Use a set of calipers to measure the outer walls of the box and the Z height. Exact dimension will depend on which gcode file is printed, but will be displayed on the machine control once the print is complete (look for current z height).

Correcting the part

Corrections will depend on what is found during inspection.

1. **The insert is placed incorrectly.** Be sure to wait until the print has paused and the insert is placed into the print cavity. Make sure the insert is pressed down tightly and does not extend above the existing printed walls.
2. **The pause code is placed incorrectly.** Verify the correct layer and height were selected and entered in the correct line of gcode. Verify that the correct code was entered. Marlin and Duet controller gcodes will differ.
3. **Top surfaces printing incorrectly.** If the top surfaces have pillowing or a rough look around the insert, add more top surfaces to the print. Lower the top surface speed for the print. Printing too quickly over the insert can lead to messy layers.

If changes are made within the slicer, reprint the insert cube until the desired result is achieved.



Wrapping up

The insert cube is a great tool to get started with inserts in a 3D print. Try a few different geometries before printing large parts and save your results.

Conclusion

The insert box is a simple but effective tool to introduce the possibilities of inserted materials and objects into printing. This print demonstrates the importance of finding the correct height, programming the pause correctly, and provides a foundation for printing with inserted objects.