Vacuum Forming Guide

Architecture Dept. 4/10/2017
# Vacuum Forming Guide

## Revision Table

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SAFETY AND CONDUCT

• Make sure that there are no materials behind the fan, on top of the heaters, inside of the Vacuum Former, on the safety metal tray, or on the wooden vacuum table.

• The equipment has movable parts, make sure nothing is obstructing its path.

• Dusting off the equipment may be necessary before use.

• **DO NOT** leave the equipment unattended during use. This will result in the suspension of your shop privileges.

What can & can’t you vacuum form?

• If the plastic piece wraps around your mold **THINK** about how you would separate them. **If your mold is a convex object, such as a sphere, the plastic will wrap around it and you will not be able to get it out. Build your objects to avoid non-removable undercuts.**

• It is critical that the mold does not exceed the dimensions of the table (**21.5” by 21.5”**) as it may obstruct the path of operation of the equipment and damage your mold or the equipment.

• This equipment uses vacuum pressure. If your mold is flimsy or delicate, you run the risk of damaging it. Use a firm material for your base mold. **Clay (fully dry), wood, plaster, and laminated chipboard topos make for good base molds.**
  
  ▪ If your mold includes a large base think about the airflow of the vacuum. You may need to drill holes through your model in order to get the proper amount of airflow.

  ▪ **Bare pink foam/Styrofoam** may be suitable for single use molds (the heat of the plastic may deform the foam after single use. We do not recommend foam for delicate, small parts and details.)

• **Recommended thermoplastics for use are ABS and PETG, between .04 - .08” thick.**
  
  ▪ **Each sheet MUST be cut to 24x24”**

  ▪ **WE HIGHLY RECOMMEND HAVING MULTIPLE PLASTIC SHEETS TO FORM WITH**
MACHINE OVERVIEW

Familiarize yourself with the location of all the controls.

Air supply is on the wall to the left of the control panel (see photo in the Machine Operation section).
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**Control Panel**

- **Touch screen**

- **Hand Light indicator**
  - It starts the cycle and controls the sliding motion of the plastic holder.

- **UP**
  - Controls the upward motion of the perforated wooden table and the vacuum action.

- **START**

- **HAND/OFF/AUTO Switch**

- **AUTO Light indicator**
  - It cancels the command been perform.

- **STOP**
  - Controls the downward motion of the perforated wooden table and the release air.

- **EMERGENCY STOP**
Moveable Parts

**Plastic Holder** Moves back and forward

**Plastic Holder** opens and closes

**Perforated wooden table** moves up and Down
MACHINE OPERATION

Setup

- Make sure the air valve on the wall is open (lever parallel to pipe)

- To turn on the Vacuum Former, flip the main power switch on wall to ON, turn the black power knob to ON, turn the Heaters knob to ON, turn the Pump knob to ON.
  - Yellow indicator lights will come on for each

  Main Power Switch
• Place a **24” by 24”** piece of plastic in the plastic holder. Make sure to clamp it down firmly by pressing the handles on the left and right side of the plastic holder all the way down. Verify that the holder is firmly holding the plastic all the way around the edge.

• Prepare the mold w/ a mold release agent. Ask staff for access to petroleum jelly. The release agent must be spread onto all areas of the mold that will be in contact w/ the thermoplastic.

• Place the mold on top of the perforated wood table (please review the section “What can & can’t you vacuum form?” section above for construction and size requirements).
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**Automatic Operation**

- For projects that require multiple pulls, utilizing the automatic mode cycles may be more efficient. Setting up and using a recipe will automatically run the machine through the entire vacuum forming process depending on set variables:

On the touch screen you will see the following display. Press “SELECT RECIPE”. This is where you adjust the parameters of the vacuum forming cycle.

Press “PLANNING” in order to access the list of parameters to adjust.

**HEAT ON TIME** refers to time in seconds that the plastic will be under the heat.
You may make changes to the SETTING PARAMETERS by directly pressing on the values. Remember the time is in seconds. Press “ENT” when you are done.

**BOTTOM PLATEN DELAY:** amount of time in seconds that the perforated wooden tray takes to rise up after the holding tray comes out of the heat. *(0.00 SEC. RECOMMENDED)*

**BOTTOM TIMER:** amount of time in seconds that the perforated wooden table would stay in the up position. *(30 SEC. RECOMMENDED)*

**VACUUM DELAY:** Vacuum Delay refers to amount of time in seconds before high pressure vacuum starts once the perforated wooden table is in the up position and the properly heated plastic is ready to be formed on top of your mold. *(2 SEC. RECOMMENDED)*
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**VACUUM TIME:** Is the duration (in seconds) the vacuum will stay on. (This step determines how tight the plastics wraps around your base mold) *(60 SEC. RECOMMENDED)*

**AIR EJECT:** Is the time in seconds between Vacuum Time and the depressurization. In other words, the time that the form would stay pressurized. (This step determines/prevents the plastic from retracting from your mold) *(2 SEC. RECOMMENDED)*

**LENGTH OF TRAVEL:** The time allowed for the perforated wooden table to come back down. (Do not change this setting unless you want the perforated wooden table to lower all the way down after the vacuum forming is completed.) *(2 SEC. RECOMMENDED)*

**MOLD-COOL TIME:** Time in seconds for the cooling fan to stay on after the vacuum forming process is complete.
PART-COOL TIME: time in seconds that the newly formed piece would stay in place (even after the fan shuts off)

HEATERS: You can adjust the power level of the 4 top heaters separately. (This is not recommended - keeping them the same is recommended)

- After pressing “NEXT” on the “HEATERS” menu, the system will take you back to the “SELECT A RECIPE” menu screen.

- Press “SAVE RECIPE” followed by “USE RECIPE” to save your settings.

(This is a crucial step to save any changes made to the preset parameters)
• Press “EXIT” after saving your settings. It will take you back to the following screen where you would be able to see the timing of each parameter as they get executed.

• We strongly recommend a “dry run”. Meaning running a test cycle without molding plastic to make sure the recipe parameters are correctly set.
• Locate the Settings control panel and turn the knob toward the right to “AUTO”

• Press the “START” and watch it go. The machine will perform an entire cycle following the set parameters.
Make sure to turn off the equipment and close the air valve when you are finished.
Manual Operation

HAND mode offers you greater control over your vacuum forming process, and may be more efficient and accurate for single-pull projects. Note: This mode also requires closer attention. All the parameters described in the previous section “VACUUM FORMER SETTINGS” can be performed directly by the operator. Read over that section to become familiar with the parameters before continuing with HAND MODE. Refer to the “Safety and Conduct” & “Getting Started” sections before turning the machine ON.

- **“HAND MODE” still requires the time parameters to be set.** Ex: Say the “HEAT ON TIME” parameter is set for 30 seconds; this would be the total time that the holding tray would stay under the heater each time. Set this and any other parameter to your desired times before hand. We recommend making the HEAT ON TIME parameter higher than you may think you need, because you can always stop it once it is heated enough.
- **Become familiar with the Control Panel**

  - **Hand Light indicator**
  - **HAND/OFF/AUTO Switch**
  - **AUTO Light indicator**
  - **START**
  - **STOP**
    - It cancels the command been perform
  - **Down**
    - controls the downward motion Perforated wooden table and the release air
  - **UP**
    - controls the upward motion Perforated wooden table and the vacuum action
  - **EMERGENCY STOP**

- **We strongly recommend a “dry run”.** Meaning running a test cycle without mold or plastic. (Get familiar with the machine)

- Locate the “Settings” control panel and turn the knob toward the LEFT to “HAND”
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- **START Button**: Press once and the plastic holder will slide under the heaters
  - (Remember that it will stay there for the time set under “Heat on Time”) unless stopped manually by pressing STOP
  - Be prepared to move quickly on the next few steps before the plastic cools
- **STOP Button**: Press once the plastic piece is warm enough (when it is sagging evenly and looks like a giant bowl or bubble, approx. ~2” from its original state) to bring the plastic frame back above the perforated table. Move quickly:
- **Press UP**: elevate the perforated wooden plate into the plastic
- **Press UP**: a second time to turn on vacuum
  - Allow around 15-20 seconds for the plastic to fully form around the object
- **Press UP**: a third time to turn on the cooling fan
  - Let the plastic cool for approx. 1 minute
- **Press and hold DOWN**: release pressure and lower perforated wooden table to its original position and out of the plastic sheet
- Unclamp and remove the molded plastic.

Make sure to turn off the equipment and close the air valve when you are finished.